UTA SERVICE CHOICES

JUNE 2020

Final Summary Report

UTA

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

Introduction and Design Principles

Introduction and Design Principles

About this Report

The UTA Service Choices project was a comprehensive effort to review, and if necessary redesign, the UTA bus network. The work was interrupted by the COVID-19 pandemic when it was close to completion.

This report presents an outline of the project's main findings, including the recommended network plan. The goal of this report is to organize useful insights from Service Choices to support service planning into the future.

About UTA Service Choices

The extensive work on this project was in three phases.

In the first phase of the project, in winter 2018-2019, a report called "UTA Service Choices" was produced. This report provided a detailed review of existing (late 2018) network performance in the context of the region's evolving needs. The report also identified important policy questions for future service design efforts to consider.

In the second phase, in the spring of 2019, community leaders and the public were engaged to think about the difficult choices that need to be made in a network design.

The feedback from this outreach process guided the design of the draft network plan, which was the third phase. In a week of full-day intensive workshops with UTA staff, the Metropolitan Planning Organizations, UDOT and other key government stakeholders, the draft network plan was drawn in detail. After many conversations with UTA bus operations staff and leadership, revisions to the network plan were made prior to its planned presentation to the public. The pandemic interrupted the process at this point.

The last phase of this project was to have compiled this Draft Plan and revisions, along with additional analysis on potential impacts on job access and other indicators, so that the plan would be ready to be presented to the public.

The final report was also to include a discussion of the relationship of this plan to the Core Routes networks contained in WFRC and MAG's Regional Transportation Plans (RTPs). That discussion appears in this report.

Effect of COVID-19 Pandemic

The COVID-19 emergency began during the late stages of work refining the network designs that were intilally developed by UTA staff, partners and the consultant team in Fall 2019. While substantial revisions were made to the plan during the period from October 2019 to March 2020, based on feedback from planning staff in each of UTA's business units, these conversations were still ongoing as the emergency began.

Near the beginning of the COVID-19 emergency, as UTA rapidly shifted to a reduced service level on most of the network, the consulting team was asked to review the Service Choices Draft Plan and identify independent groups of route redesigns that UTA could consider implementing during future service changes as service is restored. This material was delivered separately.

The conditions and financial resources for which the Draft Plan was designed no longer exist and may not exist again, so the Draft Plan is no longer a recommendation. However, it contains many good design ideas that were developed in consultation with key UTA departments and local government partners, and were reviewed by the Board and Executive Team. Many of these ideas are still relevant and should be a basis for further planning in light of the still-changing facts of the pandemic.

Figure 1: What the project did

Introduction and Design Principles

In the Choices Report, we identified key questions the Board must provide direction on in order to design a coherent Draft Service Plan. These questions were then asked of the stakeholders and the public during the outreach phase. The questions were:

- How should resources be divided between ridership goals and coverage goals?
- For service motivated by coverage, what priorities should govern its design?

Ridership or Coverage?

The many different goals of transit service can be sorted into two major categories: ridership goals and coverage goals.

Ridership means attracting as many riders as possible, even if service is not available in as many places.

When we do this, we also work towards the following goals:

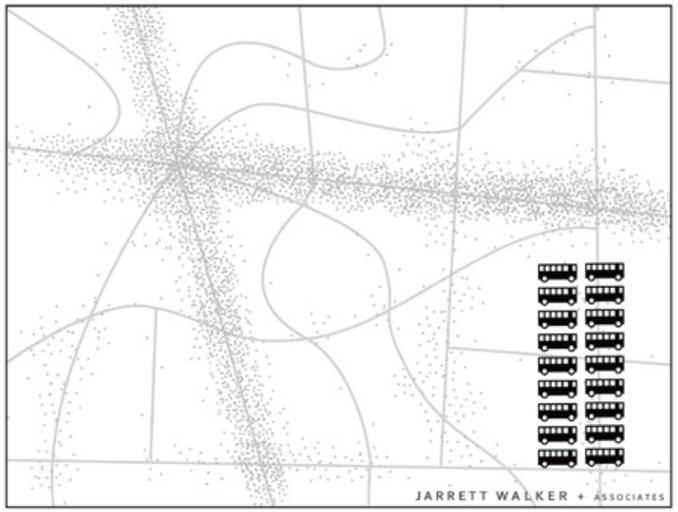
- Compete more effectively with cars, so that more people can travel down a busy road.
- Collect more fare revenue, increasing the share of our budget paid for by fares, assuming that fares don't change.
- Make more efficient use of tax dollars by reducing the cost to provide each ride.
- Improve air quality by replacing single-occupancy vehicle trips with transit trips, reducing emissions.
- Support dense and walkable development and redevelopment.
- Provide the most useful and frequent services to more people.

When we concentrate our most useful services in the places where the most people can take advantage of them, we do all of these things at once.

Coverage means being available in as many places as possible, even if not many people ride. When we do this, we can also work towards the following goals:

- Access for people without other travel options. This can

The Ridership / Coverage Tradeoff



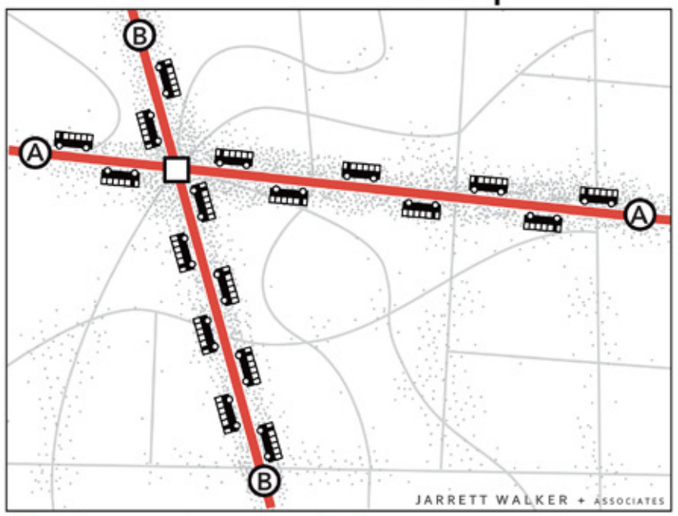
Imagine you are the transit planner for this fictional town.

The dots scattered around the map are people and jobs.

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

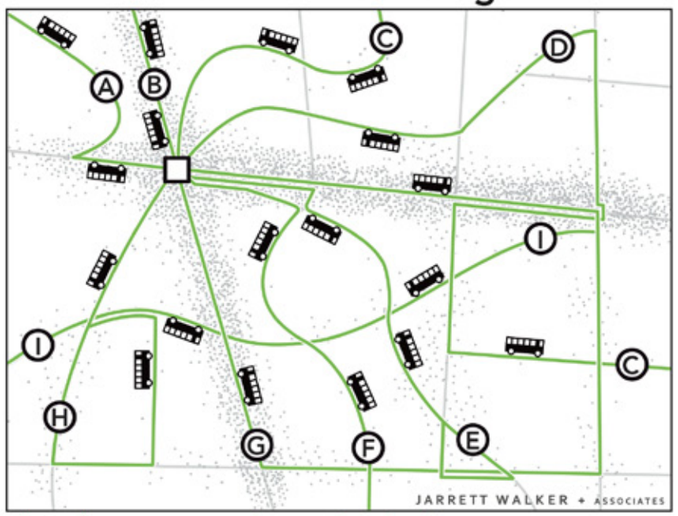
Before you can plan transit routes, you must first decide: What is the purpose of your transit system?

Maximum Ridership



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

Maximum Coverage



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

include low income people, elderly people, and disabled people, among others.

- Provide some service to everyone who pays taxes to support UTA.
- Support for lower density development, such as new low-density suburbs around the edge of the region.

These goals lead us to spread service out so that everyone gets a little bit, which is different than what we do when we are seeking ridership.

Spreading service out means spreading it thin. If UTA buses need to cover every part of the region, we have to run lots of routes. When we spread our limited budget over all those routes, we cannot afford to run very much service on each of them. That means those routes won't be very effective, because they won't run often enough, or late enough, to be there when you need them.

Ridership goals and coverage goals are both very popular. But no transit agency can pursue both goals with the same dollar, because the goals require very different kinds of bus networks. UTA, like every agency, has to decide how much of its budget it will spend pursuing ridership goals, and how much it will spend on coverage goals. There's no right or wrong answer to this question: It depends on your priorities.

What does planning for ridership mean?

Suppose, for a moment, that we planned the network for high ridership. This network would seek to be useful to the greatest number of people. What would that mean?

When a store or restaurant opens in new town, it will often fail or succeed based on its location. You want to open your business in a place with many potential customers, where it will be easy for people to make the decision to come into the store and buy your products. This is why you so frequently see a fast food restaurant or coffee shop at the intersections of busy streets, and not tucked away in neighborhoods. These businesses know that their best markets are where many people are always passing by, and where it's quick and convenient to stop in to pick up a cup of coffee or lunch.

When we are asked to plan for high ridership, we are being asked to think like a business; to identify the best markets with the most potential customers, where useful transit services can compete for the greatest number of trips. We'd concentrate cost-effective, useful service where lots of people can benefit.

Why are Coverage goals important?

Coverage services are not about ridership, they are about availability. For example, we might measure coverage as the percentage of the population that's within 1/2 mile of some service. The goal of coverage service is to make that number high, even if the result is low ridership.

Dividing the Budget by Priorities

Every transit agency has to decide how much of its budget to spend on ridership goals as opposed to coverage goals. A clear statement of policy on this question is a percentage of the operating budget to be devoted to ridership, and the rest to coverage.

To start this conversation, we assessed the current split of service, as shown in Figure 2. The split is dramatically different in the Mt. Ogden Business Unit, with a much higher share of resources devoted to coverage there.

There is very little duplication.

In this analysis, duplication refers to places where multiple parallel routes run along the same street (or on streets very close to each other) for a long distance. If these routes do not combine to form a higher frequency, then the service is meeting neither ridership nor coverage goals. Many agencies have considerable duplication, but UTA has very little.

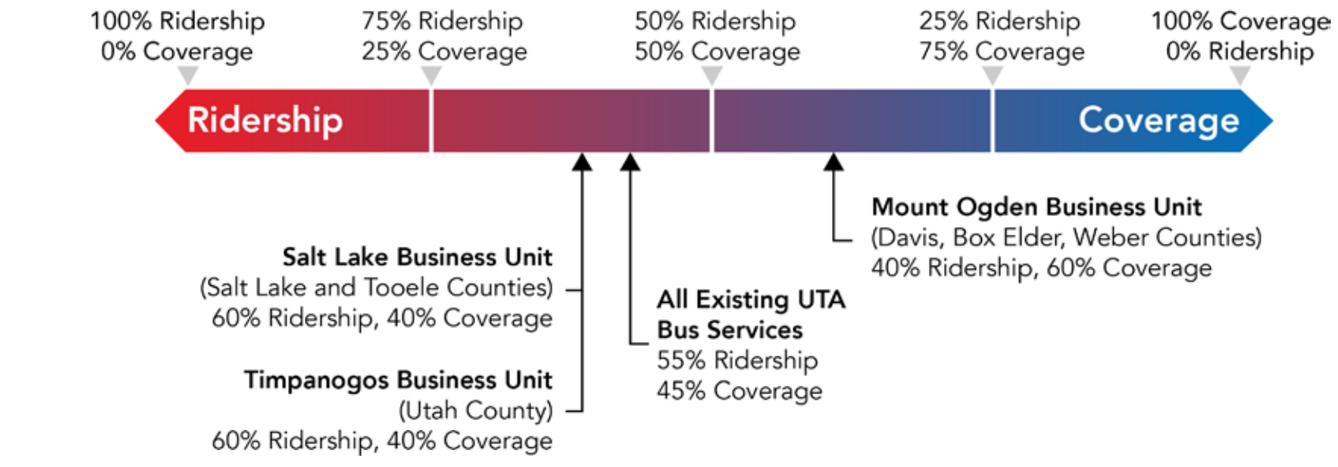


Figure 2: UTA existing services' ridership and coverage purpose

Focus of Coverage Service?

While meeting ridership goals can be assessed through ridership, meeting coverage goals requires an additional question: coverage for whom?

When people ask for coverage services, they usually give one of three reasons.

1. Transportation Options for People Who Cannot Drive

The first of these, "access for people who cannot drive," is about what people often call the social service function of transit. That is, a transportation option for people with few other choices, who are located in places where high-ridership service would not go.

This could include sites like senior living communities in suburban or rural areas, isolated lower-income communities with low vehicle ownership rates, and important destinations like community colleges or social service agencies that have chosen to build facilities in environments that are difficult for transit to serve efficiently. These are all places where some people need the service badly, but it doesn't mean that many people would use the service compared to higher-density areas that are more efficiently integrated into the rest of the transit network.

2. Some Service for Everyone Who Pays

Everyone who pays taxes into UTA could reasonably expect some service in return. This is the second common argument for coverage services.

You could also argue that even people who don't have a bus route close to home are benefiting from UTA through reduced traffic congestion and other benefits to the economy.

Still, some people want service to everywhere that pays taxes, and this is a common reason for coverage service to exist.

3. Supporting Future Development

The last reason is about the future. Sometimes, transit agencies are asked to offer a service today in places that are expected to develop in a way that may generate high ridership in the future. Developers of new neighborhoods often want transit to be there early, before there are many people, so that it is available right as people move in. This is a low-ridership service until there are enough people there.

Key Insights from the Choices Report

Key Insights from the Choices Report

Although the Choices Report was published in early 2019, much of its content and methods are still useful. Here are some key highlights.

Access Analysis

While ridership goes up and down for many reasons, ridership potential arises mostly from access, which is a measurement of how many jobs and other useful destinations a person could get to on transit in a fixed amount of time. Access has three main values as a measure:

- It describes how likely it is that a particular person will find the service useful for a trip they already make.
- It measures transit's ability to provide access to jobs and opportunity. This is an important public policy outcome independent of the ridership it generates.
- It is a purely geometric calculation based on the network design and development pattern. As a result, the benefit it describes is relatively permanent.

Access is the physical dimension of personal freedom. Our freedom lies in the presence of meaningful options of things we could do, and to the extent that these things require leaving home, access quantifies this range of possibilities.

We calculated access for every small zone in the region by looking first at the area that is reachable from that zone in 30, 45, or 60 minutes (Figure 3). We then calcuated the number of jobs in this reachable area for every zone, yielding the results shown in Figure 5.[1] From those maps we calculated the access for an average person in each of service regions (Figure 4).

During the development of the Draft Plan we reviewed how various ideas improved access from key locations of concern. We recommend continuing to use this methodology in future service planning.

Details of our access analysis methodology can be found in the appendix.

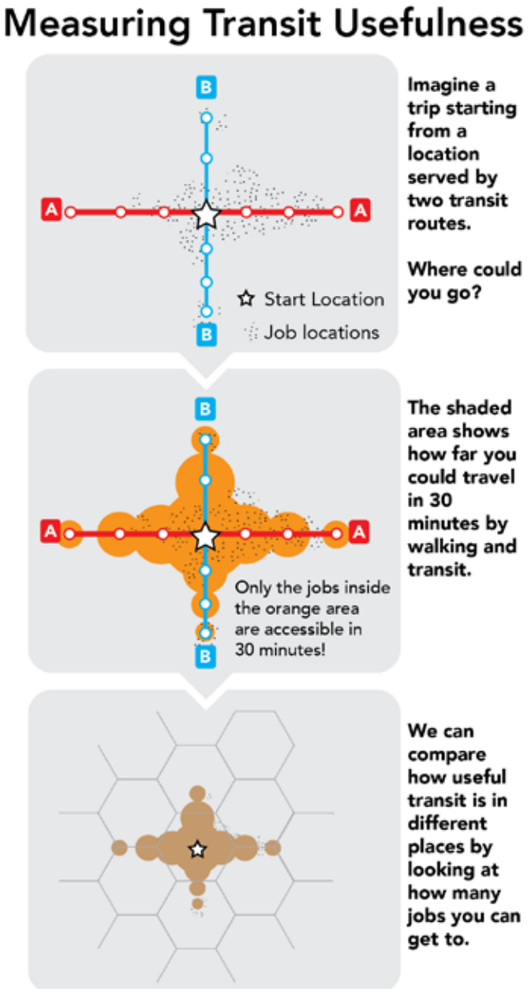


Figure 3: Measuring Transit Usefulness

	Average jobs accessible at noon per person in...		
Region	30 minutes	45 minutes	60 minutes
Central (Salt Lake County)	7,700	34,100	87,100
Central (Tooele County)	600	1,400	2,000
North	1,800	6,000	13,700
South	5,100	16,900	33,800

Figure 4: 60-Minute Access to Jobs (Weekday)

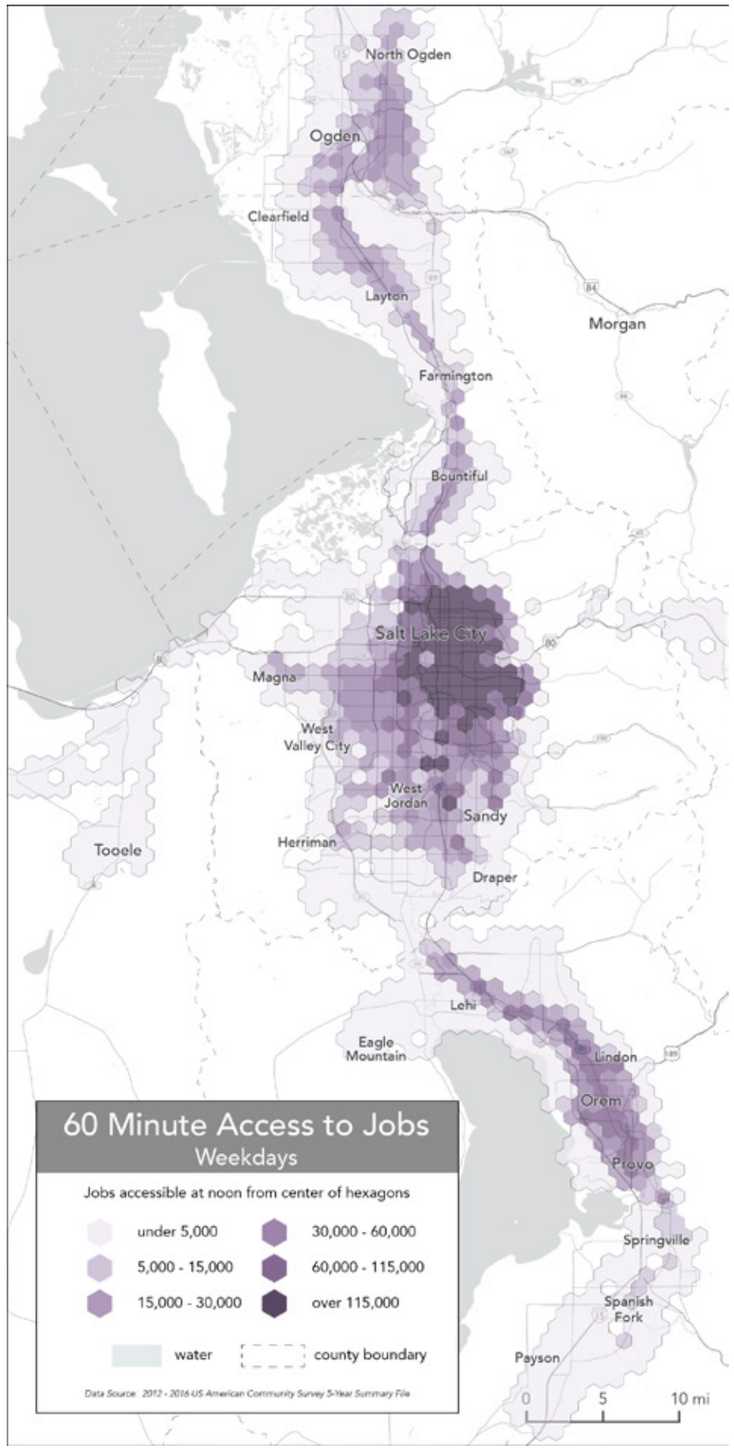


Figure 5: 60-Minute Access to Jobs (Weekday Midday)

1 Jobs are not the only important destination, but the only one for which detailed location data is readily available.

Key Insights from the Choices Report

Frequency as the Foundation of Ridership

Access by car lies mostly in the speed at which the car can travel along its path, but transit access has three elements:

- The walk to and from the service.
- The wait, measured by frequency.
- The ride, measured by average operating speed of the vehicle.

Over the typical distances of local public transit, the wait is often the dominant element. For that reason, frequency needs to be a focus of high-ridership planning.

Frequency provides three benefits to the rider that are logically independent.

- It governs waiting time.
- It makes fast connections possible, which makes it easy to travel beyond the area served by the route that you live on.
- It is a backstop for reliability: if a bus is late, another will be along soon.

Because these benefits are logically independent, it is not surprising to find that the payoff of frequency is very high. Figure 7 shows the productivity of UTA routes (ridership divided by the quantity of service provided to achieve it), compared to the frequency of the route. While many other geographical factors affect ridership, it's clear that on average more frequent routes tend to be more productive, even though higher frequency means a higher quantity of service, which pulls the productivity ratio down.

The relationship visible in UTA data is also visible across the transit industry generally. Figure 6 makes the same comparison for routes in 25 cities across the US. Again, although there is a large range of productivities at each frequency, which reflect other geographic factors about each route, productivity is generally higher at higher frequency.

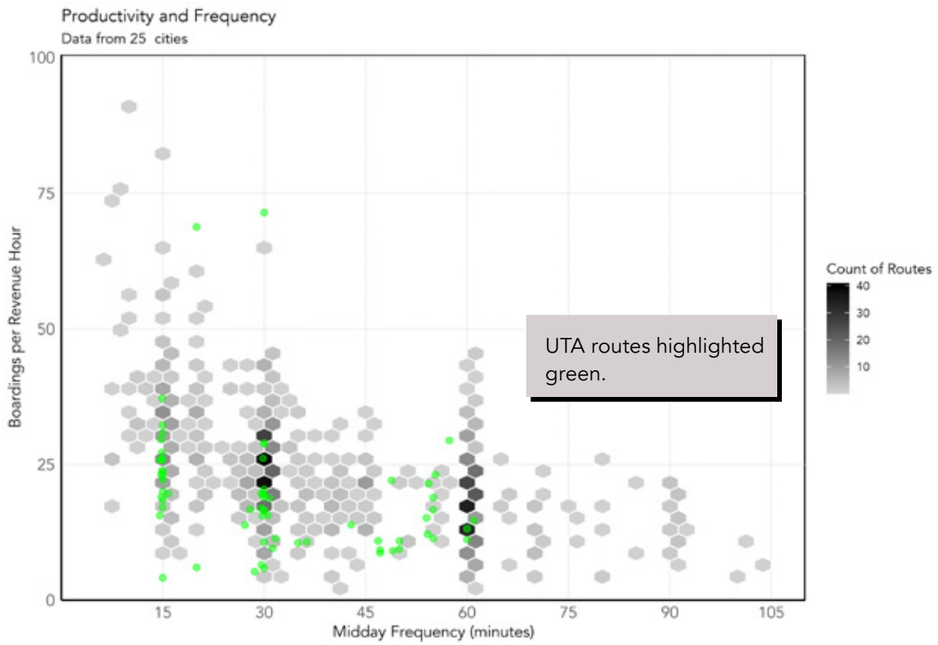


Figure 6: Frequency and Productivity - Data from UTA and 24 other US transit agencies

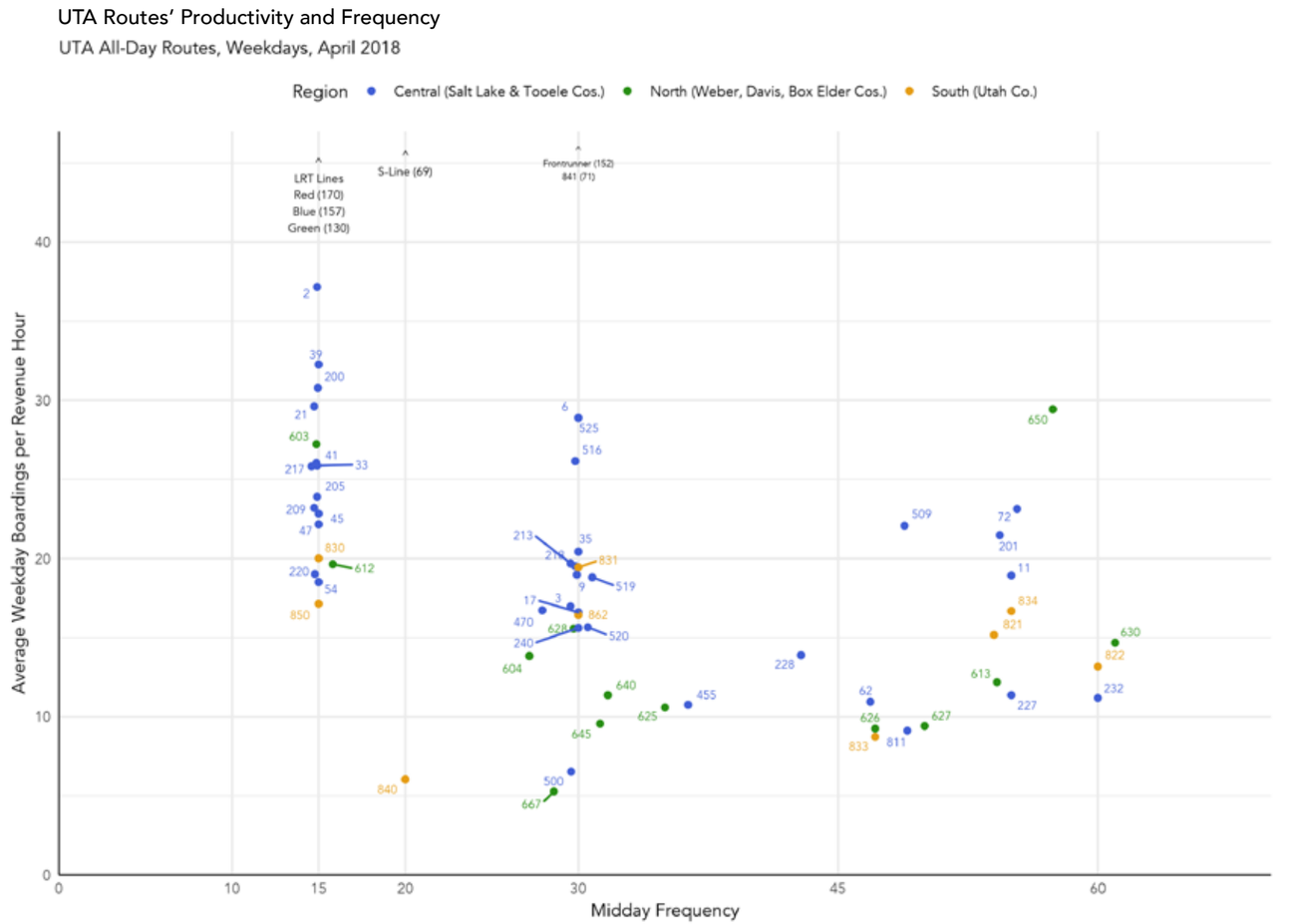


Figure 7: UTA Route Productivity and Midday Frequency

Key Insights from the Choices Report

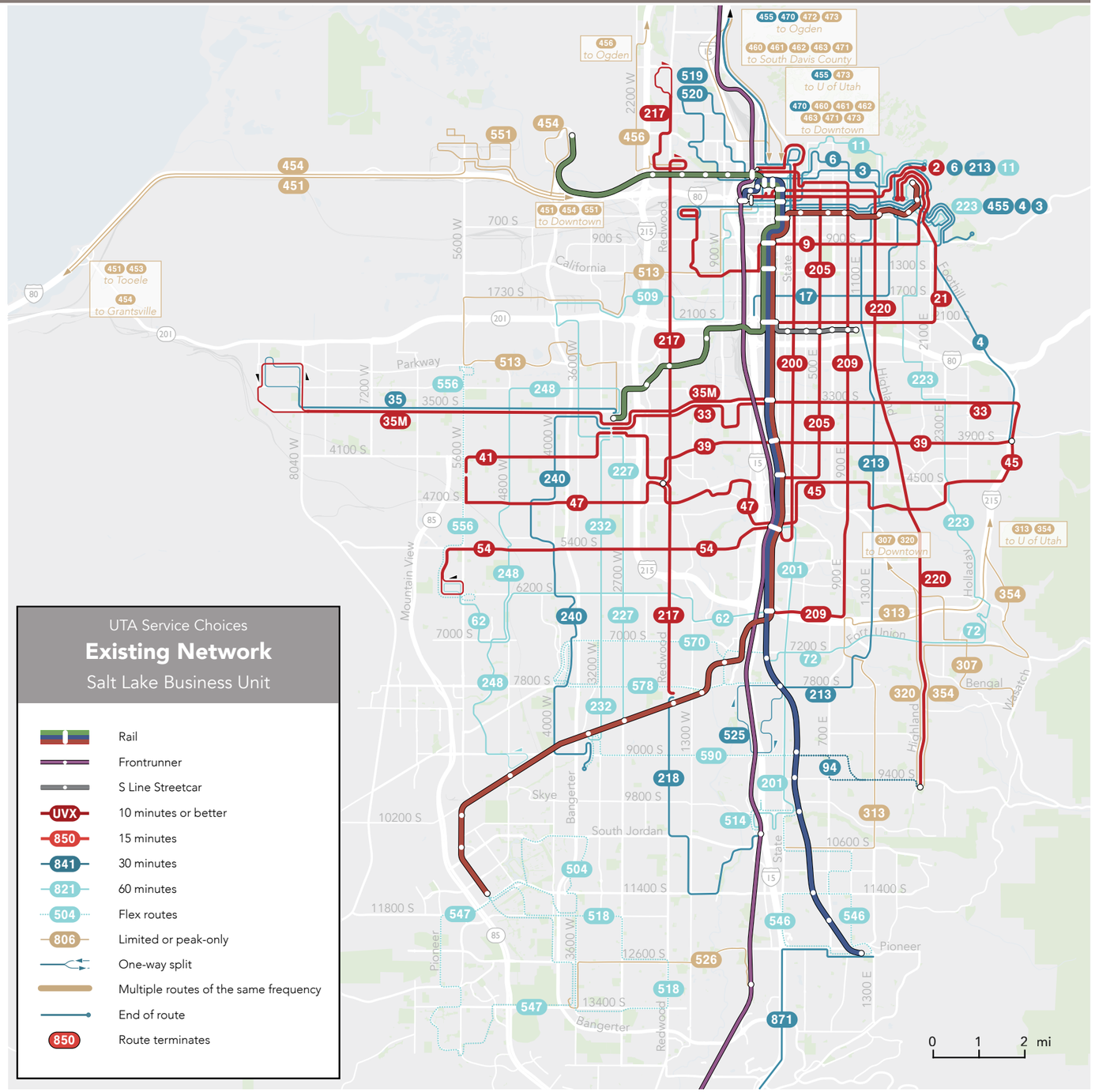
The Frequent Network

The benefit of frequency tends to increase dramatically at frequencies of around 15 minutes. In both of the figures comparing productivity and frequency, a frequency of 15 minutes or better seems to correlate with higher productivity. This happens because this frequency makes transit much more useful. Access analysis (which combines the effect of walking, waiting, and riding) tends to improve dramatically where this frequency is offered.

All day 15 minute frequency is offered across most of the denser parts of the region, as shown in Figure 8, Figure 9, and Figure 10.

However the network evolves in the future, frequent transit must be the backbone of any network that enhances access and thus sustains ridership potential. In initial responses to the pandemic, while many transit agencies cut frequency, a few, such as San Francisco's Muni and Atlanta's MARTA, increased walking distances in order to protect frequency -- by turning off routes that were close to other routes. These options will need to be carefully considered during the pandemic and beyond, because without a backbone of high frequency service, the network will simply not be useful for most trips.

Figure 8: Central Region (Salt Lake County) Transit Network Frequency



Key Insights from the Choices Report

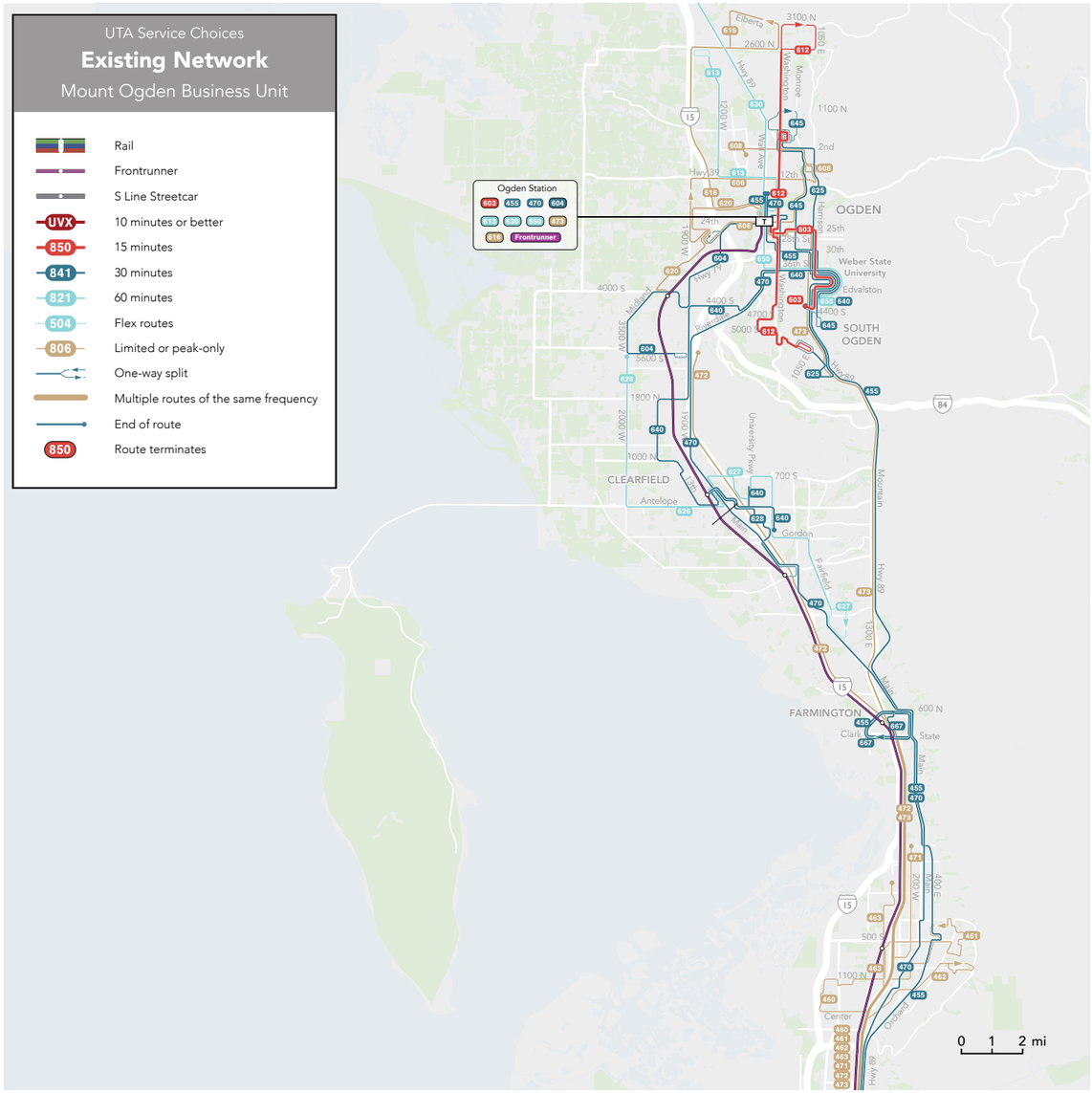


Figure 9: Northern Region (Weber, Box Elder & Davis Counties) Transit Network Frequency

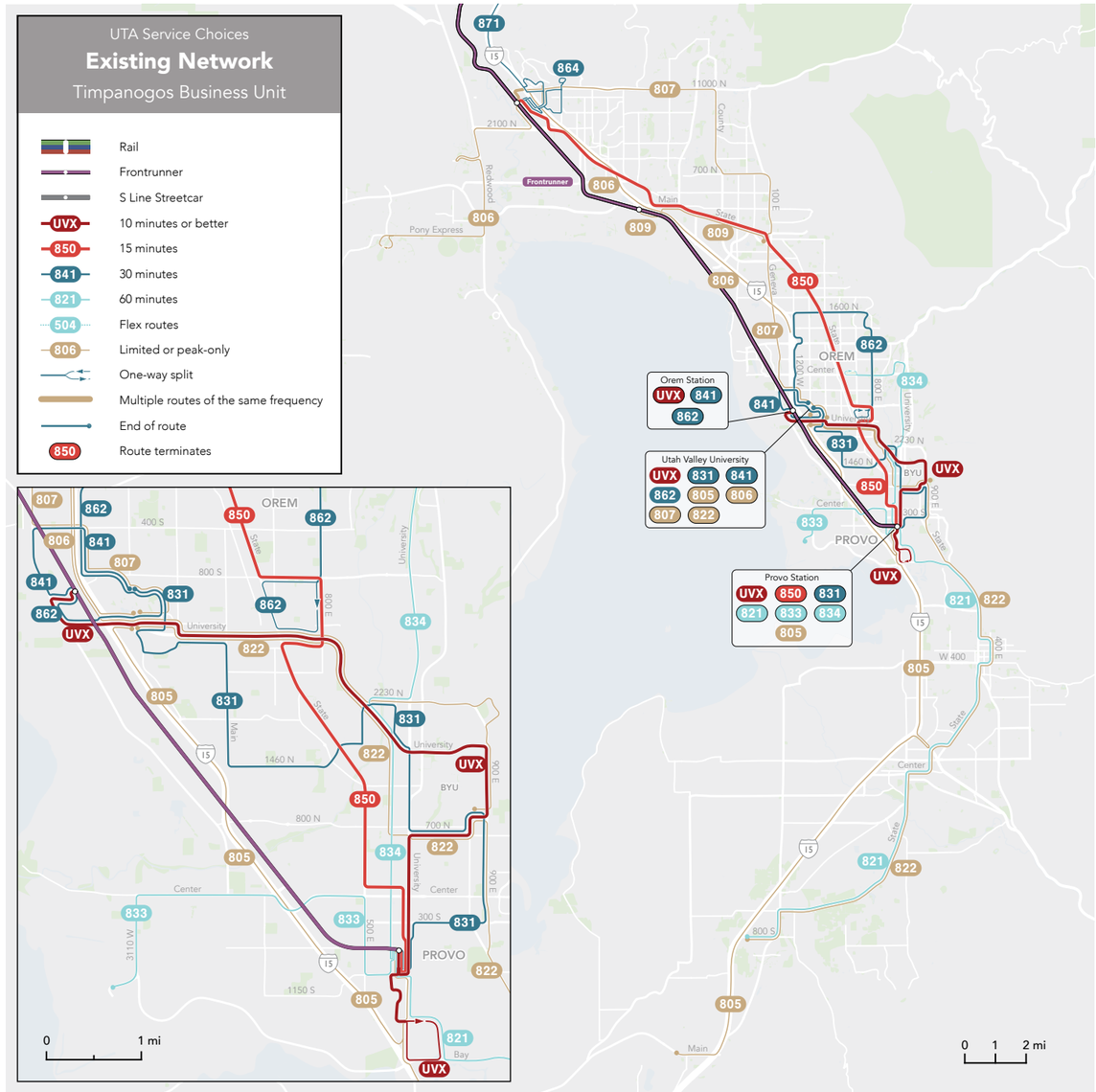


Figure 10: Southern Region (Utah County) Transit Network Frequency

KEY INSIGHTS FROM THE CHOICES REPORT

Key Insights from the Choices Report

Challenges in the Development Pattern

The development pattern of the service area presents many barriers to effective transit service.

In general, transit provides cost-effective access in places that are:

- Dense, so that there are many potential riders (and destinations) around every stop.
- Walkable, so that people can walk to the stop from homes and destinations nearby.
- Linear, so that the bus can go in a reasonably straight line that maximizes access for the most potential customers.
- Proximate, that is, without the need to cross long rural gaps. Outlying destinations on the edges of the service area are more expensive to serve because of the distance that must be crossed to reach them.

Where a development pattern provides these features, very high levels of access can be provided at a low cost per rider, achieving ridership most efficiently. Where those features are not present, cost per rider will be higher because transit must traverse a longer distance to serve fewer people. Poor linearity also means that transit must travel a circuitous path that deters passengers riding through.

This ridership-coverage tradeoff, discussed on page 5, arises from the question of how to serve these areas where the geometry of development is less favorable to transit. In general, those are the areas that would not be served if the goal of the entire network were ridership, so they tend to be served only when service is allocated to a coverage goal. This is why it was necessary to ask the public to think about the ridership-coverage tradeoff. The result was the public conversation to which we now turn.

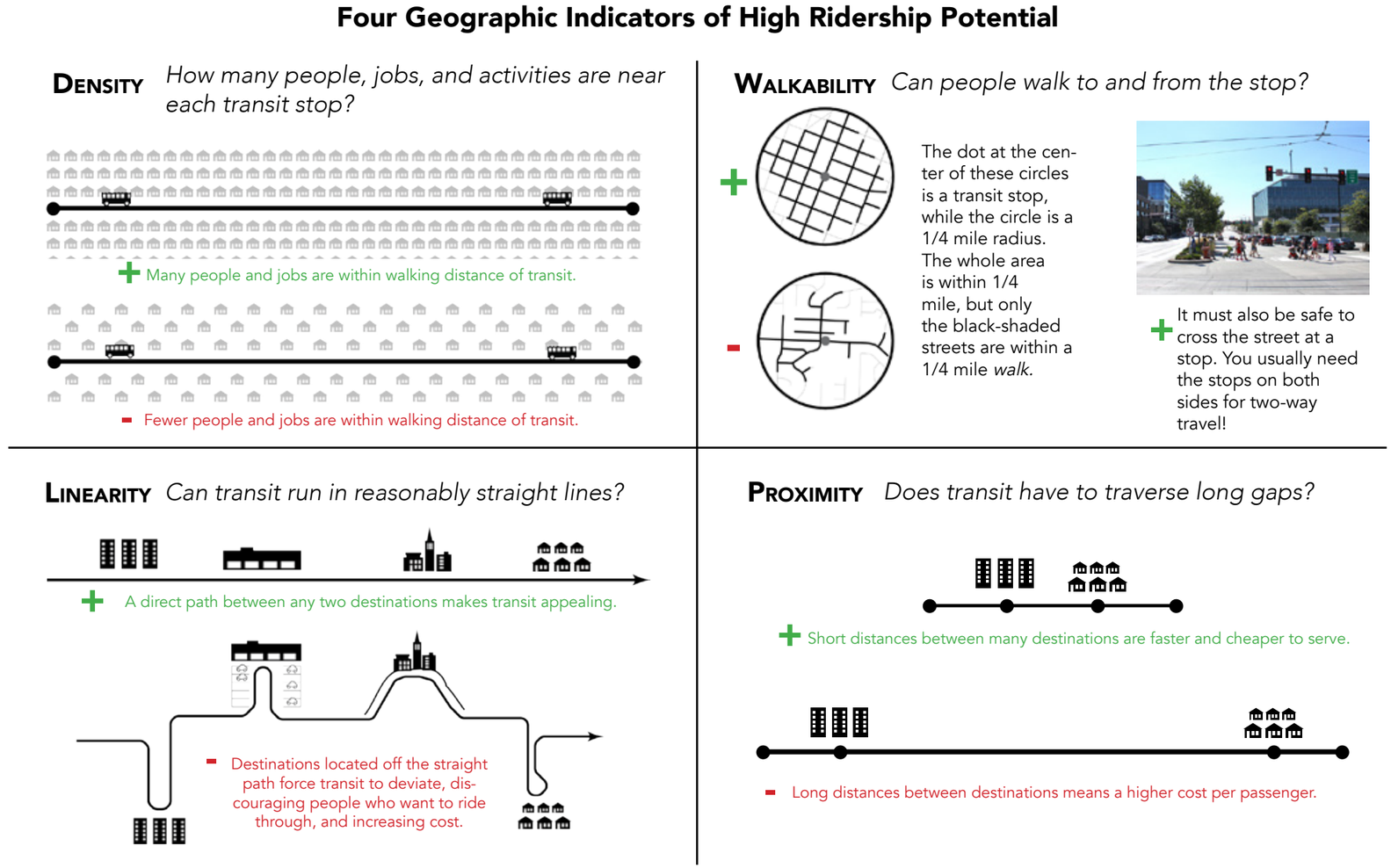


Figure 11: Community Geometry - Four Geographic Indicators of High Ridership Potential

How Public Input Shaped the Plan

How Public Input Shaped the Plan

The first step in developing direction on the design priorities of the Draft Plan was to consult the public and community leaders on their goals and priorities for transit. UTA, assisted by JWA and the Langdon Group, conducted a public outreach process that spanned the Wasatch Front metropolitan area and aimed to include all taxpayers, whether they were regular transit riders, occasional transit riders, or had never ridden transit.

Outreach efforts included:

- A **series of four community leader workshops** were held throughout UTA's service area. JWA facilitated these workshops to inform community leaders and gather their feedback on the balance between ridership and coverage.
- A **public web survey**.
- **Engaging local elected officials**, partner agency leadership and staff was key to the overall engagement plan that JWA created. To reduce "planning fatigue" and to be efficient with busy schedules, the Service Choices messaging was presented to these audiences at meetings and engagement opportunities that participants already regularly attend.
- **Three public open houses** were held in the three UTA service areas, one per service area. Any member of the public was invited to attend these events; however, they were carefully crafted to be accessible for paratransit riders to further ensure that the Service Choices events were inclusive. The open houses were advertised on socail media, UTA's website, and through mailers sent to paratransit riders with specific information about the public meetings. The public open houses featured information boards, an electronic survey station, and had UTA staff available to answer questions.
- **Six booths at public events** on fourteen days were staffed in the three service areas, totaling two per service area. These events were hosted in partnership with local community festivities with the goal to reach more members of the public at events they were already attending to engage a broader cross-section of the public.

The Key Questions

Each of these outreach efforts asked its audience to provide input on three major questions to guide UTA's future service design. These questions are about balancing competing goals that are both desirable, but which cannot be achieved through the same service design approach within a limited budget. The decision that is needed is thus fundamentally like creating a budget, where the question is not "are these good things to spend money on?", but rather "which are more important, given that we cannot afford everything?"

We identified three critical questions for members of the public, community leaders, and ultimately UTA's Board to provide direction on:

1. When deploying the existing operating budget (potentially moving service from one place to another), how should UTA balance the competing goals of ridership and coverage?

2. When deploying new resources, how should UTA balance the competing goals of ridership and coverage? (This question was asked in all business units but is currently relevant only in the Salt Lake Business Unit, where new resources for bus service are available.)

3. When deploying service with a coverage goal – in expectation of low ridership – what should be the primary principle governing that service design:

   - Serving people with no alternatives, including seniors, youth, and people with low incomes.
   - Responding to growth, by extending service to newly developing communities.
   - Serving everyone who pays taxes. This principle would lead us to try to provide service absolutely everywhere in the service area.

The Key Questions

How should UTA balance the competing goals of ridership and coverage...

... with its existing resources?

... with new resources?

When coverage is the goal, should we prioritize people with no alternative mobility options, rapidly developing communities, or try to serve each taxpayer?

How Public Input Shaped the Plan

What did we hear from community leaders and members of the public?

This outreach process involved many tools, including a public online survey and hands-on workshops with community leaders. Each were designed to directly ask people about their priorities for transit.

Before sharing their opinion on these important questions, all participants in the community leader workshops were provided a briefing summarizing the findings of the Choices Report, and then were led through an interactive exercise teaching the tools and tradeoffs of transit. In total, community leaders spent 3-4 hours engaged in each workshop, compared to the 10-15 minutes the public web survey was designed to take.

Much more detail on the results of outreach is available in the "Draft Board Decision Memo" delivered to UTA on June 27, 2019.

Balance of Service by Region

Figure 13 summarizes the results emerging from the public web survey and community leader workshops relating to the balance of service between ridership and coverage goals. The summary presented here is based on the median response on the ridership/coverage scale question, where participants were asked to allocate bus operating resources using a scale of ten percent increments from 100% ridership / 0% coverage to 0% ridership / 100% coverage.

In each region, a majority of community leaders voted to shift the balance of service with existing and additional resources towards ridership.

NORTH REGION (MOUNT OGDEN)

In the north, public survey respondents generally said to move slightly more towards ridership.

CENTRAL REGION (SALT LAKE)

In the central region, public survey respondents tended to opt to maintain the existing balance.

SOUTH REGION (TIMPANOGOS)

In the southern part of the network, the largest portion of public survey respondents opted to maintain the existing balance.

	Public Web Survey		Community Leader Workshops	
Region	Balance of Existing Resources	Balance of Additional Resources	Balance of Existing Resources	Balance of Additional Resources
North (Mount Ogden)	Focus more on ridership services	Focus more on ridership services	Focus more on ridership services	Focus more on ridership services
Central (Salt Lake)	Maintain existing balance of services	Maintain existing balance of services *Note: when weighted by zip code population, the median response in the Central region was to focus more on coverage services.*	Focus more on ridership services	Focus more on ridership services
South (Timpanogos)	Maintain existing balance of services	Focus more on coverage services	Focus more on ridership services	Focus more on ridership services

Figure 13: Balance of Service by Region

	Public Web Survey			Community Leader Workshops		
Region	Service for people with no transportation alternative	Service responding to growth or new development	Service to all taxpayers	Service for people with no transportation alternative	Service responding to growth or new developmen	Service to all taxpayers
North	1	2	3	1	3	2
Central	1	2	3	1	2	3
South	2	1	3	1	2	3

Note: when weighted by zip code population, in the South region, the top priority was "service for people with no alternative."

Figure 12: Coverage Priorities by Region

Coverage Priorities by Region

Figure 12 shows the most common ranking of coverage priorities by public survey respondents and community leaders for each region. There are three main reasons to provide coverage service, and each has different network implications:

- Service for people with no transportation alternative.
- Service responding to growth or new development.
- Service to all taxpayers.

NORTH REGION (MOUNT OGDEN)

In the north region, public web survey respondents and community leaders had the same top priority: service for people with no transportation alternative. However, while the public survey respondents ranked service responding to growth second and service to all taxpayers last, community leaders instead ranked service to all taxpayers as their number two coverage purpose.

CENTRAL REGION (SALT LAKE)

In the central region, community leaders and public web survey respondents had the same order of coverage priorities: 1) service for people with no transportation alternative; 2) service

responding to growth or new development; 3) service to all taxpayers.

SOUTH REGION (TIMPANOGOS)

In the south region, public web survey respondents' top coverage priority was "service responding to growth or new development," while community leaders' top priority was "service for people with no transportation alternative."

However, when public survey responses were weighted by zip code, the top priority was "service for people with no transportation alternative." This is mainly due to the fact that in the south, a large volume of responses (100+) were received from the zip code covering Saratoga Springs and the surrounding area. Responses from this area tended to prioritize "service responding to growth or new development" to a greater extent than those from other parts of the south region.

In the south, the median response from the public survey was to maintain the existing balance, but if new resources became available, to focus them on coverage services to a greater degree than today.

Service Choices Draft Plan

Service Choices Draft Plan

This section provides an overview of the Service Choices Draft Plan as it existed in March 2020, prior to the onset of the COVID-19 emergency. While this is no longer an active planning process, we are providing this overview so that interested readers can understand the network changes that were identified in order to achieve the project's stated goals, using the tools and strategies described earlier in this document.

What is the Draft Plan?

The Service Choices process did not produce a fully-formed Draft Plan that was presented to the public. The COVID-19 emergency began during the late stages of work refining the network designs that were intilally developed by UTA staff, partners and the consultant team in Fall 2019. While substantial revisions were made to the plan during ther period from October 2019 to March 2020 based on feedback from planning staff in each of UTA's business units, these conversations were still ongoing as the emergency began.

Near the beginning of the COVID-19 emergency, as UTA rapidly shifted to a reduced service level on most of the network, JWA staff were asked to develop a set of packages of route changes based on the Service Choices Draft Plan. These are independent groups of route redesigns that UTA could consider implementing during future service changes as service is restored.

An example of such a package is the simplification of the routes serving 3500 S from 3 routes (33, 35, 35M) to a single, more frequent 35 pattern making local stops (as is currently in operation during the reduced COVID-19 period). These packages vary in cost depending upon the nature of the changes, but provide a more modular tool to carry forward improvements developed during the Service Choices process into a period where there is likely to be substantial turbulence in terms of the travel market and UTA's financial capacity.

Financial Uncertainty

The combination of reduced consumer demand, high unemployment and general economic uncertainty put the financial assumptions underlying the 2019 Draft Plan in serious doubt. The Draft Plan assumed an equivalent level of service to 2019 would be available in 2022 in the Mount Ogden and Timpanogos business units, and that approximately $18 million in new "4th Quarter" funds would be available for service expansion in the Salt Lake business unit. These assumptions are no longer accurate, and UTA's short and medium-term financial outlook means that the agency could not likely deliver either the service levels identified in the Draft Plan, or the "Existing" pre-Covid network to which it was compared.

The Draft Plan also used 2019 costs of service as the basis for cost estimates for individual routes. These costs were escalated 5% per year through 2022, the design year for the Draft Plan network. This escalation rate was determined through consultation with UTA financial planning staff, and was based upon observed cost increases in the years prior to 2019. The COVID-19 crisis has quickly changed short, medium and long-term economic forecasts, and at this time it is impossible to accurately gauge the likely impacts on UTA's major cost drivers.

Given the uncertainty about available resources, and about transit unit costs, this Draft Plan network should no longer be viewed as a plan that could be implemented with UTA's approximate "current" resources plus the 4th Quarter in Salt Lake. UTA's existing service level is very different in June 2020 than it was in Fall 2019. UTA's service level in 2022 is unknown, and unlikely to match that assumed during this project.

As such, this Draft Plan should be seen not as a proposed program of changes to UTA's network, but as a collection of service design ideas responding to a set of conditions that were relevant in Fall 2019: resource level, costs, and most importantly, policy direction from UTA's board and executive team about the goals of service design.

Design Priorities

The Service Choices Draft Plan was designed to show how UTA's bus network could look if it were designed to focus more on generating high ridership. The Draft Plan was designed to illustrate the following shifts of resources for each business unit.

In the Salt Lake Business Unit, about 60% of current resources are focused on generating high ridership, and 40% on either unique coverage or duplicative service. **In the Draft Plan, approximately 70% of resources are focused on high-ridership services, and 30% on coverage services, because almost all new (4th Quarter) revenues are dedicated to ridership-goal services.** Because new resources are used for most of the ridership-goal improvements, the total coverage of the network changes is minimal.

In the Mount Ogden Business Unit, about 40% of current resources are focused on generating high ridership, and 60% on either unique coverage or duplicative service. **In the Draft Plan, approximately 60% of resources are focused on high-ridership services, and 40% on coverage services.** Because no new resources are available, some places that have transit service today would be further away from a route with the Draft Plan.

In the Timpanogos Business Unit, about 60% of current resources are focused on generating high ridership, and 40% on either unique coverage or duplicative service. **In the Draft Plan, approximately 70% of resources are focused on high-ridership services, and 30% on coverage services.** Because the level of resources in the Timpanogos Business Unit is so limited, moving further towards ridership would likely require a substantial contraction in the service area.

Service Choices Draft Plan

Salt Lake Business Unit

Figure 14 maps the March 2020 Draft Plan for the Salt Lake Business Unit, coloring each line by its design midday frequency. On the next page, this map is presented side-by-side with the "Existing" January 2020 network, mapped in the same style.

Major Changes

- **New Route 35 provides service on 3300 / 3500 S across the Valley.** In UTA's pre-Covid network, service on 3500 S is provided by three routes - 33, 35, and the limited-stop 35M. The Draft Plan consolidates these routes into a single Route 35 running every 12 minutes from Magna to Millcreek and Olympus Hills shopping center.
- **New super-frequent service from Salt Lake Central Station to U of U.** Frequent Route 21 would be extended from the U to Salt Lake Central Station via 200 S. On weekdays, Frequent Route 2 would also serve 200 S from Salt Lake Central Station to the U, combining with Route 21 to provide service every 7-8 minutes through downtown.
- **Route 47 realigned along similar routing to future Mid-Valley Connector BRT.** Route 47 west of 2700 W would be combined with Route 41 at 30-minute frequency.
- **More frequent service in Rose Park.** New Route 10 would provide 15-minute service throughout the day on 300 N, 900 W, 1000 N and Redwood Rd., terminating at Power Station. Local coverage in this area would be supplemented by the new Route 6 serving 600 N every 30 minutes, and Route 12 serving 1200 W. Route 12 would continue east of downtown as Route 11, providing a single-seat ride from Rose Park to the U.
- **Improved north-south routes on the west side.** Existing Route 240 would be extended north to the airport. New Route 256 would provide all-day 60-minute service on 5600 W from the airport to Old Bingham Highway Red Line station, replacing the existing 556 Flex route. Existing Route 248 would be extended south to Daybreak, and streamlined to stay on 4800 W.
- **New 30-minute east-west crosstown service on 7200 S.** New routes 70 and 78 would replace existing Route 72. Each new route would run every 60 minutes, and together they would provide 30-minute service on 7800 S west of 4000 W, and 7200 S and Fort Union east of Bingham Junction Blvd. Between Bingham Junction Blvd. and 4000 W, Route 70 would serve 7000 S and Route 78 would serve 7800 S, each every 60 minutes.
- **30-minute east-west crosstown service on 6200 S.** Route 62 would be upgraded to 30-minute service all-day, and streamlined between 4800 W and 5600 W (no longer serving 7000 S).
- **UTA On-Demand.** In the Draft Plan, the existing UTA On-Demand pilot serving southern Salt Lake County is continued.

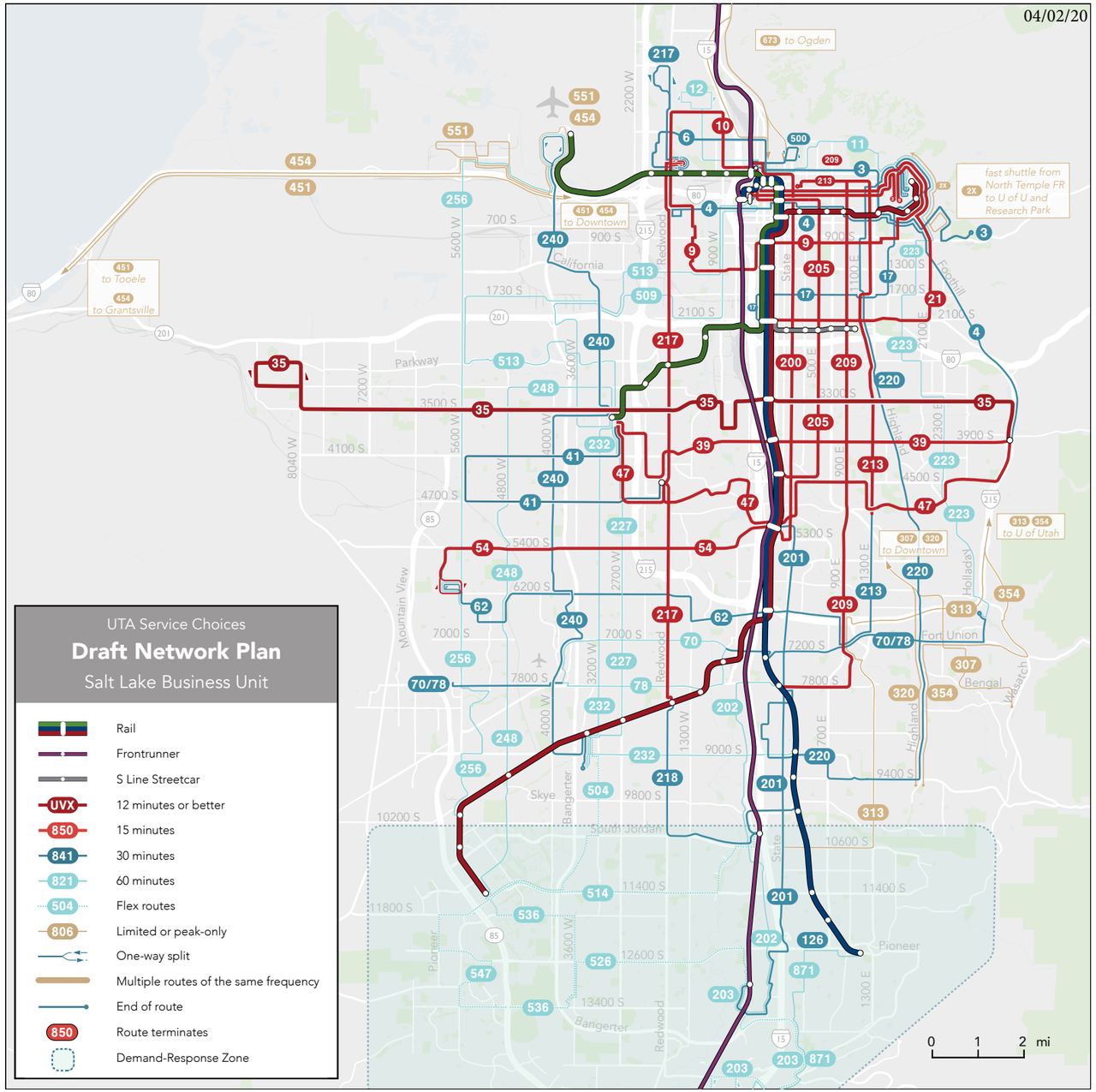


Figure 14: UTA Service Choices Draft Plan (March 2020) - Salt Lake Business Unit

Service Choices Draft Plan

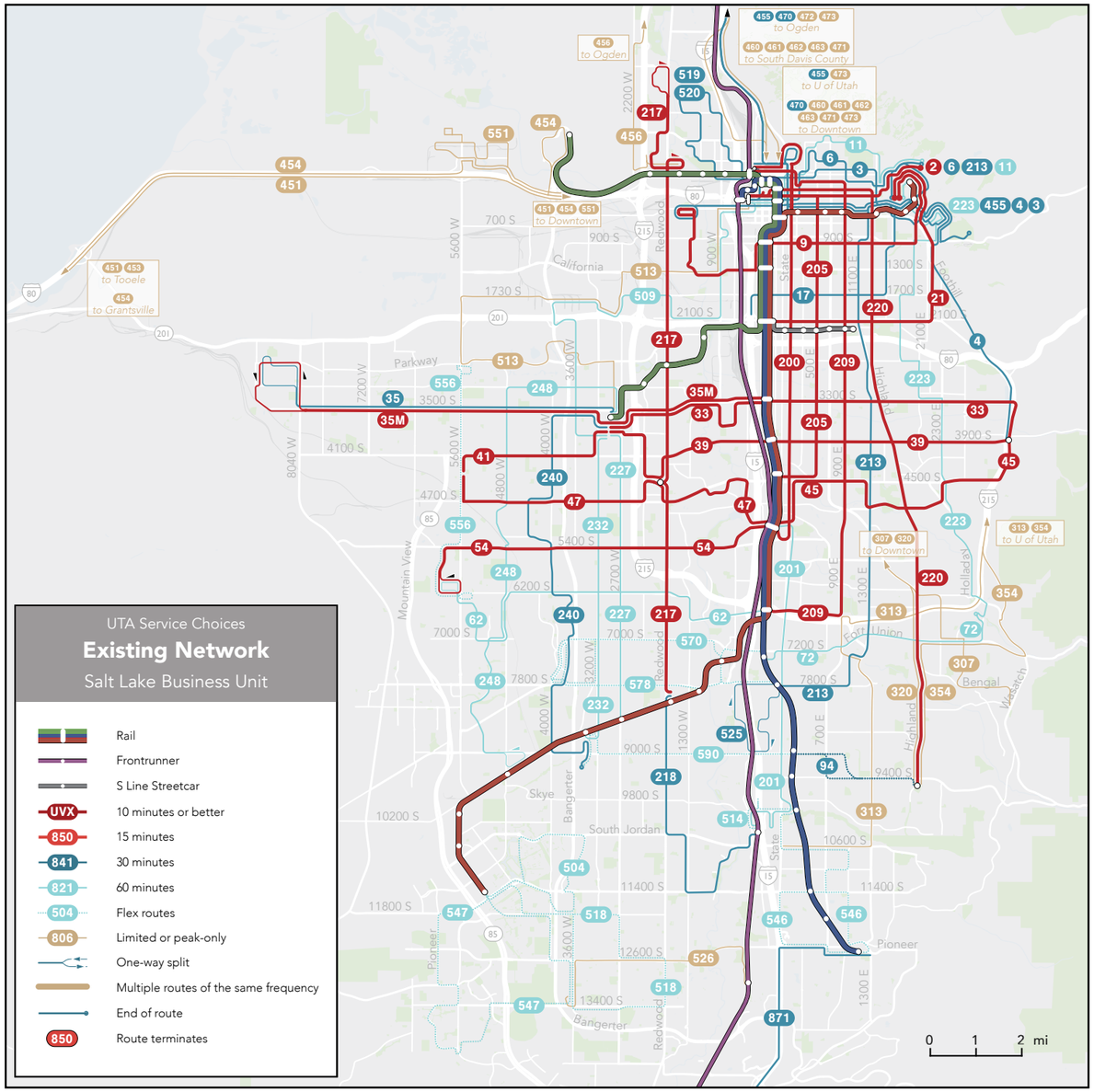


Figure 15: Existing (January 2020) UTA Network - Salt Lake Business Unit

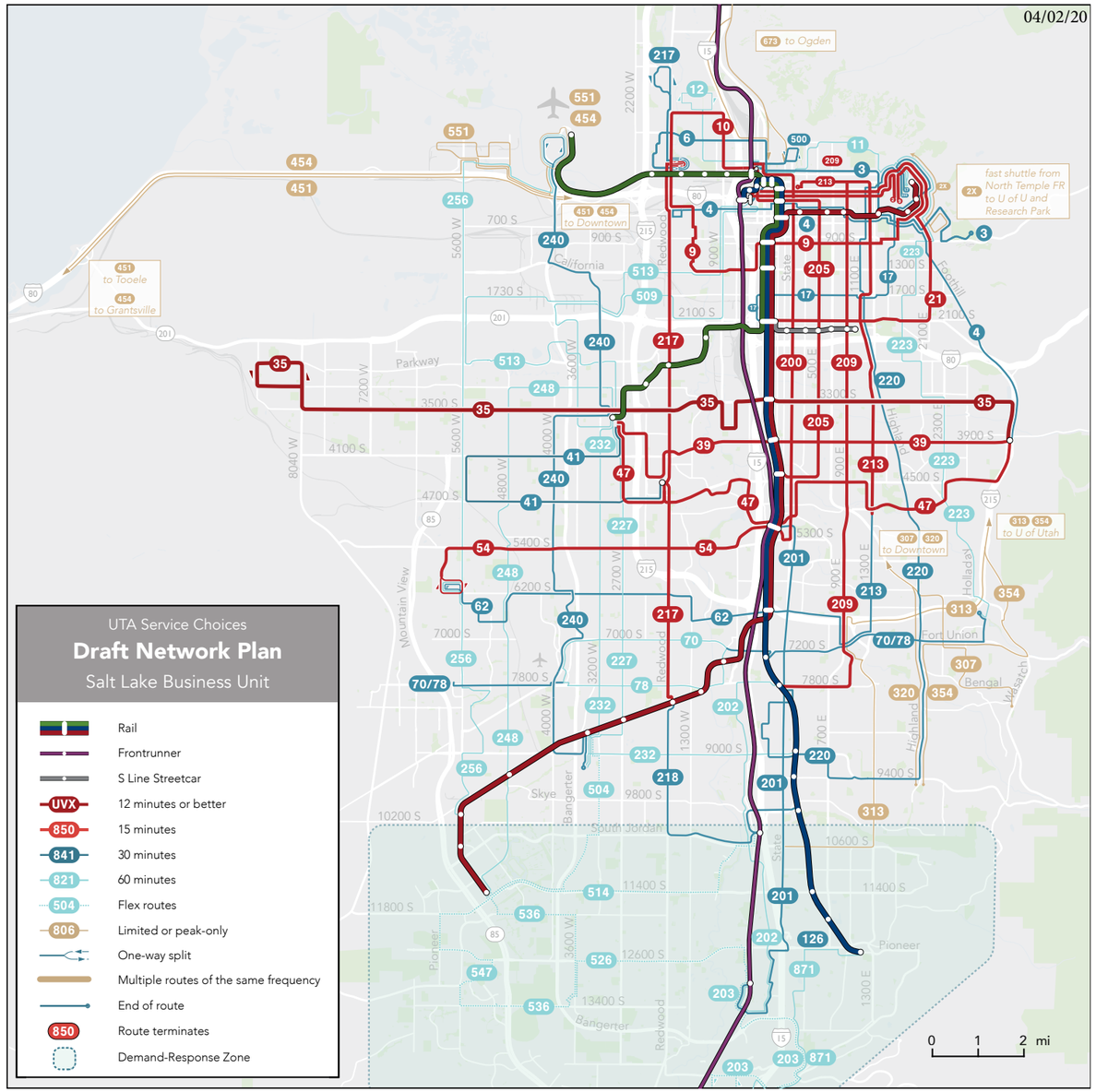


Figure 16: UTA Service Choices Draft Plan (March 2020) - Salt Lake Business Unit

Mount Ogden Business Unit

Figure 17 maps the March 2020 Draft Plan for the Mount Ogden Business Unit, coloring each line by its design midday frequency. On the next page, this map is presented side-by-side with the "Existing" January 2020 network, mapped in the same style.

Major Changes

- **New high-frequency Route 600 along Main Street from Ogden Station to Layton Station.** Route 600 would replace existing Route 470 in this segment, offering 15-minute service all-day. South of Layton, service on S Main St. would be provided by Route 670, operating with the same span and frequency as the existing Route 470.
- **Simplification of coverage services in Layton, Roy and Clearfield, in order to offset added costs of high-frequency service on Main Street (Route 600).** Route 626 extended to Roy Station via 5600 S, 1900 W, 4400 S and 2175 W. Route 604 shortened, would now end at Roy Station. 640 shortened, southern terminus would now be Clearfield Station. Route 627 replaced by new Route 641, which is also shortened to terminate near Fairfield and Gentile.
- **North Ogden Demand-Response Zone.** A demand-response zone similar to the UTA On-Demand product currently available in Salt Lake County would be established north of 2nd St. This would provide a new mobility option more suitable to the low-density land use pattern of this area, and would offset the reduction in frequency on Route 612 north of 2nd St. from every 15 to every 30 minutes.
- **Bountiful Demand-Response Zone.** 400-series express services in Bountiful would be replaced by a demand-response zone similar to the UTA On-Demand product currently available in Salt Lake County. This would allow riders to call a ride with an app between places in the zone, and to connect with FrontRunner at Woods Cross Station.
- **Elimination of express bus services duplicating FrontRunner.** Existing routes 472 and 473 connect the Mount Ogden business unit to Salt Lake City. Route 472 serves the same corridor as FrontRunner, at much lower productivity (boardings per unit of service), and would be discontinued in the Draft Plan. Route 473 provides one-seat connectivity to Salt Lake City along the Highway 89 corridor, and would be replaced by new Route 673, which would have its northern endpoint at South Weber Park & Ride.

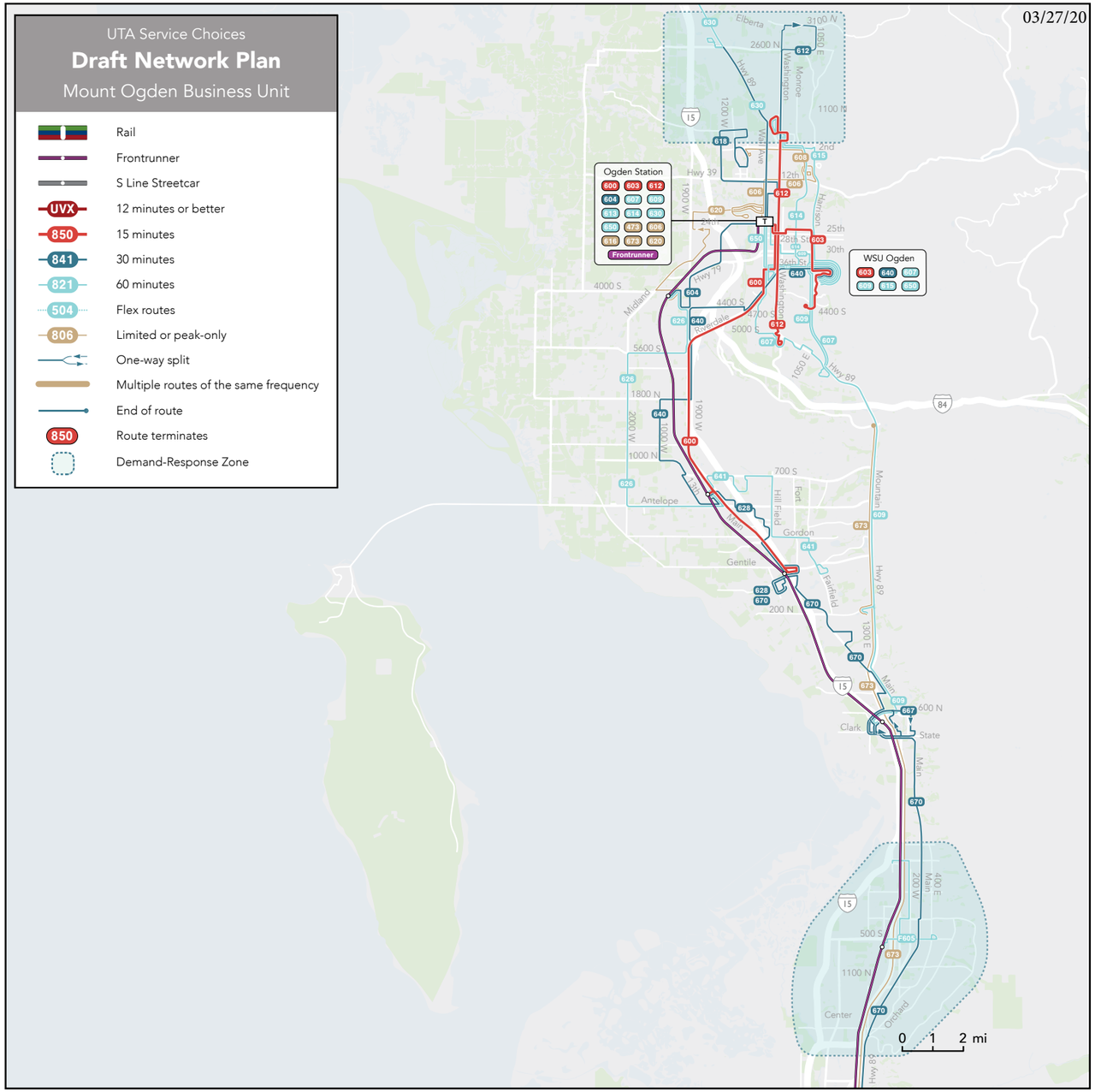


Figure 17: UTA Service Choices Draft Plan (March 2020) - Mount Ogden Business Unit

Service Choices Draft Plan

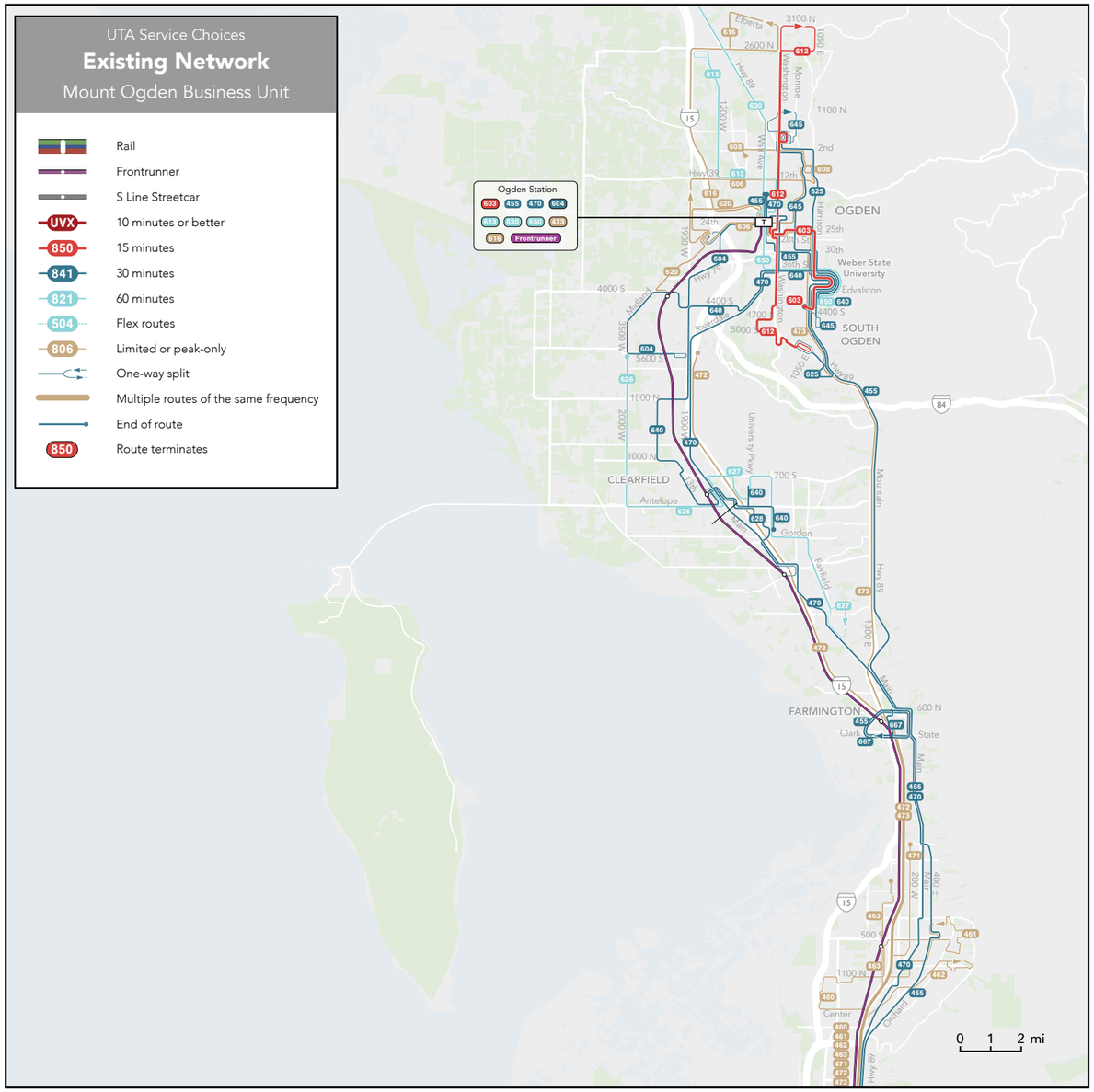


Figure 18: Existing (January 2020) UTA Network - Mount Ogden Business Unit

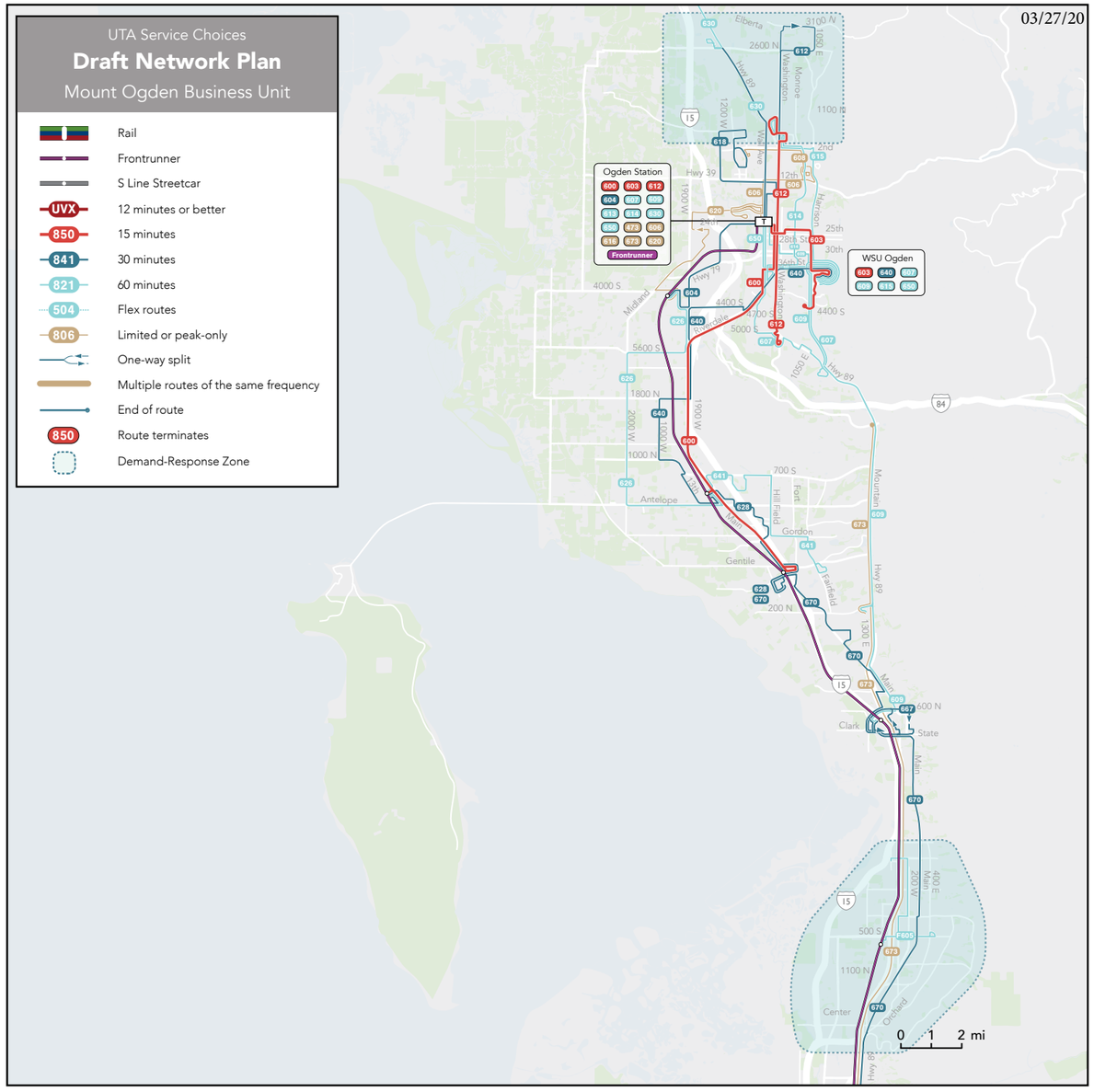


Figure 19: UTA Service Choices Draft Plan (March 2020) - Mount Ogden Business Unit

Service Choices Draft Plan

Timpanogos Business Unit

Figure 20 maps the March 2020 Draft Plan for the Mount Ogden Business Unit, coloring each line by its design midday frequency. On the next page, this map is presented side-by-side with the "Existing" January 2020 network, mapped in the same style.

The Timpanogos business unit has the most limited bus operating resources of the three business units, and so the opportunities for service improvements that reallocate service without totally abandoning currently served areas are limited.

Major Changes

- **UVX service reduced south of Provo Station.** South of the station, UVX would run every 12 minutes during midday (every other bus would turn back at Provo Station, rather than continuing south to East Bay). These resources would be reallocated to service improvements elsewhere in Utah County.
- **Service improvements in Vineyard.** This fast-developing part of Utah County would now be served by two routes. New Route 842 would run between the new Vineyard FrontRunner Station and Orem Station through the UVU campus every 30 minutes. Existing Route 834 would be realigned to terminate at Vineyard Station (rather than Orem Station), and would operate on Center before turning north to approach the station via new local roads in Vineyard.
- **Thanksgiving Point Demand-Response Zone.** Existing Route 864 would be replaced by a new demand-response zone (similar to the UTA On-Demand service now available in Salt Lake County) that would allow anywhere-to-anywhere travel with an app in this fast-growing employment area.
- **South County Frequency Improvements.** Existing Route 821 would be upgraded to 30-minute service all-day on weekdays, and would be realigned to use I-15 from Spanish Fork to Provo. Route 823 would be realigned to terminate at Springville Park & Ride. Route 805 would be unchanged. Route 822 would be elimited - its resources are used to upgrade service on Route 821.
- **Route 831 Realignment.** In Provo, Route 831 would be realigned to use State and Columbia between University Pkwy. and Cougar Blvd. This would allow the route to more directly serve dense residential development along Columbia Ln.
- **Provo Airport Demand-Response Zone.** Existing Route 833 would be replaced by a new demand-response zone (similar to the UTA On-Demand service now available in Salt Lake County) allowing anywhere-to-anywhere travel in the zone with an app.

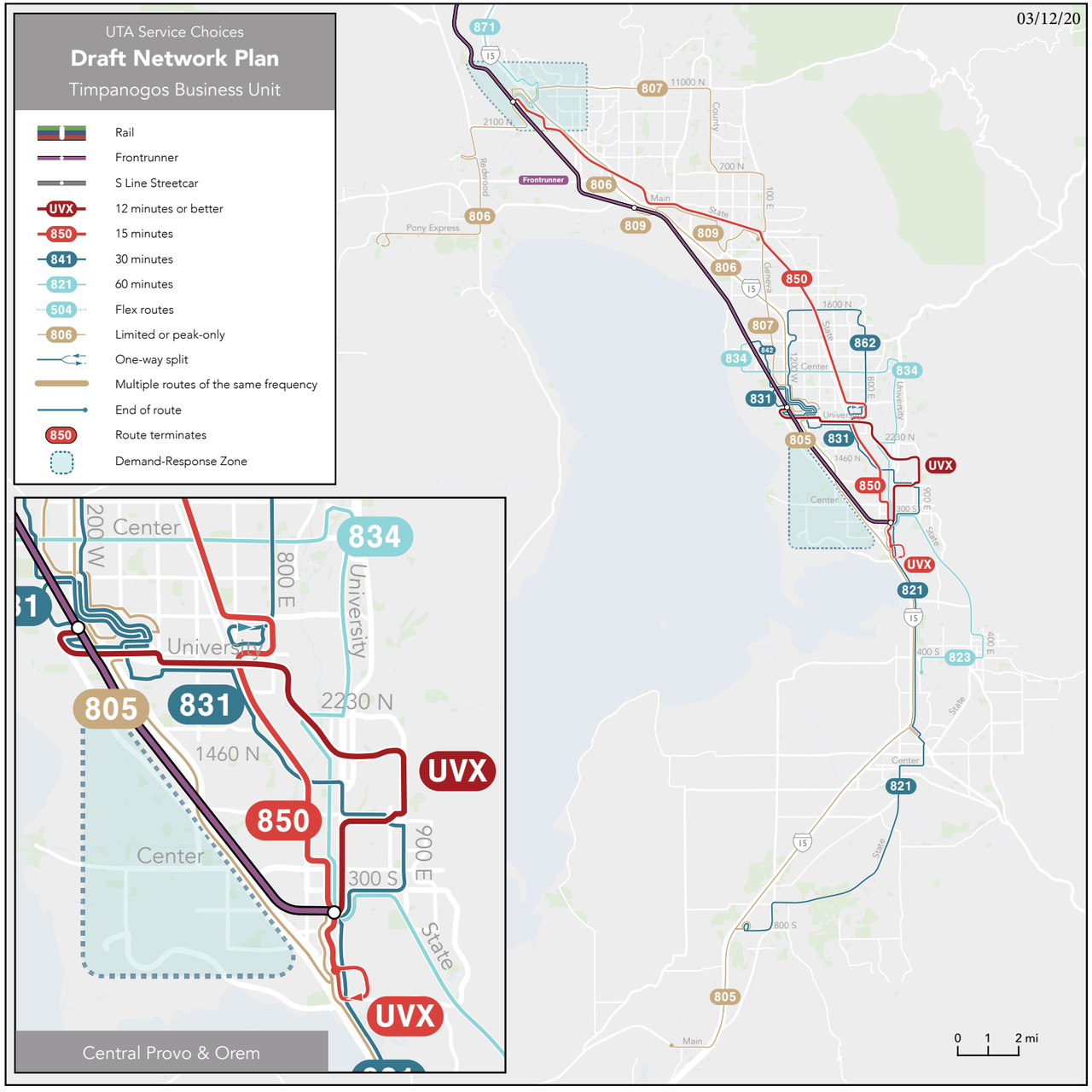


Figure 20: UTA Service Choices Draft Plan (March 2020) - Timpanogos Business Unit

Service Choices Draft Plan

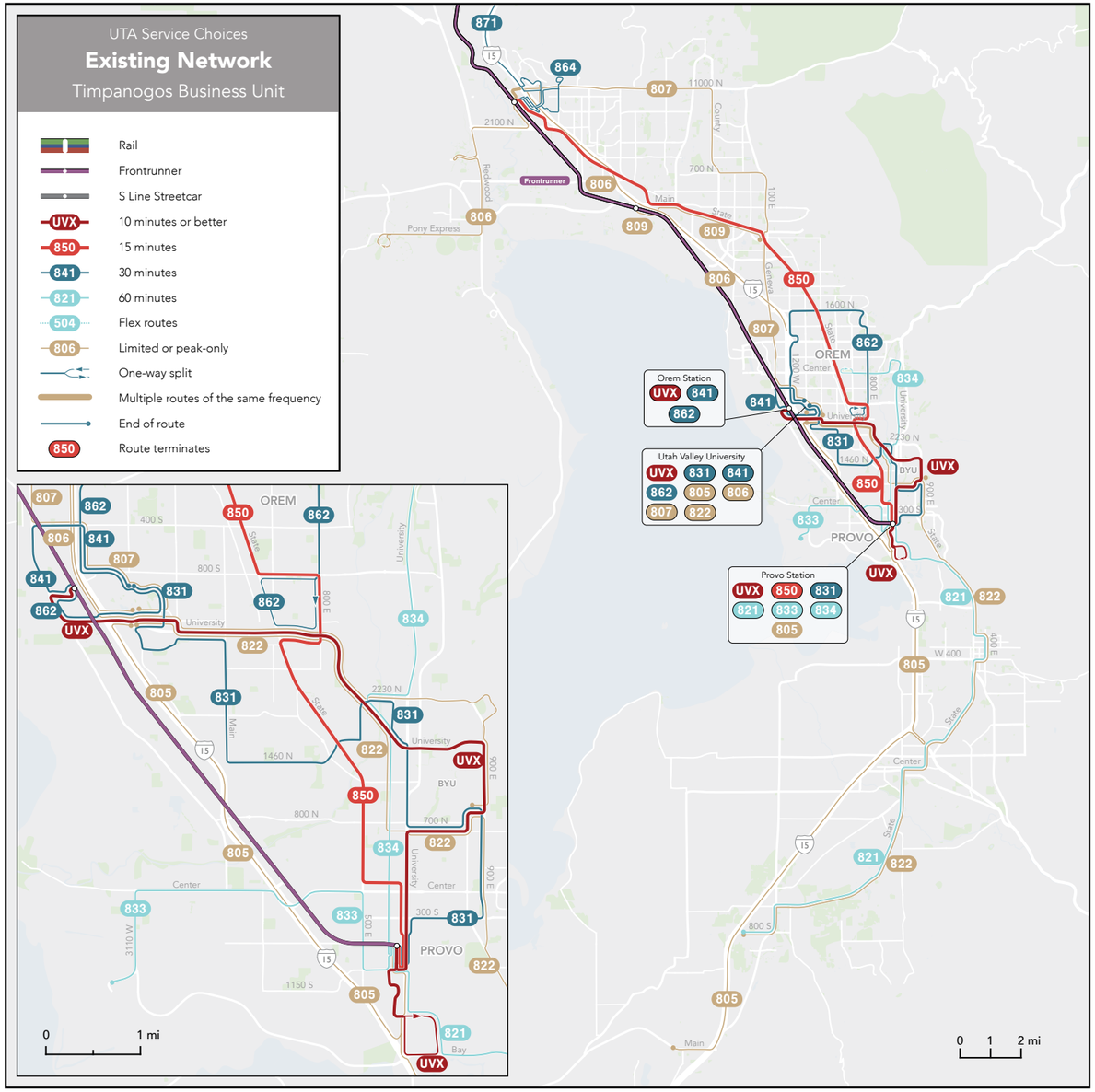


Figure 21: Existing (January 2020) UTA Network - Timpanogos Business Unit

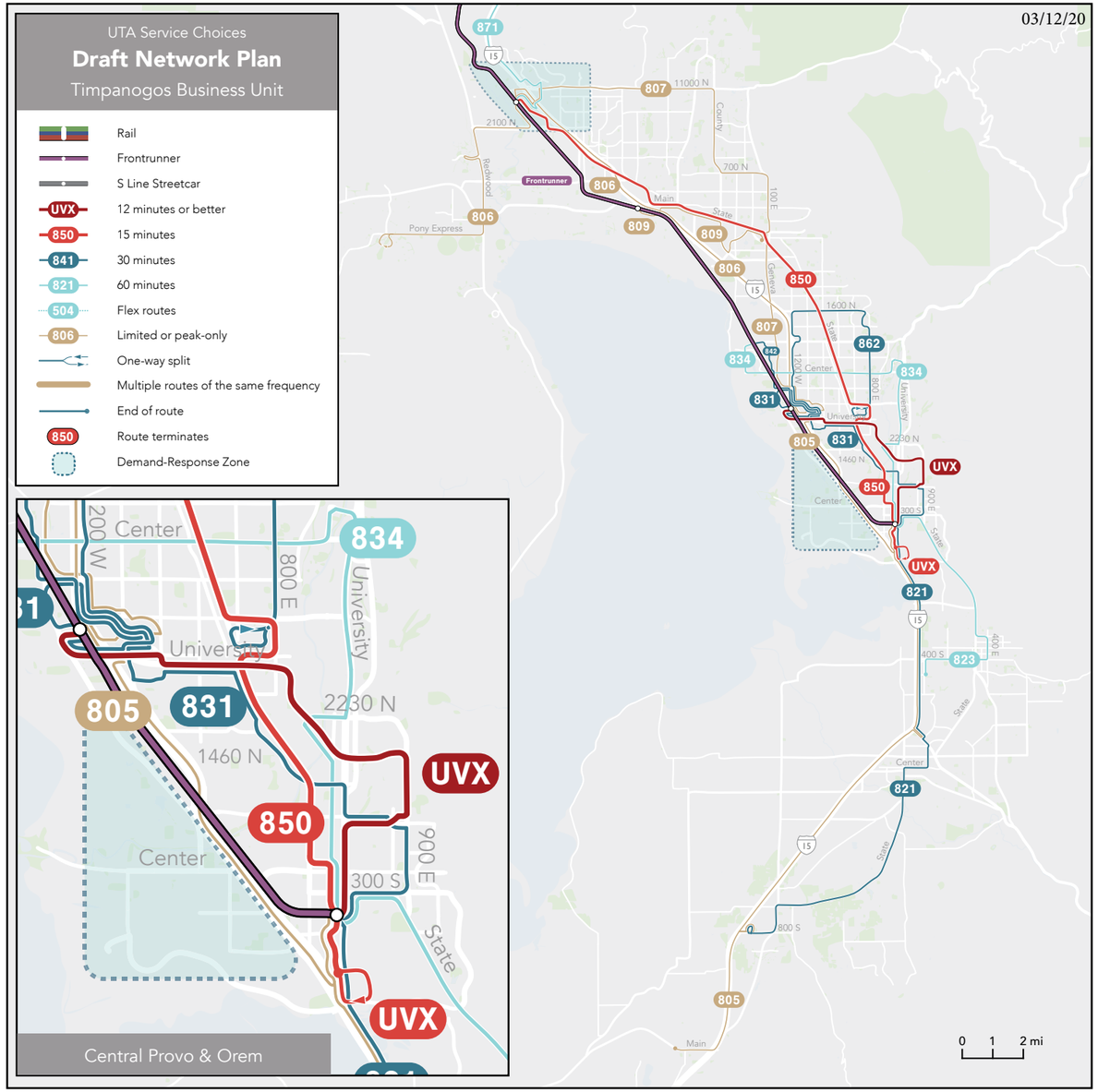


Figure 22: UTA Service Choices Draft Plan (March 2020) - Timpanogos Business Unit

SERVICE CHOICES DRAFT PLAN

The Core Network

The Core Network

The Core Network is the highest tier of mixed-traffic bus service, designed to carry the most people, and serve the busiest corridors and destinations. Core Network services are all frequent. Their high frequency and high ridership mean that UTA has a dual interest in maintaining the highest possible speed and reliability:

- Frequency means that more service is exposed to delay, which increases operating cost.
- High ridership potential means that more riders are exposed to delay, reducing the access UTA can offer them.

One important aspect of the Service Choices process was the identificaton of specific routes within UTA's network that made up the Core Network. In most cases these routes serve corridors identified as part of the Core Network in the WFRC and MAG RTP's, but not all previously identified corridors are included, because the first principle of the network design work conducted throughout this study was a focus on corridors and routes with the strongest ridership potential in the next 2-3 years. Many of the corridors identified for Core Network service in the RTPs are still developing, and while they may exhibit strong ridership potential in the future, Core Network service in the Draft Plan largely limited to areas that display that potential today. **The maps on the next page display the corridors identified for Core Route service in each RTP.**

Core Network Hierarchy and Service Levels

While the RTP identifies a very extensive Core Network, UTA cannot afford to provide the highest level of service on every corridor immediately.

WFRC's RTP identifies 2 tiers of Core Route service (5-minute and 15-minute), to be implemented over 3 phases. In almost all cases, the Draft Plan's Core Network focuses on phase 1 corridors. No Draft Plan Core Network routes meet the 5-Minute Core Route standard in the RTP, but several routes do exceed 15-minute headways at midday and rush hour.

The Draft Plan identified three tiers of Core Network routes, each with matching frequency and span standards. These tiers expand on the RTPs 5-minute and 15-minute standards, and provide for additional flexibility in establishing Core

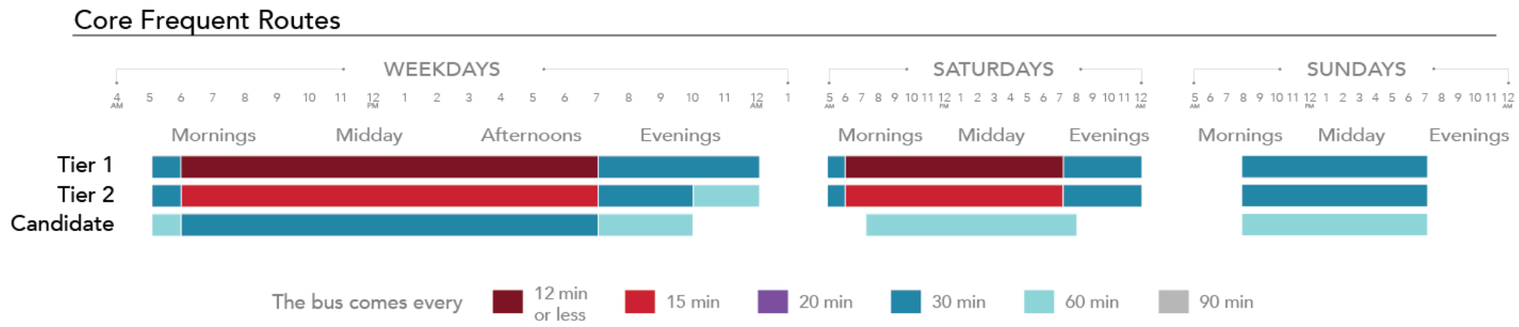


Figure 23: Core Routes Frequency and Span Minimum Standards

Network services bridging the gap between 5 and 15 minute frequencies.

The service levels for each of these tiers were determined through discussion between UTA and partner agency staff and the consultant team in the October 2019 Core Design Workshop, and then refined during subsequent iterations reflecting input from each business unit's dedicated planning staff.

- **Core Network Tier 1.** These are UTA's premier local bus services, operating every 12 minutes or better, all-day, Monday through Saturday, and 30 minute service available on Sundays. In the Draft Plan, two routes, Route 35 and the combined 2 and 21 between Salt Lake Central Station and U of U, are included in this category. While none of these services approach 5-minute headways as designed in the Draft Plan, they would exceed the 15-minute Core Route standard identified in the WFRC RTP and could potentially have service levels as high as the 5-Minute Core Route type described in the WFRC RTP, should demand warrant and resources become available.
- **Core Network Tier 2.** These routes operate every 15 minutes during the peak and midday periods on weekdays, and at least every 30 minutes during the midday on Saturdays and Sundays. Many run every 15 minutes on Saturdays as well. Examples of routes in this tier include Route 9 and Route 217 in Salt Lake County, Route 600 in Ogden, and Route 805 in Utah County. The routes would fall within the 15-minute Core Route type identified in the WFRC RTP.
- **Core Network Candidate.** Candidate Core Network routes are routes that serve corridors that have moderately high demand, but where the potential for Core Route service depends on future development and/or road improvements. These are priorities for future improvement to Core Network Tier 2 service given supportive development and street design decisions by the appropriate authorities.

Figure 23 shows the Core Route tiers' spans and frequencies visually. These are the general standards for each tier, not the exact service levels assigned to each route, which will sometimes exceed the standard based on capacity needs. For example, in the Draft Plan, Route 200, currently one of UTA's busiest frequent services, falls into Tier 2 of the Core Routes' hierarchy; but because the route was highly productive with 15-minute service on Sundays in the period prior ot the onset of COVID-19, these higher Sunday service levels were maintained.

The Core Network

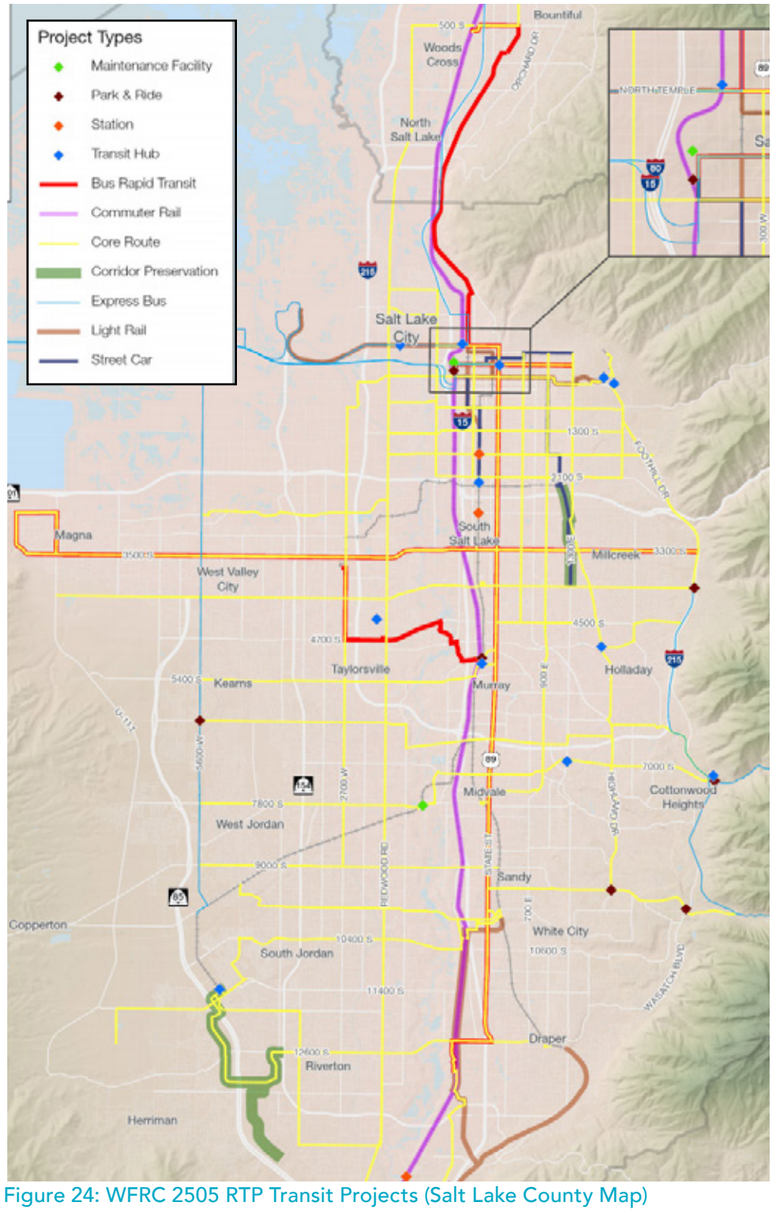


Figure 24: WFRC 2505 RTP Transit Projects (Salt Lake County Map)

Core Routes shown in yellow. Includes unfunded projects.

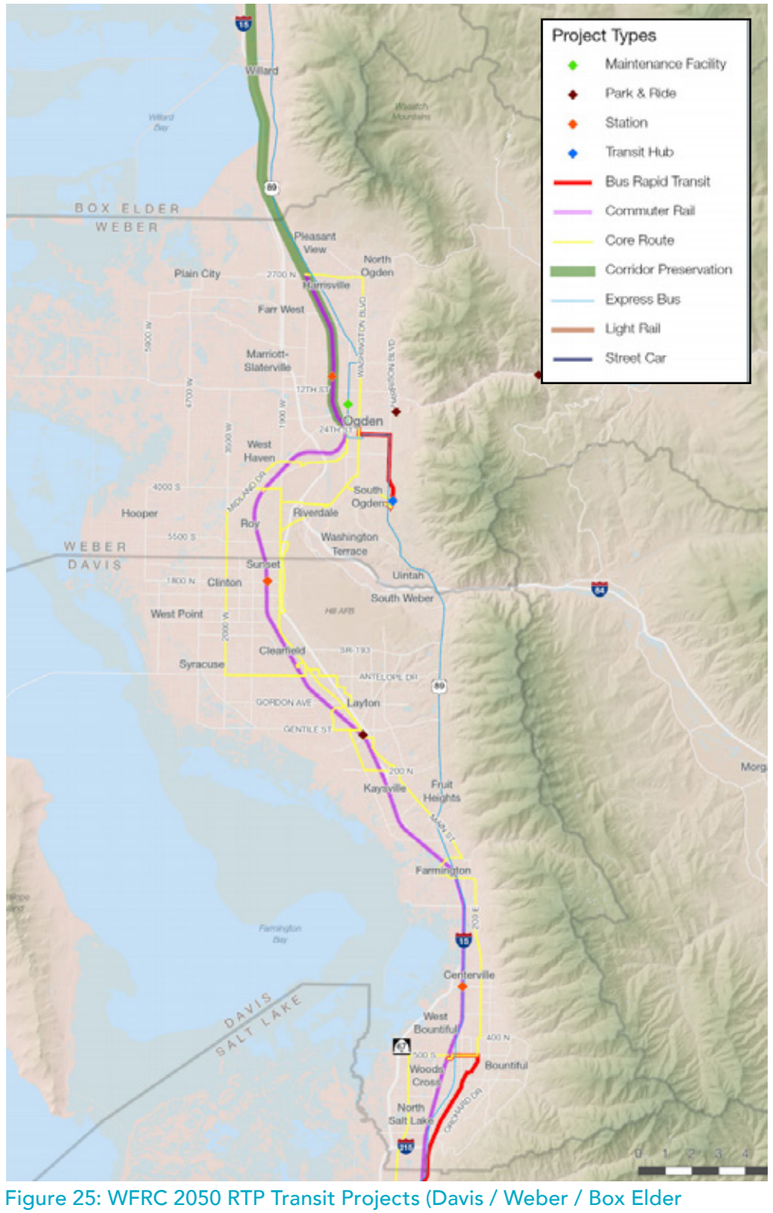
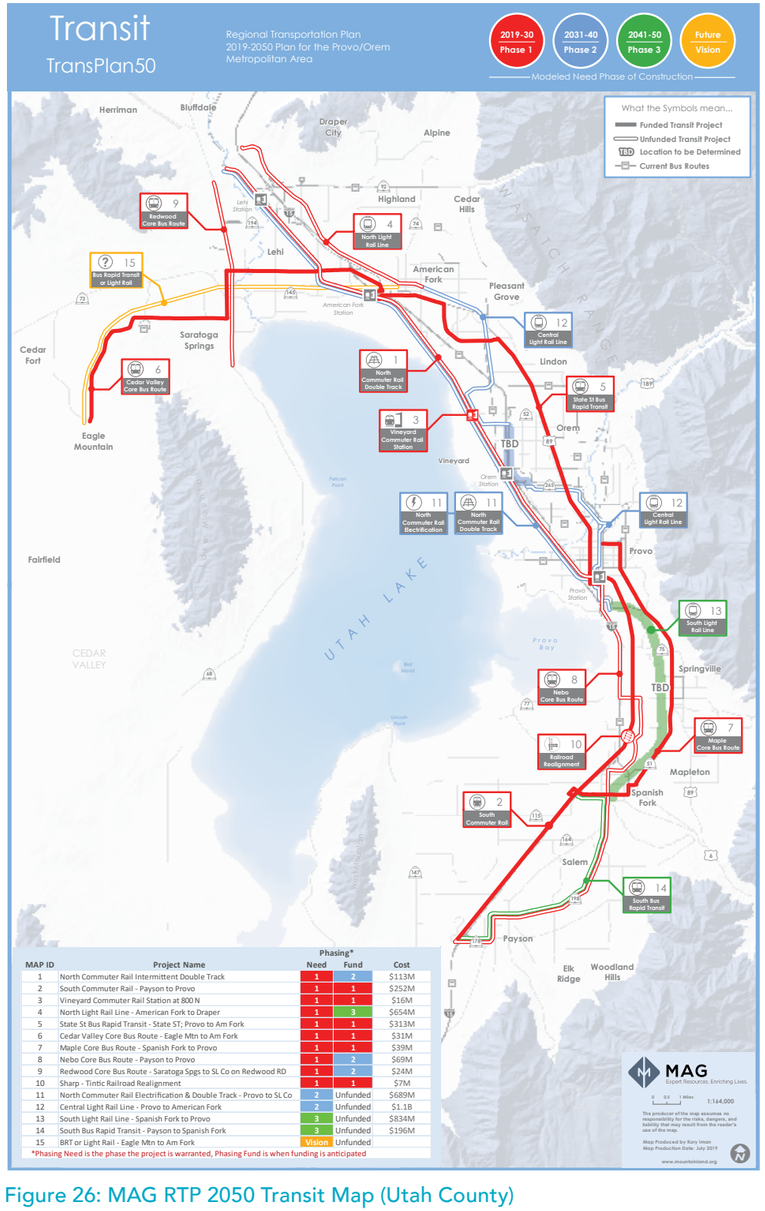


Figure 25: WFRC 2050 RTP Transit Projects (Davis / Weber / Box Elder Counties)

Core Routes shown in yellow. Includes unfunded projects.



MAP ID	Project Name	Phasing* Need	Phasing* Fund	Cost
1	North Commuter Rail Intermittent Double Track	1	2	$113M
2	South Commuter Rail - Payson to Provo	1	1	$252M
3	Vineyard Commuter Rail Station at 800 N	1	1	$16M
4	North Light Rail Line - American Fork to Draper	1	3	$654M
5	State St Bus Rapid Transit - State ST; Provo to Am Fork	1	1	$313M
6	Cedar Valley Core Bus Route - Eagle Mtn to Am Fork	1	1	$31M
7	Maple Core Bus Route - Spanish Fork to Provo	1	1	$39M
8	Nebo Core Bus Route - Payson to Provo	1	2	$69M
9	Redwood Core Bus Route - Saratoga Spgs to SL Co on Redwood RD	1	2	$24M
10	Sharp - Tintic Railroad Realignment	1	1	$7M
11	North Commuter Rail Electrification & Double Track - Provo to SL Co	2	Unfunded	$689M
12	Central Light Rail Line - Provo to American Fork	2	Unfunded	$1.1B
13	South Light Rail Line - Spanish Fork to Provo	3	Unfunded	$834M
14	South Bus Rapid Transit - Payson to Spanish Fork	3	Unfunded	$196M
15	BRT or Light Rail - Eagle Mtn to Am Fork	Vision	Unfunded	

*Phasing Need is the phase the project is warranted, Phasing Fund is when funding is anticipated

Figure 26: MAG RTP 2050 Transit Map (Utah County)

Core Routes marked on map. Includes unfunded projects.

Note: Additional details on RTP Transit projects, including proposed phasing years and funded/unfunded projects, can be found in the WFRC and MAG RTP documents.

The Core Network

Core Network Infrastructure and Amenities

Investments in infrastructure, amenities, and wayfinding are meant to benefit the maximum number of passengers. Since the Core Network comprises many of UTA's highest-ridership/highest-productivity routes, these services are likely to be high priorities for these types of investments.

Speed & Reliability Infrastructure

The Core Network serves the busiest corridors, so its routes are also the most vulnerable to delay and unreliability as a result of traffic congestion. Many cities around the U.S. are now developing or implementing programs of speed and reliability improvements targeting their core/frequent networks. These programs typically focus on lightweight improvements that can be deployed quickly and at a low cost, such as transit signal priority, queue jump lanes, and painted bus lanes, rather than major capital investments like station-style stops, fully-separated right-of-way, and unique articulated vehicles that characterize most BRT-scale projects.

Stop Amenities and Signage

UTA's existing Bus Stop Master Plan and Wayfinding and Signage Plan provide detailed recommendations on appropriate amenities at stops served by routes with different service attributes, although it does not specifically identify a set of amenities consistent with a tier called the "Core Network." Figure 27 provides an overview of the recommended amenities and signage that best cohere to the service levels envisioned in the Draft Plan Core Network.

Related Planning Document	Core Route Tier I	Core Route Tier II	Candidate Core Route
WFRC RTP Equivalent	15-minute Core Route (potentially up to 5-minute Core Route)	15-minute Core Rote	NA
Typical Midday Frequency (Draft Plan)	12 minutes or less (Core Route Tier I minimum)	15 minutes	30 minutes
Sample Routes in Draft Plan	35, 2+21 (Downtown only)	200 (State Street)	62 (6200 S)
UTA Bus Stop Master Plan corresponding level (minimum)	Level IV-A	Level II-A if fewer than 40 average daily boardings per stop; for better rider comfort, provide Level III-A	Level II-B
Proposed bus stop amenities per plan	Pole, ADA pad , Two benches, Light fixture, Sign, Trash can, Custom shelter, Digital sign	Level II-A: Pole, ADA pad, Bench, Sign, Trash can Level III-A: All Level II-A features, 4'x8' shelter	Pole, ADA pad, Bench, Sign
UTA Wayfinding and Signage Plan corresponding level	Bus Level II or III based on boarding considerations above	Bus Level II or III based on boarding considerations above	Bus Level II
Proposed wayfinding per plan	Level II: Bus flag, 12"x36" timetable posterframe Level III: Bus flag, 12"x36" timetable posterframe, 36"x48" Plan Your Trip postercase with route finder, stop finder, and local area map	Level II: Bus flag, 12"x36" timetable posterframe Level III: Bus flag, 12"x36" timetable posterframe, 36"x48" Plan Your Trip postercase with route finder, stop finder, and local area map	Bus flag, 12"x36" timetable posterframe

Figure 27: Core Network amenities in existing UTA plans

The Core Network

Service Branding & Wayfinding

Many transit agencies organize their most important bus services as a distinct brand within their wayfinding and customer information systems. UTA already does this to some degree by highlighting its frequent (15-minute or better) routes in its network map.

A transit service brand is an identity for a category of transit services that have crucial features in common, designed to call attention to those features and permit clearer identification and discussion of them. In the Draft Plan, the tiered Core Network identifies routes with a common commitment to span and frequency. While many of these routes operate every 15 minutes during the weekday in the existing network, in the Draft Plan, the Tier 1 and Tier 2 Core Network implies enough about the span of 15-minute service, and level of weekend service to constitute a distinctive class of route.

Not only do service brands help existing customers see the transit network more clearly, they also allow everyone involved in inhabiting and developing the cities within the service area to understand how the transit network relates to their own activities.

UTA is in the midst of an ongoing effort to refine its wayfinding and customer information systems, and the purpose of the Service Choices process and this report was not to make specific recommendations about any future brand elements.

However, should UTA wish to communicate the Core Network as a distinctive component of its overall service offering, we offer the following broad principles:

- Use branding to reveal service features that are hard to see. For example, frequency, span, speed and reliability are often the basis of service branding because they otherwise can't be inferred from a line on a map, or from the type of vehicle used.
- Use branding to make the Core Network more legible at a glance. Service branding should be focused on making high-frequency services easy to see and remember.
- Decide which features are part of the brand definition, and which features are typical to the brand but not essential. Definitions that are articulated in UTA customer information materials should be based on inputs that UTA controls.

Figure 28: VTA (Valley Transit Authority) Network Map (San Jose, CA)

Legend

VTA Transit Services

Light Rail

- **BLUE LINE** — Santa Teresa–Baypointe
- **GREEN LINE** — Winchester–Old Ironsides
- **ORANGE LINE** — Mountain View–Alum Rock
- Light Rail Station
- Transfer Station

Bus

- **Rapid Bus** — Limited-stop service at frequent intervals – every 15 minutes or better during day times
- **Frequent Bus** — Local service every 12-15 minutes on weekdays, every 15-30 minutes on weekends
  Less frequent part of route, generally served by every other trip
- **Local Bus** — Less frequent local service, usually every 30-60 minutes
  Selected trips or part-time service
- **Express Bus** — Direct commute-hour service to major employment centers

- Whether or not UTA chooses to distinctly brand a Core Network in the future, not every service feature needs its own brand. Some transit services will only be useful to small numbers of people or in rare situations. These should not be prominent in the information system, so as not to distract from the routes that most riders will find useful.

The images on this page show some samples of best practice branding as expressed on the new network map of VTA, the transit agency in the San Jose, California area. Note that frequent routes stand out prominently from less frequent routes, and that extremely infrequent or peak-only services (including route variants, commute shuttles, and commuter buses passing by on the freeway) all recede into the background. Those who need these services can find them but the vast majority who do not will not be distracted by them.

The Core Network

Salt Lake Business Unit

Figure 29 shows the Draft Plan network in the Salt Lake Business Unit overlaid on the WFRC 2050 RTP Core Routes network, including both funded and unfunded projects (in yellow).

The Draft Plan includes the following Core Network elements serving RTP-identified corridors:

- (A) **Tier 1 Core Network service on 3300 / 3500 S and 200 S.** Route 35 would service 3300 S and 3500 S every 12 minutes, while routes 2 and 21 would provide 7-8 minute service on 200 S.
- **Tier 2 Core Network service on Redwood Rd, 200 E, 500 E, 900 E, 1300 E, 900S, 2100 S / E, 3900 S, 4500 S, and 5400 S.** Each of these are existing UTA frequent bus corridors, but in the Draft Plan, each would have schedules corresponding to the Core Network Tier 2 service minimums shown on the preceding page.
- (B) **Tier 2 Core Network service in Rose Park (Route 10).** The WRFC RTP identifies a Core Route corridor along 900 W and 1000 N in Rose Park. Today, no 15-minute service is available in this area. In the Draft Plan, the 15-minute Route 10 would operate on these segments, from Power Station through Downtown Salt Lake City.
- **Candidate Core Network (30 minute frequency) service on 400 S, 1700 S, 4100 S, Highland, 6200 S, 7200 S, and 9400 S.** Each of these corridors are served by routes operating every 30 minutes all-day. These corridors have strong ridership potential indicators and would likely be high priorities for future improvement to Tier 2 Core Network service, if additional resources were to become available, or if the UTA Board chose to focus more service on the Core Network (and less on low-frequency coverage routes).

There are many corridors identified for Core Route service in the RTP that in this Draft Plan would not be served by a Tier 1, Tier 2, or Candidate Core Network route. The RTP identifies most major arterials in Salt Lake County as elements of the Core Network, but in a resource-constrained study such as Service Choices, UTA cannot afford to retain the existing frequent network, maintain extensive coverage, and provide at least candidate-tier service on all identified corridors.

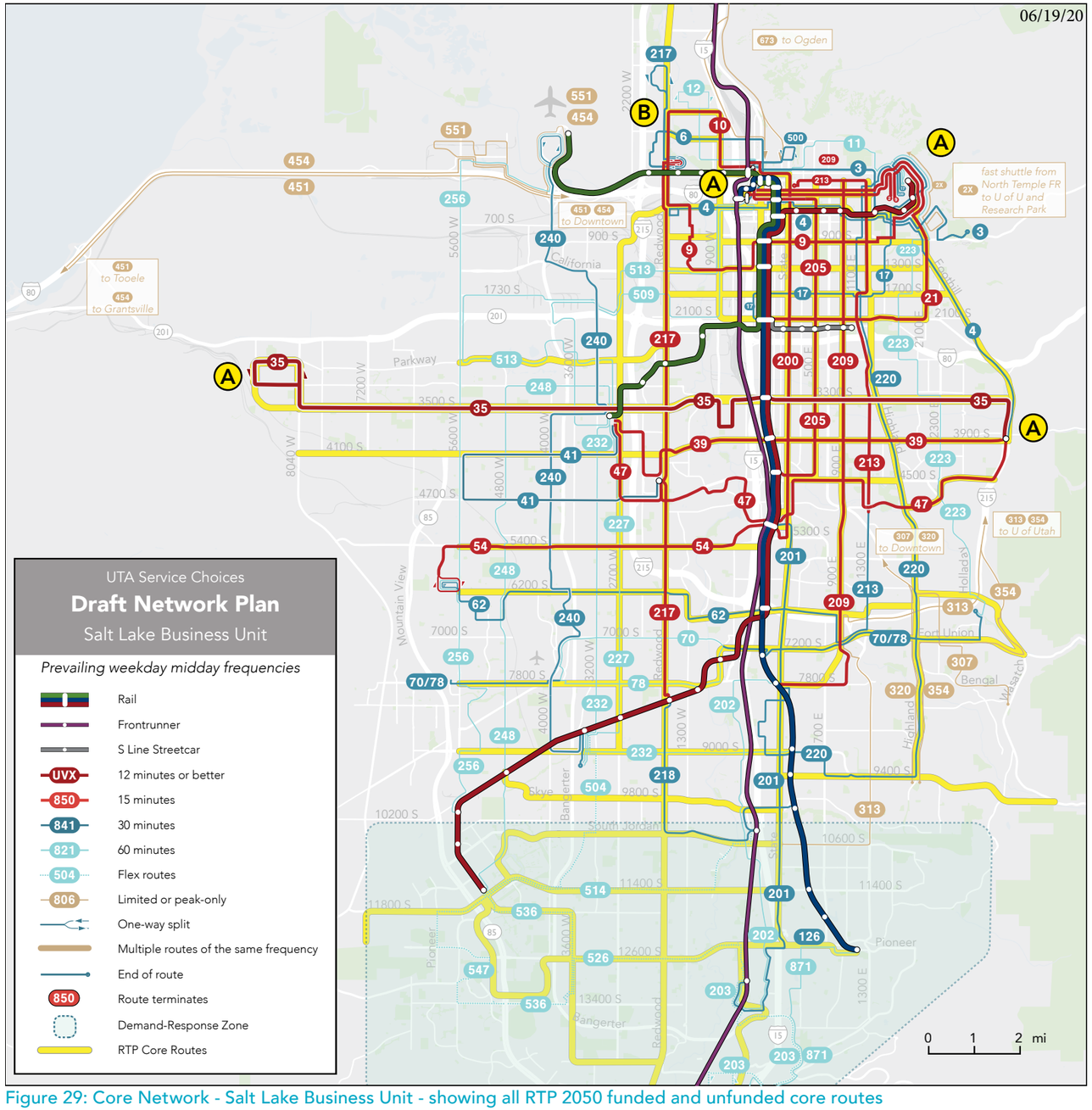


Figure 29: Core Network - Salt Lake Business Unit - showing all RTP 2050 funded and unfunded core routes

The Core Network

Mount Ogden Business Unit

Figure 30 shows the Draft Plan network in the Mount Ogden Business Unit overlaid on the WFRC 2050 RTP Core Routes network, including both funded and unfunded projects (in yellow).

The Draft Plan includes the following Core Network elements serving RTP-identified corridors:

- **A Tier 2 Core Network service on Washington Blvd.** This service is in place today as Route 612.
- **B Tier 2 Core Network service on Main St.** north of Layton. The major ridership-focused improvement made in the Mount Ogden Business Unit is the introduction of Route 600, a new frequent service at the Tier 2 service level operating on the Main St. corridor north of Layton. Because the Main St. corridor is so long, and thus high-frequency service along it is so expensive, we could only afford to upgrade its northern segment, without needing a much more severe reduction in coverage services throughout this business unit. The commercial area near Layton Hills Mall identified in the RTP could logically be served by Route 600 in the future, were issues of duplication with the locally-funded Route 628 (Midtown Trolley) resolved.
- **C Candidate Core Network service on Main St.** south of Layton. The top priority for future Core Network development in Mount Ogden is to bring the southern segment of the Main St corridor (Route 670) up to the 15-minute Tier 2 standard. Because this route is long, this is a costly improvement, and would require either new resources, or a shift of resources from low-frequency coverage services to high-frequency service on this corridor.

While there are some Core Route segments identified away from the Main St. corridor in Mount Ogden, these segments are generally in lower-density areas, and not likely to produce the ridership needed to support 15 or 30 minute service in the near term.

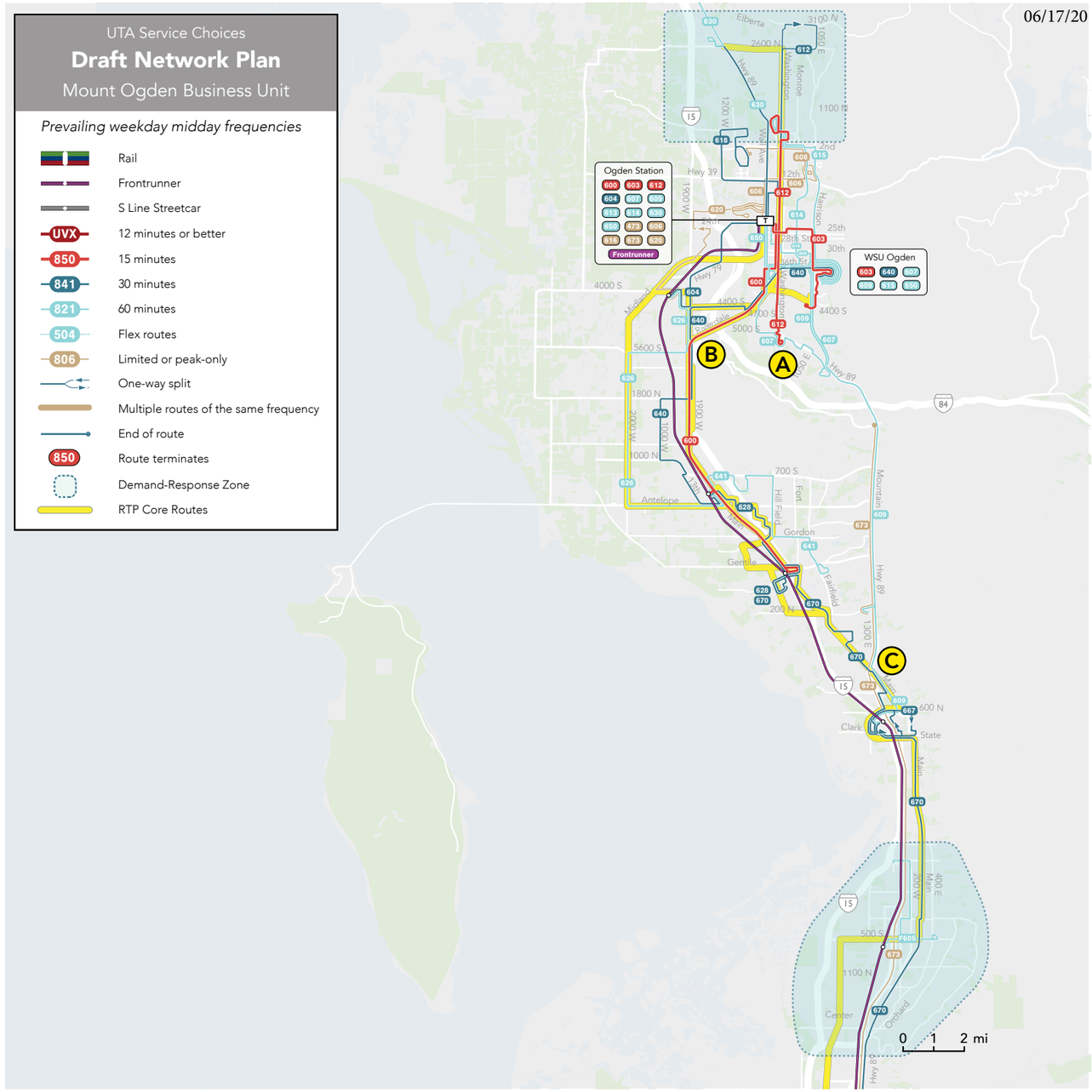


Figure 30: Core Network - Mount Ogden Business Unit- showing all RTP 2050 funded and unfunded core routes

The Core Network

Timpanogos Business Unit

Figure 31 shows the Draft Plan network in the Timpanogos Business Unit overlaid on the MAG 2050 RTP Core Routes network, including both funded and unfunded projects (in yellow).

MAG's Core Network does not include route 850 along State St., which is the highest-ridership bus service apart from UVX. This is identified as a future rapid transit corridor, rather than a Core Route. A separate study led by MAG, UDOT and UTA is currently examining options for enhanced transit on this corridor.

The Draft Plan retains the existing 15-minute Route 850, but does not bring this service to the full Core Route Tier II span and frequency minimums. In part, due to the constrained resources of this business unit, to do so would require presently unnacceptable cuts to network coverage else.

In addition, Route 850 is the only element of the Utah County network (apart from Route 871, which mainly operates outside of Utah County) that currently operates on Sundays. With constrained resources, frequency improvements to meet the Core Network Tier II standard on either Saturday or Sunday would require a transfer from weekday service that would require offsetting service cuts elsewhere.

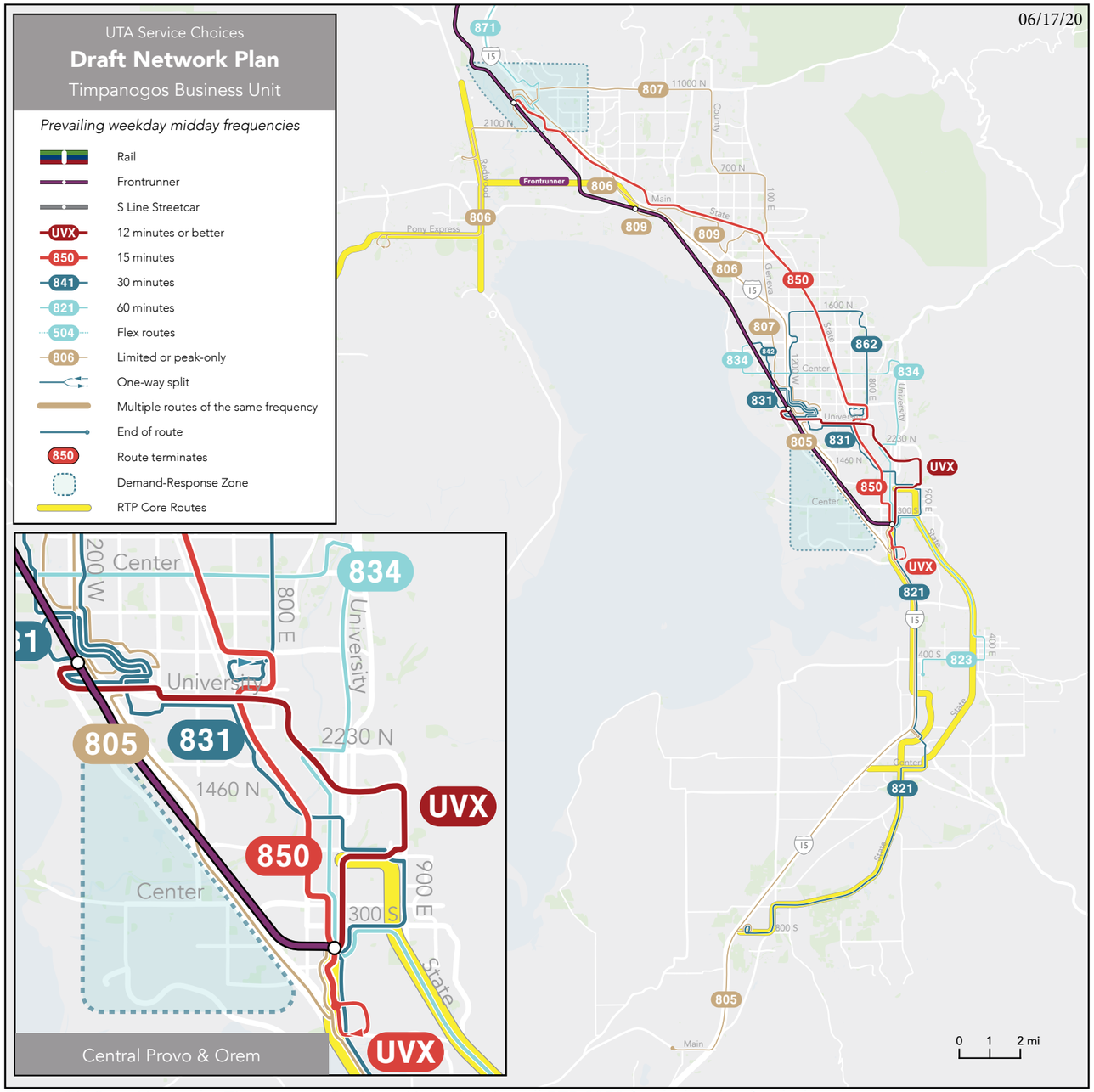


Figure 31: Core Network - Timpanogos Business Unit- showing all RTP 2050 funded and unfunded core routes

The Core Network

Considerations for Future Planning

The next iteration of RTP development may incorporate some of the considerations addressed in this Network Plan: namely, the balance of spending transit resources on routes with high ridership compared to routes that cover a large geographic area. The direction for this Network Plan was to shift focus towards ridership-based routes, which shifts resources away from lower-density and lower-intensity areas that produce fewer transit riders.

The RTP plans are updated every four years, and the methodology for determining the most appropriate locations for Core Routes may evolve in future RTPs. Recommendations on Core Route typology from this plan could help advise communities on the meaning of various levels of transit investment in the future, and expectations for transit-supportive land use along Core Route corridors.

In addition, WFRC and MAG may look to further unify their approach to identifying ridership and service parameters for Core Routes in the future. Given that one service provider (UTA) will be operating Core Routes in both areas, future plans should be coordinated in their approach to ridership criteria and terminology. If UTA chooses to continue to use Core Network standards similar to those developed in Service Choices in its ongoing network planning, the attributes documented here may be a good starting place to bring the Core Routes / Core Network plans into further coherence.

Access Analysis and Standards

Access Analysis and Standards

An individual's choice to use transit will often depend on whether it is useful for the type of trips they need to make. Can transit get me to work by the time my shift starts, reasonably fast? These fundamental questions underlay modal choice. One method of understanding how changes to the transit network could impact the usefulness of the system is access analysis, which compares the number of jobs reachable within a given travel time (i.e. 45 minutes) within the existing network, and within the network changes of the Draft Plan.

This section provides an introduction to the use of access analysis to measure transit network usefulness. It provides an overview of a typical methodology, an explanation of how these methods can be useful to UTA in future network planning efforts, and then some examples of access results from the March 2020 terminal iteration of the Service Choices Draft Plan.

Why focus on these measures?

In any proposed set of network changes, one of the most important outcomes is how a set of changes will impact the network's usefulness. Where can people travel easily? Which trips require long waits to transfer?

In the past, these types of questions were often examined using matrix-style travel time analyses (comparing before and after travel times between many points), or simply through reliance upon the knowledge and expertise of planners familiar with the system. These methods can provide very useful information, but they always require staff to judge which points are important. A travel time analysis between 20 or 50 points is probably feasible; between 2000 or 5000, less so.

Broader analysis is of course possible through travel time modeling, but modeling is generally a time-intensive process that does not always operate on the same schedule as service planning. In addition, because model outputs are capable of providing predictions about things like transit ridership and mode share, they can often encourage users to focus on predictive outcomes based on complex, often black-box assumptions.

Access analysis methods provide an option for planners to understand the direct impacts on the most important variable they can control: travel time, and where that travel time can take riders. The accuracy of predictive outcomes like ridership are often vulnerable to fluctuations in macroeconomic trends like employment, gas prices, and vehicle financing. By focusing on travel time and access, and analyzing these factors broadly across the service area, we can develop a nuanced sense of potential benefits and negative impacts to one of the most important determinants of customer utility and ultimately of their likeliness to ride.

Role in the planning process

At what point in the process should we deploy access analysis? This is an important question, because while access analysis is a simpler process than something like a full travel model run, it is still a time-intensive task that should be used when that effort can have the greatest benefit.

In our transit network design work, we have found at least four very beneficial points in service planning processes to introduce access analysis:

- At the point of a network redesign study when distinctive network alternatives have been developed, access analysis can be used to gauge the potential impacts on usefulness spatially, and identify how different socioeconomic groups fare under each option. This typically requires the use of a tool that can rapidly sketch out a conceptual GTFS (or another rapid network analysis input).
- When prioritizing different additive investments (such as a future high-capacity transit corridor), analysis can be conducted with each corridor overlaid on the existing network to compare the potential benefits of different alignments and develop prioritization metrics. This typically requires the use of a tool that can rapidly sketch out a conceptual GTFS (or another rapid network analysis input).
- As routine changes to the network are developed in the course of everyday service planning (such as frequency changes or run time adjustments), access analysis can help understand the potential compound impact of what otherwise may appear to be a package of minor changes. This typically requires either a draft schedule produced by schedulers, or the ability to edit the existing GTFS.

In general, we do not find value in a hard and fast set of absolute standards for access analysis. For instance, a network change that provides access to 1000 more jobs is much more meaningful in a place that previously had access to only 5000 jobs than in one where 50,000 jobs are within walking distance!

The primary value of this tool is to provide a comparative sense of the potential benefit of different service options to the customer. With the right tools and demographic data inputs, results can be rapidly developed covering the entire service area, tabulated for key socioeconomic characteristics, and refined within particular geographies of interest (like a particular city or county). It is our strong recommendation that UTA consider employing these tools in its future network planning efforts.

Some network planning questions we can use access analysis to understand include:

- With this network alternative, which parts of our service area gain access to more jobs, and which lose access to jobs?
- If we replace local stop route "A" with a limited-stop express route "B," does the travel time benefit of faster in-vehicle speeds outweigh the extra walk time for the customer?
- Does this package of changes have a different impact on certain socioeconomic group versus on the general population?
- How much does replacing a direct service to a job center with a feeder to a nearby frequent route reduce the jobs accessible from the sergment now on the feeder? What if we increase the frequency of the feeder?

Access Analysis and Standards

Examples from Service Choices Draft Plan

A full access analysis was not conducted on the Service Choices Draft Plan, because the plan was not completely finalized prior to the onset of the COVID-19 emergency. However, several rounds of preliminary access analysis were conducted during the refinement of the plan, including on the March 2020 draft that represents the end state of the network developed in this process.

Systemwide Outcomes by Business Unit

Graphics like the charts on this page (Figure 32 and Figure 33) help us understand how many people are positively and negatively impacted by a set of proposed transit network changes.

In these charts, each bar represents the total number of people living in each of the three business units. Segments of that bar are colored based on the percent of people who gain (green) or lose (brown) access to jobs in 60 minutes of travel time with the Service Choices Draft Plan.

For example, if we look at the bottom bar on each image, we can see that in Mount Ogen, about 50% of people gain access to at least 1% more jobs than they can reach with transit today in 60 minutes, while about 34% lose access to at least 1% of jobs. On the second chart, we can see how those relative changes look in absolute terms. About 43% of Mount Ogden residents gain access to at least 1000 more jobs than they can reach today, while about 20% lose access to at least 1000 jobs.

We can also focus on just the very dark segments of each chart to examine very strong impacts. For instance, in Mount Ogden, about 20% of people would gain access to at least 50% more jobs than they could reach with the January 2020 network in 60 minutes, while about 9% would lose access to at least 50% of the jobs they could reach with the January 2020 network.

In Salt Lake, where service was added, nearly 45% of residents would gain access to at least 5% more jobs or greater than with the January 2020 network, and over 30% would gain access to at least 10% more jobs.

In Timpanogos, the major changes to the network involved spreading reduced service on the least productive segment of the UVX, and redistributing that service to enhance access in other parts of the network. As a result, over 45% of residents would gain access to at least 1% more jobs, while fewer than 5% of residents experiencing any negative impact at all.

While these charts are useful in understanding the balance of impacts across the entire population, they don't tell the full story of which changes impact which places. For that, we must examine maps that show which parts of the region would gain and lose access to jobs with the Service Choices Draft Plan.

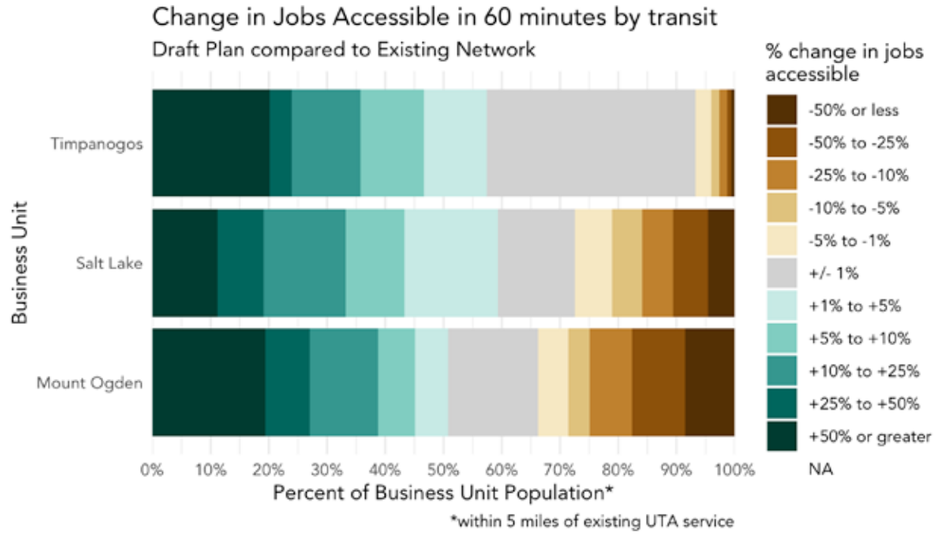


Figure 32: Percent Change in Access to Jobs

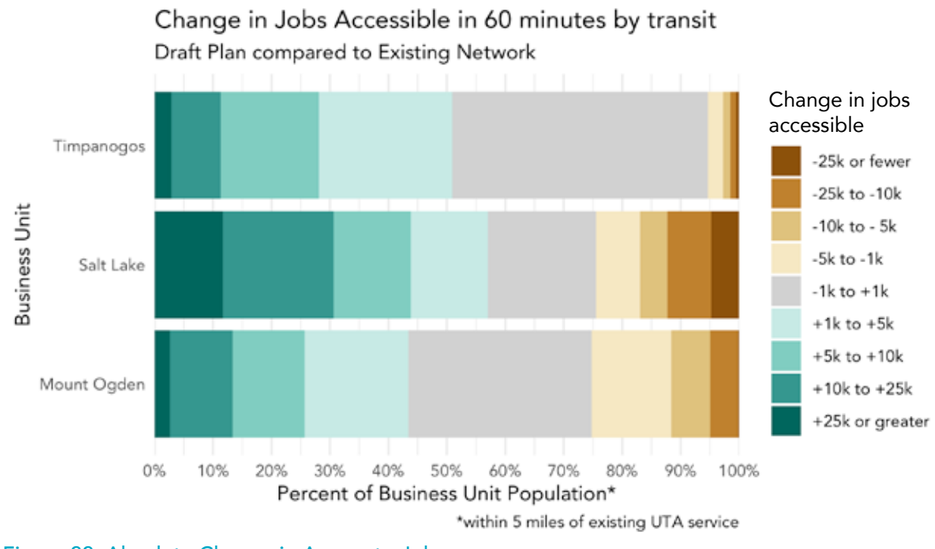


Figure 33: Absolute Change in Access to Jobs

Access Analysis and Standards

Salt Lake Business Unit

Figure 34 maps the results of the access analysis in the Salt Lake Business Unit. In this map, job access was analyzed from the center of each hexagon (spaced evenly every 1/4 mi). Hexagons shaded green are places where more jobs would be accessible, while those shaded brown would have fewer jobs accessible.

Major Changes

- (A) **3300 / 3500 S.** This corridor would now be served evey 12 minutes by Route 35. As a result, job access improves along most of the corridor, except at the western end of the line in Magna, where the existing routes' turnaround paths are consolidated.
- (B) **Rose Park.** Route 10 in the Draft Plan extends 15-minute service into Rose Park connecting to downtown, an improvement on the existing 30-minute services with the pre-Covid network.
- (C) **7000 S / 7200 S / 7800 S.** Existing Route 72 (which runs every 60 minutes) is replaced by the 30 minute routes 70 and 72. This would reduce waiting times for trips along both corridors, which produced a substantial expansion of job access in this area.
- (D) **3200 W (north end).** Route 240 is extended at 30-minute frequency through this industrial employment area to terminate at the airport.
- (E) **Realignment of Route 47 anticipating future Mid-Valley Connector.** Route 47 is redesigned to terminate at West Valley Central Station. This improves job access for most areas along 4500 S west of 1300 E. This would establish a new one-seat ride from this corridor to SLCC and Valley Fair Mall.
- (F) **South State St.** The existing Route 201 serving State St. south of Murray Central Station is upgraded to 30-minute frequency and extended at Draper Station.
- (G) **Highland Blvd.** Access would decline along Highland due to the reduction in frequency on Route 220 from every 15 minutes to every 30 minutes. Route 213 serving 1300 E is upgraded from 30-minute to 15-minute frequency,
- (H) **4100 S / 4700 S.** The changes to Route 47 (new terminus at West Valley Central) produce access gains east of 2700 W along the 4500 S corridor. This is accomplished by replacing service currently provided west of 2700 W by routes 41 and 47 with the new, less-frequent Route 41. Going from 15 to 30 minute service on these corridors produces a substantial loss of job access. Access loss is more limited along the 4100 S corridor, since much of the area between 3500 S and 4100 S enjoys a net gain in access due to improvements to Route 35.
- **Route 35 UTA Garage Deviation.** With the consolidation of patterns on 3500 S, all trips of Route 35 must perform the 700 W / 900 W deviation. This is partially offset by 12-minute headways on this route.

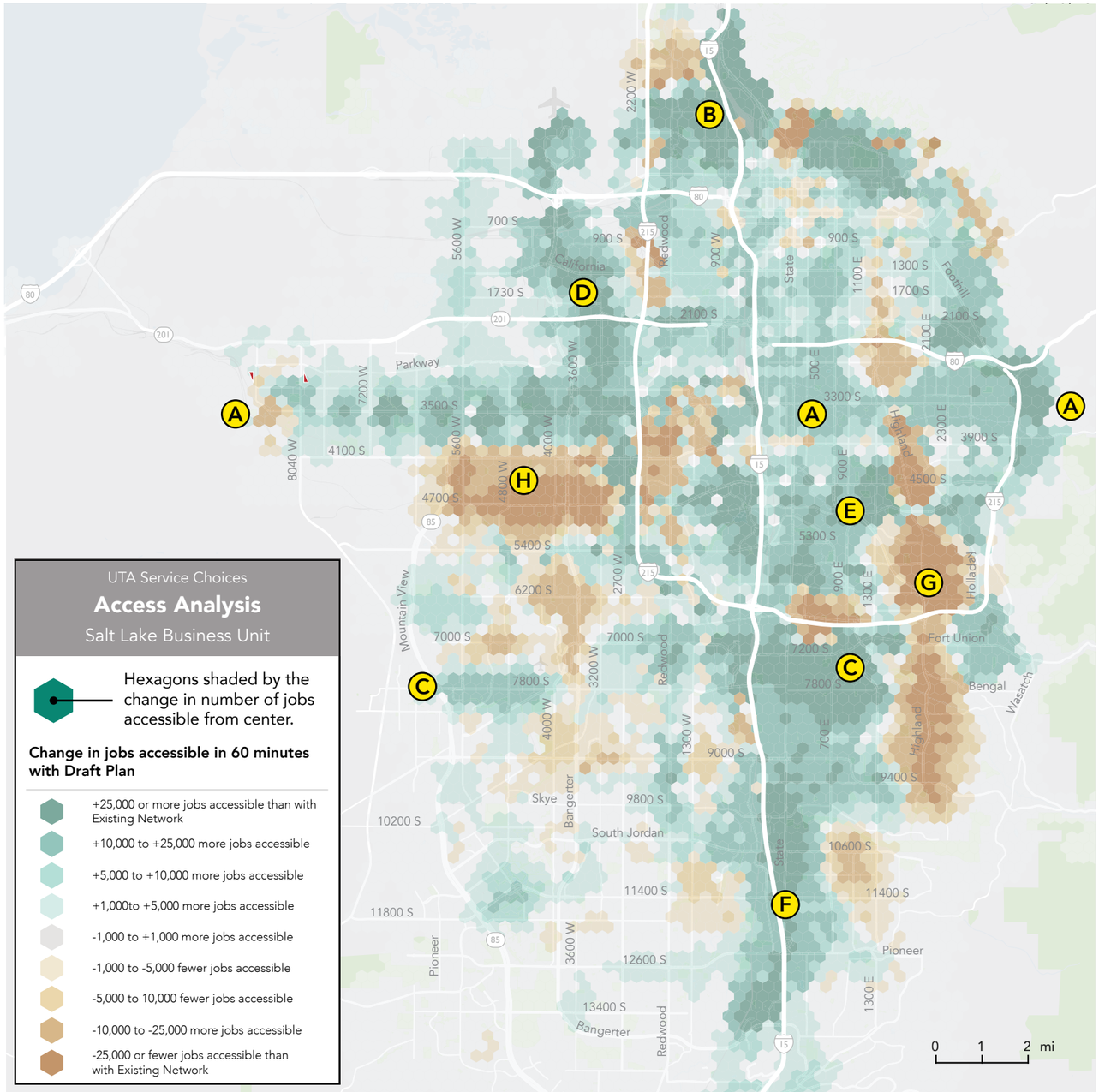


Figure 34: Access Analysis (Salt Lake Business Unit)

Access Analysis and Standards

Mount Ogden Business Unit

Figure 35 maps the results of the access analysis in the Mount Ogden Business Unit. In this map, job access was analyzed from the center of each hexagon (spaced evenly every 1/4 mi). Hexagons shaded green are places where more jobs would be accessible, while those shaded brown would have fewer jobs accessible.

Major Changes:

- (A) **Main St.** North. The addition of 15-minute service on the northern side of the Main St. corridor expands job access in areas within walking distance to new Route 600.
- (B) **Bountiful On-Demand Zone.** The existing express services to Downtown Salt Lake City are replaced by an on-demand service similar to the UTA On-Demand pilot currently in operation in Salt Lake County. This service would reduce waiting times and allow travel between any two points in the zone, including FrontRunner at Woods Cross station, but would have more limited passenger capacity than the current routes.
- (C) **Northwest Ogden Industrial Area.** Existing Route 613 is replaced by new Route 618, running every 30 minutes. This would reduce travel times to and from employment along 12th St and 1200 W.
- (D) **Midland Dr.** Route 626 is rerouted to terminate at Roy Station, and would no longer serve this segment of Midland.
- (E) **Main St.** (Farmington - Kaysville). As a result of not being able to afford to bring the entire Main St. corridor to 15-minute frequency in the draft plan, this segment near the corridor's break point at Layton loses job access in 60 minutes. This is because some jobs north of Layton that are currently accessible from this segment - with a single seat ride on Route 470 - would now require a transfer from Route 670 to Route 600.
- (F) **Northeast Ogden.** Loss of access due to frequency reduction of Route 612 north of 12th St. from every 15 minutes to every 30 minutes.
- (G) **South Ogden (Route 612 changes).** In the Draft Plan, Route 612 is streamlined and would no longer deviate into the Washington Terrace neighborhood. This route would now terminate at Ogden Regional Medical Center, rather than its pre-Covid terminus near Hwy 89 and 1050 E.

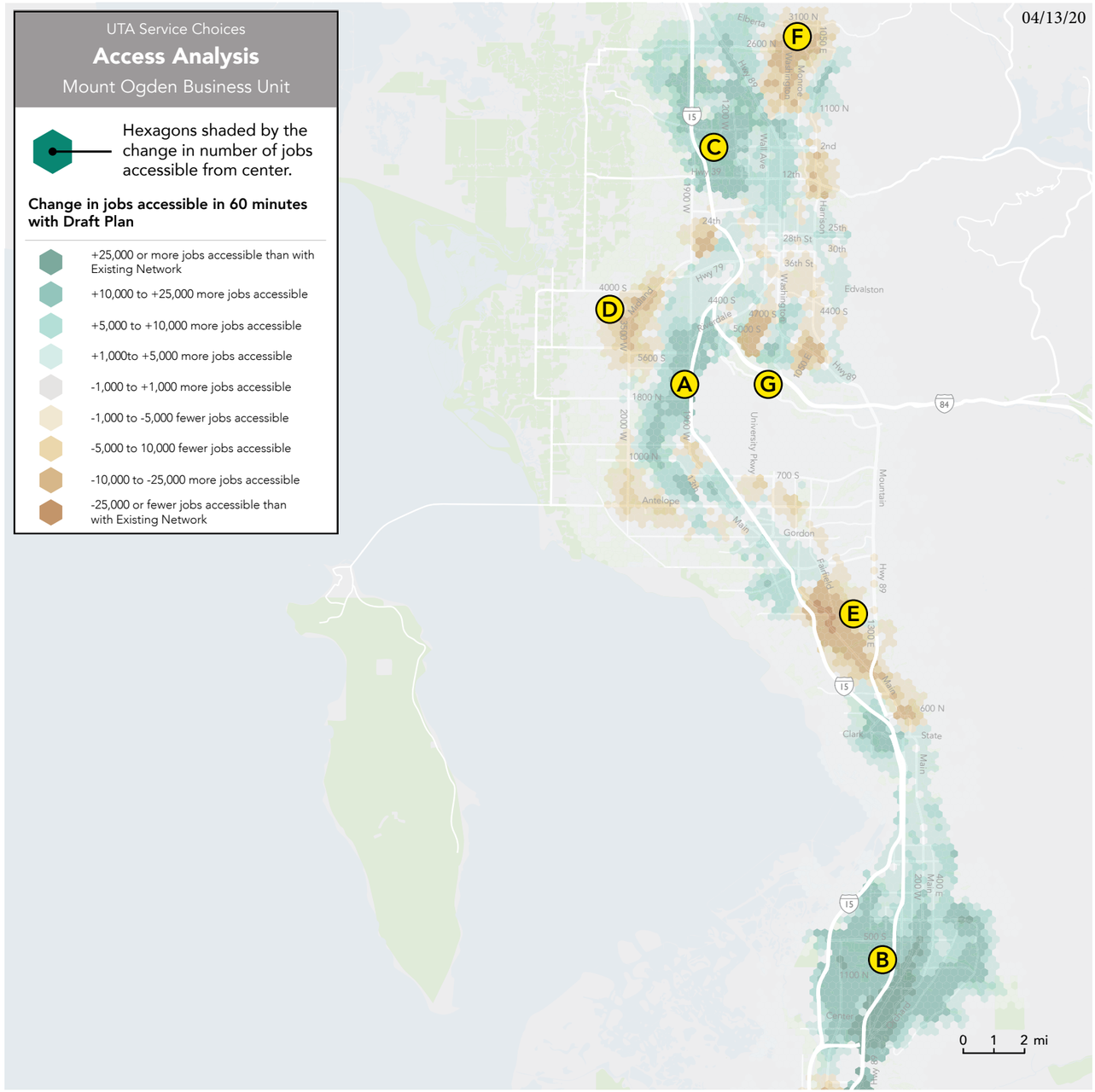


Figure 35: Access Analysis (Mount Ogden Business Unit)

Access Analysis and Standards

Timpanogos Business Unit

Figure 36 maps the results of the access analysis in the Timpanogos Business Unit. In this map, job access was analyzed from the center of each hexagon (spaced evenly every 1/4 mi). Hexagons shaded green are places where more jobs would be accessible, while those shaded brown would have fewer jobs accessible.

Major Changes:

- (A) **New Vineyard Services.** This model includes both the new Vineyard FrontRunner station, and two routes serving the Vineyard area. Existing Route 834 would now connect Vineyard Station and the west side of the area to BYU and downtown Provo, while new Route 842 would connect Vineyard Station and the east side of the area to UVU and surround commercial areas.
- (B) **South County improvements.** New all-day 30-minute service (Route 821).
- (C) **Thanksgiving Point On-Demand Zone.** The existing 30-minute Route 864 is replaced by an on-demand service similar to the UTA On-Demand pilot currently in operation in Salt Lake County. This service would reduce waiting times and allow travel between any two points in a zone covering the main retail and employment centers of Thanksgiving Point, but would have more limited passenger capacity than the current route.
- (D) **Provo Airport On-Demand Zone.** The fixed-route in this area (Route 833) would be reduced to peak-only, hourly service (approximately 6 round-trips per day), but a new on-demand zone would provide app-based connections with reduced waiting time between the airport, nearby residential areas and Provo Station. This service would have more limited passenger capacity than the current route, which is poorly used.
- (E) **831 rerouted in Provo.** This route is redesigned to more directly serve high-density areas along Columbia Ln., but this change puts some areas along 2100 W further from service, causing a loss of job access.
- (F) **UVX East Bay segment.** Frequency is reduced from every 6 to every 12 minutes in this segment south of Provo Station, and those savings are reinvested elsewhere in Utah County. For trips to or from destinations in this segment, average waiting times would increase from 3 to 6 minutes (half the headway). In the UVX segments on the north side of BYU, this would produce a net loss of job access compared to the pre-Covid network.

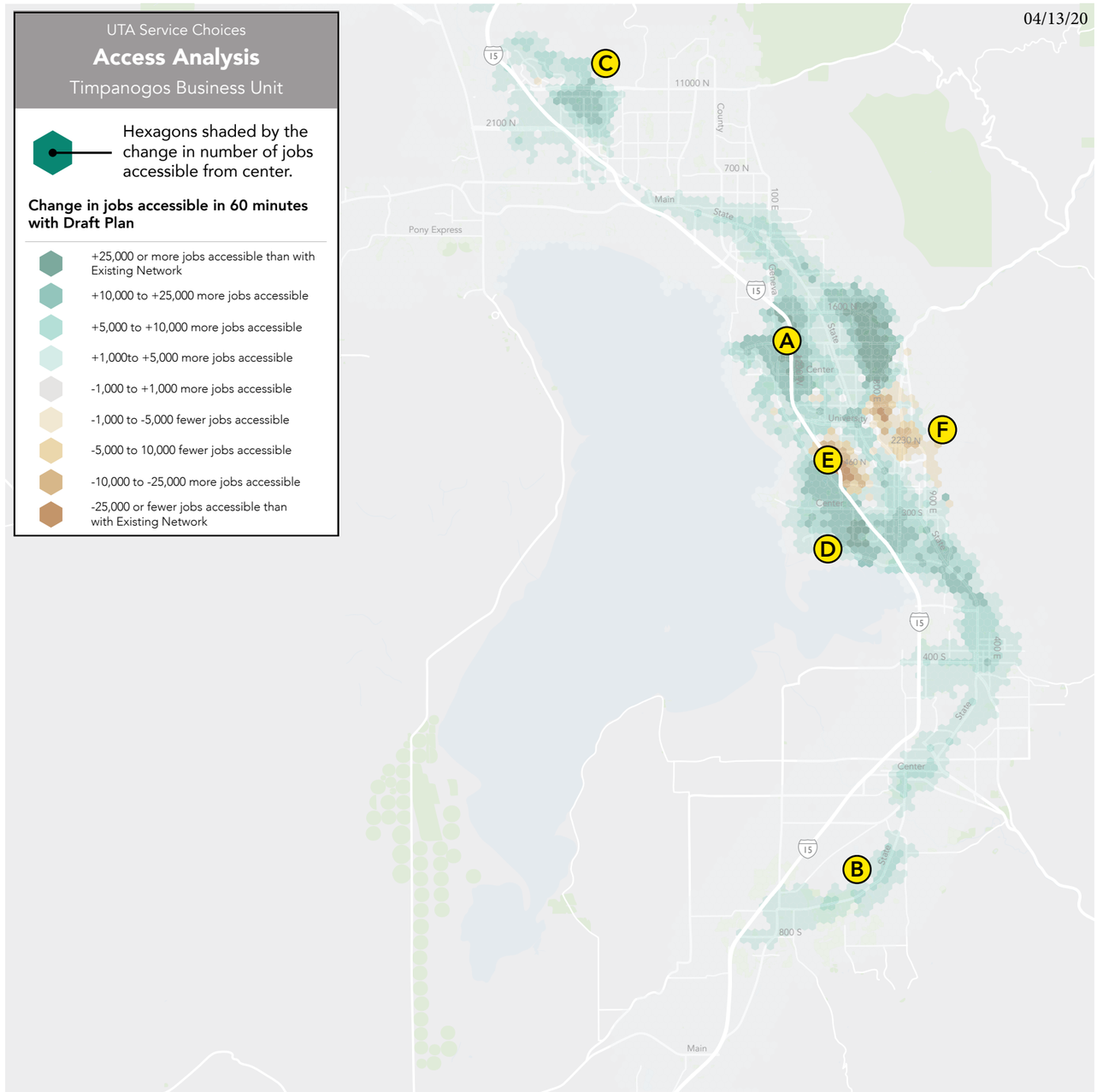


Figure 36: Access Analysis (Timpanogos Business Unit)

Access Analysis and Standards

Methodological Description

Fundamentally, access analysis is about examining what people can reach with transit. The foundation of this is the *isochrone*, which is a map showing a polygon that represents all the area reachable from a given starting location.

Where can transit take you?

Transit's ability to connect people to opportunities and essential services does not depend on how large an area they can reach, but which destinations are in that area. To capture the potential benefit of transit, count the number of opportunities within that area - jobs, educational institutions, grocery stores, hospitals, social service providers, shopping centers, etc.

Jobs are the most commonly used indicator for this type of analysis, because the US Census' Longitudinal Employer-Household Dynamics (LEHD) dataset provides comprehensive, geographically detailed data on employment locations in most U.S. jurisdictions. The preliminary results documented here rely on this data source.

Access throughout the service area

While analyzing the number of jobs reachable in a given travel time can tell us about transit's potential to connect people to jobs and opportunities in a single place, to understand impacts for all UTA riders and constituents, we must conduct that same analysis throughout the service area.

To do this, we generated a hexagonal mesh across UTA's service area at an interval of of 402 meters (approximately 1/4 mile), and generated isochrones from the centroids of each hexagon. By analyzing the number of jobs reachable from these points, we produced a regular surface of measurements of the potential benefit (in terms of jobs reachable) that transit can provide to riders. Figure 37 (shown earlier in this document) summarizes the process of generalizing the isochrone concept into an access analysis.

It is also possible to use other geoographies, such as census block groups, neighborhood boundaries, or city boundaries, as the unit of analysis for this process. The simplest method is to analyze job access based on the centroids of each area, but because census and jurisdictional boundaries vary substantially in size and shape, more reliable results can usually be produced by analyzing multiple regularly-spaced or randomly assorted sample points within each boundary, and then summarizing the results from each point.

Detailed analysis process example

Multiple tools can be used to conduct this kind of analysis, and the right choices will depend on the capabilities of the analysts assigned the task. That said, there are a few key capabilities that are necessary for this kind of work:

- **Network analysis.** The ability to conduct network routing queries using the transit network, and to properly account for walking, waiting, transfer, and ride time.

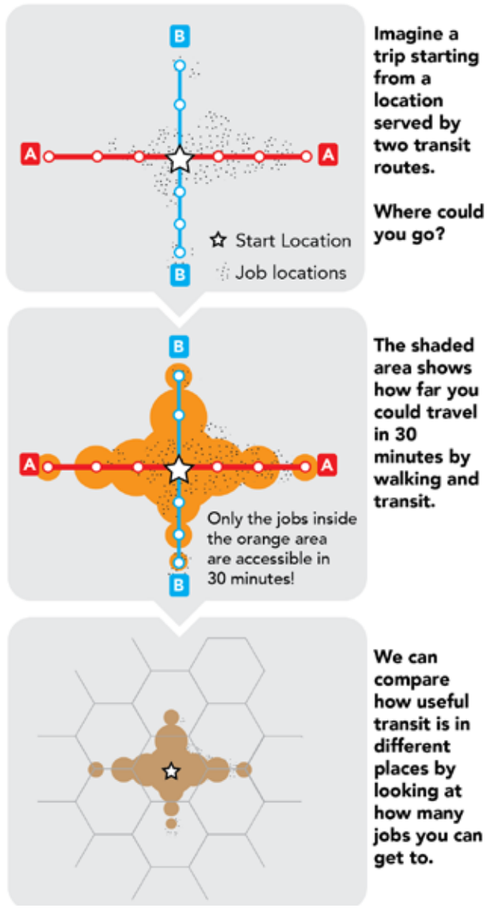


Figure 37: Measuring Transit Usefulness

- Our method uses Remix to produce a conceptual transit schedule in GTFS containing transit travel times, and the open-source routing software OpenTripPlanner to actually conduct isochrone queries. Custom R scripts were developed to provide a simple interface with OTP, and to simplify the thousands of queries required to analyze the entire service area, but there are existing third-party packages in both R and Python that do the same thing.
- A similar process can be accomplished using other tools such as Hastus planning platform, Conveyal Analyst, Optibus, Sugar Access, and other transportation modeling platforms.
- It is also possible to create a network in ArcGIS' Network Analyst tool with the proper costs for each transit link, and to conduct a similar analysis entirely within the Arc ecosystem using its built-in automation tools.

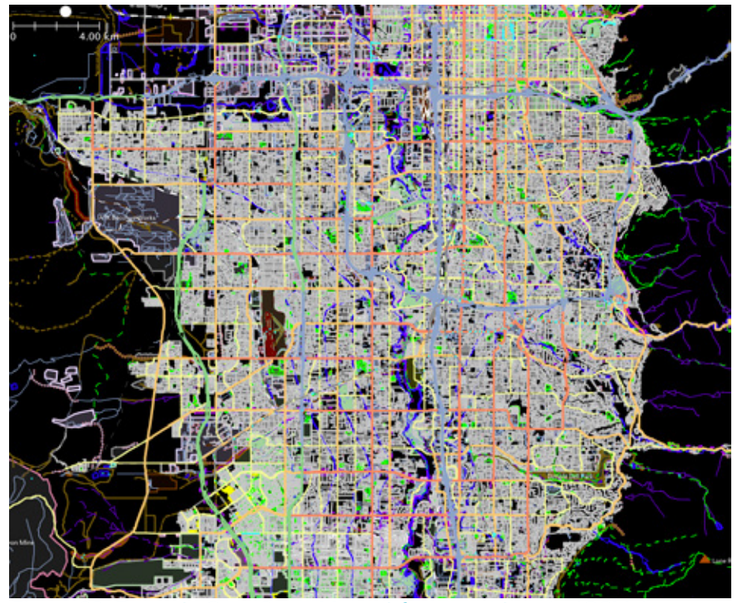


Figure 38: Example OpenStreetMap .pbf extract (show in JOSM Java OpenStreetMap Editor)

- **GIS / spatial analysis.** Some basic GIS capabilities are required to generate the grid of sample polygons and points for access analysis, and to intersect that grid of polygons with census geographies so that aggregate measures can be calculated. We do this in R for reproducibility, but these analyses can be easily accomplished in desktop GIS.

The following list provides an overview of the process we carry out to produce these types of analysis:

- Acquire census demographic and employment data (ACS and LEHD), by block and/or block group.
- Acquire OpenStreetMap (OSM) street network data (as .pbf format export). Various websites such as Geofabrik and HOTO exist for this purpose, and custom extracts can be generated from the OSM world file using tools like Osmosis.
- Build existing and proposed networks in Remix, and export GTFS for each.

Access Analysis and Standards

- A simplified version of the existing network used that assigns each route the prevailing designed headway and speed during different periods, to avoid the variability associated with low-n variations (extra school trippers, etc) . Major variants (longline-shortline segments, branching, consistently unbalanced directional headways) *are* included in this simplified GTFS.
- The proposed network design is entered into Remix at the level of detail to which it has been developed at the Draft Plan phase. In the case of the Service Choices Draft Plan, at this phase, we had developed design frequencies and spans for all days of the week, and identified all longline/shortline and branching patterns.
- Optional: add on-demand dummy routes. Demand-responsive services can't be modeled directly in Remix or OpenTripPlanner, so one method to incorporate them is to create a dummy route, serving many stops throughout the identified demand-response zone. This route should be assigned a wait time equal to the planned response time for the zone. If the demand-response zone has a call-head time of more than maximum travel time budget of the access analysis (typically less than 120 minutes), there is no need to include it in the analysis.

- Process GTFS to generate frequency-based schedule. Because the Draft Network is described in terms of frequencies, rather than specific trips, it is important to compare it to the existing network as represented by frequencies. This is one of the main reasons to build a simplified version of the existing schedule in Remix.
- Build OTP network graph from processed frequency-based GTFS and OSM ".pbf" extract.
- Generate regular polygon grid (squares or hexes) across service area in GIS, and calculate centroids of each.
- Query isochrones from OTP using "LIsochrone" API for each grid centroid location.
- For each hex centroid isochrone, calculate the number of accessible jobs. The simplest way to do this is to intersect each isochrone with census block or block group layer with number of jobs by employment location, and assign jobs to the isochrone based on the proportion of each block or block group that intersects the ischrone (areal interpolation).

The result of this analysis is a geographical table containing a line for each hexagon, and a field for each containing the number of jobs accessible within the travel time budget. This output can then be used for mapping or additional analysis.

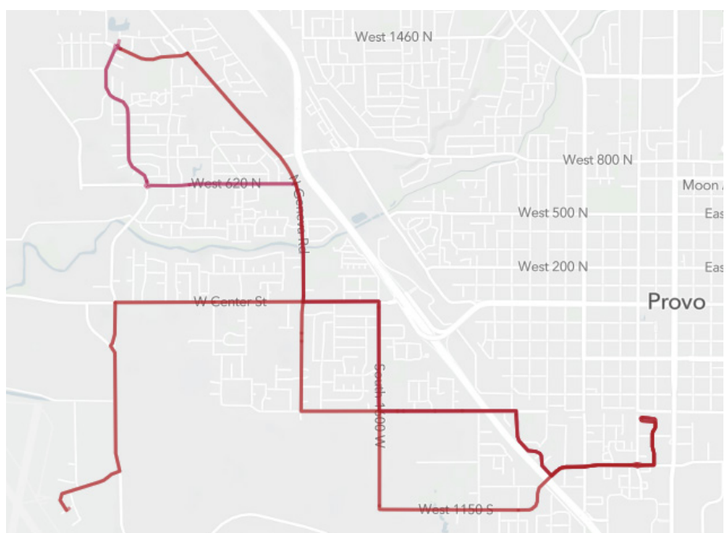


Figure 39: Example of on-demand zone dummy route (in Remix)