

# Title VI Service Monitoring

## *Evaluation of Equitable Compliance with System-Wide Standards and Policies*

### **Mountain Metropolitan Transit**

Transit Services Division  
Department of Public Works  
City of Colorado Springs



August 2017

# Table of Contents

---

<b>Introduction .....</b>	<b>1</b>
Title VI and Environmental Justice.....	1
Title VI Principles and Definitions.....	2
Disparate Impact and Disproportionate Burden .....	2
Minority.....	3
Low-Income .....	3
Minority and Low-Income Route Designation.....	7
<b>Service Monitoring Analysis .....</b>	<b>11</b>
Vehicle Load .....	11
Vehicle Headway.....	14
On-Time Performance .....	16
Service Availability .....	17
System Coverage.....	17
Stop Spacing.....	18
Shelters .....	21
Benches .....	28
Vehicle Assignment .....	30
<b>Summary.....</b>	<b>32</b>

# Introduction

---

To comply with Federal Transit Administration (FTA) Title VI guidelines, federal funding recipients are required to adopt system-wide standards and policies to guard against discriminatory service design and operations decisions. The FTA requires transit providers of a certain size (those operating 50 or more buses in peak service and serving urbanized areas greater than 200,000 in population) to evaluate the equitable application of service standards and policies at least once every three years. While Mountain Metropolitan Transit (MMT) is not yet at the size where this evaluation is required, it is anticipated that this threshold may be reached within a few years. MMT is conducting this service monitoring evaluation to be proactive in its continued efforts ensure an equitable distribution of transit service within the City of Colorado Springs and to ensure continued compliance with the FTA's Title VI requirements.

The primary goal of this Title VI Service Monitoring Evaluation is to compare the level and quality of service provided to minority and low-income populations to the level and quality of service provided to non-minority and non-low-income populations, respectively. The FTA requires agencies to adopt service standards and policies for six specific areas: vehicle load, vehicle headway, on-time performance, service availability, distribution of transit amenities, and vehicle assignment. In 2016, MMT drafted revised service standards and policies to be used for the system. This review uses these draft standard and policies to compare and assess the equitable distribution of transit service on minority, non-minority, low-income, and non-low-income populations.

## **Title VI and Environmental Justice**

Title VI of the Civil Rights Act of 1964 prohibits discrimination on the basis of race, color, or national origin in programs receiving federal financial assistance. Title VI states that “no person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.”

In 1994, President Clinton issued Executive Order 12898, which states that each federal agency “shall make achieving environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.” To that end, the FTA issued Circular 4702.1B in 2012, which replaced Circular 4702.1A, issued in 2007. This document outlines Title VI and Environmental Justice compliance procedures for recipients of FTA-administered transit program funds. Specifically, the FTA requires recipients operating more than 50 peak vehicles in urbanized areas exceeding 200,000 to “monitor the performance of their transit system relative to their system-wide service standards and service policies no less than every three years.”

## Title VI Principles and Definitions

### Disparate Impact and Disproportionate Burden

Under the FTA guidelines, transit providers are required to define their own thresholds to determine when disparate impacts and disproportionate burdens exist as a result of a major service change. “Disparate impact” refers to a facially neutral policy or practice that disproportionately impacts members of a group identified by race, color, or national origin. “Disproportionate burden” refers to a neutral policy or practice that disproportionately impacts low-income populations compared to non-low-income populations. MMT is currently undergoing a public engagement process to define these thresholds. The proposed disparate impact and disproportionate burden policies are as follows:

A determination of **disparate impact** shall be made if:

1. The adverse impacts of a fare or major service change borne by the minority population are more than **20 percent** greater than impacts borne by the non-minority population.
2. The positive impacts of a fare or major service change borne by the non-minority population more than **20 percent** greater than the impacts borne by the minority population

A determination of **disproportionate burden** shall be made if:

1. The adverse impacts of a fare or major service change borne by the low-income population are more than **20 percent** greater than impacts borne by the non-low-income population.
2. The positive impacts of a fare or major service change borne by the non-low-income population more than **20 percent** greater than the impacts borne by the low-income population

While the proposed policy noted above deals specifically with Service Equity Analysis, the same approach will be applied to the Service Monitoring Evaluation. In this evaluation, if the quantitative results indicate that the minority route compliance with the service standards and policies is not within 20 percent of the compliance for non-minority routes, there may be evidence of disparate impacts. Similarly, if the quantitative results indicate that the low-income route compliance with the service standards and policies is not within 20 percent of the compliance for non-low-income routes, there may be evidence of disproportionate burdens.

## Minority

The FTA defines a minority person as one who self-identifies as American Indian/Alaska Native, Asian, Black or African American, Hispanic or Latino, and/or Native Hawaiian/Pacific Islander. For the purposes of this evaluation, non-minority persons are defined as those who self-identify White and non-Hispanic. The remaining population is defined as minority. Minority populations represent 33.6 percent of the MMT service area. The distribution of minority and non-minority populations within the MMT service area is shown in Figure 2.

## Low-Income

While low-income populations are not an explicitly protected class under Title VI, the FTA recognizes the inherent overlap between Title VI and Environmental Justice principles. Subsequently, it requires transit providers to evaluate the impact of service and fare changes to low-income populations and to identify any disproportionate burden placed on those populations by the proposed changes. The FTA defines a low-income person as one whose household income is at or below the poverty guidelines set by the Department of Health and Human Services (DHHS). DHHS poverty guidelines are based on household size and the number of related children less than 18 years of age.

However, FTA Circular 4702.1B also allows for low-income populations to be defined using other established thresholds that are at least as inclusive as those developed by DHHS. Correspondingly, this analysis uses 2015 U.S. Census Bureau poverty thresholds, a more sophisticated measure of poverty that takes into account not only family size and the number of related children present, but also, for one- and two-person units, whether elderly or not. The U.S. Census Bureau's poverty thresholds are used for statistical purposes, while DHHS's poverty guidelines are used for administrative purposes.<sup>1</sup> The U.S. Census Bureau 2015 poverty thresholds by family size and presence of related children under 18 years is shown in Table 1.

Low-income populations represent 15.7 percent of the MMT service area. The distribution of low-income and non-low-income populations within the MMT service area is shown in Figure 2.

---

<sup>1</sup> The distinctions between poverty thresholds and poverty guidelines are described further at <https://aspe.hhs.gov/frequently-asked-questions-related-poverty-guidelines-and-poverty#programs>; and <http://www.irp.wisc.edu/faqs/faq1.htm>.

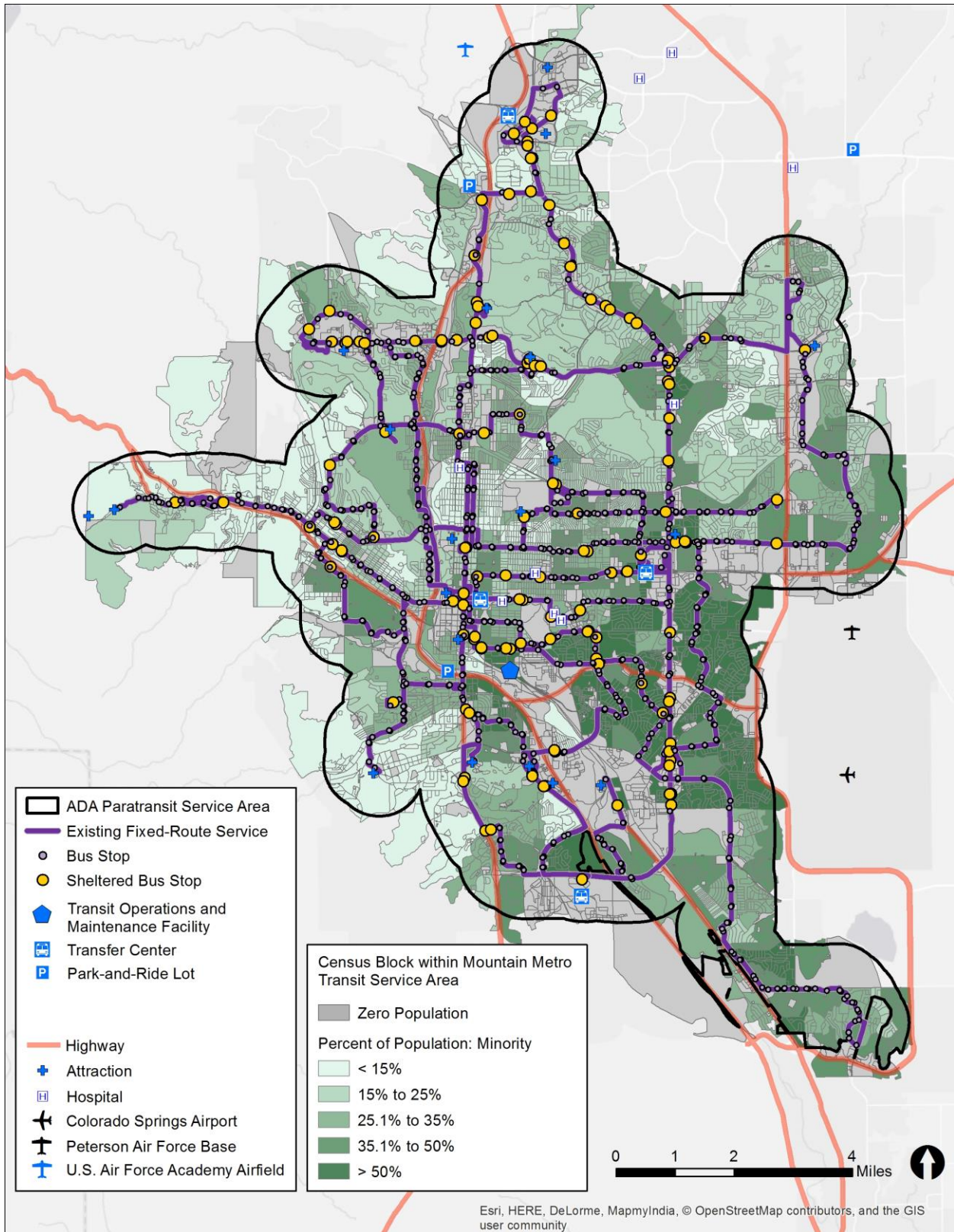
**Table 1. U.S. Census Bureau Poverty Thresholds (in Dollars), 2015**

Size of family unit	Weighted average poverty thresholds	Related children under 18 years								
		None	One	Two	Three	Four	Five	Six	Seven	Eight or more
One person (unrelated individual)	12,082									
Under 65 years	12,331	12,331								
65 years and over	11,367	11,367								
Two people	15,391									
Householder under 65 years	15,952	15,871	16,337							
Householder 65 years and over	14,342	14,326	16,275							
Three people	18,871	18,540	19,078	19,096						
Four people	24,257	24,447	24,847	24,036	24,120					
Five people	28,741	29,482	29,911	28,995	28,286	27,853				
Six people	32,542	33,909	34,044	33,342	32,670	31,670	31,078			
Seven people	36,998	39,017	39,260	38,421	37,835	36,745	35,473	34,077		
Eight people	41,029	43,637	44,023	43,230	42,536	41,551	40,300	38,999	38,668	
Nine people or more	49,177	52,493	52,747	52,046	51,457	50,490	49,159	47,956	47,658	45,822

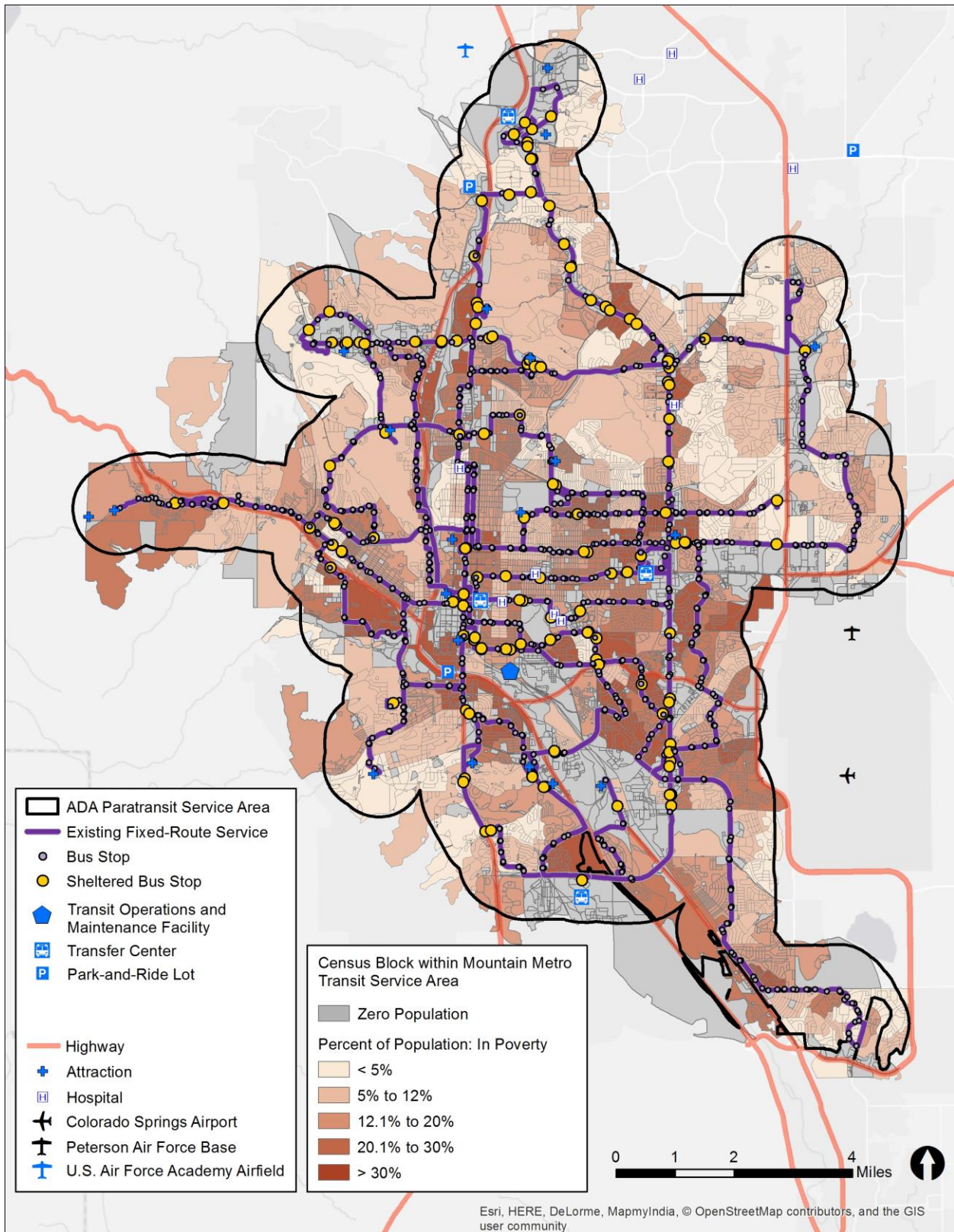
Source: [U.S. Census Bureau, 2015](#). Table C17002 in the American Community Survey.



**Figure 2. Distribution of Minority and Non-Minority Populations**



**Figure 2. Distribution of Low-Income and Non-Low-Income Populations**





## Minority and Low-Income Route Designation

The FTA’s definition of a minority transit route is “one in which at least one-third of the revenue miles are located in a Census block, Census block group, or traffic analysis zone where the percentage minority population exceeds the percentage minority population in the service area.” These same criteria apply to the definition of low-income routes. However, the FTA does allow some modification to this standard to account for routes that travel through areas which they do not actually serve, such as commuter routes.

This evaluation expands upon the FTA’s definition by using a service coverage-based approach for the designation of MMT’s routes. For each route, a service area was defined as a one-quarter-mile buffer around each stop location served by that route. Geographic information system (GIS) software was then used to identify the portions of the service areas located in predominantly minority areas<sup>2</sup> and predominantly low-income areas<sup>3</sup>. A dissolve buffer was generated for each unique route and pattern ID to avoid double counting the intersecting buffers of closely spaced stops. Each buffer was then weighted by the number of weekly trips to account for variations in service frequency for route branches, short lines, etc. If more than one-third of a route’s service coverage area was in predominantly minority areas, it was classified as a minority route. Likewise, if more than one-third of a route’s service coverage area was in predominantly low-income areas, it was classified as a low-income route.

This approach has three distinct advantages over the default FTA approach:

1. It excludes areas that a route passes through, but does not provide service to
2. It more accurately reflects the service provided by stops that are located on the border between minority/low-income and non-minority/non-low-income areas.
3. Portions of routes with greater numbers of trips are weighted more highly than less frequently used portions of routes

The minority or low-income designation for each route is summarized in Table 2. The locations of minority and non-minority routes are shown in Figure 3. The locations of low-income and non-low-income routes are shown in Figure 4.

---

<sup>2</sup> Defined as areas with a minority population greater than the system-wide average of 33.6 percent.

<sup>3</sup> Defined as areas with a low-income population greater than the system-wide average of 15.7 percent.

**Table 2. Minority and Low-Income Route Designation**

Route	Minority Route Status	Low-Income Route Status
1	Minority Route	Low-Income Route
2	Non-Minority Route	Non-Low-Income Route
3	Non-Minority Route	Low-Income Route
4	Non-Minority Route	Non-Low-Income Route
5	Minority Route	Low-Income Route
6	Non-Minority Route	Low-Income Route
7	Non-Minority Route	Low-Income Route
8	Minority Route	Low-Income Route
9	Non-Minority Route	Low-Income Route
10	Non-Minority Route	Non-Low-Income Route
11	Minority Route	Low-Income Route
12	Non-Minority Route	Low-Income Route
14	Non-Minority Route	Non-Low-Income Route
15	Minority Route	Low-Income Route
16	Non-Minority Route	Low-Income Route
17	Non-Minority Route	Non-Low-Income Route
19	Non-Minority Route	Low-Income Route
22	Minority Route	Low-Income Route
23	Non-Minority Route	Non-Low-Income Route
25	Non-Minority Route	Non-Low-Income Route
27	Minority Route	Low-Income Route
32	Minority Route	Non-Low-Income Route
33	Non-Minority Route	Low-Income Route
34	Non-Minority Route	Non-Low-Income Route
35	Minority Route	Non-Low-Income Route
39	Non-Minority Route	Non-Low-Income Route

**Figure 3. Minority Routes**

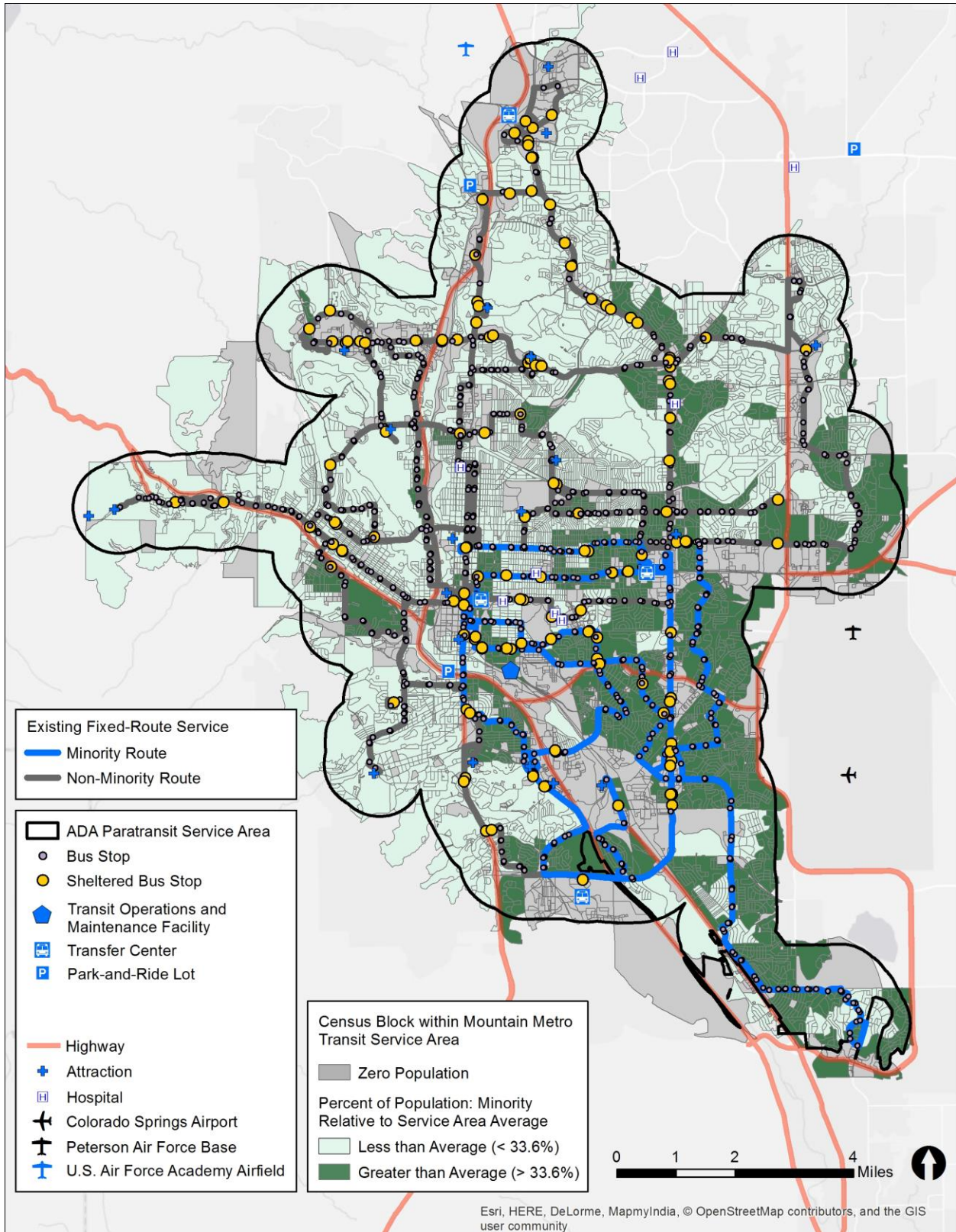
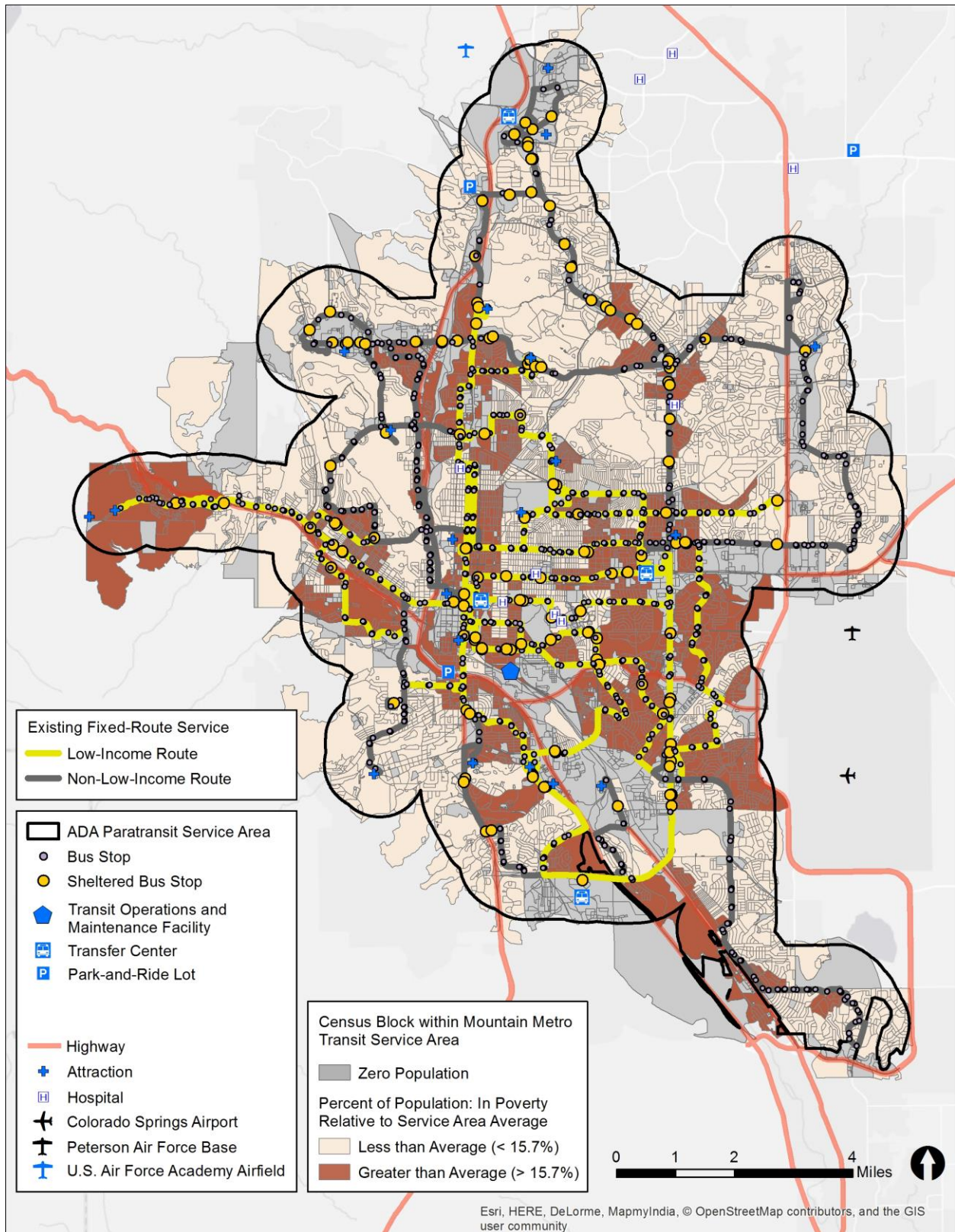




Figure 4. Low-Income Routes



# Service Monitoring Analysis

In compliance with the current FTA Circular, MMT has defined service standards and policies for six key areas, including vehicle load, vehicle headway, on-time performance, service availability, distribution of transit amenities, and vehicle assignment. Since the submittal of the previous Title VI Program in 2014, MMT has undertaken a review and reevaluation of these standards. In 2016, MMT drafted a set of replacement standards and policies. These will be used as the basis of review for this analysis. For each service standard or policy, this evaluation compares the rate of compliance between minority and non-minority routes and between low-income and non-low-income routes.

For the purposes of this analysis, the draft MMT policies for disparate impact and disproportionate burden were used to assess the equitable distribution of the service. If the rate of compliance for any given service standard or policy on minority routes was not within 20 percent of the rate of compliance for non-minority routes, this was identified as a potential disparate impact. Likewise, if the rate of compliance for any given service standard or policy on low-income routes was not within 20 percent of the rate of compliance for non-low-income routes, this was identified as a potential disproportionate burden.

The 20 percent threshold was assessed by dividing compliance rates for minority routes by the compliance rates for non-minority routes to calculate a comparison index, as shown in the sample calculation below. If the comparison index is less than 0.80 or higher than 1.20, this indicates that the compliance rates are not within 20 percent.

$$\text{Comparison Index} = \frac{\text{Minority Route Compliance Rate}}{\text{Non – Minority Route Compliance Rate}} = \frac{81\%}{88\%} = 0.92$$

## Vehicle Load

MMT’s service standard for vehicle load is to keep average vehicle loads at or below 100 percent of seating capacity during off-peak hours and at or below 120 percent of seating capacity during peak hours. These seating capacity standards are summarized below in Table 3. Additionally, no individual trip should ever exceed a “crush load” of 150 percent of seating capacity.

**Table 3. Seating Capacity Policies by Bus Size and Time of Day**

Bus Size	Seats Available	Off-Peak Capacity (100%)	Peak Capacity (120%)	Crush Load Capacity (150%)
40'	40	40	48	60
35'	31	31	37	47
30'	26	26	31	39



This basis of this evaluation is a route profile report covering the period from October 1, 2016 through March 31, 2017. The profiles contain boarding, alighting, and cumulative load information for each route in each direction (inbound and outbound), based on a sample of checked trips. The average load information is summarized in Table 4.

**Table 4. Average Passenger Load by Route, Direction, and Time of Day**

Route	AM Peak		Midday		PM Peak		Off-Peak	
	IB	OB	IB	OB	IB	OB	IB	OB
1	17	9	10	17	0	0	6	14
2	3	13	10	10	14	7	0	0
3	9	5	8	12	13	12	9	8
4	5	10	7	11	0	0	2	1
5	5	6	8	9	8	11	9	9
6	7	3	8	3	6	5	2	4
7	10	8	8	11	11	13	7	7
8	4	6	5	2	3	4	4	3
9	5	10	8	10	8	10	4	9
10	9	5	12	7	8	10	6	7
11	10	6	13	12	11	14	7	9
12	7	4	4	2	4	5	0	0
14	7	11	13	11	17	7	7	9
15	0	4	3	8	4	3	0	0
16	0	0	4	3	5	0	0	0
17	2	3	3	3	5	4	1	4
19	6	8	12	9	13	9	6	6
22	11	5	9	7	8	12	3	7
23	4	9	5	16	5	10	1	10
25	9	8	13	11	17	18	7	9
27	4	11	9	9	10	9	5	5
32	0	0	0	0	0	0	0	0
33	0	0	2	1	0	4	0	0
34	12	2	4	2	3	5	4	2
35	1	1	3	1	1	2	0	0
39	4	11	6	6	8	6	6	2

The highest average load shown in the data is 18 passengers for Route 25 outbound service during the PM Peak. This value and all the remaining average load values are below the

seating capacity thresholds and are therefore in compliance with the vehicle load standard. Since all the average load factors are within the service standards, **this review finds no disparate impacts to minority populations or disproportionate burdens to low-income populations related to vehicle load standards.**

For additional analysis, a comparison of average load factors by route type is shown in Table 5. On average, the load factors for minority and non-minority routes are very similar. In general, the average load factor for minority routes is generally lower than non-minority routes for AM peak, midday, and PM peak service, but is higher for off-peak service. For example, the comparison index value of 0.91 for the AM Peak indicates that average load factors for minority routes are 9 percent lower than for non-minority routes. The average load factor for low-income routes is higher than for non-low-income routes during all time periods. The only comparison index which is higher than 1.2 is the comparison between low-income and non-low-income routes during off-peak service. The comparison index of 1.32 indicates that the average load factors for low-income routes are 32 percent higher than for non-low-income routes. However, the average load factor of 14.0 percent for low-income routes is still substantially below the policy threshold of 100 percent.

**Table 5. Vehicle Load Factors Comparison**

Route Type	Average Load Factors			
	AM Peak	Midday	PM Peak	Off-Peak
Minority Route	16.9%	21.2%	16.5%	13.2%
Non-Minority Route	18.6%	22.8%	23.2%	12.2%
<b>Comparison Index</b>	<b>0.91</b>	<b>0.93</b>	<b>0.71</b>	<b>1.08</b>
Low-Income Route	18.1%	23.0%	21.6%	14.0%
Non-Low-Income Route	17.9%	21.3%	20.0%	10.6%
<b>Comparison Index</b>	<b>1.01</b>	<b>1.08</b>	<b>1.08</b>	<b>1.32</b>
<b>All Routes</b>	<b>18.0%</b>	<b>22.2%</b>	<b>20.9%</b>	<b>12.6%</b>

## Vehicle Headway

MMT's service standards for vehicle headway are based on mean ridership by time of day. MMT periodically calculates the mean passenger boardings per clock hour for weekdays, weekday evenings, Saturdays, and Sundays. MMT recommends the consideration of various headways when ridership rates are above or below the mean, or are above the mean plus one standard deviation as outlined in Table 6. For the purposes of this evaluation, these recommended headways were applied to each route.

**Table 6. Recommended Headways for Consideration (Minute Between Buses)**

Time of Day	Ridership Rate Below Mean	Ridership Rate Above Mean	Ridership Rate Above Mean + One Standard Deviation
Weekday	60	30	15
Weekday Evening	60	60	30
Saturday	60	60	30
Sunday	60	60	30

This analysis calculated the scheduled headway for each route at each bus stop and compared the actual headway at the stop to the recommended headways summarized above. The percent of stop-headways in each route type meeting the recommended headway standards were then compared. The results of this analysis are shown in Table 7.

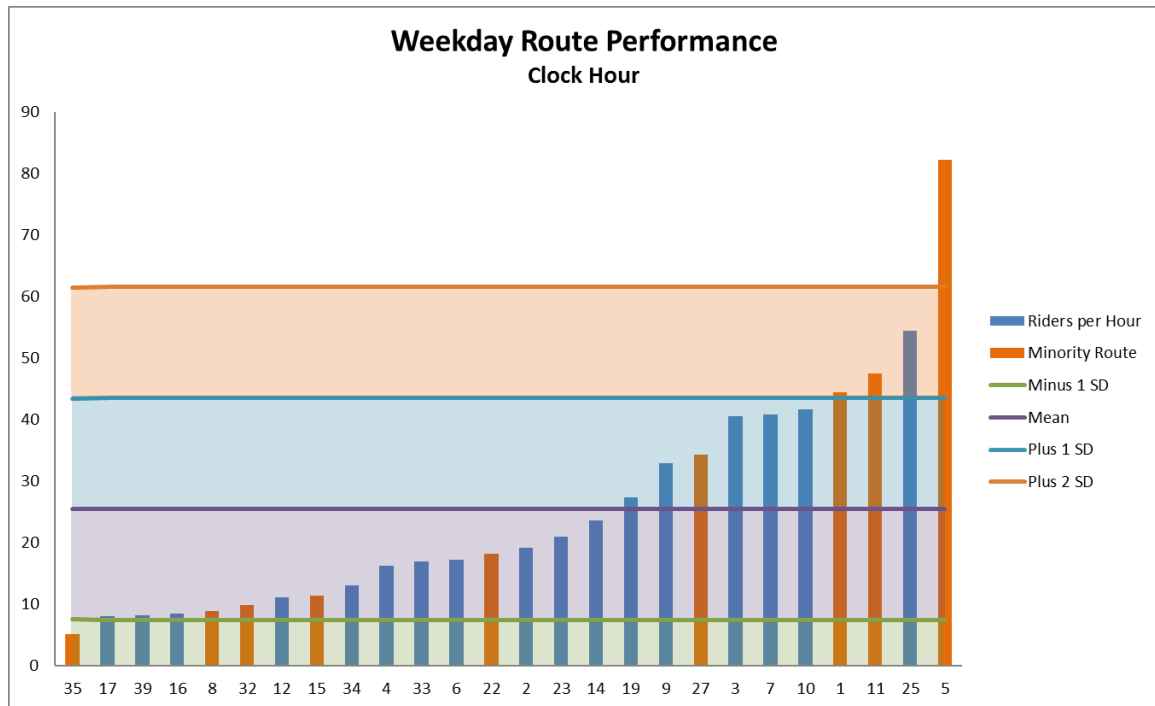
**Table 7. Percent of Bus Stop Headways Meeting Recommended Headways**

Route Type	Weekday	Weekday Evening	Saturday	Sunday
Minority Route	65.6%	88.7%	100.0%	100.0%
Non-Minority Route	89.1%	93.2%	99.7%	99.0%
<b>Comparison Index</b>	<b>0.74</b>	<b>0.95</b>	<b>1.00</b>	<b>1.01</b>
Low-Income Route	80.5%	93.3%	100.0%	100.0%
Non-Low-Income Route	80.1%	86.9%	99.3%	97.3%
<b>Comparison Index</b>	<b>1.00</b>	<b>1.07</b>	<b>1.01</b>	<b>1.03</b>
<b>All Routes</b>	<b>80.4%</b>	<b>91.4%</b>	<b>99.8%</b>	<b>99.4%</b>

In general, the percentage of stop-headways meeting the recommended headway standards is very similar between all route types. Except for the minority route analysis for weekday service, all the comparison indices range between 0.95 and 1.07, indicating that the adoption of the headway standards is within five to seven percent between route types, well within the 20 percent threshold. However, the comparison index of 0.74 for minority routes during weekday service indicates the potential for disparate impacts to minority populations.

A closer look at the cause of this outcome reveals that it is the result of this analysis applying the recommended standard of 15-minute headways for all routes exceeding the mean ridership rates plus one standard deviation. Figure 5 shows the weekday route performance in terms of ridership per clock hour relative to the system wide mean. Four routes exceed the system mean plus one standard deviation (Routes 1, 5, 11, and 25) and warrant the consideration of 15-minute service. However, although they warrant consideration of the 15-minute standard, it is still up to the judgement of MMT staff to determine when that level of service is truly warranted. Three of the four routes meeting this standard of consideration are defined as minority routes, and one is defined as a non-minority route. Route 5, a minority route with significantly higher ridership rates than other routes, is the only one of these four to be assigned 15-minute headways. This more detailed analysis shows that the consideration and application of the 15-minute headway standard is being applied both fairly and equitably. Therefore, **this review finds no disparate impacts to minority population or disproportionate burdens to low-income populations related to vehicle headway standards.**

**Figure 5. Weekday Route Performance Relative to System Mean**



## On-Time Performance

MMT measures the on-time performance of its buses at set timepoints along each route. MMT defines a bus arrival as on-time if it arrives at a timepoint no more than one minute earlier or five minutes later than the scheduled arrival time. MMT's service standard is for 85 percent of bus timepoint arrivals to be on-time.

This evaluation reviewed bus trips covering the period from October 1, 2016 through March 31, 2017. Automatic Vehicle Locator (AVL) data was used to calculate the average percentage of early, late, and on-time timepoint arrivals for each route type. The on-time performance results are summarized in Table 8.

**Table 8. On-Time Performance**

Route Type	Early Arrival	Late Arrival	On-Time Arrival	Comparison Index
Minority Route	1.8%	11.8%	86.4%	0.99
Non-Minority Route	1.4%	11.1%	87.5%	
Low-Income Route	1.9%	10.6%	87.6%	1.01
Non-Low-Income Route	0.8%	12.9%	86.3%	
<b>All Routes</b>	<b>1.5%</b>	<b>11.3%</b>	<b>87.1%</b>	-

On average, 87.1 percent of all timepoint arrivals were on-time. For minority routes, 86.4 percent of timepoint arrivals were on-time compared to 87.5 percent for non-minority routes. The comparison index of 0.99 indicates that the on-time performance measures for minority routes are within one percent of the measures for non-minority routes, well within the 20 percent threshold. **This review finds no disparate impacts to minority populations related to on-time performance standards.**

For low-income routes, 87.6 percent of timepoints were arrived at on-time compared to 86.6 percent of timepoints for non-low-income routes. The comparison index of 1.01 indicates that the on-time performance measures for low-income routes are within one percent of the measures for non-low-income routes, well within the 20 percent threshold. **This review finds no disproportionate burdens to low-income populations related to on-time performance standards.**



## Service Availability

MMT evaluates service availability through system coverage and stop spacing.

### System Coverage

Service availability is commonly measured in terms of the percent of the service area or population that is within a specified distance (most commonly one-quarter mile) of the transit system. MMT's long-term goal is to provide fixed-route transit service to 90 percent of the Colorado Springs Urbanized Area (UZA) population. For the purposes of this analysis, the percentage of each population group in the Colorado Springs UZA within one quarter-mile of the MMT fixed-route system was calculated and compared.

This analysis used the Fall 2016 configuration of MMT's routes to evaluate service availability. Using GIS software, a one-quarter mile buffer was generated around each route. All census blocks with a centroid located within this buffer were considered to have service available. Using the demographic information of each census block, the percentage of each population group within the service area with service available was calculated. Service availability information is summarized in Table 9.

**Table 9. Service Availability – System Coverage**

Population Group	Colorado Springs UZA	MMT Service Area	Percent Served	Comparison index
Minority Population	181,050	126,512	69.9%	1.15
Non-Minority Population	408,828	249,445	61.0%	
Low-Income Population	70,981	57,887	81.6%	1.32
Non-Low-Income Population	505,899	311,451	61.6%	
<b>All Routes</b>	<b>589,879</b>	<b>375,956</b>	<b>63.7%</b>	

On average, 63.7 percent of the service area population is served by transit. For minority populations, 69.9 percent is served by transit compared to 61.0 percent of non-minority populations. The comparison index of 1.15 indicates that the system coverage performance measures for minority populations are higher than the measures for non-minority populations. **This review finds no disparate impacts to minority populations related to system coverage performance standards.**

For low-income population, 81.6 percent of the population is served by transit compared to 61.6 percent of non-low-income population. The comparison index of 1.32 indicates that the system coverage performance measures for low-income routes are much higher than the measures for non-low-income routes. **This review finds no disproportionate burdens to low-income populations related to system coverage performance standards.**

## Stop Spacing

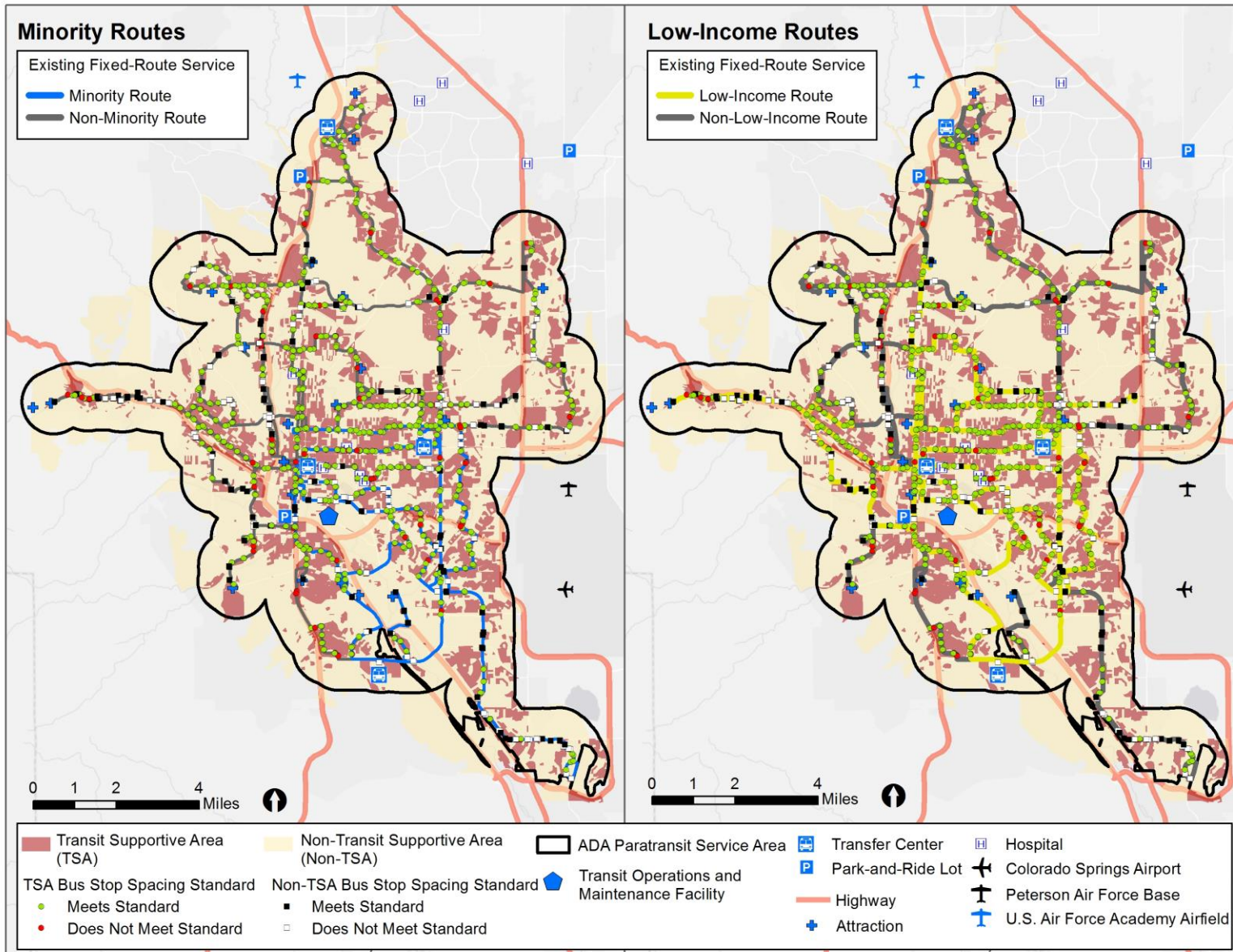
An alternative method of assessing service availability is by reviewing bus stop spacing. MMT’s bus stop spacing guidelines are based on the household and employment density of the surrounding area. Specifically, a threshold of 4 households per acre or 5 jobs per acres are used to determine whether an area meets the threshold of “transit supportive area” (TSA). Using a combination of 2014 Longitudinal Employer-Household Data and U.S. Census data, a value for jobs per acre and housing units per acre was calculated for each census block in the MMT service area. If a census block met or exceeded either threshold, it was identified as a TSA. Each bus stop was identified as being in a TSA or non-TSA by calculating the household and job density within a 1,000-foot buffer of the stop. The bus stop spacing standards for TSA and non-TSA areas are summarized in Table 10.

**Table 10. Bus Stop Spacing Guidelines**

Location Category	Stop Spacing Standard (ft.)
Transit Supportive Area: 4+ Households/Acre or 5+ Jobs/Acre	1,320 ft. ± 50% (1/8-mile to 3/8-mile)
Non-Transit Supportive Area	2640 ft. ± 50% (1/4-mile to 3/4-mile)

For each stop on each trip, the actual stop spacing from the previous stop was reviewed to assess whether its spacing exceeded the spacing standards listed above. The resulting data was then aggregated to compare the relative compliance rates between route types. The results of the evaluation are summarized in Table 11 and displayed in Figure 6.

Figure 6. Transit Supportive Areas and Bus Stop Spacing



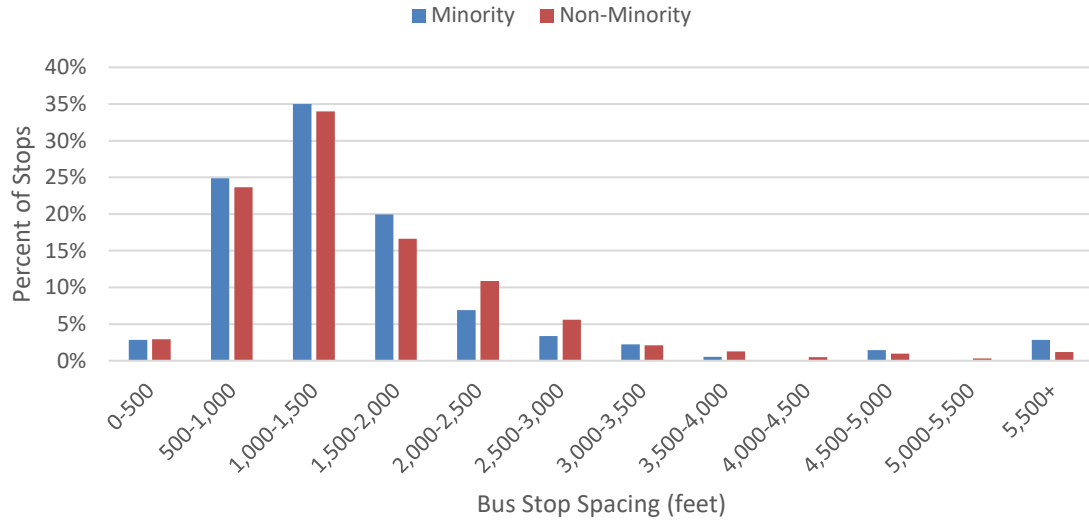
**Table 11. Service Availability – Bus Stop Spacing**

Route Type	Below Standard	Above Standard	Meets Standard	Comparison Index
Minority Route	16.6%	17.4%	66.1%	0.81
Non-Minority Route	15.4%	3.1%	81.5%	
Low-Income Route	16.5%	8.7%	74.9%	0.96
Non-Low-Income Route	14.6%	7.1%	78.4%	
<b>All Routes</b>	<b>16.1%</b>	<b>6.4%</b>	<b>77.5%</b>	

Overall, 77.5 percent of all bus stop spacing in the MMT system meets the spacing guidelines. For minority routes, 66.1 percent of bus stops meet the spacing standards compared to 81.5 percent of non-minority routes. The comparison index of 0.81 indicates that the bus stop spacing on minority routes is just within the 20 percent threshold. **This review finds no disparate impacts to minority populations related to bus stop spacing standards.**

While this results meets the MMT disparate impact policy, it is very close to the threshold. MMT should consider reviewing the potential causes of this result and pursue opportunities to address any issues that may help achieve a more equitable outcome. The percentage of stop spacings under the spacing guidelines is approximately equal between minority and non-minority routes (16.6 and 15.4 percent respectively). However, the percent of stop spacings above the guidelines is much higher for minority routes (17.4 percent) compared to non-minority routes (3.1 percent). This finding is reflected in the distribution of bus stop spacing by minority and non-minority routes as shown in Figure 7. The percentage of stops in each category is relatively similar for most stop spacing ranges, but the proportion of minority stops is notably lower in the 2,000-3,000-foot range.

**Figure 7. Bus Stop Spacing Distribution**



For low-income routes, 74.9 percent of bus stops meet the spacing standards compared to 78.4 percent of non-low-income routes. The comparison index of 0.96 indicates that the bus stop spacing on low-income routes is well within the 20 percent threshold. **This review finds no disproportionate burdens to low-income populations related to bus stop spacing standards.**

## Distribution of Transit Amenities

MMT’s service policy is for transit amenities to be distributed equitably throughout the system. MMT has defined standards for the distribution of shelters and benches at bus stops.

To evaluate the distribution of amenities, this analysis first classified each bus stop by route type. If a stop was served only by minority routes, it was classified as a minority stop. Likewise, if a stop was served only by non-minority routes, it was classified as a non-minority stop. In cases where both minority and non-minority routes served a stop, the stop was classified as “both.” An identical approach was used to classify each stop as low-income, non-low-income, or both. The percent of stops with each amenity was then calculated for each route type. It should be noted that the stops classified as “both” were included in the calculation of each route type. For example, in Table 12, the percent of minority stops with shelters was calculated as:  $(3 + 9) / (8 + 20) = 42.9$  percent. Transit amenities data in this analysis represents conditions as of September 2016.

### Shelters

According to MMT’s bus stop amenities standards, a bus stop shall be considered for a shelter if it (1) serves a single route with at least 25 daily boardings; (2) serves multiple routes; or (3) is located in a high traffic area with advertising potential. The actual conditions at a bus stop location will dictate whether amenities can be provided in a safe and effective manner. For the purposes of this analysis, a shelter was considered warranted if the bus stop

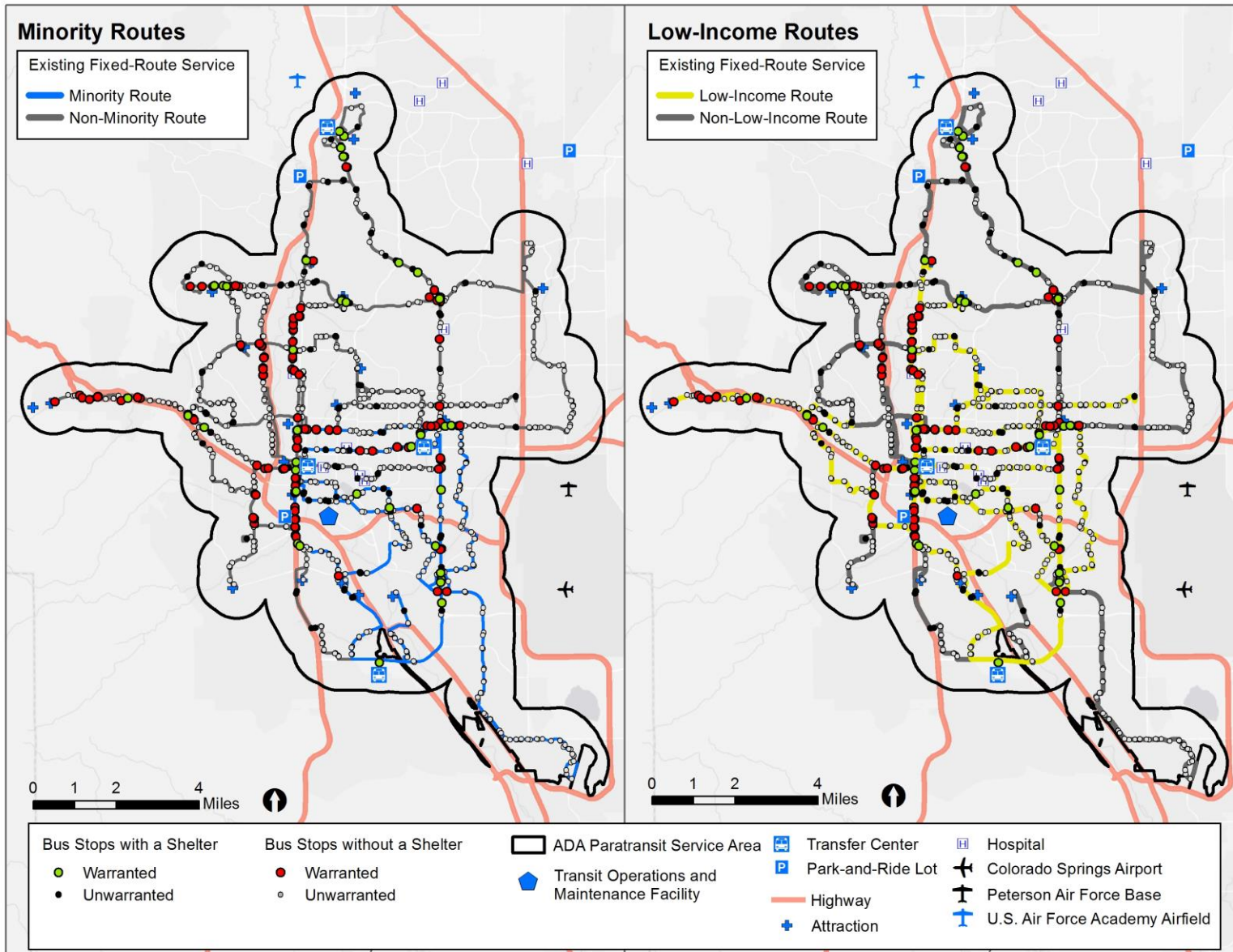


was served by multiple routes or if there were at least 25 average weekday boardings from a single route. Bus stop-level boarding data used in this analysis came from a representative sample of ridership collected in September 2016. The data show that 158 bus stops (16.9 percent) of MMT's bus stops meet the warrant for shelter placement:

- 91 stops meet the warrant based only on the presence of multiple routes
- 32 stops meet the warrant based only on meeting the minimum boarding requirement
- 35 stops meet the warrant based on both factors.

The distribution of shelters within the MMT system is shown in Figure 8. The equitable placement of shelters was evaluated through two distinct assessments: 1) the distribution of shelters at bus stops meeting the shelter warrant and 2) the distribution of shelters at bus stops not meeting the shelter warrant.

Figure 8. Distribution of Transit Amenities – Shelters



## Warranted Shelters

There are 158 bus stops in the MMT system that meet the warrant for shelter installation. Of these, 41 stops (25.9 percent) are equipped with a shelter. The percentage of stops with warranted shelters is shown for each stop type in Table 12.

**Table 12. Distribution of Transit Amenities – Warranted Shelters**

Stop Type	No Shelter	Shelter	Total Stops	Percent with Shelter	Comparison Index
Both	5	3	8		1.85
Minority Stop	11	9	20	42.9%	
Non-Minority Stop	101	29	130	23.2%	
Both	6	6	12		0.71
Low-Income Stop	55	12	67	22.8%	
Non-Low-Income Stop	56	23	79	31.9%	
<b>All Stops</b>	<b>117</b>	<b>41</b>	<b>158</b>	<b>25.9%</b>	

For minority stops warranting a shelter, 41.9 percent have shelters present compared to 23.2 percent of warranted non-minority stops. The comparison index of 1.85 indicates that the shelter placement rate at warranted minority stops is much greater than the rate for warranted non-minority stops.

For low-income stops warranting a shelter, 22.8 percent have shelters present compared to 31.9 percent of warranted non-low-income stops. The comparison index of 0.71 indicates that the shelter placement rate at warranted low-income stops is 29 percent lower than the rate for warranted non-low-income stops. **This result indicates the potential for disproportionate burdens to low-income populations related to shelter distribution standards.**

## Unwarranted Shelters

In many cases, a shelter may be placed at a location that does not meet the current shelter placement standard. The stop may have met the standards at one point, but no longer does, or the MMT may have taken advantage of opportunities for easy bus shelter installation (coinciding with roadway reconstruction, etc.). Regardless of the reason, unwarranted shelters are also evaluated to ensure an equitable distribution of transit amenities. Of MMT's 133 current shelters, 92 (69.2 percent) do not meet the shelter placement standard. The distribution of unwarranted shelters by bus stop type is displayed in Table 13.

**Table 13. Distribution of Transit Amenities – Unwarranted Shelters**

Stop Type	No Shelter	Shelter	Total Stops	Percent with Shelter	Comparison Index
Both	0	0	0		0.86
Minority Stop	249	30	279	10.8%	
Non-Minority Stop	436	62	498	12.4%	
Both	0	0	0		0.89
Low-Income Stop	394	50	444	11.3%	
Non-Low-Income Stop	291	42	333	12.6%	
<b>All Stops</b>	<b>685</b>	<b>92</b>	<b>777</b>	<b>11.8%</b>	

Among unwarranted minority stops, 10.8 percent have a shelter compared to 12.4 of unwarranted non-minority stops. The comparison index of 0.86 indicates that the shelter placement rate at unwarranted minority stops is within the 20 percent threshold.

Among unwarranted low-income stops, 11.3 percent have a shelter compared to 12.6 percent of unwarranted non-low-income stops. The comparison index of 0.89 indicates that the shelter placement rate at unwarranted minority stops is within the 20 percent threshold.

## Shelter Distribution Irrespective of Standards

This distribution of shelters at bus stops throughout the MMT service area, irrespective of shelter distribution standards, is summarized in Table 14.

**Table 14. Distribution of Transit Amenities – All Shelters**

Stop Type	No Shelter	Shelter	Total Stops	Percent with Shelter	Comparison Index
Both	5	3	8		0.93
Minority Stop	260	39	299	13.7%	
Non-Minority Stop	537	91	628	14.8%	
Both	6	6	12		0.78
Low-Income Stop	449	62	511	13.0%	
Non-Low-Income Stop	347	65	412	16.7%	
<b>All Stops</b>	<b>802</b>	<b>133</b>	<b>935</b>	<b>14.2%</b>	

For minority stops, 13.7 percent have shelters present compared to 14.8 percent of non-minority stops. The comparison index of 0.93 indicates that the shelter placement rate at minority stops is within seven percent of the rate for non-minority stops, within the 20 percent threshold. **This review finds no disparate impacts to minority populations related to shelter distribution irrespective of standards.**

For low-income stops, 13.0 percent have shelters present compared to 16.7 percent of non-low-income stops. The proportion of low-income stops with shelters is 22 percent lower than the rate for non-low-income stops and is outside of the acceptable range. **This result indicates the potential for disproportionate burdens to low-income populations related to shelter distribution irrespective of standards.**



## Summary of Shelter Distribution

As shown in Table 15, where a shelter is warranted based on shelter distribution standards, the rate of shelter distribution for minority stops (42.9 percent) is greater than that of non-minority stops (23.2 percent). However, where a shelter is unwarranted, non-minority stops have a greater rate of shelter placement (12.4 percent) than minority stops (10.8 percent). Moreover, irrespective of shelter distribution standards, non-minority stops have a greater rate of shelter placement (14.8 percent) than minority stops (13.7 percent). In all the three scenarios – warranted, unwarranted, and irrespective of standards – the comparison index is within the reasonable threshold. **This review finds no disparate impacts to minority populations related to shelter distribution.**

Where a shelter is warranted based on shelter distribution standards, the rate of shelter distribution for low-income stops (22.8 percent) is less than that of non-low-income stops (31.9 percent). Similarly, where a shelter is unwarranted, low-income stops have a lower rate of shelter placement (11.3 percent) than non-low-income stops (12.6 percent). **The comparison indices of 0.71 among warranted shelters, and 0.78 among all shelters irrespective of placement standards, indicate the potential for disproportionate burdens to low-income populations related to shelter distribution.** MMT should pursue opportunities to improve this distribution of transit shelters where possible.

**Table 15. Distribution of Transit Amenities – Shelter Placement Rates**

Stop Type	Rate of Shelter Placement		
	Warranted	Unwarranted	Irrespective of Standards
Minority Stop	42.9%	10.8%	13.7%
Non-Minority Stop	23.2%	12.4%	14.8%
<b>Comparison Index</b>	<b>1.85</b>	<b>0.86</b>	<b>0.93</b>
Low-Income Stop	22.8%	11.3%	13.0%
Non-Low-Income Stop	31.9%	12.6%	16.7%
<b>Comparison Index</b>	<b>0.71</b>	<b>0.89</b>	<b>0.78</b>
<b>All Stops</b>	<b>25.9%</b>	<b>11.8%</b>	<b>14.2%</b>

## Benches

MMT endeavors to provide a bus bench at each stop location. However, the actual conditions at a bus stop location will dictate whether amenities can be provided in a safe and effective manner. Over 59 percent of MMT’s bus stops have a bench (Table 16). The distribution of benches at bus stops throughout the MMT system is summarized in Table 16 and displayed in Figure 9.

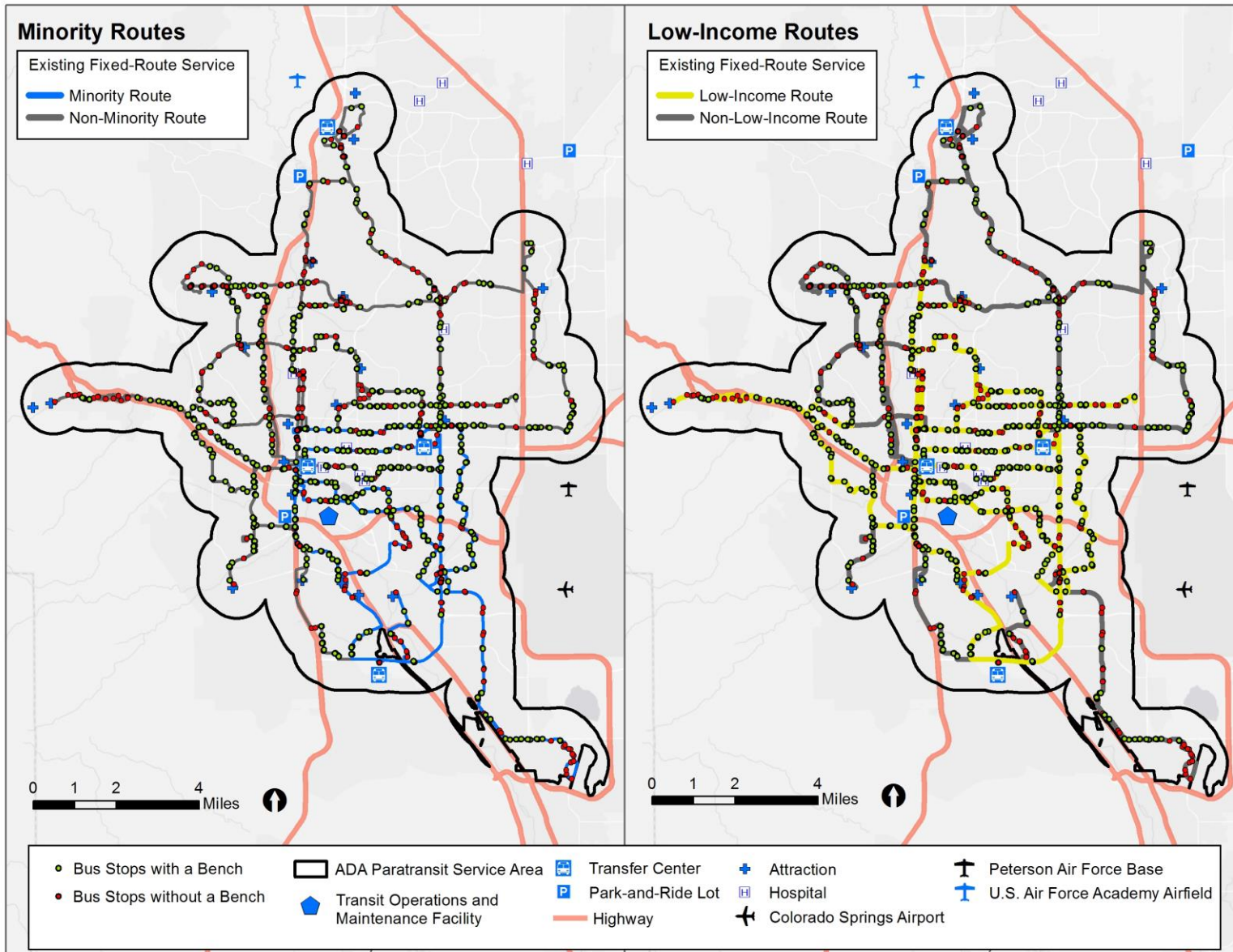
**Table 16. Distribution of Transit Amenities – Benches**

Stop Type	No Bench	Bench	Total Stops	Percent with Bench	Comparison Index
Both	4	4	8		1.06
Minority Stop	114	185	299	61.6%	
Non-Minority Stop	263	365	628	58.0%	
Both	8	4	12		1.09
Low-Income Stop	195	316	511	61.2%	
Non-Low-Income Stop	178	234	412	56.1%	
<b>All Stops</b>	<b>381</b>	<b>554</b>	<b>935</b>	<b>59.3%</b>	

For minority stops, 61.6 percent have benches present compared to 58.0 percent of non-minority stops. The comparison index of 1.06 indicates that the bench placement rate at minority stops is six percent greater than the rate for non-minority stops. **This review finds no disparate impacts to minority populations related to bench distribution.**

For low-income stops, 61.2 percent have a bench present compared to 56.1 percent of non-low-income stops. The proportion of low-income stops with a bench is nine percent greater than the rate for non-low-income stops. **This review finds no disproportionate burdens to low-income populations related to bench distribution.**

Figure 9. Distribution of Transit Amenities – Benches



## Vehicle Assignment

MMT assigns vehicles to routes based on current estimated ridership loads. MMT’s policy is to rotate similarly sized vehicle between routes to ensure an equitable distribution of both new and old buses. Buses are to be rotated within their respective size categories to equalize the wear and tear on each bus, and to equitably distribute buses of various age throughout the system.

To evaluate this policy, this analysis reviewed the vehicle assignment records for the period of October 1, 2016 through March 31, 2017. Vehicle assignment data was provided as groups of trips by route by vehicle (“work”) with associated revenue hours and miles. Data were not available for all routes; those missing from the dataset included Routes 6, 17, 27, 32, and 39, representing two minority routes and two low-income routes. Analysis was performed using nearly 58,000 revenue hours of vehicle work, representing 74 percent of the scheduled revenue hours over the six-month period. The average age of vehicles assigned to each route type was weighted by the number of revenue hours and reported by vehicle size; the results are summarized in Table 17. The table also shows the average age of vehicles assigned to each route type irrespective of vehicle length.

**Table 17. Vehicle Assignment**

Route Type	Average Age of Assigned Vehicle by Size (Length)			
	30'	35'	40'	All Vehicles
Number of Vehicles	5	27	17	49
Minority Route	1.9	7.9	11.3	8.5
Non-Minority Route	1.1	6.5	11.4	7.4
<b>Comparison Index</b>	<b>1.74</b>	<b>1.22</b>	<b>0.99</b>	<b>1.16</b>
Low-Income Route	1.3	7.0	11.4	7.8
Non-Low-Income Route	1.5	6.8	11.4	7.7
<b>Comparison Index</b>	<b>0.86</b>	<b>1.04</b>	<b>1.00</b>	<b>1.02</b>
<b>All Routes</b>	<b>1.4</b>	<b>6.7</b>	<b>11.4</b>	<b>7.8</b>

Reviewing the distribution of vehicles between minority and on-minority routes shows that the average age of assigned vehicles for the 30-foot and 35-foot buses exceeds the 20 percent disparate impact threshold with comparison indices of 1.74 and 1.22 respectively. The comparison indices are 0.99 for the distribution for 40-foot buses and 1.16 for all vehicles irrespective of size. These results fall within the 20 percent threshold. A closer examination of the results for 30- and 35-foot buses reveals that while the difference in vehicle age is large from a percentage standpoint, the difference in actual age is less substantial. For example, all five of the 30-foot vehicles in MMT’s fleet are either one or two

years old. The difference in quality between one and two-year old buses is unlikely to be noticeable to MMT customers and the resulting comparison index of 1.74 overstates the differences in vehicle quality. Given these factors and the fact that the comparison index for the average age of all vehicles assigned is within the policy threshold, **this review finds no potential for disparate impact to minority populations related to the vehicle assignment standard.** Nevertheless, MMT should review the current approach for assigning 30- and 35-foot buses to look for opportunities to improve the equitable distribution of vehicle assignments.

Reviewing the distribution of vehicles between low-income and non-low-income routes shows that the average age of assigned vehicles is within the 20 percent threshold for all vehicle types. The comparison indices range from 0.86 for 30-foot vehicles to 1.04 for 35-foot vehicles with an average comparison index of 1.02 for all vehicles. **This review finds no potential for disproportionate burden to low-income populations related to the vehicle assignment standard.**



## Summary

Under the guidance of FTA Circular 4702.1B, transit agencies operating 50 or more fixed-route vehicles in peak service in UZAs of 200,000 or more must monitor their service performance against their defined standards and policies for vehicle load, vehicle headway, on-time performance, service availability, distribution of transit amenities, and vehicle assignment. The agencies must compare the rate of compliance with these service measures between minority routes and non-minority routes and between low-income routes and non-low-income routes.

While MMT does not yet meet the thresholds requiring this analysis, MMT has taken the proactive step of applying the agency's disparate impact and disproportionate burden policies to the rates of compliance with their current service standards and policies. The evaluation results for each standard or policy is summarized in Table 18.

**Table 18. Summary of Results**

Standard or Policy	Minority Results	Low-Income Results
Vehicle Load	No Disparate Impacts	No Disproportionate Burdens
Vehicle Headway	No Disparate Impacts	No Disproportionate Burdens
On-Time Performance	No Disparate Impacts	No Disproportionate Burdens
Service Availability		
System Coverage	No Disparate Impacts	No Disproportionate Burdens
Stop Spacing	No Disparate Impacts	No Disproportionate Burdens
Transit Amenities		
Shelters	No Disparate Impacts	Potential Disproportionate Burdens
Benches	No Disparate Impacts	No Disproportionate Burdens
Vehicle Assignment	No Disparate Impacts	No Disproportionate Burdens

The evaluation found only one area of potential concern: the potential for disproportionate burdens to low-income populations based on the application of the bus stop shelter standard. MMT should more closely review these potential impacts to low-income populations and act to address these potential impacts where possible.