



# Cheyenne Transit Program 2022 Transit Development Plan

## *Interim Report #2: Development of Service Alternatives*

May 18, 2022

Prepared by:



FEHR & PEERS

Prepared for:



# **Cheyenne Transit Program 2022 Transit Development Plan**

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## INTRODUCTION

The Cheyenne Transit Program (CTP) is taking an active approach in planning to meet the transportation needs of its community. This report presents five scenario options for transit service in Cheyenne, which will allow decision makers to make informed and accurate changes to improve the quality of transit services for residents of Cheyenne.

This is the second of two Interim Reports to be completed as part of this study. This Interim Report outlines five potential transit scenarios. All scenarios include some fixed-routes services and on-demand zones, although the number of fixed routes, service frequencies, and service hours vary from scenario to scenario. This chapter presents the transit service alternatives and considerations associated with implementing them.

## TYPES OF TRANSIT SERVICE

The term “transit service” encompasses a wide range of service options. Traditionally, people think of transit service as buses operating on a strict schedule. A number of other transit-service options exist, such as demand-response, flex-route, commuter transportation, rideshare, and alternative service-delivery models. To help understand the options and the terminology used in this chapter, LSC has prepared an overview of the different types of transit services.

### Fixed-Route Service

Fixed-route service fits the popular description of a transit system with transit vehicles operating on specified routes and following set schedules. Specific bus stops are typically identified for the locations where passengers will be picked up and dropped off. Routes are usually laid out in either a radial or grid pattern.

Fixed-route service is particularly convenient for passengers without disabilities and non-elderly passengers. Research has shown that fixed-route passengers are willing to walk up to one-quarter mile to reach a bus stop. The advantages of fixed-route service are that it can be provided at a relatively low cost on a per-passenger-trip basis, schedule reliability is high since buses do not deviate from their routes, service does not require advance reservations, and service is easy to understand. However, individuals with mobility impairments may have difficulty accessing a fixed-route system.



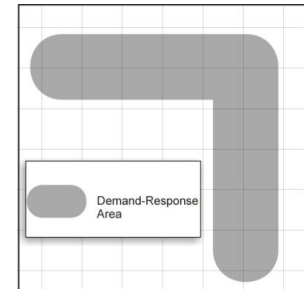
The Americans with Disabilities Act (ADA) requires that communities with fixed-route transit service also provide complementary paratransit service that operates, at a minimum, in a three-quarter-mile radius of each fixed route. Paratransit service is typically much costlier to operate than fixed-route service because of the service’s characteristics. Fixed routes are established to meet the highest-demand travel patterns, while paratransit service must serve many origins and destinations in

a dispersed pattern. Therefore, fixed-route operations lack the flexibility to meet the needs of passengers with any special requirements in low-density areas.

Prior to the COVID-19 pandemic, CTP operated fixed-route service. Fixed-route service will likely be an aspect of CTP's service in the future. The public survey showed a desire for a return to some level of fixed-route service. There is high enough demand along some corridors to justify running a fixed route, which can better serve some of the demand that is currently being served by on-demand services.

### **Demand-Response Service**

Demand-response transit service, frequently termed dial-a-ride, is characterized as door-to-door transit service scheduled by a dispatcher. With demand-response service, reservations are typically required in advance, although some immediate requests may be filled if time permits and if the service is particularly needed.

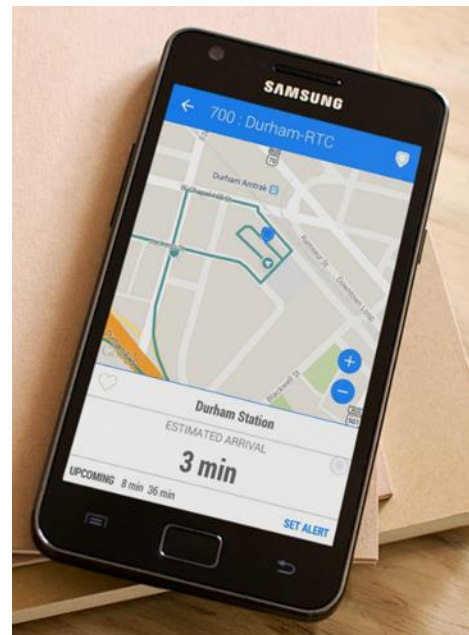


The concept of demand-response service was originally developed in the early 1970s as an alternate form of public transportation. The original efforts proved to be more expensive than envisioned and did not attract the ridership that was forecast. As a result, demand-response transit has been used almost exclusively in this country for elderly and disabled passengers. However, many communities are beginning to recognize the advantages of demand-response service for low-density areas with low levels of transit demand. Improved technology has led to improvements in dispatching and scheduling which has increased the efficiency of demand-response service and allows for real-time dispatching.

### **Microtransit Service**

Microtransit is a relatively new term and can be difficult to define. For the purposes of this study, microtransit is defined as a publicly- or privately-operated, ride-hailing form of transportation which employs on-demand dynamic-route transportation technology to serve multiple passengers in the same vehicle along a route that can either be fixed or flexible.

Microtransit companies, such as Spare Labs, Transloc, and Via, serve passengers using dynamically-generated routes, and may expect passengers to make their way to and from common pick-up or drop-off points. Vehicles can range from large SUVs to vans to shuttle buses. Microtransit can also be called dynamic shuttles or private flexible transit. It should also be noted that some existing microtransit programs have used public agency vehicles and drivers. The primary difference between microtransit and a route-deviation or demand-response service is that



microtransit employs technology that has only recently been available. Microtransit includes the use of software and smartphone technology which:

1. Allows the passenger to reserve a ride directly (without the use of a dispatcher)
2. Provides the driver with pick-up and drop-off assignments in real time
3. Calculates the most efficient route between passenger pick-ups/drop offs

General routes and schedules are followed, but these can be modified as passenger demands evolve. Microtransit services will typically use vans instead of larger buses but will cost more per passenger trip than a fixed-route service. The hope is that technology will allow microtransit programs to carry more passengers than a traditional demand-response service for a lower cost.

During the COVID-19 pandemic, CTP transitioned to microtransit service in response to significant losses in demand for public transportation. Microtransit services are presented as an option in each scenario to serve lower-demand areas and provide connections to the fixed-route bus system. Microtransit will also be combined with ADA paratransit services that complement each proposed fixed route.

## **TRANSIT SERVICE ALTERNATIVES**

A variety of transportation service alternatives have been developed based on the demographic and community conditions analysis in Interim Report #1, along with the survey results and input from CTP staff. Five service alternatives were developed and are presented here. Table 1 presents a summary of the characteristics of each scenario.

Cost estimates for the presented transit service alternatives are based on CTP's cost allocation model developed for Interim Report #1 and inflated to 2022 dollars. Capital costs and requirements for vehicles, bus stops, etcetera will be presented once the recommended transit services have been selected.

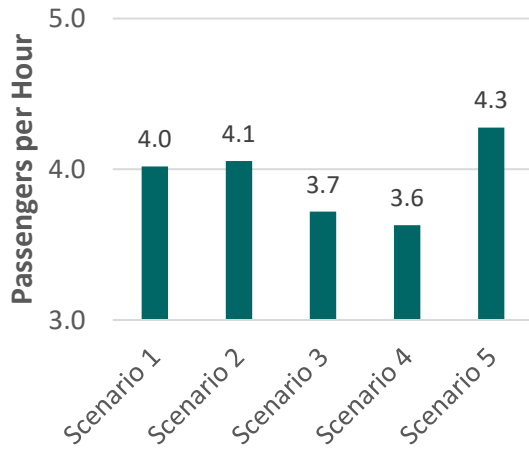
Annual ridership was estimated using potential fixed-route and demand-response models developed in Interim Report #1. Ridership estimates were lowered to be in line with continued reduced ridership due to the COVID-19 pandemic.

**Table 1: Scenario Comparison**

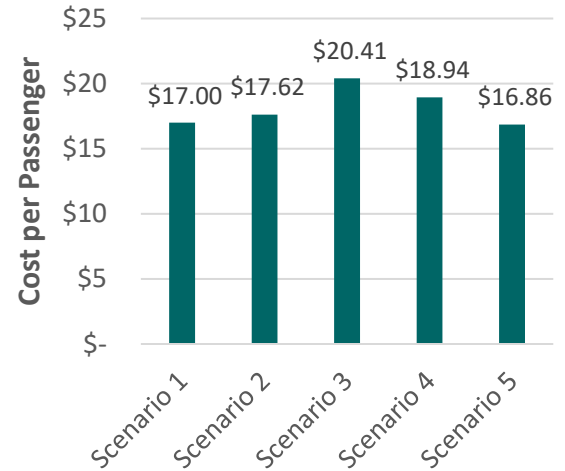
		Scenario					
			1	2	3	4	5
		# Fixed Rts	4	3	2	2	4
		# Zones	4	4	4	4	4
Existing 2021							
Operating Parameters							
Peak Vehicles in Operation	15-16	8	7	6	8	8	
Annual Revenue Hours	22,796	29,120	25,480	21,840	28,392	25,088	
Annual Vehicle Miles	342,556	374,059	320,151	273,158	358,957	322,266	
Annual Operating Cost (Millions)	\$1.89	\$1.99	\$1.82	\$1.66	\$1.95	\$1.81	
Annual Ridership	53,144	117,000	103,000	81,000	103,000	107,000	
Performance Measures							
Passengers per Vehicle Hour	2.3	4.0	4.1	3.7	3.6	4.3	
Cost per Passenger Trip	\$35.56	\$17.00	\$17.62	\$20.41	\$18.94	\$16.86	
Population Within Fixed-Route Service Area*	--	16,500	15,600	10,800	10,800	16,500	
Jobs Within Fixed-Route Service Area*	--	15,700	15,700	14,400	14,400	15,700	
* Within 1/4 mile walk of the fixed routes.							

Passengers per hour, cost per passenger, and annual operating cost by scenario are presented in Figure 1, Figure 2, and Figure 3, respectively.

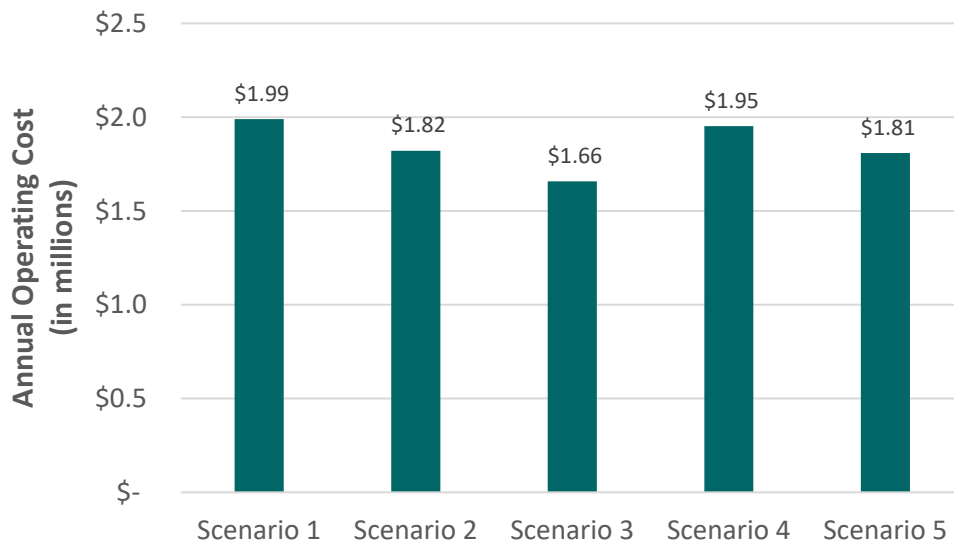
**Figure 1: Passengers per Vehicle Hour by Scenario**



**Figure 2: Cost per Passenger by Scenario**



**Figure 3: Annual Operating Cost by Scenario**





## **Scenario 1: Four Fixed Routes and Four On-Demand Zones**

The first potential scenario provides the greatest coverage throughout Cheyenne. The four fixed routes cover the areas of largest demand, and four on-demand zones provide extra coverage. This scenario assumes the same service hours as in 2019, which is 6:00 a.m. until 7:00 p.m. on weekdays and 10:00 a.m. until 5:00 p.m. on Saturdays, with no Sunday service. Each fixed route operates once per hour, and each fixed route has a runtime of 60 minutes. Figure 4 shows the map of the routes and zones. On-demand vehicles would also serve ADA paratransit needs, which would be included within  $\frac{3}{4}$  mile of each fixed route.

Descriptions of each fixed route are below:

- **Route A** (orange/north) begins service at the CTP bus facility; travels along Lincolnway to provide service to the Comea Shelter; travels through downtown serving the library, the medical center, and other downtown attractions; and connects with the Frontier Mall and the Walmart along Dell Range Boulevard.
- **Route B** (purple) begins service downtown and travels along Lincolnway to 19th Street; then travels east along Pershing Boulevard to College Drive; jogs over to Ridge Road and then turns onto Dell Range Boulevard, meeting Route A at Walmart. Route A and Route B can be interlined.
- **Route C** (red/south) begins service downtown, goes south along Ames Avenue, and goes through neighborhoods along Deming Drive and Walterscheid Boulevard. It turns on Allison Drive and serves the Safeway, then cuts down to College Drive to serve the Laramie County Community College. It then travels north to the east Walmart.
- **Route D** (blue) begins service downtown and travels along Lincolnway, serves the residential area to the east along Taft, and then comes down to the east Walmart, where it meets Route C. Route C and Route D can also be interlined.

Descriptions of each zone are below:

- The **North Zone** is a demand-response zone for residents living north of Dell Range Boulevard. The North Zone connects residents to Route A and Route B at the Frontier Mall and at the Dell Range Walmart.
- The **West Zone** is a demand-response zone for residents living east of I-25, south of Dell Range, north of I-80 and 20<sup>th</sup> Street, and east of Converse Avenue. The zone connects with fixed-route services downtown.
- The **East Zone** is a demand-response zone for residents living to the east of Converse Avenue, south of Dell Range Boulevard and 20<sup>th</sup> Street, east of approximately Campfire Trail, and north of Campstool Road. It will connect riders to the fixed-route system at the east Walmart and many points along Route B and Route D.
- The **South Zone** is a demand-response zone for residents living south of Campstool Road. It will connect with the fixed-route services at Laramie County Community College, downtown, and at the east Walmart.

**Figure 4: Scenario 1 Map**

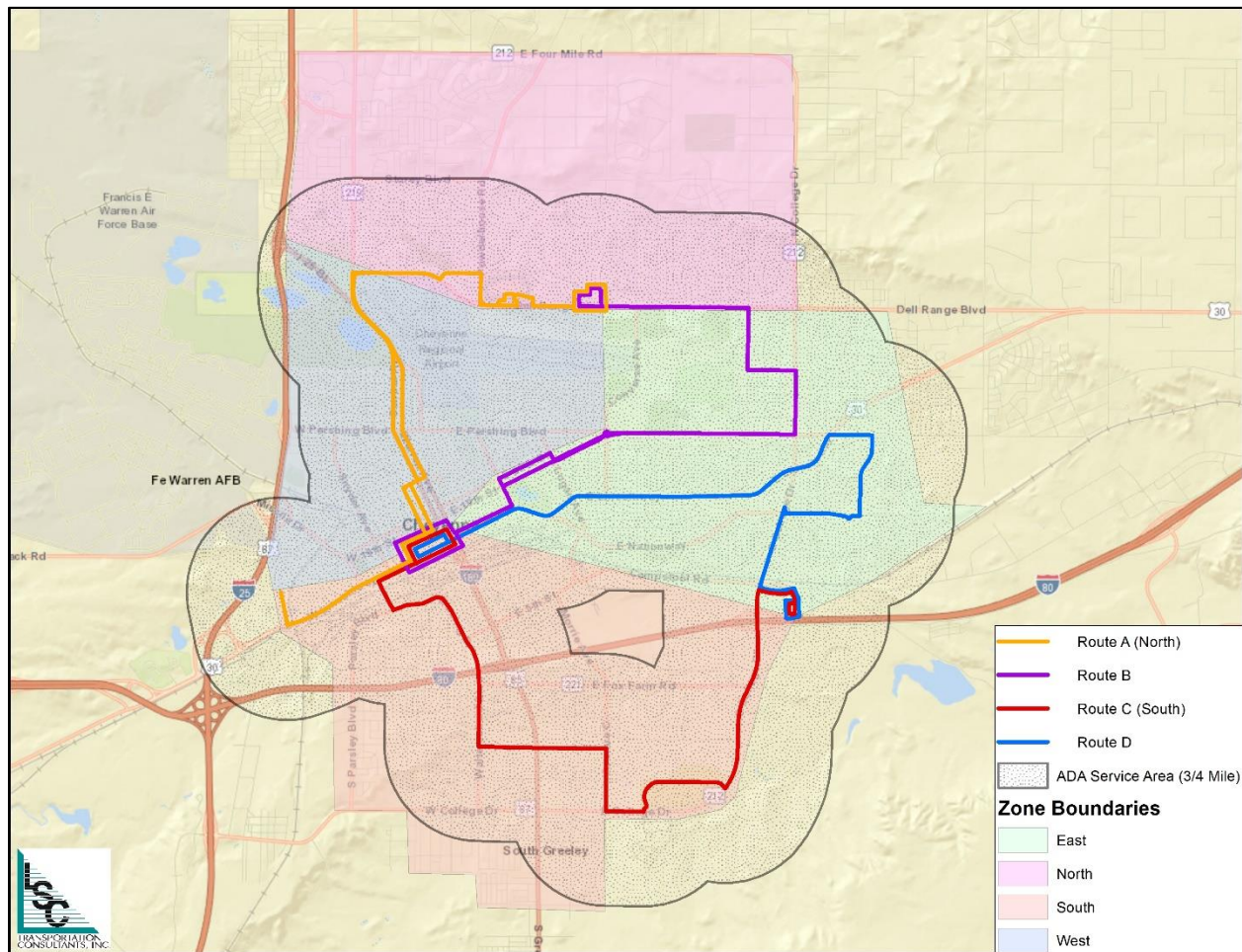


Table 2 provides operating characteristics for Scenario 1. The total cost of this scenario would be about \$1.9 million, slightly higher than the FY 2021 budget.

Route/Zone	Service Frequency	Route Length/ Area	Number of Peak Vehicles	Est. Annual Revenue Hours	Est. Annual Vehicle Miles	Est. Annual Operating Cost
Route A (Orange/North)	60 min.	13.3 mi.	1	3,640	48,300	\$164,100
Route B (Purple)	60 min.	12.9 mi.	1	3,640	47,100	\$163,200
Route C (Red/South)	60 min.	14.8 mi.	1	3,640	53,900	\$168,500
Route D (Blue)	60 min.	12.9 mi.	1	3,640	47,000	\$163,100
North Zone		7.8 sq. mi.	1	3,640	44,500	\$161,200
West Zone		4.6 sq. mi.	1	3,640	44,500	\$161,200
East Zone		5.0 sq. mi.	1	3,640	44,500	\$161,200
South Zone		7.7 sq. mi.	1	3,640	44,500	\$161,200
Fixed Cost						\$685,400
<b>Total</b>			<b>8</b>	<b>29,120</b>	<b>374,100</b>	<b>\$1,989,100</b>

Table 3 shows estimated ridership numbers for Scenario 1. Scenario 1 would generate about 117,000 trips total, with four passengers per hour and an average cost per passenger of \$17.00.

<b>Table 3: Scenario 1 Estimated Ridership</b>					
<b>Route/Zone</b>	<b>Estimated Annual Passenger Trips</b>	<b>Passengers per Vehicle Hour</b>	<b>Cost per Passenger</b>	<b>Population within ¼ mile</b>	<b>Jobs within ¼ mile</b>
Route A (Orange/North)	26,700	7.3	\$6.20	4,900	11,700
Route B (Purple)	27,900	7.7	\$5.90	6,300	4,400
Route C (Red/South)	16,500	4.5	\$10.20	900	2,900
Route D (Blue)	26,300	7.2	\$6.20	7,100	4,000
North Zone	6,000	1.7	\$26.70	12,500	6,200
West Zone	6,600	1.8	\$24.40	8,600	11,700
East Zone	4,200	1.2	\$38.30	16,200	4,500
South Zone	2,800	0.8	\$57.60	13,800	6,300
<b>Total</b>	<b>117,000</b>	<b>4.0</b>	<b>\$17.00</b>	<b>16,500*</b>	<b>15,700*</b>
<i>* Within the fixed-route service area</i>					

## **Scenario 2: Three Fixed Routes and Four On-Demand Zones**

Scenario 2 provides similar coverage as Scenario 1 but removes Route C (Red/South) which is expected to be the lowest-performing route. The southern portion of Cheyenne will be served by on-demand service in its place. The other routes, zones, and parameters stay the same as Scenario 1.

There are a few options available to ensure that the south is still served by high-quality transit service that work for the most popular stops. The South Zone will connect with other zones downtown as well as at the east Walmart. To facilitate easy access for the Laramie County Community College and easy transfers, the on-demand vehicle could have a semi-fixed schedule, departing the Community College at the top of every hour.

**Figure 5: Scenario 2 Map**

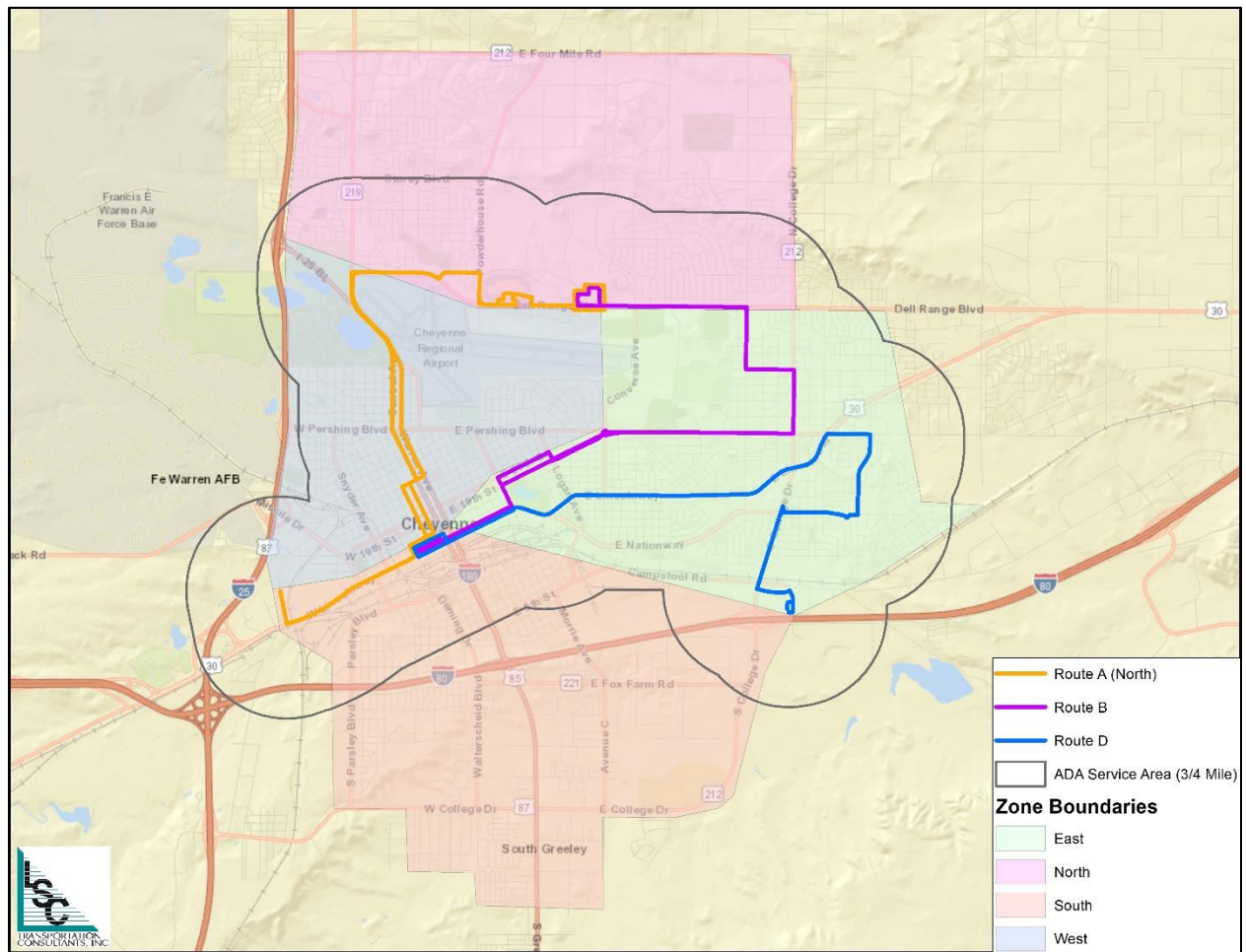


Table 4 provides operating characteristics for Scenario 2. The total cost of this scenario would be about \$1.8 million, slightly higher than the FY 2021 budget.

Route/Zone	Service Frequency	Route Length/ Area	Number of Peak Vehicles	Est. Annual Revenue Hours	Est. Annual Vehicle Miles	Est. Annual Operating Cost
<b>Route A</b>						
(Orange/North)	60 min.	13.3 mi.	1	3,640	48,300	\$164,100
<b>Route B (Purple)</b>						
	60 min.	12.9 mi.	1	3,640	47,100	\$163,200
<b>Route D (Blue)</b>						
	60 min.	12.9 mi.	1	3,640	47,000	\$163,100
<b>North Zone</b>		7.8 sq. mi.	1	3,640	44,500	\$161,200
<b>West Zone</b>		4.6 sq. mi.	1	3,640	44,500	\$161,200
<b>East Zone</b>		5.0 sq. mi.	1	3,640	44,500	\$161,200
<b>South Zone</b>		7.7 sq. mi.	1	3,640	44,500	\$161,200
<b>Fixed Cost</b>						\$685,400
<b>Total</b>			<b>7</b>	<b>25,480</b>	<b>320,200</b>	<b>\$1,820,700</b>

Table 5 shows estimated ridership numbers for Scenario 2. Scenario 2 would generate about 103,000 trips total, with 4.1 passengers per hour and an average cost per passenger of \$17.60.

<b>Table 5: Scenario 2 Estimated Ridership</b>					
<b>Route/Zone</b>	<b>Estimated Annual Passenger Trips</b>	<b>Passengers per Vehicle Hour</b>	<b>Cost per Passenger</b>	<b>Population within ¼ mile</b>	<b>Jobs within ¼ mile</b>
Route A (Orange/North)	26,700	7.3	\$6.20	4,900	11,700
Route B (Purple)	27,900	8.3	\$5.90	6,300	4,400
Route D (Blue)	26,300	7.2	\$6.20	7,100	4,000
North Zone	6,000	1.7	\$26.70	12,500	6,200
West Zone	6,600	1.8	\$24.40	8,600	11,700
East Zone	4,200	1.2	\$38.30	16,200	4,500
South Zone	5,600	0.8	\$28.80	13,800	6,300
<b>Total</b>	<b>103,300</b>	<b>4.1</b>	<b>\$17.60</b>	<b>15,600*</b>	<b>15,700*</b>
<i>* Within the fixed-route service area</i>					

### **Scenario 3: Two Fixed Routes and Four On-Demand Zones**

Scenario 3 focuses fixed-route coverage on the northern portion of town with the yellow and purple routes, removing both the red (eastern) and blue (southern) routes. The southern and eastern portions of Cheyenne would be served by on-demand service. The other zones and parameters stay the same.

The Southern zone would have the same options available as in Scenario 2, including connecting to other zones downtown and at the east Walmart, as well as having coordinated stop times at the Laramie County Community College.



**Figure 6: Scenario 3 Map**

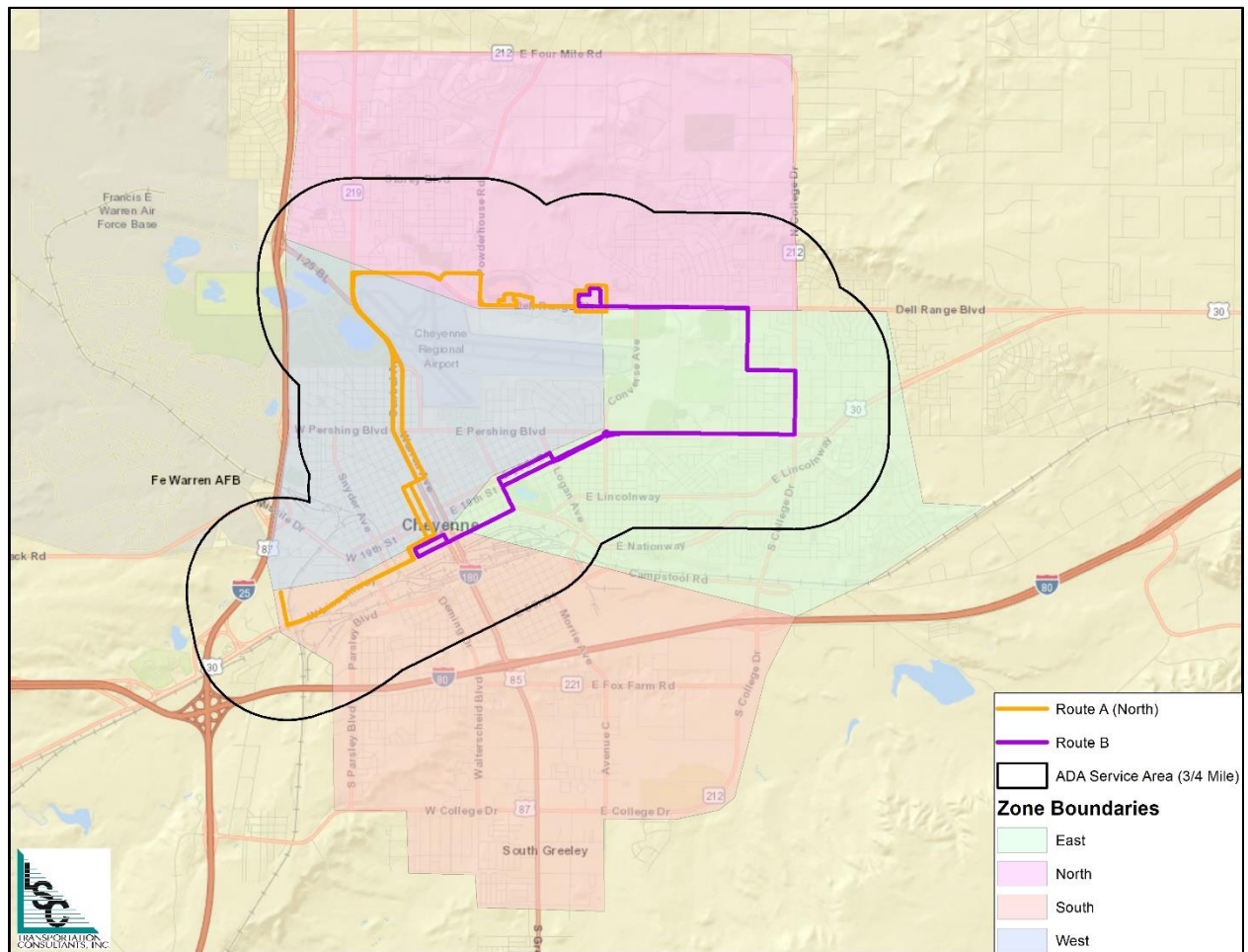


Table 6 provides operating characteristics for Scenario 3. The total cost of this scenario would be about \$1.6 million, similar to the FY 2019 budget.

Route/Zone	Service Frequency	Route Length/ Area	Number of Vehicles	Est. Annual Revenue Hours	Est. Annual Vehicle Miles	Est. Annual Operating Cost
Route A (Orange/North)	60 min.	13.3 mi.	1	3,640	48,300	\$164,100
Route B (Purple)	60 min.	12.9 mi.	1	3,640	47,100	\$163,200
North Zone		7.8 sq. mi.	1	3,640	44,500	\$161,200
West Zone		4.6 sq. mi.	1	3,640	44,500	\$161,200
East Zone		5.0 sq. mi.	1	3,640	44,500	\$161,200
South Zone		7.7 sq. mi.	1	3,640	44,500	\$161,200
Fixed Cost						\$685,400
<b>Total</b>			<b>6</b>	<b>21,840</b>	<b>273,200</b>	<b>\$1,657,500</b>

Table 7 shows estimated ridership numbers for Scenario 3. Scenario 3 would generate about 81,200 trips total, with 3.7 passengers per hour and an average cost per passenger of \$20.40.

<b>Table 7: Scenario 3 Estimated Ridership</b>					
<b>Route/Zone</b>	<b>Estimated Annual Passenger Trips</b>	<b>Passengers per Vehicle Hour</b>	<b>Cost per Passenger</b>	<b>Population within ¼ mile</b>	<b>Jobs within ¼ mile</b>
Route A (Orange/North)	26,700	7.3	\$6.20	4,900	11,700
Route B (Purple)	27,900	8.3	\$5.90	6,300	4,400
North Zone	6,000	1.7	\$26.70	12,500	6,200
West Zone	6,600	1.8	\$24.40	8,600	11,700
East Zone	8,400	1.2	\$19.10	16,200	4,500
South Zone	5,600	0.8	\$28.80	13,800	6,300
<b>Total</b>	<b>81,200</b>	<b>3.7</b>	<b>\$20.40</b>	<b>10,800*</b>	<b>14,400*</b>
<i>* Within the fixed-route service area</i>					

#### **Scenario 4: Two Fixed Routes with Half-Hour Service and Four On-Demand Zones**

Scenario 4's routes and zones are the same as Scenario 3, except that the Yellow and Purple routes would have service provided every half hour by operating two buses on each of these routes. This is possibly a plan element that can be phased in as demand necessitates it. The southern and eastern portions of Cheyenne would be served by on-demand service. Other parameters remain the same.

The Southern zone would have the same options available as in Scenario 2, including connecting to other zones downtown and at the east Walmart, as well as having coordinated stop times at the Laramie County Community College.

**Figure 7: Scenario 4 Map**

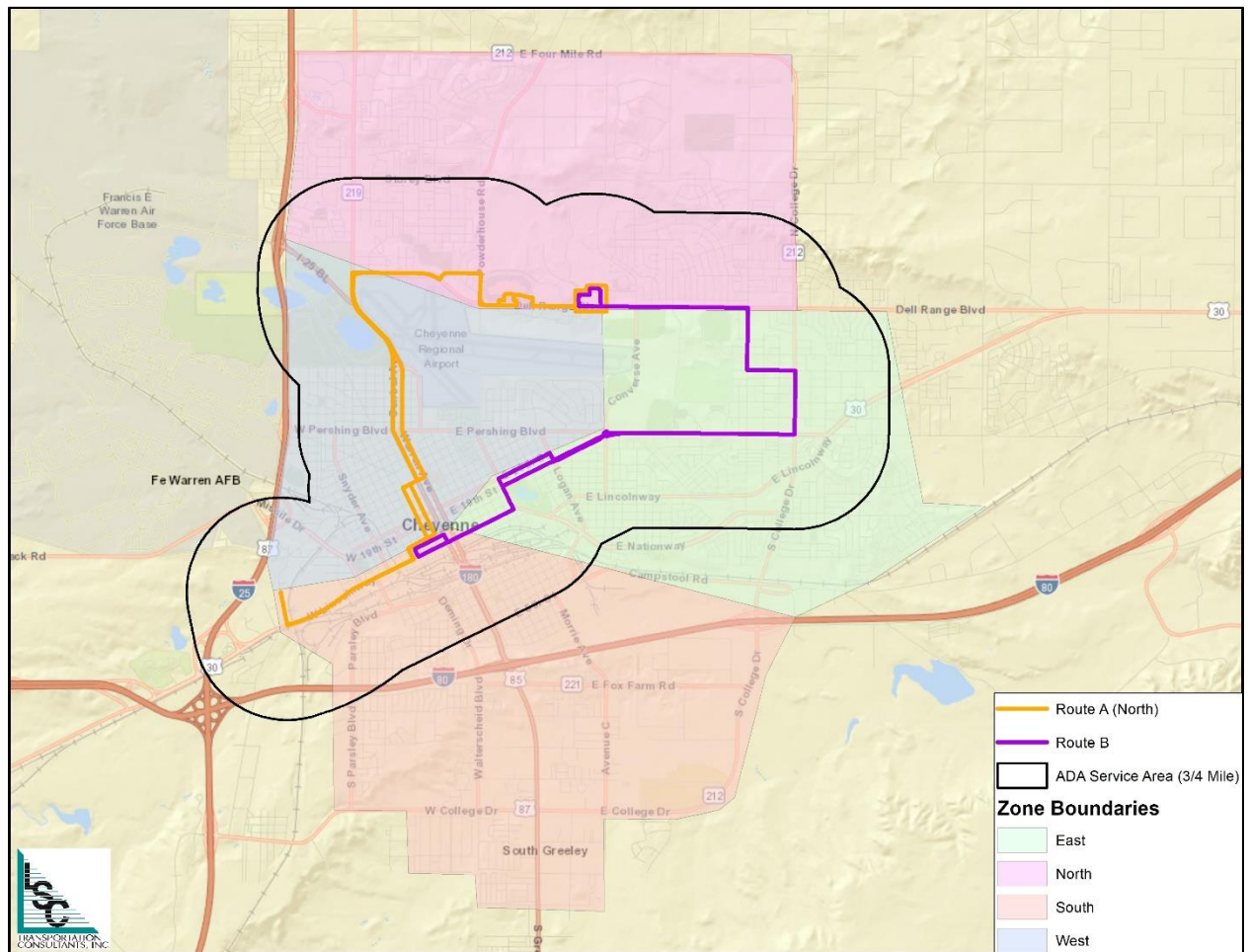


Table 8 provides operating characteristics for Scenario 4. The total cost of this scenario would be about \$1.9 million, slightly higher than the FY 2021 budget.

Route/Zone	Service Frequency	Route Length/ Area	Number of Vehicles	Est. Annual Revenue Hours	Est. Annual Vehicle Miles	Est. Annual Operating Cost
Route A (Orange/North)	30 min.	13.3 mi.	2	6,916	91,706	\$311,800
Route B (Purple)	30 min.	12.9 mi.	2	6,916	89,424	\$310,100
North Zone		7.8 sq. mi.	1	3,640	44,500	\$161,200
West Zone		4.6 sq. mi.	1	3,640	44,500	\$161,200
East Zone		5.0 sq. mi.	1	3,640	44,500	\$161,200
South Zone		7.7 sq. mi.	1	3,640	44,500	\$161,200
Fixed Cost						\$685,400
<b>Total</b>			<b>8</b>	<b>28,400</b>	<b>359,000</b>	<b>\$1,952,100</b>



Table 9 shows estimated ridership numbers for Scenario 4. Scenario 4 would generate about 92,000 trips total, with 3.2 passengers per hour and a cost per passenger of \$20.20.

<b>Table 9: Scenario 4 Estimated Ridership</b>					
<b>Route/Zone</b>	<b>Estimated Annual Passenger Trips</b>	<b>Passengers per Vehicle Hour</b>	<b>Cost per Passenger</b>	<b>Population within ¼ mile</b>	<b>Jobs within ¼ mile</b>
Route A (Orange/North)	37,000	5.4	\$8.36	4,900	11,700
Route B (Purple)	39,000	5.6	\$7.94	6,300	4,400
North Zone	6,000	1.7	\$26.70	12,500	6,200
West Zone	6,600	1.8	\$24.40	8,600	11,700
East Zone	8,400	2.3	\$19.10	16,200	4,500
South Zone	5,600	1.5	\$28.80	13,800	6,300
<b>Total</b>	<b>92,100</b>	<b>3.2</b>	<b>\$21.20</b>	<b>10,800*</b>	<b>14,400*</b>
<i>* Within the fixed-route service area</i>					

### **Scenario 5: Four Fixed Routes and Four On-Demand Zones with Limited Service Hours**

Scenario 5 includes the same routes and zones as Scenario 1, but with limited service hours. Service hours would be 7:00 a.m. until 6:00 p.m., removing one hour of service on each end of the service period each weekday. This saves operating time during times of day when ridership is relatively low, which results in an overall lower cost.

**Figure 8: Scenario 5 Map**

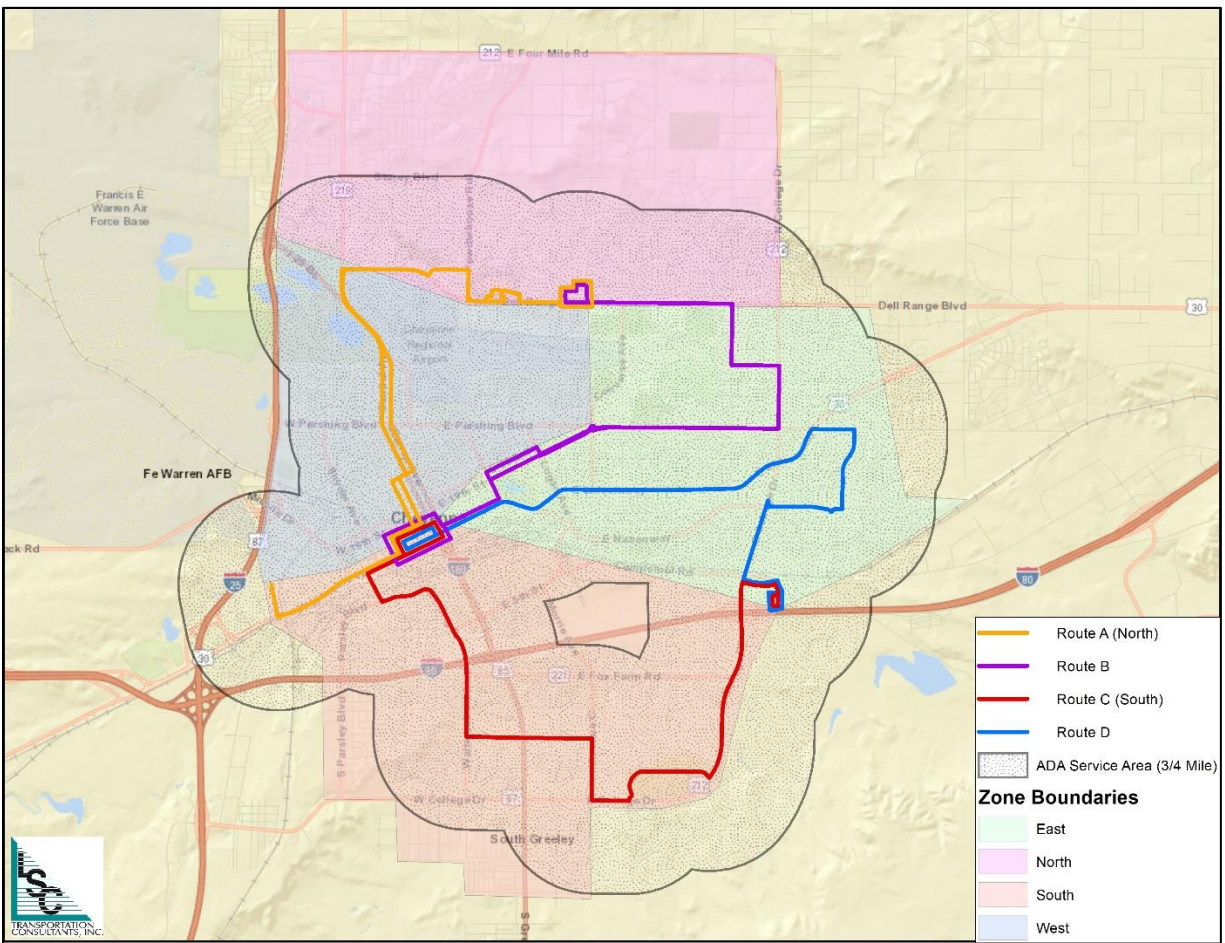


Table 10 provides operating characteristics for Scenario 5. The total cost of this scenario would be about \$1.8 million, similar to the FY 2021 budget, and about \$200,000 less than Scenario 1.

Route/Zone	Service Frequency	Route Length/ Area	Number of Peak Vehicles	Est. Annual Revenue Hours	Est. Annual Vehicle Miles	Est. Annual Operating Cost
Route A (Orange/North)	60 min.	13.3 mi.	1	3,100	41,600	\$141,400
Route B (Purple)	60 min.	12.9 mi.	1	3,100	40,500	\$140,600
Route C (Red/South)	60 min.	14.8 mi.	1	3,100	46,400	\$145,100
Route D (Blue)	60 min.	12.9 mi.	1	3,100	40,500	\$140,600
North Zone		7.8 sq. mi.	1	3,100	38,300	\$138,900
West Zone		4.6 sq. mi.	1	3,100	38,300	\$138,900
East Zone		5.0 sq. mi.	1	3,100	38,300	\$138,900
South Zone		7.7 sq. mi.	1	3,100	38,300	\$138,900
Fixed Cost						\$685,400
<b>Total</b>			<b>8</b>	<b>25,090</b>	<b>322,300</b>	<b>\$1,808,600</b>

Table 11 shows estimated ridership numbers for Scenario 5. Scenario 5 would generate about 107,000 trips total, with 4.3 passengers per hour and a cost per passenger of \$16.20.

<b>Table 11: Scenario 5 Estimated Ridership</b>					
<b>Route/Zone</b>	<b>Estimated Annual Passenger Trips</b>	<b>Passengers per Vehicle Hour</b>	<b>Cost per Passenger</b>	<b>Population within ¼ mile</b>	<b>Jobs within ¼ mile</b>
Route A (Orange/North)	24,000	7.7	\$5.90	4,900	11,700
Route B (Purple)	25,100	8.0	\$5.60	6,300	4,400
Route C (Red/South)	14,900	4.7	\$9.80	900	2,900
Route D (Blue)	23,700	7.5	\$5.90	7,100	4,000
North Zone	6,000	1.9	\$22.00	12,500	6,200
West Zone	6,600	2.1	\$21.00	8,600	11,700
East Zone	4,200	1.3	\$33.00	16,200	4,500
South Zone	2,800	0.9	\$49.60	13,800	6,300
<b>Total</b>	<b>107,300</b>	<b>4.3</b>	<b>\$16.90</b>	<b>16,500*</b>	<b>15,700*</b>
<i>* Within the fixed-route service area</i>					

## SUMMARY AND DISCUSSION

Based upon the analysis presented above, the Study Team has the following conclusions:

- All the alternatives would significantly increase ridership from the existing level, increase the productivity (passenger trips per vehicle hour) and reduce the cost per passenger trip. This indicates that at least some level of fixed-route service is warranted in Cheyenne.
- Microtransit service in each scenario should be focused on providing trips within the designated zone and connections to the fixed-route system. Trips between zones should generally be made by transfers to the fixed-route system or to the microtransit vehicle serving the destination zone.
- Scenarios 1 and 5 provide fixed-route service that is within a convenient five-minute walk of the highest number of Cheyenne residents. Scenario 2 serves only slightly fewer residents, while Scenarios 3 and 4 serve only roughly 2/3 of the residents with fixed-route service that would be served by Scenarios 1 and 5.
- Of the scenarios, the most productive is Scenario 5 at 4.3 passenger trips per vehicle hour of service. This reflects that dropping the earliest and latest service hours improves the overall productivity of the service. However, it also reduces overall ridership by roughly 10 percent.
- Scenario 2 is the second-most productive at 4.1 passenger trips per vehicle hour of service. This reflects that dropping Route C (Red/South) serving the southern portion of Cheyenne from the service plan improves the overall productivity of the system. The low effectiveness of this southern route is also indicated in the route-by-route productivity shown in Table 3, above, indicating that this route (at 4.5 passengers per vehicle hour) is substantially less productive than the other three routes (around 7.5).

- The most cost-effective scenario (Scenario 5) has a relatively low cost of \$16.90 per passenger-trip). However, this would eliminate service in the 6:00 a.m. to 7:00 a.m. and the 6:00 p.m. to 7:00 p.m. hours.
- The option with 30-minute service (Scenario 4) has the second highest cost per passenger trip at \$18.94 and the lowest productivity at 3.6 passenger trips per vehicle hour. This scenario appears not to be warranted until ridership levels increase beyond those identified in this analysis.
- The second-most cost-effective option (Scenario 1) is also the most expensive option.
- Scenarios 1 and 5 may require additional space for buses at a downtown transfer point or a new central transfer point near downtown. It may also be possible to limit the number of buses at the transfer point in the schedule.
- Use of microtransit for trips that can be served on the fixed-route system: This could be through fare policy or restriction of trips within  $\frac{3}{4}$  mile of a fixed-route to eligible complementary paratransit passengers only.
- Phased implementation may be appropriate. Performance should be monitored with thresholds identified of adding new service such as an additional fixed-route, additional microtransit vehicles, or higher fixed-route frequency.

Beyond the conclusion that some level of fixed-route service (at least two or three routes) is warranted and that half-hourly fixed-route service is less effective than hourly service, this analysis reflects the tradeoffs associated with varying extent of fixed-route service as well as varying hours of service.