MARICOPA ASSOCIATION of GOVERNMENTS

2002-2003 MAG Regional Travel Time & Travel Speed Study

APPENDICES

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APPENDIX A

Study Design

Travel Speed Survey Design

This document outlines the study procedures in detail and includes information on the following:

1. Number of runs for each segment
2. Time periods of runs
3. Description of the floating car method
4. List of routes included in the study
5. Explanation of how the segments were defined
6. Detailed procedures for data collection
7. Procedures for handling construction, accidents, and incidents
8. Situations that require a re-run
9. Training of data collectors
10. Procedures for quality control

1. According to Scope of Services defined by MAG, 8 travel time runs were made in each direction of travel during the AM and PM peak periods and 4 runs in each direction during the off-peak period.

2. The travel time runs in each period were completed over multiple days. This provided a better representation of a typical day. The times for the runs were as follows: AM Period (6:30 a.m. to 8:00 a.m.) and PM Period (4:00 p.m. to 6:00 p.m.) and for the Midday Period (9:00 am to 11:00 am). The runs were collected on Tuesdays, Wednesdays, and Thursdays, not including holidays and days when school was not in session.

3. The travel speed data collection was conducted using the floating-car technique in accordance with the Manual of Traffic Engineering Studies. This is consistent with the methods used to collect travel speed data in previous studies. In the Floating Car Procedure, the driver of the test car is instructed to pass as many vehicles as pass the test car. In this way, the average position of the vehicle in the traffic stream is maintained, and measurements tend to reflect average conditions within the traffic stream. The drivers were instructed to pass as many cars as pass them and to drive the speed limit if there are no cars impeding them. The driver avoided continued driving in the curb lane unless the road only has one lane in each direction. This provided consistent data between drivers

4. The routes included in the study are attached on the following pages.—Include list.

5. The segments are defined as links on the routes bound by a signal, stop sign or cross street on the freeway.

6. The floating-car technique applies GPS methods that included a single person (the driver) collecting date, time, vehicle position, geo-referenced digital video,

and point velocity every second. Technology improvements also allow the application of the GPS data against a linear referenced roadway centerline.

The technician used the custom data collection software on a Compaq iPAQ that automatically notes the route and beginning location. MAG provided Carter & Burgess with information on facility type, jurisdiction, and area type for inclusion in the database. GPS data was used to determine the segment length.

In addition, an audio tape recorder was used to identify events, such as accidents, construction, school zones, or other non-recurring delay.

The project manager developed a travel time run schedule using a GPS almanac to avoid times when satellite coverage was limited.

7. In those cases where construction, accidents, or other incidents occur, the data collector was instructed to continue the run and make note of the apparent cause of the non-recurring delay. In the case of construction, every effort was made to schedule the runs around construction and if possible allow time for short-term construction to be completed prior to collecting the travel time info for that route. When an occasional accident or incident occurred, the run continued. This allowed comparison of that isolated run with the other samples to demonstrate the impact of accidents and the importance of a quick return to normal conditions. If there was a major incident that impacted the runs for much of the sampling period, an alternative route was be run.

8. The need for reruns was limited to the following cases:
   - Equipment malfunctions or incomplete data that can not be reconstructed from the video or other sources.
   - Major incidents that impact the traffic flow for more than 30 minutes.
   - Inappropriate data collector driving as judged by the project manager after review of the data and video.

9. Training of data collectors

   The technicians were trained on the use of the equipment and proper procedures for the floating car travel time runs in the field by the project manager. Technicians rode along on an example run to observe, and then made several practice runs with the project manager. This ensured that the technicians understood the study procedures and use of the equipment. They were instructed to pass as many cars as pass them and to drive the speed limit if there are no cars impeding them. The driver avoided the curb lane unless the road only had one lane in each direction. This provided consistent data between drivers. Each driver was provided written documentation of the procedures, and operational instructions for each piece of equipment.

Technicians used audio tape recorders to note their observations relating to the cause of delay and other relevant information. Technicians summarized their findings daily.

Drivers completed one segment per day, and forward the data to the task manager for immediate QA/QC and input into the database.

10. Quality Control

The Carter & Burgess Team followed a quality control plan for this project that included data collection and data analysis.

Data Collection

The technicians were specifically trained for this project. Training included a review of the floating car method, review of the survey design, and hands on training on the GPS applications designed for this study. Technicians observed several practice travel time runs and were given checklists to ensure all steps are properly followed and the data was consistent. Each technician was tested on a practice run with the project manager or his assignee observing before beginning work on the project.

Each driver was furnished with audio recorders. These were used to note the location, type, and time of any abnormal traffic conditions or problems each encountered.

The GPS method of data collection provided an initial level of quality control. Location and time information is automatically marked and stored on the computer.

Data Analysis

Quality control in data analysis was accomplished by recording and manipulating data electronically, automated queries, and by spot-checking results. Calculations for travel time and delay was performed within the database. Results were pulled into tables directly from the database so that no errors were made in transferring data to the tables and any changes in calculations were automatically updated in the tables. Calculations were checked manually.

Specific elements for reviewing the data programmatically include first checking each filename to make sure there were no duplicates in the system. If the filename had already been used, the program assigned it a new appropriate filename. The filenames were also checked to make sure they represented the run correctly. For example, odd numbers were used for eastbound and northbound runs, while even numbers were used for

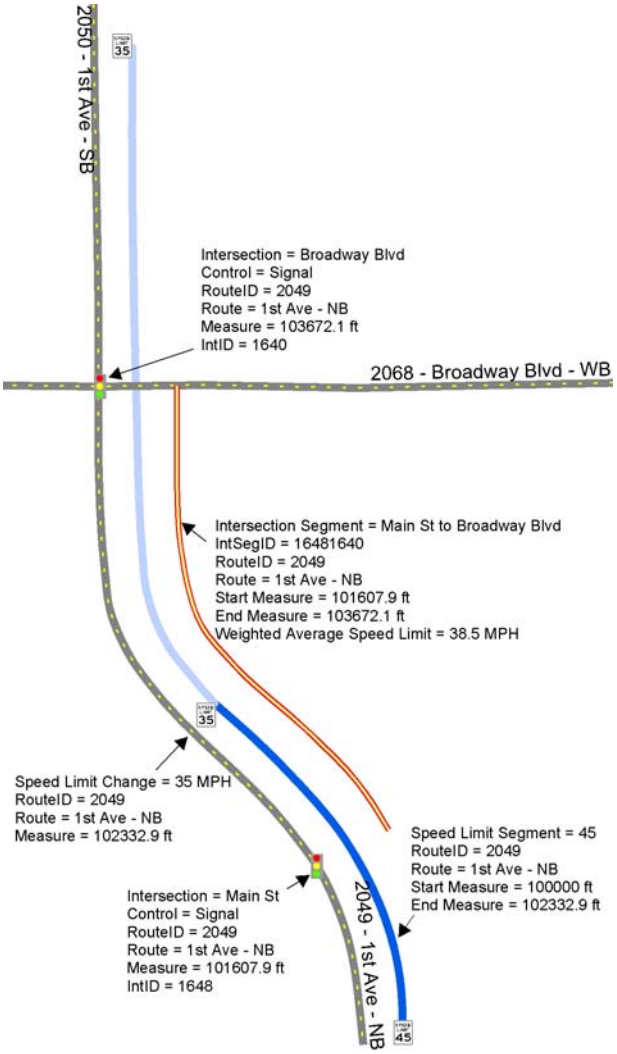
westbound and southbound. If the filename did not match the direction of the run, it was flagged for manual inspection. The filename was renamed manually to the correct direction, and then the data was rerun though the quality control process.

Each data filename was reviewed to make sure it was an appropriate name for the route and run it represented. For example, the first four digits of the filename are the route identifier. Each file was then checked to make sure it was a complete run with no mid-block breaks. This was done by measuring an offset from the centerline to the GPS points. If the distance was more than 100 feet, the run was flagged for manual inspection. Usually, this meant that a test vehicle pulled off to the side of the road or turned off their route, but in some cases, a distance of more than 100 feet could have meant a detour due to construction. Only a visual inspection of the data points and the digital video could provide accurate information.

In order to determine beginning and ending points and times for each segment, the data was checked to make sure there was at least one data point within 200 feet of the beginning and ending points of a segment. If no point existed within that distance, a point was manually created by extrapolation, if possible. If it was not possible to extrapolate a beginning or ending point from the data available, the travel time run was repeated for that segment.

All of the QA/QC methods are possible due to the use of a Linear Reference System (LRS). The routes are polylineM features with one route for each travel direction and the beginning measures start at 100,000 ft. Dynamic segmentation allows the display and analysis of route events: points or line segments along a route. Route events are stored in a tabular format. A point event (speed limit sign) is represented in the LRS with a route identifier (RouteID) and measure along the route. A line event (speed limit zone) is represented with a route identifier, a start measure (StartM) and an end measure (EndM). An offset value is used to display the route event a specified distance from the route. An example Linear Reference System is shown in following figure. The route 1st Ave – NB has a route identifier of 2049. Point events along the route in the northbound direction include the intersection at Main St (Measure = 101607.9), a speed limit change to 35 mph (Measure = 102332.9) and the intersection at Broadway Blvd (Measure = 103672.1). Line events are created from the point events using database programming since the points are stored as a table of events. The 45 mph speed limit segment is created by setting the start measure equal to the first speed limit point on the route (45 mph at Measure = 100000) and the end measure equal to the next speed limit event in the route direction (35 mph at Measure = 102332.9). The intersection segment events provide the best way to

summarize the GPS point data from a traffic analysis standpoint. The intersection segments have start and end measures of consecutive intersection point events along the route. One advantage of storing data in a LRS is the speed limit within an intersection segment; the weighted average speed limit is calculated based on the location of the speed limit change within the intersection segment. The speed limit change is independent from the end points of the intersection segment; speed limit changes do not always occur at an intersection. Other independent line event data is also used to analyze or summarize the GPS point data; advisory speeds; school zones, construction zones, number of travel lanes, area type, and functional class.



2002-2003 MAG Region Travel Time Study Routes

RouteID	Route	StartInt	EndInt	Length (ft)
1001	107TH AVE - NB	OLIVE AVE	BELL RD	28,786.6
1002	107TH AVE - SB	BELL RD	OLIVE AVE	28,786.6
1003	16TH ST - NB	BASELINE RD	NORTHERN AVE	64,279.6
1004	16TH ST - SB	NORTHERN AVE	BASELINE RD	64,279.6
1005	19TH AVE - NB	BASELINE RD	BEARDSLEY RD	108,209.4
1006	19TH AVE - SB	BEARDSLEY RD	BASELINE RD	108,209.4
1007	24TH ST - NB	BASELINE RD	LINCOLN DR	57,665.8
1008	24TH ST - SB	LINCOLN DR	BASELINE RD	57,665.8
1009	27TH AVE - NB	BUCKEYE RD	NORTHERN AVE	43,346.8
1010	27TH AVE - SB	NORTHERN AVE	BUCKEYE RD	43,346.8
1011	32ND ST (BASELINE-BROADWAY) - NB	BASELINE RD	BROADWAY RD	10,612.9
1012	32ND ST (BASELINE-BROADWAY) - SB	BROADWAY RD	BASELINE RD	10,612.9
1015	32ND ST (SHEA-BELL) - NB	SHEA BLVD	BELL RD	23,506.1
1016	32ND ST (SHEA-BELL) - SB	BELL RD	SHEA BLVD	23,506.1
1013	32ND ST (WASHINGTON-LINCOLN) - NB	WASHINGTON ST	LINCOLN DR	30,835.7
1014	32ND ST (WASHINGTON-LINCOLN) - SB	LINCOLN DR	WASHINGTON ST	30,835.7
1017	35TH AVE - NB	BASELINE RD	DEER VALLEY RD	111,991.7
1018	35TH AVE - SB	DEER VALLEY RD	BASELINE RD	111,991.7
1019	40TH ST (BASELINE-UNIVERSITY) - NB	BASELINE RD	UNIVERSITY DR	16,503.2
1020	40TH ST (BASELINE-UNIVERSITY) - SB	UNIVERSITY DR	BASELINE RD	16,503.2
1021	40TH ST (SHEA-UNION HILLS) - NB	SHEA BLVD	UNION HILLS DR	33,092.7
1022	40TH ST (SHEA-UNION HILLS) - SB	UNION HILLS DR	SHEA BLVD	33,092.7
1023	43RD AVE - NB	LOWER BUCKEYE RD	BEARDSLEY RD	90,742.8
1024	43RD AVE - SB	BEARDSLEY RD	LOWER BUCKEYE RD	90,742.8
1025	44TH ST - NB	MCDONALD DR	VAN BUREN RD	26,268.7
1026	44TH ST - SB	VAN BUREN RD	MCDONALD DR	26,268.7
1027	48TH STREET - NB	CHANDLER BLVD	I-10	42,396.4
1028	48TH STREET - SB	I-10	CHANDLER BLVD	42,396.4
1029	51ST AVE - NB	BASELINE RD	BEARDSLEY RD	107,374.5
1030	51ST AVE - SB	BEARDSLEY RD	BASELINE RD	107,374.5
1031	56TH ST (SHEA-BELL) - NB	SHEA BLVD	BELL RD	23,195.2
1032	56TH ST (SHEA-BELL) - SB	BELL RD	SHEA BLVD	23,195.2

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RouteID	Route	StartInt	EndInt	Length (ft)
1033	56TH ST (THOMAS-CAMELBACK) - NB	THOMAS RD	CAMELBACK RD	8,827.5
1034	56TH ST (THOMAS-CAMELBACK) - SB	CAMELBACK RD	THOMAS RD	8,827.5
1035	56TH ST (WILLIAMSFIELD-RAY) - NB	CHANDLER BLVD	RAY RD	5,913.4
1036	56TH ST (WILLIAMSFIELD-RAY) - SB	RAY RD	CHANDLER BLVD	5,913.4
1037	59TH AVE - NB	VAN BUREN RD	DEER VALLEY RD	85,124.3
1038	59TH AVE - SB	DEER VALLEY RD	VAN BUREN RD	85,124.3
1039	64TH ST (MCDOWELL-INDIAN SCHOOL) - NB	MCDOWELL RD	INDIAN SCHOOL RD	8,950.6
1040	64TH ST (MCDOWELL-INDIAN SCHOOL) - SB	INDIAN SCHOOL RD	MCDOWELL RD	8,950.6
1041	64TH ST (SHEA-BELL) - NB	SHEA BLVD	BELL RD	22,648.6
1042	64TH ST (SHEA-BELL) - SB	BELL RD	SHEA BLVD	22,648.6
1043	67TH AVE - NB	I-10	BEARDSLEY RD	77,138.3
1044	67TH AVE - SB	BEARDSLEY RD	I-10	77,138.3
1045	75TH AVE - NB	I-10	BEARDSLEY RD	76,971.6
1046	75TH AVE - SB	BEARDSLEY RD	I-10	76,971.6
1047	7TH AVE (BASELINE-DUNLAP) - NB	BASELINE RD	DUNLAP AVE	70,928.1
1048	7TH AVE (BASELINE-DUNLAP) - SB	DUNLAP AVE	BASELINE RD	70,928.1
1049	7TH AVE (GREENWAY-BEARDSLEY) - NB	GREENWAY PKWY	BEARDSLEY RD	15,888.3
1050	7TH AVE (GREENWAY-BEARDSLEY) - SB	BEARDSLEY RD	GREENWAY PKWY	15,888.3
1051	7TH ST - NB	BASELINE RD	DEER VALLEY RD	112,500.5
1052	7TH ST - SB	DEER VALLEY RD	BASELINE RD	112,609.4
1053	83RD AVE - NB	I-10	BELL RD	67,306.2
1054	83RD AVE - SB	BELL RD	I-10	67,306.2
1055	91ST AVE - NB	BUCKEYE RD	CACTUS RD	58,781.7
1056	91ST AVE - SB	CACTUS RD	BUCKEYE RD	58,781.7
1057	92ND ST - NB	SHEA BLVD	CACTUS RD	6,188.8
1058	92ND ST - SB	CACTUS RD	SHEA BLVD	6,188.8
1059	94TH ST - NB	CACTUS RD	FRANK LLOYD WRIGHT BLVD	9,948.0
1060	94TH ST - SB	FRANK LLOYD WRIGHT BLVD	CACTUS RD	9,948.0
1061	99TH AVE - NB	OLIVE AVE	UNION HILLS DR	33,804.0
1062	99TH AVE - SB	UNION HILLS DR	OLIVE AVE	33,804.0
1064	ADAMS - WB	17TH AVE	27TH AVE	7,003.3
1065	ALMA SCHOOL RD - NB	RIGGS RD	MCDOWELL RD	92,625.1

2002-2003 MAG Region Travel Time Study Routes

RouteID	Route	StartInt	EndInt	Length (ft)
1066	ALMA SCHOOL RD - SB	MCDOWELL RD	RIGGS RD	92,625.1
1067	APACHE BLVD - EB	MILL AVE	IDAHO RD	121,358.9
1068	APACHE BLVD - WB	IDAHO RD	MILL AVE	121,358.9
1069	BASELINE RD - EB	51ST AVE	ELLESWORTH RD	164,828.8
1070	BASELINE RD - WB	ELLESWORTH RD	51ST AVE	164,828.8
1071	BEARDSLEY RD - EB	75TH AVE	27TH AVE	33,420.8
1072	BEARDSLEY RD - WB	27TH AVE	75TH AVE	33,819.0
1073	BEELINE HWY - NB	MCDOWELL RD	SHEA BLVD	58,435.7
1074	BEELINE HWY - SB	SHEA BLVD	MCDOWELL RD	58,435.7
1075	BELL ROAD - EB	LITCHFIELD RD	SCOTTSDALE RD	133,127.0
1076	BELL ROAD - WB	SCOTTSDALE RD	LITCHFIELD RD	133,127.0
1077	BETHANY HOME RD - EB	83RD AVE	SR-51	59,152.7
1078	BETHANY HOME RD - WB	SR-51	83RD AVE	59,152.7
1079	BROADWAY RD - EB	35TH AVE	POWER RD	139,286.4
1080	BROADWAY RD - WB	POWER RD	35TH AVE	139,286.4
1081	BUCKEYE RD - EB	LITCHFIELD RD	SKY HARBOR BLVD	101,649.2
1082	BUCKEYE RD - WB	SKY HARBOR BLVD	LITCHFIELD RD	101,649.2
1083	CACTUS RD (91ST-19TH) - EB	91ST AVE	19TH AVE	47,972.3
1084	CACTUS RD (91ST-19TH) - WB	19TH AVE	91ST AVE	47,972.3
1085	CACTUS RD (CAVE CREEK-I-101) - EB	CAVE CREEK RD	I-101	46,275.5
1086	CACTUS RD (CAVE CREEK-I-101) - WB	I-101	CAVE CREEK RD	46,275.5
1087	CAMELBACK RD - EB	I-101	SCOTTSDALE RD	107,054.9
1088	CAMELBACK RD - WB	SCOTTSDALE RD	I-101	107,054.9
1089	CAREFREE HWY - EB	I-17	SCOTTSDALE RD	65,901.7
1090	CAREFREE HWY - WB	SCOTTSDALE RD	I-17	65,901.7
1091	CAVE CREEK RD - NB	DUNLAP AVE	CAREFREE HWY	94,137.4
1092	CAVE CREEK RD - SB	CAREFREE HWY	DUNLAP AVE	94,137.4
1093	CENTRAL - NB	BASELINE RD	MOUNTAIN VIEW RD	73,716.7
1094	CENTRAL - SB	MOUNTAIN VIEW RD	BASELINE RD	73,913.2
1095	CHANDLER BLVD - EB	5TH AVE	GILBERT RD	88,591.6
1096	CHANDLER BLVD - WB	GILBERT RD	5TH AVE	88,591.6
1097	CHANDLER HEIGHTS - EB	ALMA SCHOOL RD	ELLESWORTH RD	68,514.8

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RouteID	Route	StartInt	EndInt	Length (ft)
1098	CHANDLER HEIGHTS - WB	ELLESWORTH RD	ALMA SCHOOL RD	68,514.8
1099	CHAPARRAL - EB	SCOTTSDALE RD	PIMA FWY RD	12,965.4
1100	CHAPARRAL - WB	PIMA FWY RD	SCOTTSDALE RD	12,965.4
1101	COOPER RD - NB	GERMANN RD	BASELINE RD	37,666.0
1102	COOPER RD - SB	BASELINE RD	GERMANN RD	37,666.0
1103	COTTON LANE - NB	I-10	INDIAN SCHOOL RD	13,059.7
1104	COTTON LANE - SB	INDIAN SCHOOL RD	I-10	13,059.7
1105	COUNTRY CLUB DR - NB	WESTERN CANAL	MCDOWELL RD	40,068.8
1106	COUNTRY CLUB DR - SB	MCDOWELL RD	WESTERN CANAL	40,068.8
1107	COUNTY ROUTE 85 - EB	MILLER RD	LITCHFIELD RD	78,841.7
1108	COUNTY ROUTE 85 - WB	LITCHFIELD RD	MILLER RD	78,841.7
1109	CURRY RD - EB	MILL AVE	MCCLINTOCK DR	10,496.8
1110	CURRY RD - WB	MCCLINTOCK DR	MILL AVE	10,496.8
1111	DEER VALLEY RD - EB	35TH AVE	7TH ST	22,437.8
1112	DEER VALLEY RD - WB	7TH ST	35TH AVE	22,437.8
1113	DOBSON RD - NB	OCOTILLO RD	I-202	74,851.5
1114	DOBSON RD - SB	I-202	OCOTILLO RD	74,851.5
1115	DOUBLETREE RANCH RD - EB	SCOTTSDALE RD	PIMA FWY RD	17,908.2
1116	DOUBLETREE RANCH RD - WB	PIMA FWY RD	SCOTTSDALE RD	17,908.2
1117	DUNLAP AVE - EB	35TH AVE	7TH ST	21,656.5
1118	DUNLAP AVE - WB	7TH ST	35TH AVE	21,656.5
1119	DYSART RD - NB	I-10	BELL RD	67,272.0
1120	DYSART RD - SB	BELL RD	I-10	67,272.0
1121	ELLIOT RD - EB	48TH ST	LINDSAY RD	67,361.2
1122	ELLIOT RD - WB	LINDSAY RD	48TH ST	67,361.2
1123	ELLSWORTH RD - NB	RIGGS RD	MCKELLIPS RD	87,466.3
1124	ELLSWORTH RD - SB	MCKELLIPS RD	RIGGS RD	87,466.3
1125	ESTRELLA FREEWAY/303 - NB	INDIAN SCHOOL RD	GRAND AVE	69,558.3
1126	ESTRELLA FREEWAY/303 - SB	GRAND AVE	INDIAN SCHOOL RD	69,558.3
1277	FRANK LLOYD WRIGHT BLVD - EB	SCOTTSDALE RD	SHEA BLVD	37,588.6
1278	FRANK LLOYD WRIGHT BLVD - WB	SHEA BLVD	SCOTTSDALE RD	37,588.6
1127	GALVIN PARKWAY - NB	VAN BUREN RD	MCDOWELL RD	7,258.1

2002-2003 MAG Region Travel Time Study Routes

RouteID	Route	StartInt	EndInt	Length (ft)
1128	GALVIN PARKWAY - SB	MCDOWELL RD	VAN BUREN RD	7,081.8
1129	GERMANN RD - EB	PRICE RD	GILBERT RD	31,192.5
1130	GERMANN RD - WB	GILBERT RD	PRICE RD	31,192.5
1131	GILBERT RD - NB	RIGGS RD	BEELINE HWY	106,605.5
1132	GILBERT RD - SB	BEELINE HWY	RIGGS RD	106,605.5
1133	GLENDALE AVE - EB	91ST AVE	SR-51	66,025.4
1134	GLENDALE AVE - WB	SR-51	91ST AVE	66,025.4
1135	GOLDFIELD RD - NB	OLD WEST HWY	SUPERSTITION BLVD	12,545.1
1136	GOLDFIELD RD - SB	SUPERSTITION BLVD	OLD WEST HWY	12,545.1
1137	GRAND AVE - NW	VAN BUREN RD	ESTRELLA FREEWAY/303	133,742.1
1138	GRAND AVE - SE	ESTRELLA FREEWAY/303	VAN BUREN RD	133,730.6
1139	GREENFIELD RD - NB	BASELINE RD	UNIVERSITY DR	18,703.3
1140	GREENFIELD RD - SB	UNIVERSITY DR	BASELINE RD	18,703.3
1141	GREENWAY RD - EB	70TH AVE	SCOTTSDALE RD	91,218.3
1142	GREENWAY RD - WB	SCOTTSDALE RD	70TH AVE	91,218.3
1143	GUADALUPE RD - EB	PRIEST DR	VAL VISTA DR	64,681.7
1144	GUADALUPE RD - WB	VAL VISTA DR	PRIEST DR	64,681.7
1145	HAPPY VALLEY RD - EB	67TH AVE	I-17	30,006.5
1146	HAPPY VALLEY RD - WB	I-17	67TH AVE	30,011.5
1147	HAYDEN RD - NB	MCKELLIPS RD	FRANK LLOYD WRIGHT BLVD	69,496.9
1148	HAYDEN RD - SB	FRANK LLOYD WRIGHT BLVD	MCKELLIPS RD	69,496.9
1149	HIGLEY RD - NB	BASELINE RD	UNIVERSITY DR	18,180.2
1150	HIGLEY RD - SB	UNIVERSITY DR	BASELINE RD	18,180.2
1153	I-10 - EB	MILLER RD	S MARICOPA COUNTY LINE	289,753.7
1154	I-10 - WB	S MARICOPA COUNTY LINE	MILLER RD	289,805.6
1151	I-10 (HOV) - EB	83RD AVE	RAY RD	132,730.8
1152	I-10 (HOV) - WB	RAY RD	83RD AVE	132,840.0
1159	I-101 - EB	MCDOWELL RD	CHANDLER BLVD	312,484.2
1160	I-101 - WB	CHANDLER BLVD	MCDOWELL RD	313,055.2
1165	I-17 - NB	I-10	CAREFREE HWY	162,966.2
1166	I-17 - SB	CAREFREE HWY	I-10	162,174.3
1163	I-17 (HOV) - NB	INDIAN SCHOOL RD	UNION HILLS DR	63,347.5

2002-2003 MAG Region Travel Time Study Routes

RouteID	Route	StartInt	EndInt	Length (ft)
1164	I-17 (HOV) - SB	UNION HILLS DR	INDIAN SCHOOL RD	63,358.5
1169	I-202 - EB	SR-51	GILBERT RD	94,103.3
1170	I-202 - WB	GILBERT RD	SR-51	93,950.7
1171	I-202 (HOV) - EB	SR-51	HAYDEN RD	56,972.9
1172	I-202 (HOV) - WB	HAYDEN RD	SR-51	51,834.9
1173	IDAHO RD - NB	US-60	APACHE TRAIL	13,558.2
1174	IDAHO RD - SB	APACHE TRAIL	US-60	13,558.2
1175	INDIAN BEND RD - EB	SCOTTSDALE RD	I-101	14,875.0
1176	INDIAN BEND RD - WB	I-101	SCOTTSDALE RD	14,875.0
1177	INDIAN SCHOOL RD - EB	COTTON LN	PIMA FWY RD	169,372.2
1178	INDIAN SCHOOL RD - WB	PIMA FWY RD	COTTON LN	169,372.2
1179	JEFFERSON ST - EB	27TH AVE	26TH ST	28,477.7
1181	KYRENE RD - NB	CHANDLER BLVD	BASELINE RD	27,548.2
1182	KYRENE RD - SB	BASELINE RD	CHANDLER BLVD	27,548.2
1183	LINCOLN DR - EB	32ND ST	SCOTTSDALE RD	37,679.5
1184	LINCOLN DR - WB	SCOTTSDALE RD	32ND ST	37,733.4
1185	LINDSAY RD - NB	WILLIAMS FIELD RD	MCKELLIPS RD	54,208.4
1186	LINDSAY RD - SB	MCKELLIPS RD	WILLIAMS FIELD RD	54,208.4
1187	LITCHFIELD RD - NB	COUNTY ROUTE 85	GRAND AVE	82,378.4
1188	LITCHFIELD RD - SB	GRAND AVE	COUNTY ROUTE 85	82,378.4
1189	MCCLINTOCK DR - NB	CHANDLER BLVD	MCKELLIPS RD	54,031.8
1190	MCCLINTOCK DR - SB	MCKELLIPS RD	CHANDLER BLVD	54,031.8
1191	MCDONALD DR - EB	44TH ST	PIMA FWY RD	30,720.7
1192	MCDONALD DR - WB	PIMA FWY RD	44TH ST	30,720.7
1193	MCDOWELL RD - EB	91ST AVE	COUNTRY CLUB DR	126,545.3
1194	MCDOWELL RD - WB	COUNTRY CLUB DR	91ST AVE	126,545.3
1195	MCKELLIPS RD - EB	SCOTTSDALE RD	ELLESWORTH RD	92,931.3
1196	MCKELLIPS RD - WB	ELLESWORTH RD	SCOTTSDALE RD	92,931.3
1197	MCQUEEN RD - NB	RIGGS RD	BASELINE RD	58,963.2
1198	MCQUEEN RD - SB	BASELINE RD	RIGGS RD	58,963.2
1199	MESA DR - NB	BASELINE RD	LEHI RD	29,874.2
1200	MESA DR - SB	LEHI RD	BASELINE RD	29,874.2

2002-2003 MAG Region Travel Time Study Routes

RouteID	Route	StartInt	EndInt	Length (ft)
1201	MILL AVENUE - NB	BASELINE Rd	CURRY RD	22,555.9
1202	MILL AVENUE - SB	CURRY RD	BASELINE RD	22,467.3
1203	MILLER RD - NB	CR-85	I-10 W	24,003.0
1204	MILLER RD - SB	I-10 W	CR-85	24,003.0
1205	NORTHERN AVE - EB	99TH AVE	SR-51	74,287.7
1206	NORTHERN AVE - WB	SR-51	99TH AVE	74,287.7
1207	OCOTILLO RD - EB	DOBSON RD	GILBERT RD	28,349.4
1208	OCOTILLO RD - WB	GILBERT RD	DOBSON RD	28,349.4
1209	OLIVE AVE - EB	ESTRELLA FREEWAY/303	35TH AVE	87,377.6
1210	OLIVE AVE - WB	35TH AVE	ESTRELLA FREEWAY/303	87,377.6
1211	PECOS RD (DESERT FOOT HILLS-I10) - EB	DESERT FOOT HILLS PARK WAY	I-10	31,863.0
1212	PECOS RD (DESERT FOOT HILLS-I10) - WB	I-10	DESERT FOOT HILLS PARK WAY	30,106.4
1213	PECOS RD (GILBERT-DOBSON) - EB	DOBSON RD	GILBERT RD	27,323.8
1214	PECOS RD (GILBERT-DOBSON) - WB	GILBERT RD	DOBSON RD	27,323.8
1215	PEORIA AVE - EB	99TH AVE	19TH AVE	54,526.9
1216	PEORIA AVE - WB	19TH AVE	99TH AVE	54,526.9
1217	PIMA RD - NB	I-101	DYNAMITE BLVD	37,738.3
1218	PIMA RD - SB	DYNAMITE BLVD	I-101	37,738.3
1219	PINNACLE PEAK RD - EB	59TH AVE	I-17	28,262.7
1220	PINNACLE PEAK RD - WB	I-17	59TH AVE	28,262.7
1221	POWER RD - NB	CHANDLER HEIGHTS RD	MCKELLIPS RD	83,869.4
1222	POWER RD - SB	MCKELLIPS RD	CHANDLER HEIGHTS RD	83,869.4
1223	PRICE RD - NB	QUEEN CREEK RD	CHANDLER BLVD	18,639.1
1224	PRICE RD - SB	CHANDLER BLVD	QUEEN CREEK RD	18,811.5
1225	PRIEST DR - NB	RAY RD	VAN BUREN ST	48,820.2
1226	PRIEST DR - SB	VAN BUREN ST	RAY RD	48,820.2
1227	QUEEN CREEK RD - EB	I-10	GILBERT RD	50,510.1
1228	QUEEN CREEK RD - WB	GILBERT RD	I-10	50,510.1
1229	RAY RD - EB	CHANDLER BLVD	LINDSAY RD	82,494.9
1230	RAY RD - WB	LINDSAY RD	CHANDLER BLVD	82,494.9
1231	RIGGS RD - EB	I-10	GILBERT	42,302.9
1232	RIGGS RD - WB	GILBERT	I-10	42,302.9

2002-2003 MAG Region Travel Time Study Routes

RouteID	Route	StartInt	EndInt	Length (ft)
1233	RURAL RD - NB	CHANDLER BLVD	CURRY RD	49,754.8
1234	RURAL RD - SB	CURRY RD	CHANDLER BLVD	49,754.8
1235	SCOTTSDALE RD - NB	CURRY RD	CAVE CREEK RD	141,402.4
1236	SCOTTSDALE RD - SB	CAVE CREEK RD	CURRY RD	141,482.8
1237	SHEA BLVD - EB	SR-51	BEELINE HWY	95,413.0
1238	SHEA BLVD - WB	BEELINE HWY	SR-51	95,413.0
1239	SKY HARBOR BLVD - EB	SR-143	I-202	7,037.4
1240	SKY HARBOR BLVD - WB	I-202	SR-143	7,067.6
1241	SOUTHERN AVE - EB	19TH AVE	?	178,060.6
1242	SOUTHERN AVE - WB	?	19TH AVE	178,060.7
1243	SR 87 - NB	RIGGS RD	WESTERN CANAL	51,767.5
1244	SR 87 - SB	WESTERN CANAL	RIGGS RD	51,767.5
1245	SR-143 - NB	I-10	I-202	20,135.7
1246	SR-143 - SB	I-202	I-10	20,140.2
1247	SR-153 - NB	UNIVERSITY DR	VAN BUREN ST	12,329.7
1248	SR-153 - SB	VAN BUREN ST	UNIVERSITY DR	12,307.3
1249	SR-51 - NB	MCDOWELL RD	BELL RD	71,998.7
1250	SR-51 - SB	BELL RD	MCDOWELL RD	72,007.8
1251	STAPLEY DR - NB	BASELINE RD	MCKELLIPS RD	26,694.6
1252	STAPLEY DR - SB	MCKELLIPS RD	BASELINE RD	26,694.6
1253	TATUM BLVD - NB	MCDONALD DR	CAVE CREEK RD	89,377.0
1254	TATUM BLVD - SB	CAVE CREEK RD	MCDONALD DR	89,377.0
1255	THOMAS RD - EB	99TH AVE	PIMA FWY RD	120,009.1
1256	THOMAS RD - WB	PIMA FWY RD	99TH AVE	120,009.1
1259	THUNDERBIRD RD (32ND-HAYDEN) - EB	32ND ST	HAYDEN RD	32,458.3
1260	THUNDERBIRD RD (32ND-HAYDEN) - WB	HAYDEN RD	32ND ST	32,458.3
1257	THUNDERBIRD RD (99TH-CAVE CREEK) - EB	99TH AVE	PIMA FWY RD	72,148.1
1258	THUNDERBIRD RD (99TH-CAVE CREEK) - WB	PIMA FWY RD	99TH AVE	72,148.1
1261	UNION HILLS - EB	99TH AVE	TATUM BLVD	92,590.7
1262	UNION HILLS - WB	TATUM BLVD	99TH AVE	92,590.7
1263	UNIVERSITY DR - EB	BROADWAY RD	POWERS RD	104,210.5
1264	UNIVERSITY DR - WB	POWERS RD	BROADWAY RD	104,210.5

2002-2003 MAG Region Travel Time Study Routes

RouteID	Route	StartInt	EndInt	Length (ft)
1265	US-60 - EB	I-10	OLD WEST HWY	152,255.2
1266	US-60 - WB	OLD WEST HWY	I-10	149,842.8
1267	VAL VISTA DR - NB	GUADALUPE RD	MCKELLIPS RD	33,952.1
1268	VAL VISTA DR - SB	MCKELLIPS RD	GUADALUPE RD	33,952.1
1269	VAN BUREN ST - EB	59TH ST	WASHINGTON ST	77,339.6
1270	VAN BUREN ST - WB	WASHINGTON ST	59TH ST	77,283.0
1271	WARNER RD - EB	48TH ST	LINDSAY RD	67,156.7
1272	WARNER RD - WB	LINDSAY RD	48TH ST	67,156.7
1273	WASHINGTON ST - EB	26TH ST	VAN BUREN ST	26,292.1
1274	WASHINGTON ST - WB	VAN BUREN ST	17TH AVE	47,705.8
1275	WILLIAMS FIELD RD - EB	GILBERT RD	POWER RD	31,781.2
1276	WILLIAMS FIELD RD - WB	POWER RD	GILBERT RD	31,781.2

APPENDIX B

Data Dictionary

MAG 2002 Travel Speed Data Dictionary

Data Type Synonyms for SQL Server and MS Access

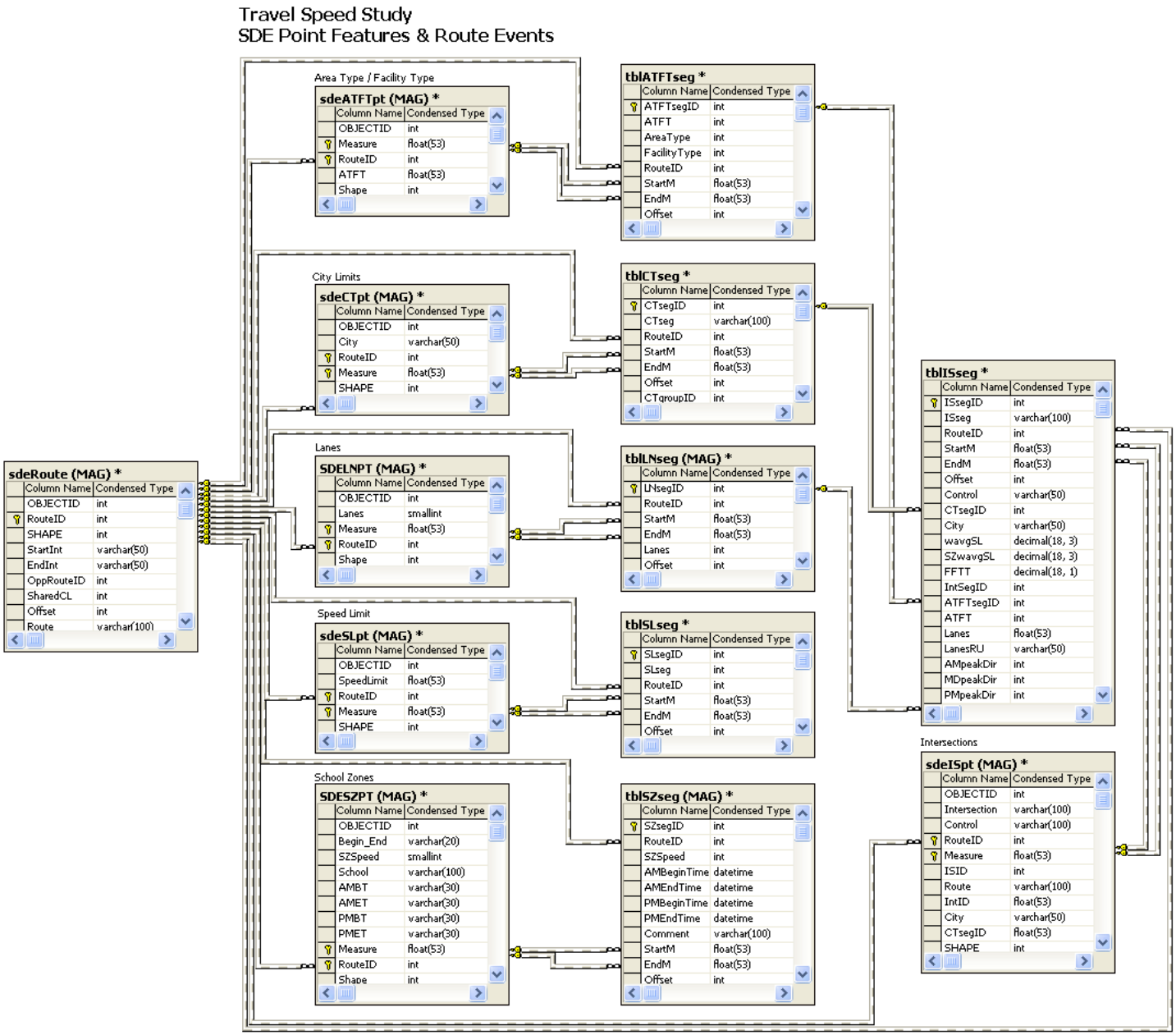
The fields described in this data dictionary are based on SQL server data types. If the data has been exported to MS Access, use the following table to determine the data type:

Access	SQL
date/time	datetime
double	float, decimal
long integer	Integer (int)
text	varchar, char

Legend

The following table describes the symbols and variables used in formulas and tables throughout this document:

Symbol	Description
*	Primary Key
i	Current record
n	Total records


Travel Speed Study
SDE Point Features & Route Events
Area Type / Facility Type
sdeATFTpt (MAG) *
Column Name Condensed Type
OBJECTID int
Measure float(53)
RouteID int
ATFT float(53)
Shape int
tblATFTseg *
Column Name Condensed Type
ATFTsegID int
ATFT int
AreaType int
FacilityType int
RouteID int
StartM float(53)
EndM float(53)
Offset int
City Limits
sdeCTpt (MAG) *
Column Name Condensed Type
OBJECTID int
City varchar(50)
RouteID int
Measure float(53)
SHAPE int
tblCTseg *
Column Name Condensed Type
CTsegID int
CTseg varchar(100)
RouteID int
StartM float(53)
EndM float(53)
Offset int
CTgroupID int
Lanes
SDELNPT (MAG) *
Column Name Condensed Type
OBJECTID int
Lanes smallint
Measure float(53)
RouteID int
Shape int
tblLNseg (MAG) *
Column Name Condensed Type
LNsegID int
RouteID int
StartM float(53)
EndM float(53)
Lanes int
Offset int
sdeRoute (MAG) *
Column Name Condensed Type
OBJECTID int
RouteID int
SHAPE int
StartInt varchar(50)
EndInt varchar(50)
OppRouteID int
SharedCL int
Offset int
Route varchar(100)
Speed Limit
sdeSLpt (MAG) *
Column Name Condensed Type
OBJECTID int
SpeedLimit float(53)
RouteID int
Measure float(53)
SHAPE int
tblSLseg *
Column Name Condensed Type
SLsegID int
SLseg int
RouteID int
StartM float(53)
EndM float(53)
Offset int
School Zones
SDESZPT (MAG) *
Column Name Condensed Type
OBJECTID int
Begin_End varchar(20)
SZSpeed smallint
School varchar(100)
AMBT varchar(30)
AMET varchar(30)
PMBT varchar(30)
PMET varchar(30)
Measure float(53)
RouteID int
Shape int
tblSZseg (MAG) *
Column Name Condensed Type
SZsegID int
RouteID int
SZSpeed int
AMBeginTime datetime
AMEndTime datetime
PMBeginTime datetime
PMEndTime datetime
Comment varchar(100)
StartM float(53)
EndM float(53)
Offset int
tblISseg *
Column Name Condensed Type
ISsegID int
ISseg varchar(100)
RouteID int
StartM float(53)
EndM float(53)
Offset int
Control varchar(50)
CTsegID int
City varchar(50)
wavgSL decimal(18, 3)
SZwavgSL decimal(18, 3)
FFTT decimal(18, 1)
IntSegID int
ATFTsegID int
ATFT int
Lanes float(53)
LanesRU varchar(50)
AMpeakDir int
MDpeakDir int
PMpeakDir int
Intersections
sdeISpt (MAG) *
Column Name Condensed Type
OBJECTID int
Intersection varchar(100)
Control varchar(100)
RouteID int
Measure float(53)
ISID int
Route varchar(100)
IntID float(53)
City varchar(50)
CTsegID float(53)
SHAPE int

Features

The following are feature classes that are stored inside of a relational database management system (SQL Server) or exported to a personal geodatabase (MS Access). The prefix 'sde' indicates a feature class, which contains spatial data and route measures.

Feature	Field Name	Data Type	Description
sdeRoute			Route PolylineM feature. Base routes for directional Linear Reference System
	ObjectID*	Integer	Object Identifier where each row is an object (AutoNumber)
	RouteID*	Integer	Route Identifier
	Route	varchar	Directional Route Name
	StartInt	varchar	Route starting point
	EndInt	varchar	Route ending point
	OppRouteID	Integer	Opposite Direction Route Identifier
	Shape	Integer	ESRI Shape Identifier
sdeATFTpt			Area Type / Facility Type point feature. Upstream points on route define ATFTseg
	ObjectID*	Integer	Object Identifier where each row is an object (AutoNumber)
	ATFT	Integer	[Area Type][Facility Type]
	Measure	float	Route Measure (ft)
	RouteID	integer	Route Identifier for sdeRoute
	Shape	Integer	ESRI Shape Identifier
sdeCTpt			City Limit point feature. Upstream points define CTseg
	ObjectID*	Integer	Object Identifier where each row is an object (AutoNumber)
	City	varchar	Jurisdiction
	Measure	float	Route Measure (ft)
	RouteID	integer	Route Identifier for sdeRoute
	Shape	Integer	ESRI Shape Identifier
sdeCZpt			Construction Zone point feature. Upstream points define CZseg properties
	ObjectID*	Integer	Object Identifier where each row is an object (AutoNumber)
	Begin_End	varchar	Begin = Beginning of Advisory Speed End = End of Advisory Speed

Feature	Field Name	Data Type	Description
	Dates	varchar	Dates of Construction
	CZSpeed	integer	Construction Zone Speed Limit if different than SLseg
	CZLanes	integer	Construction Zone Lanes if different than LNseg
	Comments	varchar	Mapping Comments
	RouteID	integer	Route Identifier for sdeRoute
	Measure	float	Route Measure (ft)
	Shape	Integer	ESRI Shape Identifier
sdeISpt			Intersection point feature. An intersection point exists for each route. Two consecutive intersection points on a route define intersection segments (ISseg)
	ObjectID*	Integer	Object Identifier where each row is an object (AutoNumber)
	CTsegID	integer	Jurisdiction (CTseg) identifier
	City	varchar	Jurisdiction of the intersection
	Control	varchar	Intersection Control: Signal Stop Roundabout Cross Street TWSC – Two Way Stop Control AWSC – All Way Stop Control Signal - No Stop – T intersection; continuous green Ped Signal SPUI – Single Point Urban Intersection Cross Section Jurisdiction External
	Intersection	varchar	Name of intersecting street
	IntID	integer	Intersection location identifier. Intersection points for all routes at the same location have the same IntID
	ISID*	integer	Intersection record identifier. Each intersection point has a unique ISID.

Feature	Field Name	Data Type	Description
	Measure	float	Route Measure (ft)
	RouteID	integer	Route Identifier for sdeRoute
	Shape	Integer	ESRI Shape Identifier
sdeLNpt			Lane point feature. Lane points are used to create lane segments (LNseg). Upstream lane points define changes in the number of lanes along a route.
	ObjectID*	Integer	Object Identifier where each row is an object (AutoNumber)
	Lanes	integer	Number of lanes on [RouteID] for the route direction
	Measure	float	Route Measure (ft)
	RouteID	integer	Route Identifier for sdeRoute
	Shape	Integer	ESRI Shape Identifier
sdeSLpt			Speed Limit point feature. Speed Limit points are used to create speed limit segments (SLseg). Upstream speed limit points define changes in speed limit along a route.
	ObjectID*	Integer	Object Identifier where each row is an object (AutoNumber)
	SpeedLimit	integer	Speed Limit on [RouteID]
	Measure	float	Route Measure (ft)
	RouteID	integer	Route Identifier for sdeRoute
	Shape	Integer	ESRI Shape Identifier
sdeSZpt			School Zone point feature. School Zone points are used to create School Zone speed segments (SLseg).
	ObjectID*	Integer	Object Identifier where each row is an object (AutoNumber)
	Begin_End	integer	Specifies the beginning or end of the school zone
	SZSpeed	integer	School Zone Speed Limit
	School	varchar	School Name
	AMBT	varchar	AM Begin Time for school zone speed
	AMET	varchar	AM End Time for school zone speed
	PMBT	varchar	PM Begin Time for school zone speed
	PMET	varchar	PM End Time for school zone speed
	Measure	float	Route Measure (ft)
	RouteID	integer	Route Identifier for sdeRoute

Feature	Field Name	Data Type	Description
	Shape	Integer	ESRI Shape Identifier

Tables

The following table describes the tabular data stored in the database. Tables containing route identifiers and measures can also be viewed spatially as point or line events. The prefix 'tbl' indicates tabular data.

Table	Field Name	Data Type	Description
tblASseg			Advisory Speed Segment.
	ASsegID*	integer	Advisory Speed Segment identifier based on consecutive segments along a route
	AdvSpeed	Integer	Advisory Speed
	RouteID	integer	Route Identifier for sdeRoute
	StartM	float	Upstream route measure
	EndM	float	Downstream route measure
	Offset	integer	Offset from route for display as GIS event data
tblATFTseg			Area Type & Facility Type Segments
	ATFTsegID*	integer	Area Type Facility Type Segment identifier based on consecutive segments along a route
	ATFT	integer	[Area Type][Facility Type]
	AreaType	integer	Area Type 1 = CBD 2 = CBD (Outlying) 3 = Mixed Urban 4 = Suburban 5 = Rural

Table	Field Name	Data Type	Description
	FacilityType	integer	Link Class 0 = HOV Lane 1 = Freeway 2 = Expressway 3 = Collector 4 = 6 Leg Arterial 5 = Centroid Connector 6 = Major Arterial 7 = Ramp 8 = Ramp Meter 9 = Uniform Time Link
	StartM	float	Upstream route measure
	EndM	float	Downstream route measure
	Offset	integer	Offset from route for display as GIS event data
tblCTgroup			Group of jurisdictions for aggregating results by region
	CTgroupID*	integer	Jurisdiction Group Identifier
	CTgroup	Varchar	Group name
	Cities	Varchar	Cities in the group
tblCTseg			Jurisdiction Segments
	CTsegID*	integer	Jurisdiction Segment identifier based on consecutive segments along a route
	CTseg	varchar	Jurisdiction
	RouteID	integer	Route Identifier for sdeRoute
	StartM	float	Upstream route measure
	EndM	float	Downstream route measure
	Offset	integer	Offset from route for display as GIS event data
	CTgroupID	integer	Jurisdiction Group Identifier
tblCZseg			Construction Zone Segments
	CZsegID*	integer	Construction Zone Segment identifier based on consecutive segments along a route
	CZSpeed	integer	Construction Zone Speed Limit

Table	Field Name	Data Type	Description
	CZLanes	integer	Construction Zone Lanes
	Dates	varchar	Dates construction zone is active
	Comments	varchar	Field Comments
	RouteID	integer	Route Identifier for sdeRoute
	StartM	float	Upstream route measure
	EndM	float	Downstream route measure
	Offset	integer	Offset from route for display as GIS event data
tblDatafile			Unique Run Identifier. This tables shows summary data by datafile and also provides a link to the digital video
	DatafileID*	integer	Datafile table identifier (AutoNumber)
	Datafile	varchar	Travel Run Identifier [1234][5][67][8] [1234]=RouteID [5] = PeakID [67] = EmployeeID [8] = Character [A-Z] to prevent duplicate datafiles
	RouteID	integer	Route Identifier for sdeRoute
	GPSDate	datetime	GPS Date
	minTime	datetime	Start time of run
	maxTime	datetime	End time of run
	Route	varchar	Directional Route Name
	avgSMS	decimal	Average Space Mean Speed (MPH). The average speed based on the travel time over the segment. $avgSMS = \frac{\max M - \min M}{TT}$
	avgTMS	decimal	Average Time Mean Speed (MPH). The arithmetic average of 1 second GPS speed within the segment.
	Vehicle	integer	Vehicle Identifier from TRA
	avgBearing	float	Average GPS Bearing for run
	avgPDOP	float	Average Position Dilution of Precision for run.
	EmployeeID	integer	Employee Record Identifier

Table	Field Name	Data Type	Description
	VideoEncoded	bit	1 = Video file exists for this run 0 = No video file for this run
	VideoFileName	varchar	Video filename for this run
	VideoGPSTime	datetime	Datafile GPS time that coorisponds to video elapsed time
	VideoElapsedTime	datetime	Video file elapsed time when real world time = VideoGPSTime
	DriverComment	text	General driver comment for this run
	SupervisorComment	text	Field supervisor comment
	StartM	float	Upstream route measure
	EndM	float	Downstream route measure
	Offset	integer	Offset from route for display as GIS event data
tblEmployee			Employee Table
	EmployeeID*	integer	Employee Record Identifier (AutoNumber)
	LName	varchar	Last Name
	FName	varchar	First Name
	Company	varchar	Company
tblExclude			Specific exclusions from tblISsegQCok and tblGPSsegQCok records. Summary data is deleted from the result tables but the GPS data still exists within tblSpeed
	ExcludeID*	integer	Exclusion table Identifier (AutoNumber)
	Datafile	varchar	Travel Run Identifier [1234][5][67][8] [1234]=RouteID [5] = PeakID [67] = EmployeeID [8] = Character [A-Z] to prevent duplicate datafiles
	IntSegID	integer	Intersection Segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	Comment	varchar	Reason for excluding data

Table	Field Name	Data Type	Description
	Category	varchar	Exclusion Category: Construction Driver Error Incident
tblGPSseg			Tenth of a Mile Segments (~528 ft). To insure that the tenth of a mile segments coincide with the endpoints of the intersection segments, the actual length of the GPS segments between a given intersection segment is calculated as d: $d = \frac{EndM - StartM}{Integer\left[\frac{EndM - StartM}{528}\right]}$ Where: StartM & EndM from tblISseg
	GPSsegID*	integer	Tenth of a Mile Segment Identifier based on consecutive segments along a route. $GPSsegID_i = (RouteID * 1000) + i_1^n$
	GPSseg	varchar	ISseg
	RouteID	integer	Route Identifier for sdeRoute
	StartM	decimal	Intersection StartM for first GPSseg within a given ISseg EndM for subsequent GPSseg
	EndM	decimal	StartM + d (see formula for d above)
	Offset	integer	Offset from route for display as GIS event data
	wavgSL	decimal	First Speed Limit encountered within GPSseg
	SZwavgSL	decimal	School Zone weighted average speed limit.
	FFTT	decimal	Free Flow Travel Time (sec). $FFTT = \frac{EndM - StartM}{wavgSL}$

Table	Field Name	Data Type	Description
tblGPSsegQCok			Summary data for each run grouped by tenth of a mile segment. Before data is entered into this table, the direction of travel is verified against the route direction, The time period is checked against tblPeriod, and records from tblExclude are deleted.
	GPSsegQCID*	integer	Record Identifier for tblGPSsegQCok
	Datafile	varchar	Travel Run Identifier [1234][5][67][8] [1234]=RouteID [5] = PeakID [67] = EmployeeID [8] = Character [A-Z] to prevent duplicate datafiles
	GPSDate	datetime	GPS Date
	RouteID	integer	Route Identifier for sdeRoute
	GPSsegID	integer	Tenth of a Mile Segment Identifier based on consecutive segments along a route. $GPSsegID_i = (RouteID * 1000) + i_1^n$
	IntSegID	integer	Intersection Segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	PeriodID	integer	Time Period Identifier. Several PeriodID's can be within one PeakID
	minT	datetime	Minimum GPS Time
	maxT	datetime	Maximum GPS Time
	minM	decimal	Minimum Route Measure
	maxM	decimal	Maximum Route Measure
	avgTMS	decimal	Average Time Mean Speed (MPH). The arithmetic average of 1 second GPS speed within the segment.
	wavgSL	decimal	First Speed Limit within GPSseg
	TT	decimal	Travel Time (sec) = maxT-minT

Table	Field Name	Data Type	Description
	FFTT	decimal	Free Flow Travel Time (sec). $FFTT = \frac{EndM - StartM}{wavgSL}$
	TTMD	decimal	Mid-Day Travel Time (seconds)
	SpeedMD	deciaml	Mid-Day Speed (MPH)
	segDelay	decimal	Segment Delay (sec) FFTT-TT
	stopDelay	decimal	Stop Delay (sec) Amount of time speed is < 3 MPH
tblISseg			Intersection Segments
	ISsegID*	integer	Intersection Segment Identifier based on consecutive intersection segments along a route. $ISsegID_i = (RouteID * 1000) + i_1^n$
	ISseg	varchar	[Upstream Intersection] to [Downstream Intersection]
	RouteID	integer	Route Identifier for sdeRoute
	StartM	decimal	Upstream route measure
	EndM	decimal	Downstream route measure
	Offset	integer	Offset from route for display as GIS event data
	Control	varchar	Intersection Control: Signal Cross Street TWSC – Two Way Stop Control AWSC – All Way Stop Control Signal - No Stop – T intersection; continuous green Ped Signal SPUI – Single Point Urban Intersection Cross Section Jurisdiction
	CTsegID	integer	Jurisdiction Segment identifier
	City	varchar	Jurisdiction

Table	Field Name	Data Type	Description
	wavgSL	decimal	Weighted Average Speed Limit. Weighted by length of speed zones where the speed limit changes between intersections $wavgSL = \frac{\sum_i SL_i \cdot d_i}{\sum_i d}$ where: SL = Speed Limit d = Length of Speed Limit zone within ISseg
	SZwavgSL	integer	School Zone weighted average speed limit. wavgSL including the length of the school zone and school zone speed within the intersection segment
	FFTT	decimal	Free Flow Travel Time. $FFTT = \frac{EndM - StartM}{wavgSL}$
	IntSegID*	integer	Intersection Segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	ATFTsegID	integer	Area Type Facility Type Segment identifier based on consecutive segments along a route
	ATFT	integer	[Area Type][Facility Type]
	Lanes	integer	Number of lanes on [RouteID] for the route direction
	LanesRU	varchar	Lanes grouped by area type for summary tables Urban All Rural 1 Rural 2+
	AMpeakDir	integer	1 if Peak Direction.
	MDpeakDir	integer	1 if Peak Direction.
	PMpeakDir	integer	1 if Peak Direction.

Table	Field Name	Data Type	Description
tblISsegQCok			Summary data for each run grouped by Intersection Segment. Before data is entered into this table, the direction of travel is verified against the route direction, there must be a GPS point within 300 feet of the upstream and downstream endpoints (ISpt), the time period is checked against tblPeriod, and records from tblExclude are deleted.
	ISsegQCID*	integer	Record Identifier for tblISsegQCok (AutoNumber)
	Datafile	varchar	Travel Run Identifier [1234][5][67][8] [1234]=RouteID [5] = PeakID [67] = EmployeeID [8] = Character [A-Z] to prevent duplicate datafiles
	GPSDate	datetime	GPS Date
	RouteID	integer	Route Identifier for sdeRoute
	ISsegID	integer	Intersection Segment Identifier based on consecutive intersection segments along a route. $ISsegID_i = (RouteID * 1000) + i_1^n$
	IntSegID	integer	Intersection Segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	PeriodID	integer	Time Period Identifier. Several PeriodID's can be within one PeakID
	minT	datetime	Minimum GPS Time
	maxT	datetime	Maximum GPS Time
	minM	decimal	Minimum Route Measure
	maxM	decimal	Maximum Route Measure
	avgSpeed	decimal	Average Speed avgSMS if (EndM-StartM) ≥ 1000 ft avgTMS if (EndM-StartM) < 1000 ft

Table	Field Name	Data Type	Description
	avgSMS	decimal	Average Space Mean Speed (MPH). The average speed based on the travel time over the segment. $avgSMS = \frac{\max M - \min M}{TT}$
	avgTMS	decimal	Average Time Mean Speed (MPH). The arithmetic average of 1 second GPS speed within the segment.
	wavgSL	float	Weighted Average Speed Limit. Weighted by length of speed zones where the speed limit changes between intersections $wavgSL = \frac{\sum_i SL_i \cdot d_i}{\sum_i d}$ where: SL = Speed Limit d = Length of Speed Limit zone within ISseg
	SZsegID	integer	School Zone Segment Identifier if the run is in an active school zone
	TT	decimal	Travel Time (sec) = maxT-minT
	FFTT	float	Free Flow Travel Time (sec). $FFTT = \frac{\min T - \max T}{wavgSL}$
	TTMD	decimal	Mid-Day Travel Time (seconds)
	SpeedMD	deciaml	Mid-Day Speed (MPH)
	Qmeasure	decimal	The first route measure within a segment where the speed < 3 MPH
	Qlength	decimal	Position in Queue (ft) = EndM – Qmeasure
	segDelay	decimal	Segment Delay (sec) FFTT-TT
	stopDelay	decimal	Stop Delay (sec) Amount of time speed is < 3 MPH
	ctrlDelay	decimal	Stop Delay * 1.2 (per HCM 2000)

Table	Field Name	Data Type	Description
	LOS	char	Level Of Service from the Highway Capacity Manual. Value is from one of the following tables depending on the downstream control: tblSignalLOS tblUnSignalLOS tblUrbanLOS
tblLanesUTDF			Intersection approach geometry in the Universal Traffic Data Format (UTDF)
	Street1	varchar	First intersecting street
	Street2	varchar	Second intersecting street
	IntID*	integer	Intersection location identifier. Intersection points for all routes at the same location have the same IntID
	RecordName*	varchar	Lanes or Shared Lanes - The record represent the number of lanes specified in each lane group field Shared – The records represents the UTFD share code for each lane group field Through Lane Share 0 = No Sharing 1 = Shared with Left 2 = Shared with Right 3 = Shared with Both Left Lane Share 0 = No Sharing 1 = Shared with Left2 or U-turn 2 = Shared with Right (T-intersection)
	NBL2	integer	Northbound Secondary Left Turn or U-Turn Lane
	NBL	integer	Northbound Left Turn Lane
	NBT	integer	Northbound Through Lane
	NBR	integer	Northbound Right Turn Lane

Table	Field Name	Data Type	Description
	NBR2	integer	Northbound Secondary Right Turn Lane
	SBL2	integer	Southbound Secondary Left Turn or U-Turn Lane
	SBL	integer	Southbound Left Turn Lane
	SBT	integer	Southbound Through Lane
	SBR	integer	Southbound Right Turn Lane
	SBR2	integer	Southbound Secondary Right Turn Lane
	EBL2	integer	Eastbound Secondary Left Turn or U-Turn Lane
	EBL	integer	Eastbound Left Turn Lane
	EBT	integer	Eastbound Through Lane
	EBR	integer	Eastbound Right Turn Lane
	EBR2	integer	Eastbound Secondary Right Turn Lane
	WBL2	integer	Westbound Secondary Left Turn or U-Turn Lane
	WBL	integer	Westbound Left Turn Lane
	WBT	integer	Westbound Through Lane
	WBR	integer	Westbound Right Turn Lane
	WBR2	integer	Westbound Secondary Right Turn Lane
	NEL2	integer	Northeast bound Secondary Left Turn or U-Turn Lane
	NEL	integer	Northeast bound Left Turn Lane
	NET	integer	Northeast bound Through Lane
	NER	integer	Northeast bound Right Turn Lane
	NER2	integer	Northeast bound Secondary Right Turn Lane
	SEL2	integer	Southeast bound Secondary Left Turn or U-Turn Lane
	SEL	integer	Southeast bound Left Turn Lane
	SET	integer	Southeast bound Through Lane
	SER	integer	Southeast bound Right Turn Lane
	SER2	integer	Southeast bound Secondary Right Turn Lane
	NWL2	integer	Northwest bound Secondary Left Turn or U-Turn Lane
	NWL	integer	Northwest bound Left Turn Lane
	NWT	integer	Northwest bound Through Lane
	NWR	integer	Northwest bound Right Turn Lane
	NWR2	integer	Northwest bound Secondary Right Turn Lane

Table	Field Name	Data Type	Description
	SWL2	integer	Southwest bound Secondary Left Turn or U-Turn Lane
	SWL	integer	Southwest bound Left Turn Lane
	SWT	integer	Southwest bound Through Lane
	SWR	integer	Southwest bound Right Turn Lane
	SWR2	integer	Southwest bound Secondary Right Turn Lane
	X	float	X coordinate; State Plane NAD 83 Arizona Central feet
	Y	float	Y coordinate; State Plane NAD 83 Arizona Central feet
tblLNseg			Lane Segments
	LNsegID*	integer	Segment Identifier for tblLNsegID
	RouteID	integer	Route Identifier for sdeRoute
	StartM	float	Upstream route measure
	EndM	float	Downstream route measure
	Lanes	integer	Number of lanes on [RouteID] for the route direction
	Offset	integer	Offset from route for display as GIS event data
tblPeriod			Time Periods. Data outside these time period is not included in the summary tables or results
	PeriodID*	integer	Time Period Identifier. Several PeriodID's can be within one PeakID
	StartTime	datetime	Time Period Start Time. Includes 5 minutes before dST if necessary.
	EndTime	datetime	Time Period End Time. Includes 5 minutes after dET if necessary.
	dST	datetime	Display Start Time for period
	dET	datetime	Display End Time for period
	Offset	integer	Offset from route for display as GIS event data
	PeakID	integer	Peak Period Identifier. Several PeriodID's can be within one PeakID 1 = AM 2 = Mid-Day (MD) 3 = PM

Table	Field Name	Data Type	Description
tblSignalLOS			Signalized Intersection Level Of Service. The following intersection control applies for this LOS table: Signal Signal - No Stop SPUI Ped Signal
	CtrlDelayLL	decimal	Control Delay Lower Limit (sec/veh)
	CtrlDelayUL	decimal	Control Delay Upper Limit (sec/veh)
	LOS*	char	Level Of Service
tblSLseg			Speed Limit Segments
	SLsegID*	integer	Speed Limit Segment Identifier based on consecutive speed limit changes along a route. $SLsegID_i = (RouteID * 1000) + i_1^n$
	SLseg	integer	Speed Limit (MPH)
	RouteID	integer	Route Identifier for sdeRoute
	StartM	decimal	Upstream route measure
	EndM	decimal	Downstream route measure
	Offset	integer	Offset from route for display as GIS event data
tblSpeed			1 second GPS positions
	SpeedID*	integer	1 second GPS position Identifier (Auto Number)
	RouteID	integer	Route Identifier for sdeRoute
	Speed	decimal	GPS Speed in MPH
	Bearing	decimal	GPS Bearing relative to last position
	PDOP	decimal	Position Dilution of Precision – a measure of the current satellite geometry. The lower the PDOP value, the more accurate the GPS positions.
	GPSDate	datetime	GPS Date
	GPSTime	datetime	GPS Time

Table	Field Name	Data Type	Description
	Datafile	varchar	Travel Run Identifier [1234][5][67][8] [1234]=RouteID [5] = PeakID [67] = EmployeeID [8] = Character [A-Z] to prevent duplicate datafiles
	Measure	decimal	Route Measure (ft)
	Accel	decimal	Acceleration (ft/sec^2) – calculated using a central difference scheme $a_i = \frac{v_{i+1} - v_{i-1}}{t_{i+1} - t_{i-1}}$ where: i = GPS point a = acceleration for GPS point i v = speed t = GPS Time
	AvgAcc5pt	decimal	Five point moving average acceleration (ft/sec^2) $a_{avg} = \frac{1}{5} \cdot \sum_{i-2}^{i+2} a_i$ where: i = GPS point a = acceleration for GPS point i
	Offset	decimal	Distance of GPS position from route (ft)

Table	Field Name	Data Type	Description
	AvgOff5pt	decimal	Five point moving average Offset (ft) $O_{avg} = \frac{1}{5} \cdot \sum_{i-2}^{i+2} O_i$ where: i = GPS point O = Offset for GPS point i
	ISsegID	integer	Intersection Segment Identifier based on consecutive intersection segments along a route. $ISsegID_i = (RouteID * 1000) + i_1^n$
	IntSegID	integer	Intersection Segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	SLSegID	integer	Speed Limit Segment Identifier based on consecutive speed limit changes along a route. $SLsegID_i = (RouteID * 1000) + i_1^n$
	SL	integer	Speed Limit (MPH)
	GPSsegID	integer	Tenth of a Mile Segment Identifier based on consecutive segments along a route. $GPSsegID_i = (RouteID * 1000) + i_1^n$
tblSummary1979			Summary results from the 1979 travel speed study
	RouteID	integer	Route Identifier for sdeRoute
	FromIntID	integer	Upstream intersection location identifier
	ToIntID	integer	Downstream intersection location identifier
	Route	varchar	Directional Route Name from sdeRoute
	FromInt	varchar	Upstream intersection name
	ToInt	varchar	Downstream intersection name
	Route1979	varchar	Route name from 1979 study

Table	Field Name	Data Type	Description
	FromInt1979	varchar	Upstream intersection name from 1979 study
	ToInt1979	varchar	Downstream intersection name from 1979 study
	Jurisdiction	varchar	Jurisdiction from 1979 study
	PkDir	varchar	Peak direction from 1979 study
	PMSpeedPkDir	float	PM Speed in the peak direction from 1979 study
	OffPkDir	varchar	Off peak direction from 1979 study
	PMSpeedOffPkDir	float	PM Speed in the off peak direction from 1979 study
	MDSpeed	float	Mid-day Speed from 1979 study
	ADT	float	Average Daily Traffic from 1979 study
	SpeedLimit	float	Speed Limit from 1979 study
	SummaryYear	integer	1979
	PMSpeed	float	Lowest PM speed between peak and off peak from 1979 study
	StartM	decimal	Upstream route measure
	EndM	decimal	Downstream route measure
	IntSegID1979	integer	$IntSegID1979_i = (FromIntID_{Upstream} * 10000) + (ToIntID_{Downstream})$
	IntSegID2003	integer	Not Null where IntSegID1979 contained within intersection segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	Offset	integer	Offset from route for display as GIS event data
	Comments	varchar	coding problems
tblSummary1986			Summary results from the 1986 travel speed study
	RouteID	integer	Route Identifier for sdeRoute
	FromIntID	integer	Upstream intersection location identifier
	ToIntID	integer	Downstream intersection location identifier
	Route	varchar	Directional Route Name from sdeRoute
	FromInt	varchar	Upstream intersection name
	ToInt	varchar	Downstream intersection name
	Route1986	varchar	Route name from 1986 study
	FromInt1986	varchar	Upstream intersection name from 1986 study
	ToInt1986	varchar	Downstream intersection name from 1986 study

Table	Field Name	Data Type	Description
	Jurisdiction	varchar	Jurisdiction from 1986 study
	FacilityType	varchar	Facility Type from 1986 study
	AreaType	float	Area type from 1986 study
	MDSpeed	float	Mid-day Speed from 1986 study
	PMSpeed	float	PM speed from 1986 study
	PM445545Speed	float	? speed from 1986 study
	ADT	float	Average Daily Traffic from 1986 study
	SpeedLimit	float	Speed Limit from 1986 study
	SummaryYear	integer	1986
	StartM	decimal	Upstream route measure
	EndM	decimal	Downstream route measure
	IntSegID1986	integer	$IntSegID1986_i = (FromIntID_{Upstream} * 10000) + (ToIntID_{Downstream})$
	IntSegID2003	integer	Not Null where IntSegID1986 contained within intersection segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	Offset	integer	Offset from route for display as GIS event data
	Comments	varchar	coding problems
tblSummary1993			Summary results from the 1993 travel speed study
	RouteID	integer	Route Identifier for sdeRoute
	FromIntID	integer	Upstream intersection location identifier
	ToIntID	integer	Downstream intersection location identifier
	Route	varchar	Directional Route Name from sdeRoute
	FromInt	varchar	Upstream intersection name
	ToInt	varchar	Downstream intersection name
	Route1993	varchar	Route name from 1993 study
	Suffix1993	varchar	Route name suffix from 1993 study
	FromInt1993	varchar	Upstream intersection name from 1993 study
	ToInt1993	varchar	Downstream intersection name from 1993 study
	AATRVTIME	float	Average AM travel time from 1993 study
	AMTRVTIME	float	Average MD travel time from 1993 study

Table	Field Name	Data Type	Description
	APTRVTIME	float	Average PM travel time from 1993 study
	AATRVSPD	float	Average AM travel speed from 1993 study
	AMTRVSPD	float	Average MD travel speed from 1993 study
	APTRVSPD	float	Average PM travel speed from 1993 study
	AARUNTIME	float	Average AM Running time from 1993 study
	AMRUNTIME	float	Average MD Running time from 1993 study
	APRUNTIME	float	Average PM Running time from 1993 study
	AACHG_DT	float	from 1993 study
	AMCHG_DT	float	from 1993 study
	APCHG_DT	float	from 1993 study
	AAINC_DT	float	from 1993 study
	AMINC_DT	float	from 1993 study
	APINC_DT	float	from 1993 study
	LENGTH1993	float	Segment Length from 1993 study
	CLASS1993	varchar	from 1993 study
	AREATYPE1993	float	Area Type from 1993 study
	FCLASS1993	varchar	Functional class from 1993 study
	VOLUME1993	float	Average Daily Traffic from 1993 study
	PLACE1993	varchar	Jurisdiction from 1993 study
	SummaryYear	integer	1986
	StartM	decimal	Upstream route measure
	EndM	decimal	Downstream route measure
	IntSegID1993	integer	$IntSegID1993_i = (FromIntID_{Upstream} * 10000) + (ToIntID_{Downstream})$
	IntSegID2003	integer	Not Null where IntSegID1986 contained within intersection segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	Offset	integer	Offset from route for display as GIS event data
	Comments	varchar	coding problems
	avgSpeedAM2003	float	Average AM speed from 2003 study
	avgSpeedMD2003	float	Average MD speed from 2003 study

Table	Field Name	Data Type	Description
	avgSpeedPM2003	float	Average PM speed from 2003 study
	chngAM93_03	float	Change in average speed between 1993 and 2003: avgSpeedAM2003 - AATRVSPD
	chngMD93_03	float	Change in average speed between 1993 and 2003: avgSpeedMD2003 - AMTRVSPD
	chngPM93_03	float	Change in average speed between 1993 and 2003: avgSpeedPM2003 - APTRVSPD
tblSZseg			School Zone Segments. School Zone times are not posted in the PAG region
	SZsegID*	integer	School Zone Segment Identifier
	RouteID	integer	Route Identifier for sdeRoute
	SZSpeed	integer	School Zone Speed Limit
	AMBeginTime	datetime	School Zone Begin Time for the AM
	AMEndTime	datetime	School Zone End Time for the AM
	PMBeginTime	datetime	School Zone Begin Time for the PM
	PMEndTime	datetime	School Zone End Time for the PM
	Comment	varchar	Record Comments
	StartM	decimal	Upstream route measure
	EndM	decimal	Downstream route measure
	Offset	integer	Offset from route for display as GIS event data
tblstat			Two-sided t-distribution statistics used to compute probability of error
	n*	integer	number of runs
	t99	decimal	t-statistic for a 99% confidence interval
	t95	decimal	t-statistic for a 95% confidence interval
	t90	decimal	t-statistic for a 90% confidence interval
	t85	decimal	t-statistic for a 85% confidence interval
	t80	decimal	t-statistic for a 80% confidence interval
	t75	decimal	t-statistic for a 75% confidence interval

Table	Field Name	Data Type	Description
tblUnSignalLOS			Stop Controlled Intersection Level Of Service. The following intersection control applies for this LOS table: AWSC Flashing Red Roundabout TWSC Stop
	CtrlDelayLL	decimal	Control Delay Lower Limit (sec/veh)
	CtrlDelayUL	decimal	Control Delay Upper Limit (sec/veh)
	LOS*	char	Level Of Service
tblUrbanLOS			Uncontrolled Intersection Level Of Service. The following intersection control applies for this LOS table: City Limit Cross Section Cross Street Flashing Yellow Jurisdiction
	SpeedLL	float	Average Speed Lower Limit
	SpeedUL	float	Average Speed Upper Limit
	FFSLL	float	Free Flow Speed Lower Limit
	FFSUL	float	Free Flow Speed Upper Limit
	LOS*	char(1)	Level Of Service
tblVoiceData			Driver Comments
	VoiceID*	integer	Record Identifier for tblVoiceData (AutoNumber)
	Datafile	varchar	Travel Run Identifier [1234][5][67][8] [1234]=RouteID [5] = PeakID [67] = EmployeeID [8] = Character [A-Z] to prevent duplicate datafiles
	GPSTime	datetime	GPS Time

Table	Field Name	Data Type	Description
	CommentType	varchar	Comment Category: Bus Incident Ped Crossing Train School Zone Weather Accident Other
	Comment	text	Driver Comment

Views and Queries

The following table lists the SQL views: queries of the data stored in the feature datasets and tables. If exported to MS Access, the views are a snapshot of the data returned by the query and appear as tabular data. The prefix 'vw' indicates a view of the data.

Feature	Field Name	Data Type	Description
vwATFTLanePeakAvgSpeed			Summary of travel speed data grouped by Area Type, Facility Type, Number of Lanes and Peak Period
	PeakID	integer	Peak Period Identifier 1 = AM 2 = Mid-Day (MD) 3 = PM
	StartTime	varchar	Peak Period Start Time
	EndTime	varchar	Peak Period End Time
	ATFT		[Area Type][Facility Type]
	AreaType	integer	Area Type 1 = CBD 2 = CBD (Outlying) 3 = Mixed Urban 4 = Suburban 5 = Rural
	FunctionalClass	integer	Link Class 0 = HOV Lane 1 = Freeway 2 = Expressway 3 = Collector 4 = 6 Leg Arterial 5 = Centroid Connector 6 = Major Arterial 7 = Ramp 8 = Ramp Meter 9 = Uniform Time Link

Feature	Field Name	Data Type	Description
	LanesRU	varchar	Lanes grouped by area type for summary tables Urban All Rural 1 Rural 2+
	Dist	float	Sum of segment distances in summary (ft)
	wavgSpeed	float	Weighted Average Travel Speed (MPH). Weighted by intersection segment length. $$wavgSpeed = \frac{\sum_i avgSpeed_i \cdot d_i}{\sum_i d}$$ where: avgSpeed = average speed over intersection segment (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)
	wavgSL		Weighted Average Speed Limit (MPH). Weighted by length of speed zones where the speed limit changes between intersections $$wavgSL = \frac{\sum_i SL_i \cdot d_i}{\sum_i d}$$ where: SL = Weighted Average Speed Limit (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)
	CI	Decimal	Congestion Index or Percent Posted Speed = wavgSpeed/wavgSL*100

Feature	Field Name	Data Type	Description
	CIMD	float	Percent of Mid-Day Speed = wavgSpeed/wavgSpeedMD
	wavgRunSpeed		Weighted Average Running Speed (MPH). Weighted by intersection segment length. $$wavgRunSpeed = \frac{\sum_i avgRunSpeed_i \cdot d_i}{\sum_i d}$$ where: avgRunSpeed = Average Running Speed over intersection segment (excluding stop time) d = Length of Intersection segment (from tblISseg)
	avgTTmi	decimal	Average Travel Time per Mile (sec/mi).
	avgFFTTmi	decimal	Average Free Flow Travel Time per Mile (sec/mi)
	stopDelayMi	decimal	Sum of Stop Delay divided by total miles traveled (sec/mi)
	segDelayMi	decimal	Sum of Segment Delay divided by total miles traveled (sec/mi)
	ctrlDelayMi	decimal	Sum of Segment Control Delay divided by total miles traveled (sec/mi)
	WavgError90	float	Average 90% confidence interval error weighted by segment length
	WavgError85	float	Average 85% confidence interval error weighted by segment length
vwATFTPeakAvgSpeed			Summary of travel speed data grouped by Area Type, Facility Type, and Peak Period
	PeakID	integer	Peak Period Identifier 1 = AM 2 = Mid-Day (MD) 3 = PM
	StartTime	varchar	Peak Period Start Time

Feature	Field Name	Data Type	Description
	EndTime	varchar	Peak Period End Time
	ATFT		[Area Type][Facility Type]
	AreaType	integer	Area Type 1 = CBD 2 = CBD (Outlying) 3 = Mixed Urban 4 = Suburban 5 = Rural
	FunctionalClass	integer	Link Class 0 = HOV Lane 1 = Freeway 2 = Expressway 3 = Collector 4 = 6 Leg Arterial 5 = Centroid Connector 6 = Major Arterial 7 = Ramp 8 = Ramp Meter 9 = Uniform Time Link
	Dist	float	Sum of segment distances in summary (ft)
	wavgSpeed	float	Weighted Average Travel Speed (MPH). Weighted by intersection segment length. $wavgSpeed = \frac{\sum_i avgSpeed_i \cdot d_i}{\sum_i d}$ where: avgSpeed = average speed over intersection segment (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)

Feature	Field Name	Data Type	Description
	wavgSL		Weighted Average Speed Limit (MPH). Weighted by length of speed zones where the speed limit changes between intersections $$wavgSL = \frac{\sum_i SL_i \cdot d_i}{\sum_i d}$$ where: SL = Weighted Average Speed Limit (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)
	CI	Decimal	Congestion Index or Percent Posted Speed = wavgSpeed/wavgSL*100
	CIMD	float	Percent of Mid-Day Speed = wavgSpeed/wavgSpeedMD
	wavgRunSpeed		Weighted Average Running Speed (MPH). Weighted by intersection segment length. $$wavgRunSpeed = \frac{\sum_i avgRunSpeed_i \cdot d_i}{\sum_i d}$$ where: avgRunSpeed = Average Running Speed over intersection segment (excluding stop time) d = Length of Intersection segment (from tblISseg)
	avgTTmi	decimal	Average Travel Time per Mile (sec/mi).
	avgFFTTmi	decimal	Average Free Flow Travel Time per Mile (sec/mi)
	stopDelayMi	decimal	Sum of Stop Delay divided by total miles traveled (sec/mi)

Feature	Field Name	Data Type	Description
	segDelayMi	decimal	Sum of Segment Delay divided by total miles traveled (sec/mi)
	ctrlDelayMi	decimal	Sum of Segment Control Delay divided by total miles traveled (sec/mi)
vwATLanePeakAvgSpeed			Summary of travel speed data grouped by Area Type, Number of Lanes and Peak Period
	PeakID	integer	Peak Period Identifier 1 = AM 2 = Mid-Day (MD) 3 = PM
	StartTime	varchar	Peak Period Start Time
	EndTime	varchar	Peak Period End Time
	AreaType	integer	Area Type 1 = CBD 2 = CBD (Outlying) 3 = Mixed Urban 4 = Suburban 5 = Rural
	LanesRU	varchar	Lanes grouped by area type for summary tables Urban All Rural 1 Rural 2+
	Dist	float	Sum of segment distances in summary (ft)

Feature	Field Name	Data Type	Description
	wavgSpeed	float	Weighted Average Travel Speed (MPH). Weighted by intersection segment length. $$wavgSpeed = \frac{\sum_i avgSpeed_i \cdot d_i}{\sum_i d}$$ where: avgSpeed = average speed over intersection segment (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)
	wavgSL		Weighted Average Speed Limit (MPH). Weighted by length of speed zones where the speed limit changes between intersections $$wavgSL = \frac{\sum_i SL_i \cdot d_i}{\sum_i d}$$ where: SL = Weighted Average Speed Limit (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)
	CI	Decimal	Congestion Index or Percent Posted Speed = wavgSpeed/wavgSL*100
	CIMD	float	Percent of Mid-Day Speed = wavgSpeed/wavgSpeedMD

Feature	Field Name	Data Type	Description
	wavgRunSpeed		Weighted Average Running Speed (MPH). Weighted by intersection segment length. $$wavgRunSpeed = \frac{\sum_i avgRunSpeed_i \cdot d_i}{\sum_i d}$$ where: avgRunSpeed = Average Running Speed over intersection segment (excluding stop time) d = Length of Intersection segment (from tblISseg)
	avgTTmi	decimal	Average Travel Time per Mile (sec/mi).
	avgFFTTmi	decimal	Average Free Flow Travel Time per Mile (sec/mi)
	stopDelayMi	decimal	Sum of Stop Delay divided by total miles traveled (sec/mi)
	segDelayMi	decimal	Sum of Segment Delay divided by total miles traveled (sec/mi)
	ctrlDelayMi	decimal	Sum of Segment Control Delay divided by total miles traveled (sec/mi)
	WavgError90	float	Average 90% confidence interval error weighted by segment length
	WavgError85	float	Average 85% confidence interval error weighted by segment length
vwCityAvgSpeed			Summary of travel speed data grouped by Jurisdiction
vwCityAvgSpeedArt			Summary of Arterial travel speed data grouped by Jurisdiction
vwCityAvgSpeedFwy			Summary of Freeway travel speed data grouped by Jurisdiction
	City	varchar	Jurisdiction
	Dist	float	Sum of segment distances in summary (ft)

Feature	Field Name	Data Type	Description
	wavgSpeed	float	Weighted Average Travel Speed (MPH). Weighted by intersection segment length. $$wavgSpeed = \frac{\sum_i avgSpeed_i \cdot d_i}{\sum_i d}$$ where: avgSpeed = average speed over intersection segment (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)
	wavgSL		Weighted Average Speed Limit (MPH). Weighted by length of speed zones where the speed limit changes between intersections $$wavgSL = \frac{\sum_i SL_i \cdot d_i}{\sum_i d}$$ where: SL = Weighted Average Speed Limit (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)
	CI	Decimal	Congestion Index or Percent Posted Speed = wavgSpeed/wavgSL*100
	CIMD	float	Percent of Mid-Day Speed = wavgSpeed/wavgSpeedMD

Feature	Field Name	Data Type	Description
	wavgRunSpeed		Weighted Average Running Speed (MPH). Weighted by intersection segment length. $$wavgRunSpeed = \frac{\sum_i avgRunSpeed_i \cdot d_i}{\sum_i d}$$ where: avgRunSpeed = Average Running Speed over intersection segment (excluding stop time) d = Length of Intersection segment (from tblISseg)
	avgTTmi	decimal	Average Travel Time per Mile (sec/mi).
	avgFFTTmi	decimal	Average Free Flow Travel Time per Mile (sec/mi)
	stopDelayMi	decimal	Sum of Stop Delay divided by total miles traveled (sec/mi)
	segDelayMi	decimal	Sum of Segment Delay divided by total miles traveled (sec/mi)
	ctrlDelayMi	decimal	Sum of Segment Control Delay divided by total miles traveled (sec/mi)
vwCityFTMiles			Directional Miles and Miles Driven grouped by City and Facility Type
	City	varchar	Jurisdiction

Feature	Field Name	Data Type	Description
	Facility	integer	Link Class 0 = HOV Lane 1 = Freeway 2 = Expressway 3 = Collector 4 = 6 Leg Arterial 5 = Centroid Connector 6 = Major Arterial 7 = Ramp 8 = Ramp Meter 9 = Uniform Time Link
	DirectionalMiles	decimal	Directional Miles
	GPSMilesAM	decimal	Number of Miles traveled in the AM during the GPS travel speed study
	GPSMilesMD	decimal	Number of Miles traveled in the Mid-Day during the GPS travel speed study
	GPSMilesPM	decimal	Number of Miles traveled in the PM during the GPS travel speed study
	GPSMilesTotal	decimal	Number of Miles traveled dring the GPS travel speed study
vwCityMiles			Directional Miles and Miles Driven grouped by City
	City	varchar	Jurisdiction
	DirectionalMiles	decimal	Directional Miles
	GPSMilesAM	decimal	Number of Miles traveled in the AM during the GPS travel speed study
	GPSMilesMD	decimal	Number of Miles traveled in the Mid-Day during the GPS travel speed study
	GPSMilesPM	decimal	Number of Miles traveled in the PM during the GPS travel speed study
	GPSMilesTotal	decimal	Number of Miles traveled dring the GPS travel speed study
vwCityPeakAvgSpeed			Summary of travel speed data grouped by City and Peak Period

Feature	Field Name	Data Type	Description
vwCityPeakAvgSpeedArterial			Summary of Arterial travel speed data grouped by City and Peak Period
vwCityPeakAvgSpeedFreeway			Summary of Freeway travel speed data grouped by City and Peak Period
	City	varchar	Jurisdiction
	PeakID	integer	Peak Period Identifier 1 = AM 2 = Mid-Day (MD) 3 = PM
	StartTime	varchar	Peak Period Start Time
	EndTime	varchar	Peak Period End Time
	Dist	float	Sum of segment distances in summary (ft)
	wavgSpeed	float	Weighted Average Travel Speed (MPH). Weighted by intersection segment length. $$wavgSpeed = \frac{\sum_i avgSpeed_i \cdot d_i}{\sum_i d}$$ where: avgSpeed = average speed over intersection segment (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)

Feature	Field Name	Data Type	Description
	wavgSL		Weighted Average Speed Limit (MPH). Weighted by length of speed zones where the speed limit changes between intersections $$wavgSL = \frac{\sum_i SL_i \cdot d_i}{\sum_i d}$$ where: SL = Weighted Average Speed Limit (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)
	CI	Decimal	Congestion Index or Percent Posted Speed = wavgSpeed/wavgSL*100
	CIMD	float	Percent of Mid-Day Speed = wavgSpeed/wavgSpeedMD
	wavgRunSpeed		Weighted Average Running Speed (MPH). Weighted by intersection segment length. $$wavgRunSpeed = \frac{\sum_i avgRunSpeed_i \cdot d_i}{\sum_i d}$$ where: avgRunSpeed = Average Running Speed over intersection segment (excluding stop time) d = Length of Intersection segment (from tblISseg)
	avgTTmi	decimal	Average Travel Time per Mile (sec/mi).
	avgFFTTmi	decimal	Average Free Flow Travel Time per Mile (sec/mi)
	stopDelayMi	decimal	Sum of Stop Delay divided by total miles traveled (sec/mi)

Feature	Field Name	Data Type	Description
	segDelayMi	decimal	Sum of Segment Delay divided by total miles traveled (sec/mi)
	ctrlDelayMi	decimal	Sum of Segment Control Delay divided by total miles traveled (sec/mi)
vwExclude			View of tblExclude. Can be viewed as GIS line event data
	Datafile	varchar	Travel Run Identifier [1234][5][67][8] [1234]=RouteID [5] = PeakID [67] = EmployeeID [8] = Character [A-Z] to prevent duplicate datafiles
	IntSegID	integer	Intersection Segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	Comment	Varchar	Reason for excluding data
	Category	varchar	Exclusion Category: Construction Driver Error Incident
	Route	varchar	Directional Route Name
	RouteID	Integer	Route Identifier for sdeRoute
	StartM	Float	Upstream route measure
	EndM	Float	Downstream route measure
	Offset	Integer	Offset from route for display as GIS event data

Feature	Field Name	Data Type	Description
vwFTMiles			Directional miles in the travel speed study by facility type
	Facility	integer	Link Class 0 = HOV Lane 1 = Freeway 2 = Expressway 3 = Collector 4 = 6 Leg Arterial 5 = Centroid Connector 6 = Major Arterial 7 = Ramp 8 = Ramp Meter 9 = Uniform Time Link
	DirectionalMiles	decimal	Directional Miles
vwFTPeakAvgSpeed			Summary of travel speed data grouped by Facility Type and Peak Period
	PeakID	integer	Peak Period Identifier 1 = AM 2 = Mid-Day (MD) 3 = PM
	StartTime	varchar	Peak Period Start Time
	EndTime	varchar	Peak Period End Time

Feature	Field Name	Data Type	Description
	FunctionalClass	integer	Link Class 0 = HOV Lane 1 = Freeway 2 = Expressway 3 = Collector 4 = 6 Leg Arterial 5 = Centroid Connector 6 = Major Arterial 7 = Ramp 8 = Ramp Meter 9 = Uniform Time Link
	Dist	float	Sum of segment distances in summary (ft)
	wavgSpeed	float	Weighted Average Travel Speed (MPH). Weighted by intersection segment length. $$wavgSpeed = \frac{\sum_i avgSpeed_i \cdot d_i}{\sum_i d}$$ where: avgSpeed = average speed over intersection segment (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)

Feature	Field Name	Data Type	Description
	wavgSL		Weighted Average Speed Limit (MPH). Weighted by length of speed zones where the speed limit changes between intersections $$wavgSL = \frac{\sum_i SL_i \cdot d_i}{\sum_i d}$$ where: SL = Weighted Average Speed Limit (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)
	CI	Decimal	Congestion Index or Percent Posted Speed = wavgSpeed/wavgSL*100
	CIMD	float	Percent of Mid-Day Speed = wavgSpeed/wavgSpeedMD
	wavgRunSpeed		Weighted Average Running Speed (MPH). Weighted by intersection segment length. $$wavgRunSpeed = \frac{\sum_i avgRunSpeed_i \cdot d_i}{\sum_i d}$$ where: avgRunSpeed = Average Running Speed over intersection segment (excluding stop time) d = Length of Intersection segment (from tblISseg)
	avgTTmi	decimal	Average Travel Time per Mile (sec/mi).
	avgFFTTmi	decimal	Average Free Flow Travel Time per Mile (sec/mi)
	stopDelayMi	decimal	Sum of Stop Delay divided by total miles traveled (sec/mi)

Feature	Field Name	Data Type	Description
	segDelayMi	decimal	Sum of Segment Delay divided by total miles traveled (sec/mi)
	ctrlDelayMi	decimal	Sum of Segment Control Delay divided by total miles traveled (sec/mi)
	WavgError90	float	Average 90% confidence interval error weighted by segment length
	WavgError85	float	Average 85% confidence interval error weighted by segment length
vwGPSsegAvgSpeedPeak			Summary of all travel runs by tenth of a mile segment by Peak Period
vwGPSsegAvgSpeedPeriod			Summary of all travel runs by tenth of a mile segment by 15-minute time period
	RouteID	Integer	Route Identifier for sdeRoute
	GPSsegID	Integer	Tenth of a Mile Segment Identifier based on consecutive segments along a route. $GPSsegID_i = (RouteID * 1000) + i_1^n$
	Route	varchar	Directional Route Name
	GPSseg	varchar	ISseg
	PeakID	integer	Peak Period Identifier 1 = AM 2 = Mid-Day (MD) 3 = PM
	StartTime	varchar	Peak Period Start Time
	EndTime	varchar	Peak Period End Time
	Runs	Integer	Number of Travel Speed Runs
	avgTMS	Decimal	Average Time Mean Speed (MPH). The arithmetic average of 1 second GPS speed within the segment.
	avgSpeedMD	decimal	Average Mid-Day Speed (MPH)
	avgTT	Decimal	Average Travel Time (sec)
	avgFFTT	Decimal	Average Free Flow Travel Time (sec)

Feature	Field Name	Data Type	Description
	wavgSL	Decimal	First Speed Limit within GPSseg
	CI	Decimal	Congestion Index or Percent Posted Speed = avgTMS/wavgSL*100
	CIMD	float	Percent of Mid-Day Speed = wavgSpeed/wavgSpeedMD
	Stops	integer	Number of runs where the speed was <= 3 MPH for this segment
	pctStops	float	Stops/Runs
	avgSegDelay	Decimal	Average Segment Delay (sec)
	avgStopDelay	Decimal	Average Stop Delay (sec)
	avgRunTime	Decimal	Average Running Time (sec) = avgTT - avgStopDelay
	avgRunSpeed	float	Average Running Speed (mph) = speed without stop delay
	StartM	Decimal	Intersection StartM for first GPSseg within a given ISseg EndM for subsequent GPSseg
	EndM	Decimal	StartM + d
	LengthFt	Decimal	Segment Length (ft) = EndM – StartM
	Offset	integer	Offset from route for display as GIS event data
	City	varchar	Jurisdiction
	Lanes	float	Number of lanes on [RouteID] for the route direction
	ATFT	integer	[Area Type][FacilityType]
vwGPSsegSpeedRun			Summary of each travel runs by tenth of a mile segment
	RouteID	Integer	Route Identifier for sdeRoute
	GPSsegID	Integer	Tenth of a Mile Segment Identifier based on consecutive segments along a route. $GPSsegID_i = (RouteID * 1000) + i_1^n$
	Route	varchar	Directional Route Name
	GPSseg	varchar	ISseg

2002-2003 MAG Region Travel Time Data Dictionary

Feature	Field Name	Data Type	Description
	Datafile	varchar	Travel Run Identifier [1234][5][67][8] [1234]=RouteID [5] = PeakID [67] = EmployeeID [8] = Character [A-Z] to prevent duplicate datafiles
	PeriodID	integer	Time Period Identifier. Several PeriodID's can be within one PeakID
	PeakID	integer	Peak Period Identifier 1 = AM 2 = Mid-Day (MD) 3 = PM
	StartTime	varchar	Period Start Time
	EndTime	varchar	Period End Time
	avgTMS	Decimal	Average Time Mean Speed. The arithmetic average of 1 second GPS speed within the segment.
	TT	Decimal	Travel Time (sec) = maxT-minT
	FFTT	Decimal	Free Flow Travel Time (sec). $FFTT = \frac{EndM - StartM}{wavgSL}$
	wavgSL	Decimal	First Speed Limit within GPSseg
	CI	Decimal	Congestion Index or Percent Posted Speed = avgTMS/wavgSL*100
	CIMD	float	Percent of Mid-Day Speed = wavgSpeed/wavgSpeedMD
	Stop	bit	1 (true) = stop delay > 0 0 (false) = stop delay = 0
	segDelay	Decimal	Segment Delay (sec) FFTT-TT
	stopDelay	Decimal	Stop Delay (sec) Amount of time speed is < 3 MPH
	RunTime	Decimal	Running Time (sec) = TT - stopDelay

Feature	Field Name	Data Type	Description
	StartM	Decimal	Intersection StartM for first GPSseg within a given ISseg EndM for subsequent GPSseg
	EndM	Decimal	StartM + d
	LengthFt	Decimal	Segment Length (ft) = EndM – StartM
	Offset	integer	Offset from route for display as GIS event data
	City	varchar	Jurisdiction
	Lanes	float	Number of lanes on [RouteID] for the route direction
	ATFT	integer	[Area Type][Facility Type]
vwIntDelay			Summary of Intersection Delay for all approaches with data. The delay is a straight average and is un-weighted since the volume of each approach is unknown.
	RouteID	integer	Route Identifier for sdeRoute
	Approaches	integer	Number of Approaches summarized
	PeakID	integer	Peak Period Identifier 1 = AM 2 = Mid-Day (MD) 3 = PM
	StartTime	varchar	Peak Period Start Time
	EndTime	varchar	Peak Period End Time
	IntID	integer	Intersection location identifier. Intersection points for all routes at the same location have the same IntID
	IntDelay	decimal	Average Delay for all approaches within included in the study (sec/veh)
	stopDelay	decimal	Average Stop Delay (sec/veh)
	Measure	float	Route Measure (ft)
	IntName	varchar	Intersection Name

Feature	Field Name	Data Type	Description
	Control	varchar	Intersection Control: Signal Cross Street TWSC – Two Way Stop Control AWSC – All Way Stop Control Signal - No Stop – T intersection; continuous green Ped Signal SPUI – Single Point Urban Intersection Cross Section Jurisdiction
	LOS	char(1)	Level Of Service from the Highway Capacity Manual. Value is from one of the following tables depending on the downstream control: tblSignalLOS tblUnSignalLOS tblUrbanLOS
vwISsegAvgSpeedPeak			Summary of all travel runs by Intersection Segment by Peak Period
vwISsegAvgSpeedPeriod			Summary of all travel runs by Intersection Segment by 15-minute time period
	RouteID	Integer	Route Identifier for sdeRoute
	ISsegID	Integer	Intersection Segment Identifier based on consecutive intersection segments along a route. $ISsegID_i = (RouteID * 1000) + i_1^n$
	IntSegID	integer	Intersection Segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	Route	varchar	Directional Route Name
	ISseg	varchar	[Upstream Intersection] to [Downstream Intersection]

Feature	Field Name	Data Type	Description
	PeakID	integer	Peak Period Identifier 1 = AM 2 = Mid-Day (MD) 3 = PM
	StartTime	varchar	Peak Period Start Time
	EndTime	varchar	Peak Period End Time
	Runs	Integer	Number of Travel Speed Runs
	avgSpeed	decimal	Average Speed avgSMS if (EndM-StartM) ≥ 1000 ft avgTMS if (EndM-StartM) < 1000 ft
	stdSpeed	float	Standard Deviation of avgSpeed
	Error90	float	90% Confidence Interval based on the t-distribution. There is a 90% probability that the average speed is between [avgSpeed – Error90] & [avgSpeed + Error90]
	Error85	float	85% Confidence Interval based on the t-distribution. There is a 85% probability that the average speed is between [avgSpeed – Error85] & [avgSpeed + Error85]
	avgSMS	decimal	Average Space Mean Speed (MPH). The average speed based on the travel time over the segment. $avgSMS = \frac{\max M - \min M}{TT}$
	avgTMS	decimal	Average Time Mean Speed. The arithmetic average of 1 second GPS speed within the segment.

Feature	Field Name	Data Type	Description
	wavgSL	Decimal	Weighted Average Speed Limit. Weighted by length of speed zones where the speed limit changes between intersections $$wavgSL = \frac{\sum_i SL_i \cdot d_i}{\sum_i d}$$ where: SL = Speed Limit d = Length of Speed Limit zone within ISseg
	avgTT	Decimal	Average Travel Time (sec)
	avgFFTT	Decimal	Average Free Flow Travel Time (sec)
	avgRunTime	Decimal	Average Running Time (sec) = avgTT - avgStopDelay
	avgRunSpeed	float	Average Running Speed (mph) = speed without stop delay
	minQLength	decimal	Minimum Queue Position
	avgQLength	decimal	Average Queue Position
	maxQLength	decimal	Maximum Queue Position
	CI	Decimal	Congestion Index or Percent Posted Speed = avgSpeed/wavgSL*100
	CIMD	float	Percent of Mid-Day Speed = wavgSpeed/wavgSpeedMD
	Stops	integer	Number of runs where the speed was <= 3 MPH for this segment
	pctStops	float	Stops/Runs
	avgSegDelay	Decimal	Average Segment Delay (sec)
	avgStopDelay	Decimal	Average Stop Delay (sec)
	avgCtrlDelay	Decimal	Average Control Delay (sec)
	avgSegDelayMi	Decimal	Average Segment Delay per Mile (sec/mi)
	avgStopDelayMi	decimal	Sum of Stop Delay divided by total miles traveled (sec/mi)
	avgCtrlDelayMi	decimal	Sum of Segment Control Delay divided by total miles traveled (sec/mi)

Feature	Field Name	Data Type	Description
	StartM	Decimal	Upstream route measure
	EndM	Decimal	Downstream route measure
	LengthFt	Decimal	Segment Length (ft) = EndM – StartM
	Offset	integer	Offset from route for display as GIS event data
	City	varchar	Jurisdiction
	Lanes	float	Number of lanes on [RouteID] for the route direction
	ATFT	integer	[Area Type][FacilityType]
	Control	varchar	Intersection Control: Signal Cross Street TWSC – Two Way Stop Control AWSC – All Way Stop Control Signal - No Stop – T intersection; continuous green Ped Signal SPUI – Single Point Urban Intersection Cross Section Jurisdiction
	LOS	char(1)	Level Of Service from the Highway Capacity Manual. Value is from one of the following tables depending on the downstream control: tblSignalLOS tblUnSignalLOS tblUrbanLOS
vwISsegSpeedRun			Summary of each travel runs by Intersection Segment
	RouteID	Integer	Route Identifier for sdeRoute
	ISsegID	Integer	Intersection Segment Identifier based on consecutive intersection segments along a route. $ISsegID_i = (RouteID * 1000) + i_1^n$

Feature	Field Name	Data Type	Description
	IntSegID	integer	Intersection Segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	Datafile	varchar	Travel Run Identifier [1234][5][67][8] [1234]=RouteID [5] = PeakID [67] = EmployeeID [8] = Character [A-Z] to prevent duplicate datafiles
	Route	varchar	Directional Route Name
	ISseg	varchar	[Upstream Intersection] to [Downstream Intersection]
	GPSDate	datetime	GPS Date
	PeriodID	integer	Time Period Identifier. Several PeriodID's can be within one PeakID
	PeakID	integer	Peak Period Identifier 1 = AM 2 = Mid-Day (MD) 3 = PM
	StartTime	varchar	Period Start Time
	EndTime	varchar	Period End Time
	avgSpeed	decimal	Average Speed (MPH) avgSMS if (EndM-StartM) ≥ 1000 ft avgTMS if (EndM-StartM) < 1000 ft
	avgSpeedMD	decimal	Average Mid-Day Speed (MPH)
	avgSMS	decimal	Average Space Mean Speed (MPH). The average speed based on the travel time over the segment. $avgSMS = \frac{\max M - \min M}{TT}$
	avgTMS	decimal	Average Time Mean Speed. The arithmetic average of 1 second GPS speed within the segment.

Feature	Field Name	Data Type	Description
	wavgSL	Decimal	Weighted Average Speed Limit. Weighted by length of speed zones where the speed limit changes between intersections $$wavgSL = \frac{\sum_i SL_i \cdot d_i}{\sum_i d}$$ where: SL = Speed Limit d = Length of Speed Limit zone within ISseg
	TT	Decimal	Travel Time (sec) = maxT-minT
	FFTT	Decimal	Free Flow Travel Time (sec). $$FFTT = \frac{\min T - \max T}{wavgSL}$$
	RunTime	Decimal	Running Time (sec) = TT - stopDelay
	RunSpeed	float	Running Speed (mph) = speed without stop delay
	QLength	decimal	Position in Queue (ft) = EndM – Qmeasure
	CI	Decimal	Congestion Index or Percent Posted Speed = avgSpeed/wavgSL*100
	CIMD	float	Percent of Mid-Day Speed = wavgSpeed/wavgSpeedMD
	Stop	bit	1 (true) = stop delay > 0 0 (false) = stop delay = 0
	segDelay	Decimal	Segment Delay (sec) FFTT-TT
	stopDelay	Decimal	Stop Delay (sec) Amount of time speed is < 3 MPH
	SegDelayMi	Decimal	Segment Delay per Mile (sec/mi)
	StopDelayMi	decimal	Stop Delay per Mile (sec/mi)
	CtrlDelayMi	decimal	Control Delay per Mile (sec/mi)
	StartM	Decimal	Upstream route measure
	EndM	Decimal	Downstream route measure

Feature	Field Name	Data Type	Description
	LengthFt	Decimal	Segment Length (ft) = EndM – StartM
	Offset	integer	Offset from route for display as GIS event data
	City	varchar	Jurisdiction
	Lanes	float	Number of lanes on [RouteID] for the route direction
	ATFT	integer	[Area Type][FacilityType]
	Control	varchar	Intersection Control: Signal Cross Street TWSC – Two Way Stop Control AWSC – All Way Stop Control Signal - No Stop – T intersection; continuous green Ped Signal SPUI – Single Point Urban Intersection Cross Section Jurisdiction
	LOS	char(1)	Level Of Service from the Highway Capacity Manual. Value is from one of the following tables depending on the downstream control: tblSignalLOS tblUnSignalLOS tblUrbanLOS
vwPeakAvgSpeed			Summary of travel speed runs by Peak Period
vwPeakAvgSpeedArt			Summary of Arterial travel speed runs by Peak Period
vwPeakAvgSpeedFwy			Summary of Freeway travel speed runs by Peak Period
	PeakID	integer	Peak Period Identifier 1 = AM 2 = Mid-Day (MD) 3 = PM
	StartTime	varchar	Peak Period Start Time
	EndTime	varchar	Peak Period End Time
	Dist	float	Sum of segment distances in summary (ft)

Feature	Field Name	Data Type	Description
	wavgSpeed	float	Weighted Average Travel Speed (MPH). Weighted by intersection segment length. $$wavgSpeed = \frac{\sum_i avgSpeed_i \cdot d_i}{\sum_i d}$$ where: avgSpeed = average speed over intersection segment (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)
	wavgSL		Weighted Average Speed Limit (MPH). Weighted by length of speed zones where the speed limit changes between intersections $$wavgSL = \frac{\sum_i SL_i \cdot d_i}{\sum_i d}$$ where: SL = Weighted Average Speed Limit (from tblISsegQCok) d = Length of Intersection segment (from tblISseg)
	CI	Decimal	Congestion Index or Percent Posted Speed = wavgSpeed/wavgSL*100
	CIMD	float	Percent of Mid-Day Speed = wavgSpeed/wavgSpeedMD

Feature	Field Name	Data Type	Description
	wavgRunSpeed		Weighted Average Running Speed (MPH). Weighted by intersection segment length. $$wavgRunSpeed = \frac{\sum_i avgRunSpeed_i \cdot d_i}{\sum_i d}$$ where: avgRunSpeed = Average Running Speed over intersection segment (excluding stop time) d = Length of Intersection segment (from tblISseg)
	avgTTmi	decimal	Average Travel Time per Mile (sec/mi).
	avgFFTTmi	decimal	Average Free Flow Travel Time per Mile (sec/mi)
	stopDelayMi	decimal	Sum of Stop Delay divided by total miles traveled (sec/mi)
	segDelayMi	decimal	Sum of Segment Delay divided by total miles traveled (sec/mi)
	ctrlDelayMi	decimal	Sum of Segment Control Delay divided by total miles traveled (sec/mi)
	WavgError90	float	Average 90% confidence interval error weighted by segment length
	WavgError85	float	Average 85% confidence interval error weighted by segment length
vwQueue			Queue positions by Peak Period for display as GIS line event data
	ISsegID	integer	Intersection Segment Identifier based on consecutive intersection segments along a route. $$ISsegID_i = (RouteID * 1000) + i_1^n$$
	ISseg	varchar	[Upstream Intersection] to [Downstream Intersection]

Feature	Field Name	Data Type	Description
	IntSegID	integer	Intersection Segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	Runs	integer	Number of Travel Speed Runs
	minQ	decimal	Minimum Queue Position (feet measured from downstream control)
	avgQ	decimal	Average Queue Position (feet measured from downstream control)
	maxQ	decimal	Maximum Queue Position (feet measured from downstream control)
	minQM	decimal	Upstream route measure for Minimum Queue Position
	maxQM	decimal	Upstream route measure for Maximum Queue Position
	avgQM	decimal	Upstream route measure for Average Queue Position
	minOffset	integer	Route Offset for Minimum Queue Position
	maxOffset	integer	Route Offset for Maximum Queue Position
	avgOffset	integer	Route Offset for Average Queue Position
	RouteID	integer	Route Identifier for sdeRoute
	Route	varchar	Directional Route Name
	EndM	decimal	Downstream route measure
	PeakID	integer	Peak Period Identifier 1 = AM 2 = Mid-Day (MD) 3 = PM
	StartTime	varchar	Peak Period Start Time
	EndTime	varchar	Peak Period End Time
vwSpeed			View of tblSpeed used to create GIS point event data
	SpeedID*	integer	Record Identifier
	RouteID	integer	Route Identifier for sdeRoute
	Route	varchar	Directional Route Name
	Speed	decimal	GPS Speed in MPH

Feature	Field Name	Data Type	Description
	Bearing	decimal	GPS Bearing relative to last position
	PDOP	decimal	Position Dilution of Precision – a measure of the current satellite geometry. The lower the PDOP value, the more accurate the GPS positions.
	GPSDate	datetime	GPS Date
	GPSTime	datetime	GPS Time
	Datafile	varchar	Travel Run Identifier [1234][5][67][8] [1234]=RouteID [5] = PeakID [67] = EmployeeID [8] = Character [A-Z] to prevent duplicate datafiles
	Measure	decimal	Route Measure (ft)
	Accel	decimal	Acceleration (ft/sec^2) – calculated using a central difference scheme $a_i = \frac{v_{i+1} - v_{i-1}}{t_{i+1} - t_{i-1}}$ where: i = GPS point a = acceleration for GPS point i v = speed t = GPS Time
	AvgAcc5pt	decimal	Five point moving average acceleration (ft/sec^2) $a_{avg} = \frac{1}{5} \cdot \sum_{i-2}^{i+2} a_i$ where: i = GPS point a = acceleration for GPS point i
	Offset	decimal	Distance of GPS position from route (ft)

Feature	Field Name	Data Type	Description
	AvgOff5pt	decimal	Five point moving average Offset (ft) $O_{avg} = \frac{1}{5} \cdot \sum_{i-2}^{i+2} O_i$ where: i = GPS point O = Offset for GPS point i
	ISsegID	integer	Intersection Segment Identifier based on consecutive intersection segments along a route. $ISsegID_i = (RouteID * 1000) + i_1^n$
	IntSegID	integer	Intersection Segment Identifier based on intersection IntIDs: $IntSegID_i = (IntID_{Upstream} * 10000) + (IntID_{Downstream})$
	SL	integer	Speed Limit (MPH)
	GPSsegID	integer	Tenth of a Mile Segment Identifier based on consecutive segments along a route. $GPSsegID_i = (RouteID * 1000) + i_1^n$
vwVoiceData			View of tblVoiceData used to create GIS point event data
	VoiceID	integer	From tblVoiceData
	SpeedID	integer	1 second GPS position Identifier
	RouteID	integer	Route Identifier for sdeRoute
	Measure	decimal	Route Measure (ft)
	Offset	decimal	Distance of GPS position from route (ft)
	GPSDate	datetime	GPS Date
	GPSTime	datetime	GPS Time
	Datafile	varchar	Travel Run Identifier from Driver Comment

Feature	Field Name	Data Type	Description
	CommentType	varchar	Comment Category: Bus Incident Pedestrian Crossing Train School Zone Weather Accident Other
	Comment	varchar	Driver Comment

APPENDIX C

Delay Theory

Delay Theory

In that study, very rigorous procedures were applied to precisely measuring the control delay from the GPS trajectory data, particularly with regard to identifying acceleration and deceleration points.

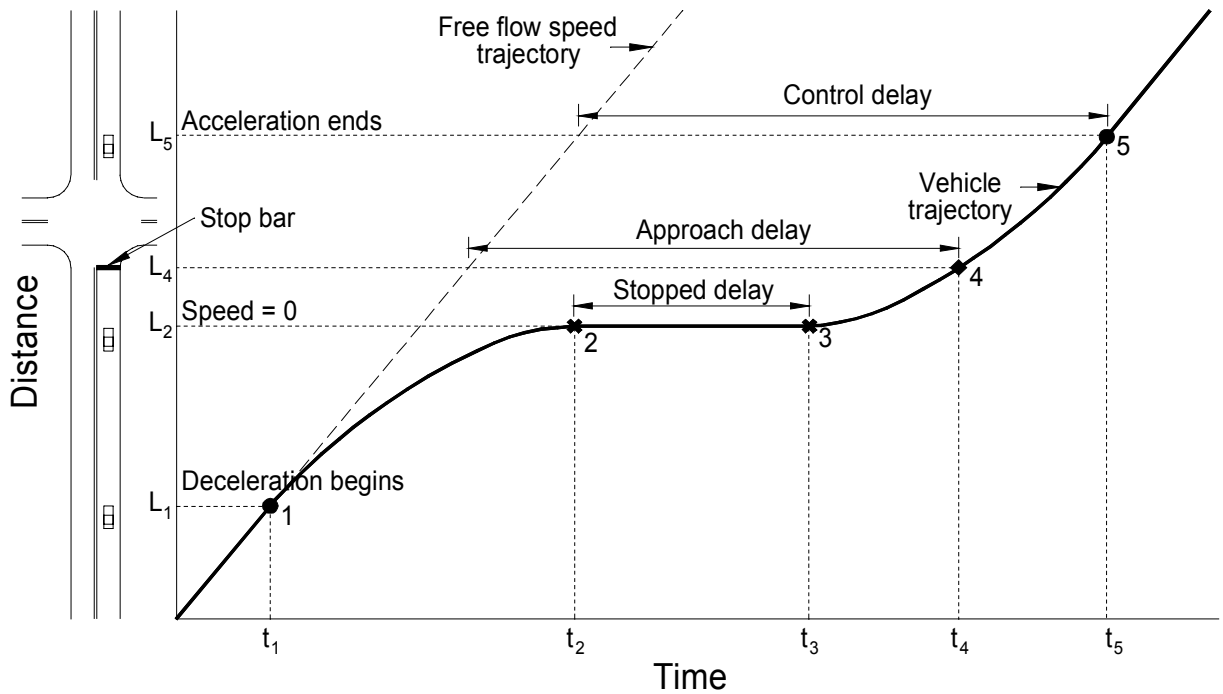


Figure C-1 – Delay Measurements at Signalized Intersections

Although these procedures could certainly be repeated in the MAG study, such precision at identifying points 1 and 5 in **Figure C-1** is not warranted. A more efficient approach would be to define physical locations upstream and downstream of each signal that denote sections of roadway that will not be influenced either by deceleration for a queue, a queue, or acceleration after the signal. As long as these points are selected such that probe vehicles will not be in the area of influence, the control delay can be calculated using the following equation:

Control Delay= Actual time to travel from Location 1 to Location 5 – Theoretical time to travel from Location 1 to Location 5 (eq. 1)

or

$$\text{Control Delay}=t_5-t_1 - (L_5-L_1)/(\text{Speed Limit} *(22/15)) \quad \text{(eq. 2)}$$

For completeness, approach delay can be calculated as

$$\text{Approach Delay}=t_4-t_1 - (L_4-L_1)/(\text{Speed Limit} *(22/15)) \quad \text{(eq. 3)}$$

For the purposes of obtaining control delay, the precise location of points 1 and 5 will not influence the results, provided point 1 is before deceleration begins (**Figure C-1**)

and point 5 is after acceleration is completed (**Figure C-1**). To illustrate this point, consider what would happen if point 1 is shifted further upstream of the signal. In that case, the increase in additional actual travel time would exactly be offset by the additional calculated theoretical travel time (eq. 1 and eq. 2). **Figure C-1** graphically illustrates this point as the projected free flow trajectory (dashed line) is if point 5 is shifted further downstream.

Consequently, to calculate control delay, the following procedure could be used:

- Examining color coded maps showing speed deficit (posted speed-actual speed) for multiple runs, define point 1 on a direction basis for each intersection in the network. This point 1 will be selected so that it is <u>upstream</u> of any documented speed deficit.
- Examining color coded maps showing speed deficit (posted speed-actual speed) for multiple runs, define point 5 on a direction basis for each intersection in the network. This point 5 will be selected so that it is <u>downstream</u> of any documented speed deficit.
- Prepare a database query that checks to make sure no upstream distance from a signal extends further then the next signalized intersection. When such cases arise, they are probably due to intersection spillback and engineering judgment will have to be exercised to locate point within the segment between intersections (Most likely point 5 will be a short distance downstream of its respective signal and will be collocated with point 1 for the downstream signal. Notes of these situations will be made, as we will want to tabulate control delay for “groups” of signals that have spillback separately because it will be difficult to attribute control delay equitably to individual signals.
- Prepare a database query that calculates the upstream distance of point 1 for each intersection and tabulate in a histogram of these distances. This will be a good QAQC check.
- Prepare a database query that checks to make sure no downstream distance from a signal extends further then the next signalized intersection. Similar procedures to the upstream case will have to be followed when these cases are identified.
- Prepare a database query that calculates the downstream distance of point 5 for each intersection and tabulate in a histogram of these distances. This will be a good QAQC check.

Following completion of this procedure, tables could be constructed to compute summary statistics summarizing the control delay experienced at study intersection approaches.

However the above procedure would be quite labor intensive to identify Locations 1 and 5 in **Figure C-1** for every intersection in the study area and a more efficient procedure is needed to economically process the MAG travel time data. The above process can be simplified, if one assumes the incremental delay associated with accelerating after a vehicle crosses the stop bar (**Figure C-1**, Location 4) to the posted speed (**Figure C-1**, Location 5) is fairly constant. For example, in **Figure C-2**, the time between points c-d,

g-h, and k-l are all approximately the same duration. Consequently, along a signalized arterial with a constant speed limit, the control delay could be approximated quite closely by calculating the difference between the observed travel time between intersections (via GPS) and the theoretical travel time (distance/posted speed).

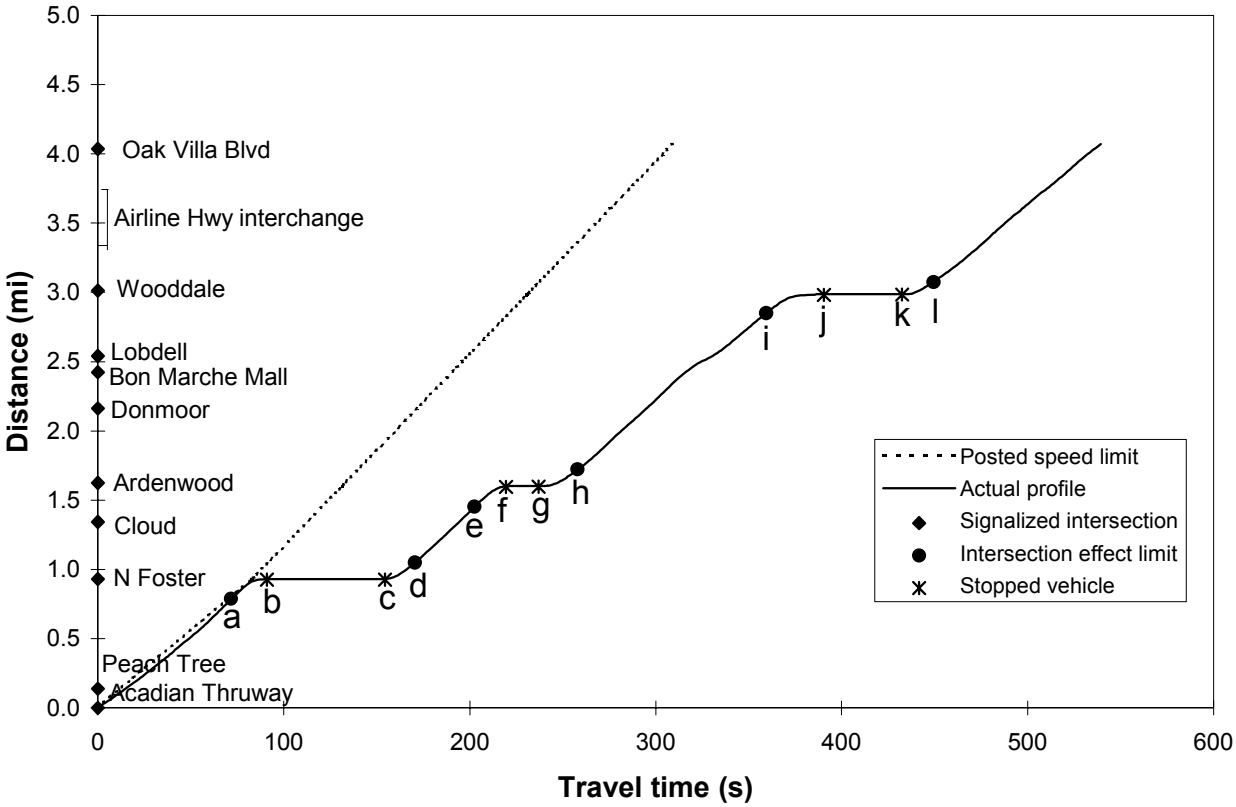


Figure C-2– Distance vs. Time Profile

APPENDIX D

Additional Figures

Figure D-1-Arterial Percent of Mid-Day Speed-AM

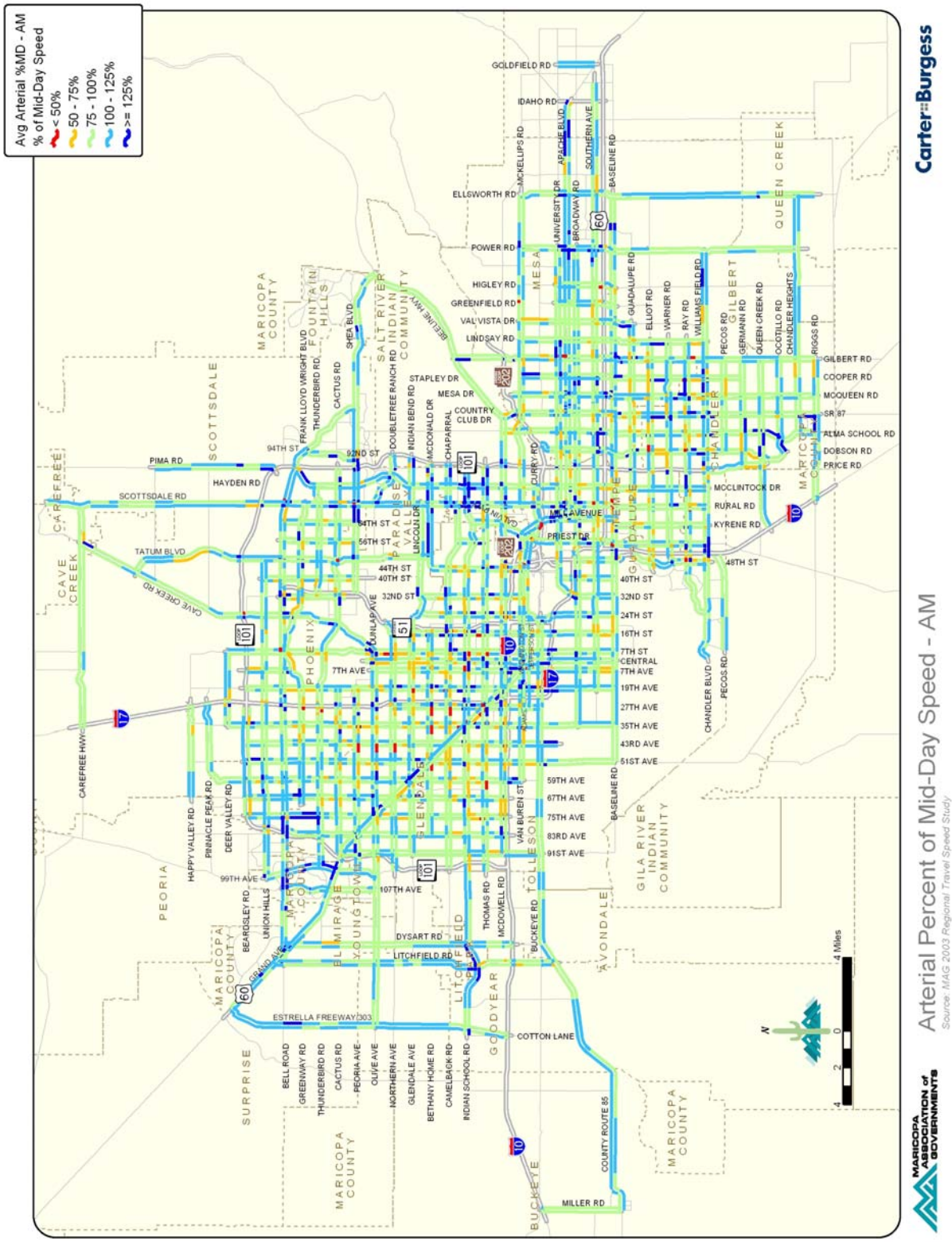


Figure D-2-Arterial Percent of Mid-Day Speed-PM

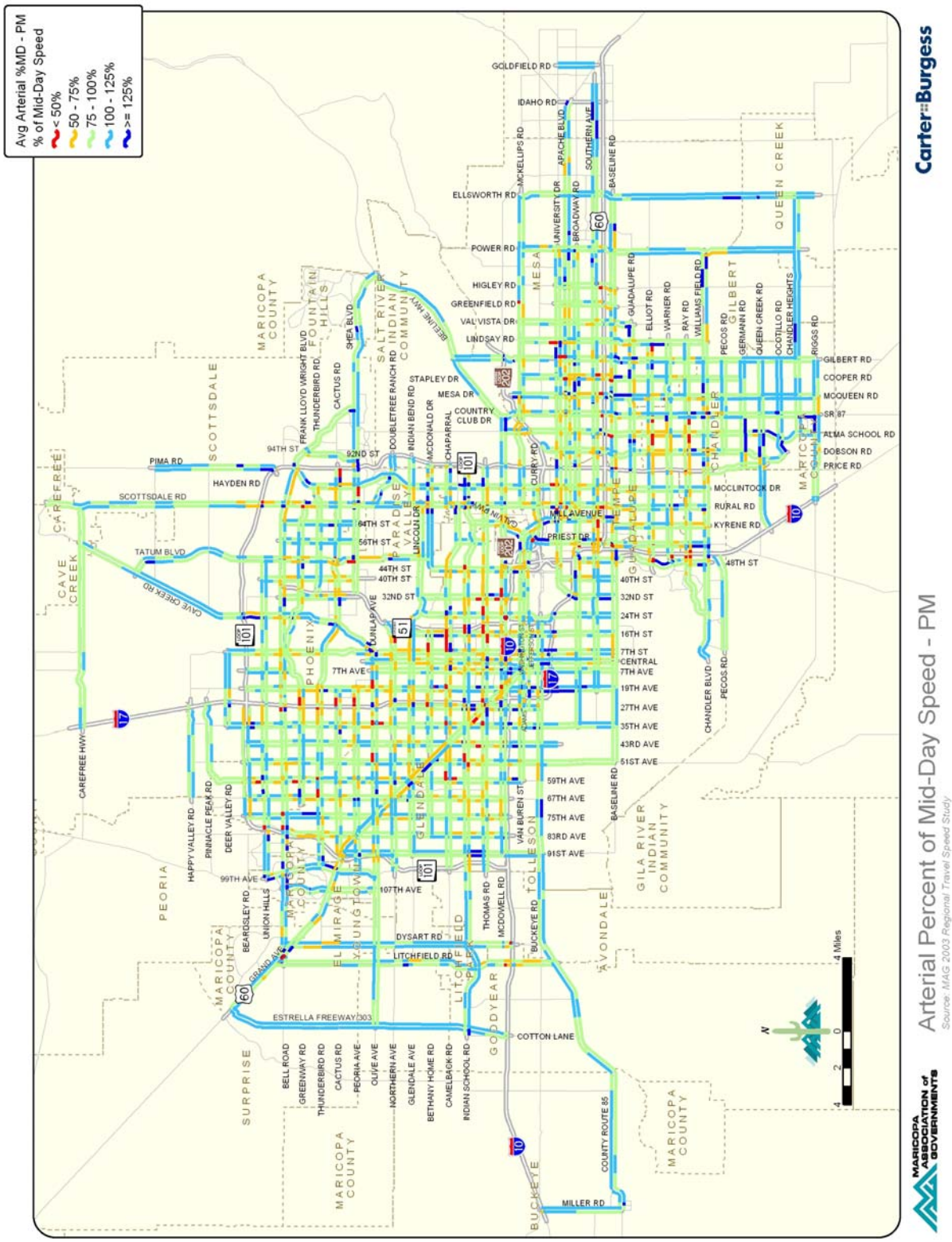


Figure D-3-Freeway Percentage of Mid-Day Speed-AM

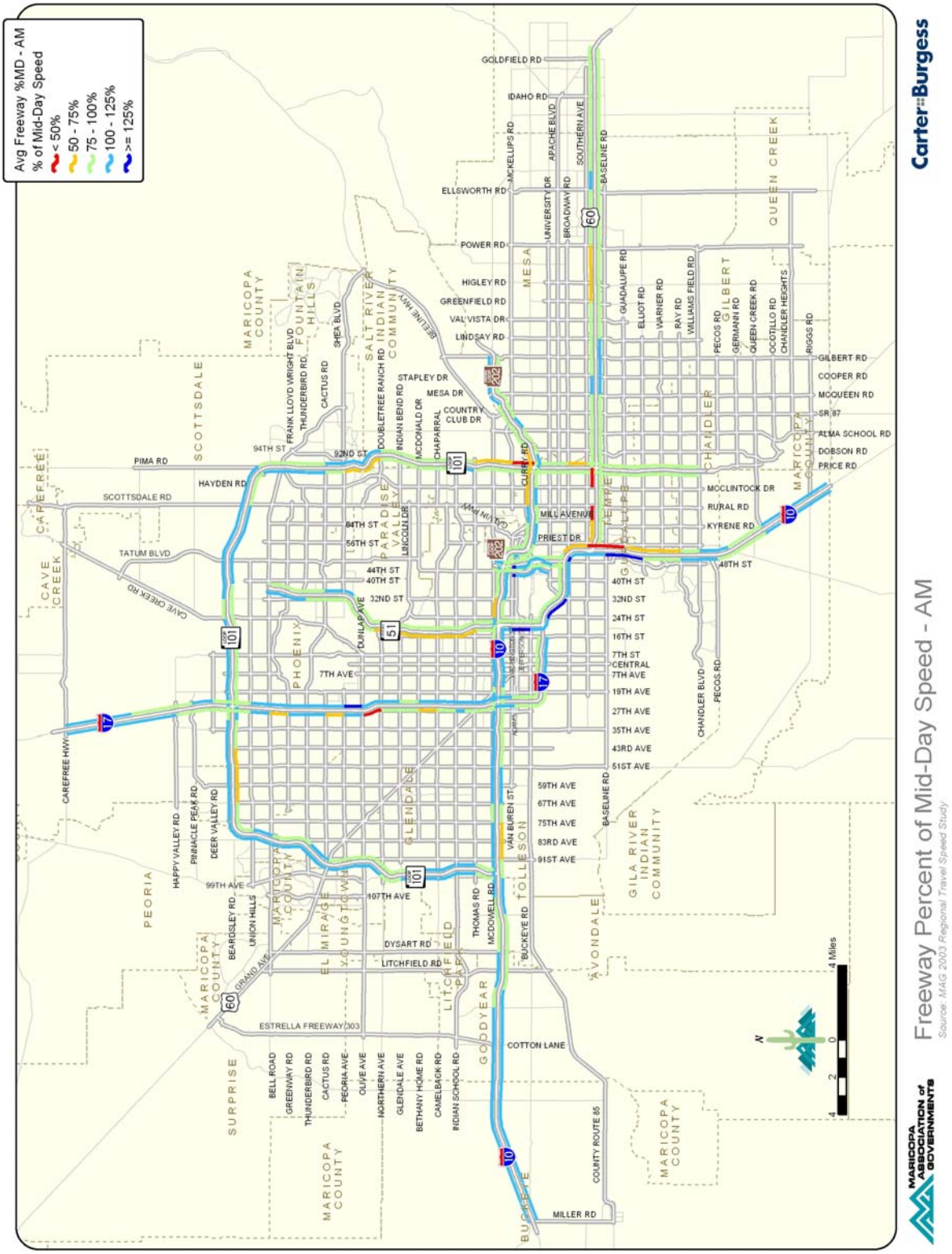


Figure D-4-Freeway Percent of Mid-Day Speed-PM

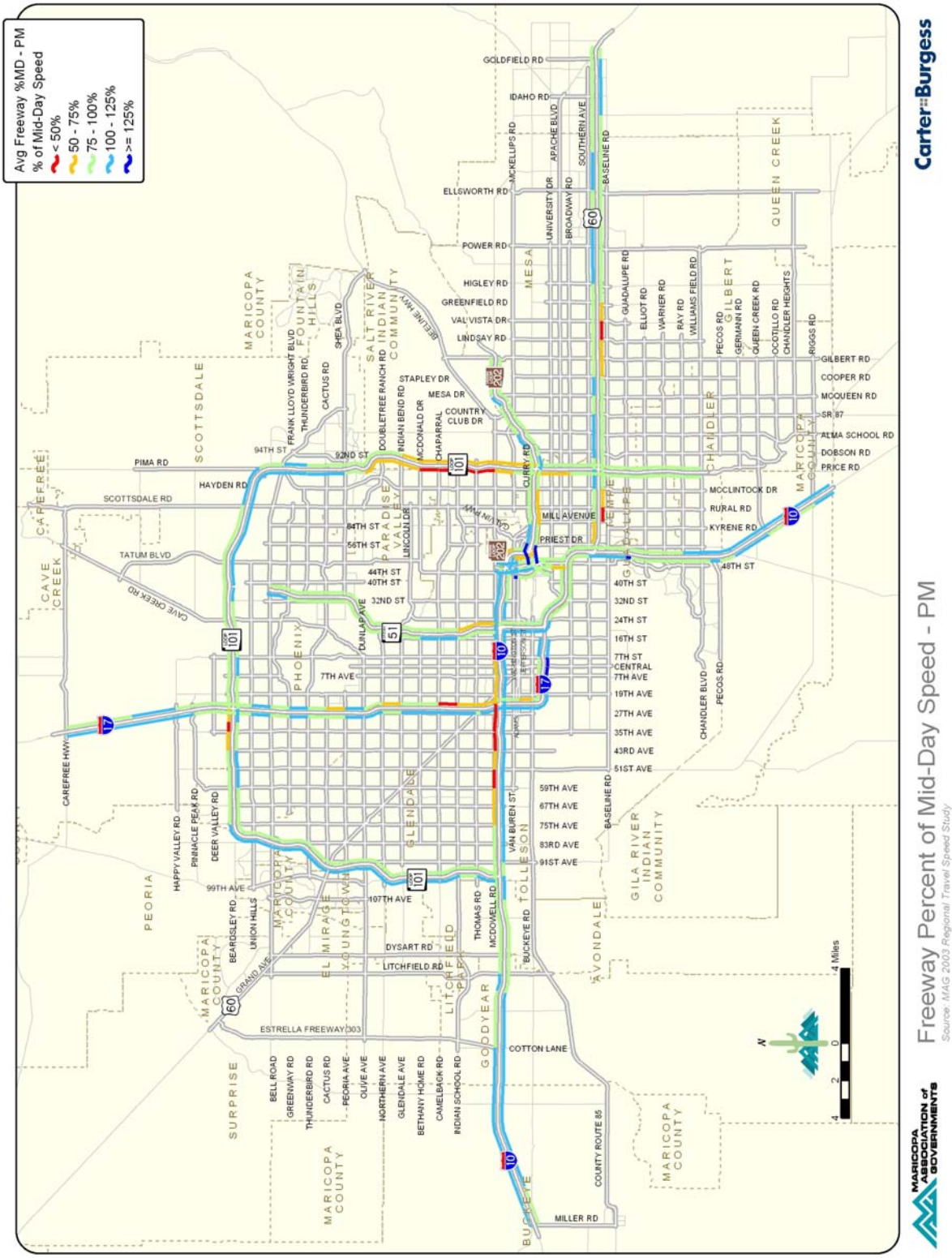


Figure D-5-Percent Travel Runs Stopped at Intersections-AM

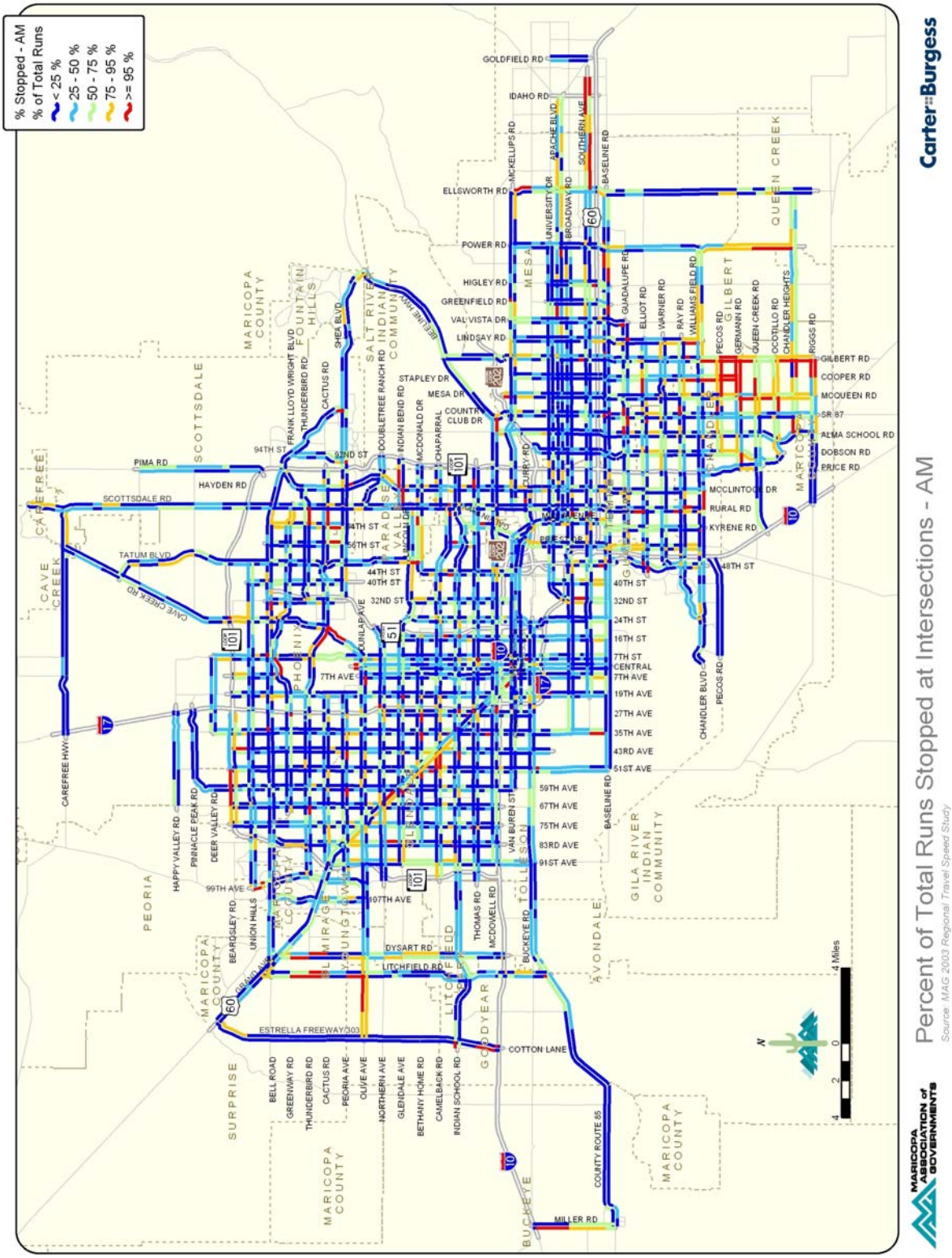


Figure D-6-Percent Travel Runs Stopped at Intersections-MD

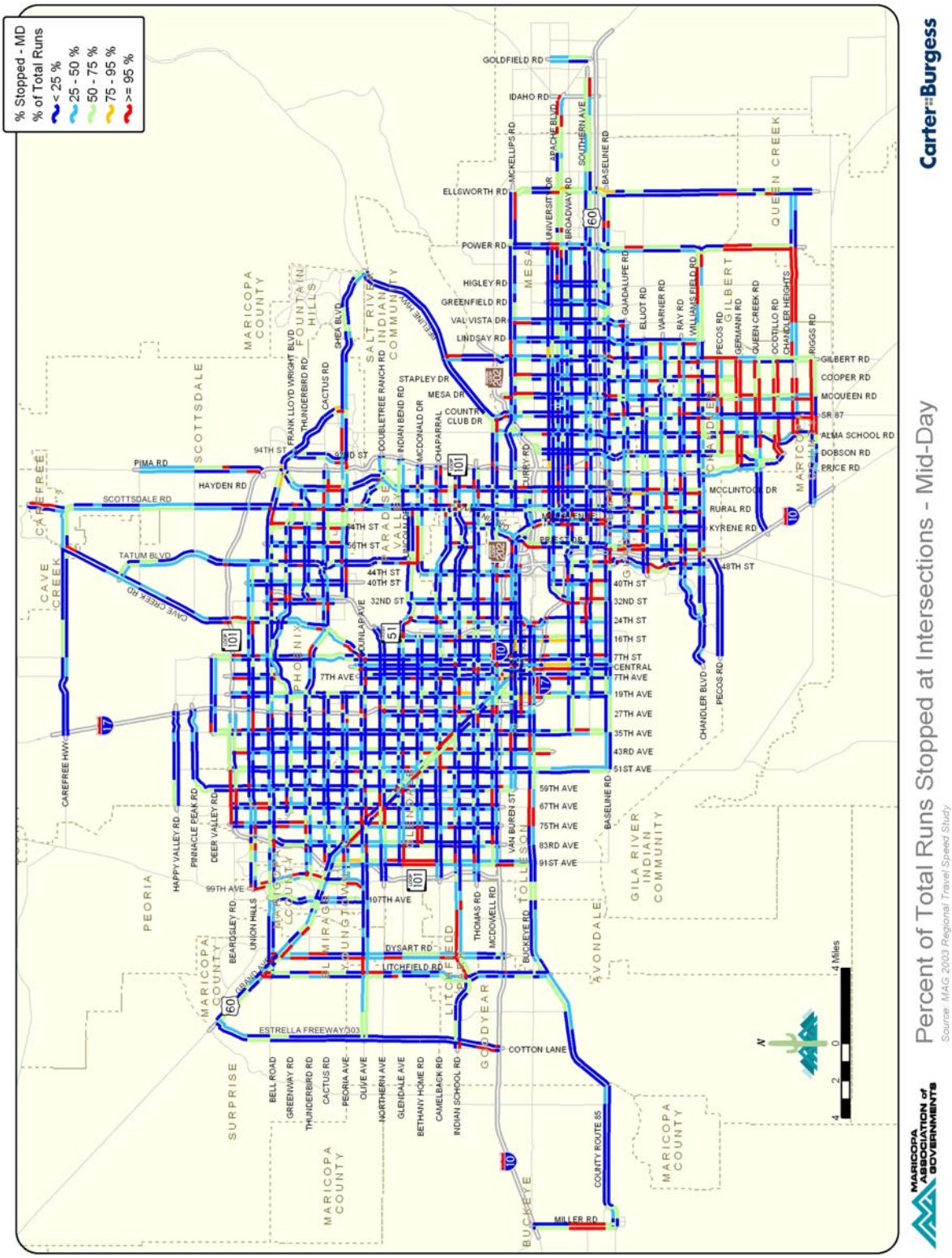


Figure D-7-Travel Time Contours-Avondale Inbound-AM

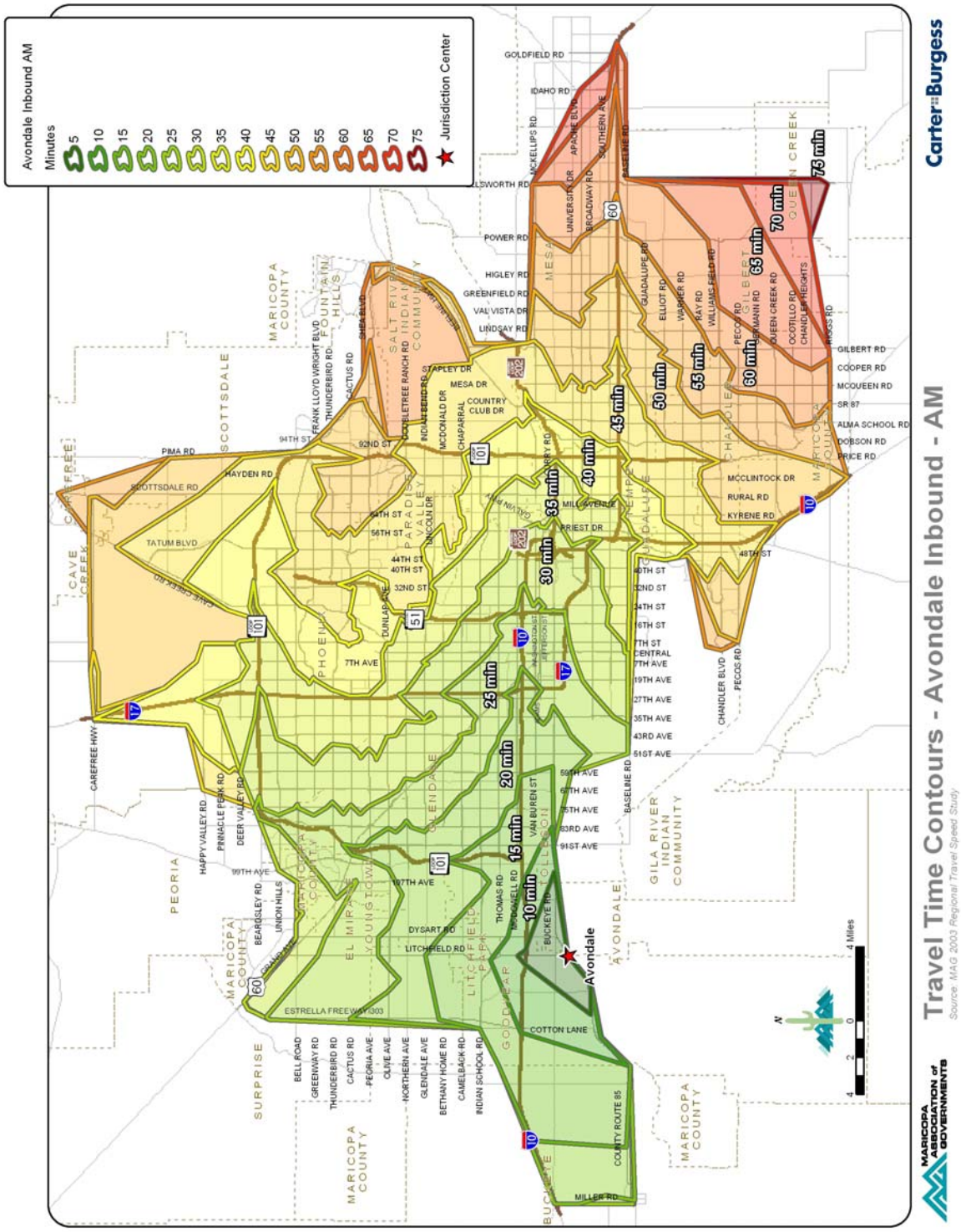


Figure D-8-Travel Time Contours-Avondale Inbound-PM

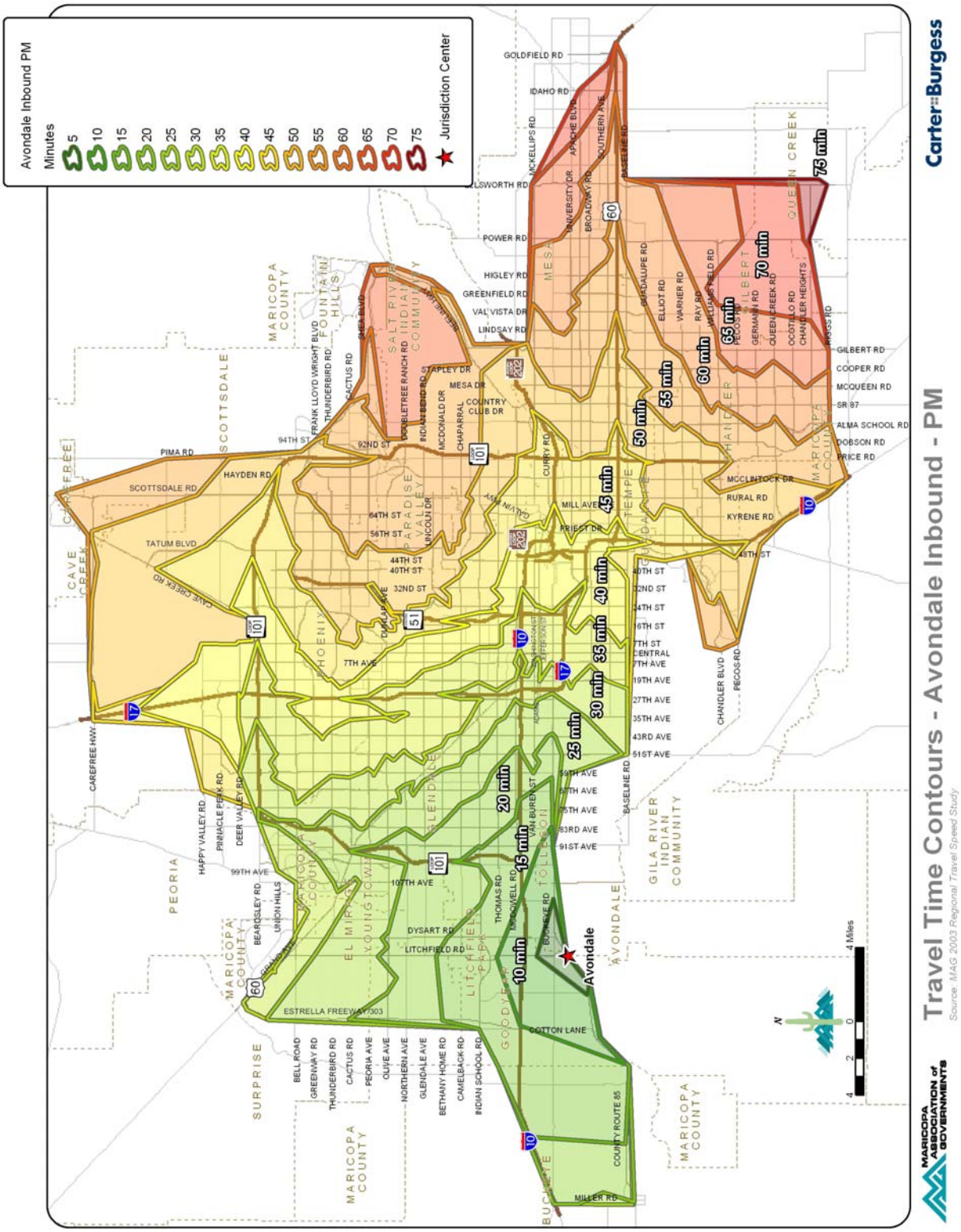


Figure D-9-Travel Time Contours-Avondale Inbound-Free Flow (Posted Speed Limit)

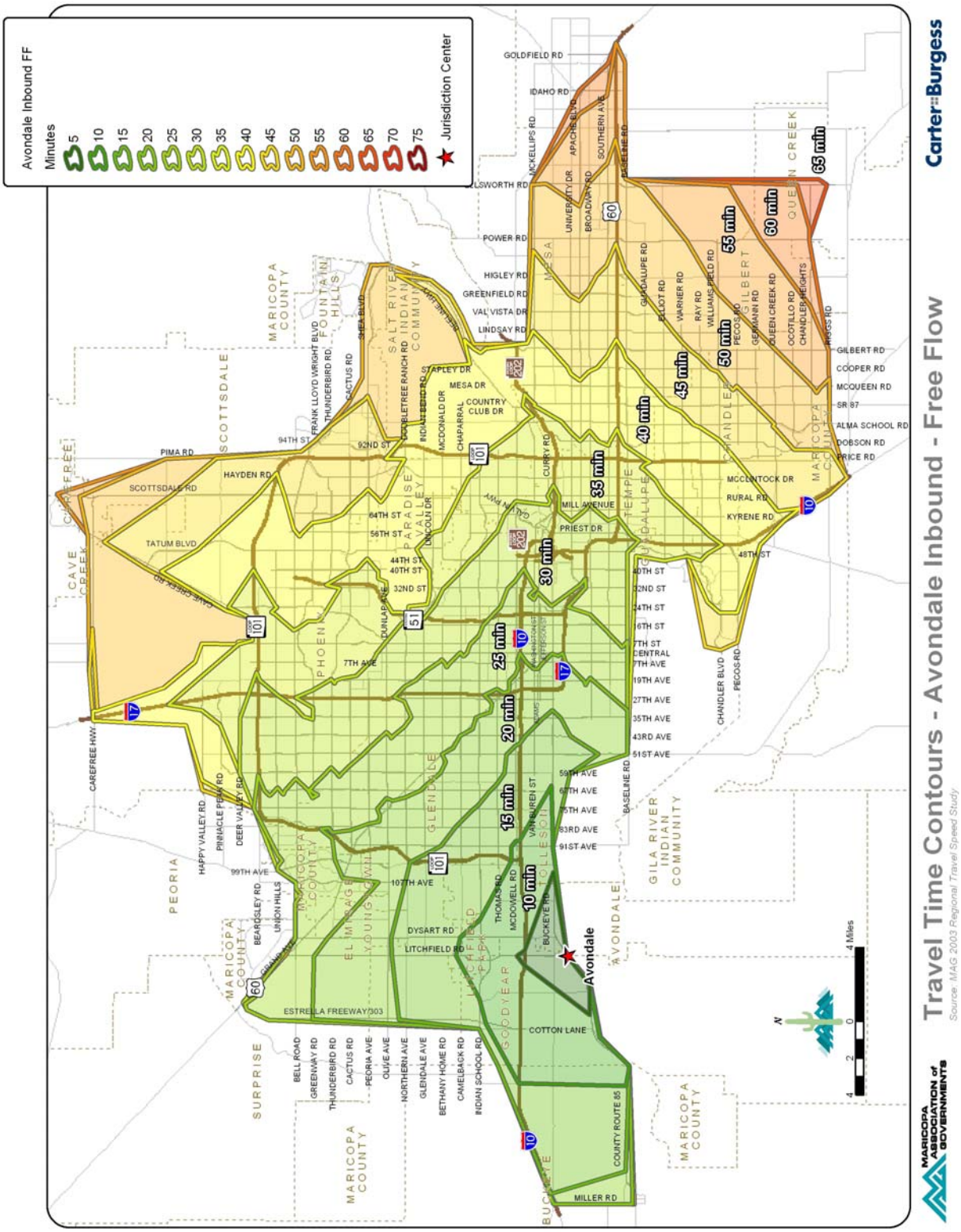


Figure D-10-Travel Time Contours-Avondale Outbound-AM

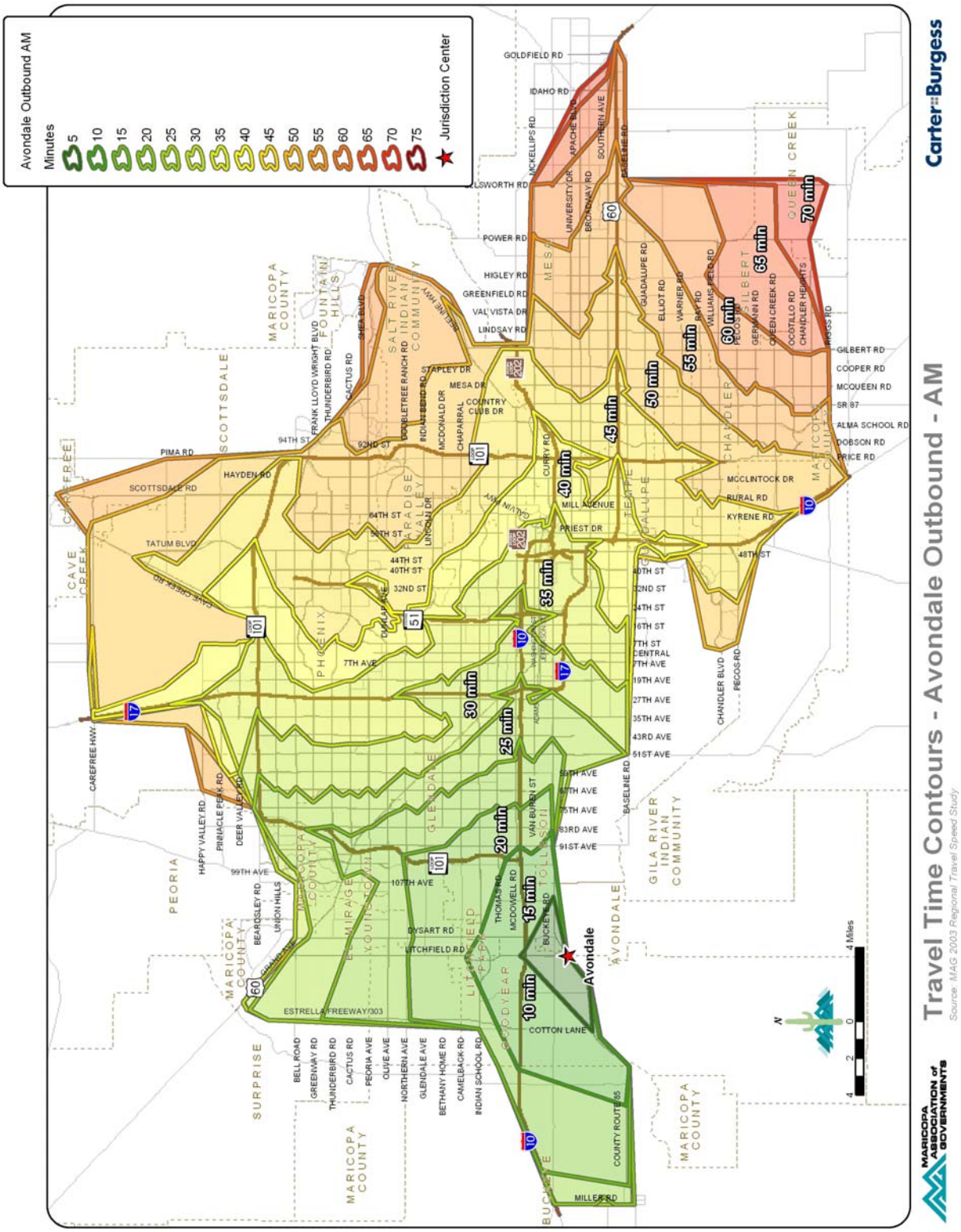


Figure D-11-Travel Time Contours-Avondale Outbound-PM

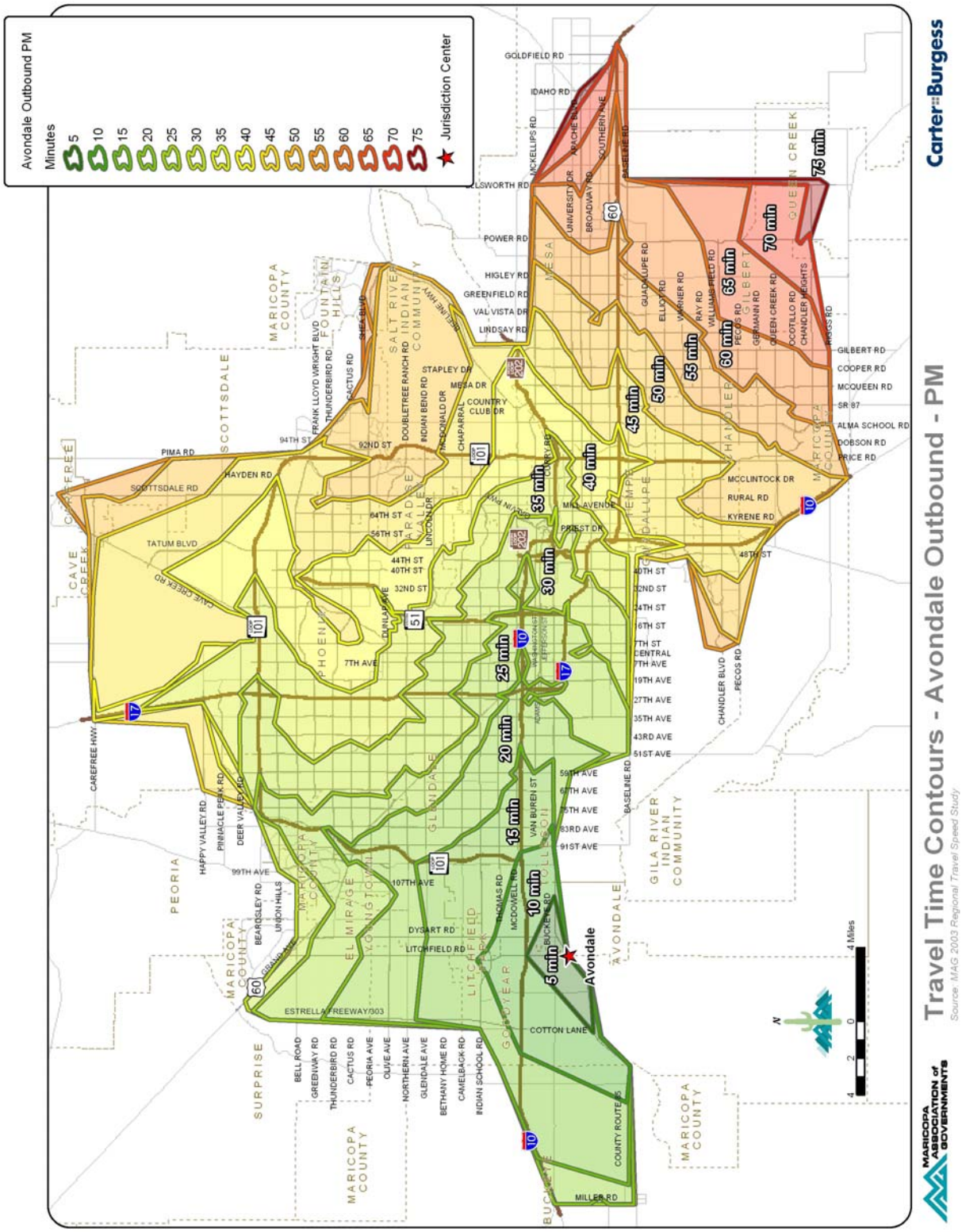


Figure D-12-Travel Time Contours-Avondale Outbound-Free Flow (Posted Speed Limit)

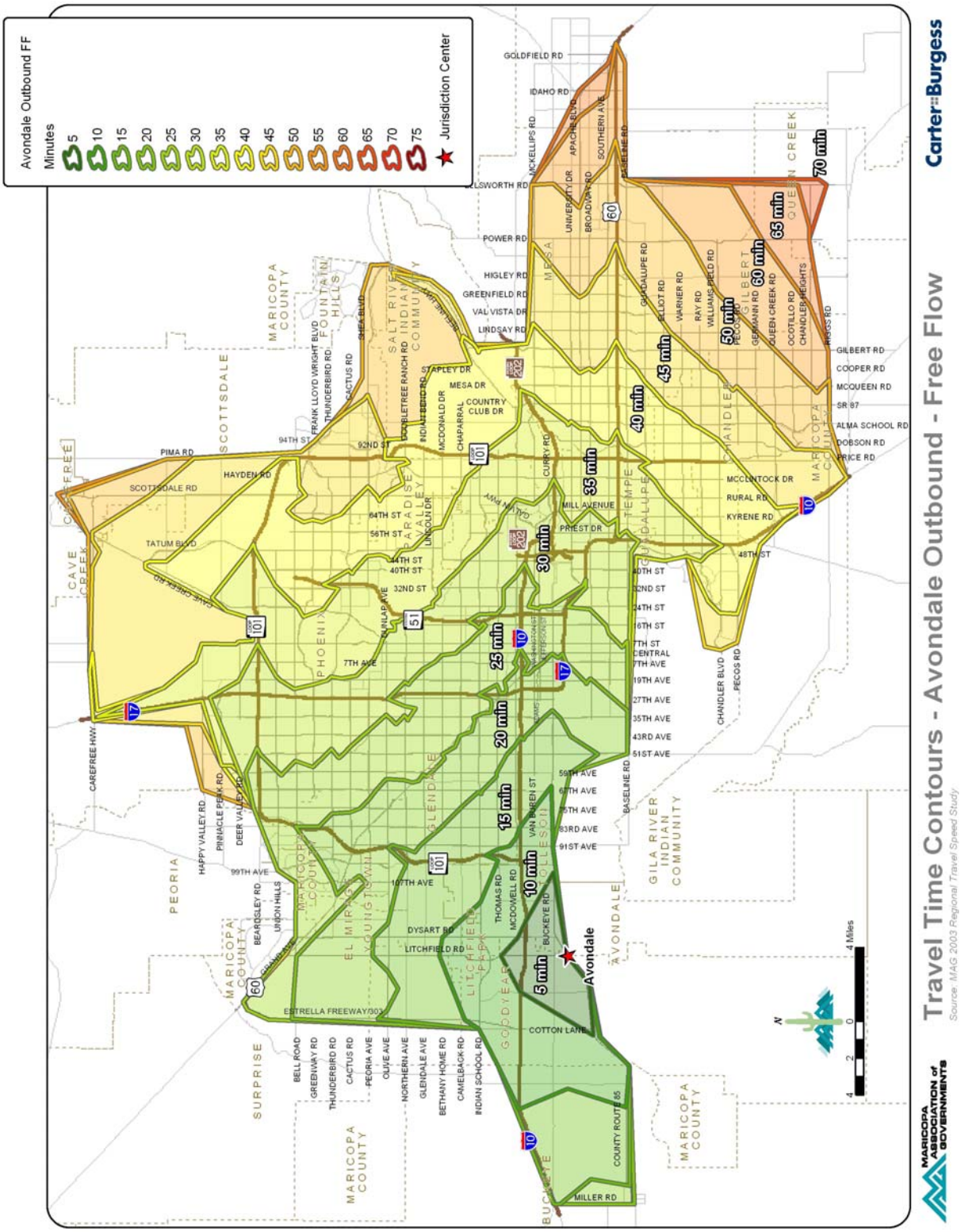


Figure D-13-Travel Time Contours-Gilbert Inbound -AM

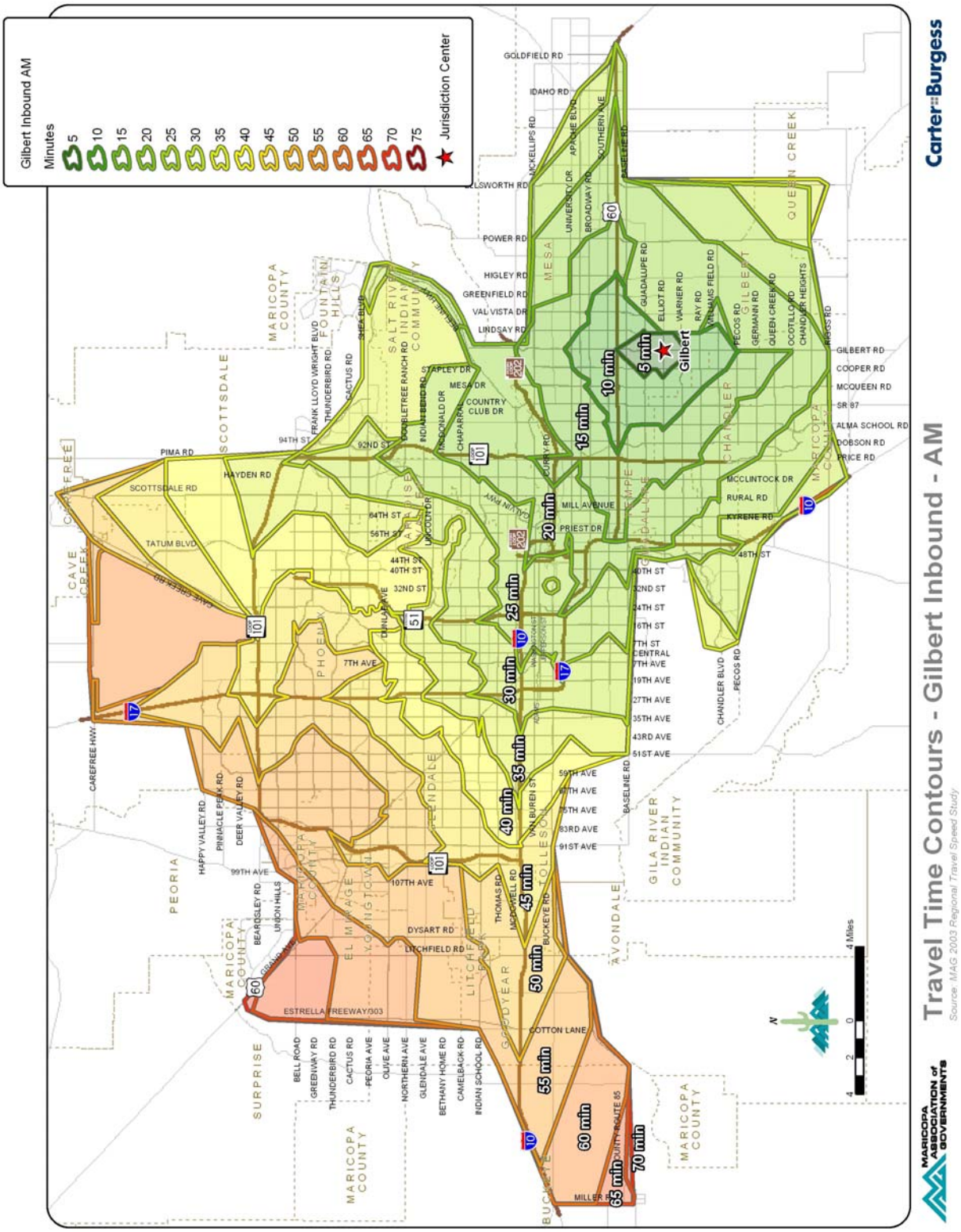


Figure D-14-Travel Time Contours-Gilbert Inbound –PM

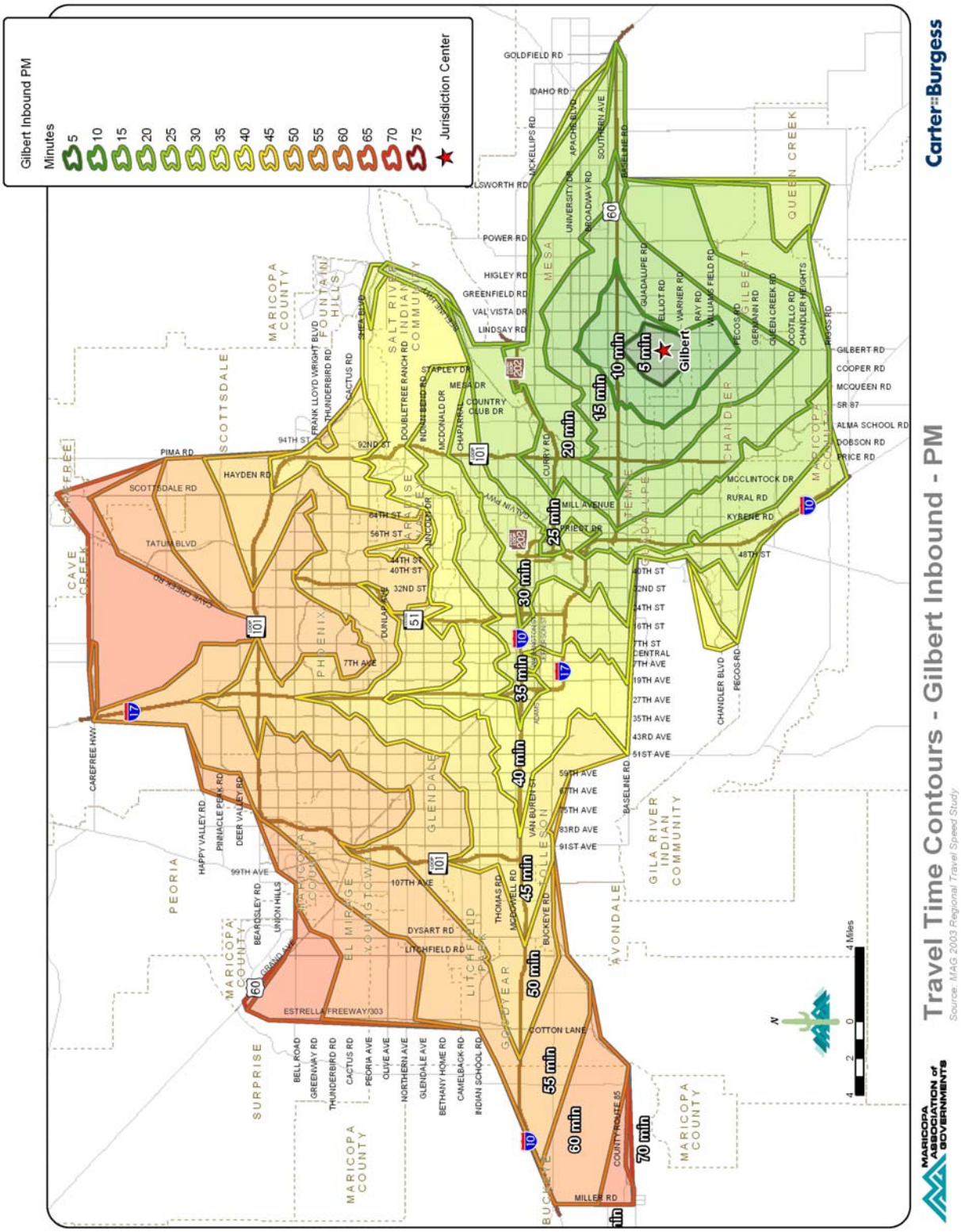


Figure D-15-Travel Time Contours-Gilbert Inbound-Free Flow (Posted Speed Limit)

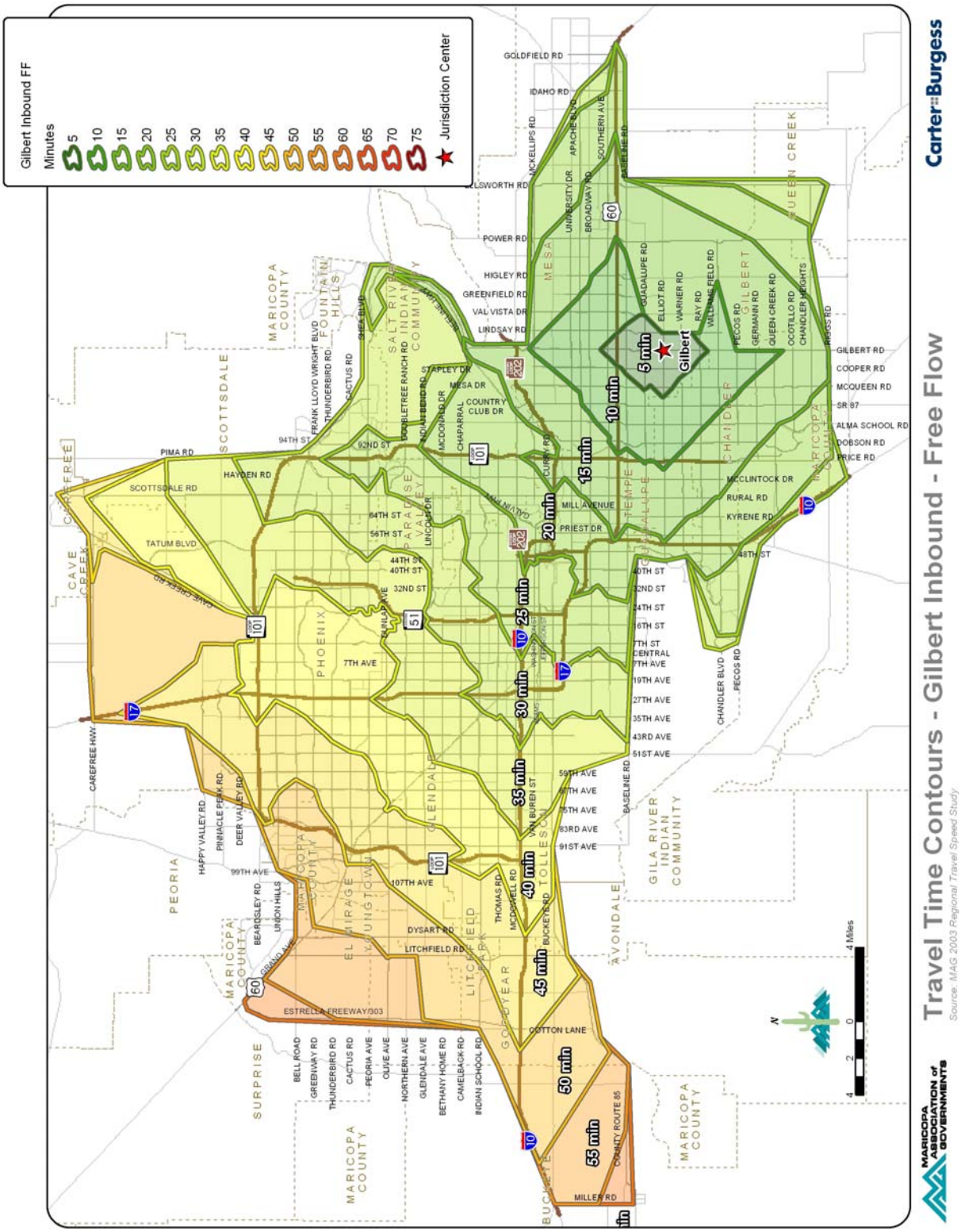


Figure D-16-Travel Time Contours-Gilbert Outbound –AM

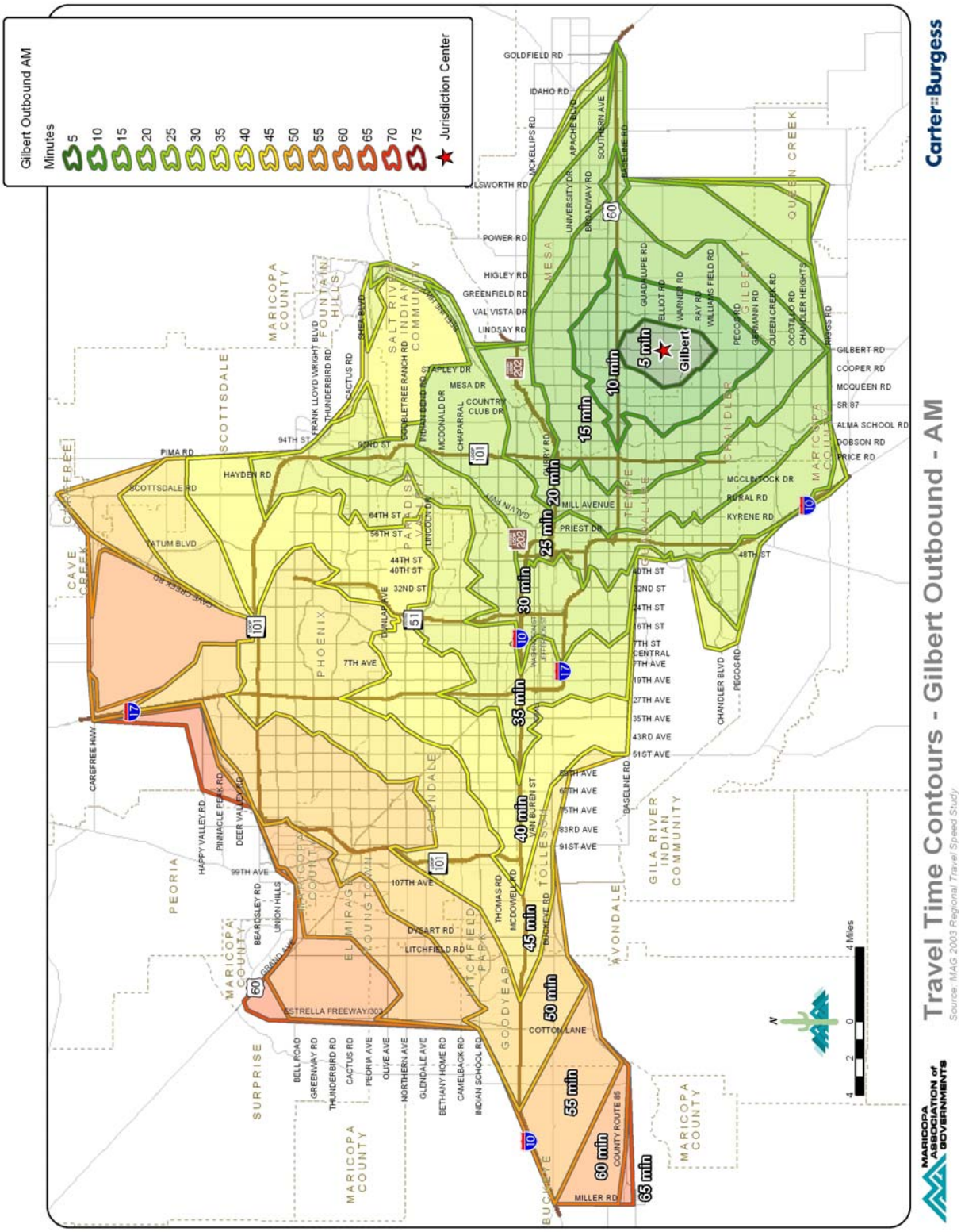


Figure D-17-Travel Time Contours-Gilbert Outbound –PM

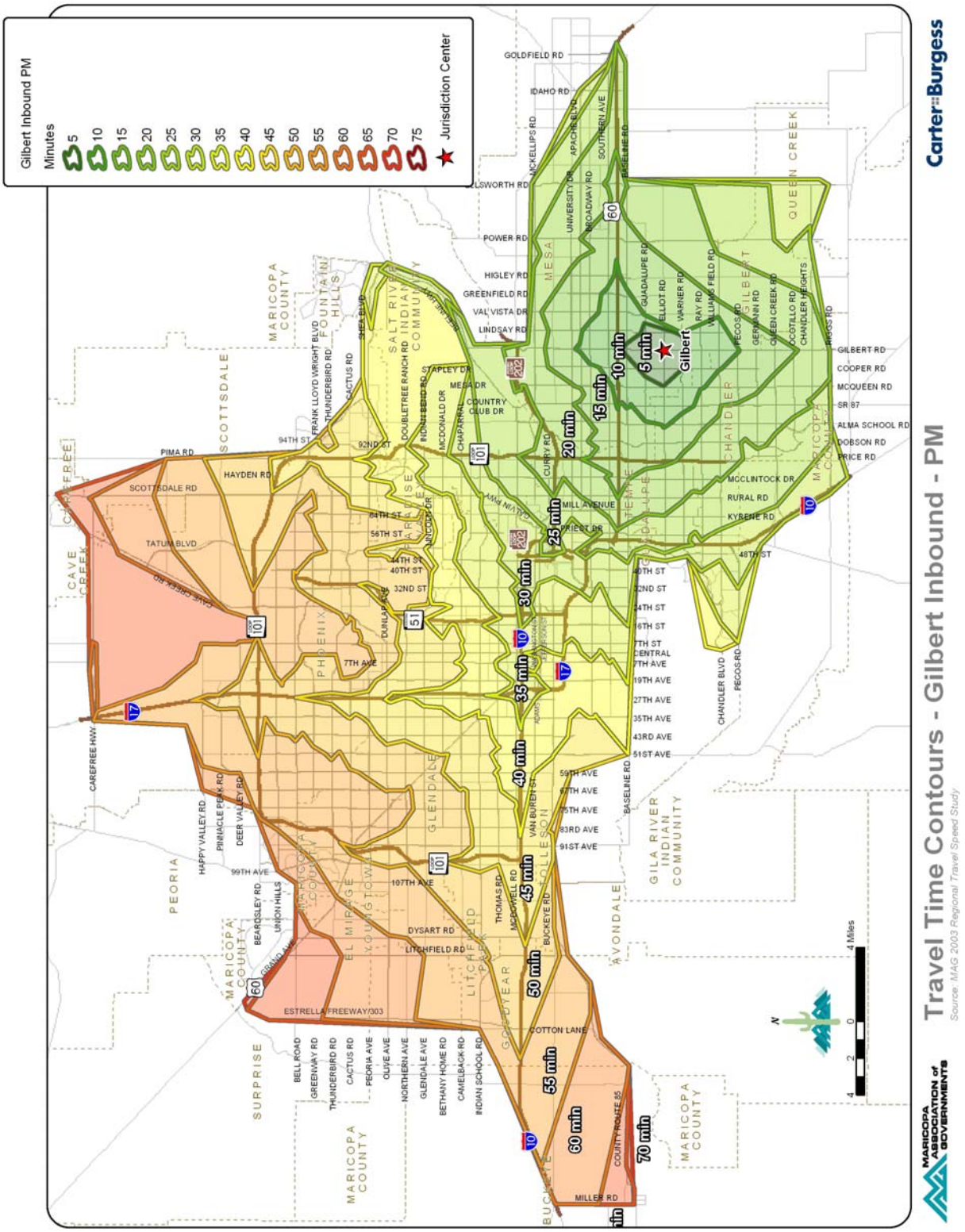


Figure D-18-Travel Time Contours-Gilbert Outbound-Free Flow (Posted Speed Limit)

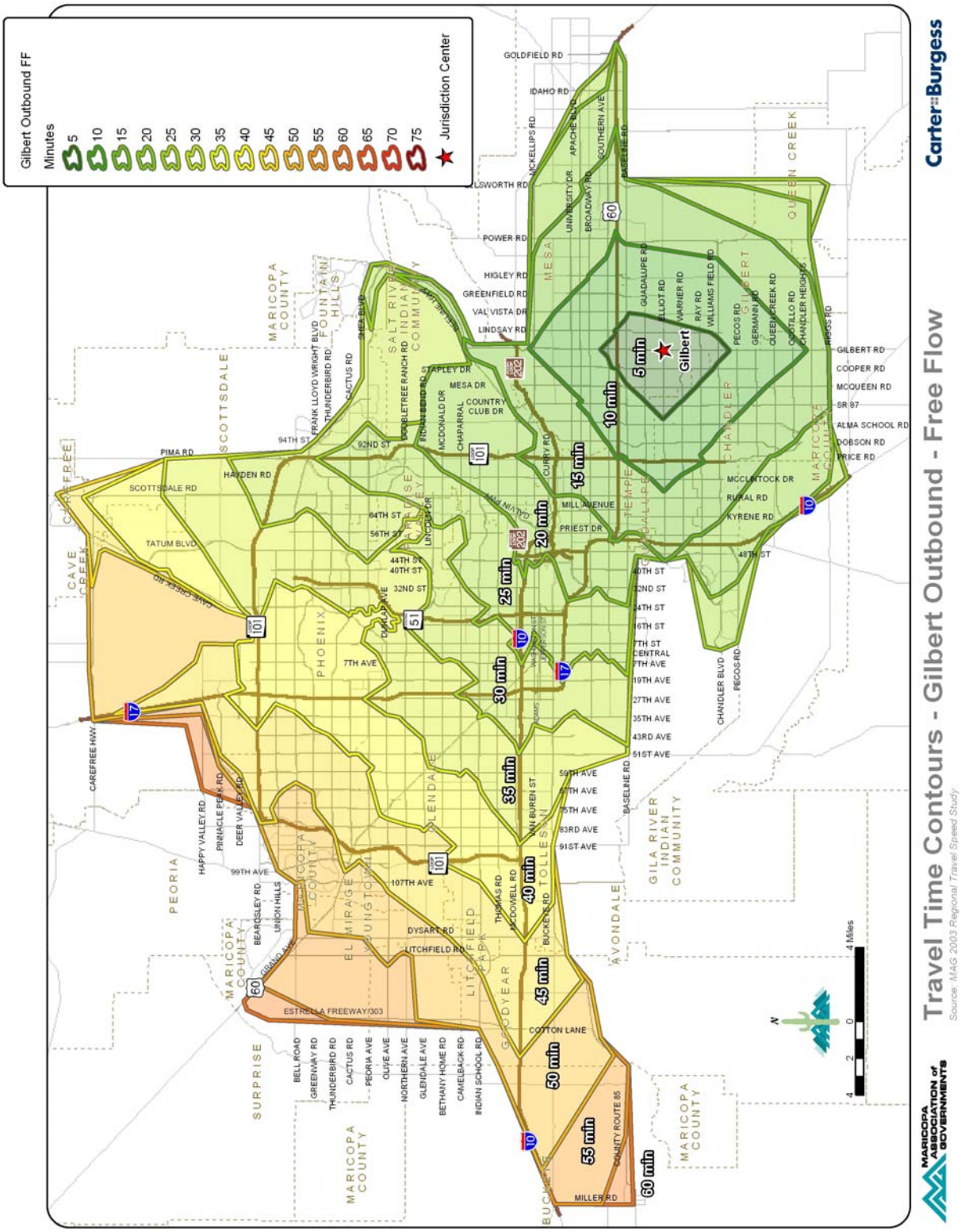


Figure D-19-Travel Time Contours-Peoria Inbound –AM

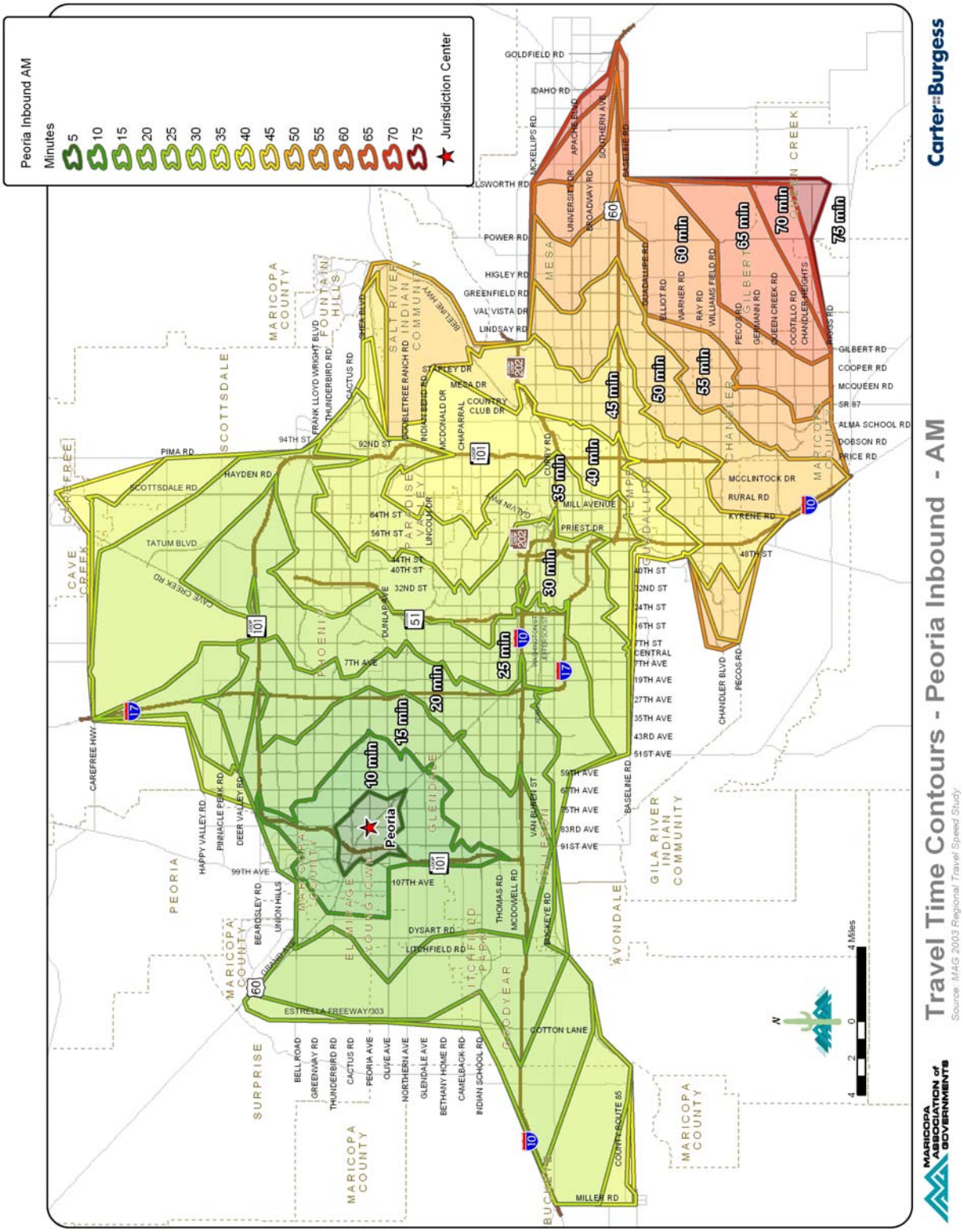


Figure D-20-Travel Time Contours-Peoria Inbound –PM

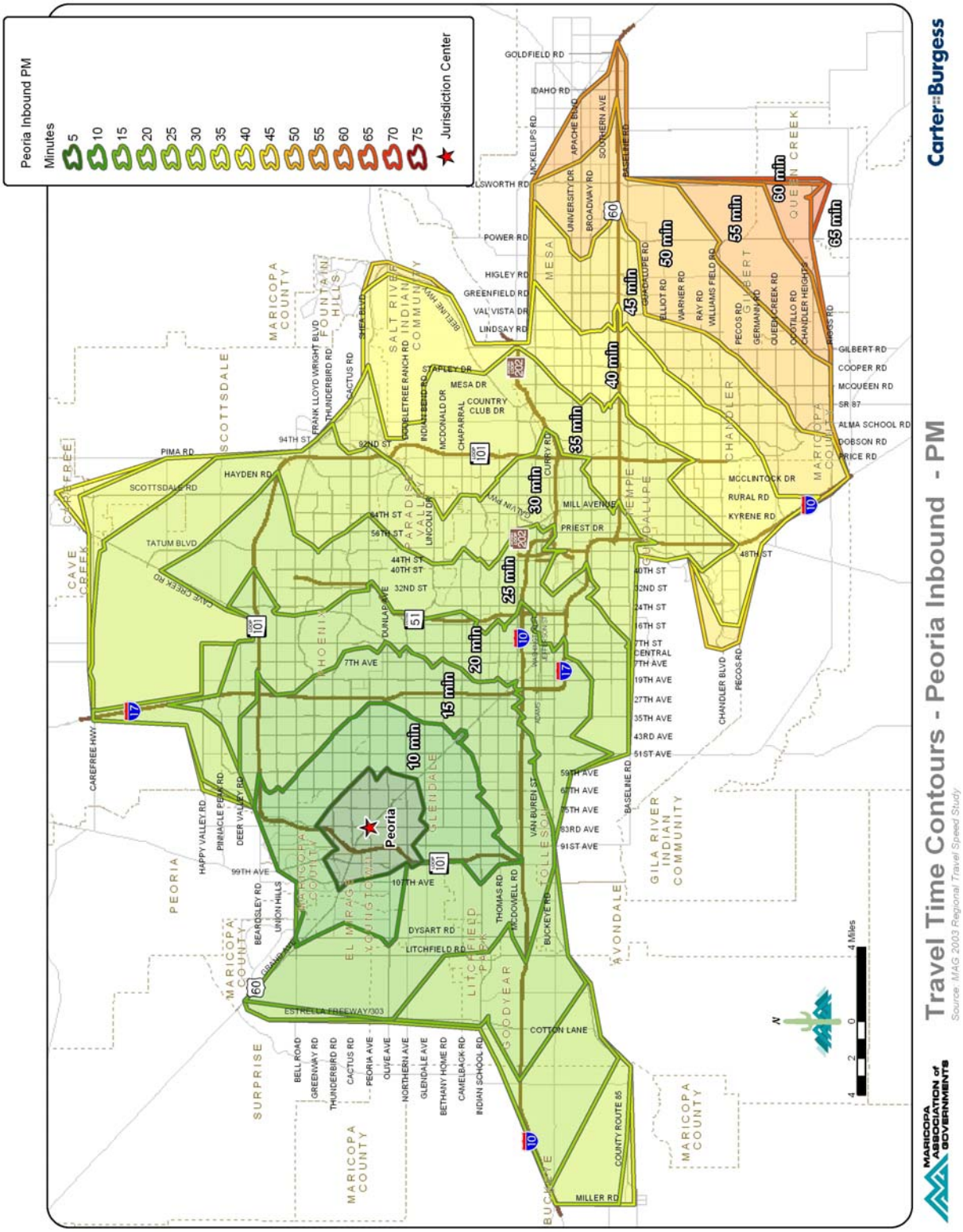


Figure D-21-Travel Time Contours-Peoria Inbound-Free Flow (Posted Speed Limit)

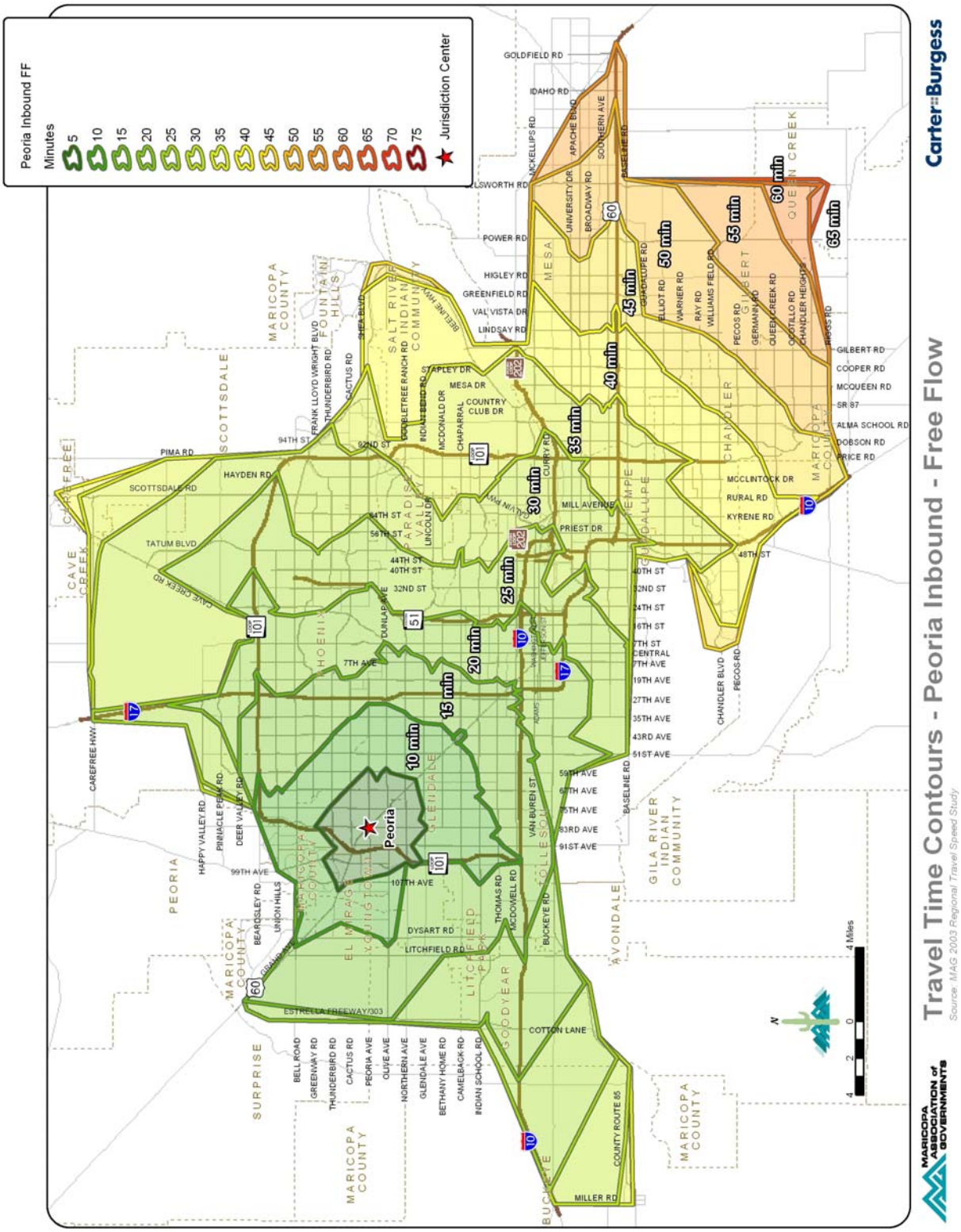


Figure D-22-Travel Time Contours-Peoria Outbound –AM

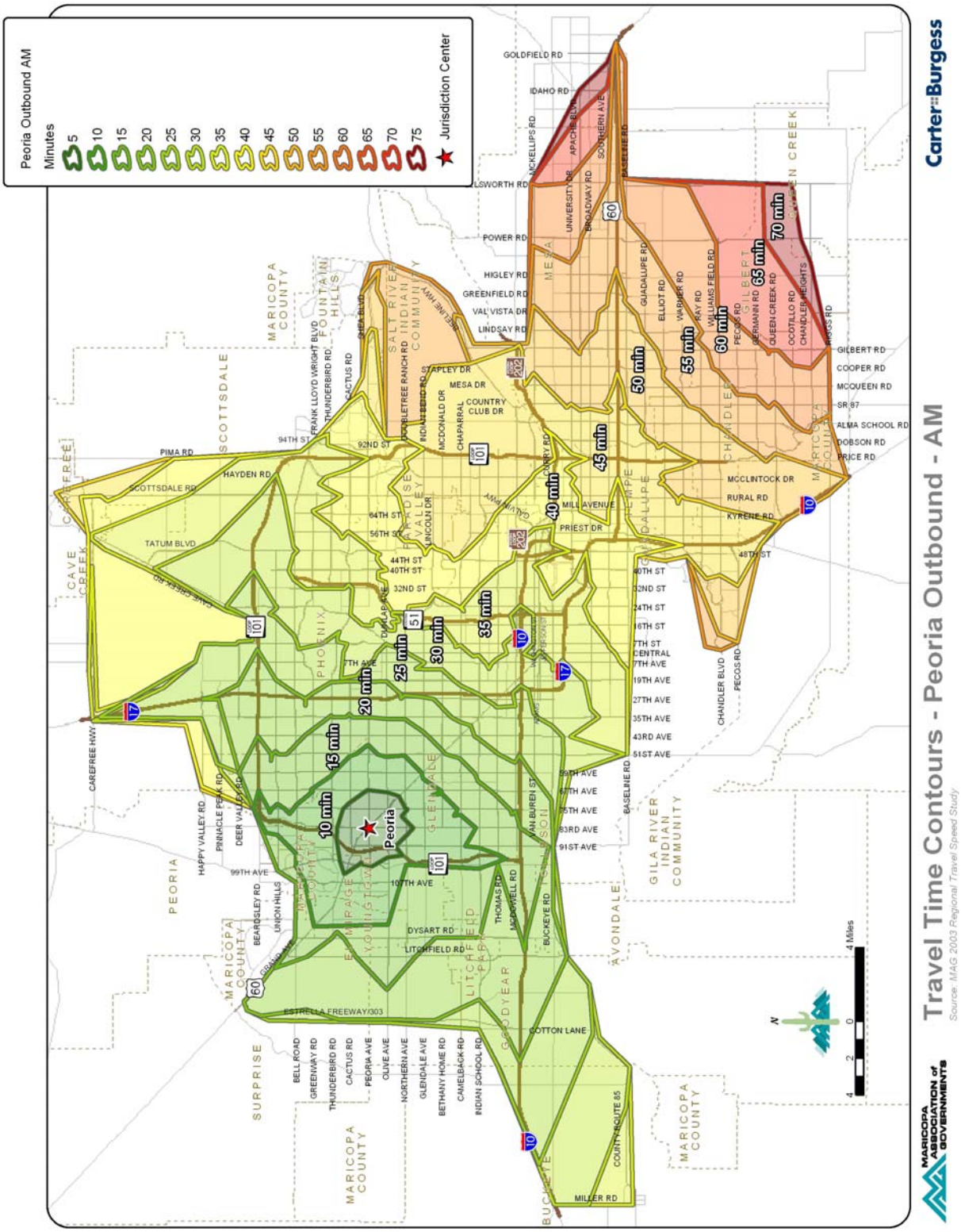


Figure D-23-Travel Time Contours-Peoria Outbound –PM

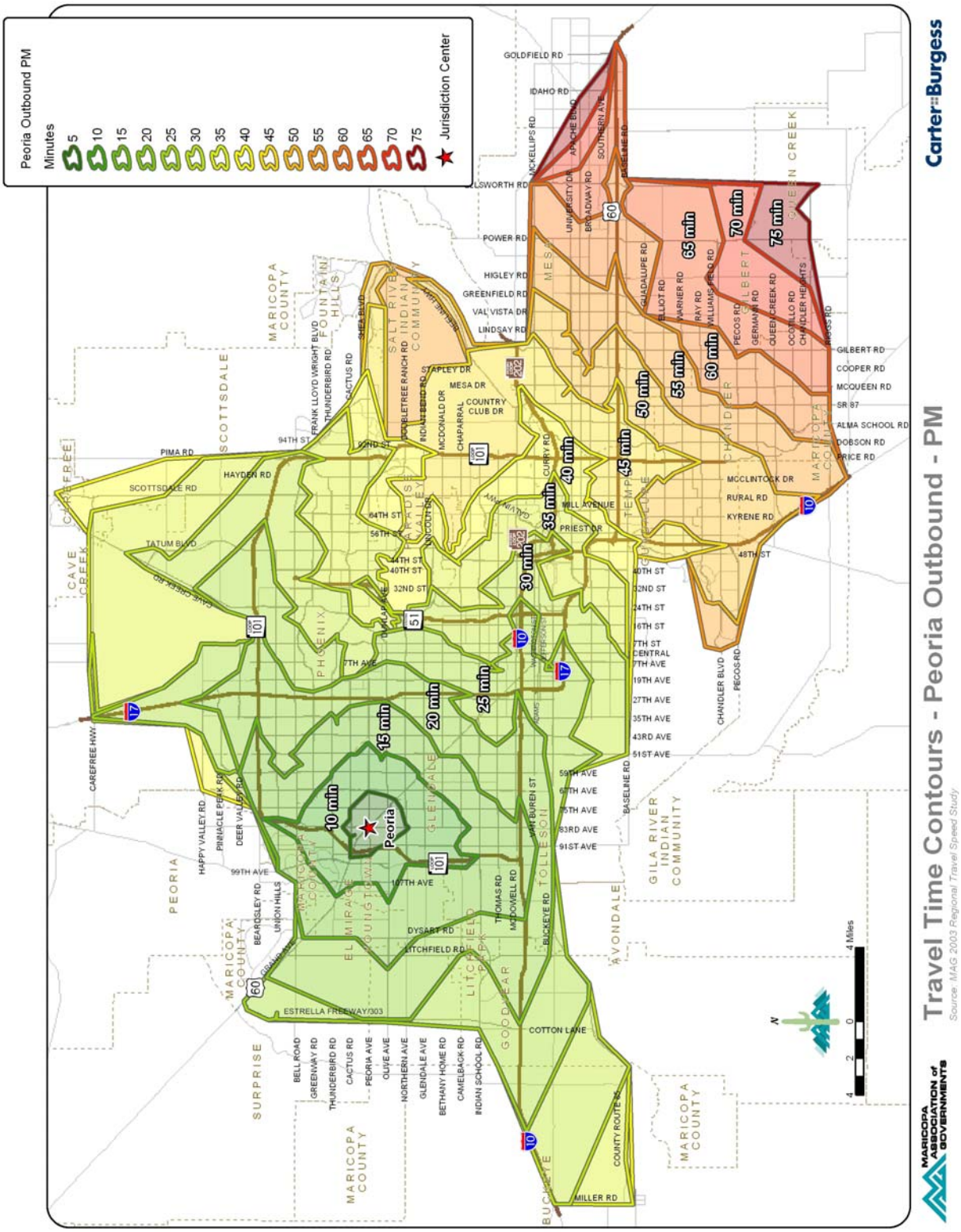


Figure D-24-Travel Time Contours-Peoria Outbound-Free Flow (Posted Speed Limit)

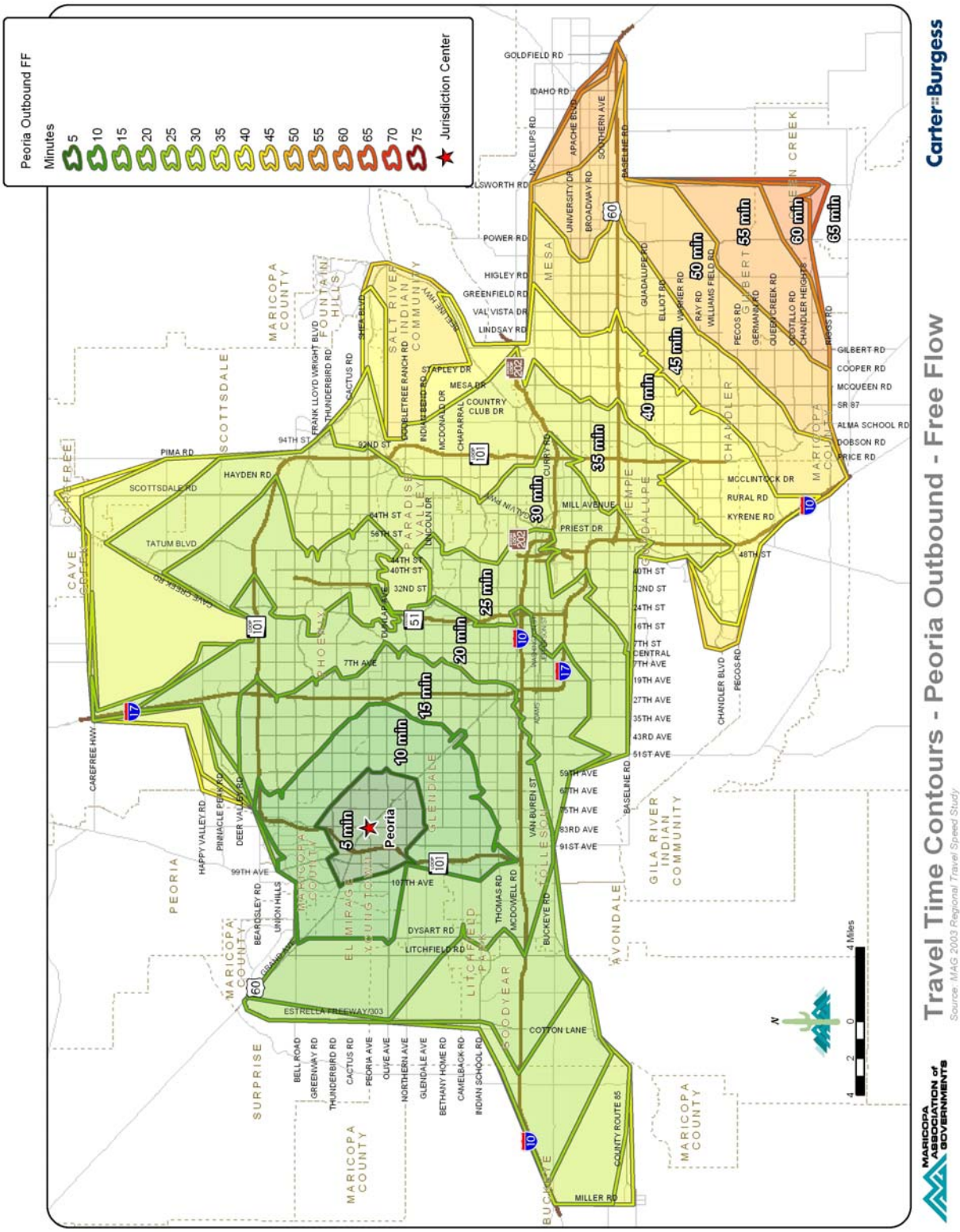


Figure D-25-Travel Time Contours-Phoenix Inbound-PM

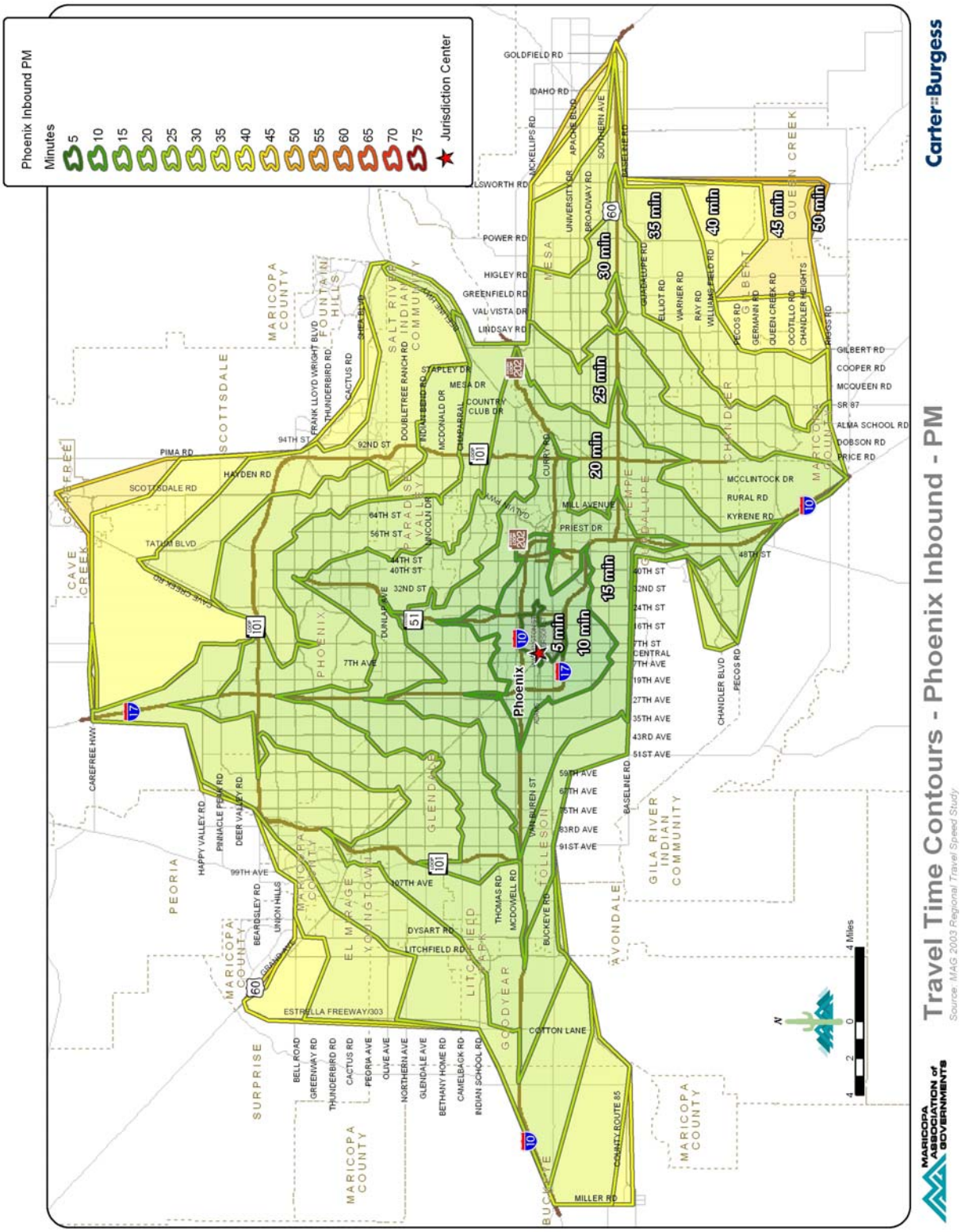


Figure D-26-Travel Time Contours-Phoenix Outbound-AM

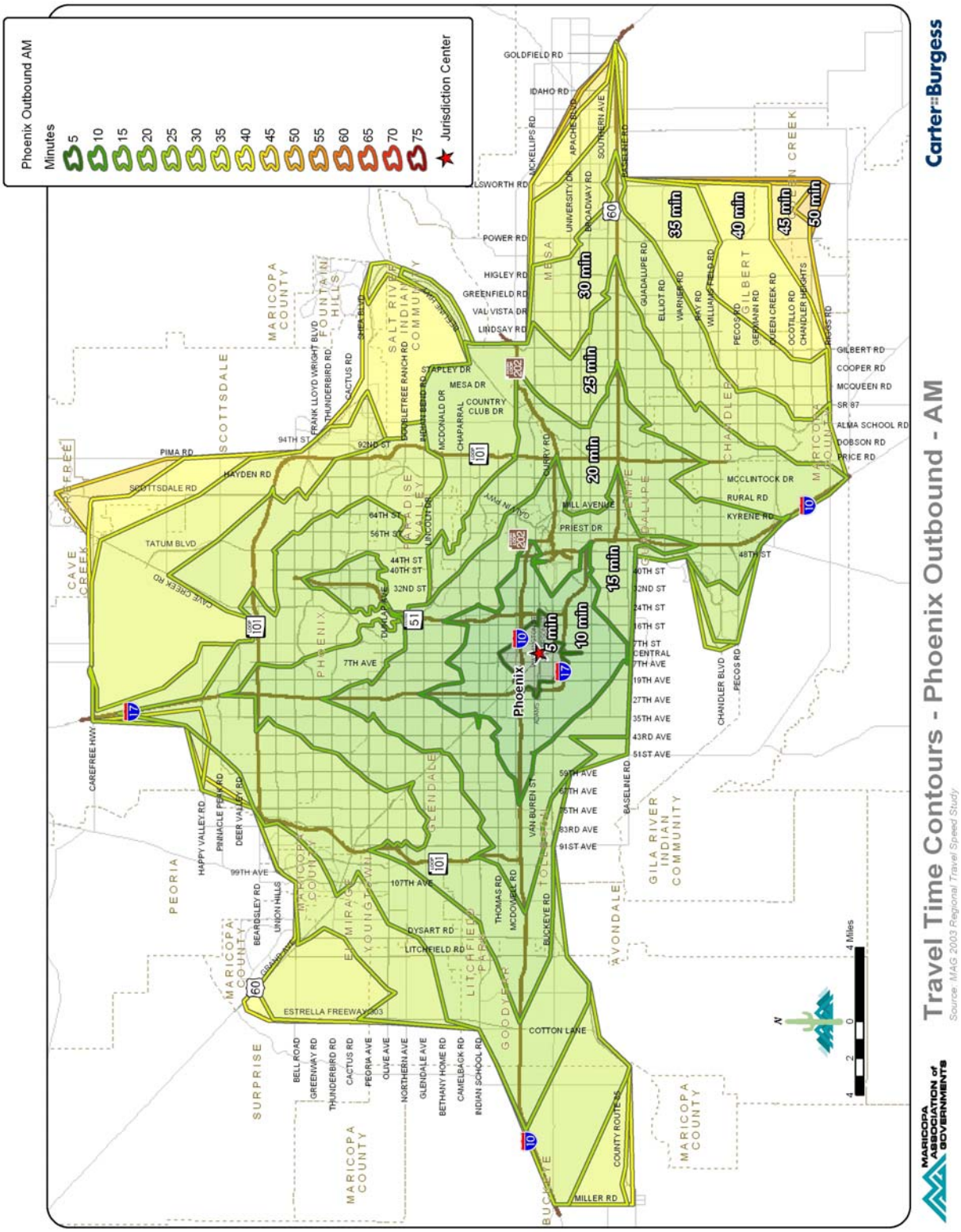


Figure D-27-Travel Time Contours-Phoenix Outbound-Free Flow (Posted Speed Limit)

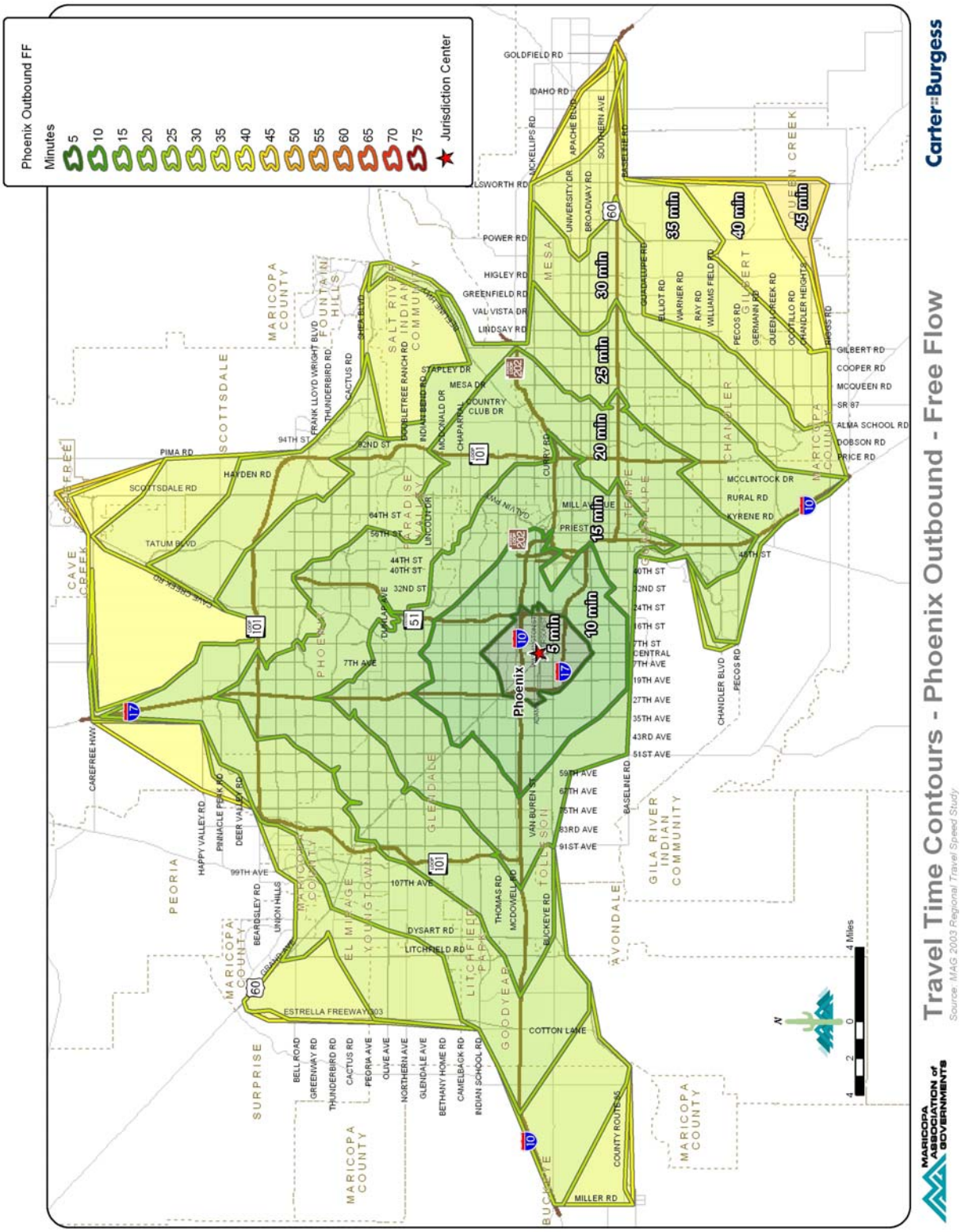


Figure D-28-Travel Time Contours-Scottsdale Inbound-AM

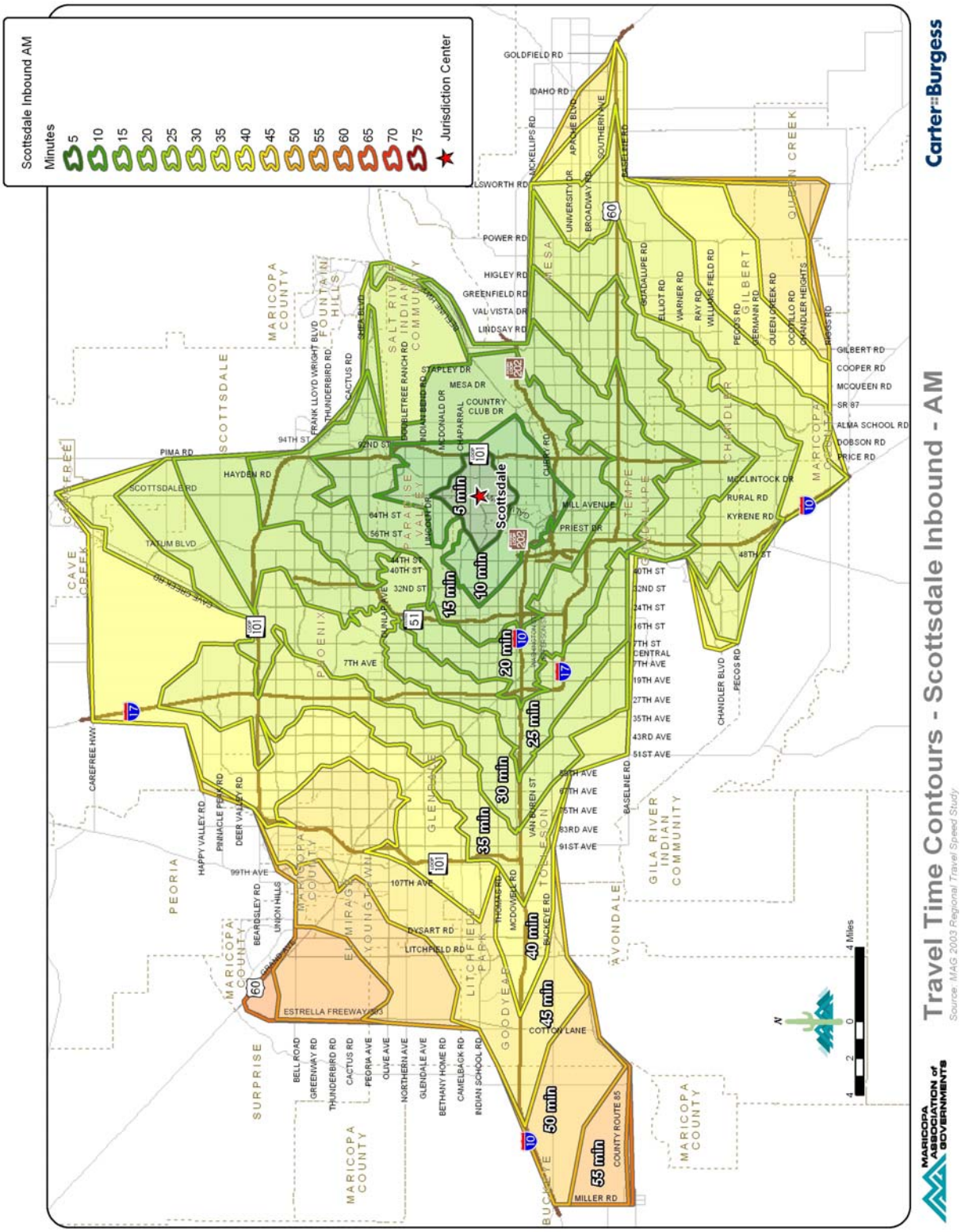


Figure D-29-Travel Time Contours-Scottsdale Inbound-PM

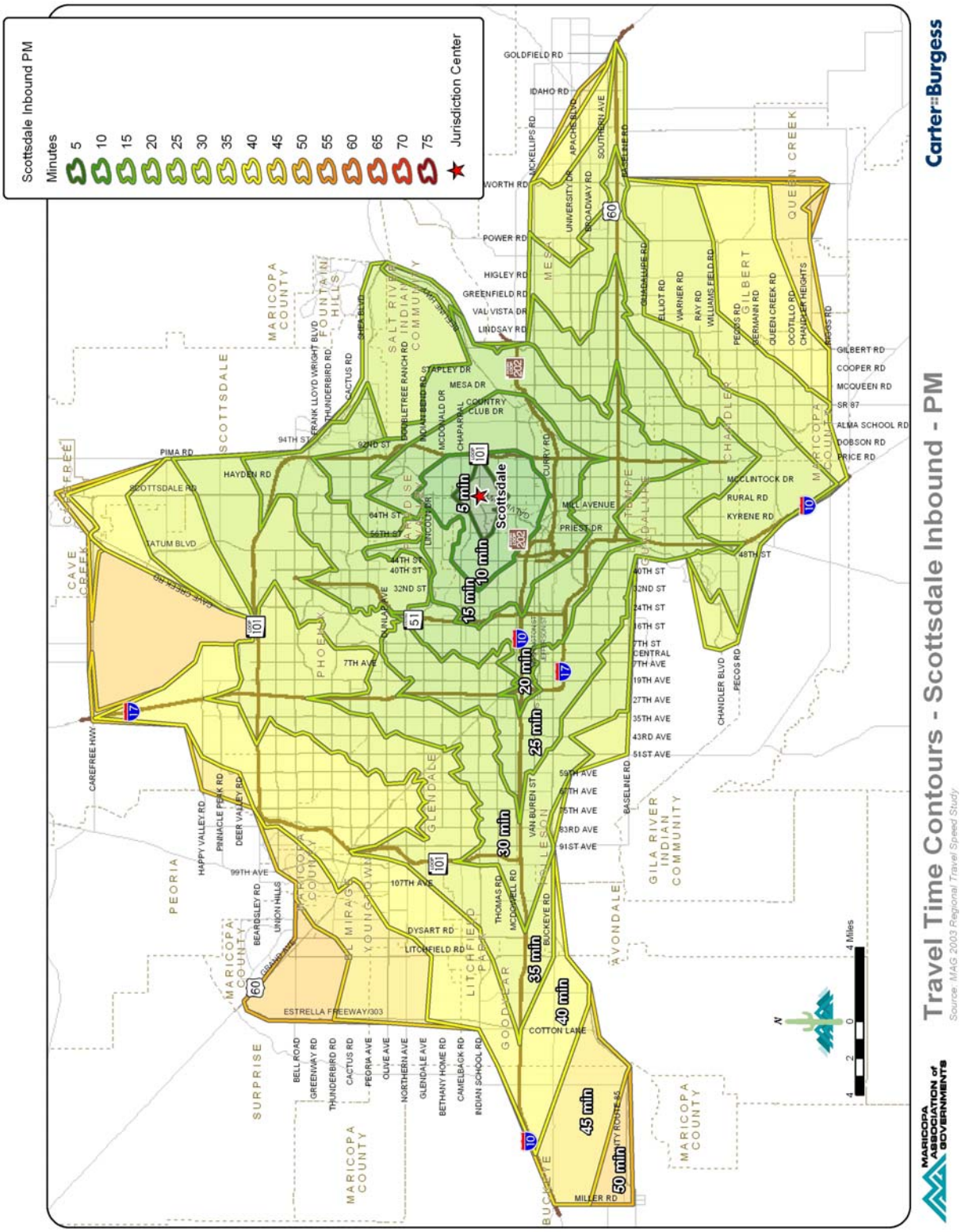


Figure D-30-Travel Time Contours-Scottsdale Inbound-Free Flow (Posted Speed Limit)

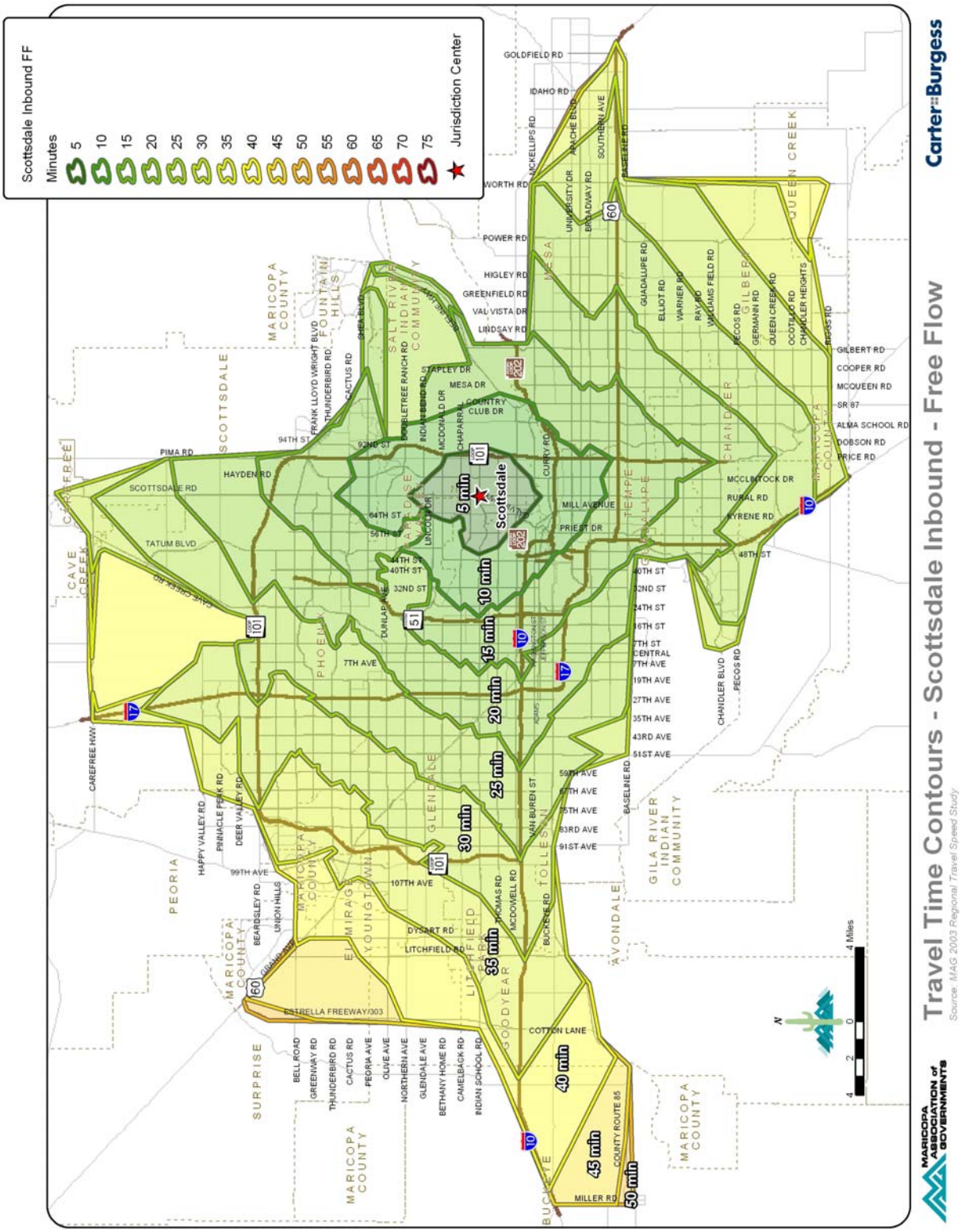


Figure D-31-Travel Time Contours-Scottsdale Outbound-AM

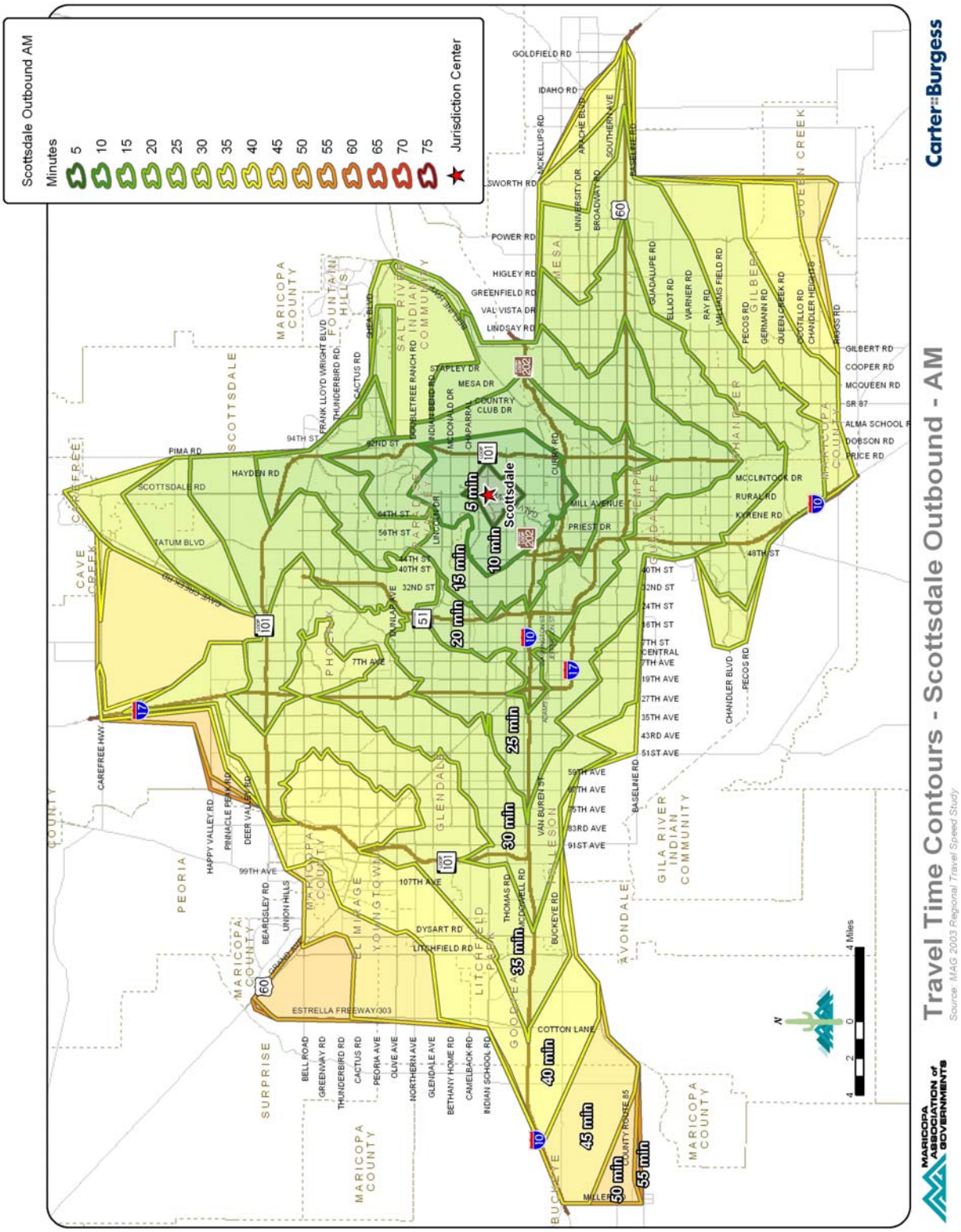


Figure D-32-Travel Time Contours-Scottsdale Outbound-PM

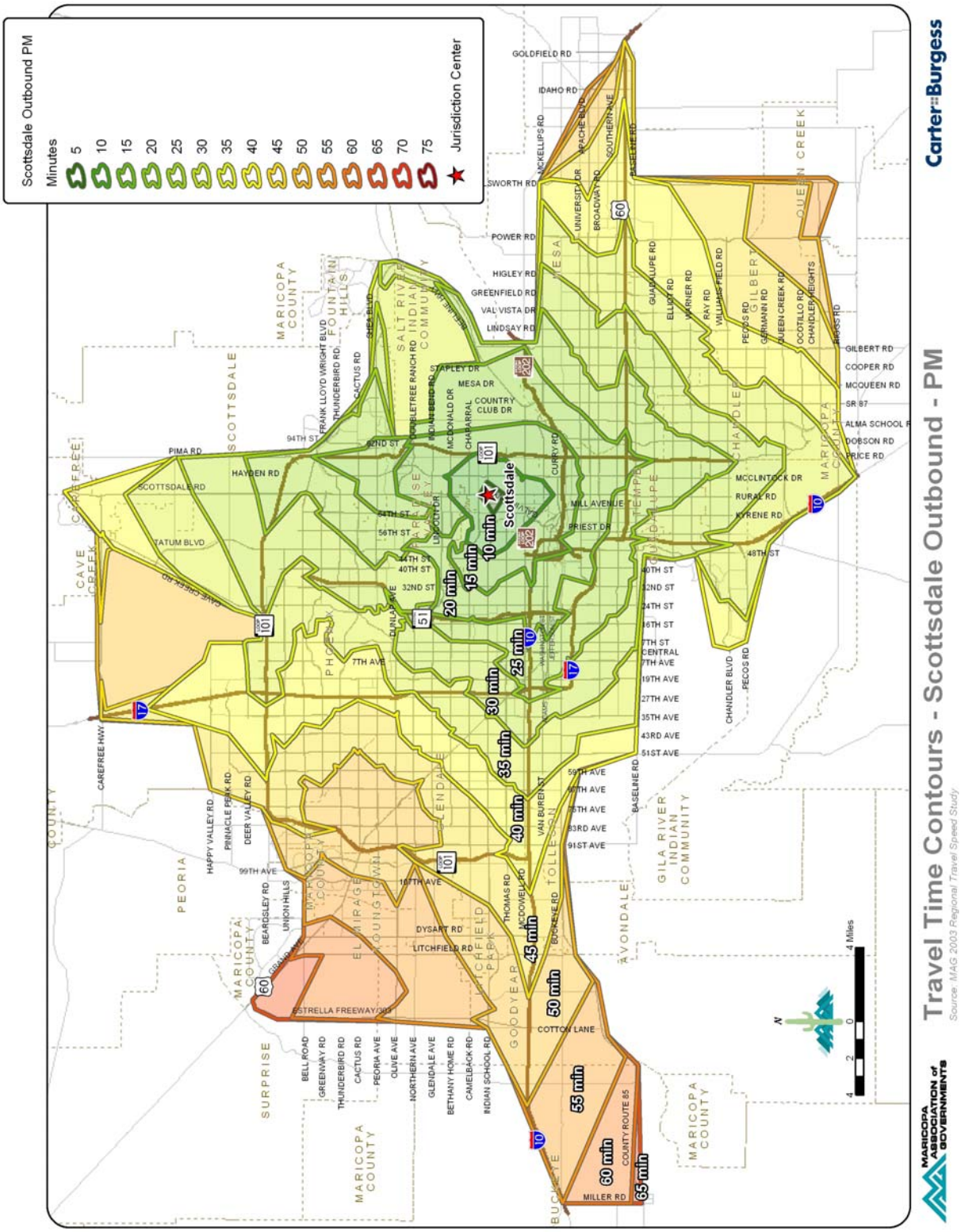


Figure D-33-Travel Time Contours-Scottsdale Outbound-Free Flow (Posted Speed Limit)

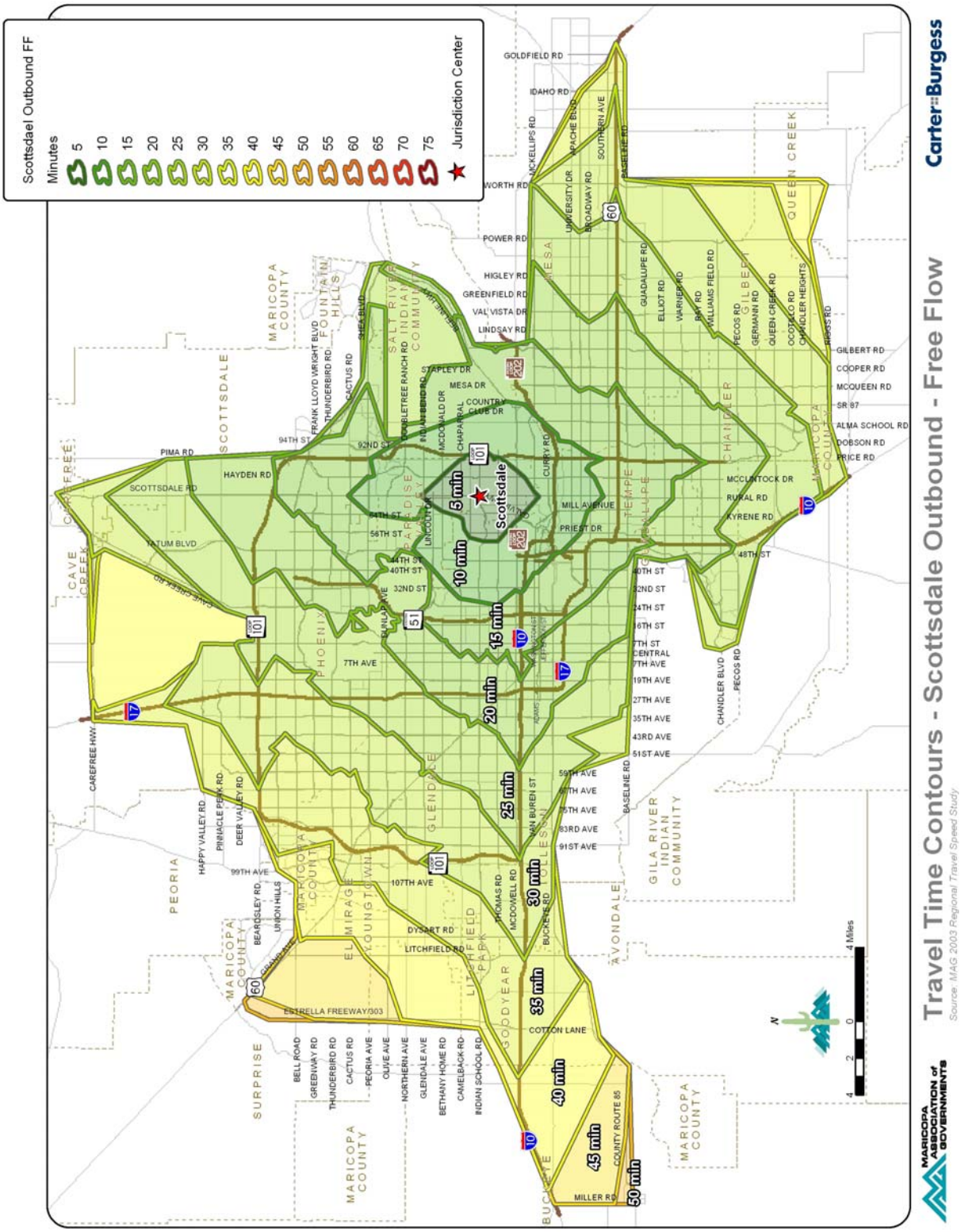


Figure D-34-Travel Time Contours-Sky Harbor Inbound-AM

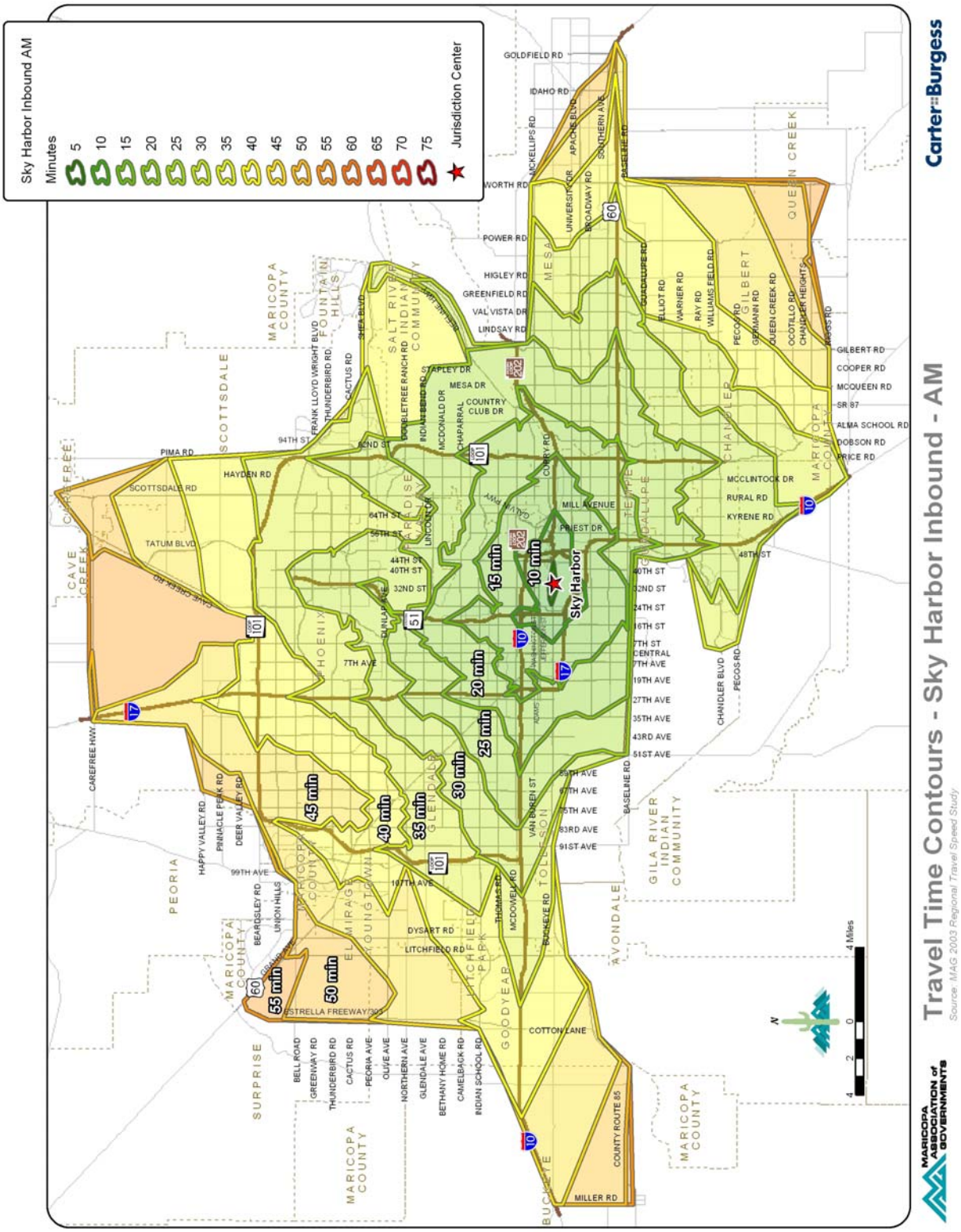


Figure D-35-Travel Time Contours-Sky Harbor Inbound-PM

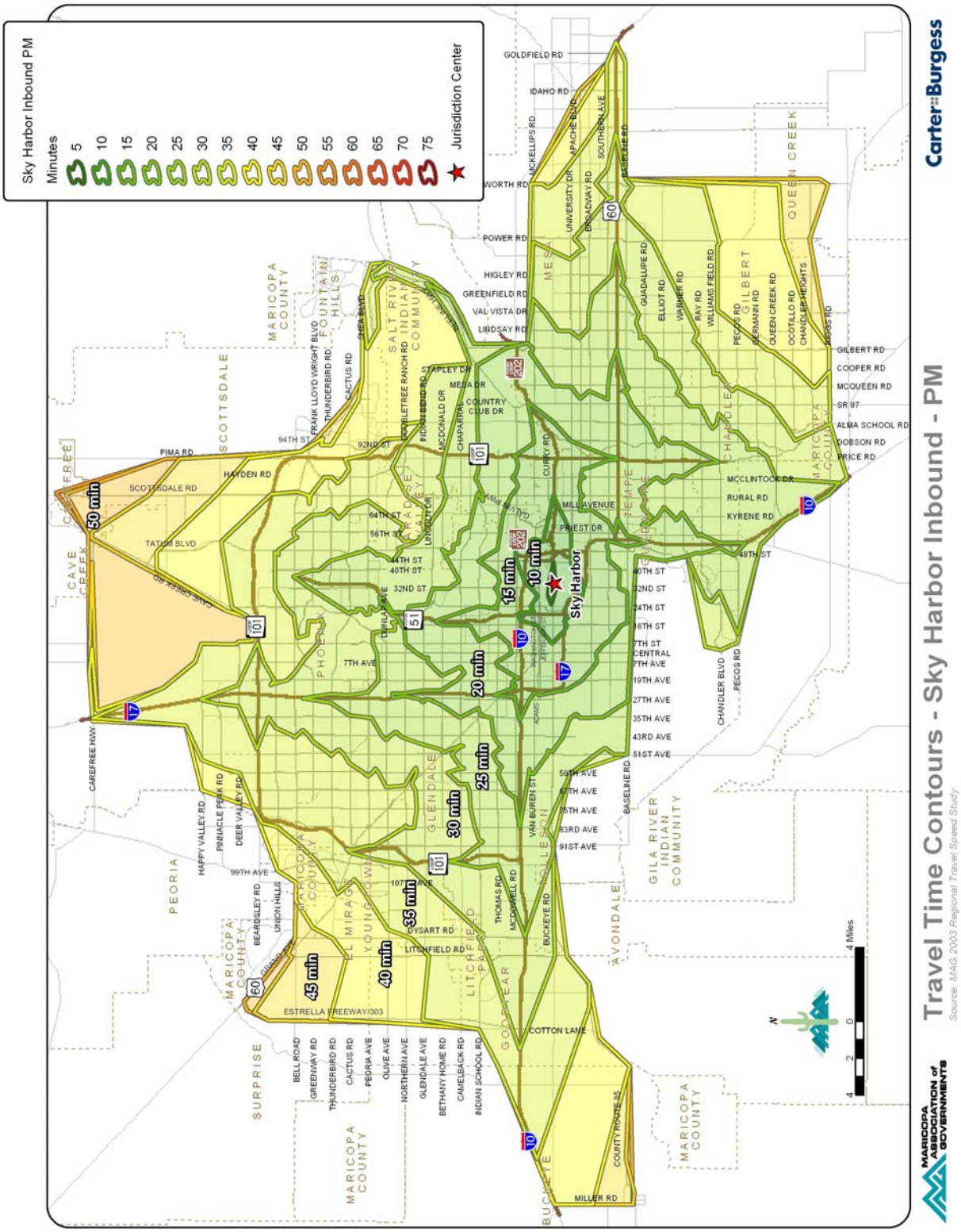


Figure D-36-Travel Time Contours-Sky Harbor Inbound-Free Flow (Posted Speed Limit)

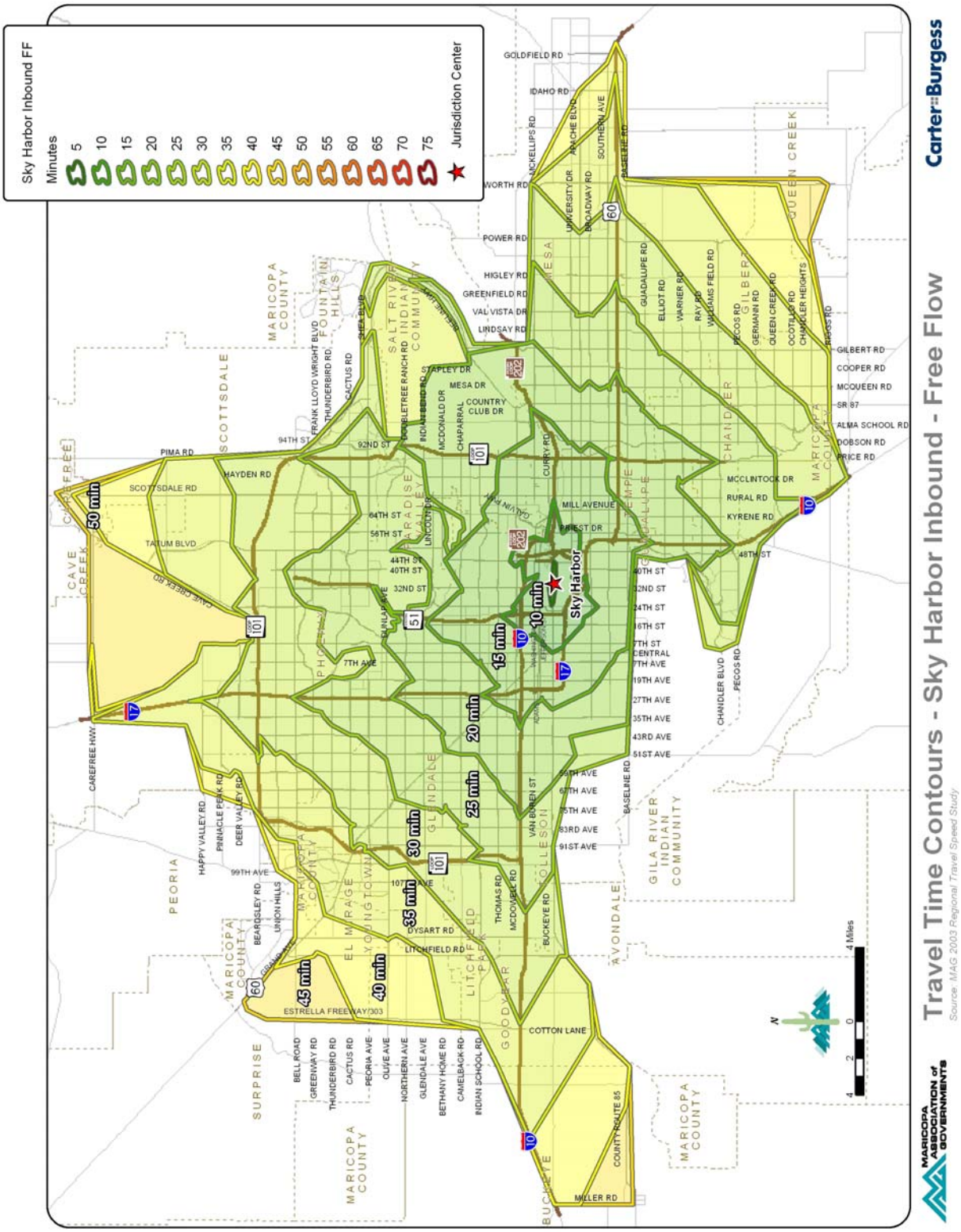


Figure D-37-Travel Time Contours-Sky Harbor Outbound-AM

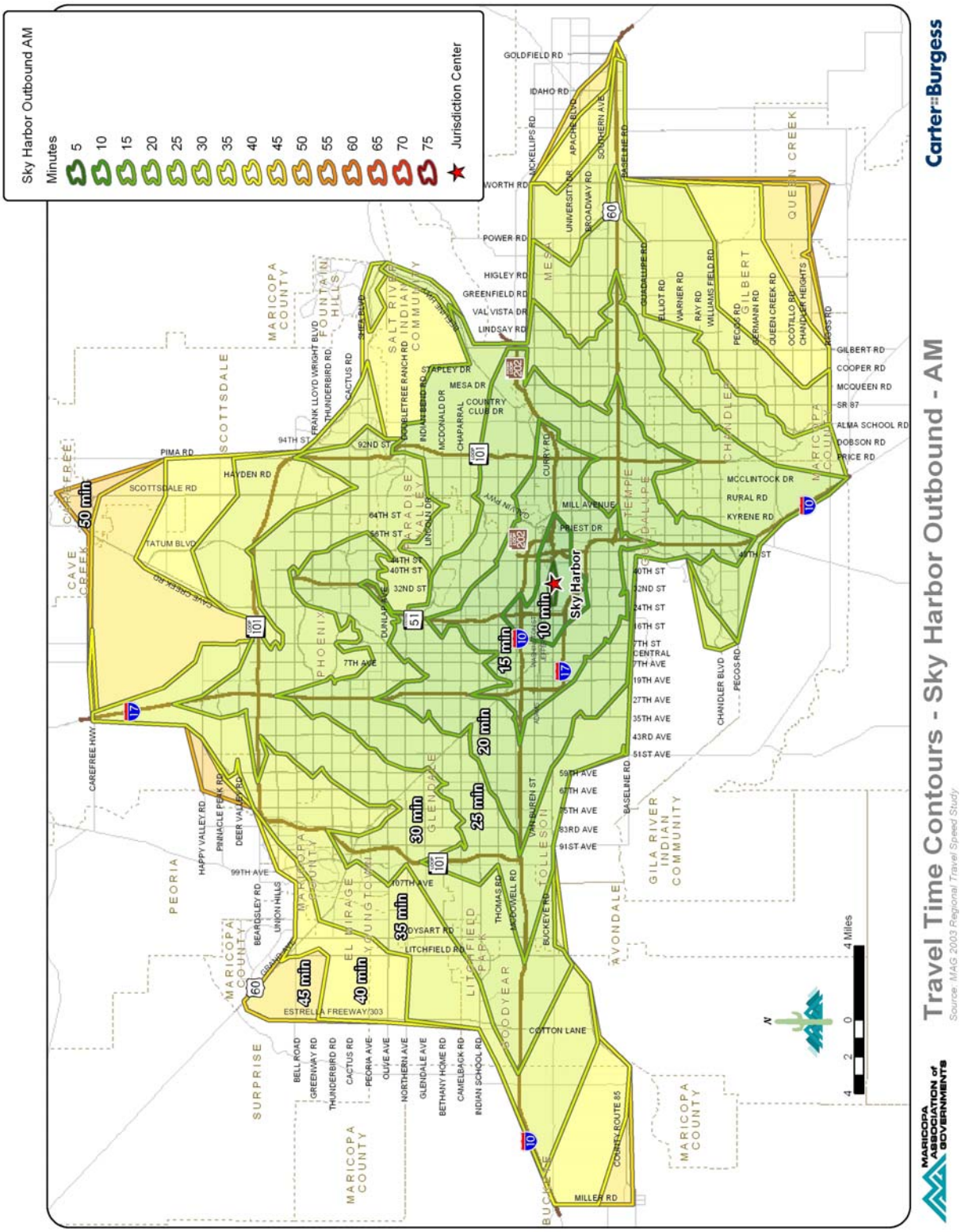


Figure D-38-Travel Time Contours-Sky Harbor Outbound-PM

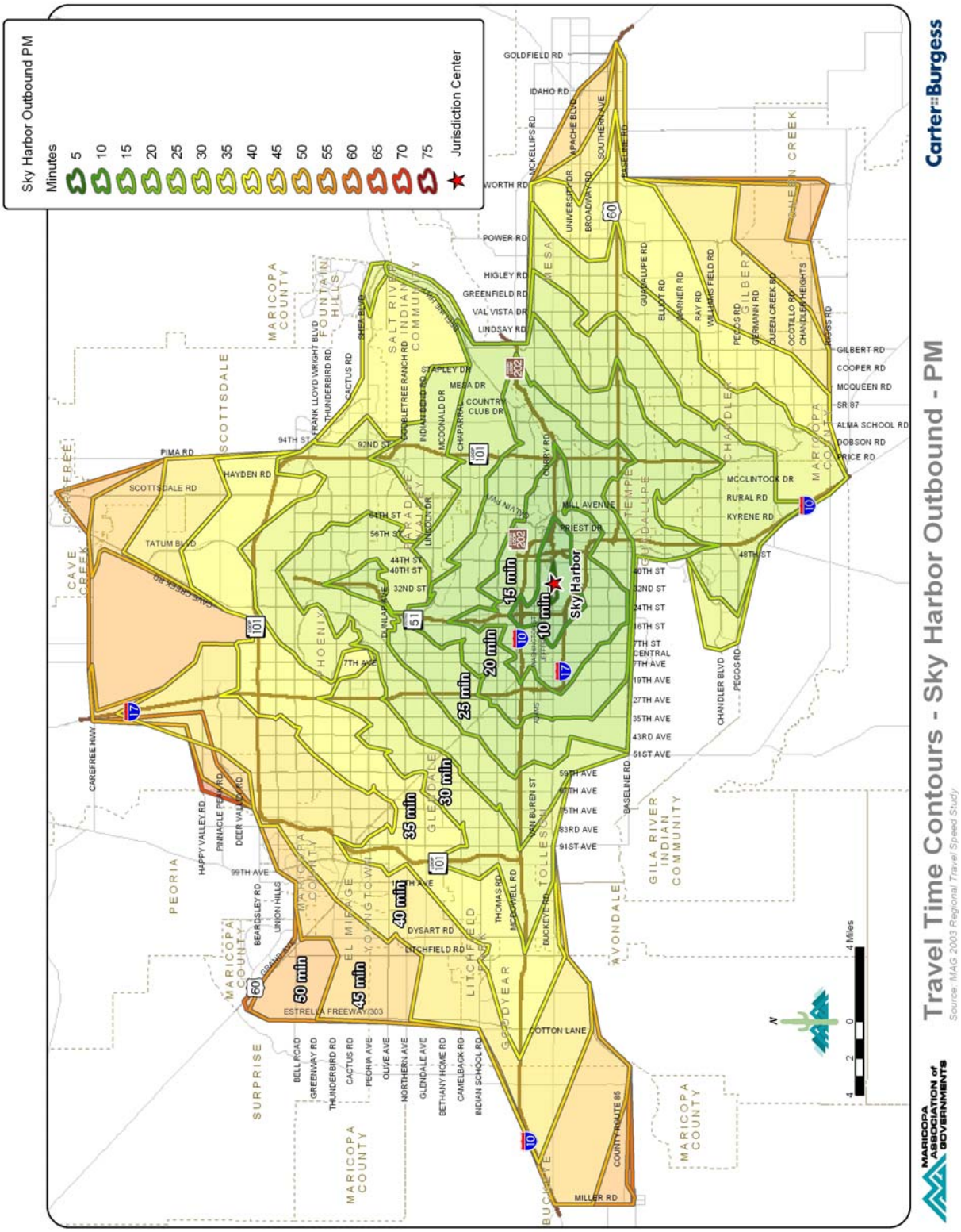


Figure D-39-Travel Time Contours-Sky Harbor Outbound-Free Flow (Posted Speed Limit)

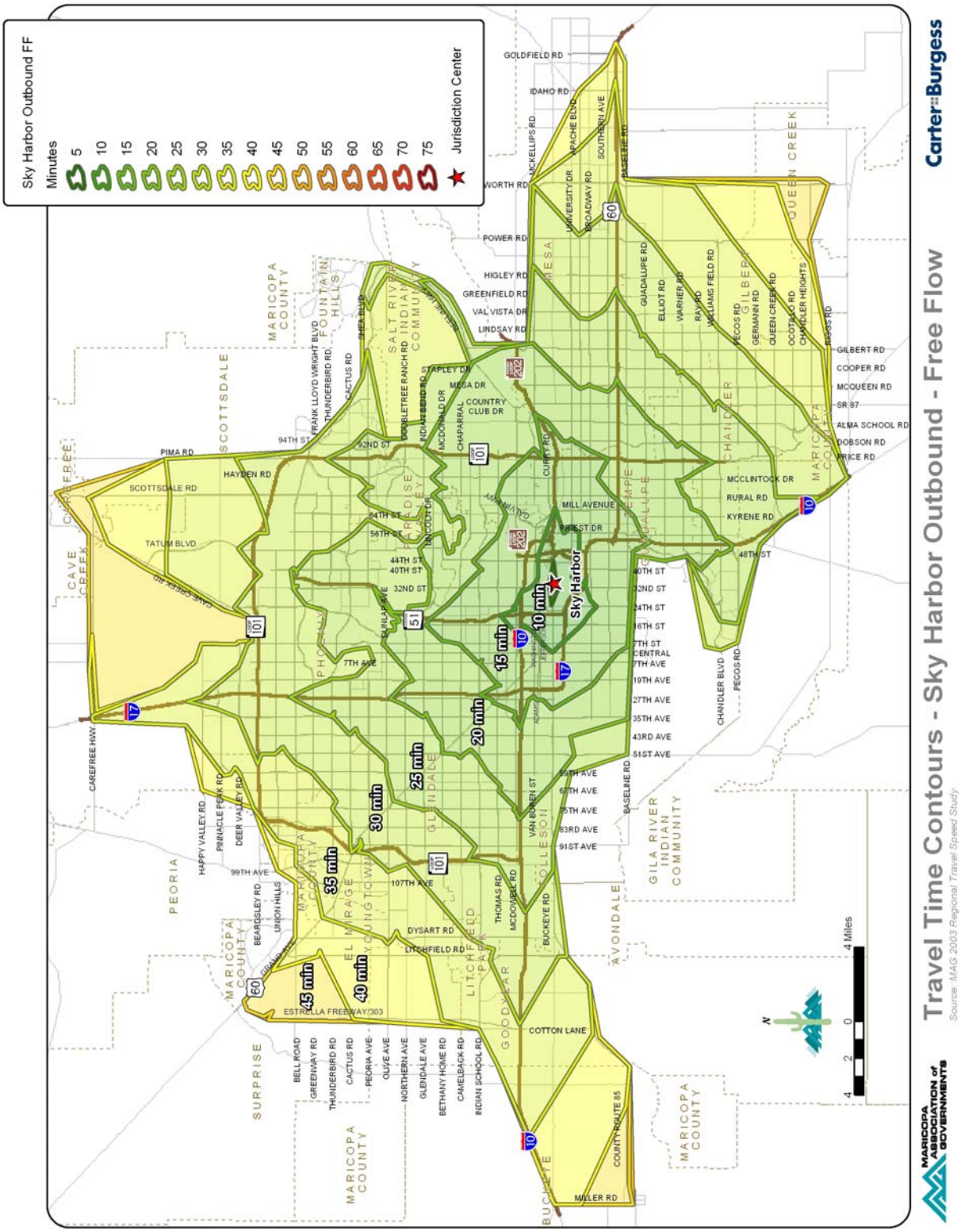


Figure D-40-Maximum Observed Intersection Queue Position

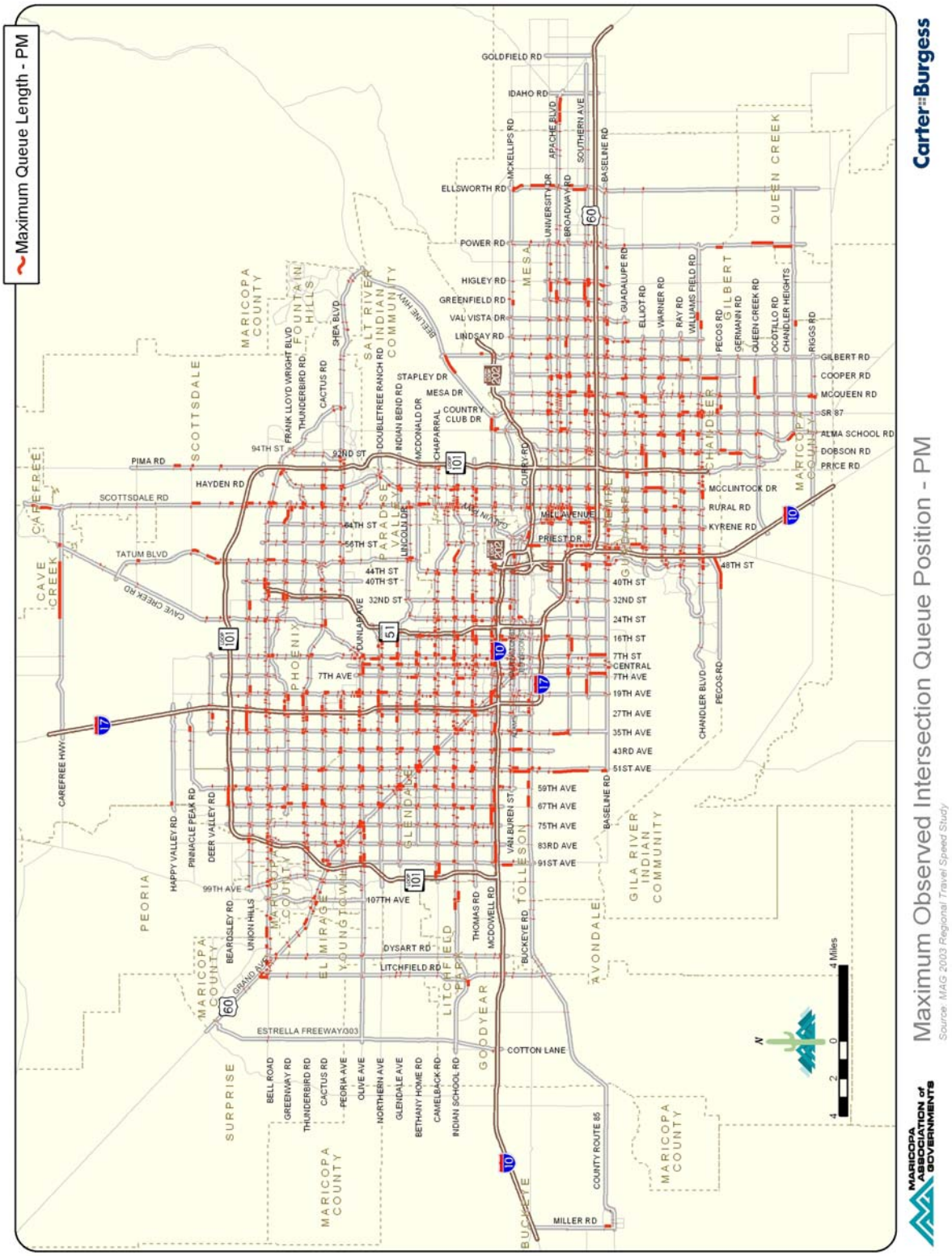


Figure D-41-Average Arterial Control Delay-AM Detail (Map 1 of 7)

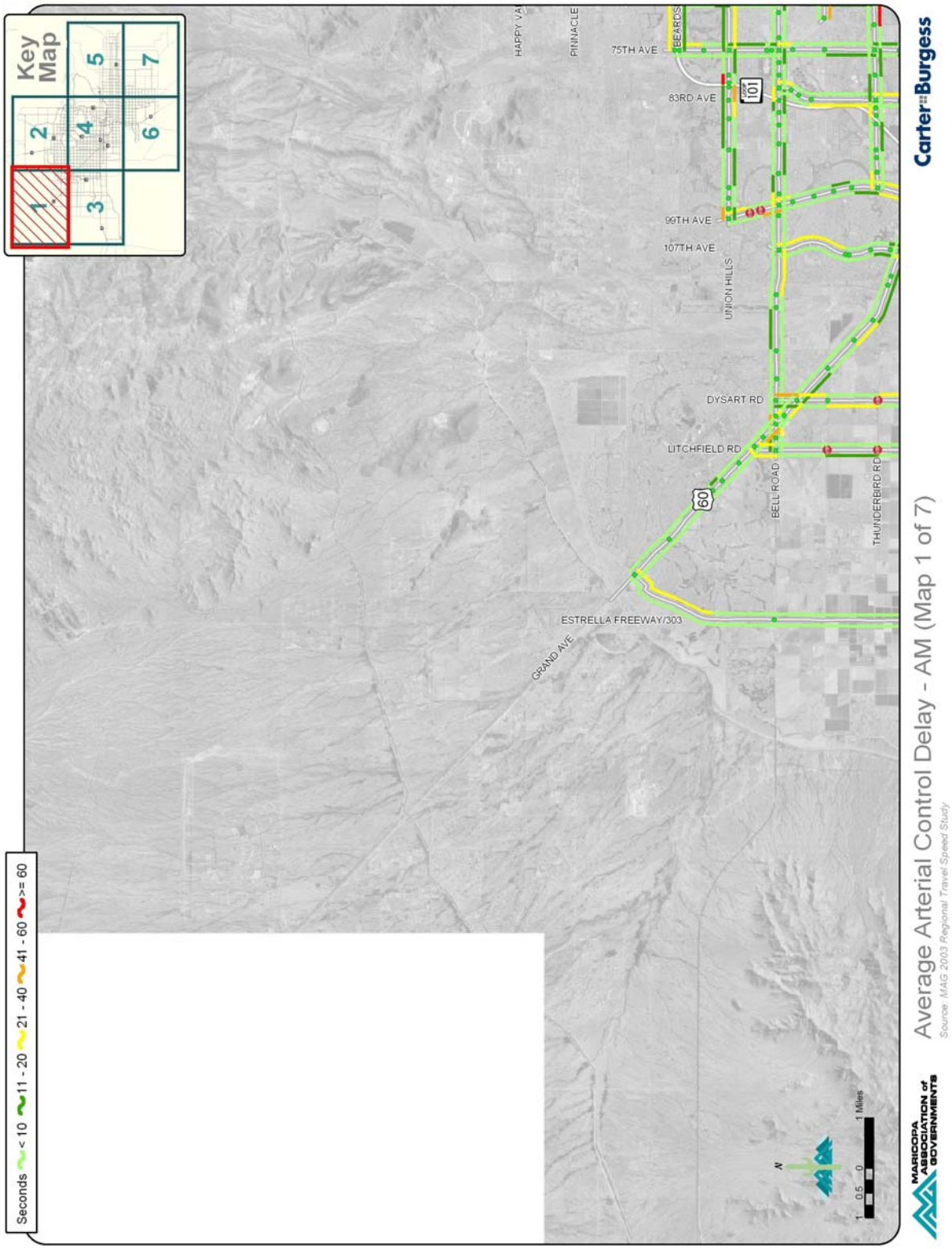


Figure D-42-Average Arterial Control Delay-AM Detail (Map 2 of 7)

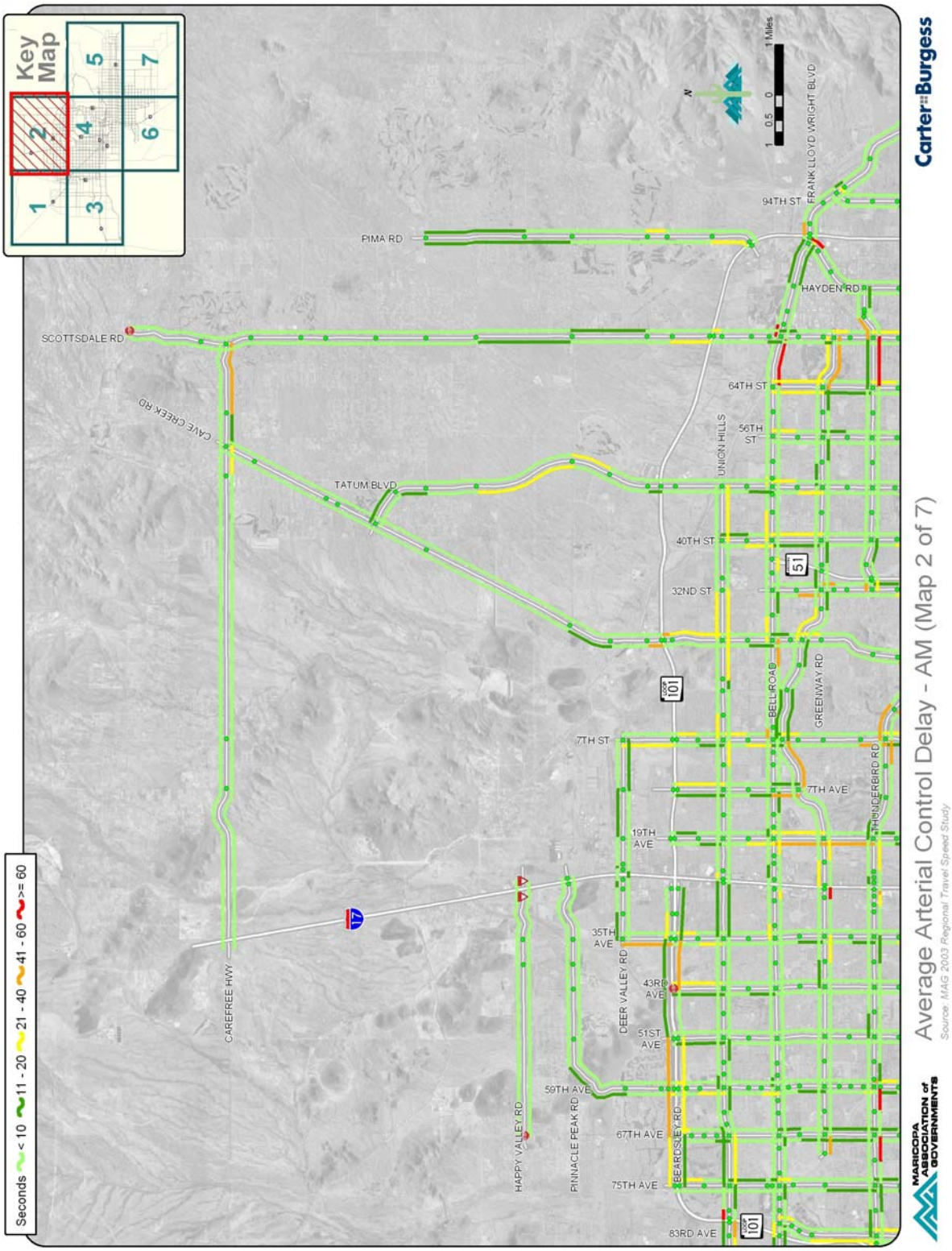


Figure D-43-Average Arterial Control Delay-AM Detail (Map 3 of 7)

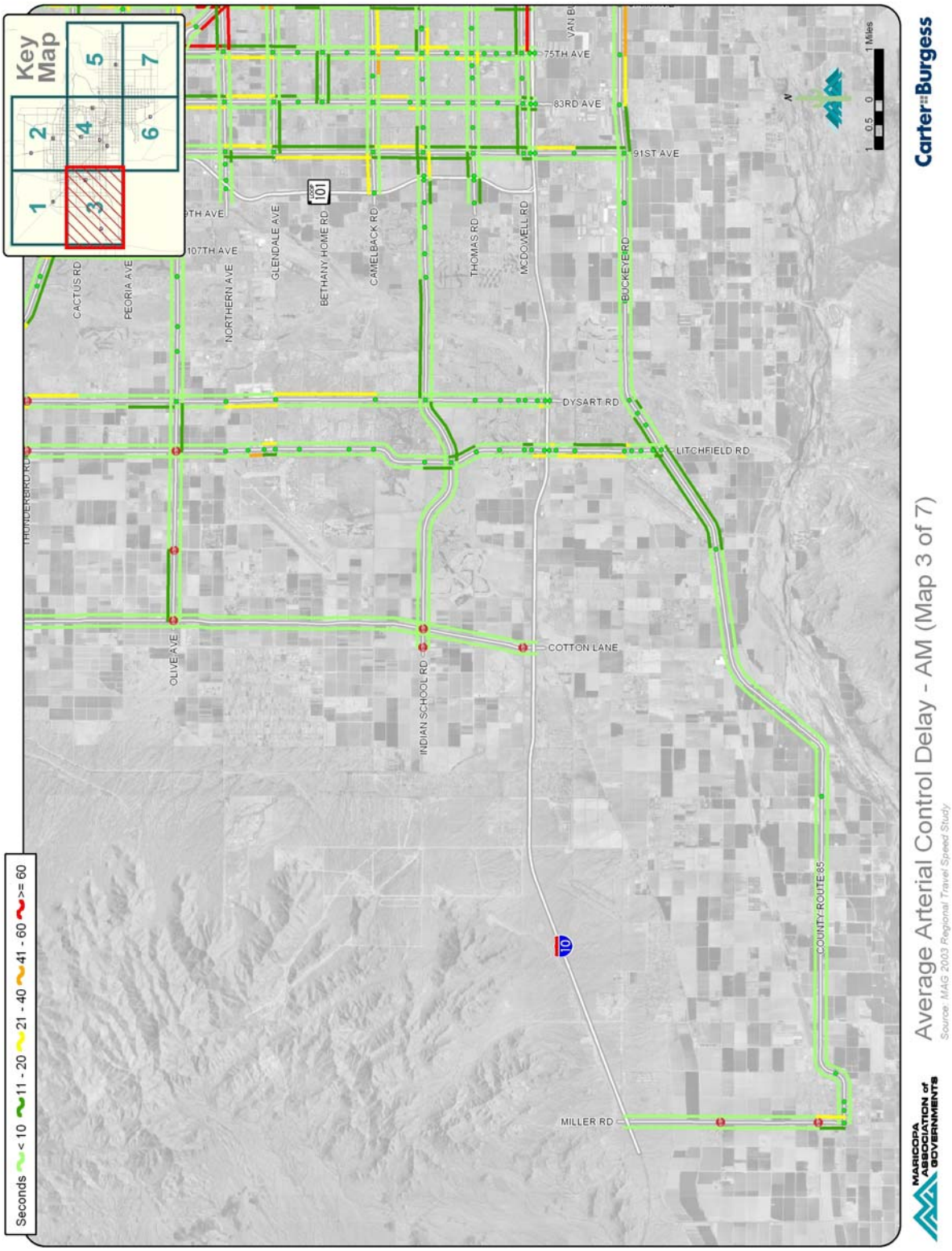


Figure D-44-Average Arterial Control Delay-AM Detail (Map 4 of 7)

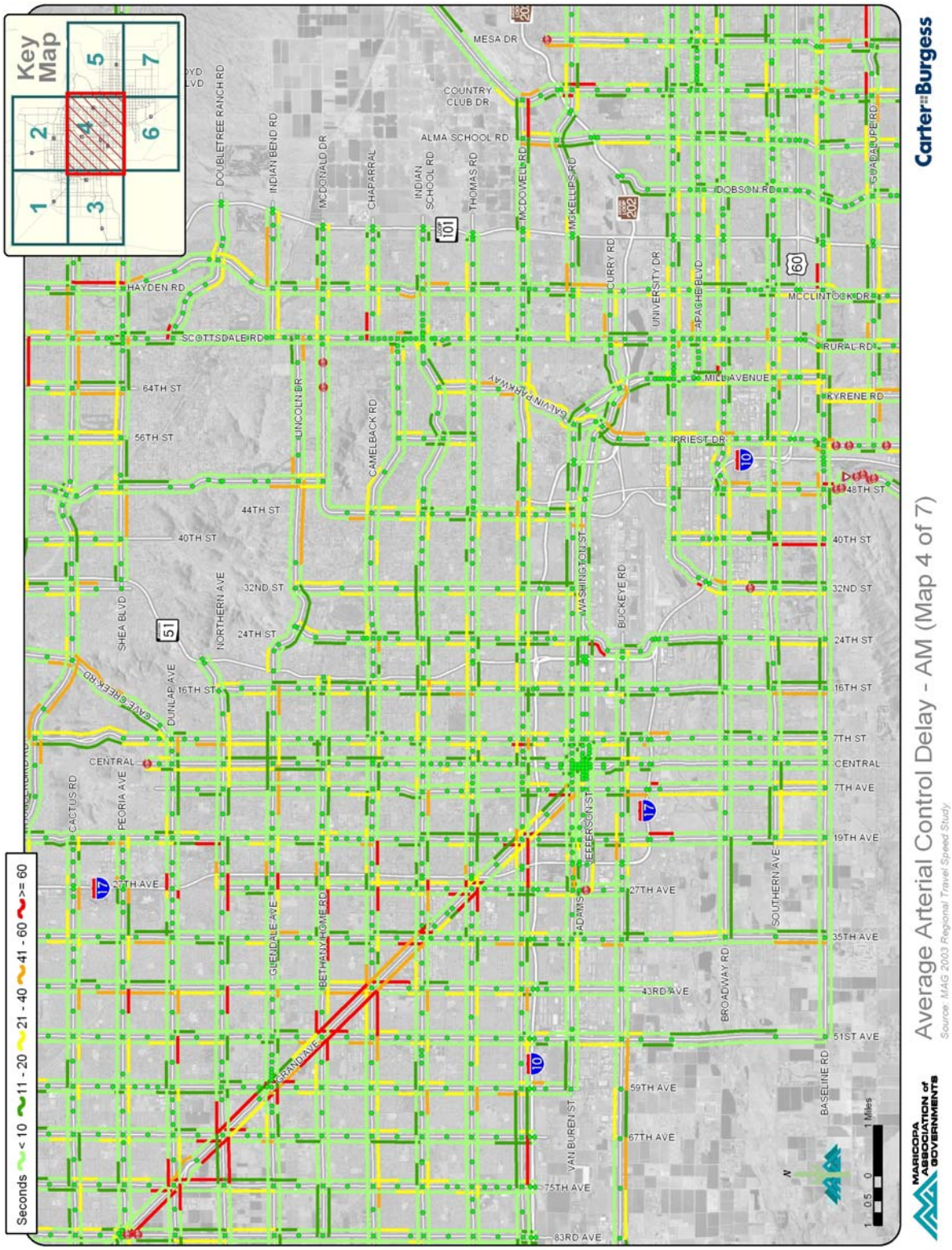


Figure D-45-Average Arterial Control Delay-AM Detail (Map 5 of 7)

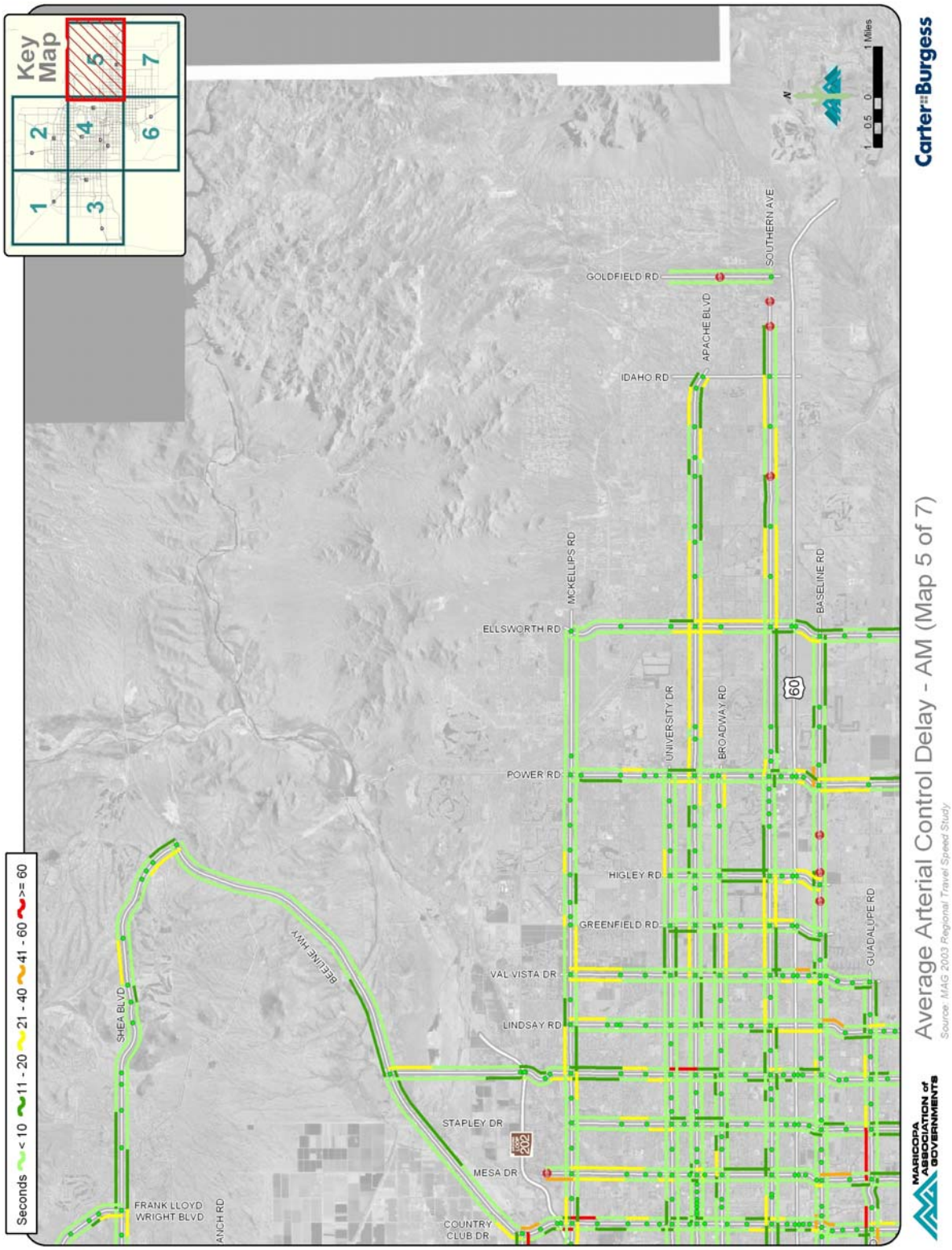


Figure D-46-Average Arterial Control Delay-AM Detail (Map 6 of 7)

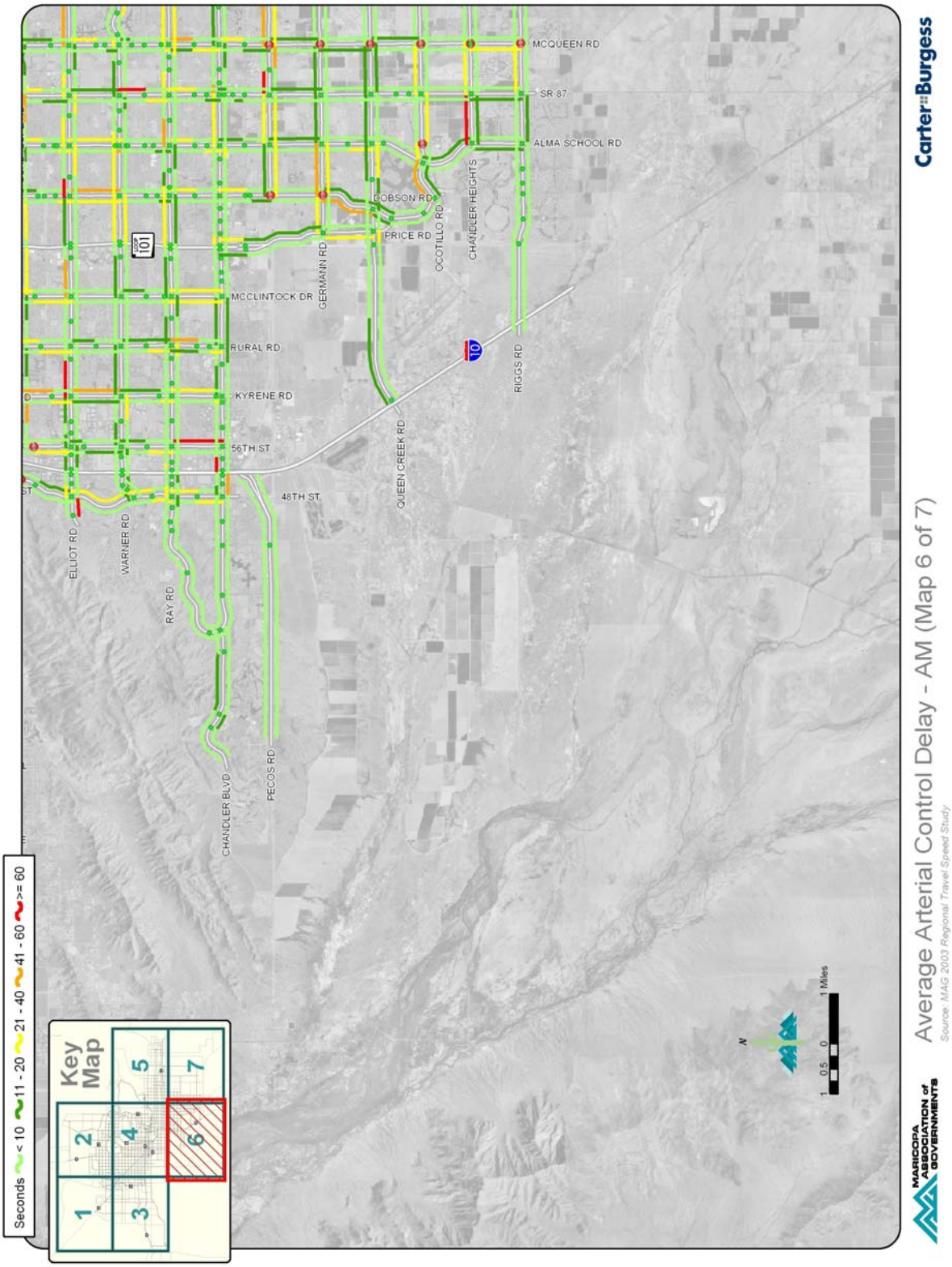


Figure D-47-Average Arterial Control Delay-AM Detail (Map 7 of 7)

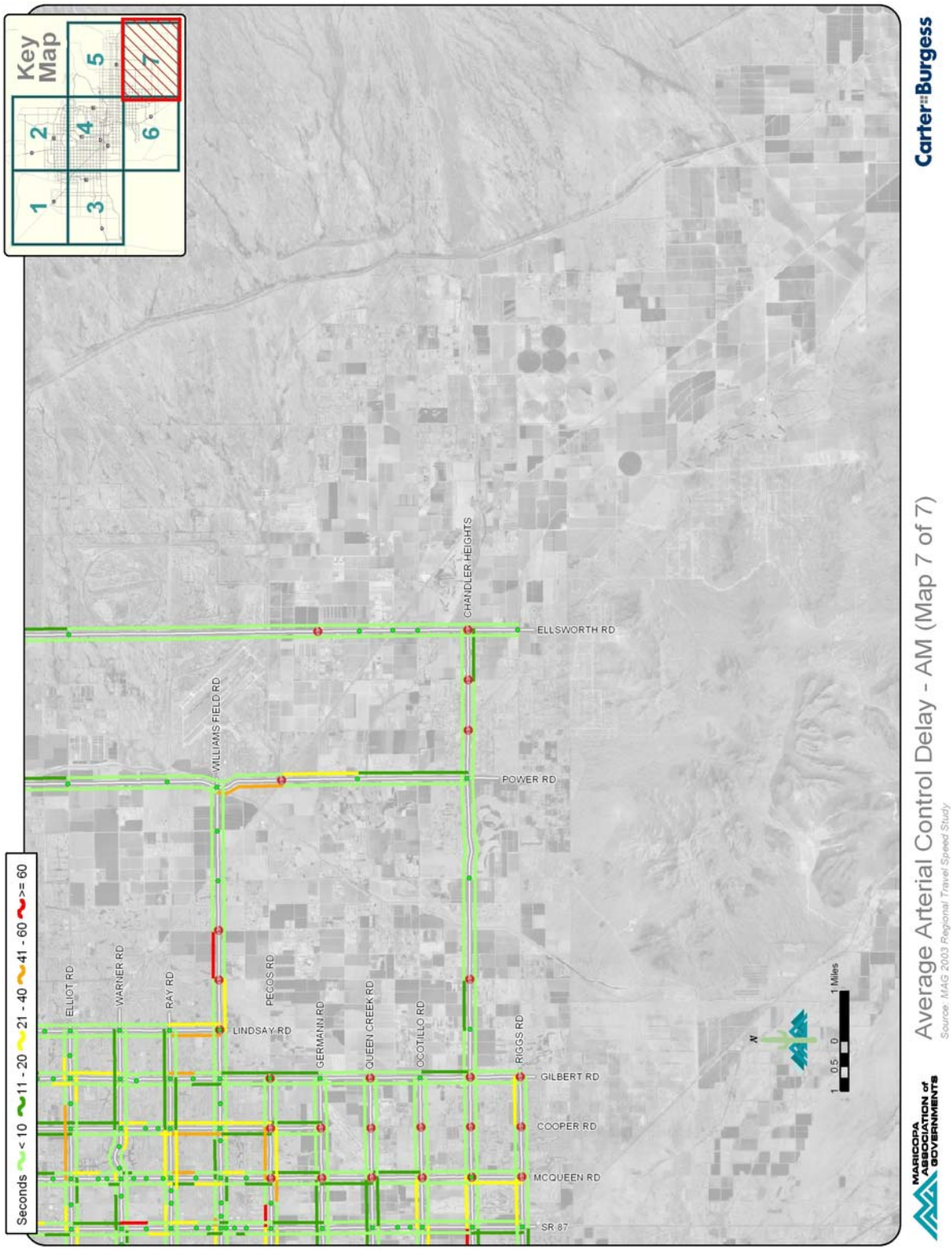


Figure D-48-Average Arterial Speed-AM Detail (Map 1 of 7)

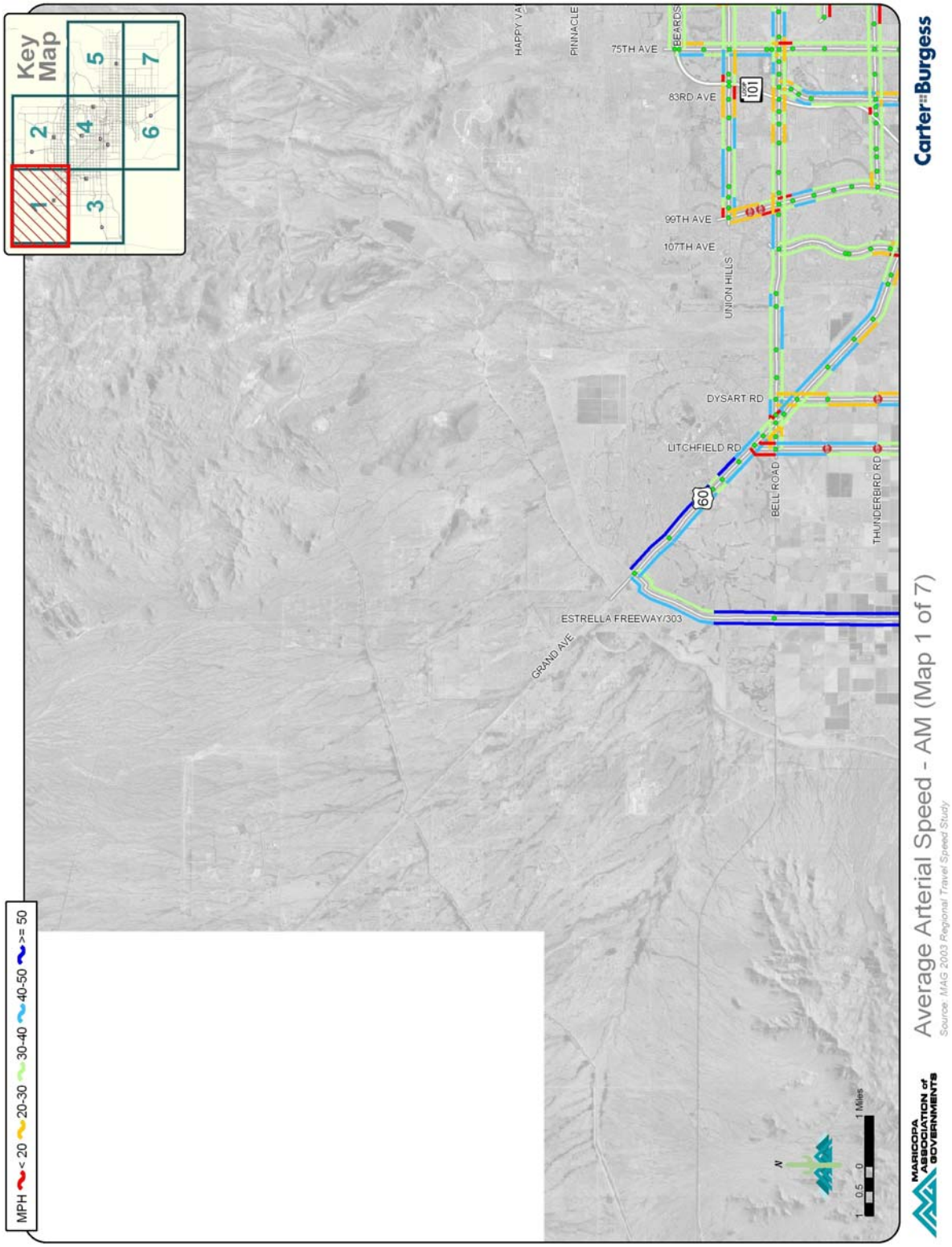


Figure D-49-Average Arterial Speed-AM Detail (Map 2 of 7)

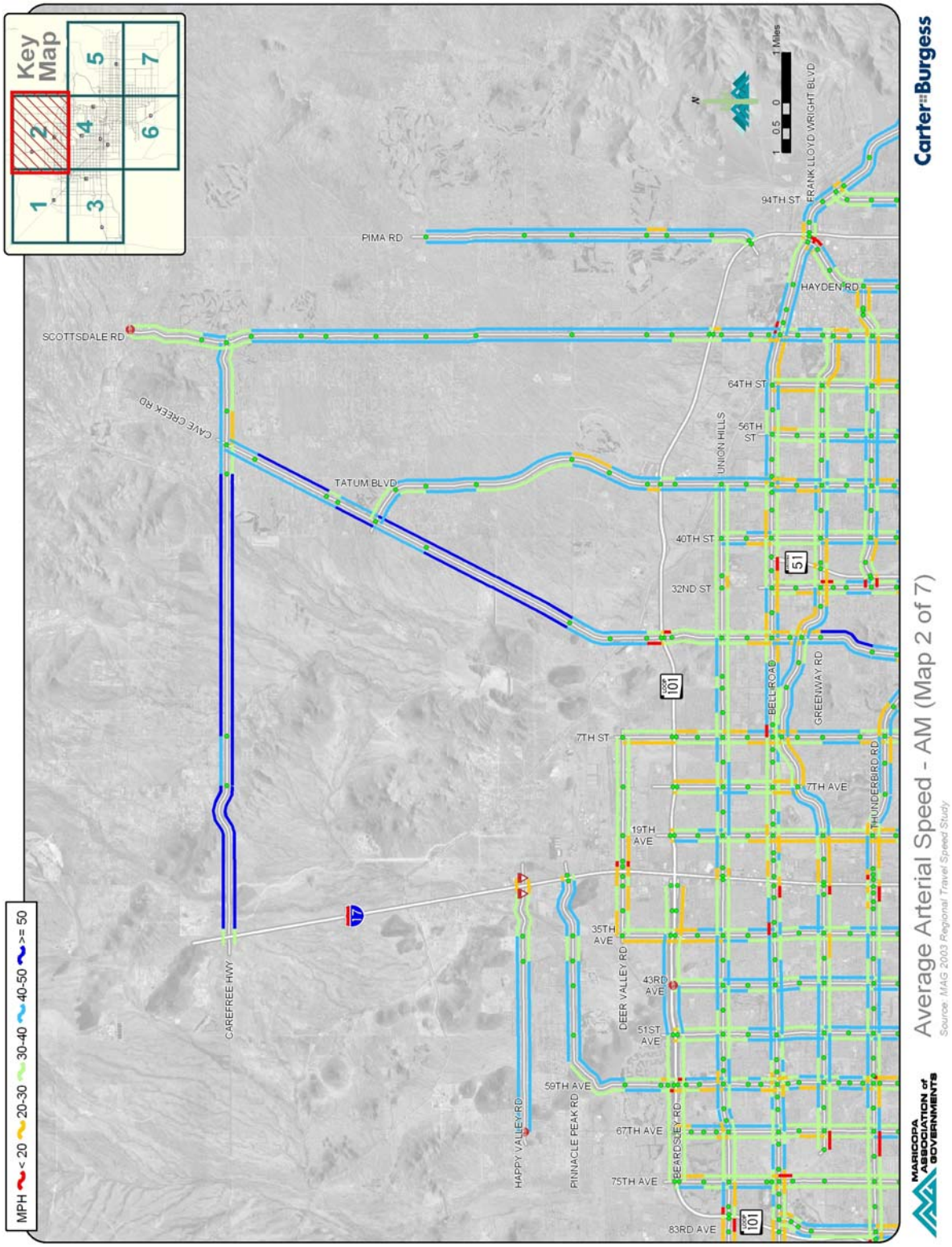


Figure D-50-Average Arterial Speed-AM Detail (Map 3 of 7)

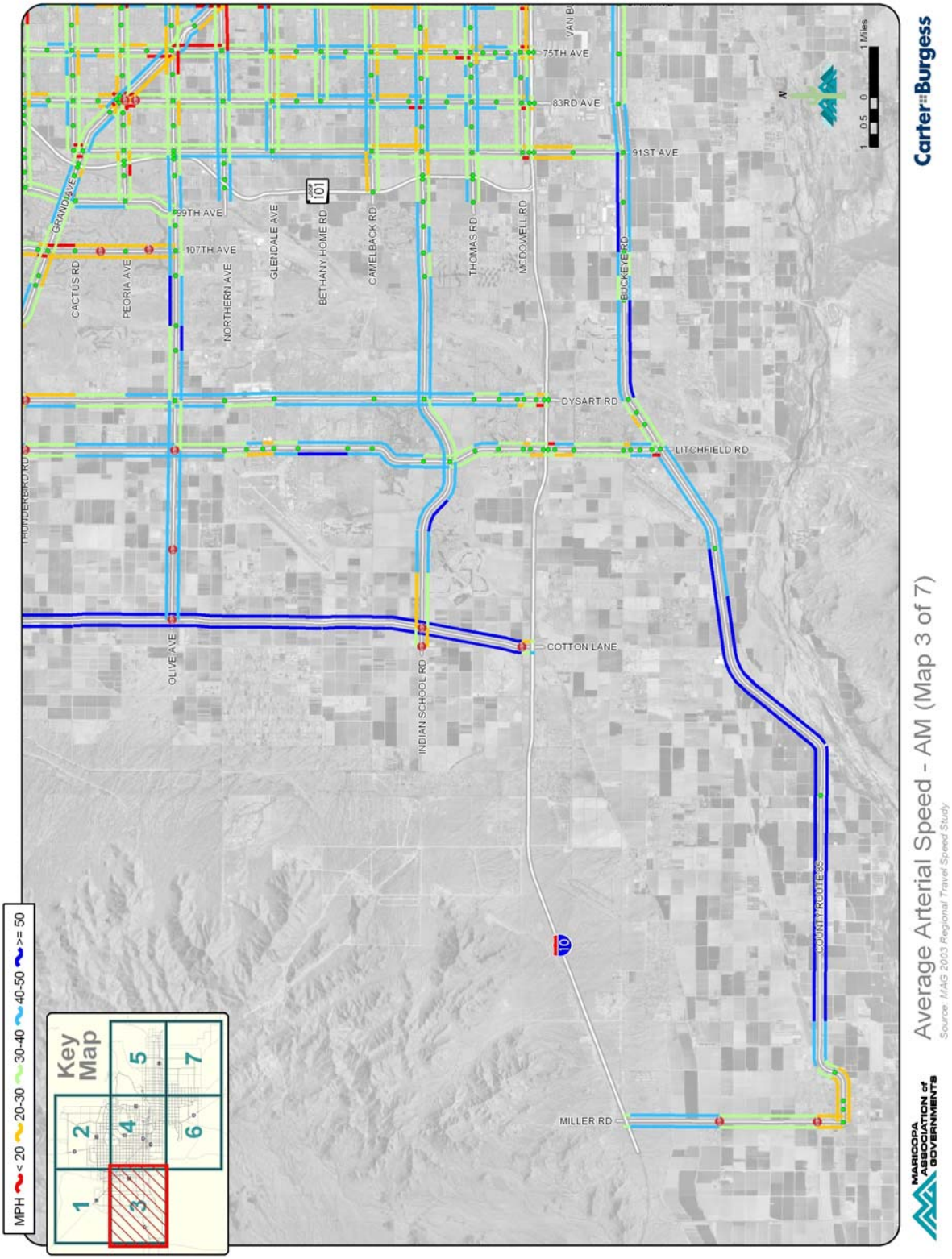


Figure D-51-Average Arterial Speed-AM Detail (Map 4 of 7)

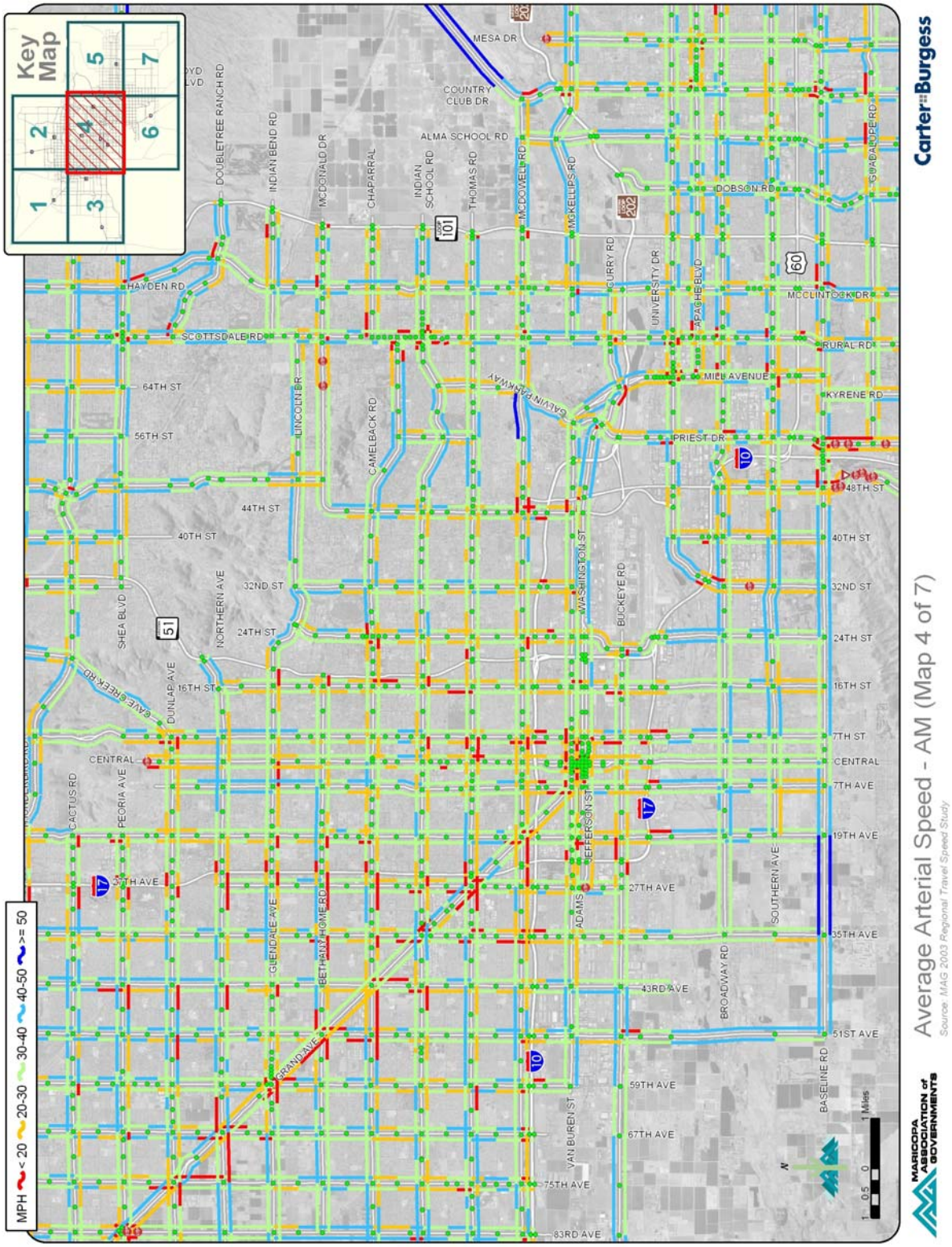


Figure D-52-Average Arterial Speed-AM Detail (Map 5 of 7)

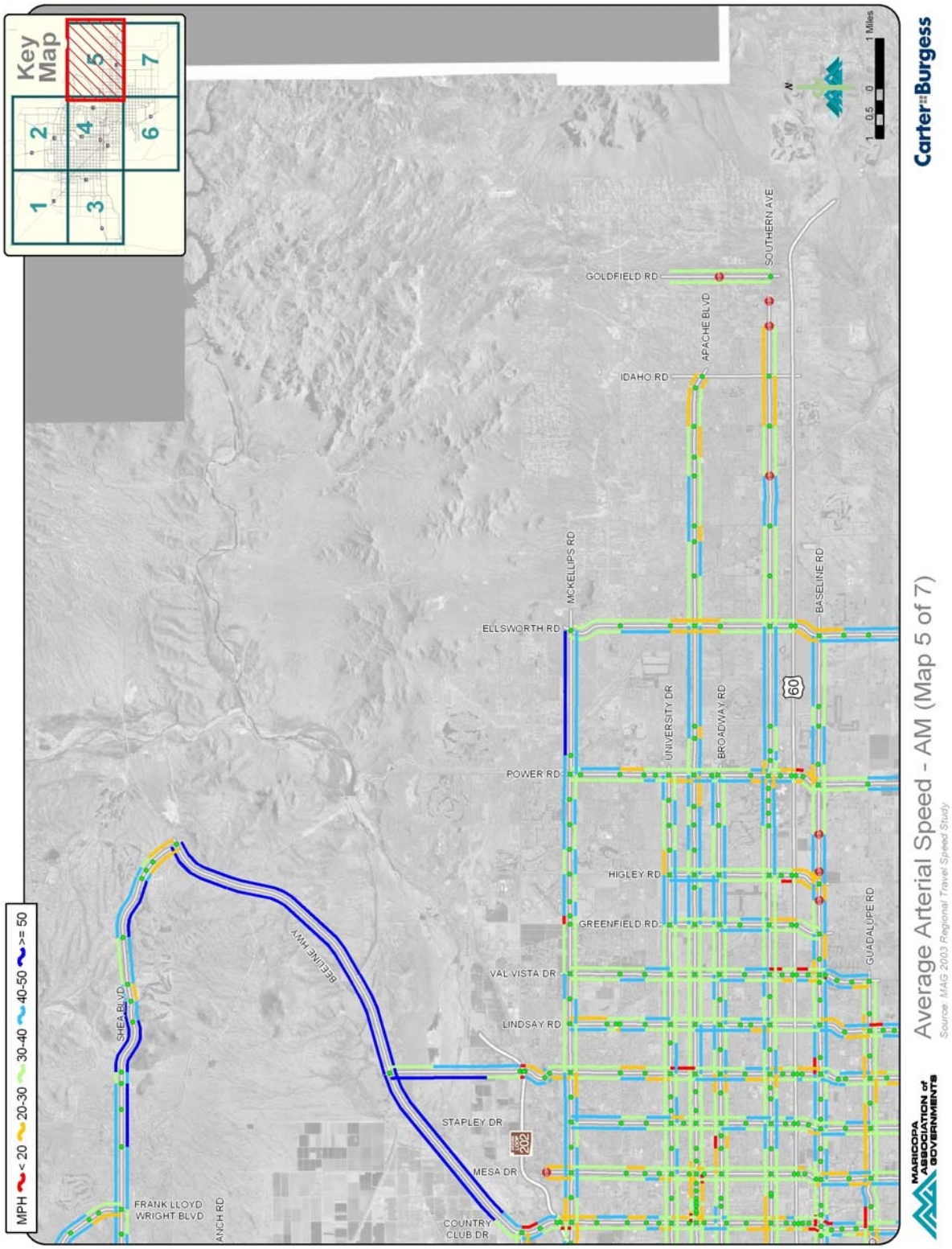


Figure D-53-Average Arterial Speed-AM Detail (Map 6 of 7)

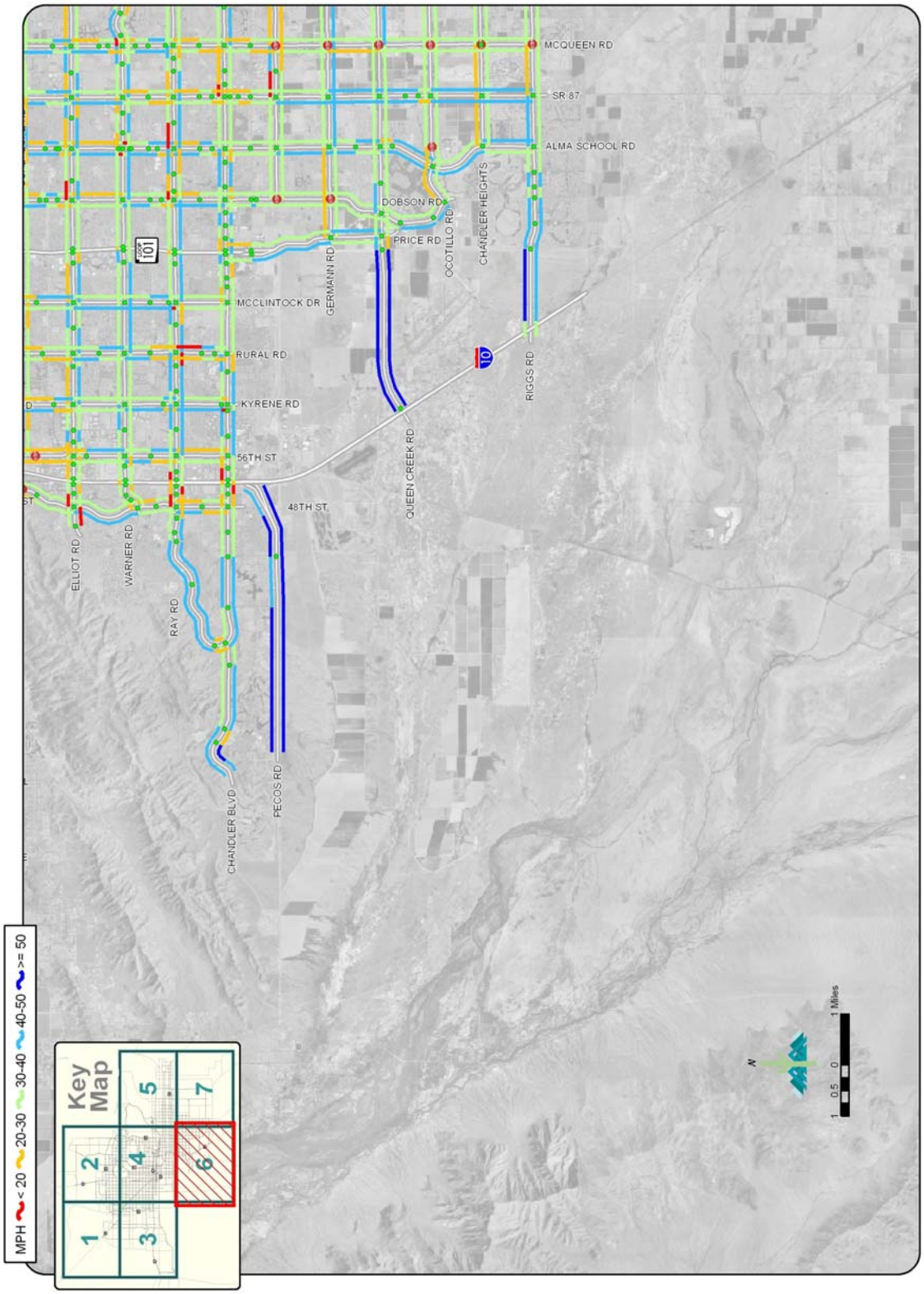


Figure D-54-Average Arterial Speed-AM Detail (Map 7 of 7)

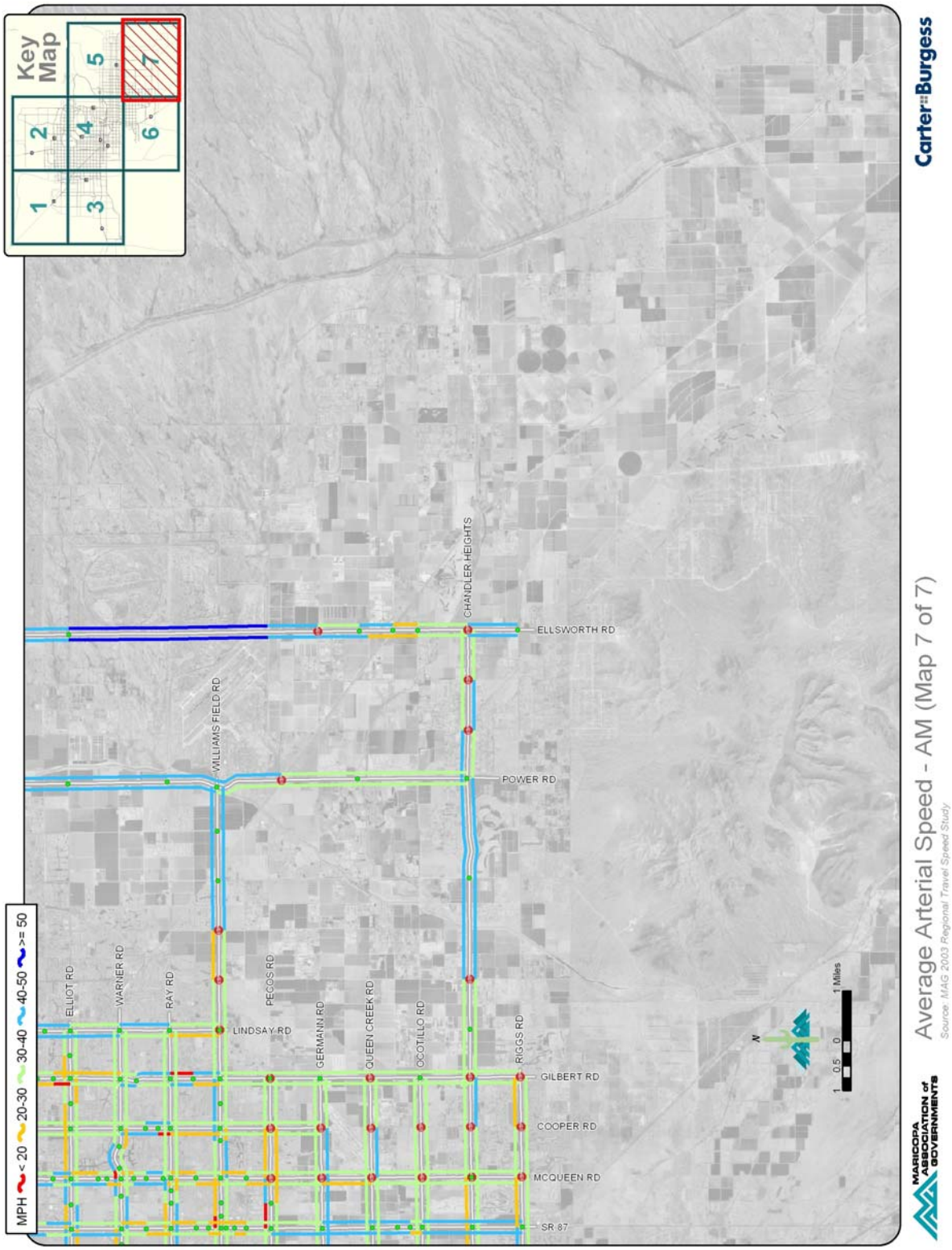


Figure D-55-Average Arterial Speed-PM Detail (Map 1 of 7)

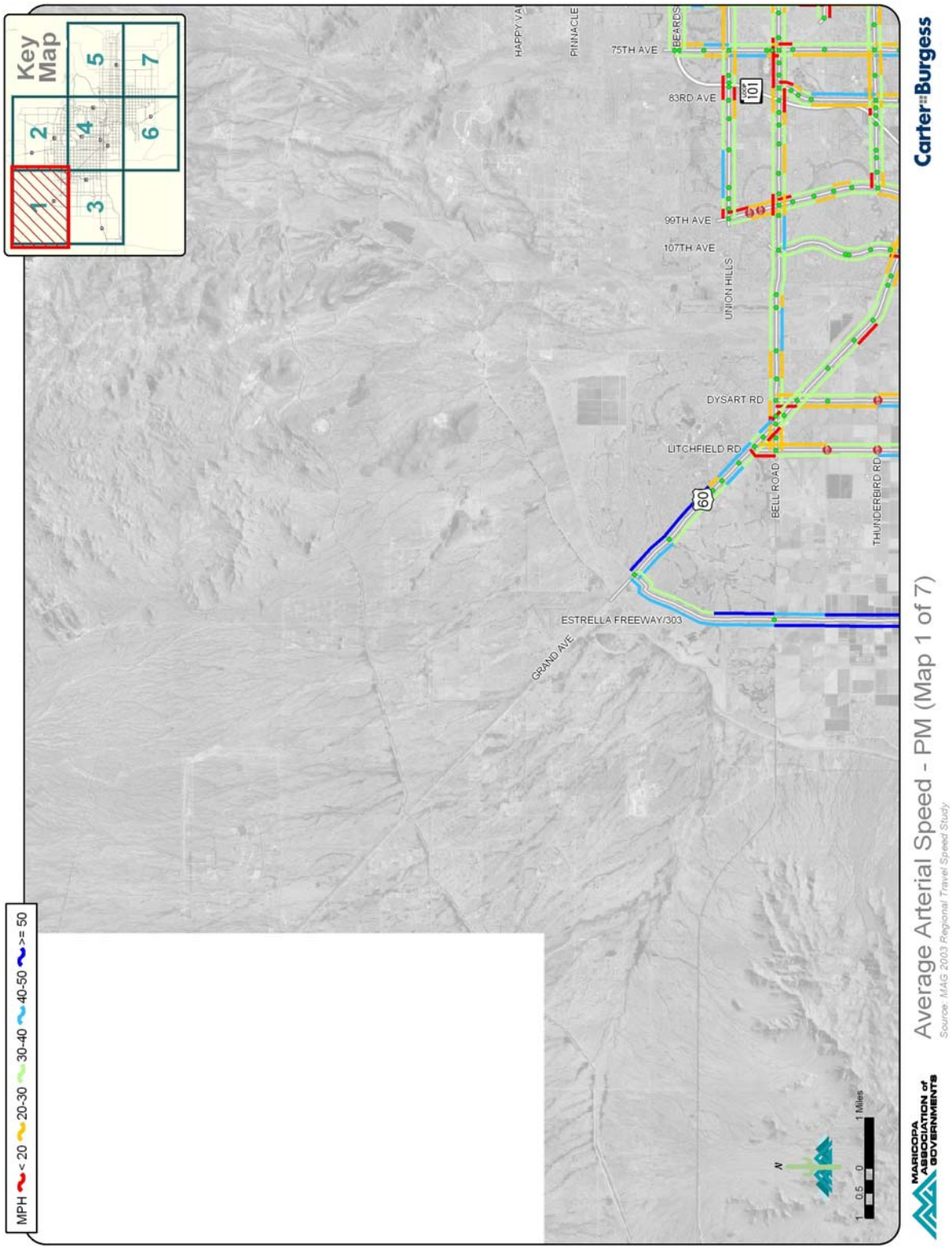


Figure D-56-Average Arterial Speed-PM Detail (Map 2 of 7)

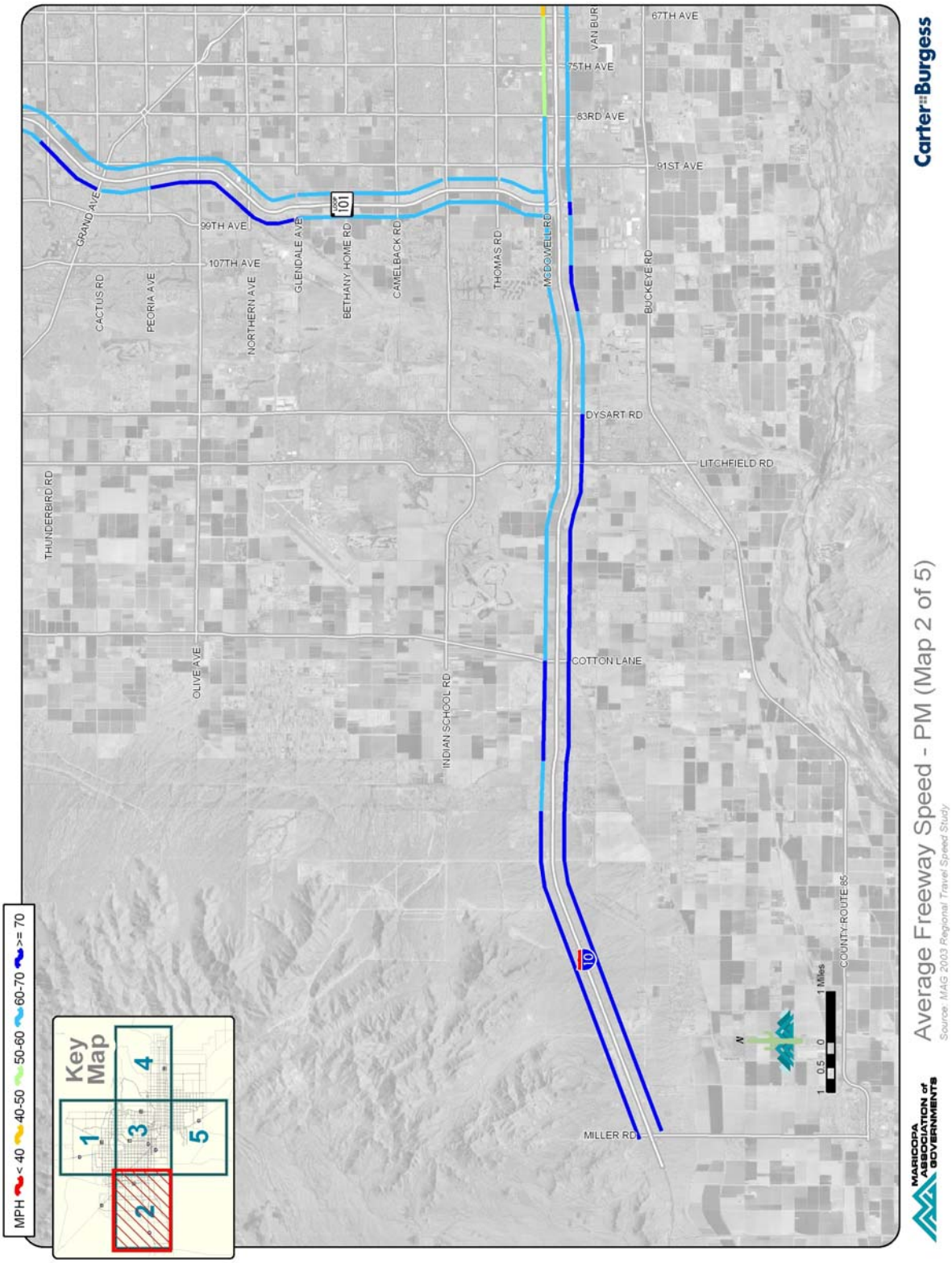


Figure D-57-Average Arterial Speed-PM Detail (Map 3 of 7)

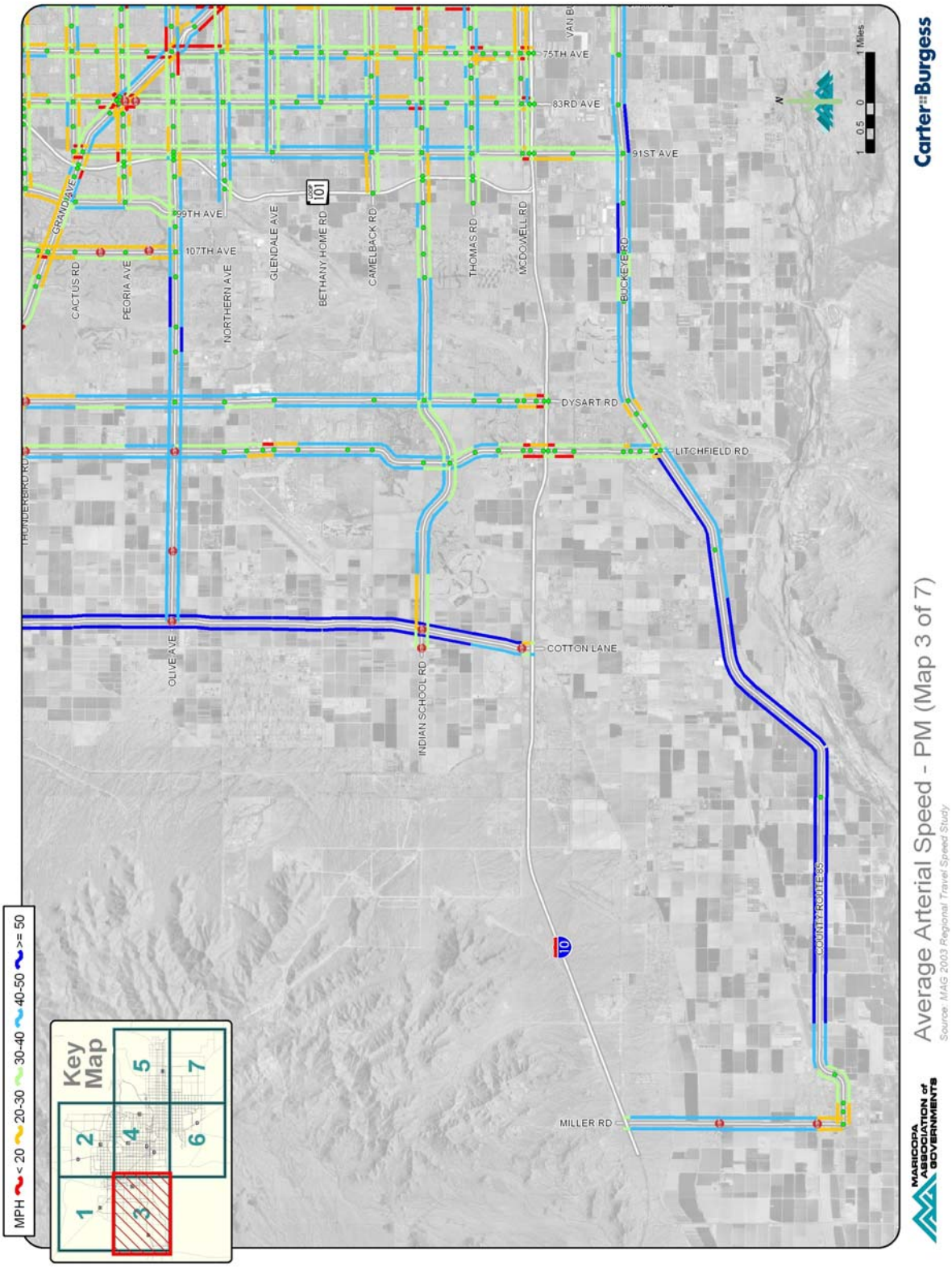


Figure D-58-Average Arterial Speed-PM Detail (Map 4 of 7)

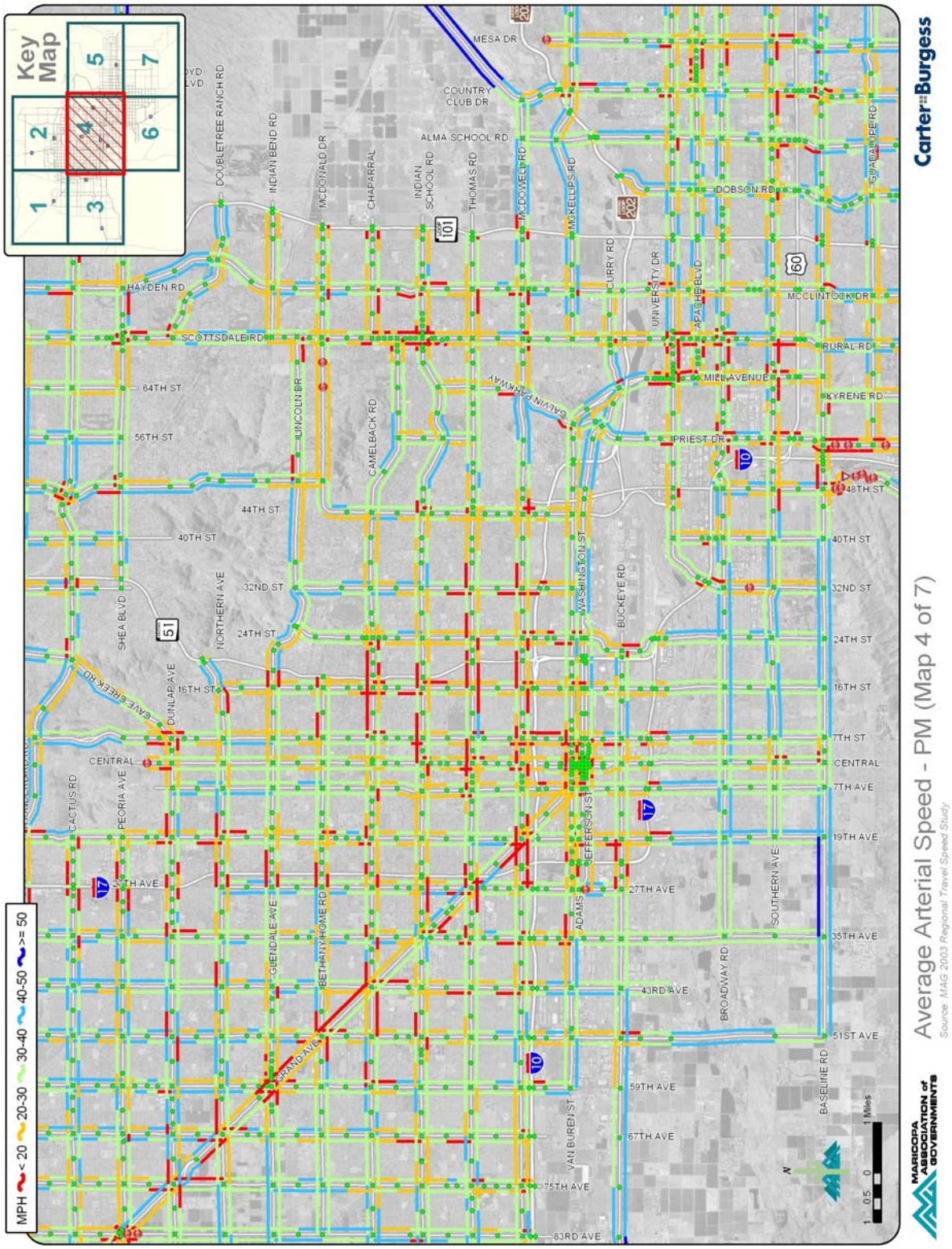


Figure D-59-Average Arterial Speed-PM Detail (Map 5 of 7)

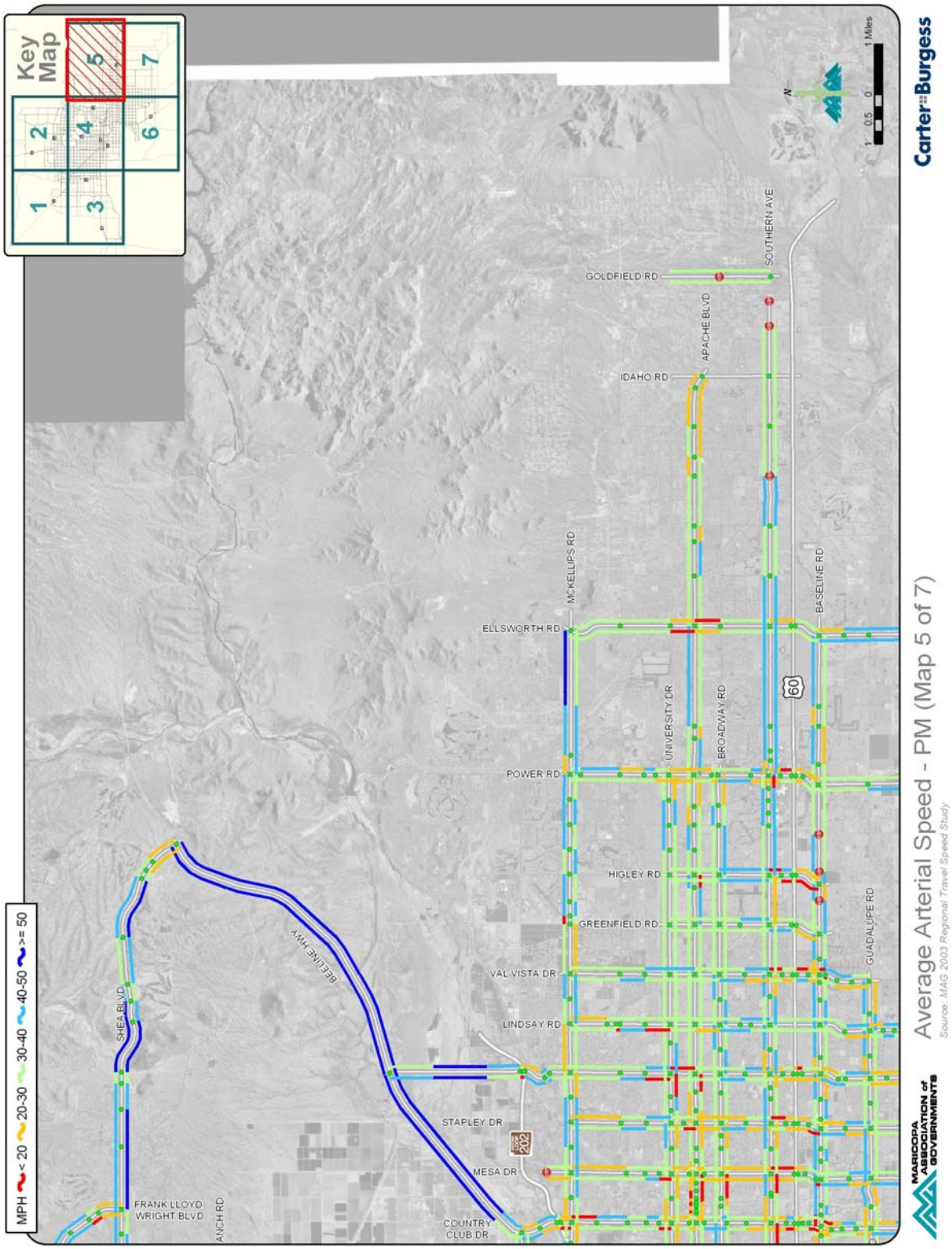


Figure D-60-Average Arterial Speed-PM Detail (Map 6 of 7)

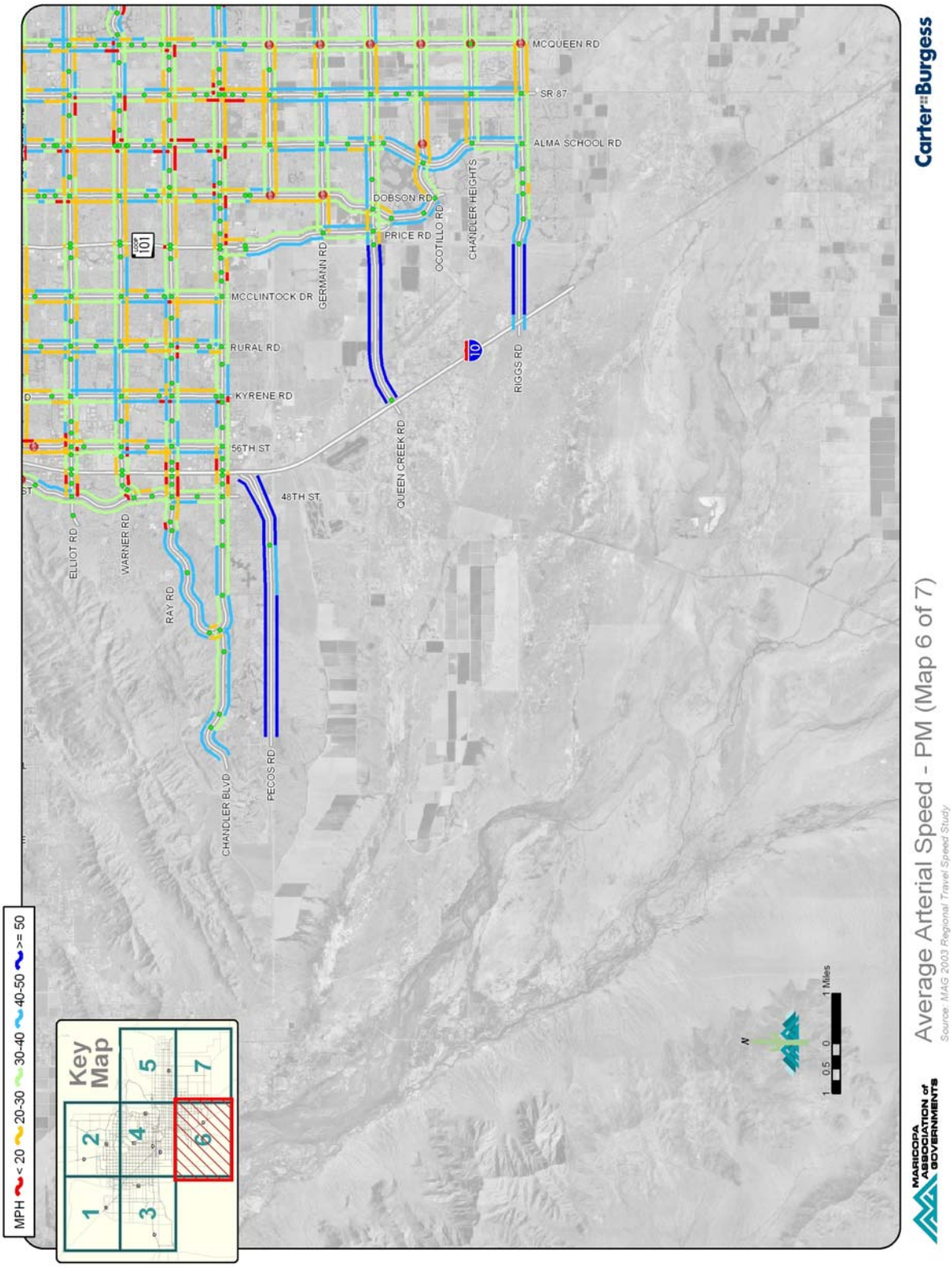


Figure D-61-Average Arterial Speed-PM Detail (Map 7 of 7)

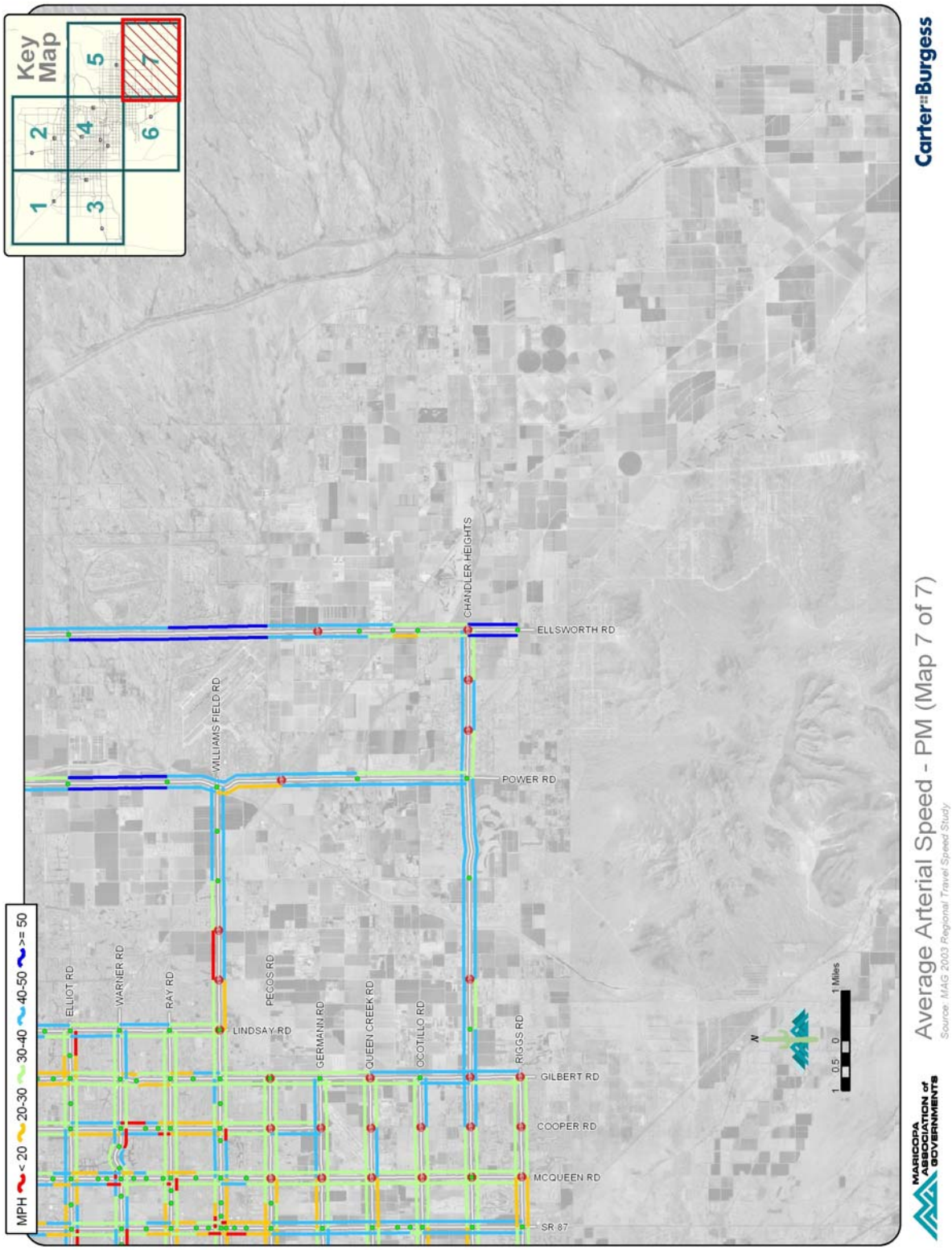


Figure D-62-Average Freeway Speed-AM Detail (Map 1 of 5)

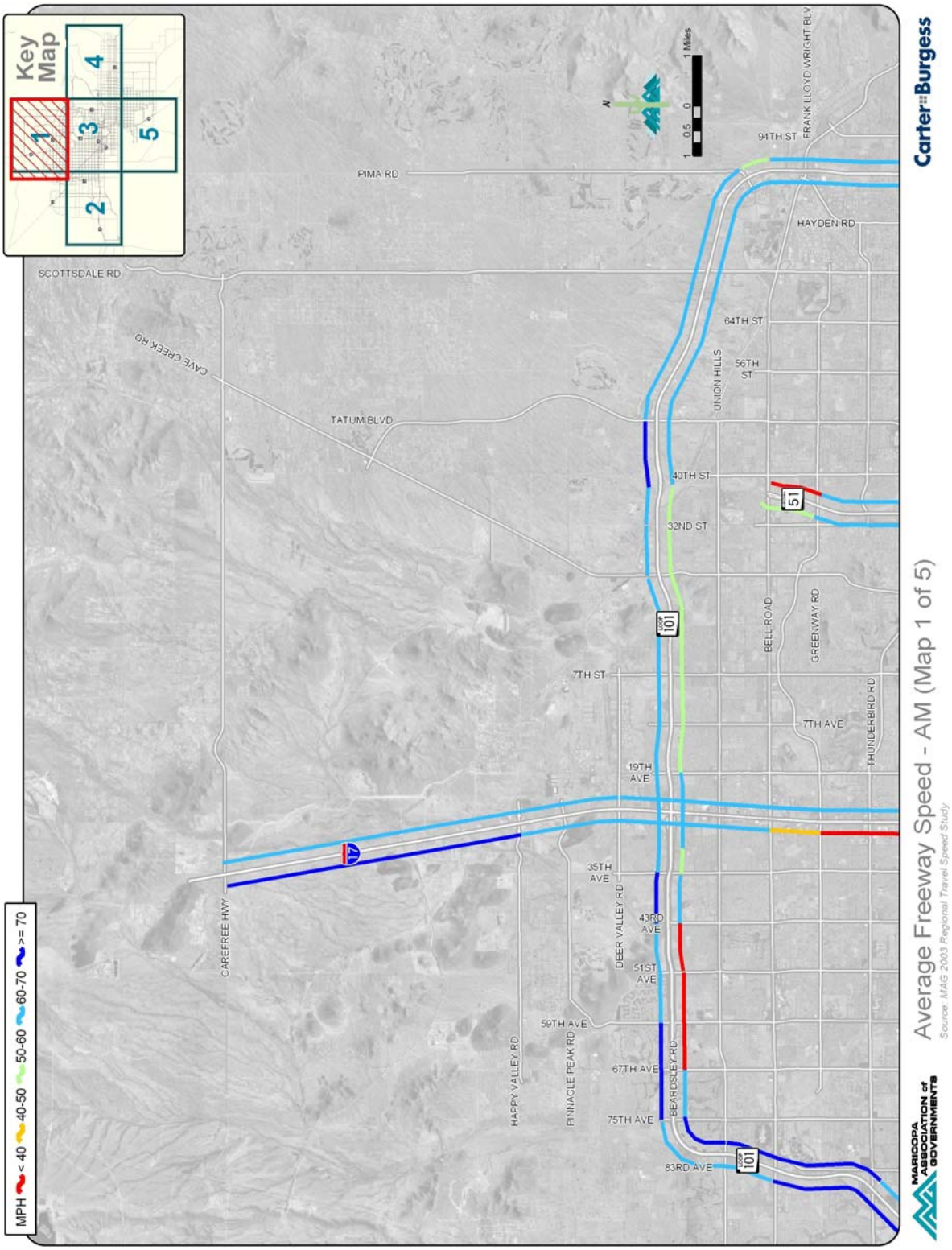


Figure D-63-Average Freeway Speed-AM Detail (Map 2 of 5)

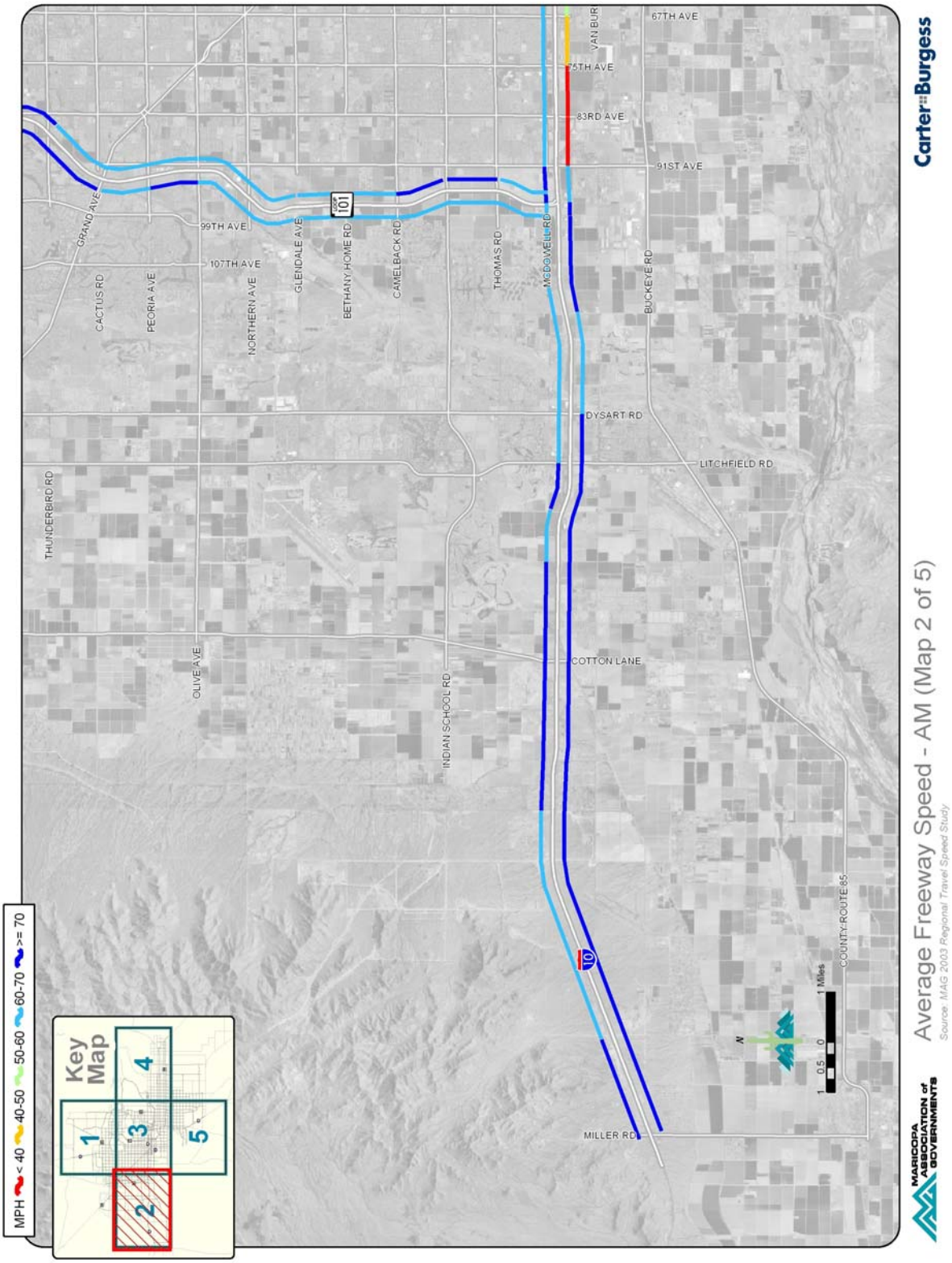


Figure D-64-Average Freeway Speed-AM Detail (Map 3 of 5)

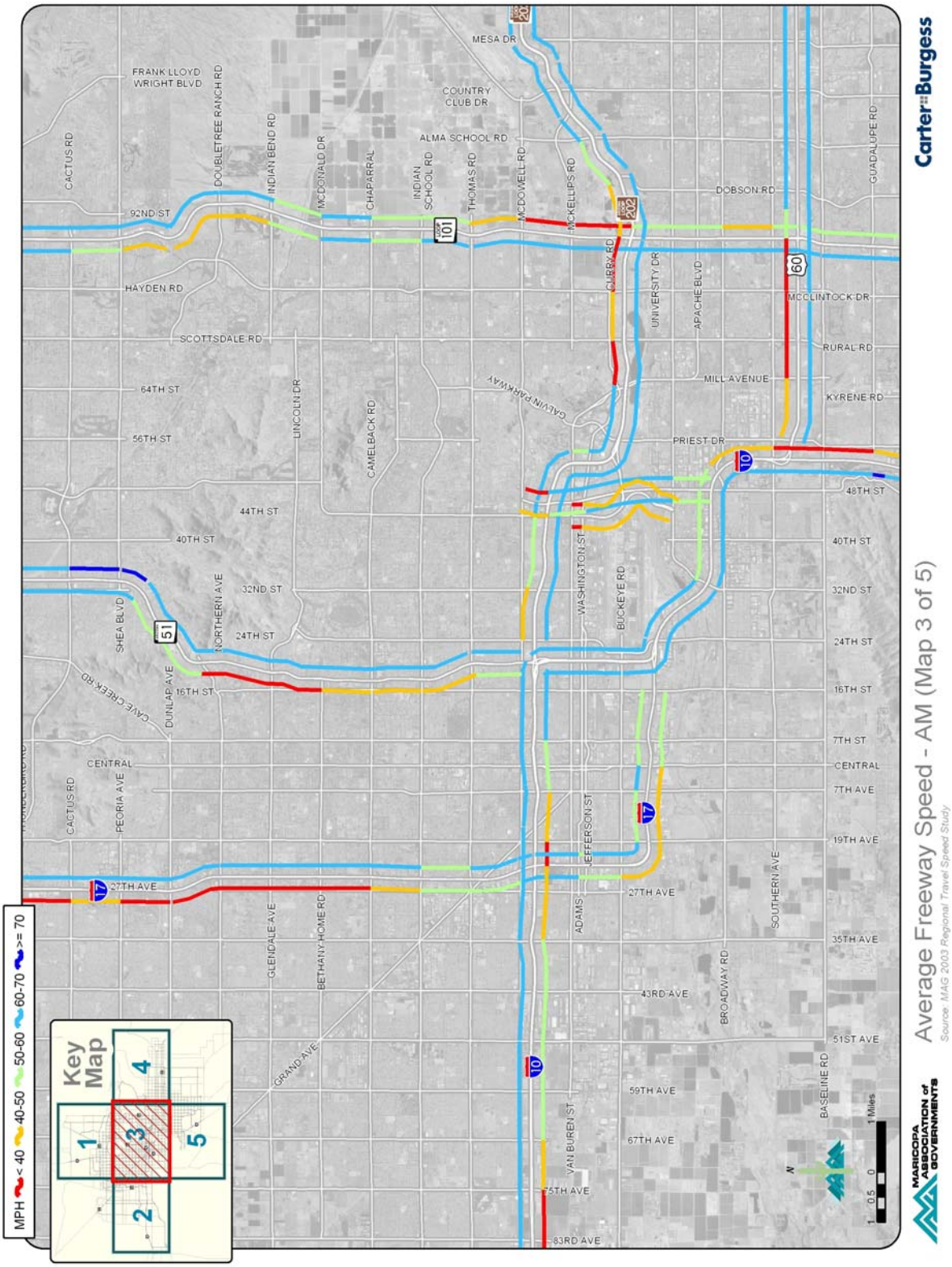


Figure D-65-Average Freeway Speed-AM Detail (Map 4 of 5)

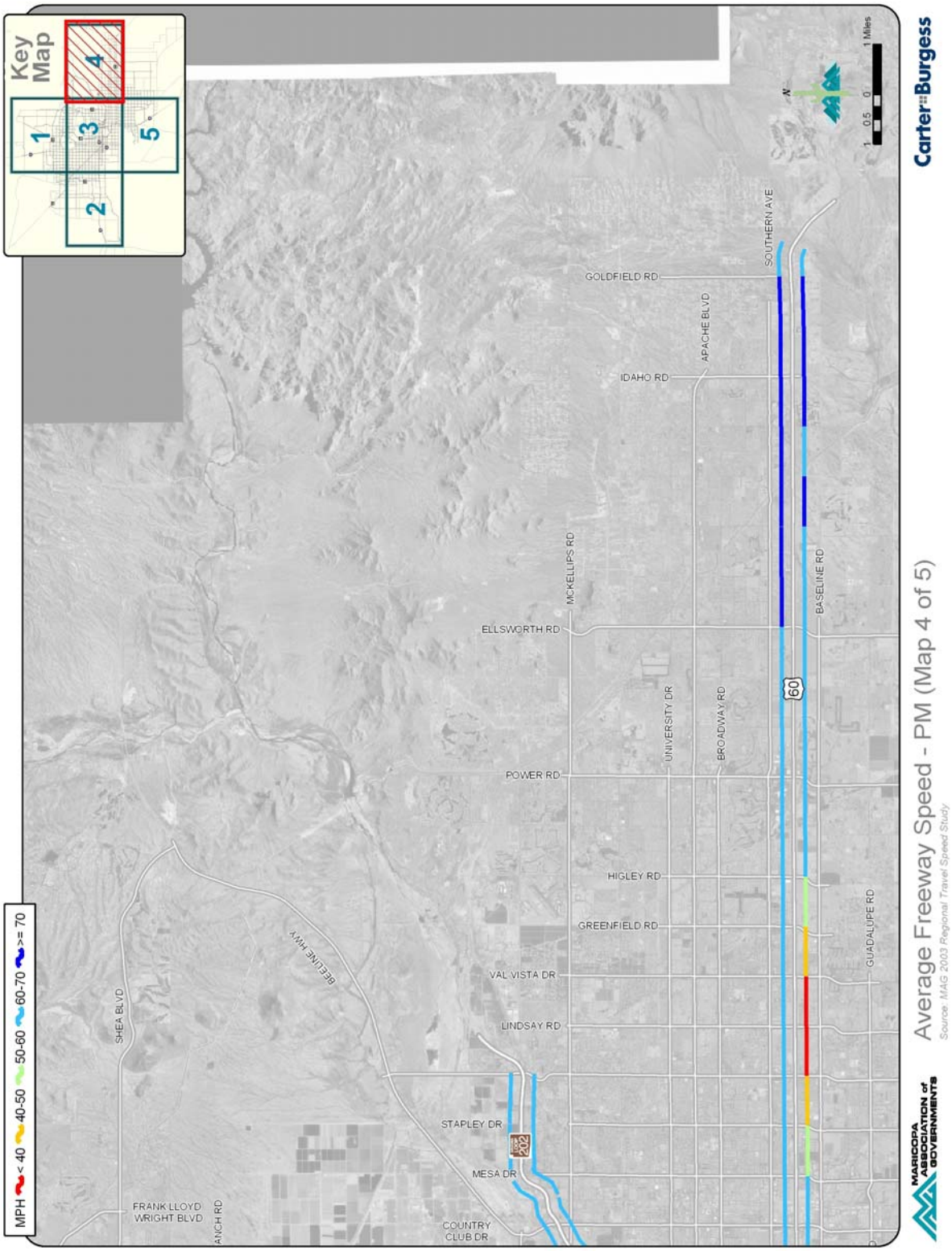


Figure D-66-Average Freeway Speed-AM Detail (Map 5 of 5)

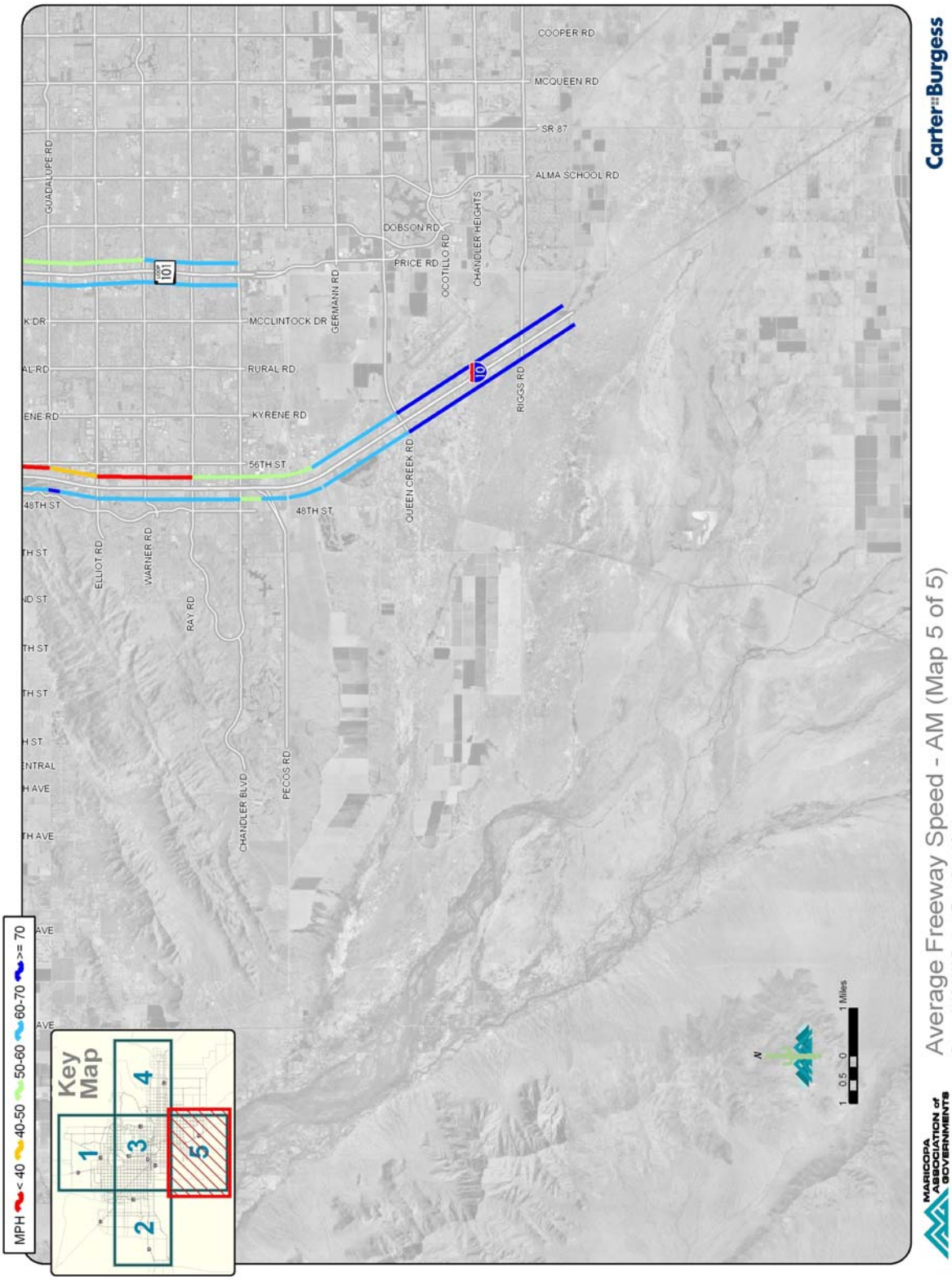


Figure D-67-Average Freeway Speed-PM Detail (Map 1 of 5)

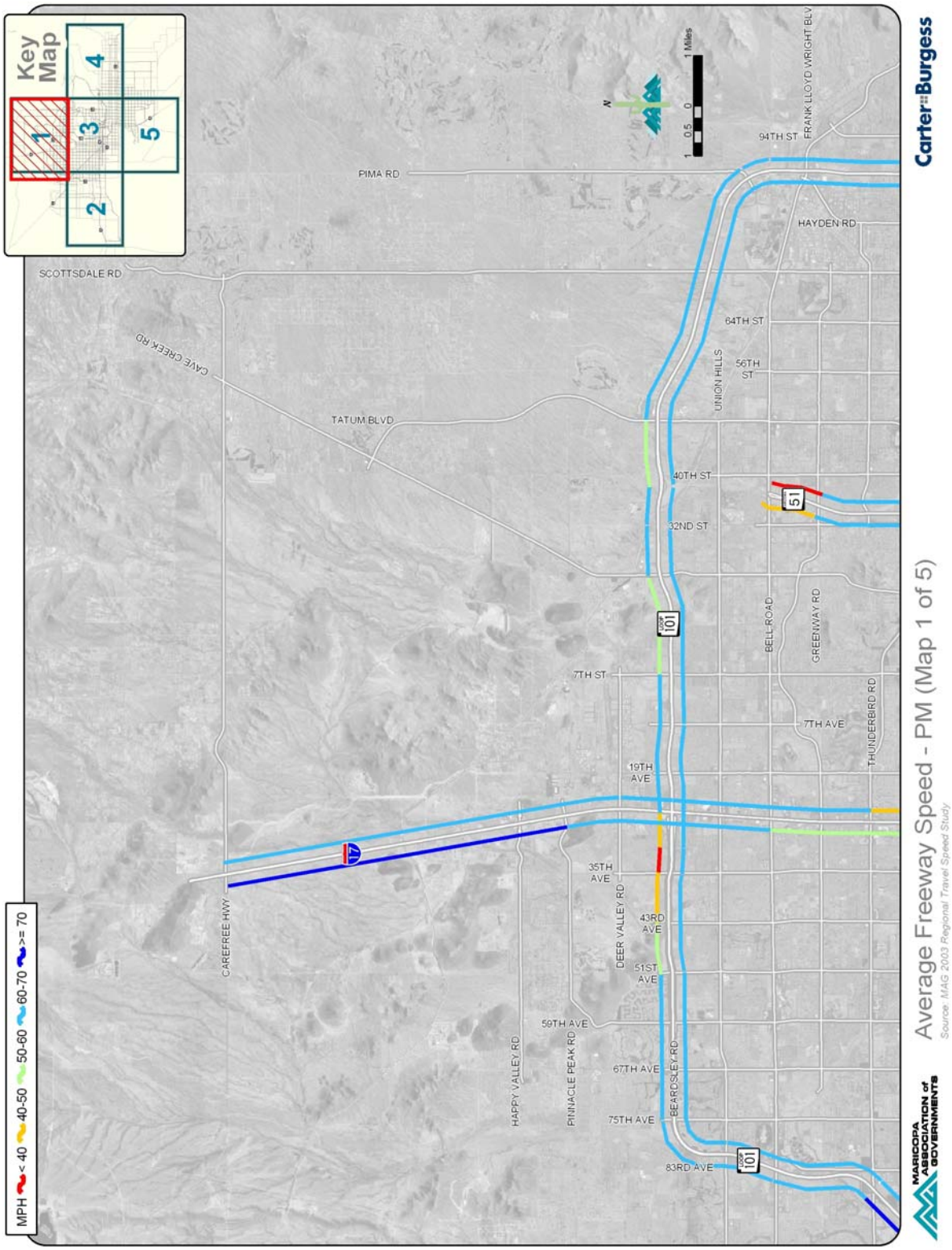


Figure D-68-Average Freeway Speed-PM Detail (Map 2 of 5)

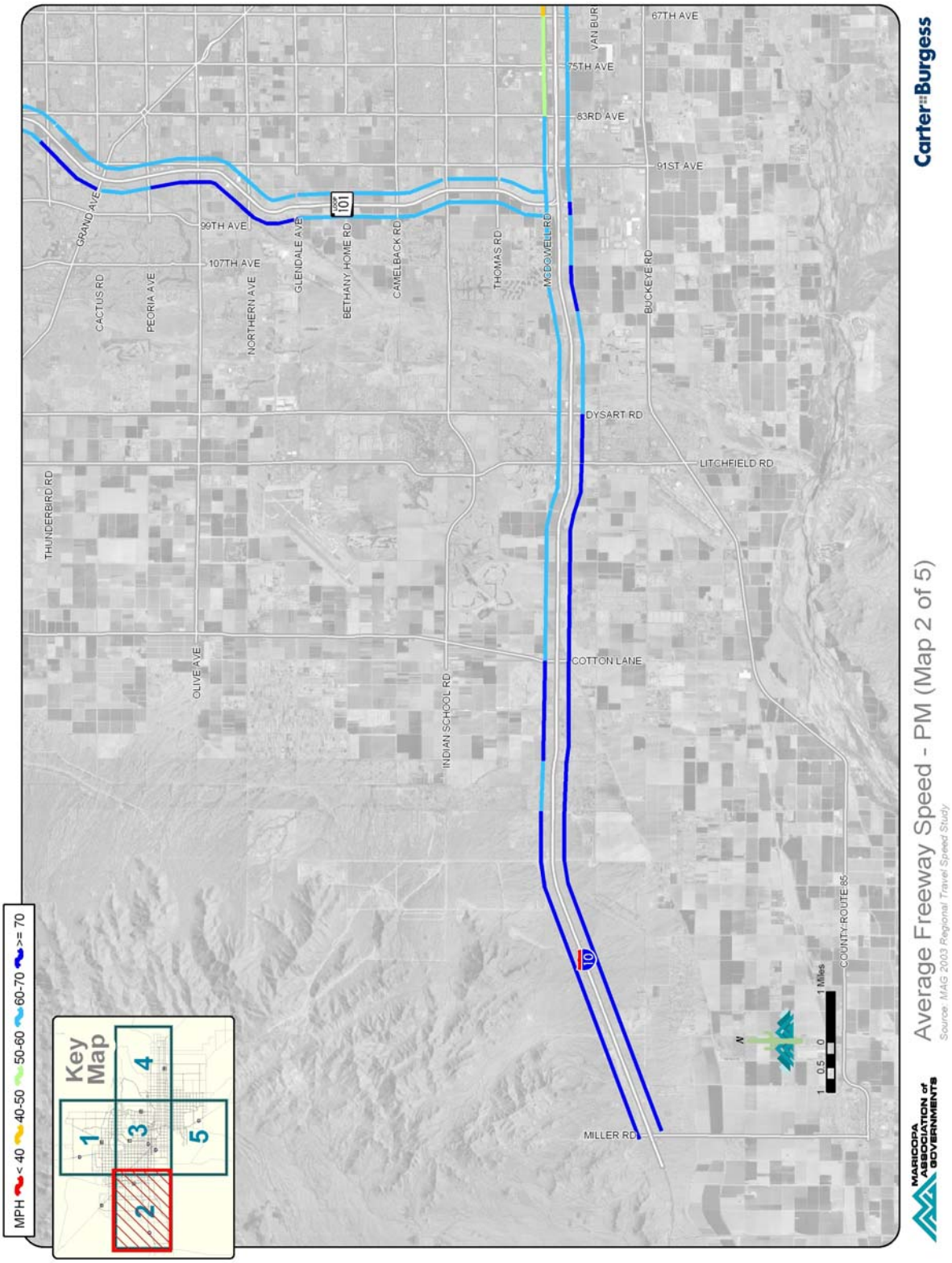


Figure D-69-Average Freeway Speed-PM Detail (Map 3 of 5)

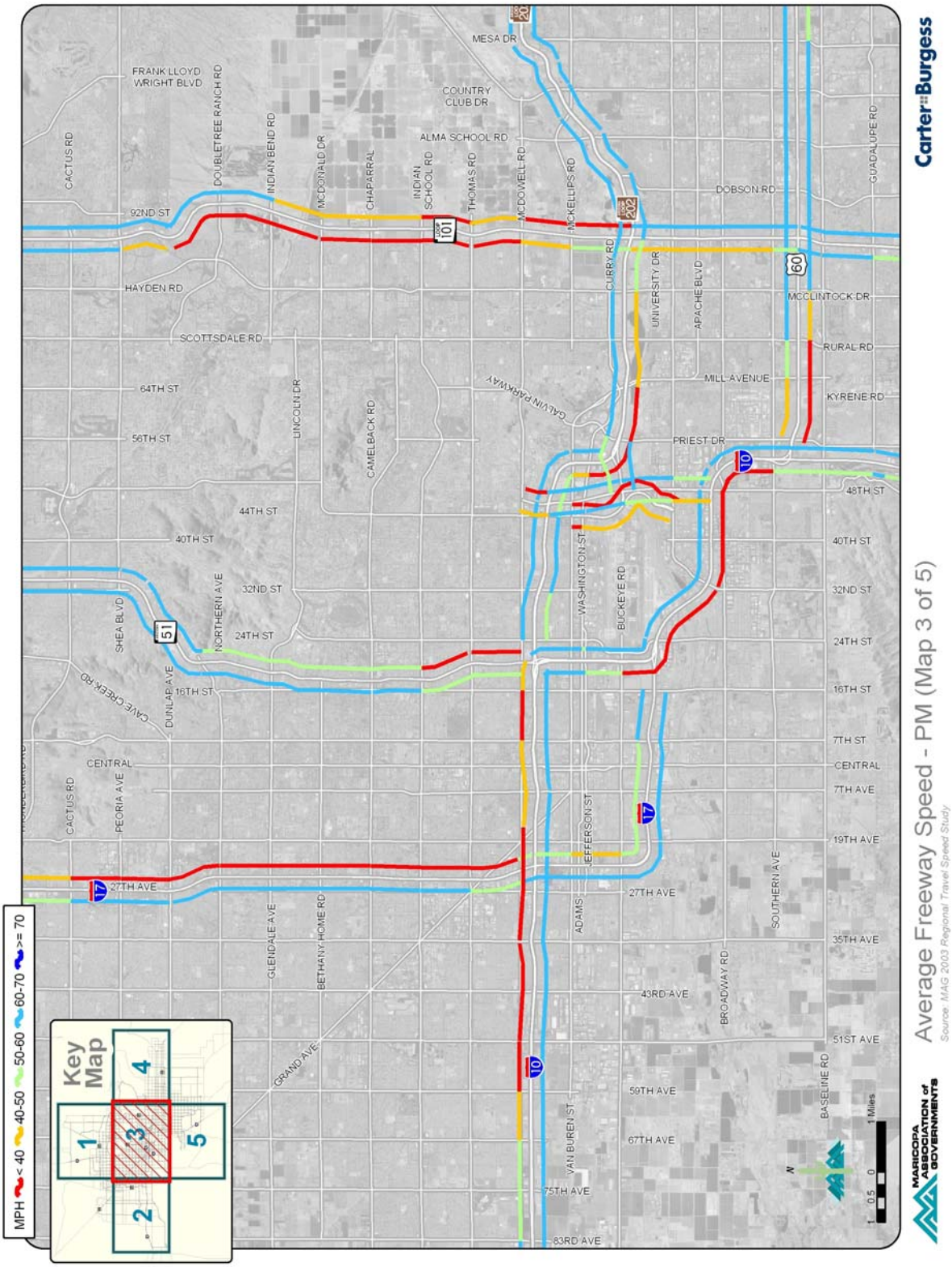


Figure D-70-Average Freeway Speed-PM Detail (Map 4 of 5)

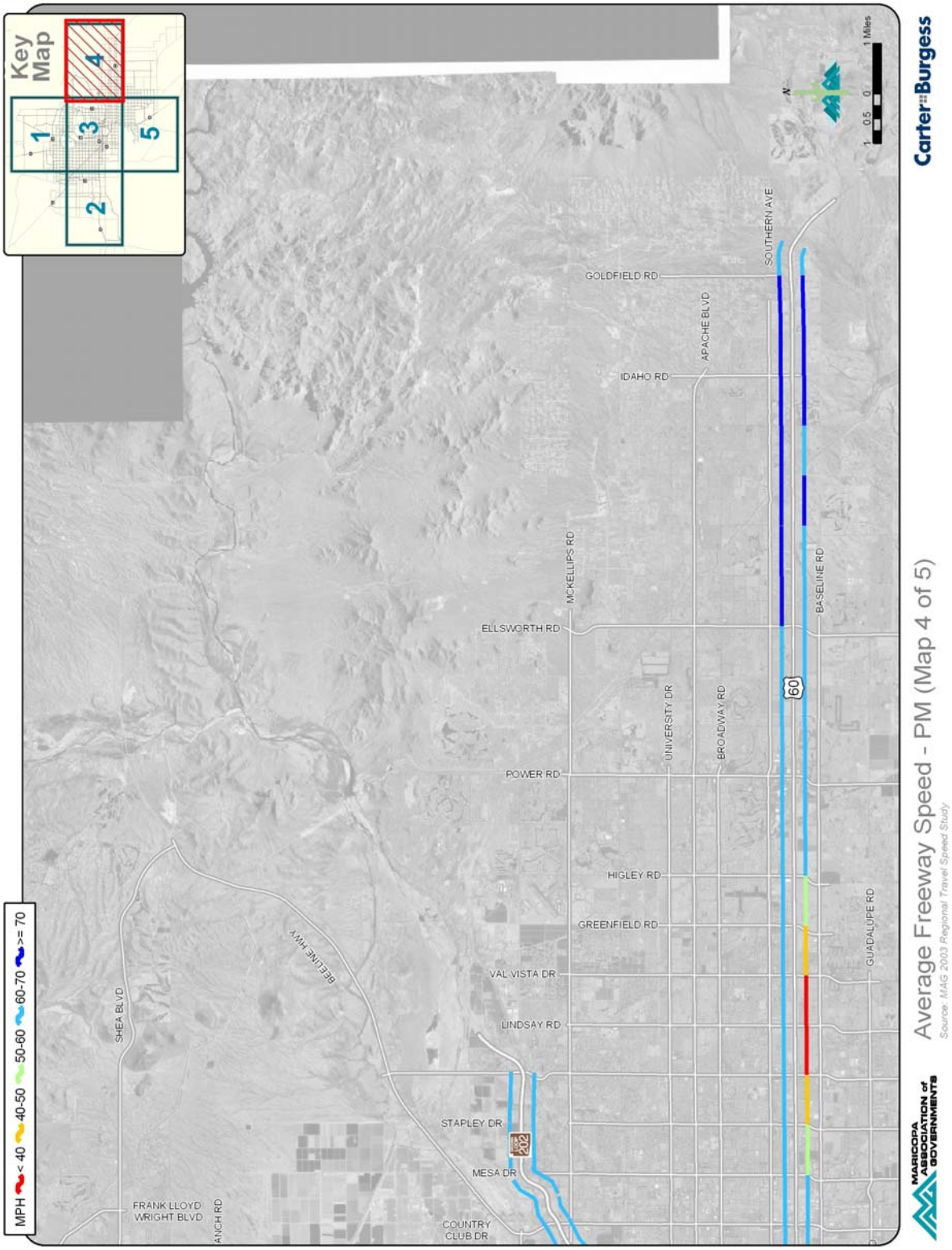


Figure D-71-Average Freeway Speed-PM Detail (Map 5 of 5)

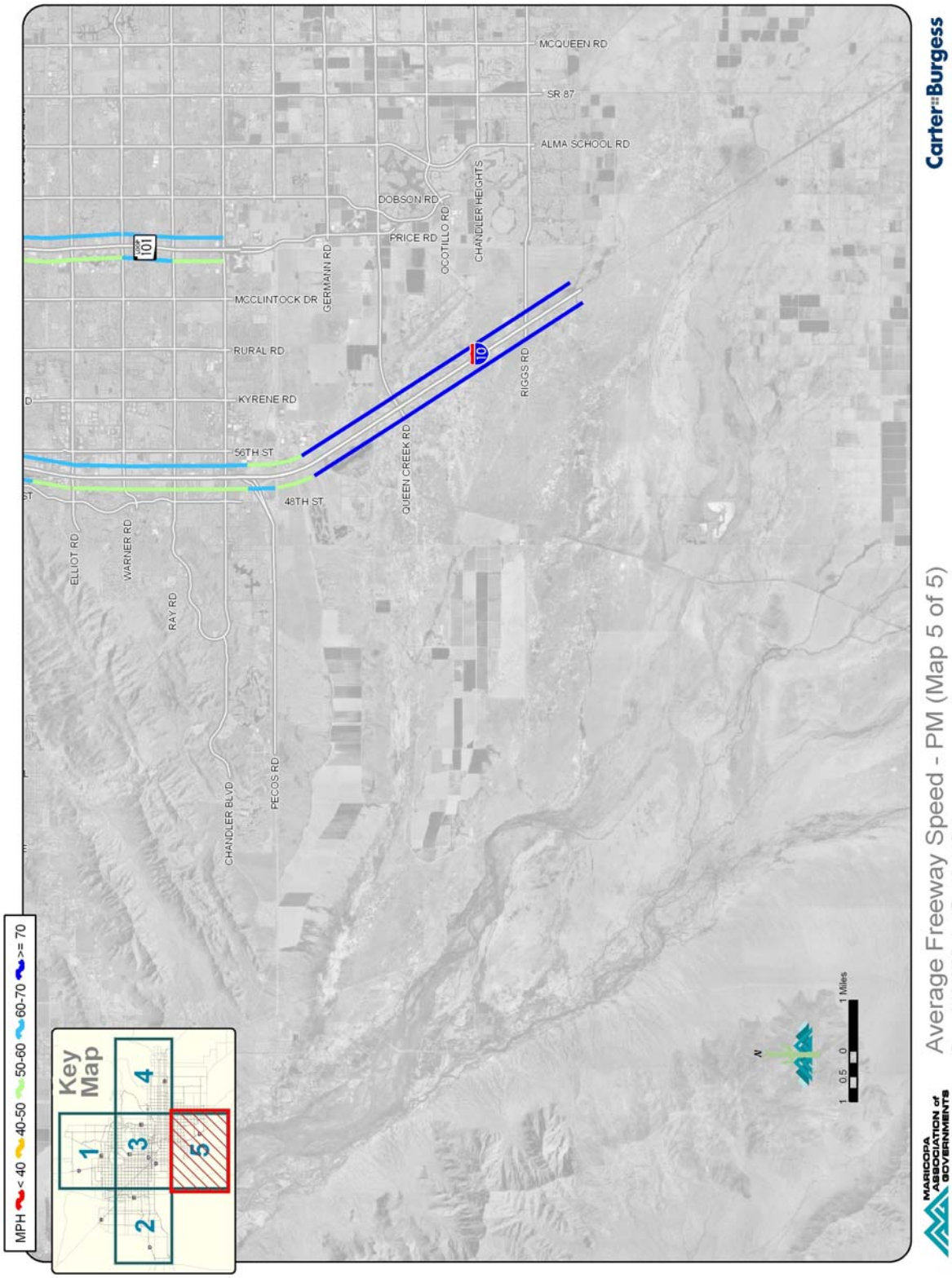


Figure D-72-Peak Direction of Travel-AM

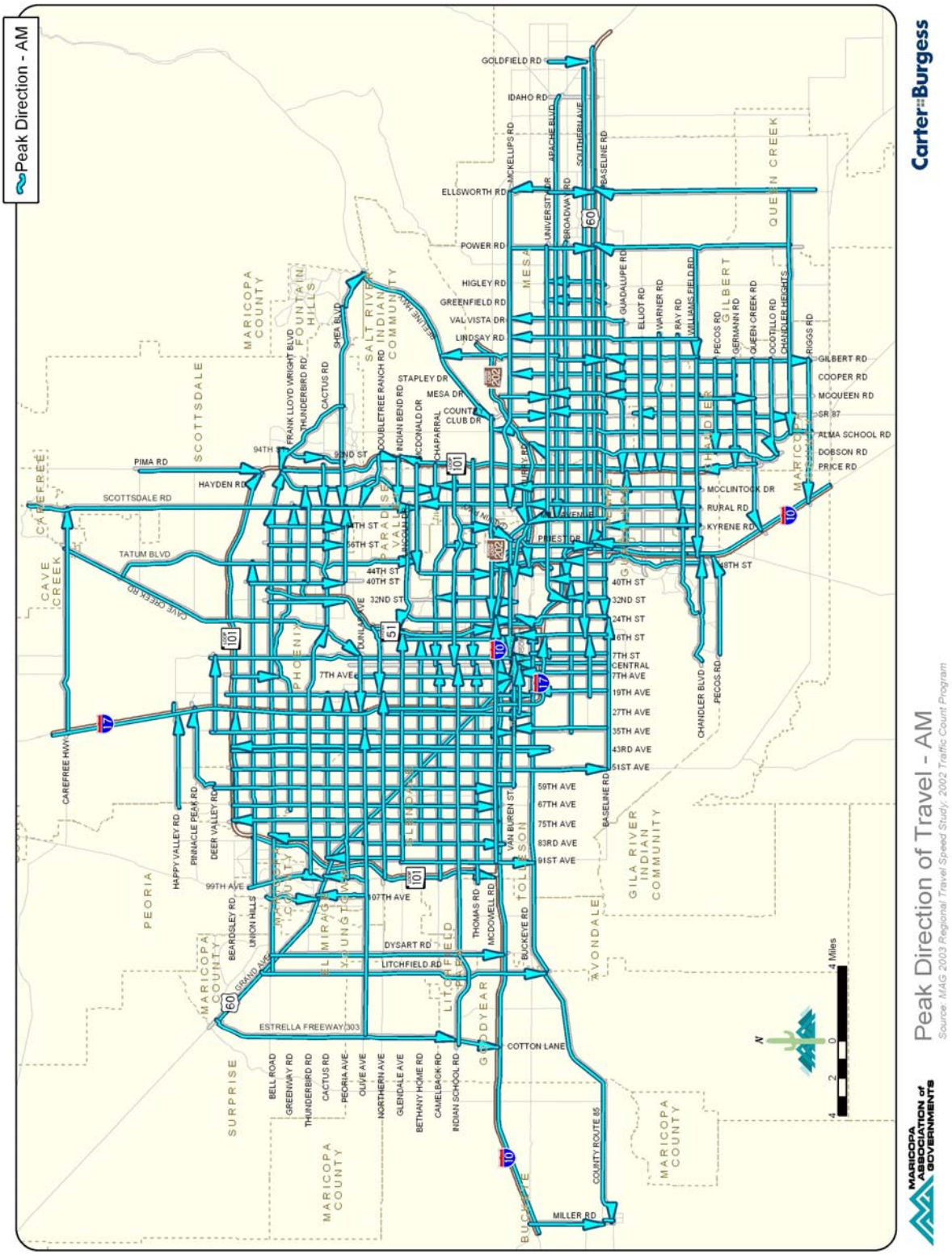
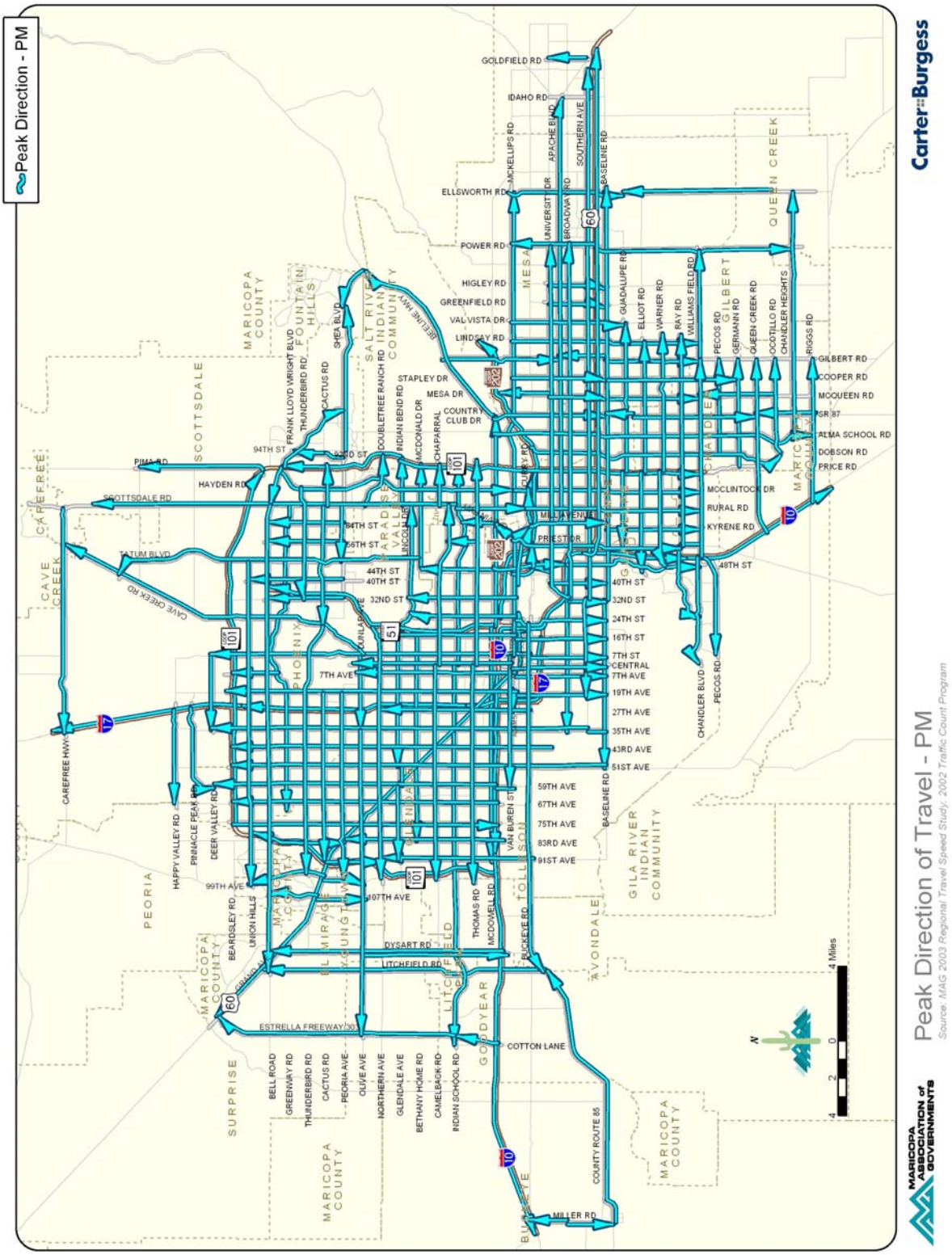



Figure D-73-Peak Direction of Travel-PM