

East & I-225 Rail Corridors Preliminary Service Plan



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1. Project Purpose and Background

1.1. Background and Focus

As part of the overall FasTracks program to enhance rail service in the Denver region, the upcoming East and I-225 rail lines also known as the A Line and R Line respectively will represent significant milestones in achieving improved connectivity and travel times for RTD customers. Both projects are likely to stimulate residential, retail, and commercial growth and contribute to increases in ridership within the corridors. The East and I-225 Corridor Service Plan contains recommendations for developing a restructured bus network capable of meeting the demand and mobility needs generated by the expansion of commuter rail and light rail services. Recommendations in this study were formulated based on a comprehensive assessment of existing conditions, service area demographics, transit market research, route performance and analysis, and stakeholder input. Data collection activities included both on-site field work and stakeholder meetings held with RTD and FasTracks personnel.

1.2. Study Area

The study area of this project is defined by 104th Avenue to the north, Tower Road and DIA to the east, Hampden Avenue to the south, and downtown Denver to the west. The study area includes the cities of Aurora and Denver.

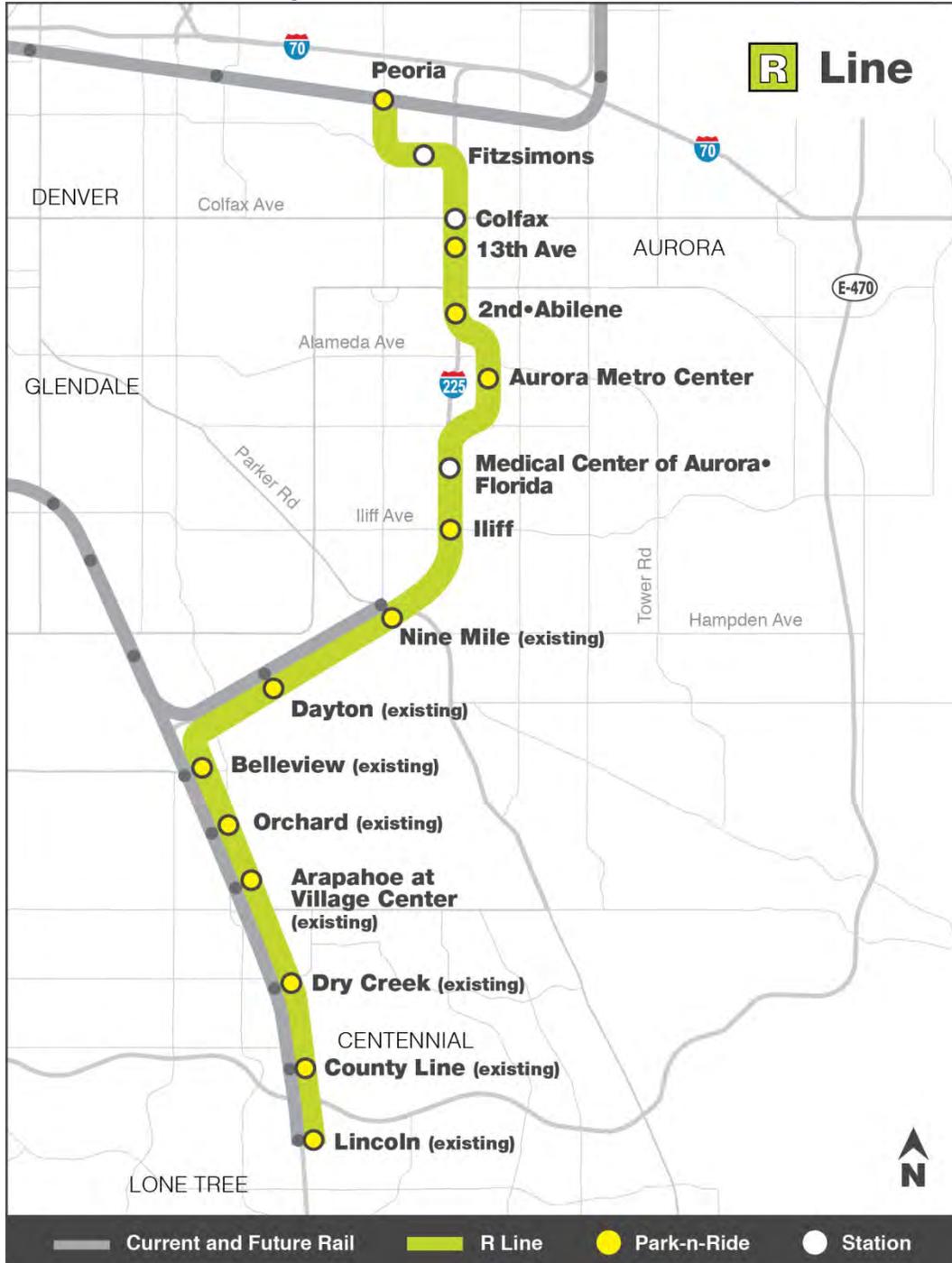
Map 1 - A Line Rail Alignment



The A Line is a new 22.8-mile electrified commuter rail line that will operate between Denver Union Station and Denver International Airport (DIA) with connections to adjacent employment centers, neighborhoods, and development areas in the City of Denver and

Aurora. The A Line will serve seven stations, including Denver Union Station, 38th/Blake, 40th/Colorado, Central Park, Peoria, 40th Ave & Airport Blvd/Gateway Park, and DIA. Total travel time between Denver Union Station and DIA is approximately 35 minutes.

Map 2 – R-Line Rail Alignment



The R Line is a new 10.5-mile light rail line within the City of Aurora that will provide key regional connections to the existing East and Southeast Rail Lines with stops serving major

activity centers including the Aurora City Center, Anschutz/Fitzsimons Medical Center and DIA, the latter through a transfer at Peoria to the A Line. The R Line will serve nine stations, including Peoria, Fitzsimons, Colfax, 13th Ave, 2nd & Abilene, Aurora City Center, Florida, Iliff Ave, and the current station at Nine Mile. Total travel time between Nine Mile and Peoria is 33 minutes.

2. Relevant Studies

The proposed East and R Service Plan is also informed by previous planning studies and publications, including:

2.1. East Corridor Transit Operations Plan (2009)

- I-225 Corridor Transit Operations Plan (2012)
- I-225 Environmental Evaluation (2009)
- West Corridor Service Plan (2013)
- Downtown Denver Commuter Survey (2013)
- Stapleton Redevelopment Area (2010)
- Blueprint Denver (2002)
- Aurora Station Area Plans (2014)
- Denver TOD Strategic Plan (2014)

2.2. East Corridor Transit Operations Plan (2009)

The East Corridor Transit Operations Plan contains bus and rail operations plans related to the environmental benefits, costs, and impacts of the proposed service alternatives between downtown Denver and DIA. Existing transit service descriptions and characteristics of the corridor and corresponding routes are provided.

In 1997, the Denver Regional Council of Governments (DRCOG) completed a Major Investment Study for the East Corridor and recommended a rail alternative for the corridor. Subsequent analysis of the corridor indicated that the electric multiple unit (EMU) commuter rail cars with maximum operating speeds of 50 to 79 miles per hour would provide the greatest benefit. Travel times between downtown Denver and DIA, based on speed limits, performance characteristics of the EMU vehicle, track alignment, and station dwell time, are expected to be 35 minutes one-way. The line is currently under construction, the new rail cars have been ordered, and it is expected to be operational in 2016.

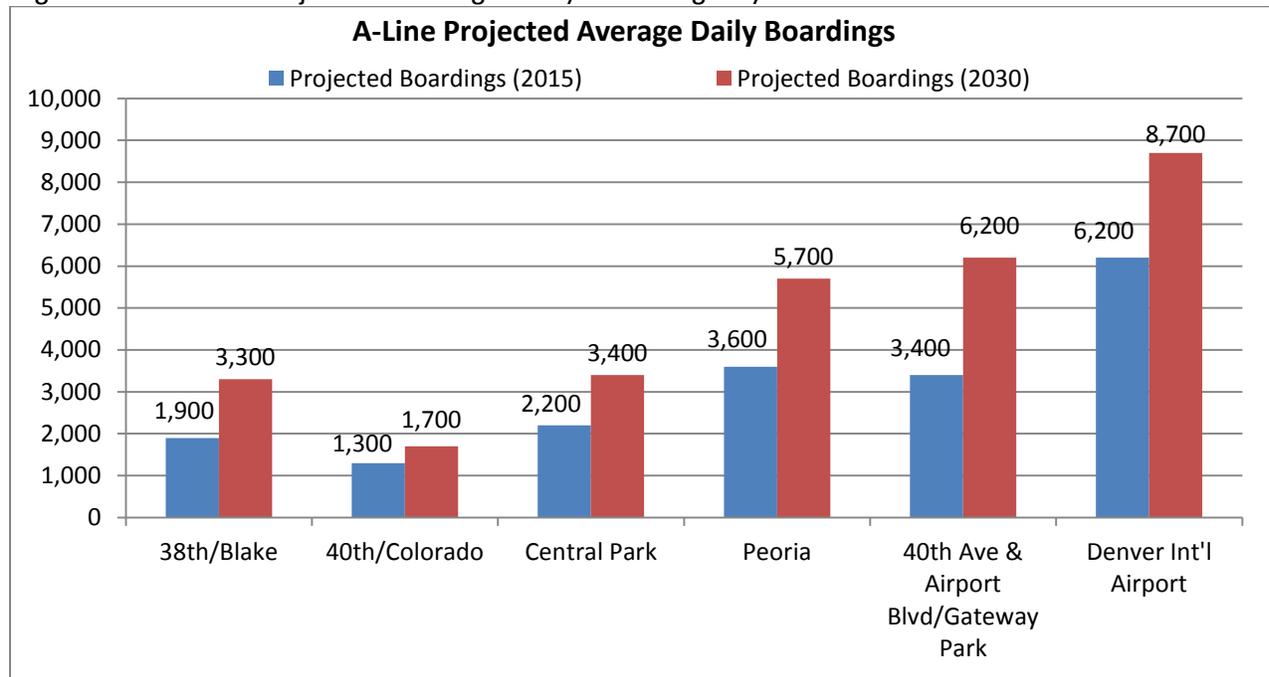
The rail operations service plan includes the following proposed service frequency levels on the A Line:

Table 1 - A-Line Service Levels

A-Line Rail Service Frequency			
Weekday	3:00 AM to 12:30 AM	Peak Periods	15 minutes
		Midday	15 minutes
		Early Evening (6:00pm – 8:00 pm)	15 minutes
		Late Evening (8:00pm-12:30am)	30 minutes
Weekend/Holiday	3:00 AM to 1:00 AM	Midday	15 minutes
		Late Evening (8:00pm-1:00am)	30 minutes

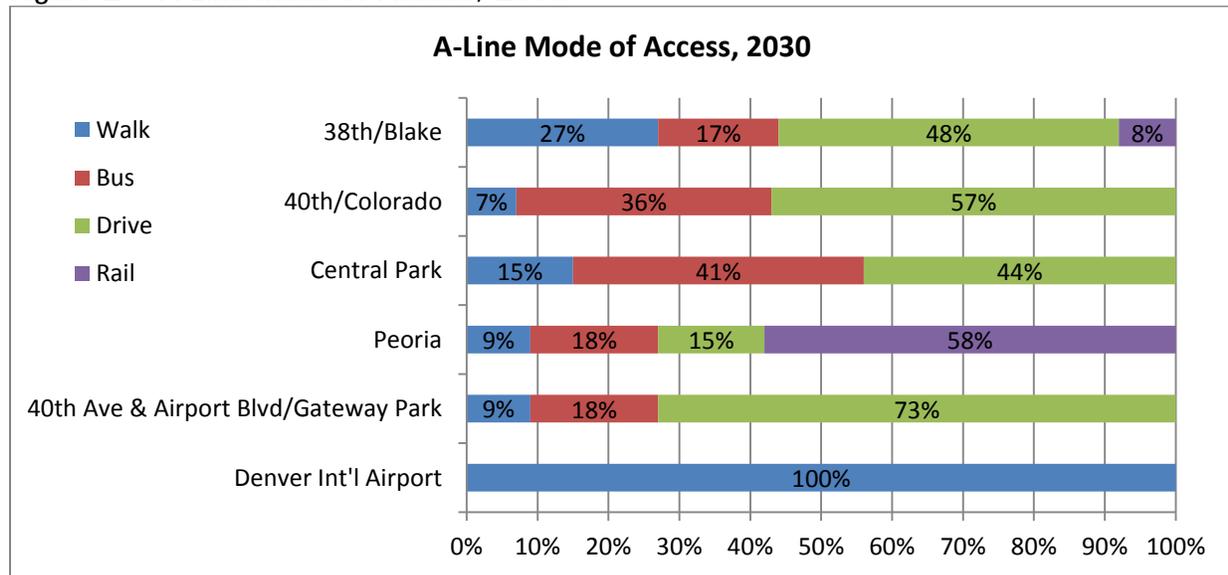
Ridership estimates were developed for the A-Line based on DRCOG modeling scenarios that accounted for various transit investments and incorporated the factors of land use, development, parking, fare structure, and vehicle load standards. Other inputs included demographic information such as projected population, employment, and income. The model projected average daily boardings by station for the year before its initial year of operation and for the future year of 2030. The stations of Peoria, 40th Ave & Airport Blvd/Gateway Park, and DIA are expected to generate the greatest ridership.

Figure 1 – A-Line Projected Average Daily Boardings by Station



Additionally, mode of access to each station was projected to determine the method by which rail passengers are expected to arrive at the station. The stations of 40th & Colorado and 40th Ave & Airport Blvd stations are the only stations projected to have more the 50% of passengers accessing the station via automobile, while passengers at all other stations access the station by walking or taking transit. Notably, the station at Peoria is expected to have a 58% share of access from the R-Line light rail line.

Figure 2 – A-Line Mode of Access, 2030



The R-Line light rail alignment will connect the existing Nine Mile Station with the new Peoria Station and A-Line commuter rail service. Existing light rail service in the I-225 Corridor is currently provided on the H-Line from Nine Mile Station to the 18th/California Station in downtown Denver operating on a 15 minute all-day frequency. Under the preferred operating scenario, the H-Line would be extended beyond the Nine Mile Station to serve the two future R-Line stations at Iliff and Florida. Service on the R-Line would operate between Peoria Station and Lincoln Station on the Southeast Corridor.

Table 2: R-Line Service Levels

R-Line Rail Service Frequency			
Weekday	4:30 AM to 12:00 Midnight	Peak Periods	15 minutes
		Midday	15 minutes
		Evening (9:00pm-11:00pm)	30 minutes
		Late Evening (11:00pm-midnight)	60 minutes
Weekend/Holiday	5:00 AM to 2:00 AM	Midday	15 minutes
		Late Evening (9:00pm-2:00am)	30 minutes

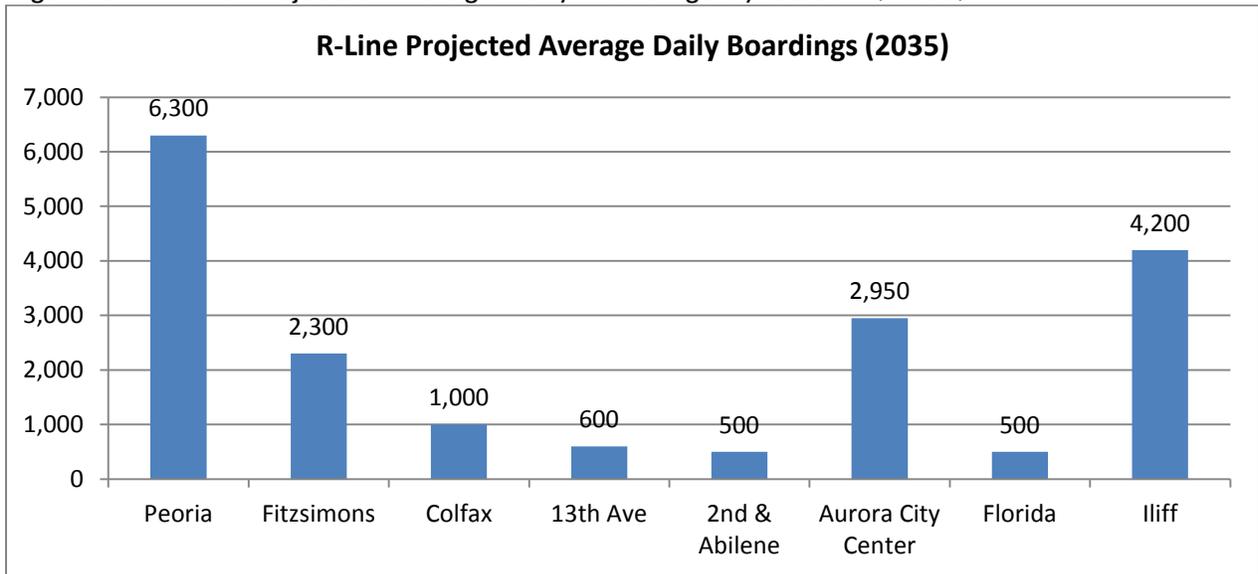
For light rail vehicles operated by RTD, the maximum speed will be 55 miles per hour; however, actual operating speed may vary somewhat due to final track alignment, speed restrictions, and track design. Travel time simulations resulted in the following one-way trip times.

Table 3: R-Line Travel Time

Peoria to Nine Mile	33 minutes
Florida to 18th/California (H-Line)	41 minutes
Florida to Lincoln Ave.	25 minutes

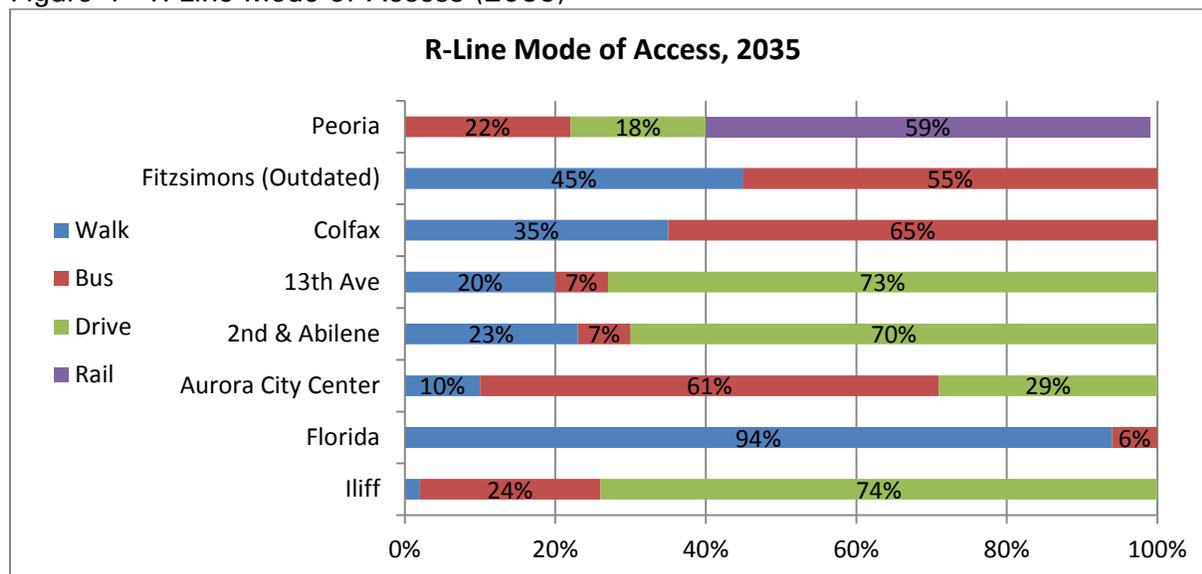
The DRCOG ridership model projected average daily boardings by station for the future year of operation of 2035. The stations at Peoria, Aurora Metro Center, and Iliff are expected to generate the greatest ridership. The data for the Fitzsimons Station is out-of-date as the alignment of the R-Line has been restructured to continue along Fitzsimons Parkway and will no longer provide an on-site station at the medical center complex. The closest station to the medical center complex will now be Colfax Station. Projections for the Fitzsimons Station are not considered to be reliable due to this change.

Figure 3 – R-Line Projected Average Daily Boardings by Station (2035)



Mode of access to each station was projected to determine the method by which rail passengers are expected to arrive at the station. The stations of 13th Ave, 2nd & Abilene, and Iliff are the only stations projected to have more the 50% of passengers accessing the station via automobile, while passengers at all other stations access the station by walking or taking transit. Notably, the station at Peoria is expected to have a 59% share of access from the A-Line commuter rail line.

Figure 4 - R Line Mode of Access (2035)



3. Existing Conditions

3.1. Existing Market Conditions

The following market assessment presents an overview of the population demographics and characteristics of each corridor and was used to identify areas that are more prone to transit use. Demographic characteristics incorporated into this assessment include income, ethnicity, car ownership, and senior populations. Additionally, the population and employment densities within the corridors were used to determine the location of high density trip generators and potential ridership patterns.

3.2. Population and Employment Density

Population densities in the East and I-225 Corridors are on average higher than elsewhere in the Denver region. The greater population densities exhibited in these corridors is due to Denver and Aurora's land use policies and historic character, which has led to dense housing developments and a greater concentration of people. Notable areas of high population density include downtown Denver, areas immediately surrounding Cherry Creek, Colfax Avenue in Denver, Sable Blvd. in Aurora, and Iliff Avenue in Aurora. Colfax Avenue represents the strongest corridor for density in the study area, outside of downtown Denver. South of Colfax Avenue, densities become more spread out with pockets of dense populations in different neighborhoods. Population density in the East Corridor drops off along the Interstate 70 alignment but becomes stronger in the neighborhoods of Montbello and Green Valley Ranch near Gateway Park. The I-225 Corridor exhibits greater densities east of Interstate 225, particularly in the areas surrounding the Aurora City Center.

Employment density in the study area is highest in downtown Denver and adjacent neighborhoods. Other prominent areas of high density employment include the warehouse

district west of Montbello, Gateway Park located east of Montbello, Cherry Creek, and Colorado Blvd. located southeast of downtown, Parker Road located west of Nine Mile Station, and Sable Blvd. located east of Interstate 225. The East Corridor exhibits strong employment densities resulting from the industrial and warehouse businesses that surround the current freight alignment heading east from downtown Denver to beyond the city limits. I-225 Corridor employment densities are retail focused with big box retailers and the Town Center at Aurora shopping center, as well as the commercial businesses adjacent to the existing Nine Mile Station.

Montbello Industrial Park is the largest industrial submarket in Denver, containing over 70 million square feet of warehouse space. It is located along the I-70 industrial corridor between downtown Denver and DIA. Surrounding amenities include the Stapleton residential and retail development along with Dick's Sporting Goods Park, which is home to the Colorado Rapids professional soccer team. Gateway Park is an office and industrial complex near DIA at Interstate 70 and Peña Boulevard.

Cherry Creek is located near the geographic center of the City and County of Denver and is a mixture of dense urban development and residential streets. The Cherry Creek shopping and dining district is a 16 city-block area with more than 320 galleries, retail storefronts, restaurants, and the Fillmore Plaza.

Colorado Boulevard is a major arterial road of east Denver that runs in a north-south direction and intersects both Interstate 70 and Interstate 25. Much of the road is devoted to commercial development, including both office and residential high rises. It passes along the east side of Denver City Park and is served by RTD Route 40. See Map 3 for population and employment densities.

3.3. Customer Demographics

Income

The low-income populations are most concentrated in the areas of downtown Denver, Montbello, and along major arterial roadways including Colfax Ave, Mississippi Ave, Peoria Street, and Chambers Road. The A-Line stations of 38th & Blake, 40th & Colorado and Peoria are in the closest proximity to higher concentrations of low income persons. While all R-Line stations have a low-income population located nearby, the stations of Colfax, 13th Ave, and Florida have the greatest concentration of low-income persons. See Map 4, Population in Poverty.

Minorities

Minority populations in the study area are most concentrated in the neighborhoods of downtown Denver, Montbello, Green Valley Ranch, and along the major arterial roadways of Colfax Ave and Mississippi Ave. These areas were recognized and will be taken into account when developing the service plan recommendations. See Map 5, Minority Populations.

Senior Population

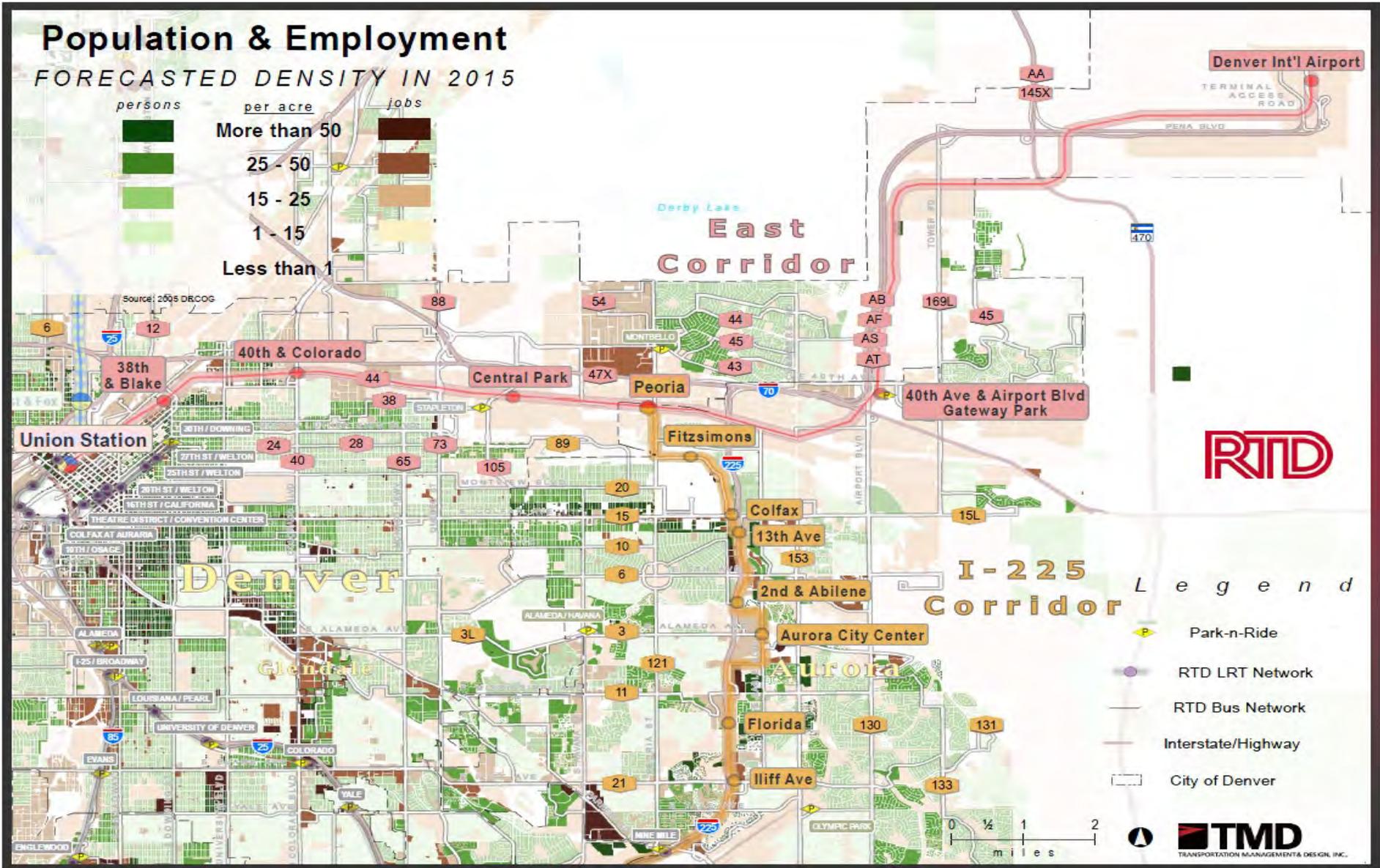
The senior population is concentrated in various areas throughout the study area including areas along Alameda Avenue (Windsor Gardens) and Colorado Blvd., and in the area adjacent to Nine Mile Station. See Map 6, Senior Citizens.

Vehicle Access

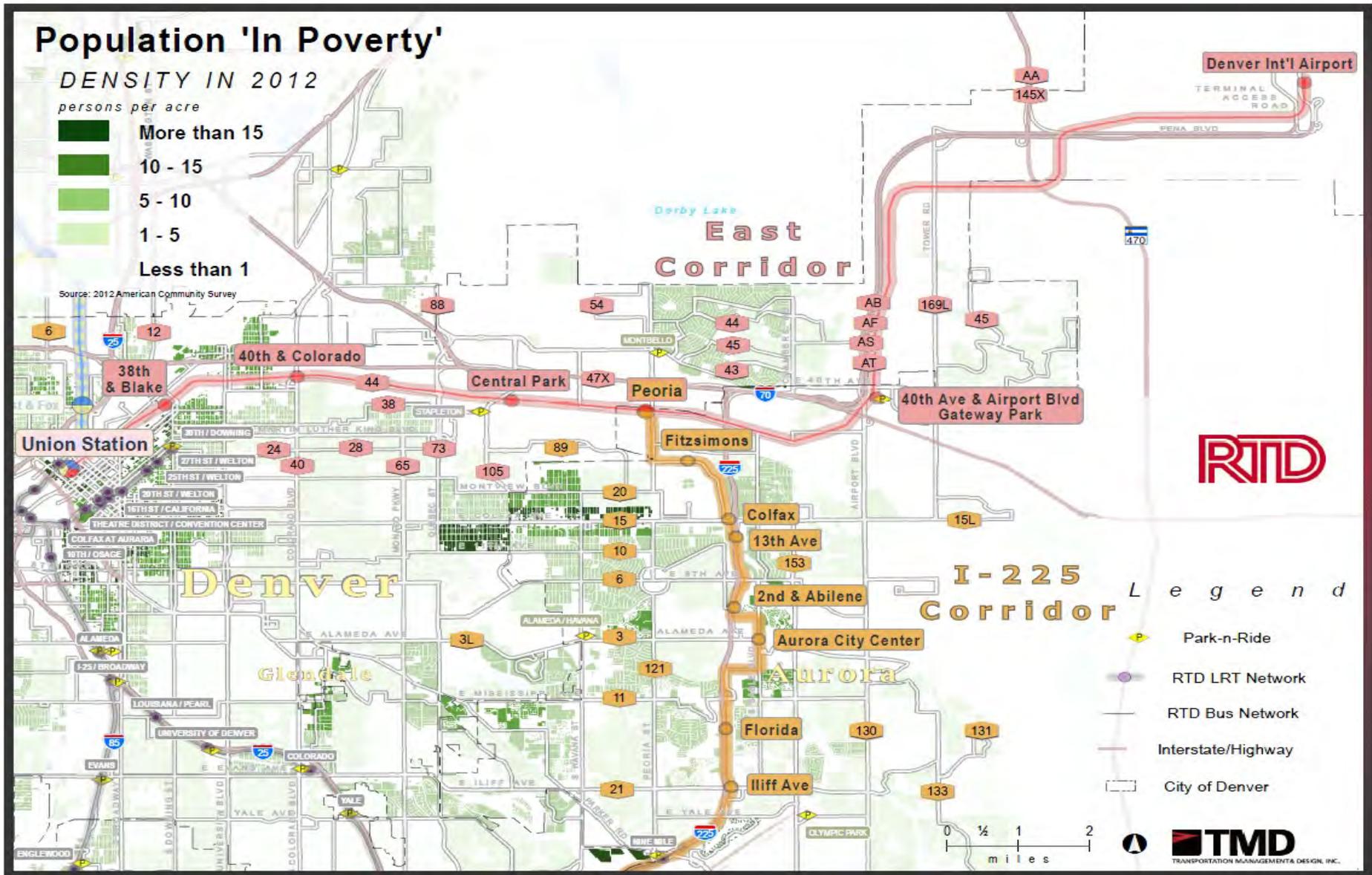
Downtown Denver, Colfax Ave, and the area adjacent to Nine Mile Station exhibit the greatest number of households without access to a vehicle. These areas also maintain some of the highest population densities in the study area and have some of the best levels of transit service in the RTD network. See Map 7, Zero Vehicle Households.



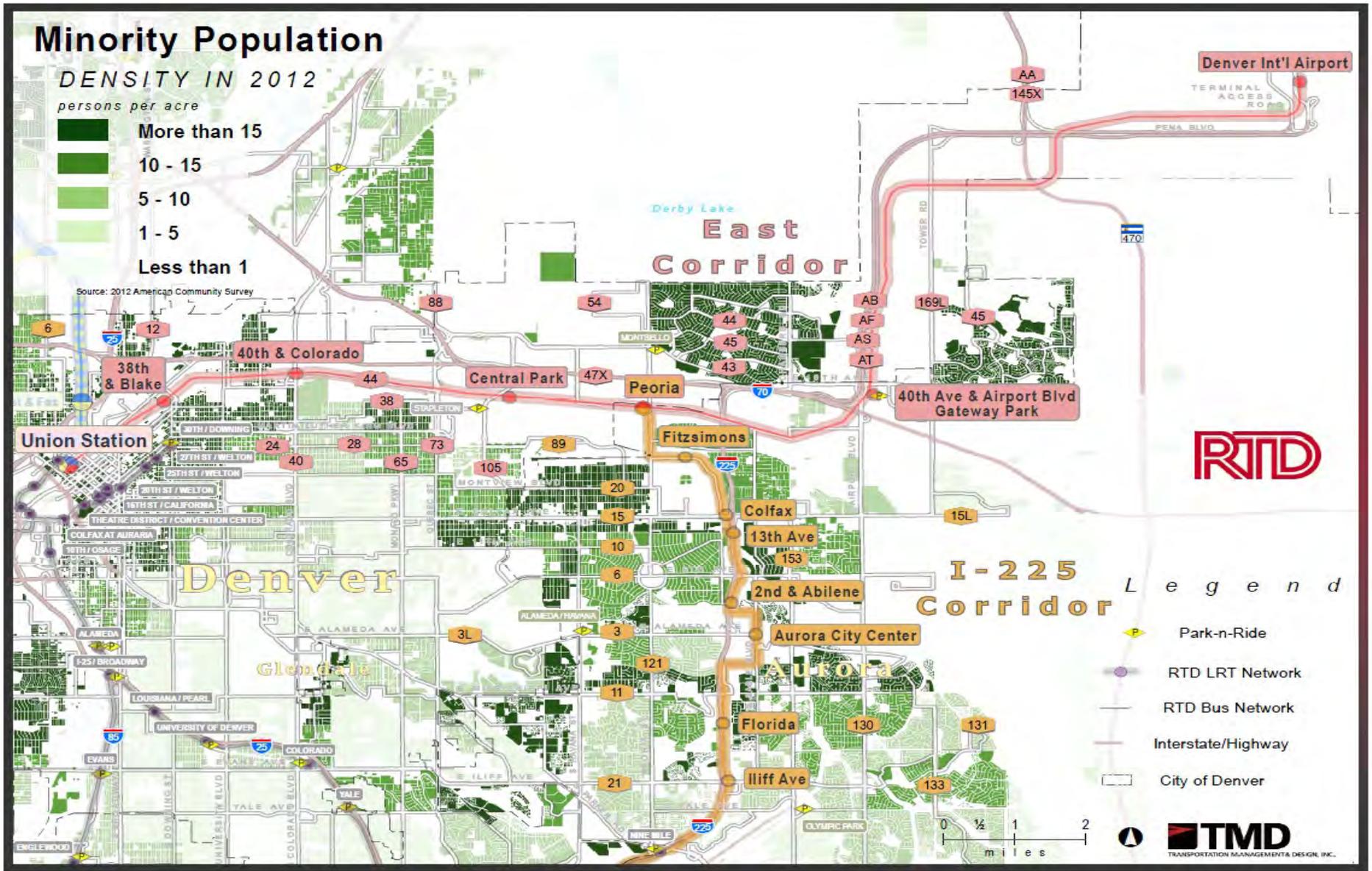
Map 3 - Population & Employment Density, 2015



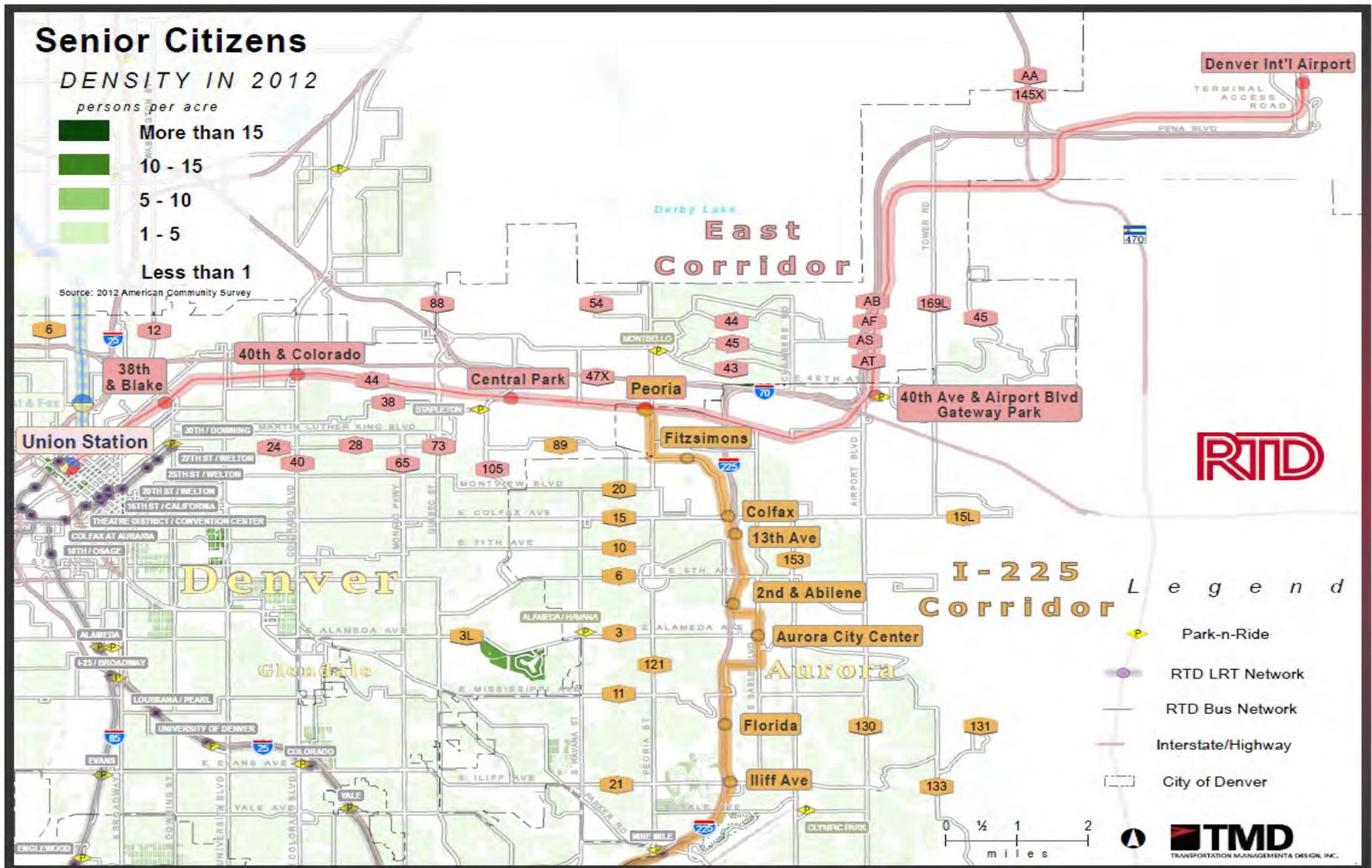
Map 4 - Population in Poverty Density, 2012



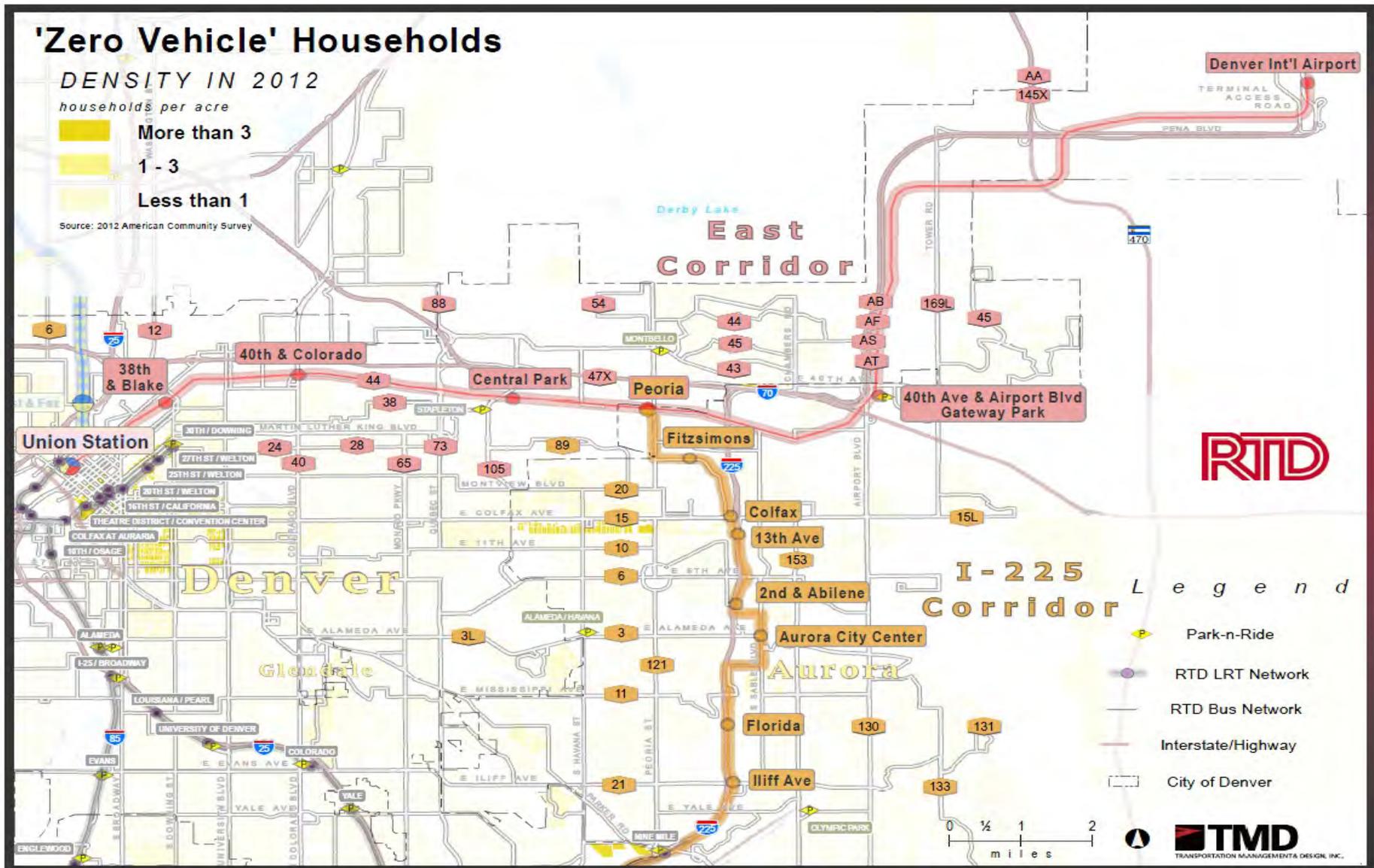
Map 5 - Minority Population Density, 2012



Map 6 - Senior Citizens Density, 2012



Map 7 - Zero Vehicle Households Density, 2012



4. Service Evaluation

An assessment of the existing transit service is essential for understanding a route's role within the larger transit network and for analyzing individual route performance against the service standard metrics. Included in this assessment is a ridership review that helped to identify boarding activity and ridership trends.

4.1. Existing Service Conditions

4.1.1. Transit Route Network

RTD services are divided into various service classes depending on service type, route alignment, and frequency. Each service class has its own service standards derived from the performance of all routes within each class. RTD conducts an annual route review using the performance indicators of subsidy per boarding and boardings per hour.

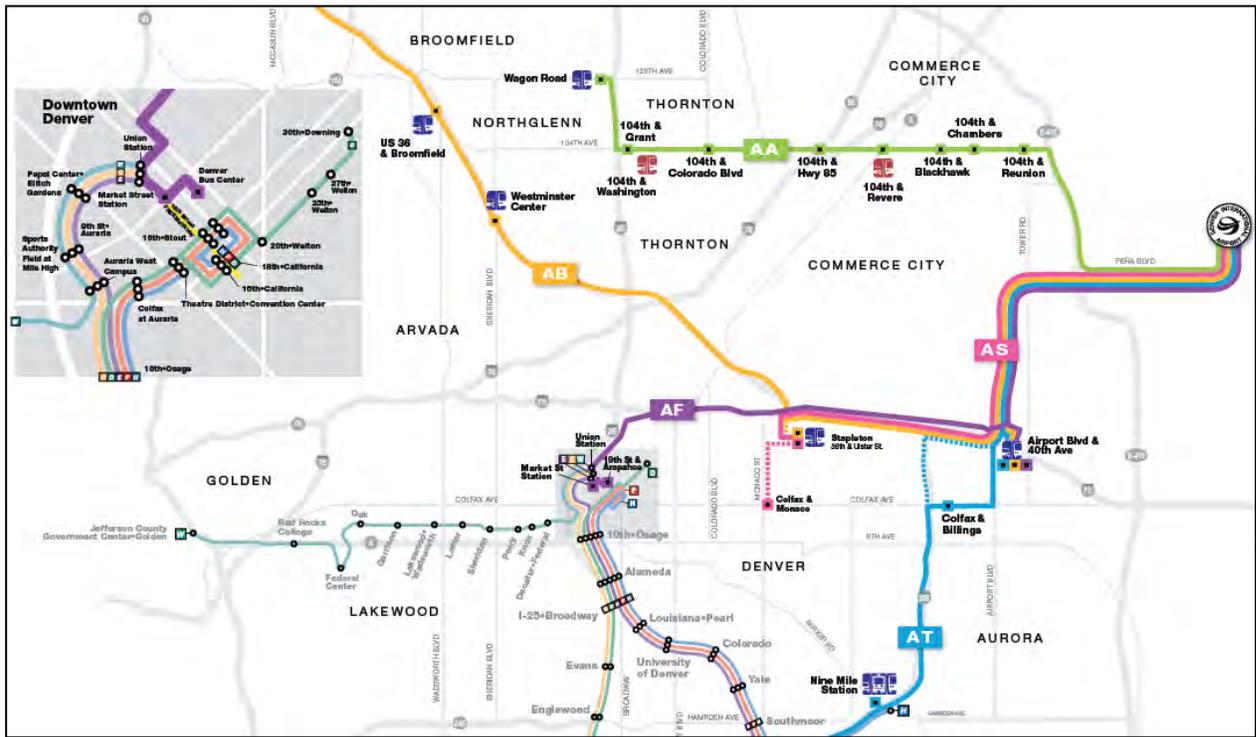
Routes in the East and I-225 Corridors fall into one of the following categories: Central Business District (CBD) Local, Urban Local, Suburban Local, Express, or SkyRide. CBD Local routes provide direct, one-seat trips into or through downtown Denver, while Urban Local routes operate on major streets and provide connections to the greater RTD network outside of the downtown core. Suburban Local routes offer transit coverage to some of the less developed communities in the far reaches of the service area. Express routes provide peak-only service between outlying communities and downtown Denver, while SkyRide routes provide premium fare one-seat rides to DIA from regional transit nodes.

The East Corridor is served by a significant number of routes from five different route classes. Local routes in this corridor typically operate on a 15-minute peak frequency with a 30-minute off-peak frequency. In addition, there are a number of routes that provide SkyRide service to DIA. Park-n-Ride facilities at 30th/Downing Station, Stapleton, Montbello, and Airport Blvd/40th Ave are within the corridor and located nearby to the future A-Line stations. See Map 8, SkyRide Routes.

Table 4: A-Line Corridor Bus Routes

Service Class	Routes
CBD Local	28-38-44
Urban Local	12-24-40-43-45-54-65-73-89-105-121-153
Suburban Local	88-169L
Express	47X
SkyRide	AF-AS-AT

Map 8 - Skyride Services



The I-225 Corridor is served entirely by local routes providing a wide range of coverage across the RTD network. Routes typically operate on a 15 minute peak and 30 minute off-peak frequencies. Transit facilities and destinations in this corridor include Centrepont/Sable, Nine Mile Station, and the Anschutz Medical Campus. Routes connecting to the station at Peoria, shared by the A-Line and R-Lines, are listed under the A-Line (Table 4).

Table 5: R-Line Corridor Bus Routes

Service Class	Routes
CBD Local	3L-6-10-15-15L-20
Urban Local	3-11-21-89-121-153
Suburban Local	130-131-133

4.1.2. Transit Service Levels

Transit service levels include frequency and span. Frequency refers to how often a route runs and span refers to the hours and days of operation. Transit service levels are often dictated by a number of factors, the most important being actual usage, i.e. market demand. Increased demand for transit often translates into an increased supply of service with better frequencies, longer spans, and multiple days of operation. Similarly, less demand usually translates into less service. Other contributing factors that influence transit service levels include connections to key destinations, historical precedent, regional significance, and operating agreements.

4.1.3. Frequency

In the RTD route network, frequency is broken down into three categories: spontaneous-use (15 minutes or less), coordinated (30 minutes), and lifeline (60 minutes or more).

Spontaneous-use frequencies minimize passenger wait times and eliminate the need for passengers to plan their trips in advance around the schedule which ultimately attracts more riders making routes more cost-effective. CBD Local and Urban Local routes often possess frequencies that facilitate spontaneous use.

Coordinated frequencies require passengers to coordinate their trips in advance to arrive and depart in a fashion that will minimize wait times and reduce their overall travel time. Coordinated frequencies are often found on routes that cannot support spontaneous-use frequencies but have enough demand to support greater service levels than the lifeline frequencies.

Lifeline frequencies provide transit coverage to areas that cannot support higher frequencies. These services are often used to expand the transit service area to provide access to outlying communities. Focusing efforts on lifeline coverage does not typically grow ridership but can provide critical mobility for many passengers located in low density markets. Suburban Local routes often have lifeline frequencies. Routes that provide “trips” rather than a regular frequency are often the result of commute oriented travel patterns where transit demand is not sufficient enough to warrant midday service or regular service frequencies.

East Corridor

In the East Corridor, spontaneous use frequencies are found south of Interstate 70 on three east-west CBD Local Routes. These are Routes 28, 38, and 44 which serve Stapleton and downtown Denver. Other spontaneous use frequency routes are found on the north-south roadways of Colorado Boulevard, Havana Street, Peoria Street, and Chambers Road. All other routes in the East Corridor have coordinated frequencies and are concentrated in the areas north of Interstate 70 and within close proximity to DIA. Interestingly, Montbello has several routes (43, 44, 45, and 153) in very close proximity to each other with coordinated frequencies and is a candidate for consolidation with spontaneous use frequencies on fewer routes.

Table 6: East Corridor Frequency and Span of Service

Route	Description	Weekday Frequency			Weekend Frequency		Span of Service		
		AM Peak	PM Peak	Off-Peak	Sat	Sun	Wkdy	Sat	Sun
CBD Local Routes									
28	28th Avenue	15/30	15/30	30	60	60	4:37a-11:46p	6:10a-11:45p	6:33a-11:45p
38	38th Avenue	15/30	15/30	30	30	60	4:39a-1:51a	4:49a-1:48a	4:49a-1:48a
44	44th Avenue	15/30	15/30	30	60	60	4:52a-12:44a	4:52a-12:43a	

Route	Description	Weekday Frequency			Weekend Frequency		Span of Service		
		AM Peak	PM Peak	Off-Peak	Sat	Sun	Wkdy	Sat	Sun
Urban Local Routes									
12	Downing / N Washington	15/30	15/30	30	30	60	4:16a-12:58a	4:26a-1:05a	5:41a-12:36a
24	University Blvd	30	30	30	60	60	4:36a-10:50p	5:46a-9:15p	7:08a-8:15p
40	Colorado Boulevard	10/30	10/30	15/30	15	30	4:03a-1:00a	4:56a-1:00a	4:56a-12:57a
43	MLK Blvd / Gateway	15/30	15/30	15/30	15/30	15/30	3:31a-2:32a	2:01a-2:30a	2:01a-2:30a
45	Montbello / Green Valley Ranch	30	30	30	60	60	5:02-6:53p	8:16a-6:45p	8:16a-6:45p
54	Montbello Industrial Park	6 trips	6 trips	-	-	-	6:05a-8:50a / 2:35p-5:51p	-	-
65	Monaco Parkway	30	30	30	30	30	3:39a-12:28a	3:46a-12:19a	7:16a-8:19p
73	Quebec Street	30	30	30	30	30	5:29-11:36p	6:22a-11:36p	6:22a-11:36p
89	Stapleton / Anschutz Campus	60	60	60	-	-	5:52a-10:11p	-	-
105	Havana Street	15	15	15	15	30	4:05a-1:43a	4:58a-1:44a	4:57a-1:38a
121	Peoria Street	15	15	30	30	30	4:49a-12:58a	5:25a-12:57a	5:25a-12:57a
153	Chambers Road	15/30	15/30	30	30	60	2:46a-12:58a	4:14a-12:58a	5:44a-12:58a
Suburban Local Routes									
88	Northglenn / Commerce City / Stapleton	30	30	30	30	60	4:34a-12:55a	4:33a-12:57a	4:43a-12:50a
169L	Buckley / Tower /DIA Limited	5 trips	7 trips	-	12 trips	12 trips	3:48a-12:54p / 1:40p-11:05p	3:48a-12:54p / 1:40p-11:04p	3:48a-12:54p / 1:40p-11:04p
Express Routes									

Route	Description	Weekday Frequency			Weekend Frequency		Span of Service		
		AM Peak	PM Peak	Off-Peak	Sat	Sun	Wkdy	Sat	Sun
47X	Green Valley Ranch / Montbello Express	5 trips	5 trips	-	-	-	5:38a-8:14a / 3:43p-6:49p	-	-
SkyRide Routes									
AF	Downtown / DIA	30	30	60	60	60	2:58a-1:39a	3:34a-1:44a	3:34a-1:40a
AS	Stapleton / DIA	15	15	30	30	30	3:07a-1:42a	3:07a-1:42a	3:07a-1:42a
AT	Arapahoe County / DIA	60	60	60	60	60	3:12a-1:49a	3:12a-1:49a	3:12a-1:49a

I-225 Corridor

The I-225 Corridor generally also provides spontaneous use frequency services that meet the demands of a dense urban center where population and employment densities are higher and ridership demand is consequently also increased.

Table 7: I-225 Corridor Frequency and Span of Service

Route	Description	Weekday Frequency			Weekend Frequency		Span of Service		
		AM Peak	PM Peak	Off-Peak	Sat	Sun	Wkdy	Sat	Sun
CBD Local Routes									
3L	East Alameda Limited	15/30	15/30	-	-	-	5:48a-8:45a / 3:38p-7:13p	-	-
6	East 6th Avenue / North Pecos	15/30	15/30	30	30	60	4:46a-11:29p	5:42a-11:30p	6:12a-11:04p
10	East 12th Avenue	15/30	15/30	15/30	30	30	4:50a-12:09a	5:33a-12:09a	5:59a-12:10a
15	East Colfax Avenue	7.5	7.5	10	15	15	24 hour service	24 hour service	24 hour service
15L	East Colfax Limited	10/30	10/30	10/30	15	15	4:31a-1:03a	5:15a-1:03a	5:15a-1:03a
20	20th Avenue	15	15	30	30	30	5:08a-11:53p	5:15a-11:55p	5:21a-11:55p
Urban Local Routes									
3	Alameda	60	60	60	60	60	4:27a-	5:10a-	5:10a-

Route	Description	Weekday Frequency			Weekend Frequency		Span of Service		
		AM Peak	PM Peak	Off-Peak	Sat	Sun	Wkdy	Sat	Sun
	Avenue						12:57a	12:57a	12:57a
11	Mississippi Avenue	30	30	30	30	60	4:12a-12:40a	5:14a-12:12a	6:21a-8:12p
21	Evans Avenue	15	15	30	30	60	4:15a-12:54a	5:23a-12:37a	5:53-10:55p
89	Stapleton / Anschutz Campus	60	60	60	-	-	5:52a-10:11p	-	-
121	Peoria Street	15	15	30	30	30	4:49a-12:58a	5:25a-12:57a	5:25a-12:57a
153	Chambers Road	15	15	30	30	60	2:46a-12:58a	4:14a-12:58a	5:44a-12:58a
Suburban Local Routes									
130	Yale /Buckley	15	15	30	30	30	3:49a-10:37p	4:25a-9:53p	6:12a-9:53p
131	East Iliff / Seven Hills	30	30	-	-	-	5:14a-7:23p	-	-
133	Hampden / Tower	15	15	30	30	30	4:39a-10:30p	5:07a-10:30p	5:07a-10:30p

4.1.4. Span of Service

Span of service in the RTD network often varies by service class and is based on service policy and ridership demand. A wider service span gives passengers greater flexibility when planning their trips and encourages ridership at different hours of the day to meet varying passenger needs, but conversely increases cost.

CBD Local and Urban Local routes typically begin weekday service between 4:00 AM to 5:00 AM. The end of service, however, varies greatly with some routes ending service around 10:00 PM and others ending service at 2:00 AM the next day.

Suburban Local routes typically begin weekday service between 4:00 AM and 5:00 AM with service ending between 7:00 PM and 11:00 PM.

Express routes provide peak-only service for the early morning commute and again in the afternoon to meet the demand of commuters traveling to and from large employment centers.

SkyRide routes typically begin weekday service at 3:00 AM with service ending around 1:00 AM the next day.

The East Line Corridor is served predominantly by CBD Local and Urban Local routes with greater frequencies and spans. CBD Local Routes 28, 38, and 44 have 15 minute frequencies during weekday peak periods and 30 to 60 minutes during off-peak weekdays and weekends. All Urban Local Routes operate weekdays and weekends at frequencies of 15, 30, or 60 minutes except Route 54 which serves the Montbello Industrial Park on weekdays only. The corridor is intersected with Route 40 which travels north-south and provides service along the major arterial road of Colorado Boulevard. This route connects with the Southeast Rail Line further south of the East Corridor. The East Corridor is also served by express Route 47X. Route 47X is entirely within the East Corridor.

The I-225 Corridor is served primarily by CBD and Urban Local routes. CBD Local Routes provide on-peak and off-peak service to and from downtown Denver with Route 15 remaining operational throughout the week with 24-hour service. Urban Local Routes in this corridor typically operate at frequencies of 15, 30, or 60 minutes throughout the day. Only Route 89 operates only on weekdays as most labs and educational facilities in the Fitzsimons Life Science District and Anschutz Medical Campus remain closed during the weekends.

4.1.5. Performance

Route performance is essential in developing appropriate service plan recommendations as resources need to be invested to optimize performance and maximize ridership. Performance is measured in productivity; how efficient the service is provided in regards to expenditure and how effective the service is at accomplishing its intended objectives. Productivity increases as market demand begins to match the current supply of service and productivity decreases when the supply of service exceeds the market demand.

Although the market for transit cannot be controlled¹, poor market conditions can be mitigated through service and network design choices. Matching transit service levels, including frequency and span, with the transit market demand is one way to strengthen service productivity.

Table 8: RTD Service Class Service Standards
Subsidy per Boarding

Service Class	Subsidy per Boarding		Boardings per Revenue Hour	
	Average	10% Cutoff ²	Average	10% Cutoff
CBD Local	(\$2.88)	(5.31)	34.6	23.55
Urban Local	(\$3.27)	(\$8.21)	29.5	19.17
Suburban Local	(\$6.61)	(\$11.76)	17.7	10.77
Express	(\$3.11)	(\$7.06)	47.8	13.13

RTD conducts an annual route review using performance indicators such as subsidy per boarding. The subsidy per boarding measurement determines the portion of the operating cost, after subtracting fare revenues, that RTD pays on a per passenger boarding basis. Routes with a higher subsidy per boarding cost more to operate and therefore, perform worse than routes with a lower subsidy per boarding. Potential methods to improve subsidy per boarding include lowering operating costs by reducing route frequency and span. This will decrease the number of buses, drivers, pay hours, and service miles required to operate a route but can also reduce ridership. Another method to improve subsidy per boarding is to increase ridership and revenue through route alignment, route consolidation, or route deviation. Additional ridership and revenue can also be generated by marketing the service, improving operating characteristics such as on-time-performance, safety, reliability, and route network integration with other transit services. Improvements in scheduling can often result in reduced operating costs, improved service efficiency and reliability.

¹ RTD through collaboration with its member cities and counties can support changes that influence mobility choice. For instance, current RTD support of sustainable community Smart Growth initiatives that foster transit oriented development develop “transit lifestyle” markets where transit, biking, and walking play stronger roles in public mobility.

² Based on RTD Service Standards, the bottom 10% performing routes by each service class are evaluated for possible consolidation, realignment or improved marketing.

Figure 5 - East Corridor, Subsidy per Boarding, 2012

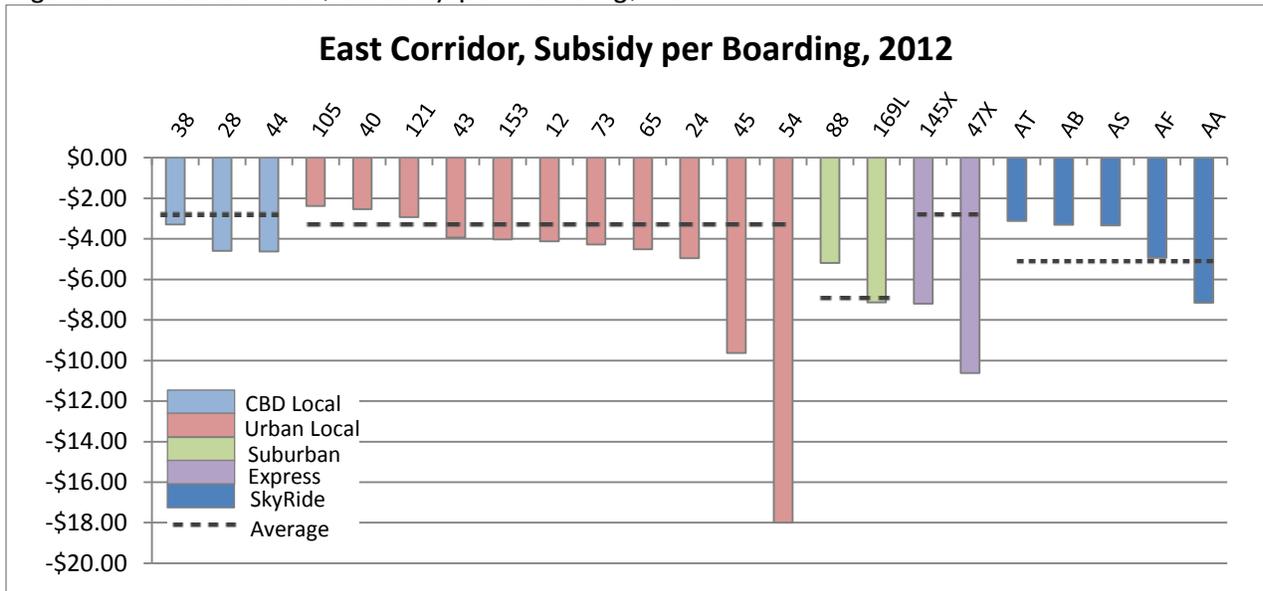
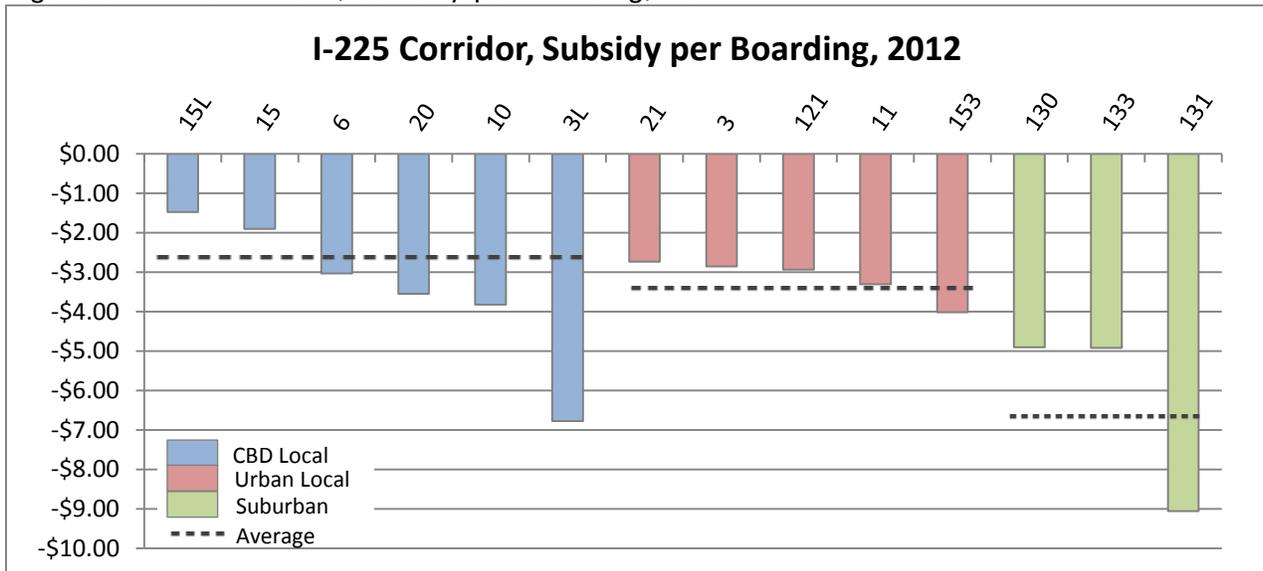


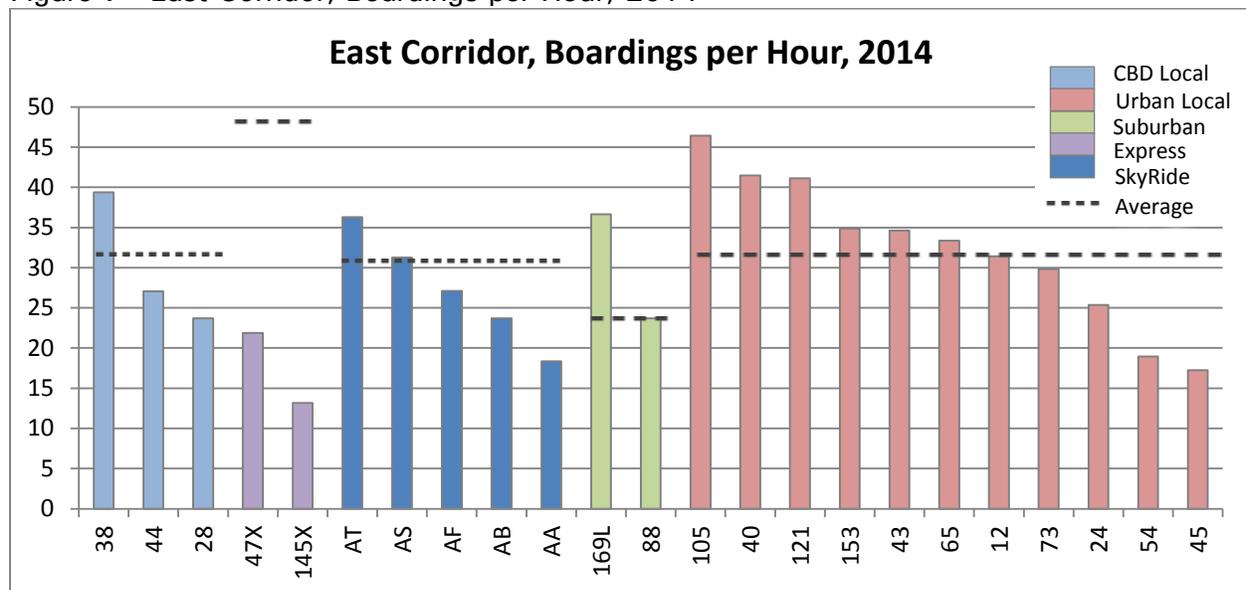
Figure 6 - I-225 Corridor, Subsidy per Boarding, 2012



Boardings per Hour

RTD also uses the boardings per revenue hour metric to measure route performance. The boardings per revenue hour calculation measures the average number of passenger boardings per hour of revenue service. Routes that generate higher boardings per hour represent more productive routes where market demand (boardings) is balanced with the supply of service (revenue hours). If demand increases, but supply remains the same, then productivity will increase. If supply increases, but demand remains the same, then productivity will decrease. By balancing the supply of service with the market demand, transit providers can generate the greatest return on their investment by reducing operating costs and associated subsidies – RTD has service standards policies that address both high and low performing routes. Following is service productivity for bus routes within the East and I-225 corridors.

Figure 7 - East Corridor, Boardings per Hour, 2014

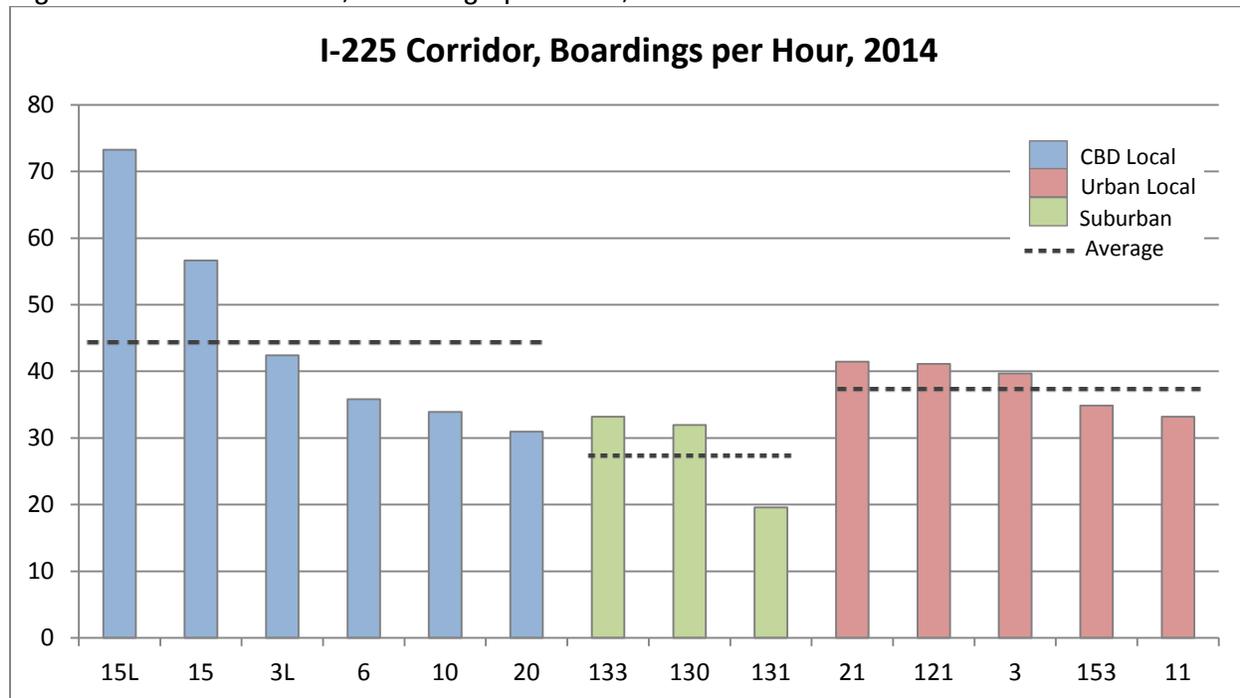


Within the East Corridor, the bus lines that go through downtown Denver underperform compared to similar services operated by RTD. The lines travel from the West side of the region through downtown Denver and then into the East side of the metro area. Because the entire line is not within the study area for the East Corridor, these routes were segmented to perform a more detailed analysis. The 47X Express service on the other hand is located solely within the East Corridor study area. This service travels through Green Valley Ranch and Montbello as a local service before merging onto I-70 as an express line. The 47X has 50% worse productivity when compared to other express routes in the RTD system and runs a route similar to the A-Line. It is expected that ridership will decline significantly once A-Line rail service opens making its ongoing retention tenuous.

There are also three bus lines in the study area that primarily serve DIA (AT, AS, and AF). The 169L also serves DIA, but primarily serves communities along the R-Line Corridor. This line performs well but has very low revenue service hours.

The Urban Local bus services in this corridor have an average boarding per revenue hour of 36 which is just above the average for the region, 35. Some lines do well in particular such as the 105 which has 46 boardings per revenue hour. This line travels from Denver Tech Center in the south to Stapleton (Central Park) in the north. On the other hand, bus lines such as the 45 and 54 have boardings per hour of 17 and 19 respectively. Both these services are north of the East Corridor in the Montbello and Green Valley Ranch neighborhoods and have circuitous routes.

Figure 8 - I-225 Corridor, Boardings per Hour, 2014



Transit lines that serve the I-225 Corridor perform better than comparable services within the RTD Service Area. In particular the 15 and 15L (limited) lines have very good performance with 57 and 73 boardings per hour, respectively. They both travel along Colfax Avenue from Aurora to downtown Denver. The performance of these lines can largely be attributed to the nature of the corridor and neighborhoods they serve. Colfax Avenue is a heavily travelled corridor and holds some of the highest density tracts in the region. The Suburban Local Lines 130 and 133 also do well with above average boardings per hour. Both of these lines start at the Nine Mile Station on the H Line Light Rail and end near the Aurora Town Center which is a major destination. Finally the Urban Local Lines 3, 21, and 121 all perform above the RTD average as well. The 121 line connects the H Light Rail Line to the south, runs along Peoria, and ends in the Montbello neighborhood to the north. The neighborhoods that this line passes through are high density, and contain low income populations that are more likely to take transit.

Farebox Recovery

Farebox recovery is the ratio of fare revenue to operating costs. It indicates the percentage of operating costs covered by passenger boarding revenue. The higher the farebox recovery, the lower the subsidy a route requires to operate, leaving more funding available to operate more service. Routes with a high farebox recovery ratio have the greatest share



of the operating cost paid by passengers. SkyRide offers the most productive service as a result its high fare structure, high demand from DIA to key destinations, and speed of service. Express routes represent the second most productive service class in this category due to the strong ridership, higher fare of \$4.00 instead of the local fare of \$2.25, and focused operating costs as a result of providing peak-only service. The farebox recovery for the entire RTD system was 23.8% in 2012.

Table 9: Farebox Recovery by Service Class

Service Class	Average Farebox Recovery
CBD Local	27.1%
Urban Local	25.6%
Suburban Local	14.7%
Express	44.6%
SkyRide	53.6%

Figure 9 - East Corridor, Farebox Recovery, 2012

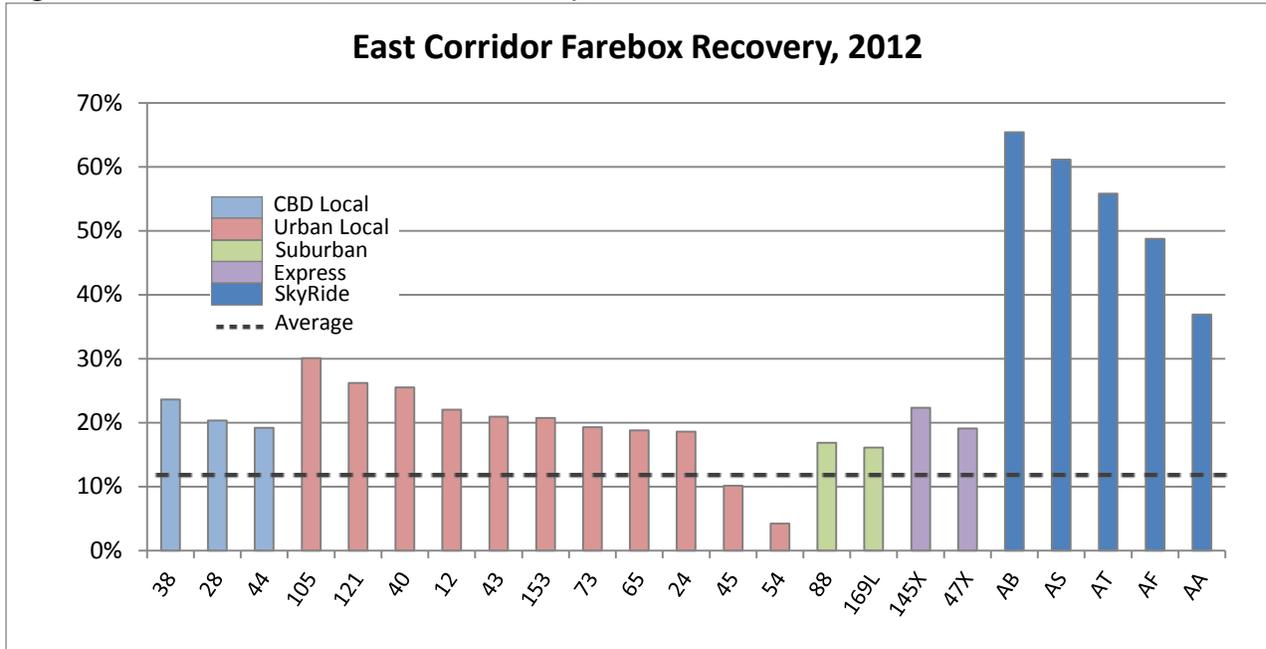
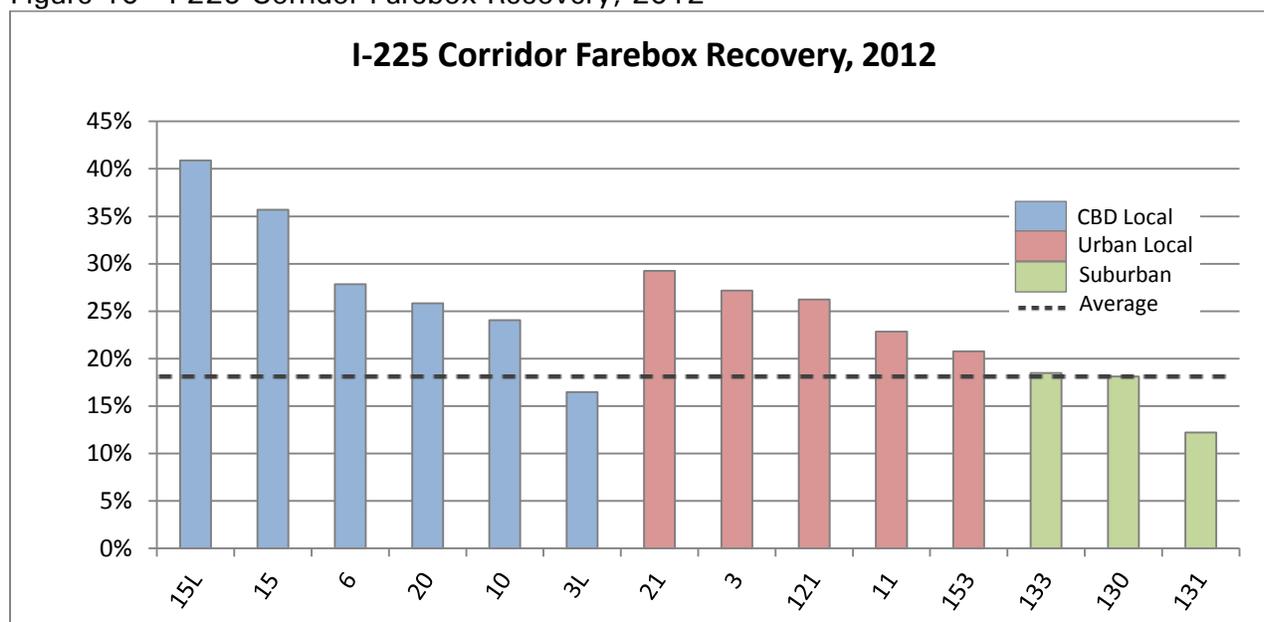


Figure 10 - I-225 Corridor Farebox Recovery, 2012



Productivity Analysis

Productivity varies greatly across service class. CBD Local and Urban Local routes generate the best performance statistics due to the number of people carried on these services. Identifying which routes are the most costly to run can help result in a more efficient allocation of resources. Routes with strong financial effectiveness are candidates for additional investment, while routes with weak financial effectiveness may be candidates for service reduction or realignment.

RTD service standards state “the least productive 10% of routes based on either subsidy per boarding or boardings per revenue hour need to be evaluated for marketing, revision, or elimination.” These are noted below in Red.

Table 10: East Corridor Bus Performance

Route	Subsidy per Boarding		Boardings per Hour	
	Average	10% Cutoff	Average	10% Cutoff
CBD Local Routes				
28	(\$4.59)	(\$5.31)	23.69	23.55
38	(\$3.30)	(\$5.31)	39.37	23.55
44	(\$4.62)	(\$5.31)	27.05	23.55
Urban Local Routes				
12	(\$4.12)	(\$8.21)	31.43	19.17
24	(\$4.95)	(\$8.21)	25.38	19.17
40	(\$2.53)	(\$8.21)	41.48	19.17
43	(\$3.93)	(\$8.21)	34.63	19.17
45	(\$9.62)	(\$8.21)	17.24	19.17
54	(\$18.00)	(\$8.21)	18.97	19.17
65	(\$4.51)	(\$8.21)	33.38	19.17

Route	Subsidy per Boarding		Boardings per Hour	
	Average	10% Cutoff	Average	10% Cutoff
73	(\$4.29)	(\$8.21)	29.86	19.17
105	(\$2.39)	(\$8.21)	46.45	19.17
121	(\$2.94)	(\$8.21)	41.12	19.17
153	(\$4.02)	(\$8.21)	34.87	19.17
Suburban Local Routes				
88	(\$5.19)	(\$11.76)	23.72	10.77
169L	(\$7.13)	(\$11.76)	36.64	10.77
Express Routes				
47X	(\$10.62)	(\$7.06)	13.18	13.13
SkyRide Routes				
AA	(\$7.14)	(\$6.20)	18.37	9.19
AB	(\$3.31)	(\$6.20)	23.70	9.19
AF	(\$4.93)	(\$6.20)	27.10	9.19
AS	(\$3.34)	(\$6.20)	31.27	9.19
AT	(\$3.12)	(\$6.20)	36.28	9.19

East Corridor Route Performance

The East Corridor is primarily served by CBD Local and Urban Local Routes, which are typically more productive due to their high frequencies and consistently strong ridership. In the corridor, Routes 38, 40, 43, 105, 121, AB, AS, and AT perform best in the subsidy per boarding category with each requiring a subsidy per boarding of less than \$4.00. The system-wide subsidy per boarding is \$3.31 for Year 2012. Routes 45, 47X, 54, 145X, 169L, and AA require a greater subsidy than the group average and exceed the \$6.00 subsidy per boarding and will require further analysis. All routes except 47X generate more than 15 boardings per hour.

Of all the routes in the East Corridor, only Route 54 fails the subsidy per boarding 10% service class standard. Route 54 is a loop that begins at the Montbello Park-n-Ride and circulates through the Montbello Industrial Park. It serves a major employment, low income, high minority area. The route operates clockwise in the morning and counter-clockwise in the afternoon on weekdays only with frequencies of thirty minutes during peak and off-peak periods.

Table 11: I-225 Corridor Bus Performance

Route	Subsidy per Boarding		Boardings per Hour	
	Average	10% Cutoff	Average	10% Cutoff
CBD Local Routes				
3L	(\$6.77)	(\$5.31)	41.3	19.1
6	(\$3.03)	(\$5.31)	28.7	19.1
10	(\$3.83)	(\$5.31)	29.2	19.1
15	(\$1.90)	(\$5.31)	44.7	19.1
15L	(\$1.48)	(\$5.31)	54.9	19.1

Route	Subsidy per Boarding		Boardings per Hour	
	Average	10% Cutoff	Average	10% Cutoff
20	(\$3.55)	(\$5.31)	24.8	19.1
Urban Local Routes				
3	(\$2.85)	(\$8.21)	35.0	16.6
11	(\$3.31)	(\$8.21)	26.6	16.6
21	(\$2.74)	(\$8.21)	30.8	16.6
89	–	(\$8.21)	9.6	16.6
121	(\$2.94)	(\$8.21)	41.3	16.6
153	(\$4.02)	(\$8.21)	29.8	16.6
Suburban Local Routes				
130	(\$4.90)	(\$11.76)	28.3	7.9
131	(\$9.06)	(\$11.76)	18.6	7.9
133	(\$4.92)	(\$11.76)	30.3	7.9

I-225 Corridor Route Performance

The I-225 Corridor is served mainly by CBD Local and Urban Local Routes, which often require a lower subsidy to operate and are typically more productive due to their high frequencies and consistently strong ridership. Two routes (3L and 131) exceed the \$6.00 subsidy per boarding compared to one in the East Corridor. All CBD and Urban Local Routes in this corridor exceed 15 boardings per hour. In the corridor, Routes 3, 6, 10, 11, 15, 15L, 20, 21, and 121 perform best in the subsidy per boarding category with each requiring a subsidy per boarding of less than \$4.00. The system-wide subsidy per boarding figure was \$3.31 for Year 2012.

Of all the routes in the I-225 Corridor, only Routes 3L and 131 fail the subsidy per boarding 10% service standard class. Route 3L is a CBD local (limited stop) route traveling from the Civic Center Station to East Ohio Drive/Alameda Parkway in Aurora. Route 131 is a suburban local route traveling from the Nine Mile LRT Station in Aurora to East Jewell Avenue/South Dunkirk Street in Aurora. Both of these routes operate weekdays only during peak periods. The higher subsidy for Route 131 is a result of the less productive suburban market ridership as compared with Urban Local and CBD local routes. Route 3L runs one direction during the peak period only which may help explain the higher subsidy.

5. East and I-225 Corridor Service Plan

Building upon RTD’s significant investments in transit, the addition of rail service in the East and I-225 Corridors is another major step forward in developing a comprehensive and seamless transit network for the people of the greater Denver area. However, rail service is only part of the overall transit improvements envisioned for these corridors. The bus network which carries the vast majority of transit riders was evaluated and recommendations were made to complement the additional rail service with direct and convenient access to the new rail stations. Recommendations were also made to the bus network to enhance intra-corridor mobility and to strengthen connectivity to urban and suburban regional destinations while improving operational efficiency and the rider’s experience.

5.1. Plan Framework and Strategies

To fully ensure that the transit network makes the most effective use of limited operating resources, it was imperative that the recommendations were congruent with RTD’s vision for a regionally integrated transit network that will improve mobility, enhance economic competitiveness, reduce congestion and pollution, and will ultimately retain existing riders while continuing to attract new ones. The service recommendations not only focus on enhancing operating efficiency and improving transit network effectiveness, but also aim to make transit the region’s mode of choice.

The Existing Conditions findings from the ridership analysis, service performance, and market conditions also informed the development of guiding principles which served as the framework for the service plan. The framework and strategies guided the development of the plan recommendations from both a “top-down” network-level perspective as well as a route-level “bottom-up” perspective.

5.2. Network Design Strategies

Transit system success is built over a network, not by individual bus route or rail line. The critical goal for the East and I-225 Corridor Service Plan is to build a simple, easy-to-use network that is comprised of a family of bus and rail service tiers, all focusing on delivering the overall network experience desired by existing and potential customers.

Leverage Rail Investment

RTD has made a significant investment in new rail alignments to improve regional mobility. These investments will help shape land use patterns, enhance the competitive advantage of the region, reduce congestion and pollution, and improve the livability and vibrancy of the area. However, new rail infrastructure alone can’t accomplish these goals. Investments in rail infrastructure must be leveraged and seamlessly integrated into RTD’s larger network of transit services.

The East Corridor offers new fast regional train service between downtown Denver and Denver International Airport (DIA) and provides new network opportunities. The I-225 Corridor Rail completes the connection between the East and the Southeast Corridors and also opens new network opportunities for both rail and bus transit. As a result, the adjacent or intersecting bus routes should be considered for realignment to serve the new rail stations, resources of duplicative bus service reallocated, and bus route alignment changes made to refocus network coverage. Through these actions, an integrated transit

network is proposed that will attract riders, reduce operating costs, and strengthen regional and community mobility.

Strengthen Bus Service Tiers

RTD has a number of bus tiers which are defined by their target markets and service characteristics. The East and I-225 Corridor Service Plan further differentiate the network and corridor target markets between “transit lifestyle” and “coverage” markets. Service designed for sustainable lifestyle consumers focuses on spontaneous-use frequencies of 10-15 minutes throughout the day and week that allow consumers to walk-up and catch the next trip without planning their arrival at the stop. These spontaneous use corridors will form the top tier of arterial bus transit and are good candidates for future infrastructure investment to enhance the wait (upgraded stops) and travel experience (reduced delay; improved reliability) for customers.

Lifestyle areas require development densities high enough to sustain these service levels productively (meeting RTD standards) together with community orientation that facilitates transit, walking, and biking active mobility. Coverage transit markets are those where densities and community design are focused on automobile travel, which makes significant transit mode penetration not possible and/or cost-effective. The proposed plan focuses increased service frequency investment to network areas and corridors that support lifestyle transit while tailoring transit options for coverage service areas.

Route Spacing and Prioritization

Where multiple routes operate along shared or parallel corridors, route consolidation or prioritizing was evaluated in order to create a more robust transit service with greater frequency that adds value to riders and supports spontaneous network use. Routes operating along the same or adjacent corridors usually compete for the same riders, reducing the effectiveness and increasing the net cost of service of each route. By consolidating or prioritizing routes, limited resources can be reinvested within the transit network to provide more direct, faster, and reliable service. For example, instead of operating three 20 minute service routes in parallel, the plan looks to operate one at 10 or 15 minutes with the other two at 30 or 60 minutes.³ In many instances, the middle route operates on a major arterial and can be a candidate for infrastructure enhancement to reduce delay and improve the customer experience - this investment has more ridership and performance return on streamlined corridors with higher service levels.

Alternative First/Last Mile Transit

In most cases, network transit mobility is best served using regular fixed route bus service. In some cases where the mobility needs are more limited (e.g., work or school commuting; senior mobility) or where development intensity is too low to productively support regular fixed route bus service, alternative mobility options are appropriate. The East and I-225 Corridor Service Plan considered more cost-effective alternatives in such instances

³ Research in many cities has documented that corridor prioritizing generates more overall ridership for the same resource cost because more consumers are attracted. They walk further to better bus transit with the average access for basic local bus at ¼ mile (80th percentile ridership catchment) while for enhanced frequent bus this walk shed increases to ½ mile attracting more riders.

including Call-n-Rides, station-based vanpools or car-sharing, home-to-work vanpools, or private shuttles – especially for the dispersed light industry development adjacent to the I-70 and the East Rail Corridors. Existing express services should be reconfigured as first-mile connectors to the nearest rail station where current ridership is low or where the rail connection offers improved service frequency and/or travel time. RTD should consider remote PnRs rather than walk-up access to improve performance of these first-mile replacement services where densities are insufficient to support productive transit.

5.3. Route Design Strategies

To fully ensure that the transit network makes the most effective use of its operating resources, it is important to ensure that not only is there a coherent vision for a complete transit network, but that individual routes can attract ridership as well. The following route design strategies focus not only maintaining high operating efficiency, but providing an improved customer experience that will attract more riders and operating revenue, thus improving effectiveness as well.

Route Streamlining

Deviating routes from the main transit corridors reduces the walking distance and makes transit more attractive to small numbers of riders but makes it significantly less attractive to large numbers of riders using the main corridor. The result is fewer total riders at higher operating cost.⁴ The East and I-225 Corridor Service Plan calls for limiting deviations to areas that can justify the additional travel time and costs by high ridership on the deviation – areas such as rail stations, transit hubs, and major destinations in order make individual routes, as well as the transit network, more productive and attractive to riders. In cases where the deviation was providing needed lifeline coverage, alternative service was proposed while also proposing streamlined corridor bus transit.

Short-Lining

Routes often vary in terms of ridership and performance along the length of their alignments. Generally, areas with higher population and employment densities generate more ridership than areas with lower densities. For example, Route 21 serves the Iliff and Evans Avenues corridor where ridership is much stronger between the Southwest Rail Station (Delaware) and the Centrepont & Sable Hub in Aurora, making short-lining more service on the eastside a cost-effective solution.

⁴ RTD's out-of-direction standard calls for deviations to have less than 3 minutes increased travel time impact to through-passengers for each rider served on the deviation to avoid total route ridership loss. Also, deviations typically cost more to operate due to increased mileage and slower off-route operating speeds.

Stop Consolidation

One of the greatest sources of operating delay and on-time performance impacts is dwell time at bus stops. While closely-spaced bus stops increase the ease in which riders can access the transit system that convenience comes at the expense of operating speed and service reliability. Closely spaced stops not only impact route performance, increase stop maintenance costs, and accelerate bus maintenance costs, but they can significantly reduce the competitiveness of the service. By finding an optimal balance of stop spacing to maintain convenient access to transit service while reducing potential for delay, the efficiency and effectiveness of transit can be increased significantly. While stop consolidation is not proposed per se as part of the East and I-225 Corridor Service Plan, it is recommended that RTD continue its stop consolidation program throughout the bus network.

Corridor Segment Consolidation

In some instances where multiple routes serve the same corridor at different points, it is more intuitive for the customer to have one streamlined route that serves the corridor continuously. If general travel patterns on the corridor show a higher degree of through travel relative to local mobility, routes that link complimentary origins and destinations together were consolidated to increase rider convenience by eliminating or reducing transfers required to complete their trip along a natural transit corridor. In some cases this results in restructuring the corridor into routes with consistent roles: one is streamlined to serve the main arterial with frequent service while one or more are designed to serve the neighborhood interior with less direct service where walk access to the main corridor is not feasible. An example of this is reorienting service on MLK (Route 43) as the key enhanced fast direct transit corridor (15-minute service to downtown Denver) while Route 38 becomes the neighborhood route connecting to the 30th & Downing Rail Station with 30-minute service.

Route Segmentation

In contrast to the segment consolidation strategy, where routes exhibited a very high proportion of rider transfer activity at a single point, the benefits of separating those routes into two distinct routes at that point to improve schedule adherence or scheduling efficiency was evaluated. This was primarily due to the low number of riders remaining on the bus and traveling through the point in question. These actions also resulted in routes with more balanced service levels on either side of this midpoint based on demand.

Low Performing Service Replacement

If a route or route segment performed poorly and the potential to improve performance appeared to be limited within the existing configuration, then alternatives to fixed route service were considered. These alternative mobility options included Call-n-Rides, special shuttles (destination), service routes (tailored for specific trip-making, e.g., seniors), or commute oriented programs (e.g., station vans, car/bike sharing). These options maintain service coverage mobility while reducing RTD's net subsidy.

6. East and I-225 Bus Service Recommendations

Service recommendations were informed by previous East and I-225 Corridor planning efforts and additional market and service analyses conducted as part of this study. The

following recommendations follow the network and route design principles discussed above and were developed to enhance mobility in both corridors upon the opening of the East and R-Lines.

Existing and proposed service frequencies are compared in the following table. Route recommendations are organized by primary cardinal direction (north-south and east-west). The key findings from the market and service analyses are presented together with the specific route alignment, schedule, and operating recommendations.

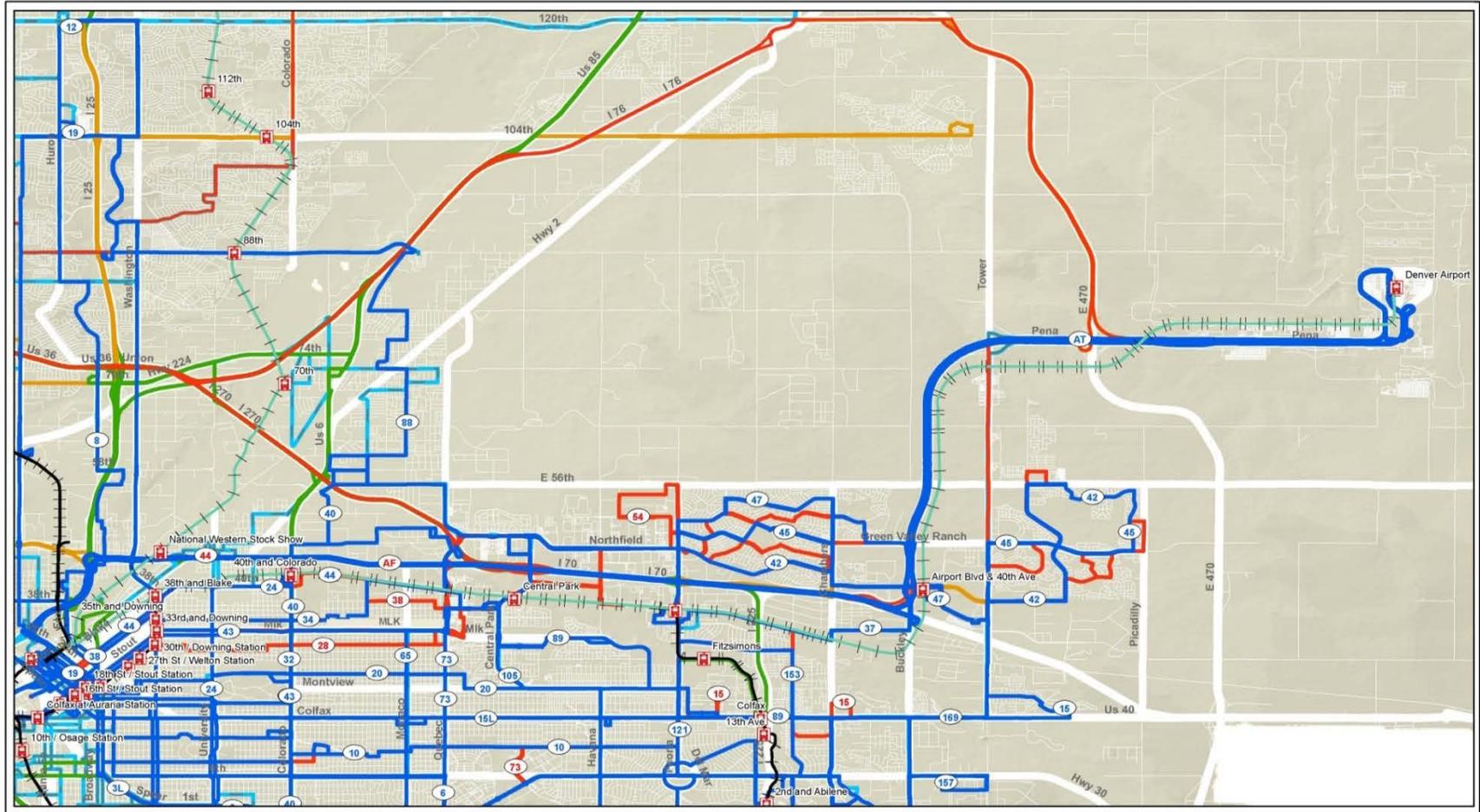
Table 12: Existing and Proposed Bus Frequencies

Proposed Route	Route Name	Proposed Peak Frequency	Proposed Base Frequency	Existing Peak Frequency	Existing Midday Frequency
3	Alameda Avenue	60	60	60	60
3L	East Alameda Limited	20-30	–	20-30	–
6	East 6th Avenue	15/30	30	15/30	30
10	East 12th Avenue	10-15/30	15/30	10-15/30	15/30
11	Mississippi Avenue	15-30	30	15-30	30
12	Downing / N Washington	15	30	15	30
15	East Colfax Avenue	7.5/15	10/30	7.5/15	10-30
15L	East Colfax Limited	6-10	10	6-10	10
20	20th Avenue	15	30	15	30
21	Evans Avenue	15/30	30	15/30	30
24	University Blvd	30	30	30	30
32	West 32nd Avenue / City Park	15-30	30	15-30	30
28 W/38W	28th Avenue/38th Avenue	15	30	15	30
34 East	East 38th Avenue	15-30	30	15	30
37	Peoria/Smith Industrial	30	-	30	30
40	Colorado Blvd	10/30	15/30	10/30	15/30
42	Stapleton/Montbello/Green Valley Ranch	* 15*	30	30	30
43	MLK Blvd	* 10-15*	15	15	15
44	44th Avenue	30	30	15-30	30
45	Gateway Avenue/Green Valley Ranch Boulevard	* 15*	30	30	30
47	Maxwell Place/Chambers Road	* 15*	30	15-30	30
54	Montbello Industrial Park	–	–	30	30
65	Monaco Parkway	30	30	30	30
73	Quebec Street	30	30	30	30
88	Northglenn / Commerce City / Stapleton	30	30	30	30
89	Stapleton / Anschutz Campus	60	60	60	60

Proposed Route	Route Name	Proposed Peak Frequency	Proposed Base Frequency	Existing Peak Frequency	Existing Midday Frequency
105	Havana Street	15	15	15	15
121	Peoria Street	15	*15*	15	30
130	Yale / Buckley	15	30	15	30
131	East Iliff / Seven Hills	30	*30*	30	–
133	Hampden / Tower	15	30	15	30
153	Chambers Road	15-30	30	15-30	30
157	Town Center at Aurora/Buckley AFB	30	30	30	30
169	Buckley / Tower	*30*	*30*	12 trips	–
483	Lincoln / Parker / Nine Mile	60	*60*	30-60	–



Map 9 - Proposed Route Changes: Northeast Denver



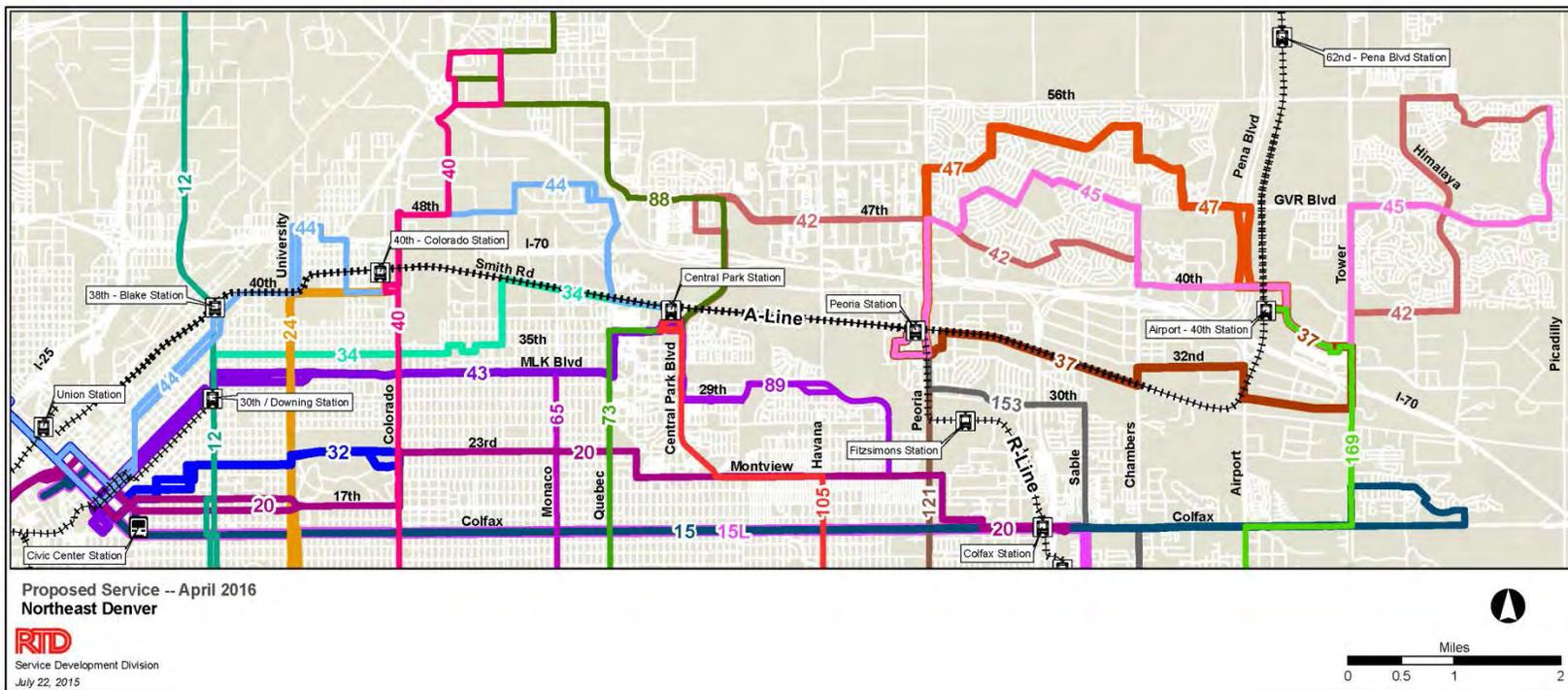
**Northeast Denver
Proposed Route Changes**

RTD
Service Development Division
Date: 5/7/2015

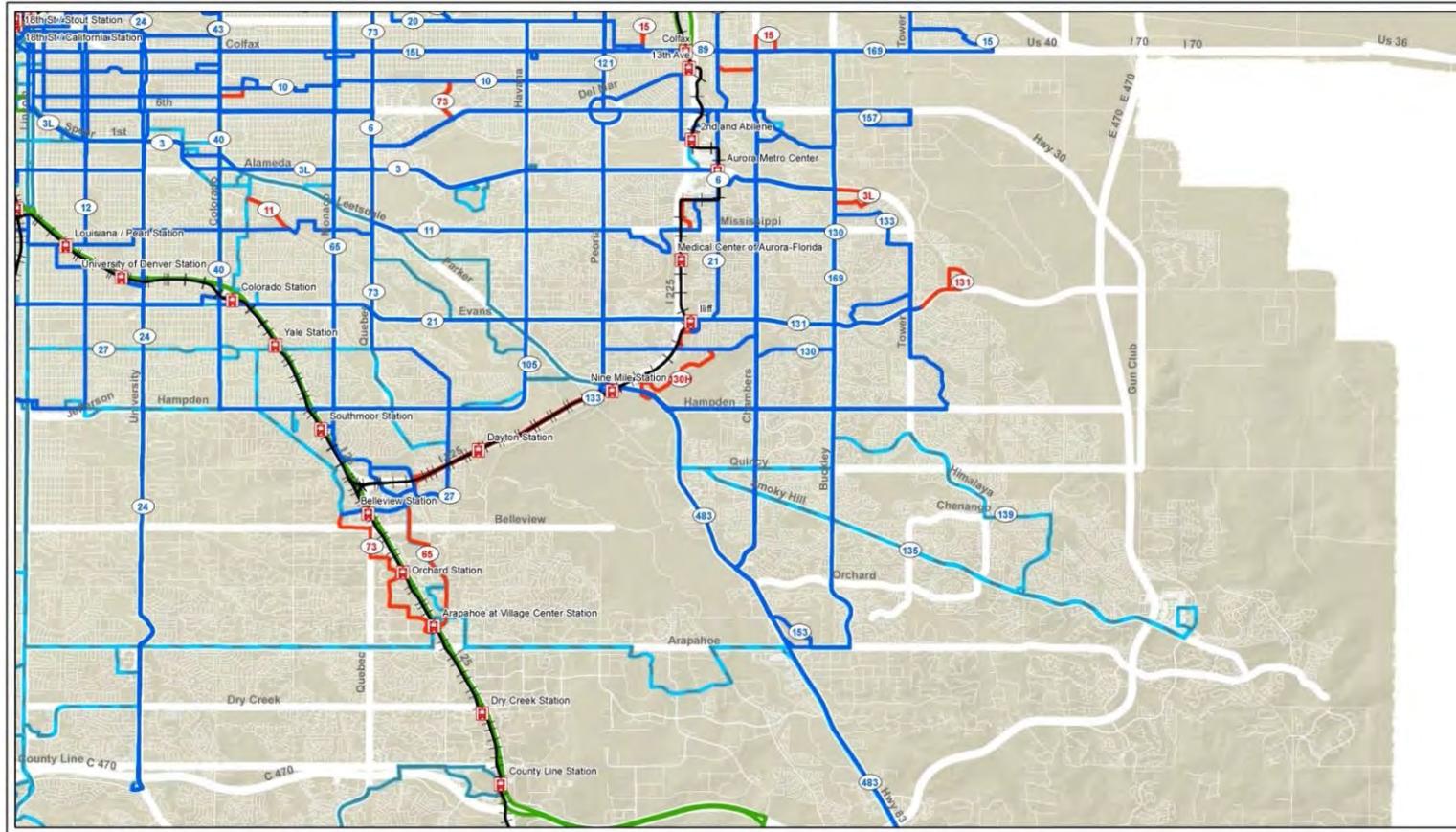
Rail Type	Proposed Changes	Existing Routes Types
Diesel Commuter Rail	Current Service To Remain	Local
Electric Commuter Rail	Discontinued Service	Limited
Light Rail		Express
		Regular



Map 10 - Proposed Service - Northeast Denver



Map 11 - Proposed Network: Southeast Denver and Aurora



**Southeast Denver
Proposed Route Changes**

RTD
Service Development Division
Date: 5/7/2015

Rail Type

- Diesel Commuter Rail
- Electric Commuter Rail
- Light Rail

Proposed Changes

- Current Service To Remain
- Discontinued Service

Existing Routes Types

- Local
- Limited
- Express
- Regular



7. Route Recommendations

Route 3 – Alameda Avenue

- The deviation into Havana & Alameda Park-n-Ride will be discontinued. Passengers may instead use stops on Alameda, only 300 feet away.
- Service through Cherry Creek will be straightened out to operate, from Steele Street, via Bayaud Avenue and Colorado Blvd. to Alameda Avenue, then resume the current route. This routing provides convenient access for the neighborhoods between Steele Street and Colorado Blvd., while also providing more direct service for through passengers.

Route 3L – East Alameda Limited

- Service east of Aurora Metro Center Station (Centrepoint & Sable) to Ohio/Buckley will be discontinued. Ridership east of Sable Blvd. averages 34 passengers/day, or 5 passengers/trip. Excellent service is available via Route 133 with 15 minute peak frequency and 30 minute frequency at all other times of the day, and provides convenient connection opportunities at Aurora Metro Center Station.

Route 6 – East 6th Avenue SPLIT

- Route 6 is proposed to be split into two routes, Route 6-East 6th Avenue and Route 19-North Pecos: Route 6 will terminate at Denver Union Station, accessed via Wewatta Street and 18th Street. Route 6 routing will otherwise remain unchanged.

Route 10 – East 12th Avenue

- It is proposed to discontinue Route 10 service east of the Community College of Aurora to Buckley Air Force Base. Route 10 service to Buckley will be replaced by proposed new Route 157. The new eastern terminal location for Route 10 will be the Community College of Aurora – CentreTech Campus.
- Connect with R-Line light rail at the 2nd & Abilene Station by deviating by Potomac, 2nd Avenue, Abilene Street, 4th Avenue, and Billings Street

Route 11 – Mississippi Avenue

- Discontinue the deviation via Cherry Street and Cherry Creek Drive South in Glendale, instead operating directly via Mississippi Avenue. Most passenger boardings occur one block north of Mississippi at Kentucky Avenue. Passengers at Cherry Creek Drive may walk, or use Route 46.
- Reroute via Blackhawk Street instead of Abilene, between Mississippi and Exposition Avenues.

Route 12 – Downing/North Washington

- Changes for August 2015: Eliminate northbound deviation into 30th & Downing Station. Transferring passengers will instead use a new northbound bus stop at Downing/29th Avenue, immediately across the street from the LRT Station. Saves approximately 4 minutes for northbound through passengers.

Route 15 – East Colfax Avenue

- Changes for August 2015: Discontinue deviation via Sable, 13th Avenue, Chambers Road, and 17th Avenue. These deviations have excellent alternative services available via Routes 15L, 20, and 153.
- Utilizing operational savings from discontinuing the above deviations, Route 15 will be extended east of Chambers Road to Himalaya Street, replacing current Route 15L service.

Route 15L – East Colfax Limited

- Changes for August 2015: Discontinue weekday trips east of Sable Blvd to Tower Road and Himalaya Street. These trips will instead terminate at Colfax/Billings Street. Service east of Sable will be provided by newly extended Route 15 trips.

Route 19 - North Pecos

- Route 19 replaces Route 6 service on North Pecos St between downtown Denver and Northglenn.

Route 20 – 20th Avenue

- Changes for August 2015. Extend route east from 16th/Aurora Ct. (Anschutz Medical Campus) via Colfax Ave. to Colfax/Billings St., in order to provide connections with R-Line light rail service at the Colfax Station.
- Reroute eastbound trips from Lakewood as they enter downtown Denver, to use Market Street instead of Wazee Street to 17th Street. Westbound trips destined for Union Station will operate via Lawrence Street.

Route 21 – Evans Avenue

- Changes for August 2015: Reroute at Colorado Station via Monroe St. between Evans Ave and Buchtel Blvd to avoid Colorado Blvd. traffic delay while maintaining service connections.
- Route 21 will provide a direct connection with R-Line light rail service at the Aurora Metro Center Station. Service will not deviate from Iliff Avenue at the Iliff Station, instead passengers may utilize pedestrian connections between Iliff and the rail platform.
- Sunday/holiday frequency will be improved from every 60 to every 30 minutes.

Route 24 – University Boulevard

- Eliminate the deviation via Race Street and Davies Avenue at the Streets at Southglenn. University Blvd. provides equivalent access, while reducing travel time for through passengers.
- Discontinue deviation via 47th Avenue through Swansea and Elyria neighborhoods. Route 24 will instead operate directly east on 40th Avenue from York Street, to the new 40th & Colorado Station for connections with A-Line rail service. Replacement service in Swansea and Elyria will be provided by rerouted Route 44 service.

Route 28 – East 28th Avenue DISCONTINUED

- Route 28 service east of downtown Denver to Central Park Station will be discontinued, due to low ridership and much more attractive nearby service provided by Route 43. Alternative service is available by Route 43 on Martin Luther King Blvd. two blocks north. Route 43 is proposed to be extended to downtown Denver, eliminating the need to transfer to light rail or bus service at 30th & Downing Station. Alternative service is also available via Route 32 on 22nd and 23rd Avenues west of Colorado Blvd., and by Route 20 on 23rd Avenue east of Colorado Blvd. Route 28 service west of downtown Denver to northwest Denver and Wheat Ridge will not be affected.

Route 32 – 32nd Avenue/City Park

- Route 32 weekday service will be cut back to 22nd Avenue/Colorado Blvd., eliminating the duplication with Route 40 between 22nd and 9th Avenues. Saturday/Sunday/holiday service will be reestablished east of downtown Denver to

22nd/Colorado, replacing Route 28 service between downtown and Downing Street, and providing weekend service to the Denver Zoo.

Route 34 – Bruce Randolph Blvd. NEW (Replaces Route 38 East)

- Existing Route 38 service east of downtown Denver to Central Park Station will be replaced by new Route 34. Route 34 will operate between 30th & Downing Station and Central Park Station, utilizing the existing Route 38 routing. Service west of 30th & Downing to downtown Denver will be served by existing D-Line Light Rail and extended Route 43, operating via Stout and California Streets.
- Route 34 will operate via Holly Street and Smith Road to Central Park Station, in order to serve the Denver Rescue Mission homeless shelter at Smith/Kearney. Current Route 38 passengers between Holly and Quebec on 38th Avenue may use Route 34 on Smith Road or Route 43 on Martin Luther King Blvd.

Route 35 – Hampden Avenue

- No changes are proposed for Route 35.

Route 37 – Smith Road Industrial NEW (Replaces Route 153 on Smith Road)

- New Route 37 will provide peak period access to the industrial areas along Smith Road, operating between the Peoria Station and Airport & 40th Station via Smith Road, Sable, Moncrieff, 32nd Avenue, Airport Blvd, and Salida St.

Route 38 – 38th Avenue SPLIT

- Route 38 service east of downtown Denver replaced by new Route 34. See Route 34 for full description.

Route 40 – Colorado Boulevard

- Route 40 will be rerouted via 40th Avenue and Jackson Street to serve the 40th & Colorado Station for connections with A-Line rail service.
- The peak period branch east of Dahlia Street to Central Park Station (Stapleton) will be discontinued. Service along 48th and 49th Avenues through the Stapleton Industrial area will instead be provided by extending selected peak trips of the Route 44 from Colorado to Central Park Station.

Route 42 – Central Park/Montbello/Green Valley Ranch NEW (Replaces Route 43 east of Central Park Station)

- New Route 42 will replace existing Route 43 east of Central Park Station to Montbello and Green Valley Ranch. Route 42 will operate via Central Park Blvd., 46th Avenue and Willow Street, serving the Shops at Northfield, then via the current Route 43 alignment via 47th Avenue, through Montbello via Albrook Dr., 46th Ave., and 40th Ave., to 40th & Airport Station.
- Continuing east to Green Valley Ranch Route 42 will then operate via Salida Street, Tower Road, 38th Avenue, Himalaya, Dunkirk Street, 56th Avenue, Ireland Street, and Maxwell Place to Orleans Street.
- Route 42 will operate every 15 minutes during weekday peak periods, and every 30 minutes at all other times including early morning and late evening, similar to current Route 43 service through this area.

Route 43 – Martin Luther King Boulevard

- Route 43 will be reconfigured to be the high frequency and direct service between Central Park Station, northeast Denver, and downtown Denver. Route 43 will be extended to operate into downtown Denver via Stout and California Streets, replacing existing Route 38. Service east of Central Park Station to Montbello and Green Valley Ranch will be replaced by new Route 42. Service will continue to be

provided every 15 minutes during daytime hours, and every 30 minutes in the early morning and late evening. Service will not deviate into the 30th & Downing light rail station, passengers desiring to connect with light rail may instead make easy connection either on-street around 30th and Downing, or downtown along Stout and California Streets.

Route 44 – 44th Avenue

- Route 44 will be discontinued east of the 40th & Colorado Station. Replacement service on Smith Road to the Denver Rescue Mission will be provided by new Route 34. Service through Montbello will be provided by new Route 45.
- Reroute Route 44 via York Street, 47th/46th Avenues, and Steele Street to 40th Avenue, replacing Route 24 service in the Swansea and Elyria neighborhoods.
- Provide selected peak period trips east of Colorado Blvd., operating via 48th/49th Avenues through the Stapleton Industrial area, to Central Park Station, replacing existing Route 40 service.

Route 45 – Gateway Blvd./Green Valley Ranch Boulevard

- The existing Route 44 and 45 routings through Montbello will be merged into one route, as the Route 45. The new Route 45 will originate at the Peoria Station, then operate via Peoria, Albrook Drive, Crown Blvd. serving Montbello High School, 51st Avenue and Gateway Blvd. to Chambers Road. It will then operate via Chambers Road and 40th Avenue to the Airport & 40th Station.
- Continuing east to Green Valley Ranch, Route 45 will operate via Salida Street, Tower Road, Green Valley Ranch Blvd., and Orleans Street to Maxwell Place.
- Route 45 will operate every 15 minutes during weekday peak periods, and every 30 minutes at all other times including early morning and late evening.

Route 47 – Maxwell Place/Parkfield – NEW

- New Route 47 replaces existing Route 153 service in Montbello. Route 47 will originate at the Peoria Station, and operate via Peoria, 51st Avenue, Uvalda Street, Maxwell Place to Chambers Road, then via 53rd Avenue and Kittredge Street serving Parkfield, and then via Pena Blvd. to 40th Avenue and terminating at the Airport & 40th Station.
- Route 47 will operate every 15 minutes during weekday peak periods, and every 30 minutes at all other times including early morning and late evening.

Route 47X – Green Valley Ranch/Montbello Express DISCONTINUED

- Service will be discontinued, replaced by A-Line rail service and improved local bus route feeder service in the Montbello and Green Valley Ranch neighborhoods.

Route 54 – Montbello Industrial Park DISCONTINUED

- Service will be discontinued, due to very low ridership. Access to the area will continue to be available via Route 42 on 47th Avenue and Route 47 on Peoria Street.

Route 65 – Monaco Parkway

- Discontinue weekday service south of Ulster/Tufts along DTC Blvd. and Yosemite Street to Arapahoe Station. Ridership on this segment averages approximately 200 per day, or 5 trip. The majority of passengers board or alight at Arapahoe Station, where frequent light rail service is available. Other passengers may use the existing light rail service at Belleview, Orchard, or Arapahoe Station, and walk or use Call-n-Ride service for job access.

Route 66 – Arapahoe Road

- No changes are proposed for Route 66.

Route 73 – Quebec Street

- Discontinue deviation through Lowry via 11th Avenue, Yosemite Street, and Lowry Blvd. Most ridership on this deviation is also served by Route 10 on 11th Avenue, and Route 6 on Lowry Blvd.
- Discontinue unproductive service south of Ulster/ Tufts (DTC Transfer Center) along Quebec and Syracuse Streets to Arapahoe Station. Ridership on this segment averages approximately 200 per day, or 5 per trip. The majority of passengers board or alight at Arapahoe Station, where frequent light rail service is available. Other passengers may use the existing light rail service at Belleview, Orchard, or Arapahoe Station, and walk or use Call-n-Ride service for job access.

Route 79L – Cherry Creek/Dayton Way Limited

Route 83L – Cherry Creek/Parker Road Limited

- No changes are proposed for Routes 79L and 83L.

Route 89 – Stapleton/Anschutz Campus

- No changes are proposed for Route 89

Route 105 – Havana Street

- No changes are proposed for Route 105.

Route 121 – Peoria Street

- Weekday service between Nine Mile Station and Ulster/Tufts (DTC Transfer Center) will be discontinued, due to low ridership and replacement by R-Line light rail service.
- Discontinue deviation via Quentin Street in the Anschutz Medical Campus, route will instead operate directly on Peoria Street. Ridership averages 150 per day, 2 per trip. Customers may instead transfer at Peoria/Colfax to Routes 15 and 15L for access to the campus.
- Discontinue the deviation east to Sable Blvd. via 30th Avenue and Smith Road through Morris Heights. Route 121 will instead operate directly north to 33rd Avenue, and then to the Peoria Station for connections with A-Line and R-Line rail service. Service on 30th Avenue through the Morris Heights neighborhood will instead be provided by Route 153, with similar service levels. Service on Smith Road will be provided during peak periods by new Route 37.
- Weekday midday service frequency will be improved from every 30 to every 15 minutes.

Route 130 – Yale/Buckley

- Route 130 service north of Aurora Metro Center Station to the Community College of Aurora will be replaced by new Route 157. See Route 157 for detailed description.
- Discontinue Route 130H service on Marina Drive through Heather Gardens due to very low ridership and service productivity. Passengers may instead board Route 130 on Yale Avenue. Passengers at the office complex and hotel near Parker Road are within walking distance of Nine Mile Station.

Route 131 – East Iliff/Seven Hills

- Terminate route at new R-Line Iliff Station, eliminating unnecessary duplication with Route 130 on Yale and Peoria to Nine Mile Station.

- Discontinue service east of Tower Road due to very low ridership. Route will instead loop via Quintero, Evans, Tower, and Iliff.
- Weekday midday service will be added, operating every 30 minutes.

Route 133 –Hampden/Tower

- No changes are proposed for Route 133.

Route 135 –Smoky Hill Road

- No changes are proposed for Route 135.

Route 139 – Quincy

- No changes are proposed for Route 139.

Route 153 – Chambers Road

- Route 153 service north of Sable/30th will be discontinued. Route 153 will instead operate west on 30th Avenue serving the Morris Heights neighborhood, and terminate at the Peoria Station for connections with A-Line and R-Line rail services. Service along Smith Road and Airport Blvd. will be replaced by new Route 37. Service through Montbello on Maxwell Place and 51st Avenue will be replaced by new Route 47.
- Selected weekday trips between Arapahoe Crossing (Lewiston Way/Jasper) and Parker Park-n-Ride will be discontinued. Service will be replaced by new Route 483, operating between Parker, Arapahoe Crossing, and Nine Mile Station. See Route 483 for detailed description.
- Sunday/holiday frequency will be improved from every 60 to every 30 minutes.

Route 157 – Aurora Metro Center/CCA/Buckley AFB – NEW

- Route 157 will replace Route 130 service between Aurora Metro Center Station (Centrepont & Sable) and the Community College of Aurora, operating via Chambers, 1st Avenue, and Centretech Drive. From there the route will continue via Centretech, Airport Blvd., and 6th Avenue to Buckley Air Force Base, replacing current Route 10 service. Service will be provided weekdays only, every 30 minutes from 6:00am to 9:30pm.

Route 169 – Buckley Road (Replaces Route 169L)

- Route 169L service north of Salida Street on Tower Road to DIA will be discontinued. Route 169L will be redesignated as Route 169-Buckley Road, and will be rerouted west on Salida Street to the Airport & 40th Station for connections to A-Line rail service. Route 169 service will be expanded to operate seven days per week, with service every 30 minutes weekday daytimes, and service every 60 minutes nights and weekends, in both directions. Ridership remains consistently low north of the 40th/Airport Blvd. Station. Potential riders between 67th Ave. and 71st Ave. on Tower Rd. can request shuttle service from local hotels.

Route 410 – Lincoln Ave./Parker DISCONTINUED

- Merged with new Route 483.

Route 483 – Lincoln/Parker/Nine Mile – NEW

- Route 483 will replace existing Route 153 service between Parker and Arapahoe Crossing, but will operate north to Nine Mile Station for connections with H-Line and R-Line light rail service, as well as numerous bus routes. It will also include existing Route 410 service between Parker and Lincoln Station. This will create one through route between Lincoln Station, Parker, and Nine Mile Station. Service will be every 60 minutes weekdays only, but will include new midday service.

Route AF – Union Station/DIA SkyRide DISCONTINUED

- Service will be discontinued, replaced by A-Line rail service.

Route AS – Stapleton/DIA SkyRide DISCONTINUED

- Service will be discontinued, replaced by A-Line rail service.

Route AT – Arapahoe County/DIA SkyRide

- Service between Arapahoe Station, Nine Mile Station and DIA will continue to be provided, with 60 minute frequency all day. These trips will operate similarly to the current ATX pattern trips. “Short” trips between Colfax/Billings, Airport & 40th, and DIA will be discontinued, replaced by A-Line and R-Line rail service.

Route P – Parker/Denver

- No changes are proposed for Route P.

8. Customer Benefits and Impacts

When the recommendations are fully implemented, current transit riders will benefit from better network connectivity, faster service, more frequency along major transit corridors, and excellent access to new rail stations. These recommendations encompass 1,226,000 revenue hours, 14,599,400 revenue miles and 294 peak buses. While the net benefit is substantial, there will be some riders that will have to walk further to reach fixed-route transit service and a small number of riders that will no longer have transit service within walking distance. Special care was taken to analyze and balance both customer benefits as well as impacts during the development of the service recommendations.

Although certain routes were consolidated onto major streets to enhance corridor integrity and improve travel times, many existing riders continue to be within walking distance of the proposed RTD network. The rider impact walking analysis uses the street grid to more accurately determine the number of existing riders impacted by proposed service changes. The walking distance was $\frac{1}{4}$ mile access for bus stops and $\frac{1}{2}$ mile access for rail stations. This translates to a 5-minute and 10-minute walk, respectively.

The project team recommended several improvements to service frequencies. Nearly 40 percent of existing bus riders in the study area will be within a $\frac{1}{4}$ mile walk of more frequent service.

Overall RTD ridership continues to grow as transit service offerings expand, service delivery improves, and land use development patterns change. With the completion of the A-Line and R-Line alignments in 2016, ridership growth will accelerate. To leverage RTD’s investments in these rail alignments, bus routes adjacent to and intersecting with these rail lines were evaluated to determine if route alignments and changes in frequency were warranted to better serve the public. In some cases, bus routes were realigned and frequencies enhanced to serve rail stations. In a few cases, routes or route segments were recommended for elimination to reduce duplication between rail and bus services. Where practical, bus routes on key transit corridors were strengthened with increased frequency and improved directness. All of these efforts were aimed at attracting new riders while improving service for existing riders.

With the implementation of new rail service, increased frequencies, and improvements in bus operating efficiencies, overall carrying capacity in the East and I-225 corridors will

increase. More importantly, capacity will increase in key transit corridors where it is needed the most. Based on an analysis of existing capacity, only one trip within the East and I-225 corridor study area exceeds the load standard set by RTD.⁵ The route 11 eastbound trip at 6:22am had a load factor of 147%. An additional bus at that time in that direction would provide relief from overcrowding. Other trips such as Route 15L westbound at 6:31am and 7:52am as well as Route 15 westbound at 6:38am had load factors between 113% and 116%. These load factors are lower than the 125% threshold set by RTD and the trips should be able to accommodate additional ridership growth. As ridership continues to grow, more resources should be invested in these corridors to relieve overcrowding issues that may develop.

⁵ According to RTD Performance Standards, the load standard for bus service is 125% of seated capacity.

8.1. Resource Allocation

Table 13 - East I-225 Resource Plan

East & I-225 Corridor Bus Plan Resource Allocation		Existing Weekday	Proposed Weekday	
Route	Name	Hours	Hours	Change
3L	E Alameda Limited	23.6	25.0	1.4
6	East 6th	151.5	171.0	19.5
10	East 12th	161.5	149.5	-12.0
11	Mississippi	137.0	140.0	
20	20th Ave	144.1	158.0	13.9
21	Evans	162.4	169.4	7.0
24	University	93.2	82.0	-11.2
28	28th Ave	108.2	66.0	-42.2
32	32nd Ave	80.8	69.0	-11.8
34	Bruce Randolph	0.0	45.0	45.0
37	Smith Road	0.0	15.0	15.0
38	38th Ave	135.8	87.0	-48.8
40	Colorado Blvd	172.8	153.0	-19.8
42	Montbello	0.0	112.0	112.0
43	MLK Blvd	174.3	201.0	26.7
44	44th Ave	187.5	170.0	-17.5
45	Gateway Blvd	46.4	112.0	65.6
47	Maxwell Place	0.0	54.0	54.0
54	Montbello Industrial	6.0	0.0	-6.0
65	Monaco	82.9	69.0	-13.9
73	Quebec	85.2	71.0	-14.2
105	Havana	157.3	160.3	3.0
121	Peoria	132.9	108.0	-24.9
130	Yale/Buckley	76.4	69.0	-7.4
131	Iliff	20.0	15.0	-5.0
153	Chambers Road	165.1	125.0	-40.1
157	CentreTech/Buckley	--	29.0	29.0
169	Buckley Road	22.7	76.0	53.3
410	Lincoln/Parker	9.5	0.0	-9.5
483	Parker/Nine Mile	--	45.0	40.0
				0.0
47X	Montebello/Green Valley Express	19.2	0.0	-19.2
AF	Union Station/DIA SkyRide	79.1	0.0	-79.1
AS	Stapleton/DIA SkyRide	84.8	6.0	-78.8
AT	Arapahoe County/DIA SkyRide	86.0	44.0	-42.0
	Total	2806.2	2796.2	-10.0

Peak Bus Change			
30 ft	40 ft	45 ft	60 ft
	1		
	-1		
	1		
	-1		
	-3		
	-1		
	3		
	2		
	-4		
	-2		
	7		
	1		
	-2		
	4		
	3		
-1			
	-1		
	-1		
	-4		
	-1		
	-1		
	-5		
	2		
	4		-2
-2			
3			
	-2	-2	
		-3	
		-3	
0	-1	-8	-2

9. Process

RTD is developing this service plan in concert with state, county, municipal and other transportation stakeholders as well as customer and public input on the following schedule:

Proposed East and I-225 Service Plan – July 1, 2015 COMPLETE

Stakeholder meetings to review proposed service plan – July 8 – August 10, 2015

Review Proposed East and I-225 Service Plan with RTD Board Operations Committee – August 11, 2015

Revised Proposed East and I-225 Service Plan – August 15, 2015

Conduct public meetings Proposed East and I-225 Service Plan – August 15 – September 30, 2015

Revised Service Plan based upon public input – October 1, 2015

Board Approval of Final East and I-225 Service Plan – November 17, 2015

Implement Service Plan – May 2016 (estimated)

This schedule provides time for substantial review and comment. The plan will be made available on RTD's website for the widest possible access. In addition RTD staff will be available to make presentations to groups as a forum for detailed discussions. To request a presentation please contact Jeff Dunning at jeff.dunning@RTD-Denver.com or 303-299-2455. Email comments should be sent to service.changes@RTD-Denver.com with subject line "East and I-225 Service Plan."