

## VEHICLE LOAD

Vehicle load, also known as the max load ratio, is expressed as the ratio of passengers to the number of seats on a vehicle during the vehicle's maximum load point. The results shown in the plan are based on sample data of 56 non-peak and 60 peak routes out of 95 fixed routes in the system. The sample data is random manual ride check data that is captured for National Transit Database reporting. The ride checks for non-peak time analysis were taken between 9am – 1pm and 6pm – end-of-shift on weekdays, as well as any time during the day on Saturday and Sunday. The ride checks for peak time analysis were taken between 6am – 9am and from 1pm – 6pm for weekdays. An initial measurement was taken between October 2006 and November 2007. This first analysis showed five routes exceeding the service standard threshold. However, this first check did not take into consideration the new buses that were subsequently added to the fleet (many of which were articulated buses). In order to gauge the impact of the new buses on the overcrowded routes, a special ride check was undertaken between March and April of 2008. The new ride check data confirmed that overcrowding had been alleviated and the max load ratio on the five routes was below the service standard threshold.

The data results are contained in the following Table, *Vehicle Load, Headway, On-Time Performance*. When comparing peak and non peak max load ratios for minority and low income routes against non-minority and non-low income routes there was no difference in the data. Peak and non-peak minority and low income routes as well as peak and non-peak non-minority and non-low income routes were not exceeding the service standard in terms of max load ratios.

## VEHICLE HEADWAY

Vehicle headway is the time interval between two vehicles traveling in the same direction on the same route. The headway is generally expressed for peak and off peak service as an increment of time, for example, 15 minute peak and 30 minute off-peak service.

The results shown in the plan are based on a sample of 70 local routes out of 95 fixed routes in the entire system. For this analysis, only fixed local routes were used because it provides a clear representation of the headway policies dictated by each transit provider. The vehicle headway data is for the period of July through December of 2007.

The data for this assessment is in the following Table *Vehicle Load, Headway, On-Time Performance*. In comparing bus route headway within the service area, the data showed a significant difference between minority and non minority bus routes as well as low-income and non low-income bus routes. In essence, there were more minority and low-income routes with peak headway of 15 minutes or better. For minority routes, of the routes sampled, 37% had peak headway of 15 minutes or better while non minority routes had only 25%. For low-income and non low-income routes, 38% of the low-income routes sampled had peak headway of 15 minutes or better, while non low-income routes only had 20% that met the standard.

## ON-TIME PERFORMANCE

On-time performance is a measure of runs completed as scheduled. More specifically, on-time performance means that a bus arrives at a “published time point” or bus stop referenced in the Transit Book no later than five minutes and 59 seconds after the scheduled time. The results shown in the plan are based on 91 local routes out of 95 fixed routes in the entire system representing the routes with VMS equipped vehicles. On-time performance data represents the period of September – November 2007.

The assessment data is in the following Table, *Vehicle Load, Headway, On-Time Performance Assessment*. In comparing bus routes with on-time performance of 90% or better, non minority bus routes had a slightly better on-time performance than minority routes, although the difference is not significant. On the other hand, low-income bus routes had a better on-time performance than non low-income bus routes. Minority routes compared favorably to the percentage for all routes which was 51%.

Vehicle Load, Headway, On-Time Performance

### DISTRIBUTION OF TRANSIT AMENITIES

	Number of Bus Routes	Routes Max Load Ratio Less than 1.0 - Non Peak	Percent	Routes Max Load Ratio Less than 1.25 - Peak	Percent	Routes 90% On-Time or Better	Percent	Local Routes Peak Headway 15 Minutes or Better	Percent
Non-Minority Routes	27	20 of 20	100%	20 of 20	100%	14 of 25	56%	6 of 24	25%
Minority Routes	68	36 of 36	100%	40 of 40	100%	32 of 66	48%	17 of 46	37%
Non-Low Income Routes	22	17 of 17	100%	17 of 17	100%	10 of 21	48%	4 of 20	20%
Low Income Routes	73	39 of 39	100%	43 of 43	100%	36 of 70	51%	19 of 50	38%
All Routes	95	56 of 56	100%	60 of 60	100%	46 of 91	51%	23 of 70	33%

Max load data not available for all routes. Max load analysis is base upon ridecheck samples collected during the period of October 2006 to November 2007. A special recheck was performed between March and April of 2008 for those routes that exceeded the average peak and off peak maximum load. The recheck was necessary since the routes that exceeded the averages had new articulated buses assigned to them after the initial recheck had performed. Peak time: M-F 6am-9am and 1pm-6pm. Off Peak time: M-F 6pm-6am, 9am-1pm, Saturday and Sunday service.

Minority and low income routes determined by the route length serving one third or more of low income census tracts (2000 US Census).

On-Time Performance data is based on data collected from September to November 2007.

Countywide Averages: Minority 33.81% Low Income 11.75%

Service Area Averages: Minority 36.22% Low Income 12.57%

## BUS STOP AMENITIES

Bus shelters and benches should be installed in locations where they are most needed. This includes high density areas, stops with longer wait times between buses, and areas currently unprotected with natural shade. A point system was developed to determine if a location warrants such amenities. If a location earns 4 points or higher a bench is warranted, with 12 points or higher a shade structure is also warranted. Warrants for bus shelters and benches were established and calculated based on a point system as follows:

Condition	Points
Located within one-quarter mile of a major activity center.	4
Located within one-quarter mile residential and employment density above the regional average.	4
Daily bus boardings above the regional average.	4
No natural or man-made shade.	4
Wait-time at peak in excess of 15 minutes.	4

To assess equitable distribution of bus stop amenities, stops were compared across minority/low-income and non minority/low-income census tracts. This comparison is summarized in the following Table, *Bus Stop Amenities*. A slightly higher percentage of bus stops located in non minority and non low - income census tracts that warranted a bench, had the bench in place when compared to bus stops in minority and low-income census tracts, but the difference is not considered significant. In terms of bus stops that warrant a shelter and have the shelter constructed at the bus stop, the percentages compared between bus stops located in minority and low-income census tracts and those stops located in non

minority and non low-income census tracts are virtually identical. These statistics represent an equitable distribution of bus stop amenities to minority and low-income populations.

The final column in the table is addressing the question as to whether bus stops in non minority and non low-income neighborhoods that warrant absolutely no amenities are getting those amenities at the expense of the minority and low-income populations. The data demonstrates that this inequity is not occurring. In fact, a significantly higher percentage of stops in minority and low-income census tracts are receiving amenities when the warrants do not justify their placement.

**Bus Stop Amenities**

	Bus Stops	Warrant Bench	Warrant Bench/ Has Bench	Percent Warrant Bench/ Has Bench	Warrant Shelter	Warrant Shelter/ Has Shelter	Percent Warrant Shelter/Has Shelter	Warrant No Amenities	Warrant No Amenities/ But Has Amenities	Percent Warrant No Amenities/ But Has Amenities
Non-Minority Stops	3,945	2,576	1,289	<b>50%</b>	747	459	<b>61%</b>	622	372	<b>60%</b>
Minority Stops	3,360	1,721	789	<b>46%</b>	1,207	736	<b>61%</b>	432	302	<b>70%</b>
Non-Low Income Stops	3,764	2,481	1,219	<b>49%</b>	669	412	<b>62%</b>	614	357	<b>58%</b>
Low Income Stops	3,541	1,816	859	<b>47%</b>	1,285	783	<b>61%</b>	440	317	<b>72%</b>
All Stops	7,305	4,297	2,078	<b>48%</b>	1,954	1,195	<b>61%</b>	1,054	674	<b>64%</b>

## TRANSIT CENTERS

Transit Centers serve as major nodes in the transit network connecting various regional and local bus lines and express routes and circulator services. Transit centers are designed specifically to ease transferring between bus routes and between bus and other travel modes. They are often located within major activity centers.

If a census tract meets the following criteria, a transit center is warranted: located within one-quarter mile of a major activity center; residential and employment density above the regional average; more than 400 boardings per day at the bus stops within the census tract; served by 10 or more routes and/or served by four or more routes that have their terminus within the tract.

The census tract is considered served by a transit center if the tract is within a 1.5 mile radius of an existing transit center or within eight miles of the Central Station downtown regional transit center. This aspect of the service standard avoids the practice of providing routes to transit centers that “bend the grid system”.

To assess equitable access to transit centers, the percentage of census tracts that warrant and have a facility was compared across minority/low-income and non-minority/low-income census tracts. The results are summarized in the following Table, *Transit Center Analysis*. Census tracts warranting a transit center are illustrated in the following Map, *Transit Centers*. The percentage of census tracts that warrant a transit center and actually have one located in the census tract is nearly identical when comparing minority census tracts to those that are not minority census tracts. The percentage for low-income census tracts is significantly higher than non low-income census tracts. This data represents an equitable distribution of transit center placement.

**Transit Center Analysis**

	All Census Tracts	Warrants Transit Center	Warrants Transit Center/ Has Transit Center	Percent Warrants Transit Center/ Has Transit Center
Non-Minority Census Tracts	437	16	14	<b>88%</b>
Minority Census Tracts	226	31	27	<b>87%</b>
Non-Low Income Census Tracts	440	10	8	<b>80%</b>
Low Income Census Tracts	223	37	33	<b>89%</b>
All Census Tracts	663	47	41	<b>87%</b>

Tract Average Percent HH with Vehicle = 0.93

Tract Average Employment Density = 2,100 per SqMi

Tract Average Population Density = 4,700 per SqMi

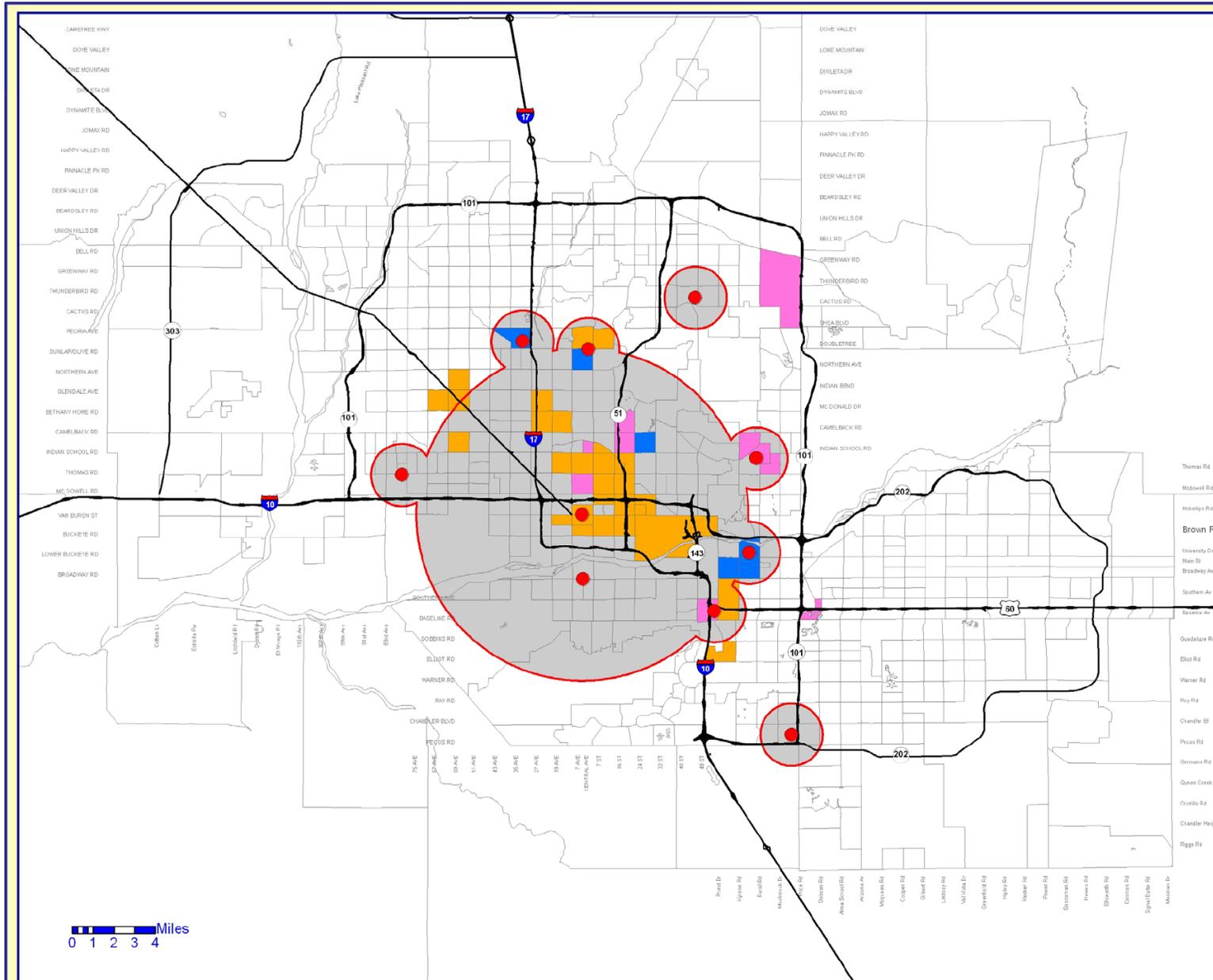
# Phoenix Area 2009 Title VI Plan Update

## Transit Centers

### Census Tracts Meeting the Transit Center Warrant

- NonTitleVI
- Low Inc Only
- Low Inc & Minority

Served by Existing  
Transit Centers



## **PARK AND RIDE FACILITIES**

The primary function of a park-and-ride lot is to serve the outlying areas of the regional service area, providing a safe convenient transfer point between automobile and public transportation for commuters. Often intended primarily to serve regional express and bus rapid transit routes, these facilities also accommodate local and limited stop bus service, dial-a-ride, and other rideshare modes, such as carpools and vanpools.

In order for park-and-rides to provide commuter access that is inviting, they should be highly visible, safe and accessible from as many directions as possible, while providing quick, direct connection to the commuting corridor.

An area warrants a park-and-ride facility if the following criteria are met: located eight miles or more from the downtown core; located within one mile of a freeway; auto-ownership is equal to or above the regional average; residential density is equal to or above the regional average.

All census tracts in the service area were measured for these conditions and determined to warrant or not warrant a park-and-ride. If the census tract contained or was within two miles of an existing facility, it was considered to have access to the facility. Park-and-rides are currently placed a minimum of four miles apart. Census tracts warranting a park-and-ride facility are illustrated in the following Map *Park and Rides*.

To assess equitable access to park-and-rides, the percentage of census tracts that warrant and have a facility was compared across minority/low-income and non-minority/low-income census tracts. The results are summarized in the following Table *Park-and-Ride Facilities*. The percentage of minority census tracts warranting a park and ride facility that have one located in the census tract is

almost identical (25%) when compared to non minority census tracts (27%). The percentage of low-income census tracts that warrant a park and ride and have one located in the census tract is significantly higher (40%) when compared to non low-income census tracts (25%). The data supports the conclusion that there is equitable distribution of park and ride facilities to minority and low-income populations.

**Park & Ride Facilities**

	All Census Tracts	Warrants Park&Ride	Warrants Park&Ride/ Has Park&Ride	Percent Warrants Park&Ride/ Has Park&Ride
Non-Minority Census Tracts	437	37	10	<b>27%</b>
Minority Census Tracts	226	4	1	<b>25%</b>
Non-Low Income Census Tracts	440	36	9	<b>25%</b>
Low Income Census Tracts	223	5	2	<b>40%</b>
All Census Tracts	663	41	11	<b>27%</b>

Tract Average Percent HH with Vehicle = 0.93

Tract Average Employment Density = 2,100 per SqMi

Tract Average Population Density = 4,700 per SqMi

# Phoenix Area 2009 Title VI Plan Update

## Park-and-Rides

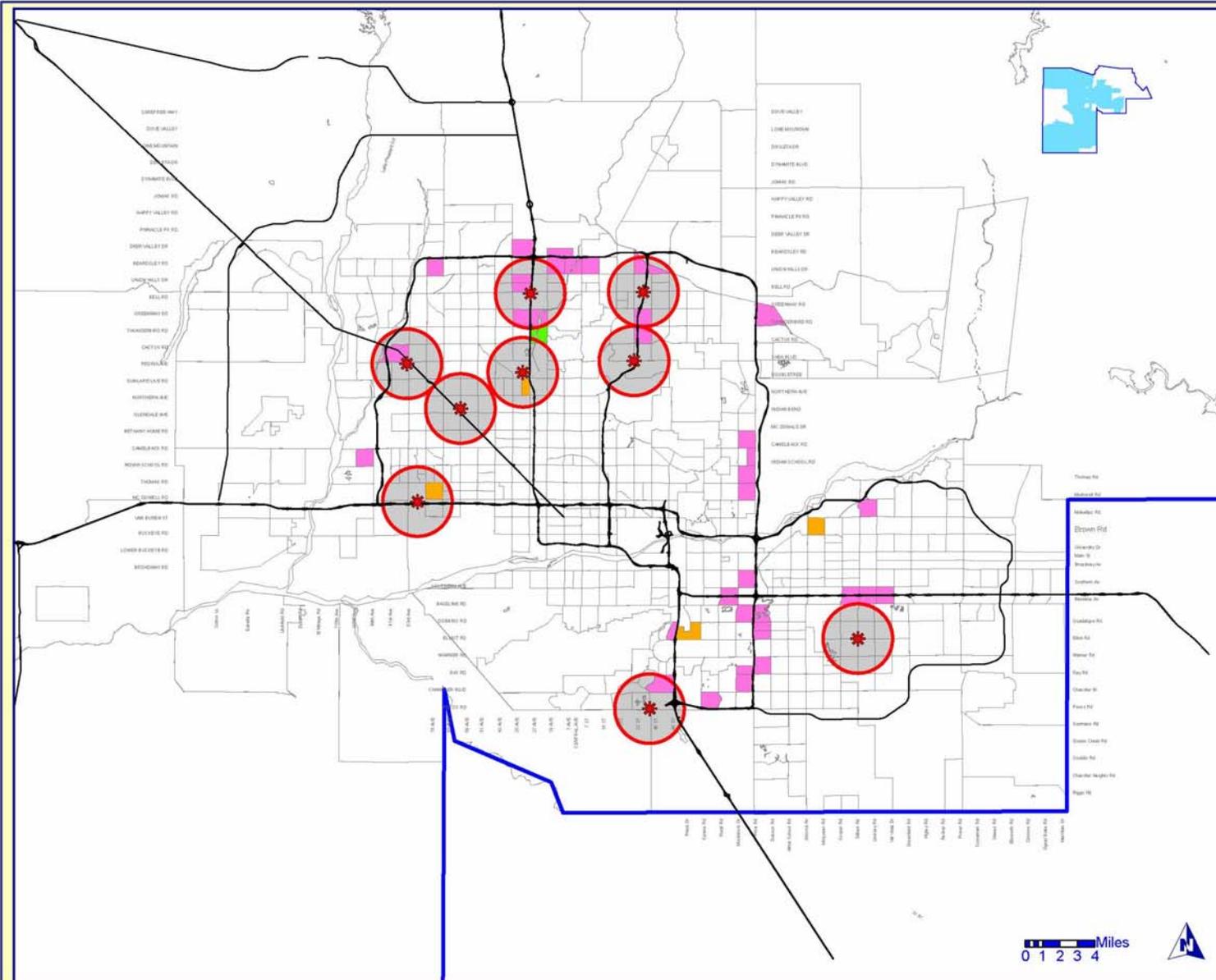
### Census Tracts Meeting the Park-and-Ride Warrant

- NonTitleVI
- Low Inc Only
- Minority Only
- Low Inc & Minority
- Served by Existing Park-and-Rides

\* Park-n-Ride

Title VI Census Tracts are Low Income and/or Minority areas defined as follows:

- Low Income = 12.6% or more of population below poverty level
- Minority = 36.2% or more of population non-white and/or hispanic



0 1 2 3 4 Miles



## SERVICE AVAILABILITY

### **BUS STOP PLACEMENT**

The Phoenix area standard is that bus stops should be placed no more than one-quarter mile apart. To analyze if stops were placed equitably, gaps were calculated as the distance between bus stops for all routes. For each route, the number of gaps that exceed one-quarter mile was divided by the total number of gaps on the route to obtain the percentage of bus stop gaps that exceed one-quarter mile. A comparison of minority and low-income routes to non minority and non low income routes is summarized in the following Table, *Bus Stop Placement*.

Bus stop placement exceeds the standard more often on non- minority and low-income routes than on minority and low-income routes. For minority routes, 44% of the gaps exceed one-quarter mile compared to 48% for non-minority routes. On low Income routes, 43% of the gaps exceed the standard, compared to 50% for the non-low income routes. This result is expected, given the fact that the non-minority and low-income routes are more likely to be found in the lower density areas.

#### **Bus Stop Placement**

	Total Number of Spacing Gaps that Do Not Meet Standard	Total Number of Gaps on Routes	Percent of Gaps that Exceed Standard
Non-Minority Routes	1,545	3,206	<b>48%</b>
Minority Routes	2,547	5,842	<b>44%</b>
Non-Low Income Routes	1,370	2,746	<b>50%</b>
Low Income Routes	2,722	6,302	<b>43%</b>
All Routes	4,092	9,048	<b>45%</b>

## ACCESS TO TRANSIT

In the Phoenix Metropolitan service area, the standard is for 70% or better of the population to have access to transit. For the purposes of this study, areas within one-quarter mile of a transit stop are considered to have access to that service. This is typically accepted as the distance an average rider is willing to walk to access the transit system. To obtain an estimate of the percent of population with access within a census tract, census block group data was used. Minority/low-income census tracts were then compared to non-minority/low-income census tracts to assess equitable access to transit service. The results are summarized in the following Table, *Access to Transit*.

The results indicate that minority/low-income populations have much greater access to transit than non minority/low-income populations. The average population that has access to transit in minority and low-income census tracts is 81% and 82% respectively as compared to the average access in non minority/low-income census tracts which is 50%. Only 35% of non minority census tracts exceed the standard of 70% access, whereas 78% of minority census tracts exceed the standard. Likewise, with low income census tracts, 35% of the non-low income census tracts exceed the standard while 79% of low income census tracts are above the standard.

**Access to Transit**

	Total Tracts	Avg Percent of Tract Pop w Access	Number Tracts Exceed 70%	Percent Tracts Exceed 70%
Non-Minority Tracts	437	50%	155	<b>35%</b>
Minority Tracts	226	81%	177	<b>78%</b>
Non-Low Income Tracts	440	50%	155	<b>35%</b>
Low Income Tracts	223	82%	177	<b>79%</b>
All Tracts	663	61%	332	<b>50%</b>

## VEHICLE ASSIGNMENT

This analysis is based on vehicle age, fuel type, floor height, and seat type. Five points are awarded to each component for a total of 20 points for each vehicle. The “vehicle amenities” sample size is based on HASTUS bus duty data. The bus duty information was used to evaluate the buses assigned to service the routes in the system. The HASTUS bus duty information was crosschecked with actual garage dispatch sheets to verify if the bus assigned in HASTUS was the actual bus providing service on the street. In the case of “vehicle amenities”, route sample size was based on revenue generating routes.

Data results are based on the average of all the buses assigned to 87 of 95 fixed routes in the entire system for the period of December 3 – 9, 2007.

In regards to vehicle amenities, there was no disparity in the assignment of vehicles to minority and non minority routes or to low-income and non low-income routes. The vehicle amenity score averages were virtually identical. A major contributing factor is that the region’s bus fleet has been shifting towards uniformity, eliminating older buses and replacing them with low-floor, cloth insert, and clean diesel as well as LNG and CNG buses.

### Vehicle Amenities

	Average Fuel Points	Average Seat Points	Average Floor Points	Average Age Points	Total of Point Averages
Non-Minority Routes	4.3	3.0	4.9	4.0	16.2
Minority Routes	4.3	3.2	4.8	4.0	16.3
Non-Low Income Routes	4.2	3.0	4.9	4.1	16.3
Low Income Routes	4.3	3.2	4.8	4.0	16.3

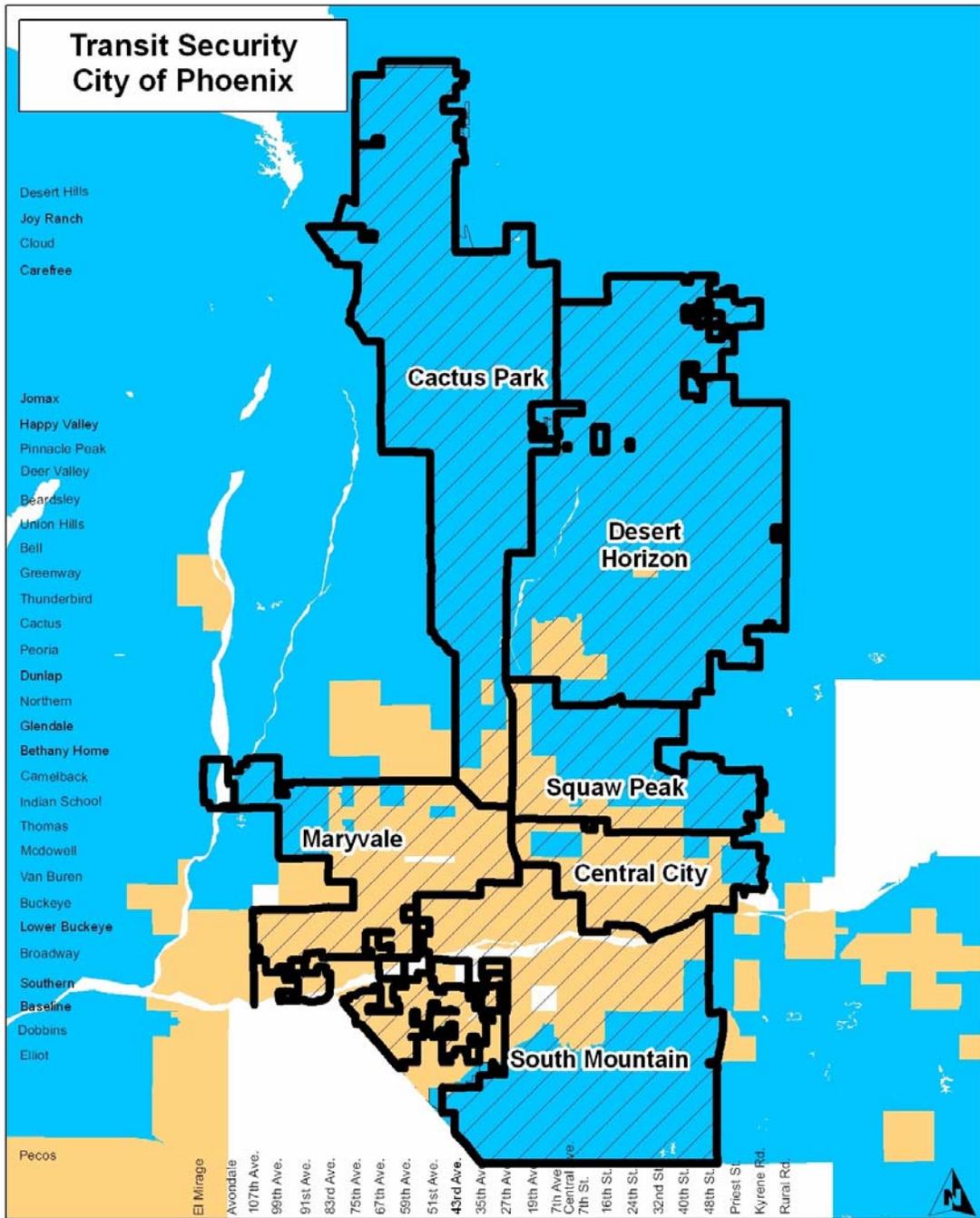
Vehicle amenity analysis based on bus samples collected during the period of December 3rd to December 9th 2008.

## **TRANSIT SECURITY**

### **DEPLOYMENT OF POLICE TRANSIT BUREAU SECURITY PERSONNEL**

City of Phoenix Police Precincts are displayed in the following Map *Transit Security City of Phoenix*. Those census tracts that are minority, low -income or both minority and low- income are indicated by precinct. The vast majority of low-income and minority census tracts are located in the Maryvale, Central City and South Mountain precincts. Minority and low-income census tracts also comprise approximately one third of the Squaw Peak precinct.

# Transit Security City of Phoenix



City of Phoenix Police Precincts
  Title VI Census Tracts (Minority and Low Income)
  Non Title VI Census Tracts

October 18, 2007

0 1.25 2.5 5 7.5 10 Miles  
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The Police Transit Bureau deploys eight sworn officers, 20 police assistants and 36 municipal guards to provide security to 12 transit facilities, transit centers and park and rides covering 515 square miles. Police Transit Bureau assignments are displayed in the following Table, *Transit Security Assignments*.

In general, assignments to the South Mobile Patrol, and South Facility correspond to the South Mountain precinct, assignments to the Central Mobile Patrol and Central Station correspond to the Central City precinct, and assignments to the North Mobile Patrol and North Facility correspond to the Squaw Peak, Desert Horizon and Cactus Park police precincts. Assignments to the West Mobile Patrol correspond to the Maryvale police precinct. Those assigned to the South Swing Mobile Patrol alternate coverage between the Desert Horizon and South Mountain precincts. Sworn officers and police assistants also provide security to bus routes.

All sworn officers and police assistants on mobile patrol are subject to deployment outside of their primary zone to respond to security issues. However, of the 28 sworn officers and police assistants, 22 or 78% are deployed primarily in census tracts that are predominantly minority and low-income. Fifteen of the total 36 municipal guards or 42% are deployed to Central Station and Ed Pastor, the two largest transit centers in the City of Phoenix. Both transit centers are located in minority and low-income census tracts. A total of 27 municipal guards out of the total of 36 are assigned to transit facilities located in minority and low-income census tracts.

The deployment data for the Police Transit Bureau supports the conclusion that transit security is equitably provided to minority and low-income populations.

## VEHICLE SURVEILLANCE CAMERAS

The “transit security” route sample size is based on HASTUS bus duty data. The bus duty information was used to evaluate the buses assigned to service the routes in the system. The HASTUS bus duty information was crosschecked with actual garage dispatch sheets to verify if the bus assigned in HASTUS was the actual bus providing service on the street. Eighty seven fixed route local, Express, and RAPID route buses are equipped with fully operational security cameras while neighborhood circulator routes are not equipped with security cameras.

For this analysis, five points were awarded to each vehicle that had surveillance technology; zero points were awarded to those that had none. The result shown in the plan is based on the average of all the buses assigned to 87 of 95 fixed routes in the entire system for the period of December 3 – 9, 2007.

The results of the data assessment are in the following Table, *Average Amount of Points for Security Cameras*. For the routes sampled, the average camera points for minority and low-income routes were slightly lower but not significantly different from the average camera points for non minority and non low-income routes. This data supports the equitable distribution of surveillance cameras aboard vehicles serving minority and low-income routes.

**Average Amount of Points for Security Cameras**

	Number of Bus Routes	Sampled Routes	Average Camera Points
Non-Minority Routes	27	22	4.7
Minority Routes	68	65	4.1
Total Routes	95	87	4.3
Non-Low Income Routes	22	20	4.6
Low Income Routes	73	67	4.2
Total Routes	95	87	4.3