



**2006 MAG FREEWAY
LEVEL-OF-SERVICE STUDY**

EXECUTIVE SUMMARY & FINAL REPORT

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for the Maricopa Association of Governments



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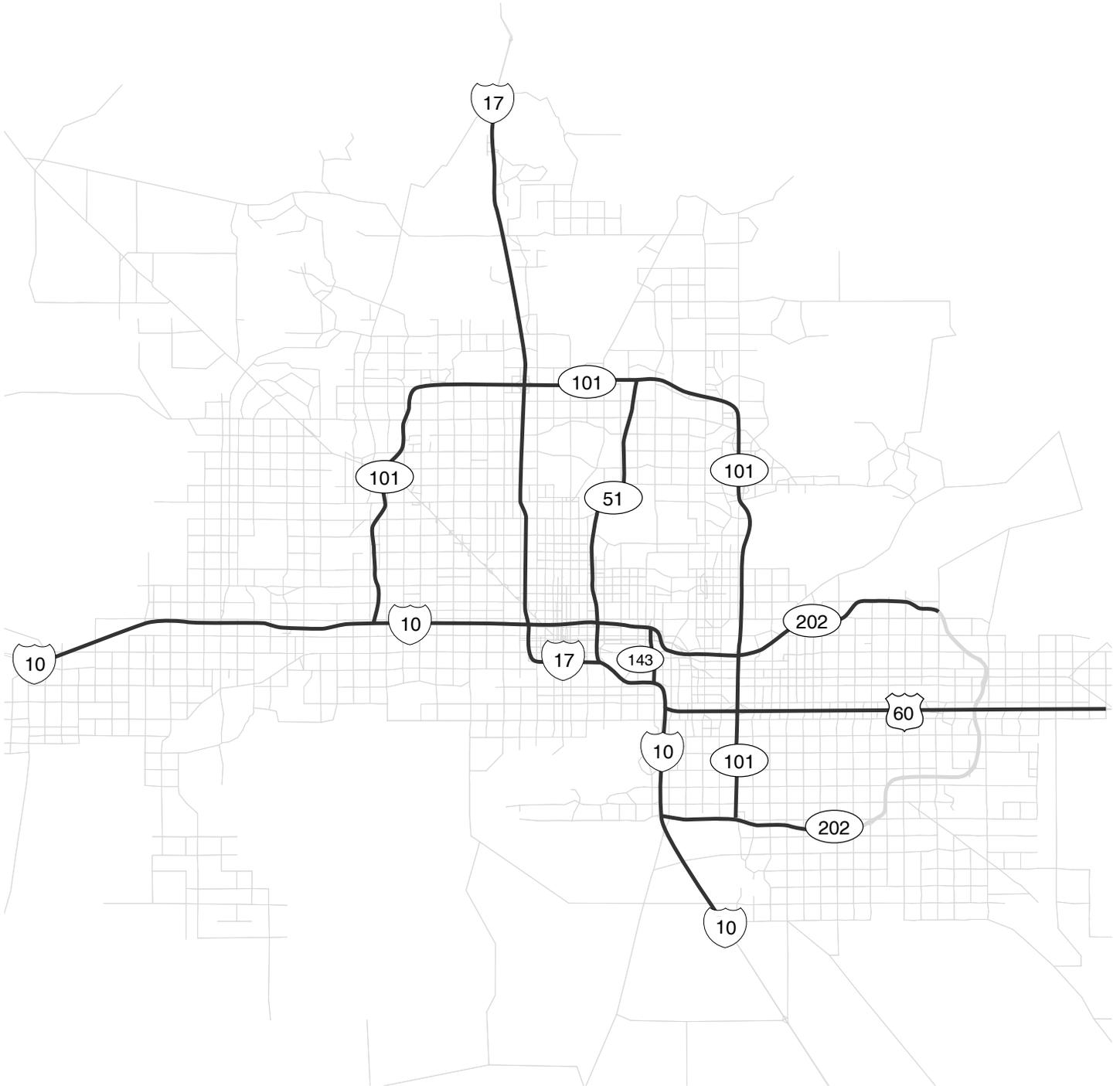
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SURVEYED HIGHWAYS (SPRING 2006)



INTRODUCTION

The purpose of this aerial survey program is to rate the performance of the regional Phoenix freeway system on a recurring basis, and to provide related data to stakeholders, regional planners, and decision-makers. This mobility monitoring program began in the fall of 1998, at which time approximately 110 centerline miles of limited-access highway in the Phoenix metropolitan area were surveyed (data collection occurred during both morning and evening peak commuter periods). Coverage was repeated three years later in the fall of 2001 (an additional 65 miles were added to the highway system), and again in the spring of 2006. *Note: The survey program in 1998 included a photographic inventory and queue analysis at approximately 520 intersections in the Phoenix metropolitan area.*

The aerial survey methodology takes advantage of the mobility and vantage point of fixed-wing aircraft, permitting data collection across a vast highway network that could not be affordably accomplished using traditional ground-based survey methods. All data were acquired through the use of high-resolution digital cameras. On average, each frame covered approximately 1/2 mile of highway; this provided enough resolution to clearly see details such as highway striping and vehicle travel lanes. The photos also afford clear views of traffic on the entrance and exit ramps, as well as any congestion on crossroads at the interchanges.

Overlapping photographic coverage was obtained for each designated highway, repeated once an hour for four hours over four mornings and four evening commute periods; this allowed for a total of sixteen morning and sixteen evening observations for all highway segments. The start points for the flight patterns were staggered to allow for two observations per half-hour for each highway segment. Therefore, each hourly level-of-service rating presented in this report typically represents the average of four observations, while half-hour ratings represent the average of two observations. During the 1998 and 2001 surveys, morning flights were conducted between 6:00 and 9:00 a.m. and evening flights between 3:30 and 6:30 p.m. In 2006, the survey time period was expanded to 5:30-9:30 a.m. and 3:00-7:00 p.m. For the purpose of comparing traffic conditions between 2001 and 2006, density data were averaged in the same manner for the morning and evening survey periods:

6:00-6:30 a.m.	3:30-4:00 p.m.
6:30-7:30 a.m.	4:00-5:00 p.m.
7:30-8:30 a.m.	5:00-6:00 p.m.
8:30-9:00 a.m.	6:00-6:30 p.m.

Density data for the additional hour of survey coverage in the morning and evening were averaged as follows:

5:30-6:00 a.m.	3:00-3:30 p.m.
9:00-9:30 a.m.	6:30-7:00 p.m.

Survey flights were conducted on weekdays, excluding Monday mornings, Friday evenings and mornings after holidays. The flight schedule can be found in **Appendix C**. There were four mornings surveyed when darkness was a factor in obtaining vehicle counts between 5:30-5:40 a.m.; in these instances, digital versions of the high resolution photographs were used to count vehicles. During two of these morning surveys, vehicle counts were not obtainable for several highway segments; for these segments, the level-of-service for the 5:30-6:00 a.m. half-hour time period were based on one observation vs. two.

Freeway	Date/Time	Note
I-10	April 18th 5:30 a.m.	Data not obtained for first two segments beginning at western end (between Ogelsby Rd and 195th Ave). East of 195th Ave, sufficient light allowed for data reduction.
I-17	April 12th 5:30 a.m.	No data obtained beginning at north end (between New River Rd and Loop 101); sufficient light available south of Loop 101.
Loop 101	April 20th 5:30 a.m.	Sufficient light available for data reduction for all segments (began northbound at Loop 202S)
Loop 202N	April 19th 5:30 a.m.	Sufficient light available for data reduction for all segments (began westbound at McKellips Rd)

FEATURES OF THE AERIAL SURVEY PROGRAM

Features of the aerial survey program include:

1) 2006 Survey Findings (Written Report)

The **Executive Summary** includes a comparison of traffic conditions for locations on the highway system where major changes were found between the 2001 and 2006 surveys. The nature of the changes and any apparent causes are discussed.

Part One of the report contains regional graphics of the freeways system surveyed in 2006; the first set of graphics (morning and evening) depicts all locations where congestion was found using directional arrowheads alongside the freeways. The second set of graphics (30 and 60 minute intervals), generated in a GIS file, depict level-of-service by direction using colors to represent different levels-of-service.

Performance rating tables of traffic conditions on the 175 miles of surveyed freeways are presented in **Part Two** (morning) and **Part Three** (evening) of this report, *on the right-hand side pages*. The ratings are presented in tables by highway segment, by direction and by time slice. Hourly ratings represents the average of four observations (from four different days), minus any data affected by incidents (the half-hour time slices represent the average of two observations). The ratings are density-based level-of-service (LOS) designations "A", "B", "C", "D", "E" and "F", as defined in the *2000 Highway Capacity Manual (HCM)*. The procedures for arriving at the performance ratings have been outlined in **Appendix A**.

Also in Part One and Part Two of this report, highway maps containing congestion arrows and narratives have been placed opposite each performance-rating table, *on the left-hand side*. The narratives clarify the severity and frequency of all congestion found along each highway segment. Apparent causes of the congestion are also described where evident. Congestion on cross roads and ramps are also depicted and discussed.

Entrance and exit ramp queue profiles (30-minute intervals) are presented in **Appendix D** of this report. Entrance ramp queues typically represent congestion found at ramp meters; however, in some cases, the head of the queue was found where vehicles merged into the mainline. Exit ramp queue profiles represent two separate turning movements (left and thru/right) at signalized intersections at the head of each ramp.

In order to allow the estimation of vehicle speeds from densities on the freeways, Skycomp has built a database from data collected in other cities demonstrating the precise relationship between traffic densities and speeds. From this database, a look-up table was developed relating the two variables. The result of Skycomp's work in other cities is provided in **Appendix B**.

2) Highlight Aerial Photographs (iView Catalog)

This product includes aerial photographs for all of the congested locations presented in the written report. Each of the narratives that describe a congested location includes a note number; to view the associated highlight photographs, select the note number in the iView Catalog.

3) Survey Database

A primary deliverable for this project is the Survey Database (built in Microsoft Access). The database contains all of the data collected for the uninterrupted facilities (including freeway-to-freeway ramps), from vehicle counts and road segmentation, to flight information, and the variables used to calculate densities. Using this database, a number of reports can be displayed or printed, including comparative reports, segment densities, vehicle classification, and incident information.

4) Signal Queues (entrance ramps & exit ramps)

Queue populations at freeway on-ramps (ramp meters) and off-ramps (signal queues) have been recorded for each observation. Each entry also includes physical characteristics of the ramp, including the number of lanes associated with each turning movement. These data will be provided separately in .xls format.

5) Photographic Archive (iView Catalog)

An archive of all photographs taken during the 2006 aerial survey has been provided in an iView Catalog on a hard drive.

ACKNOWLEDGMENTS AND DISCLAIMER

Survey operations would not have been possible without the assistance of regional FAA air traffic controllers. Aircraft were furnished by or contracted through the Southwest Flight Center in Scottsdale, Arizona.

In order to predict average travel speeds from traffic densities, a staff member of the Metropolitan Washington, D.C. Council of Governments (Paul DeVivo) calibrated a single-regime model developed by Michel Van Aerde for use in the metropolitan Washington area. The model was submitted by Van Aerde to the Transportation Research Board in 1995 (TRB Paper No. 95082; see also discussion in Appendix B).

The preparation of this report was financed by the Maricopa Association of Governments. The opinions, findings and conclusions expressed in this report are from Skycomp, not this agency.

QUESTIONS

If there are any questions about this survey program or the underlying methodology, please direct them to Greg Jordan at 410-884-6900.

Executive Summary

Locations Where Congestion was Found & Major Trends and Changes in Traffic Conditions Between 2001 and 2006

This section of the report identifies locations on the highway system where congestion was found and includes discussion on major trends and changes in traffic conditions since the last aerial survey in 2001.

Note: In order to estimate vehicle speeds from densities (for level-of-service "F" conditions), a look-up table was used relating the two variables. See appendix B for details on the speed/density relationship.

I-10

New Construction: Since the previous aerial survey conducted in 2001, capacity was added in each direction to sections of I-10 between Loop 101 (Agua Fria Fwy) and SR 51/Loop 202.

Morning (Eastbound):

(Between Oglesby Rd and Loop 101)

During the 2006 survey, a short zone of eastbound congestion was found on I-10 between Estrella Pkwy and Dysart Rd; when congested, estimated speeds typically ranged from 30 to 50 mph. Traffic merging from the ramps at Estrella Pkwy and Litchfield Rd appeared to cause the congestion. In 2001, relatively light traffic was found along this section of I-10 (level-of-service "B").

(Between Loop 101 and SR 51/Loop 202)

During the 2001 survey, eastbound congestion was found on I-10 between Loop 101 and the vicinity of 51st Ave; average speeds during the peak period (6:30-7:30 a.m.) typically ranged from 20 to 40 mph. While congestion was found at this location again in 2006, average speeds generally improved (40 to 50 mph); the addition of a travel lane likely contributed to the improvement. In 2001, eastbound travelers typically resumed free flow speeds east of 51st Ave; however, in 2006, congestion persisted through the interchange at I-17 (5:30-8:30 a.m.).

Morning (Northbound):

(Between Pinal County Line and SR 51/Loop 202)

During the surveys in 2001 and 2006, similar northbound congestion was found on I-10 between Chandler Blvd and SR 143; congestion was particularly severe south of US 60 where average speeds were estimated at 15 to 30 mph. Contributing to this congestion was the lane drop (4 lanes to 3) at Baseline Rd, and traffic merging into the mainline from the ramps at Warner Rd, Elliot Rd and US 60.

Evening (Eastbound):

(Between Estrella Pkwy and Dysart Rd)

During the 2006 survey, a short zone of eastbound congestion was found on I-10 between Estrella Pkwy and Dysart Rd; it appeared that the congestion was caused by traffic merging into the mainline from the ramp at Litchfield Rd (located between Estrella Pkwy and Dysart Rd). Congestion found was limited to the earlier part of the evening survey period (before 4:30 p.m.). Relatively light traffic (level-of-service "B") was found at this location during the 2001 survey.

(Between SR 51/Loop 202 and US 60)

Southeast-bound congestion along this section of I-10 has increased considerably in both severity and duration. During the 2001 survey, congestion was typically found between the I-17 and US 60 interchanges; the peak hour was between 5:00 and 6:00 p.m., with average speeds estimated at 30 to 50 mph. During the 2006 survey, a continuous zone of congestion was found between the interchanges at SR 51/Loop 202 and US 60; between 4:00 and 6:00 p.m., average estimated speeds along this seven-mile section of I-10 ranged from 15 to 30 mph.

Evening (Westbound):

(Between SR 51/Loop 202 and 75th Ave)

During the 2001 survey, a short zone of westbound congestion was found in the vicinity of the SR 51/Loop 202 interchange where traffic merged into the mainline of I-10; after the merge, westbound traffic typically resumed free flow speeds until encountering congestion again in the vicinity of the I-17 interchange. During the peak hour (5:00-6:00 p.m.), this congestion typically persisted west to the vicinity of 67th Ave; average speeds were estimated at 20 to 40 mph along this six-mile section of I-10. During the 2006 survey, a significant increase was found in both the severity and duration of congestion along this corridor. Between 3:30 and 6:00 p.m., a mostly continuous zone of congestion extended for approximately 10 miles between SR 51/Loop 202 and 75th Ave; average estimated speeds ranged widely, from 10 to 50 mph, with the more severe congestion found east of 43rd Ave.

(Between Loop 101 and Dysart Rd)

During the 2006 survey, two separate zones of westbound congestion were found on I-10 between Loop 101 and Dysart Rd; potential causes of the congestion were traffic merging from the Loop 101 ramp, and the lane drop (3 lanes to 2) at Dysart Rd. When congested, average estimated speeds ranged from 30 to 50 mph. Congestion was not found along this section of I-10 during the 2001 survey.

I-10 HOV**Morning (Eastbound / Southbound):**

(Between Loop 101 and Ray Rd)

During the 2001 survey, eastbound / southbound vehicles consistently traveled at free flow speeds along the entire length of the HOV facility. Similar conditions were found in 2006, with the exception of intermittent eastbound congestion found between 83rd Ave and 51st Ave; other than increased demand (2+ occupancy), no apparent cause was found for the congestion along this section of the HOV facility.

Morning (Westbound / Northbound):

(Between Ray Rd and Loop 101)

During the 2001 survey, northbound / westbound vehicles consistently traveled at free flow speeds along the entire length of the HOV facility. Similar conditions were found in 2006, with the exception of a short zone of intermittent northbound congestion found in the vicinity of US 60; this congestion appeared to be caused by US 60 HOV vehicles merging into the HOV lane on I-10.

Evening (Eastbound / Southbound):

(Between SR 51/Loop 202 and US 60)

During the 2001 survey, eastbound / southbound vehicles utilizing the HOV lane on I-10 consistently traveled at free flow speeds for the entire length of the facility; average level-of-service data for each of the segments were virtually all "A" and "B", corresponding to light traffic flow. During the 2006 survey, extensive eastbound / southbound congestion was found in the HOV lane between SR 51/Loop 202 and US 60. Congestion typically developed between 3:30 and 4:00 p.m. and persisted until sometime between 6:00 and 6:30 p.m.; congestion in the HOV lane along this section of I-10 was similar to that found in the general purpose lanes (non-HOV) in terms of severity. Average speeds for both HOV and non-HOV vehicles were typically less than 30 mph during the peak period.

Evening (Westbound):*(Between SR 51/Loop 202 and Loop 101)*

During the 2001 survey, two zones of westbound congestion were found in the HOV lane between SR 51/ Loop 202 and 51st Ave; the congested locations were found in the vicinity of where traffic entered I-10 from freeway ramps (SR 51, Loop 202 and I-17). Congestion was found intermittently between 5:00 and 6:30 p.m., with average speeds estimated at 35 to 55 mph. During the 2006 survey, HOV congestion was found again along the same section of I-10; however, a significant increase in the severity and duration of congestion was apparent. Westbound vehicles in the HOV lane typically encountered congestion in the vicinity of the SR 51/ Loop 202 interchange; during the peak period, this congestion persisted westbound to the vicinity of 35th Ave. Congestion developed early in the survey period, and typically persisted until sometime between 6:00 and 6:30 p.m.; average estimated speeds during the peak period typically ranged from 30 to 40 mph.

I-17

New Construction: Since the previous aerial survey conducted in 2001, auxiliary lanes were added to I-17 between Dunlap Ave. and Bell Rd.

Morning (Southbound):*(Between New River Rd and Loop 101)*

During the 2006 survey, southbound congestion was found on I-17 between the vicinity of Happy Valley Rd and Deer Valley Rd; during the peak period, estimated speeds typically ranged from 20 to 40 mph. Traffic merging into the mainline from the ramps at Happy Valley Rd and Pinnacle Peak Rd appeared to cause the congestion. Congestion was not found along this section of I-17 during the 2001 survey.

(Between Loop 101 and I-10)

During the surveys in 2001 and 2006, southbound congestion was found on I-17 between Bell Rd and Camelback Rd; while the duration and extent of congestion found here was similar during each of the surveys, it appeared that in 2006, traffic flow improved. The addition of auxiliary lanes along this section of I-17 may have contributed to the improved flow.

(Between the I-10 Interchanges)

During the survey in 2001, marginal intermittent congestion (eastbound) was found on I-17 between Buckeye Rd and 7th St (between 6:30 and 7:30 a.m.). In 2006, congestion here consistently developed very early in the survey period (5:30-6:00 a.m.) and persisted until approximately 7:30 a.m.; estimated speeds typically ranged from 30 to 50 mph.

Evening (Westbound / Northbound):*(Between I-10 and Cactus Rd)*

During the 2001 survey, westbound/northbound travelers on I-17 encountered mostly free flow conditions between the I-10 Interchanges; however, northbound congestion was typically encountered just north of I-10 in the vicinity of Thomas Rd. This congestion persisted approximately 8 miles north to the vicinity of Cactus Rd; estimated speeds along this section of I-17 typically ranged from 20 to 40 mph. During the peak period in 2006, westbound/northbound congestion was found on I-17 between the I-10 Interchanges; estimated speeds here typically ranged from 25 to 45 mph. North of I-10, congestion in 2006 was similar to that found in 2001, except for the 4-mile section between Bethany Home Rd and Cactus Rd (marginal intermittent congestion); the increased capacity of the highway along this section of I-17 may have contributed to the improved flow.

Evening (Southbound):

(Between New River Rd and Loop 101)

During the 2006 survey, southbound congestion was found on I-17 between the vicinity of Happy Valley Rd and Deer Valley Rd; during the peak period, estimated speeds typically ranged from 25 to 40 mph. Traffic merging into the mainline from the ramp at Pinnacle Peak Rd appeared to cause the congestion. Congestion was not found along this section of I-17 during the 2001 survey.

I-17 HOV**Morning & Evening**

(Between 99th Ave and I-10)

Congestion was not found on the HOV facility during the morning or evening surveys (2001 and 2006).

SR 51

New Construction: Since the previous aerial survey conducted in 2001, an HOV lane was added in each direction on SR 51 between McDowell Rd and Shea Blvd. SR 51 was also extended several miles to the north from Bell Rd to Loop 101.

Morning (Southbound):

(Between Greenway Rd and Shea Blvd)

During the 2006 survey, southbound congestion was found on SR 51 between Greenway Rd and Shea Blvd; congestion was found here between 6:30 and 8:00 a.m. with estimated speeds ranging from 30 to 50 mph. Traffic merging into the mainline from the ramps at Greenway Rd, Thunderbird Rd and Cactus Rd appeared to cause or exacerbate the congestion. No congestion was found along this section of SR 51 during the 2001 survey.

(Between Northern Ave and I-10)

During the 2001 and 2006 surveys, southbound congestion was found on SR 51 between Northern Ave and Thomas Rd; average speeds during the peak period (7:30-8:30 a.m.) typically ranged from 25 to 50 mph. The lane drop (4 lanes to 3) at Glendale Ave, and traffic merging from ramps at Bethany Home Rd, Highland Ave and Indian School Rd appeared to cause the congestion. While the severity and extent of congestion found was similar in the two surveys, the duration was slightly longer in 2006; in 2001, congestion typically dissipated by 8:30 a.m., whereas congestion persisted until approximately 9:00 a.m. during the 2006 survey.

Evening (Northbound):

(Between I-10 and Glendale Ave)

During the 2001 survey, northbound congestion was found on SR 51 between I-10/Loop 202 and Glendale Ave; during the peak period, average estimated speeds ranged from 15 to 40 mph. While similar conditions were found here in 2006, congestion was generally less severe (25 to 40 mph), and typically dissipated after 6:00 p.m.; severe congestion persisted through the end of the survey period in 2001 (6:30 p.m.). It is likely the increased capacity of the highway contributed to the improvement.

(Between Northern Ave and Shea Blvd)

During the 2001 survey, marginal intermittent congestion was found on SR 51 between 32nd St and Shea Blvd; the lane drop (4 lanes to 3) at Shea Blvd appeared to cause the congestion. In 2006, congestion was typically found here between 4:30 and 6:30 p.m.; in some cases, congestion extended several miles upstream to the vicinity of Northern Ave.

Evening (Southbound):*(Between Indian School Rd and I-10)*

During the surveys in 2001 and 2006, southbound congestion was found on SR 51 approaching the terminus at I-10/Loop 202; factors contributing to the congestion included the lane drop at I-10 (3 lanes to 2), and vehicles queued in the right lane on the approach to the I-10 westbound/Loop 202 ramp. A slight increase in the severity and extent of congestion was documented during the 2006 survey.

SR 51 HOV**Morning & Evening (Northbound & Southbound):***(Between I-10/Loop 202 and Shea Blvd)*

Congestion was not found on the HOV facility during the morning or evening surveys in 2006.

US 60

New Construction: Since the previous aerial survey conducted in 2001, a twelve-mile section of US 60 was widened between I-10 and Val Vista Dr; the widening included the construction of an HOV facility (left lane–concurrent flow). During the 2006 survey, construction was present on US 60 between Val Vista Dr and Crimson Rd to the east.

Morning (Eastbound):*(Between I-10 and Goldfield Rd)*

During the surveys in 2001 and 2006, eastbound vehicles on US 60 consistently traveled at free-flow speeds throughout the morning survey period. In 2001, average level-of-service was predominantly “C” and “D”; average level-of-service in 2006 was predominantly “A” and “B”, which may be attributed to the increased capacity of the highway.

Morning (Westbound):*(Between Val Vista Dr and I-10)*

During the 2001 survey, ongoing construction along US 60 between Val Vista Dr and I-10 appeared to have affected traffic flow along this corridor. Two distinct zones of westbound congestion were found, between Greenfield Rd and Country Club Dr, and farther west between Loop 101 and the terminus at I-10. Congestion persisted throughout most of the morning survey period (6:00–9:00 a.m.) with average speeds estimated between 20 and 40 mph. In 2006, two distinct zones of westbound congestion were found again during the morning survey period, between Ellsworth Rd and Greenfield Rd, and as found in 2001, between Loop

101 and the terminus at I-10. Congestion east of Greenfield Rd was found throughout the morning survey period (5:30-9:30 a.m.) while congestion approaching I-10 was typically limited to 6:30 to 8:30 a.m.; average estimated speeds in each of the congested zones normally ranged from 15 to 40 mph.

Evening (Eastbound):

(Between I-10 and Val Vista Dr)

During the 2001 survey, ongoing construction along US 60 between I-10 and Val Vista Dr appeared to have affected traffic flow along this corridor. Two distinct zones of eastbound congestion were found, between I-10 and McClintock Dr, and between Loop 101 and Lindsey Rd. Congestion persisted throughout the evening survey period (3:30-6:30 p.m.) with average estimated speeds during the peak period ranging from 15 to 40 mph. When surveyed in 2006, a significant improvement was evident in the severity, extent and duration of congestion on US 60. Two separate one to two mile zones of eastbound congestion were found; between I-10 and McClintock Rd, and between Gilbert Rd and Val Vista Dr; average estimated speeds ranged from 30 to 50 mph. Congestion was not found during any observations after 6:00 p.m.

Evening (Westbound):

(Between Goldfield Rd and I-10)

During the 2001 survey, westbound travelers on US 60 typically maintained free flow speeds, with the exception of intermittent marginal congestion found in the vicinity of Mesa Dr and Dobson Rd; construction may have contributed to the congestion. During the 2006 survey, no congestion was found along US 60, with average level-of-service "A", "B" and "C" recorded throughout the evening survey period.

US 60 HOV

Morning & Evening (Eastbound & Westbound):

(Between I-10 and Val Vista Dr)

Congestion was not found on the HOV facility during the morning or evening surveys in 2006.

Loop 101

New Construction: Since the previous aerial survey conducted in 2001, several new sections of Loop 101 were constructed to include: 1) Scottsdale Rd to Bell Rd; 2) Chandler Blvd to Loop 202 (Santan Fwy).

Morning (Eastbound):

(Between Union Hills Dr and SR 51)

Conditions along this section of Loop 101 have changed considerably. During the survey in 2001, a short zone of marginal intermittent congestion was found on Loop 101 eastbound between 51st Ave and 43rd Ave. In 2006, two separate zones of eastbound congestion were found along this section of Loop 101, between Union Hills Dr and 35th Ave, and farther east between 19th Ave and Cave Creek Rd. At each of these locations, it appeared that traffic merging into the mainline caused the congestion; congestion persisted for most of the survey period,

with average speeds during the peak period estimated at 20 to 40 mph.

Morning (Southbound):

(Between Shea Blvd and Indian Bend Rd)

During the survey in 2001, a short zone of marginal intermittent congestion was found on Loop 101 southbound between 90th St and Via Ventura Blvd; when congested speeds were estimated at 40 to 50 mph. In 2006, southbound congestion was found in the same location; however a slight increase in the duration, severity and extent of congestion was apparent. Between 7:30 and 8:30 a.m., southbound congestion was typically encountered in the vicinity of Shea Blvd and persisted several miles south to Via Ventura Blvd; average estimated speeds typically ranged from 30 to 50 mph.

Morning (Northbound):

(Between Loop 202-Santan Fwy and US 60)

Conditions along this section of Loop 101 have changed considerably. In 2001, northbound travelers typically progressed at free flow speeds until encountering a short zone of congestion approaching the US 60 interchange; this congestion was typically found early in the survey period between 6:30 and 7:30 a.m. In 2006, an extended zone of northbound congestion was found between Chandler Blvd and Guadalupe Rd; this congestion was found on each of the four days surveyed, between 7:30 and 9:00 a.m. (average estimated speeds typically ranged from 25 to 45 mph). Increased demand from Loop 202 (Santan Fwy) may have contributed to congestion found on this section of Loop 101. Vehicles consistently resumed free flow speeds north of Guadalupe Rd where the roadway widens from three to four lanes (added capacity here since the 2001 survey).

(Between US 60 and Loop 202-Red Mountain Fwy)

During each of the surveys in 2001 and 2006, northbound congestion was found on Loop 101 approaching the interchange at Loop 202; congestion on the ramp to westbound Loop 202 typically extended back into the right-hand lanes of Loop 101, and ultimately across all lanes. In general, it appeared that congestion found in 2006 was more intermittent.

(Between Loop 202-Red Mountain Fwy and Indian Bend Rd)

During the 2001 survey, northbound congestion was found on Loop 101 between Loop 202 and Thomas Rd; during the peak hour between 7:30 and 8:30 a.m., average estimated speeds ranged from 30 to 40 mph. In 2006, northbound travelers did not typically encounter congestion until just north of McKellips Rd; however, this congestion typically persisted five to six miles north to the vicinity of Indian Bend Rd. Traffic merging from the ramps at the series of interchanges along this section of Loop 101 appeared to cause the congestion.

Evening (Northbound):

(Between Loop 202-Santan Fwy and US 60)

This section of Loop 101 was relatively lightly traveled in the northbound direction during the survey in 2001 (average Level-of-service "A", "B" and "C"). In 2006, vehicles also traveled at free flow speeds during most of the evening survey period; however, between 4:30 and 6:00 p.m., intermittent northbound congestion was found between Warner Rd and Guadalupe Rd. This congestion appeared to be caused by traffic merging into the mainline from the interchanges at Warner Rd, Elliot Rd and Guadalupe Rd; the completed section of Loop 101 between Chandler Blvd and Loop 202 (Santan Fwy) may have contributed to increased demand along this

section of Loop 101.

(Between Loop 202-Red Mountain Fwy and 90th St)

During the 2001 survey, northbound travelers on this section of Loop 101 typically traveled at free flow speeds, with the exception of marginal intermittent congestion encountered between McDowell Rd and Thomas Rd. In 2006, northbound congestion was found during most observations (3:30-6:00 p.m.) between Chaparral Rd and Indian Bend Rd; in some cases, this congestion extended back to the vicinity of Thomas Rd. Traffic merging into the mainline from the ramps at Chaparral Rd and McDonald Rd appeared to cause the congestion.

Evening (Southbound):

(Between Shea Blvd and McKellips Rd)

During the 2001 and 2006 surveys, southbound congestion was found on Loop 101 between Shea Blvd and Loop 202; while the severity and extent of congestion found was similar (6-8 miles / 20-50 mph), it appeared that in 2006, congestion developed earlier in the evening. Congestion found in 2001 typically developed sometime between 4:00 and 5:00 p.m., whereas congestion in 2006 had often developed by the first observation between 3:00 and 3:30 p.m.

(Between Loop 202-Red Mountain Fwy and US 60)

Southbound congestion found along this section of Loop 101 was similar during the surveys in 2001 and 2006; congestion typically developed between 4:00 and 5:00 p.m. and persisted through the end of the evening survey period (6:30 p.m. in 2001 / 7:00 p.m. in 2006). When congested, average estimated speeds along this four-mile corridor ranged from 30 to 50 mph.

Evening (Westbound):

(Between Scottsdale Rd and I-17)

During the 2001 survey, this section of Loop 101 was very lightly traveled throughout the evening survey period; for the most part, average level-of-service was "A" and "B". Conditions were considerably different when surveyed in 2006, with westbound congestion consistently found between 4:00 and 6:00 p.m.; average estimated speeds from 30 to 50 mph were typically found between Hayden Rd and 19th Ave where the roadway narrowed to two lanes at the exit to I-17. Congestion appeared to be exacerbated by traffic merging into the mainline from the series of interchanges along this 10 mile corridor (including the SR 51 interchange that was not present during the 2001 survey).

Evening (Westbound):

(Between I-17 and 59th Ave)

During the surveys in 2001 and 2006, similar westbound congestion was found along this section of Loop 101; congestion appeared to be caused by traffic merging from the ramp at I-17, and the lane drop (4 lanes to 3) at 51st Ave. During the peak period (4:00-6:00 p.m.), estimated speeds typically ranged from 35 to 50 mph.

SR 143

Morning (Northbound & Southbound):

(Between I-10 and Loop 202)

Similar conditions were found on SR 143 during the 2001 and 2006 surveys; travelers in each direction

consistently maintained free flow speeds throughout the morning survey period.

Evening (Southbound):

(Between Sky Harbor Blvd and I-10)

During the surveys in 2001 and 2006, southbound congestion was found on SR 143 approaching I-10; when congested, the head of the queue was found on the ramp to I-10 eastbound. During the 2006 survey, a significant increase was found in the severity, extent and duration of congestion here; the tail of the queue during the peak period was found in the vicinity of Sky Harbor Blvd, with estimated speeds typically less than 30 mph.

Loop 202 (Santan Freeway)

New Construction: Since the previous survey conducted in 2001, a new section of Loop 202 (Santan Freeway) was constructed between I-10 and Gilbert Rd.

Morning (Eastbound & Westbound):

(Between I-10 and Gilbert Rd)

In the morning, the peak direction of travel was westbound with average level-of-service for each segment either "A", "B" or "C"; in the off-peak direction (eastbound), average level-of-service was "A".

Evening (Eastbound & Westbound):

(Between I-10 and Gilbert Rd)

In the evening, the peak direction of travel was eastbound with average level-of-service for each segment either "A", "B" or "C"; in the off-peak direction (westbound), average level-of-service was "A".

Loop 202 (Red Mountain Freeway)

New Construction: Since the previous aerial survey conducted in 2001, Loop 202 was extended approximately 10 miles to the east between McKellips Rd and Power Rd.

Morning (Westbound):

(Between Country Club Dr and Mill Ave)

During the 2001 survey, westbound congestion was found on Loop 202 between Loop 101 and Mill Ave; congestion was typically found between 6:30 and 8:30 a.m., with estimated speeds during the peak period ranging from 30 to 50 mph. In 2006 an increase in the extent, severity, and duration of congestion was apparent; during the peak period, congestion typically extended 3 to 4 miles east of Loop 101, with estimated speeds ranging from 15 to 40 mph. In most cases, congestion persisted until 9:00 a.m.

Evening (Eastbound):

(Between SR 143 and Loop 101)

During the surveys in 2001 and 2006, eastbound congestion was found on Loop 202 between SR 143 and Loop 101. While a slight increase in the extent of congestion was apparent in 2006, congestion generally formed later and dissipated earlier (vs. 2001). Average speeds during the peak period typically ranged from 15 to 45 mph (2001 and 2006).

Evening (Westbound):

(Between SR 143 and SR 51)

During the surveys in 2001 and 2006, westbound congestion was found on Loop 202 between 40th St and SR 51; in 2006, an increase in the severity and duration of congestion was apparent along this section of Loop 202. Congestion consistently developed by 3:30 p.m. and persisted until approximately 6:30 p.m.; estimated speeds during the peak period ranged from approximately 10 to 30 mph.

Loop 202 HOV (Red Mountain Freeway)**Morning (Eastbound & Westbound):**

(Between SR 51 and Loop 101)

No congestion was found on the Loop 202 HOV facility during the morning survey period.

Evening (Westbound):

(Between 32nd St and SR 51)

During the survey in 2006, a short zone of westbound congestion was found intermittently in the HOV lane; congestion appeared to be caused by the merge with I-10 HOV traffic (two HOV lanes converge to one). Congestion was not found at this location during the survey in 2001.

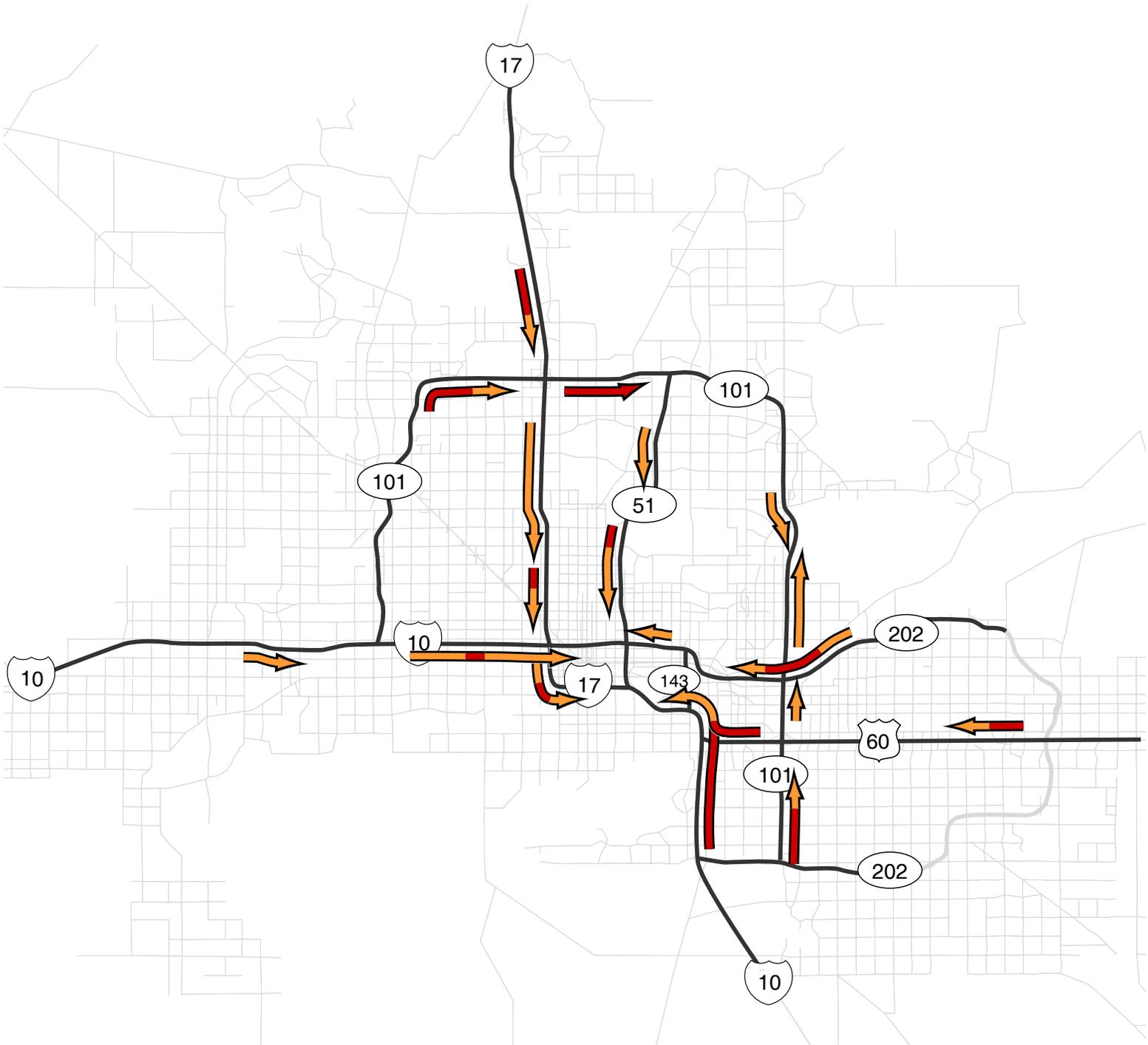
Part One

Regional Congestion Maps Regional Level-of-Service Maps

This section of the report contains regional graphics of the freeway system surveyed in 2006; the first set of graphics (morning and evening) depicts all locations where congestion was found using directional arrowheads alongside the freeways. The second set of graphics (30 and 60 minute intervals), generated in a GIS file, depict level-of-service by direction using colors to represent different levels-of-service.

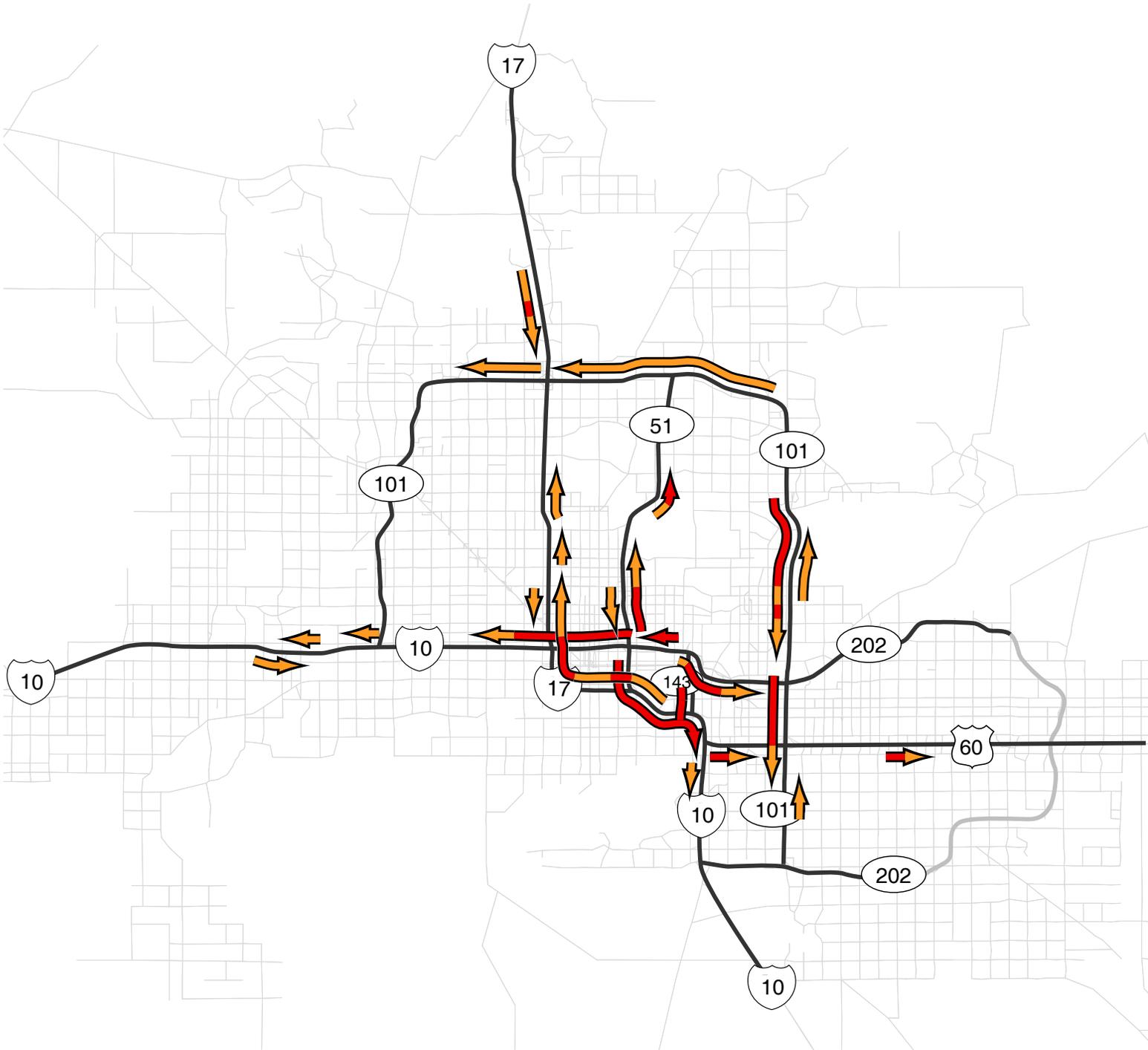
Locations Where Congestion was Found

Morning (5:30 - 9:30 a.m.)

**Legend**

-  Congested flow (Estimated average speed 30-50 mph)
-  Congested flow (Estimated average speed < 30 mph)

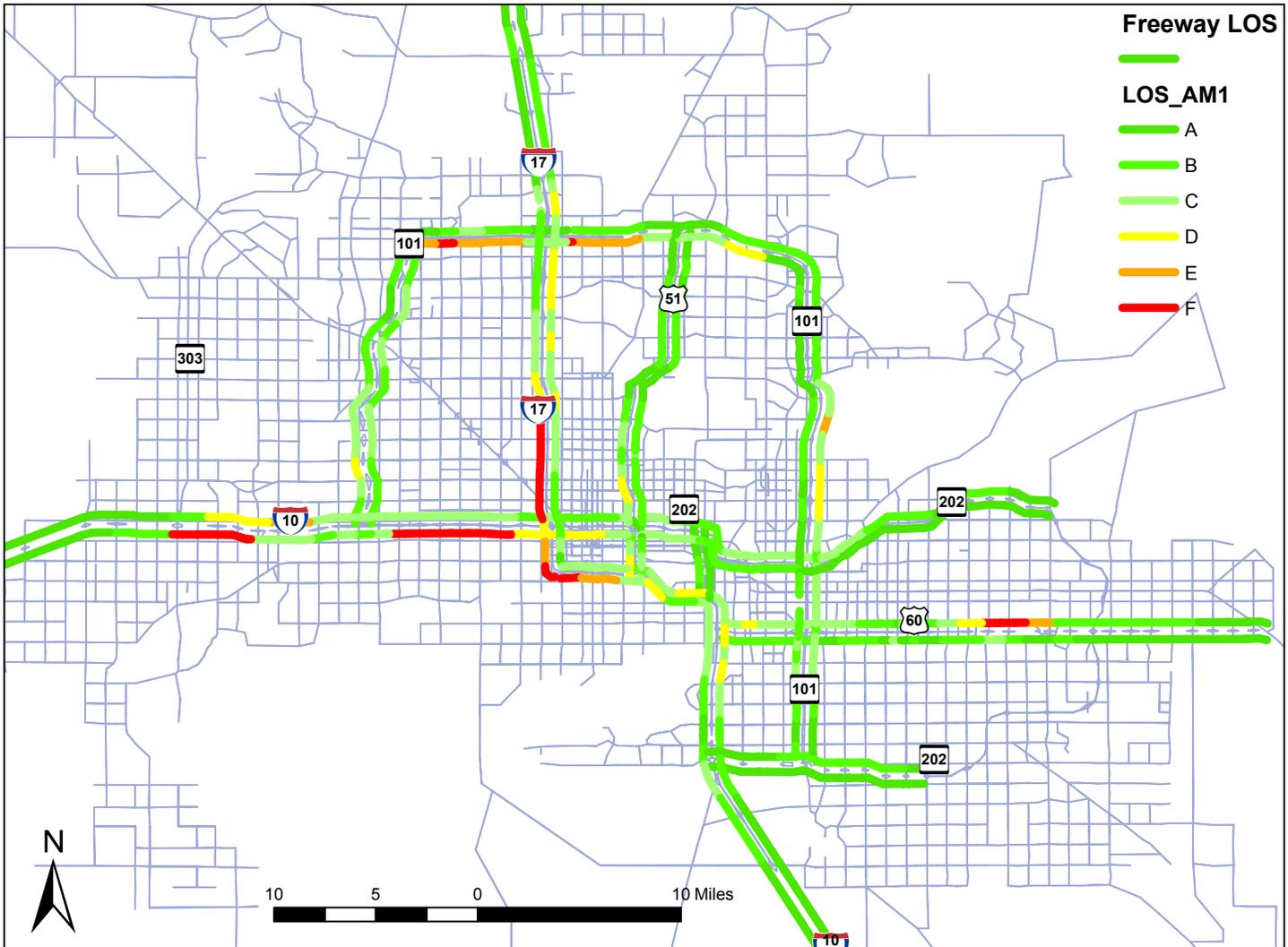
Locations Where Congestion was Found Evening (3:00 - 7:00 p.m.)



Legend

-  Congested flow (Estimated average speed 30-50 mph)
-  Congested flow (Estimated average speed < 30 mph)

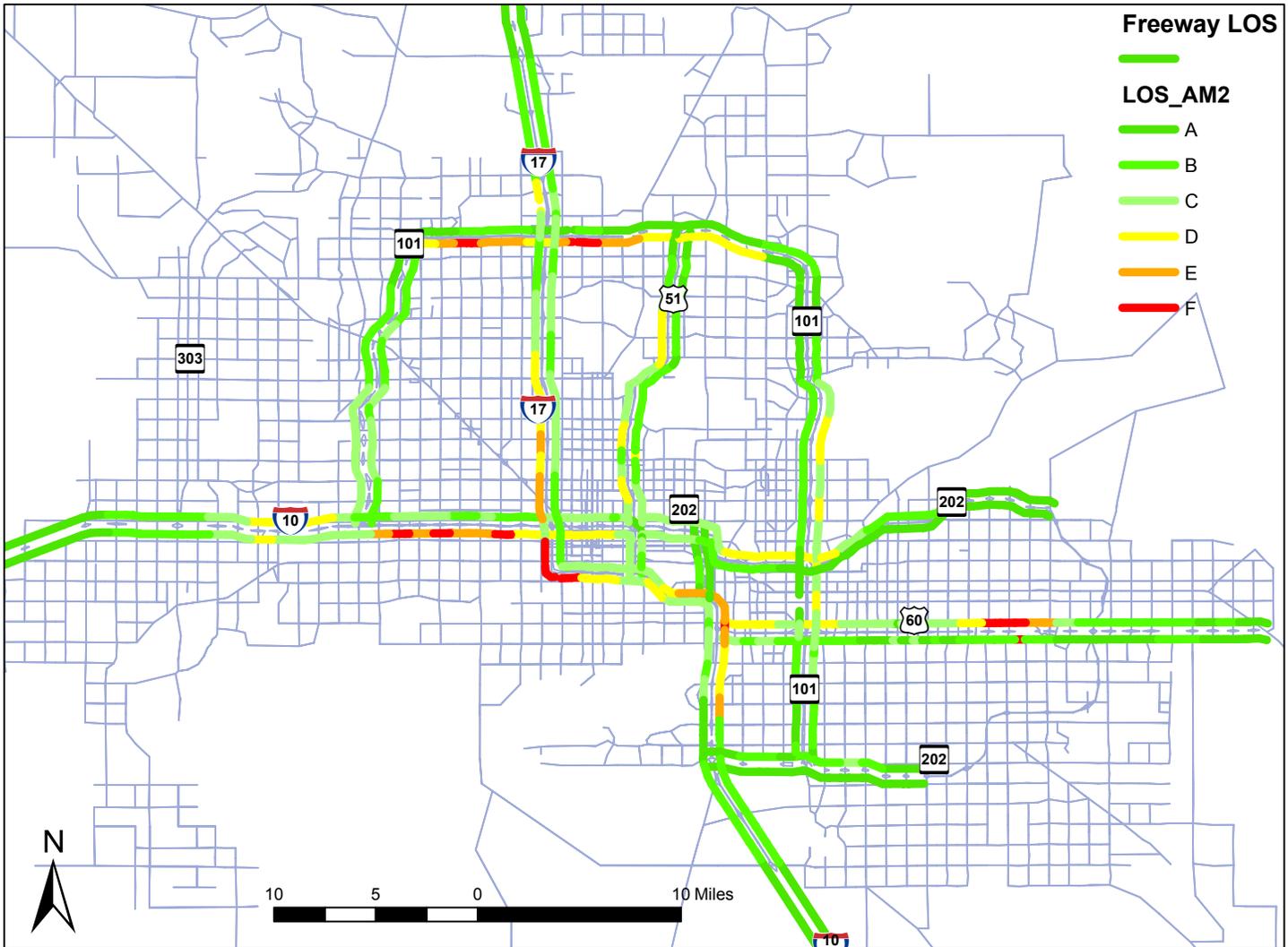
MAG Regional Freeway Level-of-Service Morning (5:30 - 6:00 a.m.)



Legend

- Congested flow (Estimated average speed 30-50 mph)
- Congested flow (Estimated average speed < 30 mph)

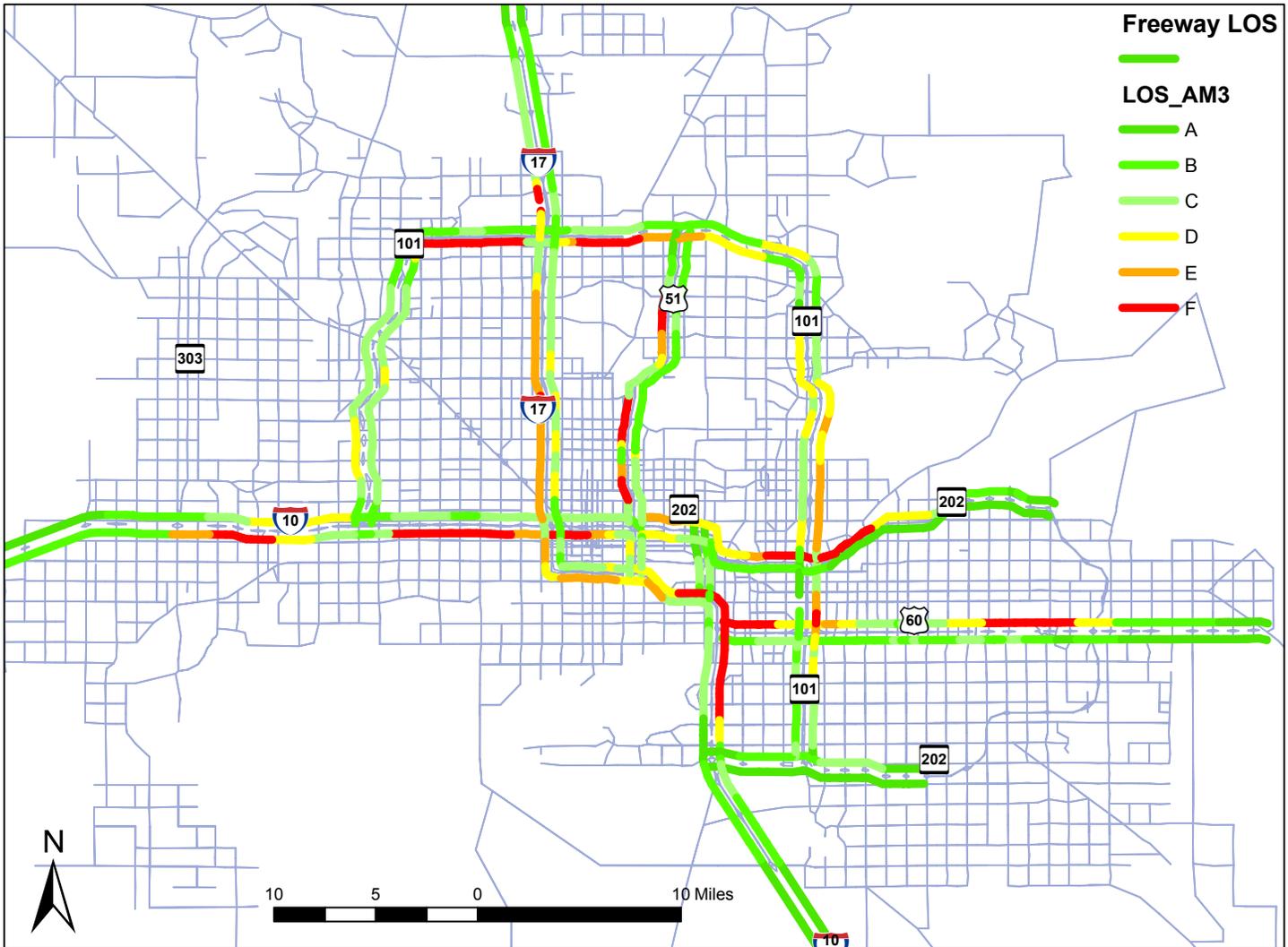
MAG Regional Freeway Level-of-Service Morning (6:00 - 6:30 a.m.)



Legend

-  Congested flow (Estimated average speed 30-50 mph)
-  Congested flow (Estimated average speed < 30 mph)

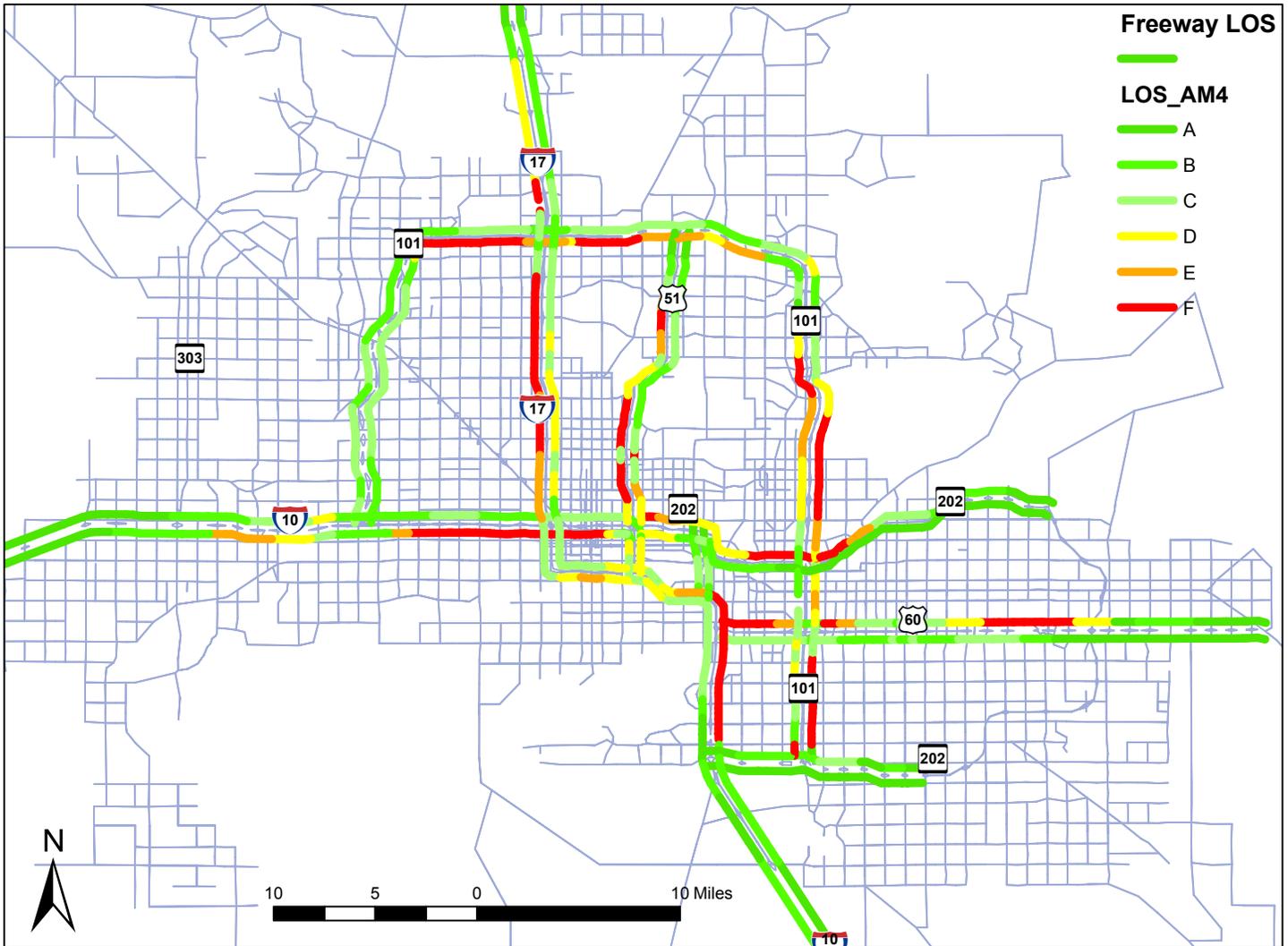
MAG Regional Freeway Level-of-Service Morning (6:30 - 7:30 a.m.)



Legend

- Congested flow (Estimated average speed 30-50 mph)
- Congested flow (Estimated average speed < 30 mph)

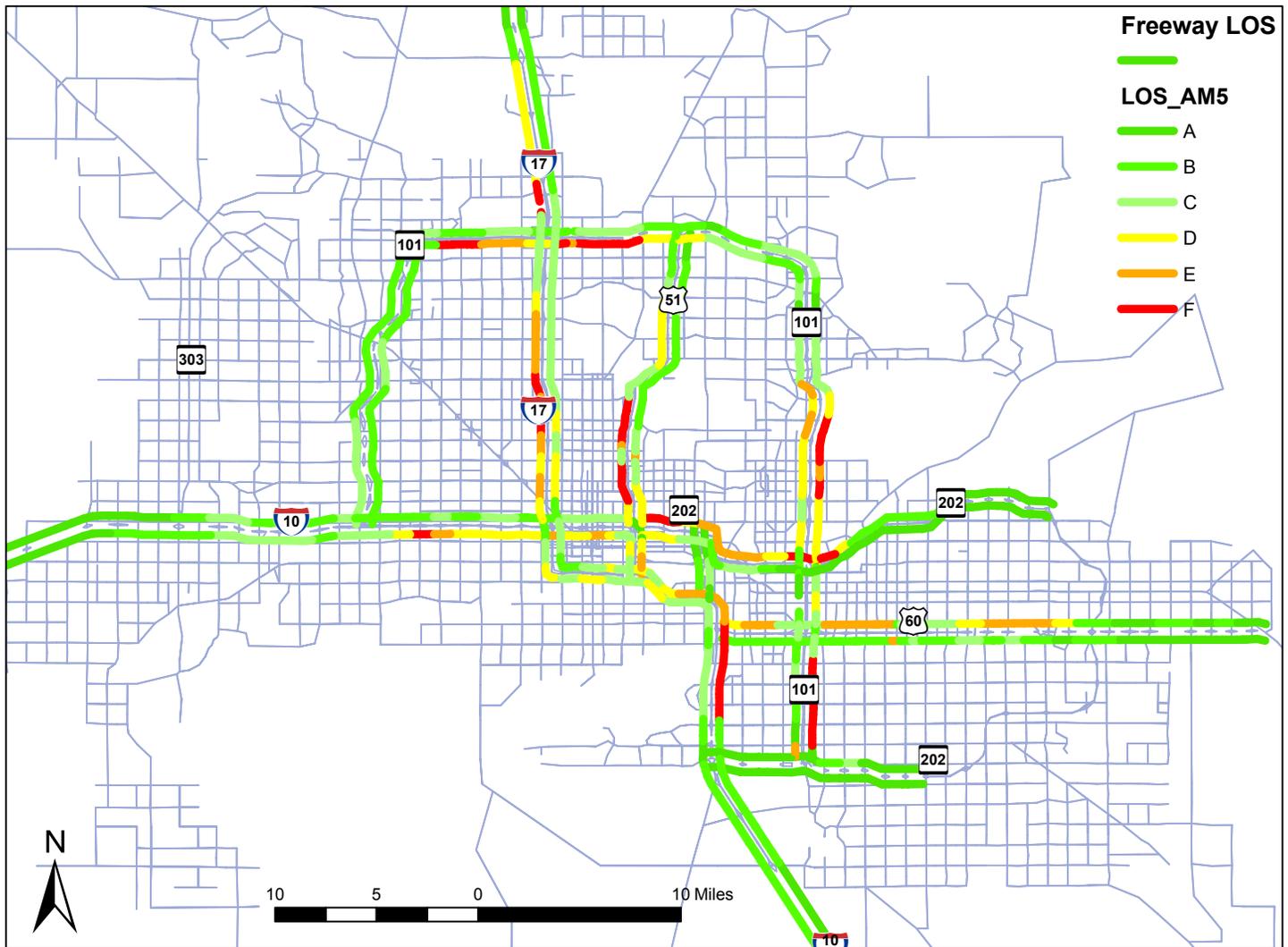
MAG Regional Freeway Level-of-Service Morning (7:30 - 8:30 a.m.)



Legend

-  Congested flow (Estimated average speed 30-50 mph)
-  Congested flow (Estimated average speed < 30 mph)

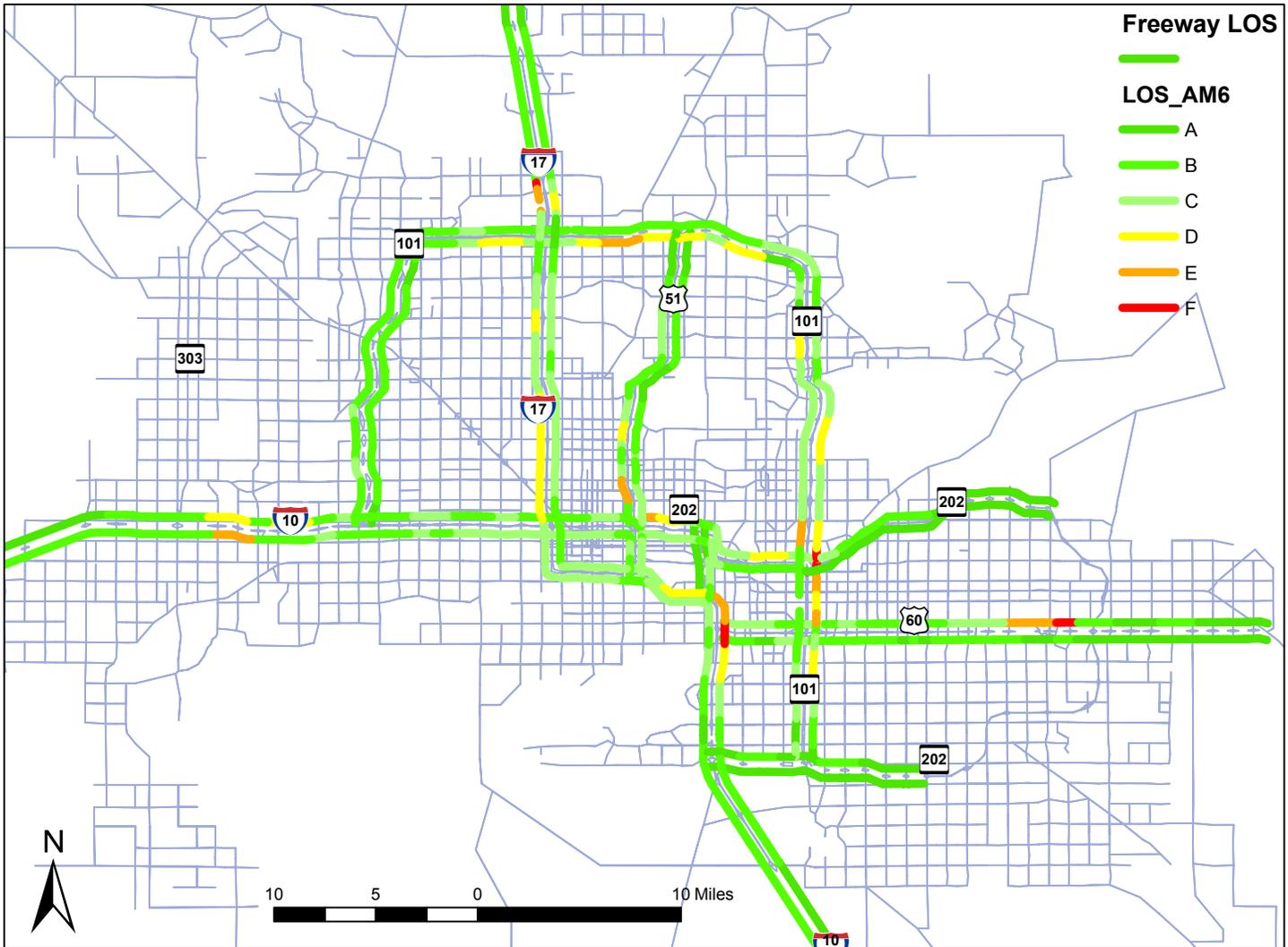
MAG Regional Freeway Level-of-Service Morning (8:30 - 9:00 a.m.)



Legend

- Congested flow (Estimated average speed 30-50 mph)
- Congested flow (Estimated average speed < 30 mph)

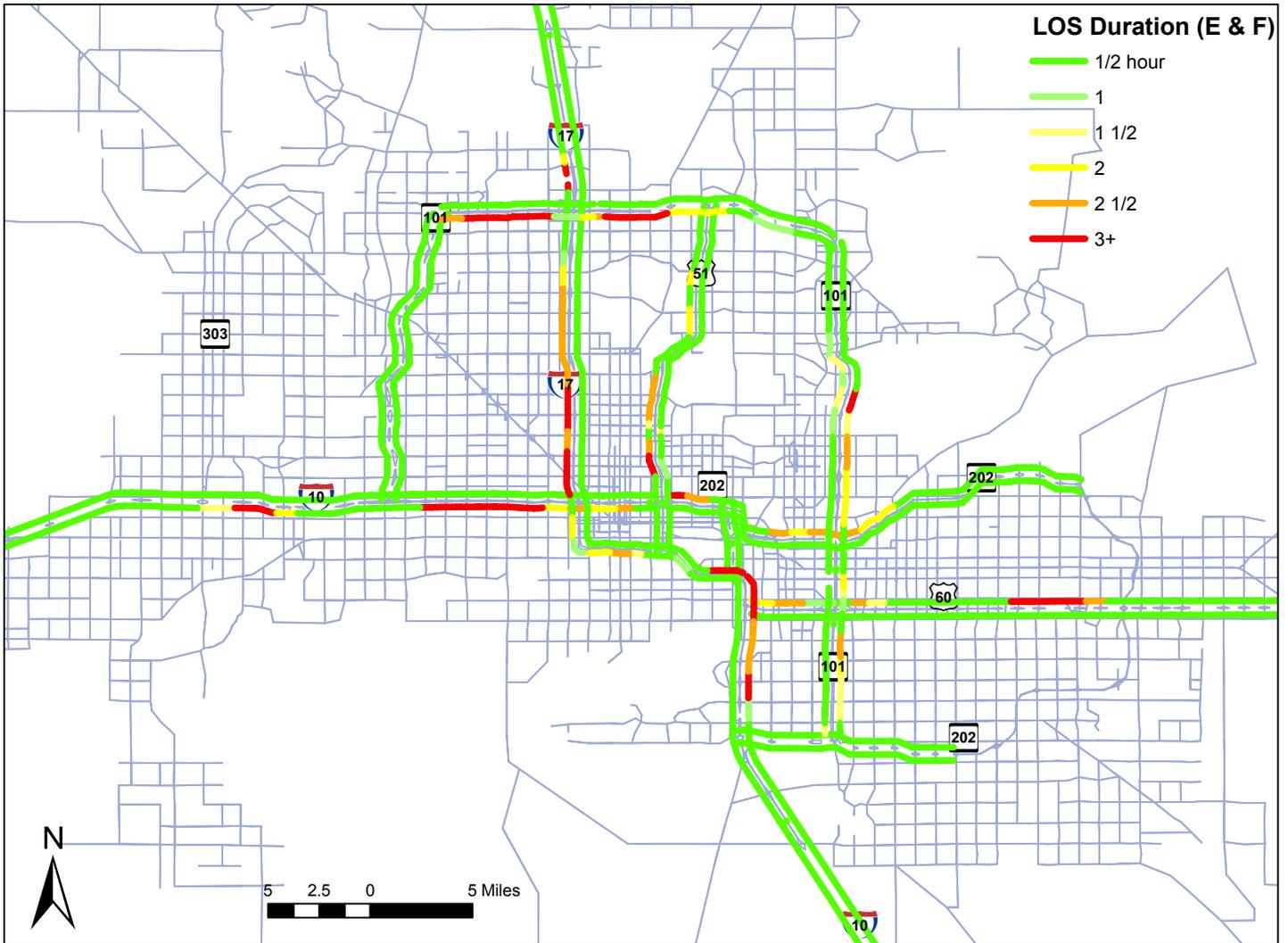
MAG Regional Freeway Level-of-Service Morning (9:00 - 9:30 a.m.)



Legend

- Congested flow (Estimated average speed 30-50 mph)
- Congested flow (Estimated average speed < 30 mph)

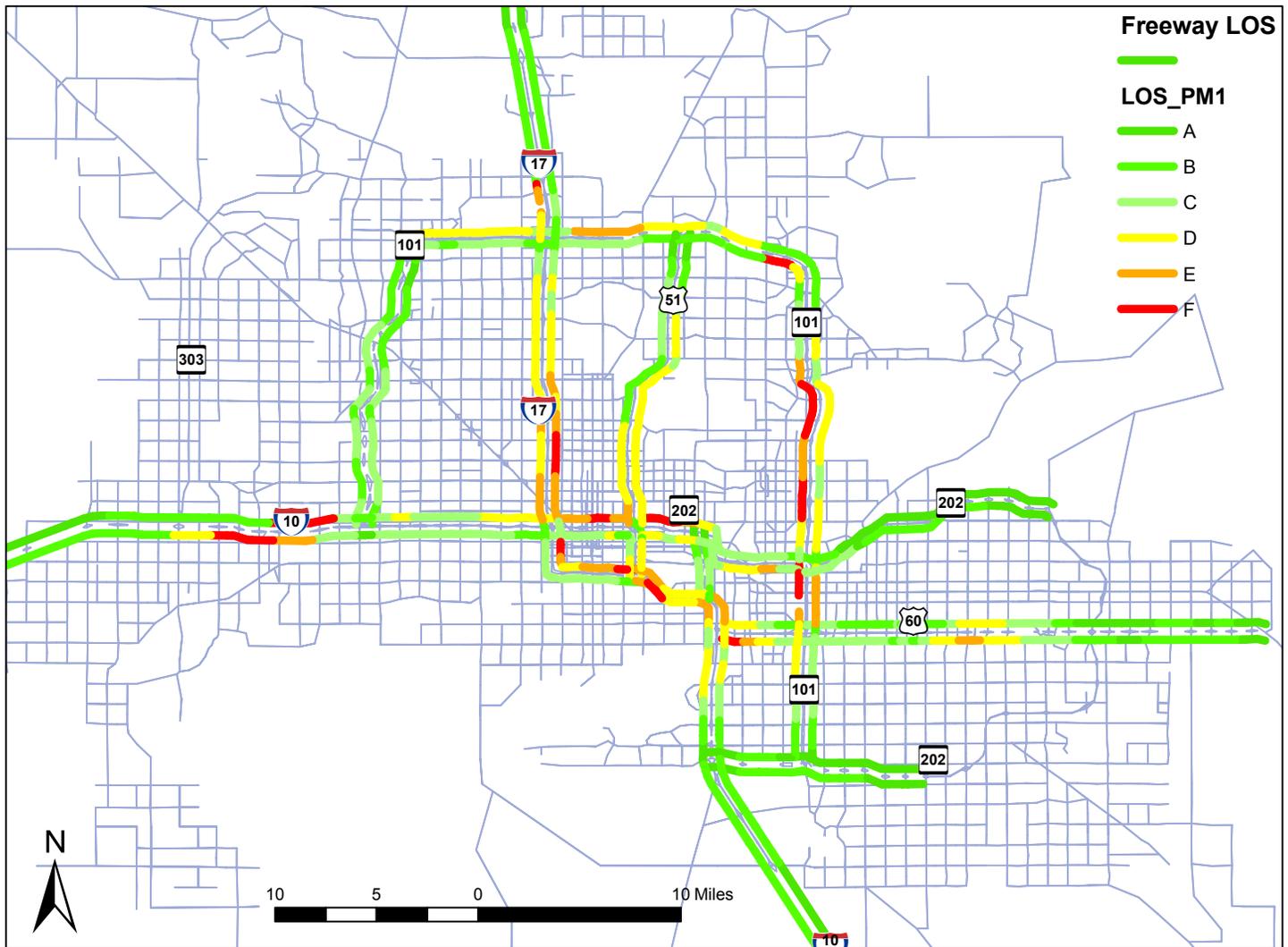
MAG Regional Freeway Level-of-Service Morning (5:30 - 9:30 a.m.)



Legend

- Congested flow (Estimated average speed 30-50 mph)
- Congested flow (Estimated average speed < 30 mph)

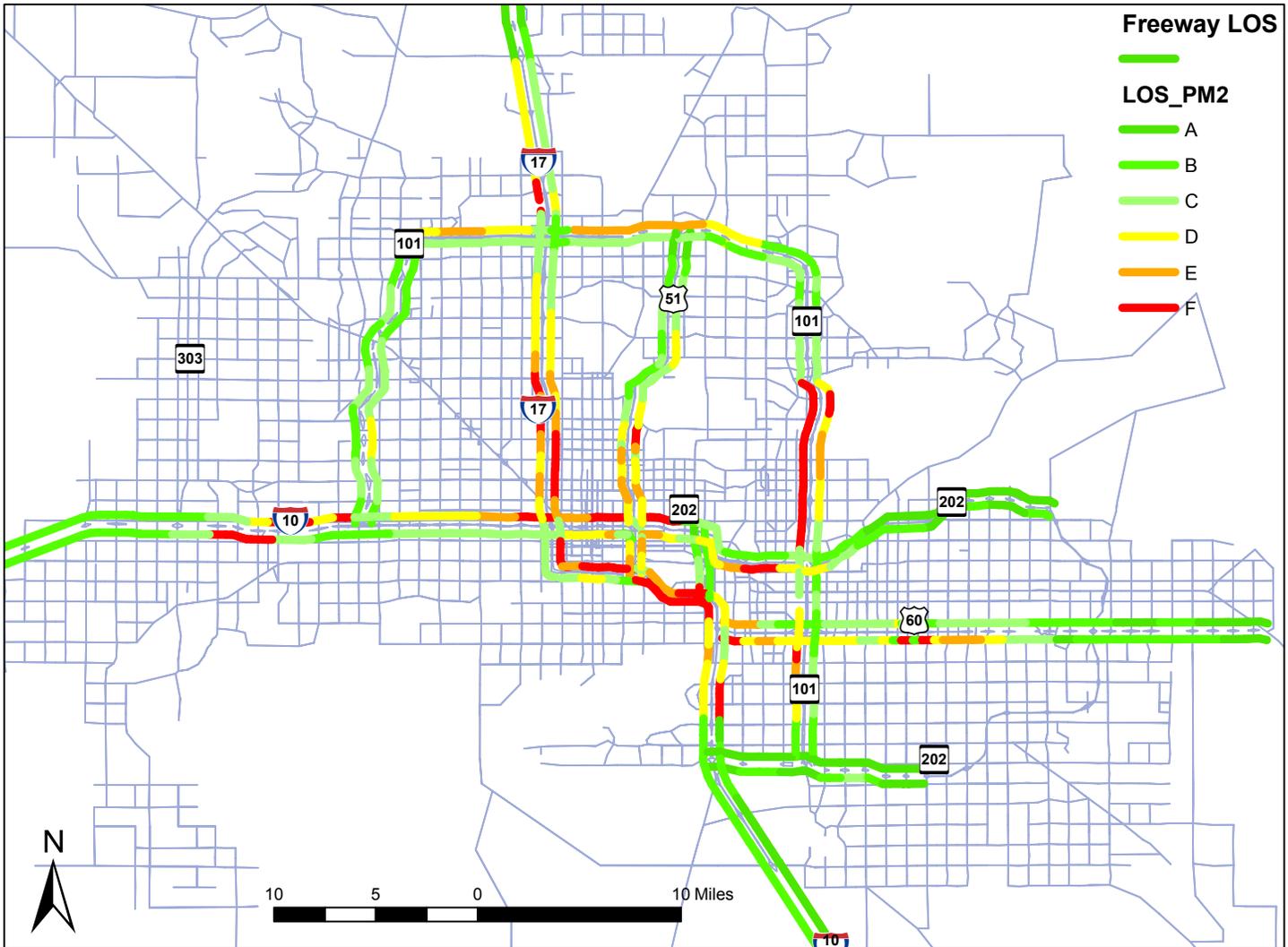
MAG Regional Freeway Level-of-Service Evening (3:00 - 3:30 p.m.)



Legend

- Congested flow (Estimated average speed 30-50 mph)
- Congested flow (Estimated average speed < 30 mph)

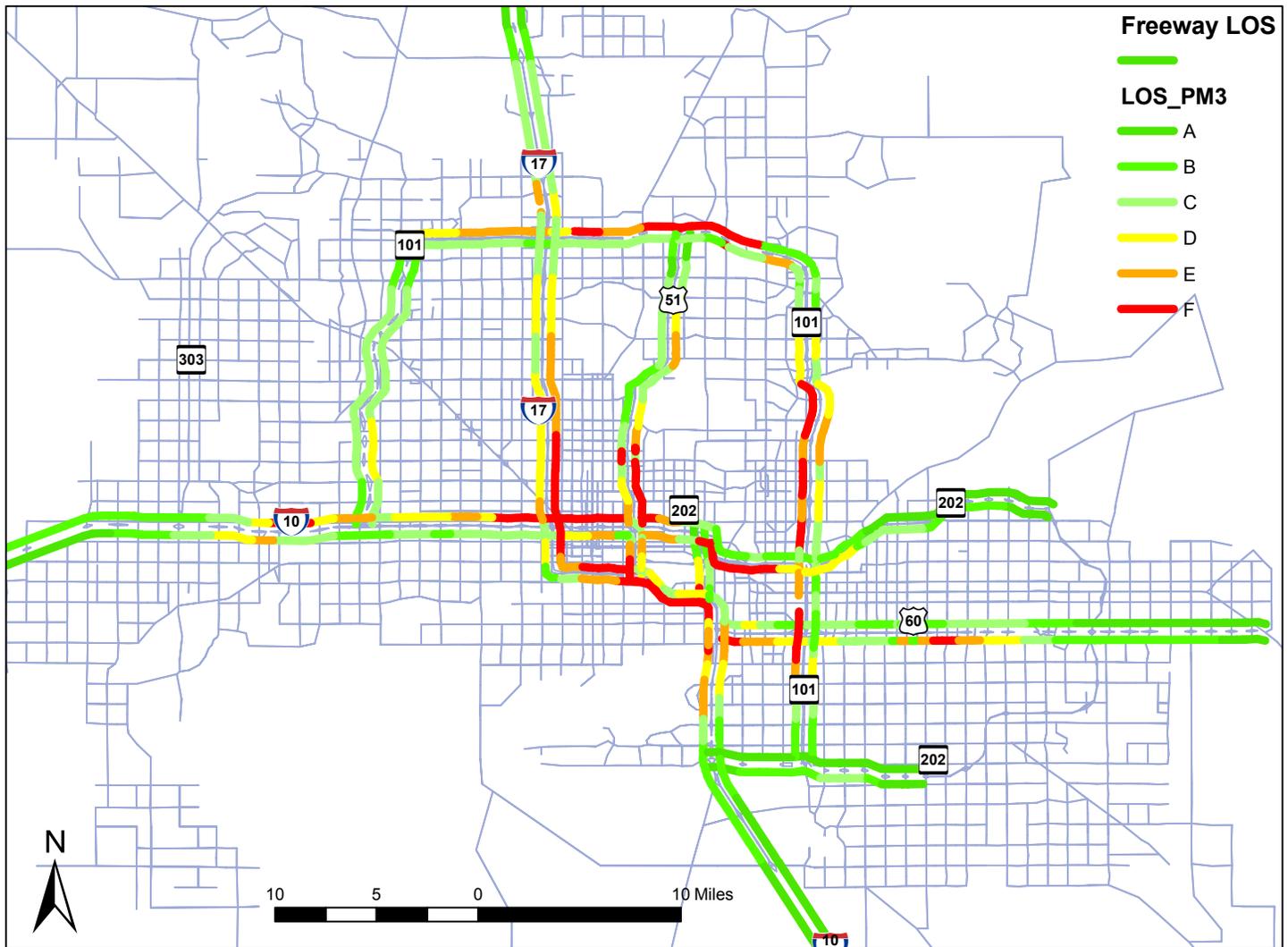
MAG Regional Freeway Level-of-Service Evening (3:30 - 4:00 p.m.)



Legend

- Congested flow (Estimated average speed 30-50 mph)
- Congested flow (Estimated average speed < 30 mph)

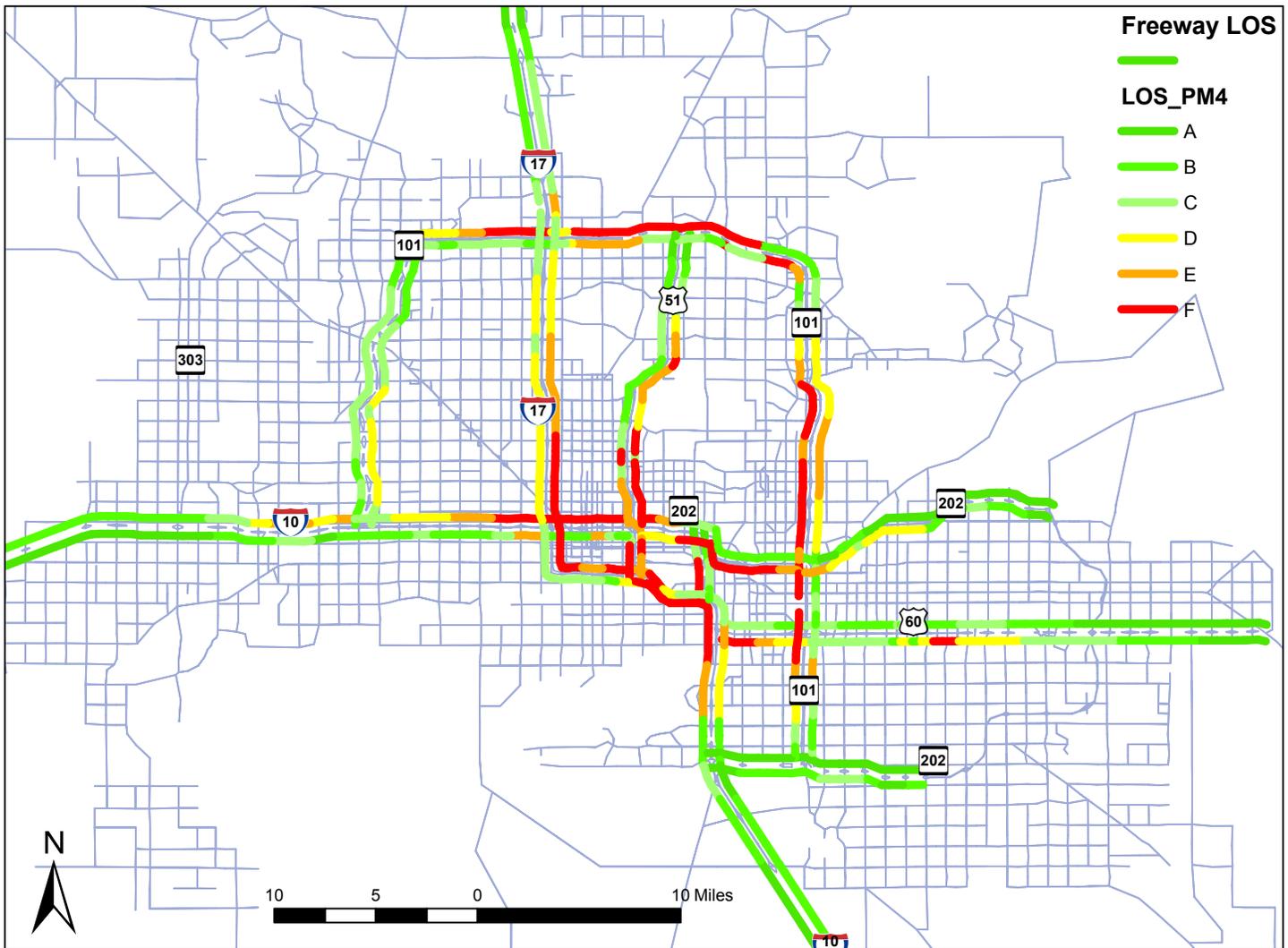
MAG Regional Freeway Level-of-Service Evening (4:00 - 5:00 p.m.)



Legend

- Congested flow (Estimated average speed 30-50 mph)
- Congested flow (Estimated average speed < 30 mph)

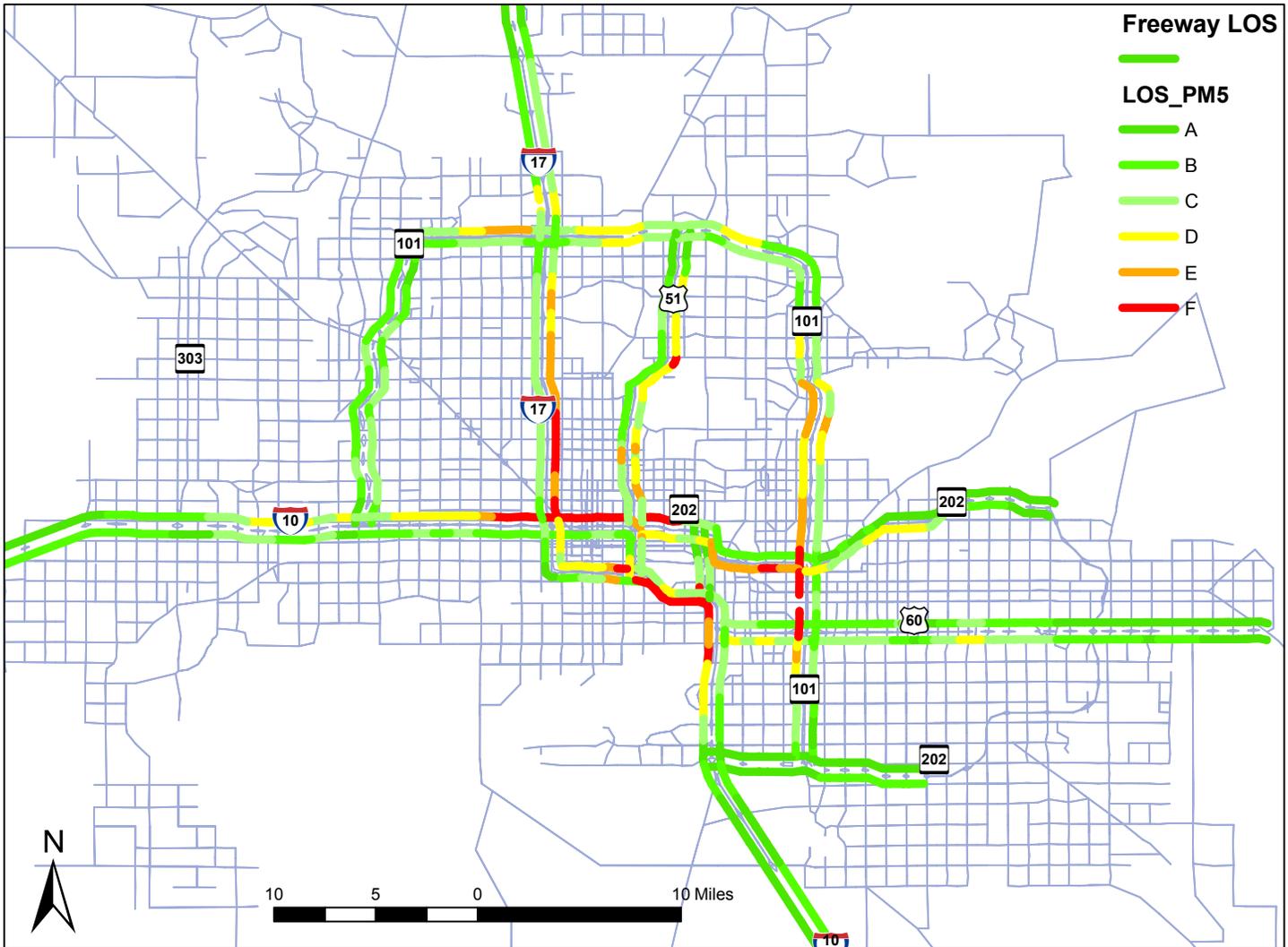
MAG Regional Freeway Level-of-Service Evening (5:00 - 6:00 p.m.)



Legend

- Congested flow (Estimated average speed 30-50 mph)
- Congested flow (Estimated average speed < 30 mph)

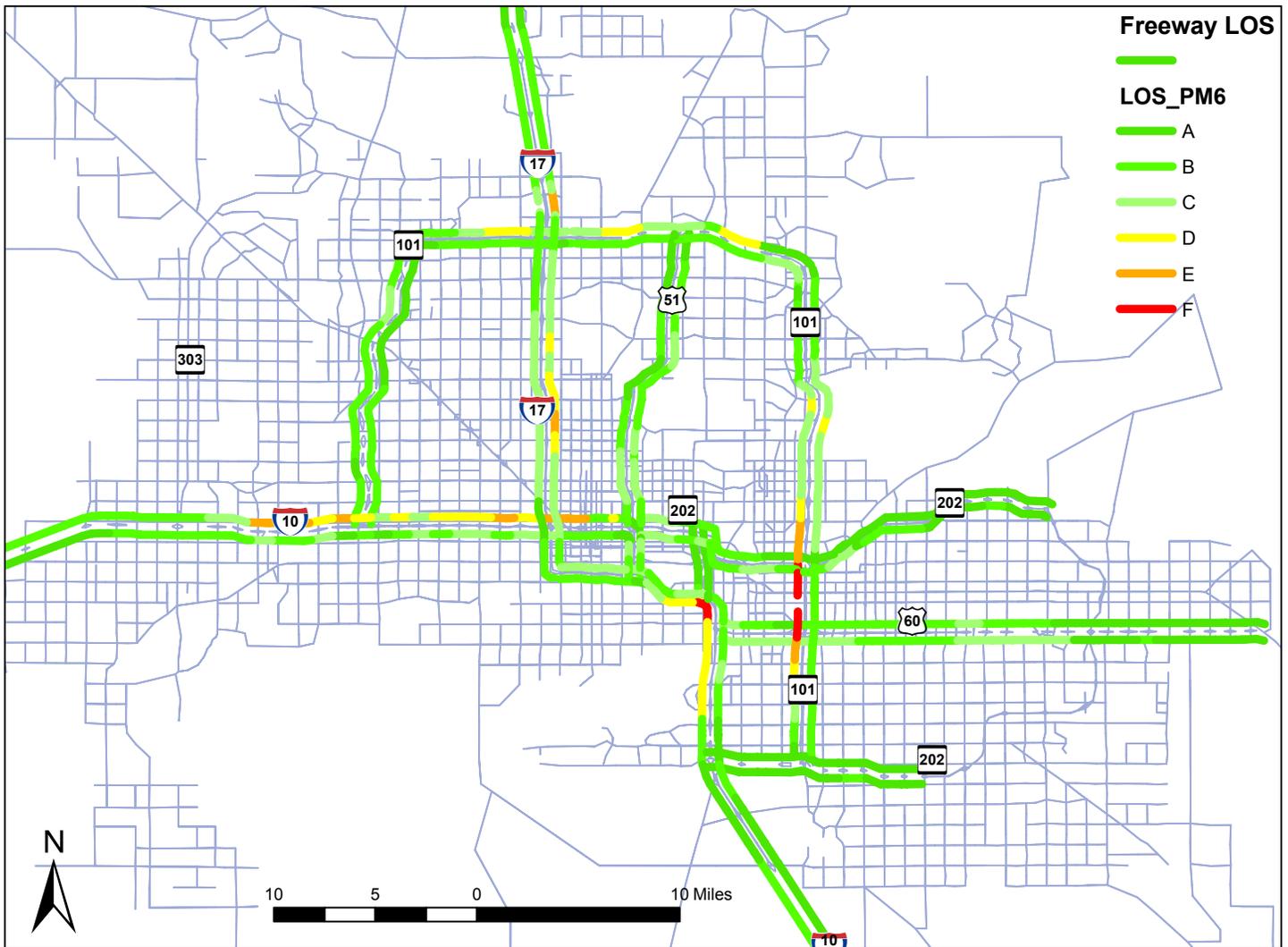
MAG Regional Freeway Level-of-Service Evening (6:00 - 6:30 p.m.)



Legend

- Congested flow (Estimated average speed 30-50 mph)
- Congested flow (Estimated average speed < 30 mph)

MAG Regional Freeway Level-of-Service Evening (6:30 - 7:00 p.m.)



Legend

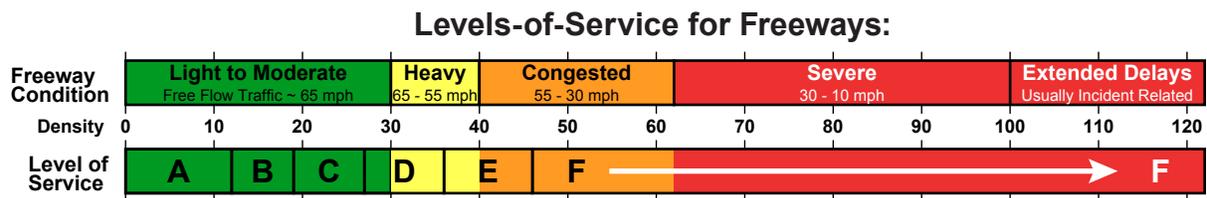
- Congested flow (Estimated average speed 30-50 mph)
- Congested flow (Estimated average speed < 30 mph)

Part Two

Morning - Spring 2006

This section of the report presents findings from the spring 2006 morning survey flights. Each freeway is presented in a set of opposing maps. The maps with the performance rating tables on the right contain average density-based level-of-service ratings, minus the effects of any known or suspected incidents (actual density values are provided for all LOS "F" ratings). Example: F(60).

Performance-Rating Tables



Level-of-Service data for some highway segments represent the mathematical average of densities that varied widely; these data have been tagged with a superscript in the LOS tables. Four types of "nested" congestion that contribute to the variability have been identified as follows:

- Type 1 - Congestion present on some days, but not others.
- Type 2 - Congestion more severe in left or right-hand lanes.
- Type 3 - Congestion present only in the first or second half-hour (hourly averages).
- Type 4 - The length of the congested zone within the segment varies.

Example:

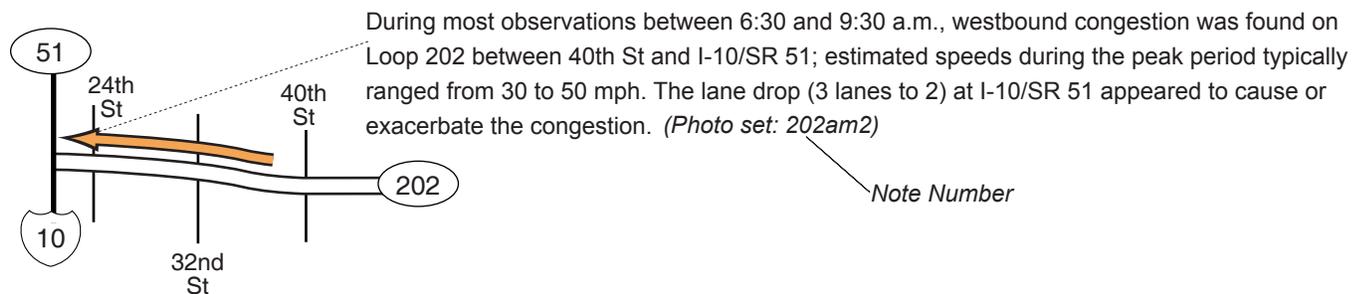


A scale accompanies each rating table in this section of the report.



Freeway Congestion Maps

Freeway maps containing congestion arrows and narratives have been placed opposite each performance-rating table, on the left-hand side. The narratives clarify the severity and frequency of all congestion found along each highway segment. Apparent causes of the congestion are also described where evident. Congestion on cross roads are also depicted and discussed.

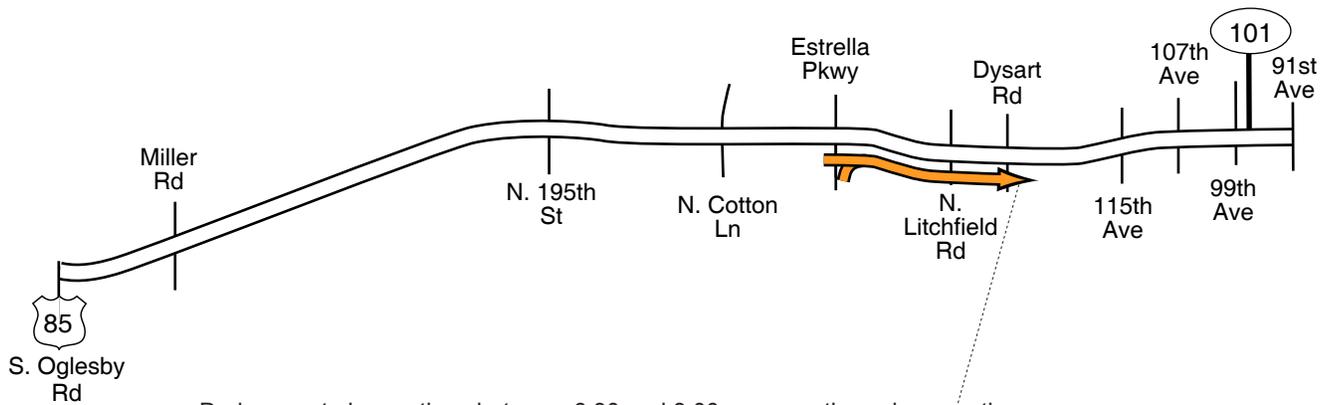


Highlight Photographs

The DVD-ROM included with this report contains highlight photographs for all congested locations (morning and evening). The photographs are assembled in an iView Catalog that allows easy access for viewing. Each of the narratives describing a congested location includes a note number (see example above); to view the corresponding photographs, select the note number in the iView Catalog.

I-10 (OGLESBY RD - 91ST ST)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



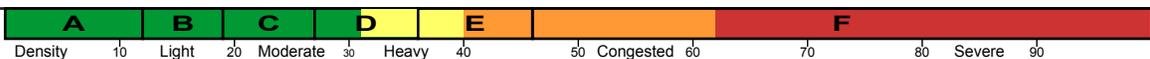
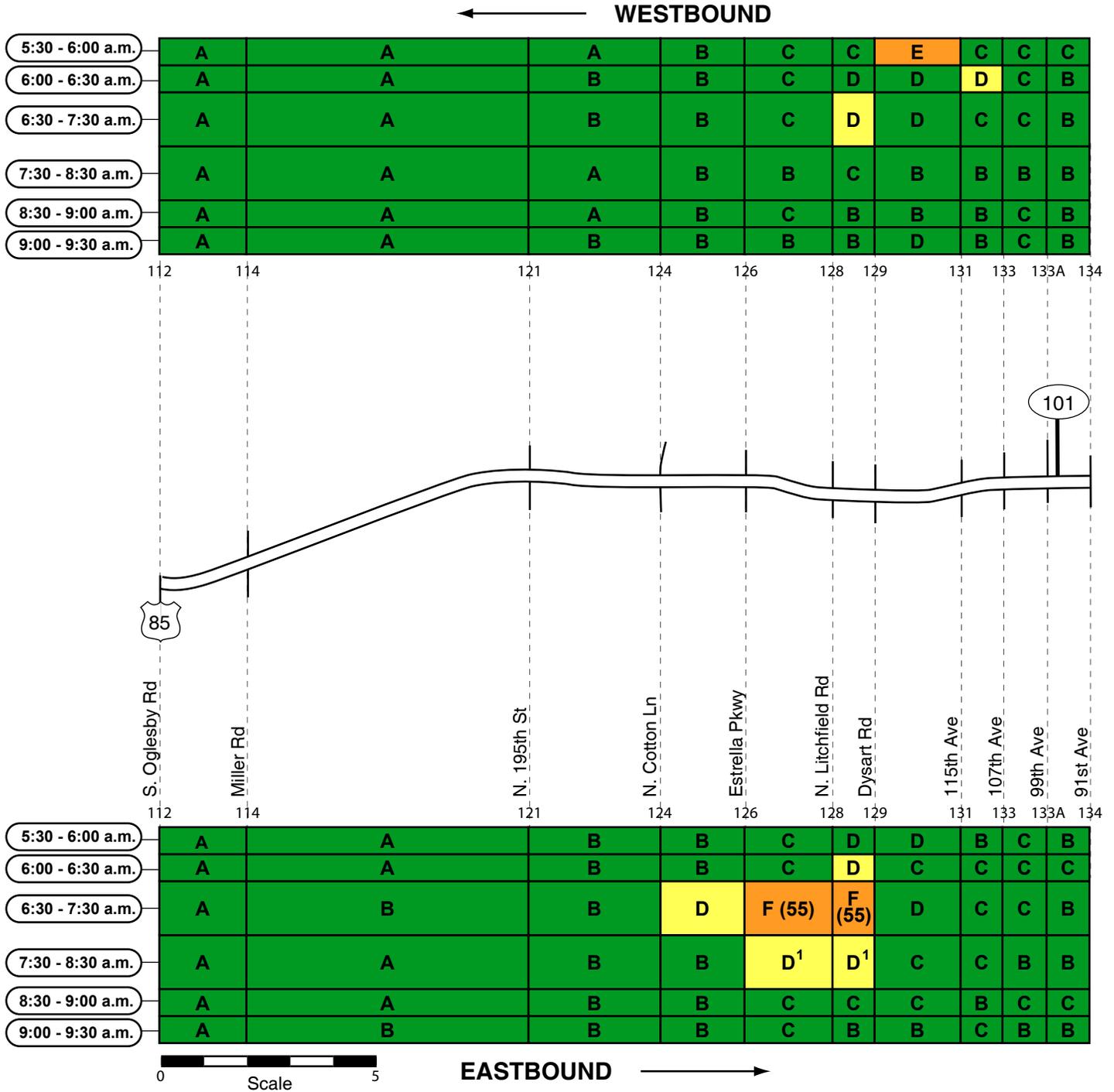
During most observations between 6:30 and 8:00 a.m., eastbound congestion was found on I-10 between Estrella Pkwy and Dysart Rd; when congested, estimated speeds typically ranged from 30 to 50 mph. Traffic merging from the ramps at Estrella Pkwy and Litchfield Rd appeared to exacerbate the congestion. Vehicles typically resumed free flow speeds east of Dysart Rd where the roadway widens from two to three lanes. (Photo set: 10am4)

Legend

- | | | | |
|--|--|--|----------------------------|
| | Congested flow (Estimated average speed 30-50 mph) | | Signal Queue - Cross Road |
| | Congested flow (Estimated average speed < 30 mph) | | Entrance / Exit Ramp Queue |

I-10 (OGLESBY RD - 91ST ST)

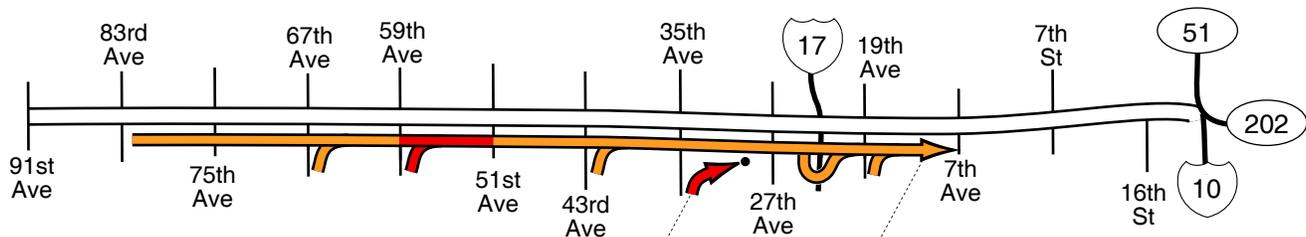
MORNING (5:30 - 9:30 A.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-10 (91ST AVE - SR 51)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



Intermittently, congestion was found on the eastbound entrance ramp at 35th Ave; when congested, queue populations at the ramp meter ranged from approximately 25 to 50 vehicles (2 lanes).
 (Photo set: 10am6)

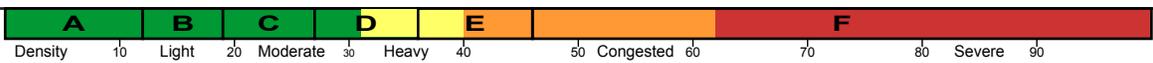
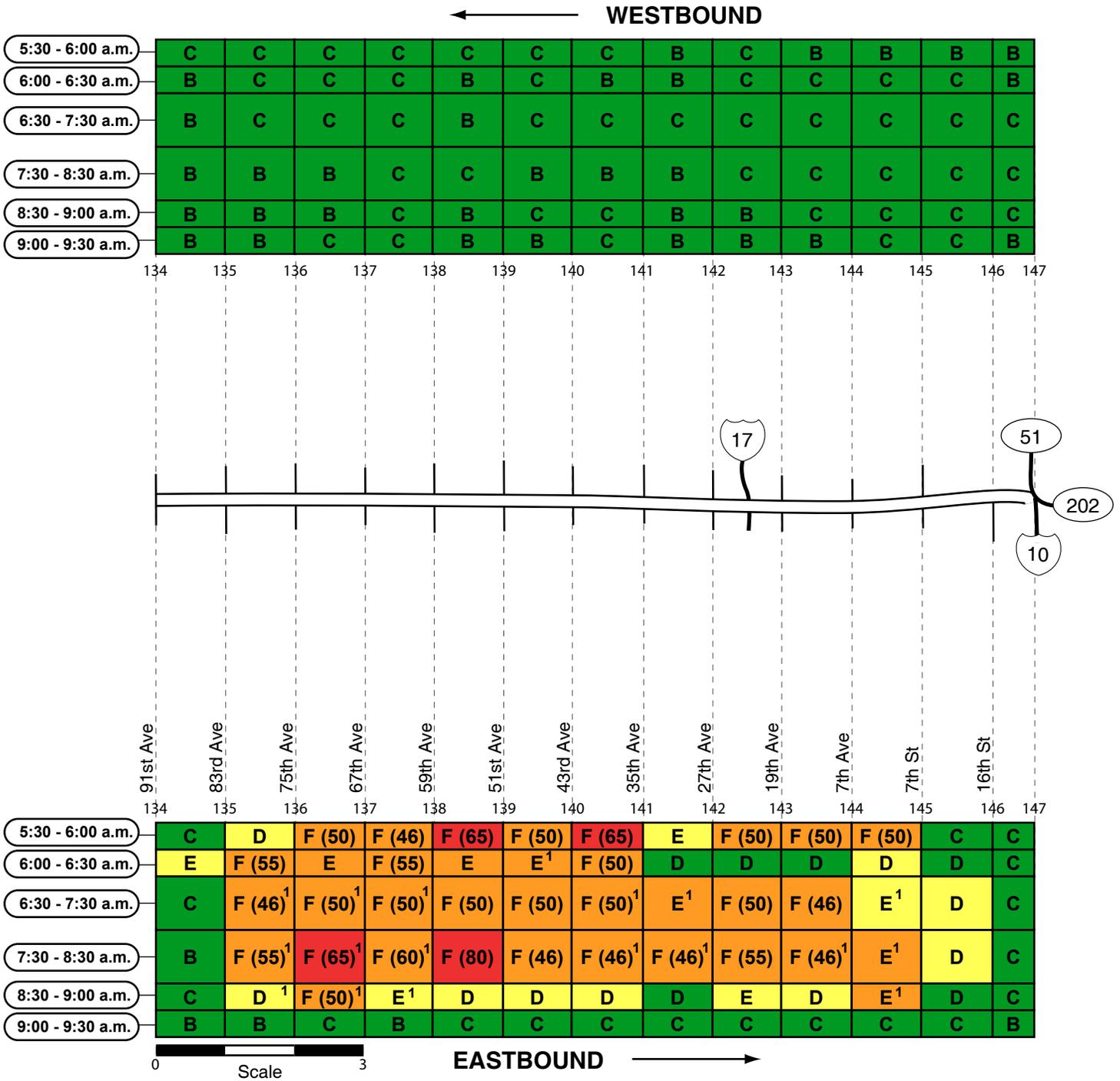
During most observations between 5:30 and 9:00 a.m., eastbound congestion was found on I-10 between 83rd Ave and 7th Ave; the extent and severity of congestion varied day to day, with estimated speeds ranging widely from 15 to 50 mph. Factors that appeared to contribute to the congestion included: 1) traffic merging into the mainline from the ramps at 67th Ave, 59th Ave, 43rd Ave, I-17 and 19th Ave; 2) the lane drop (5 lanes to 3) at I-17. (Photo set: 10am5)

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

I-10 (91ST AVE - SR 51)

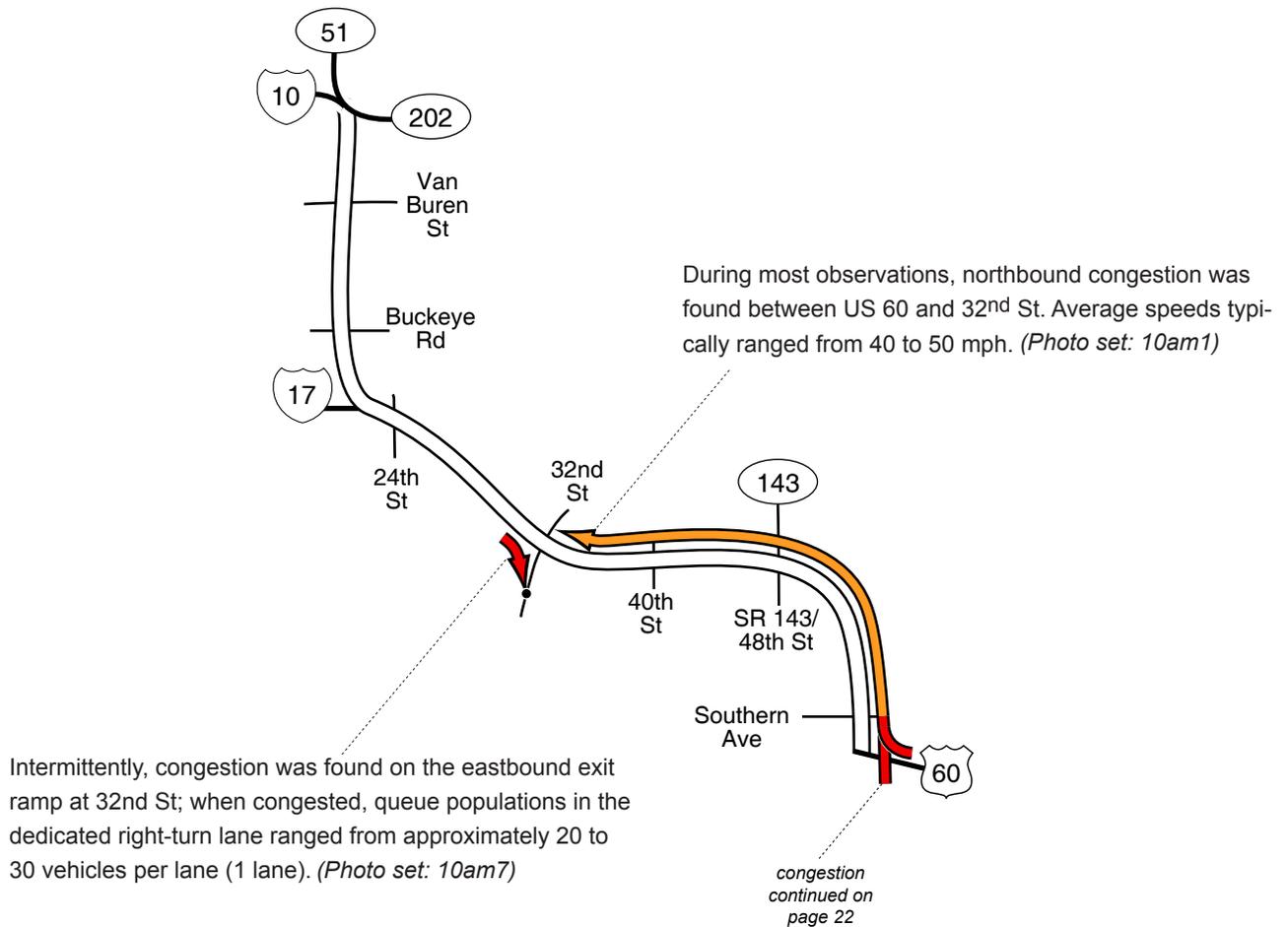
MORNING (5:30 - 9:30 A.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-10 (SR 51 - US 60)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

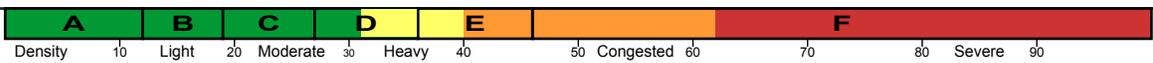
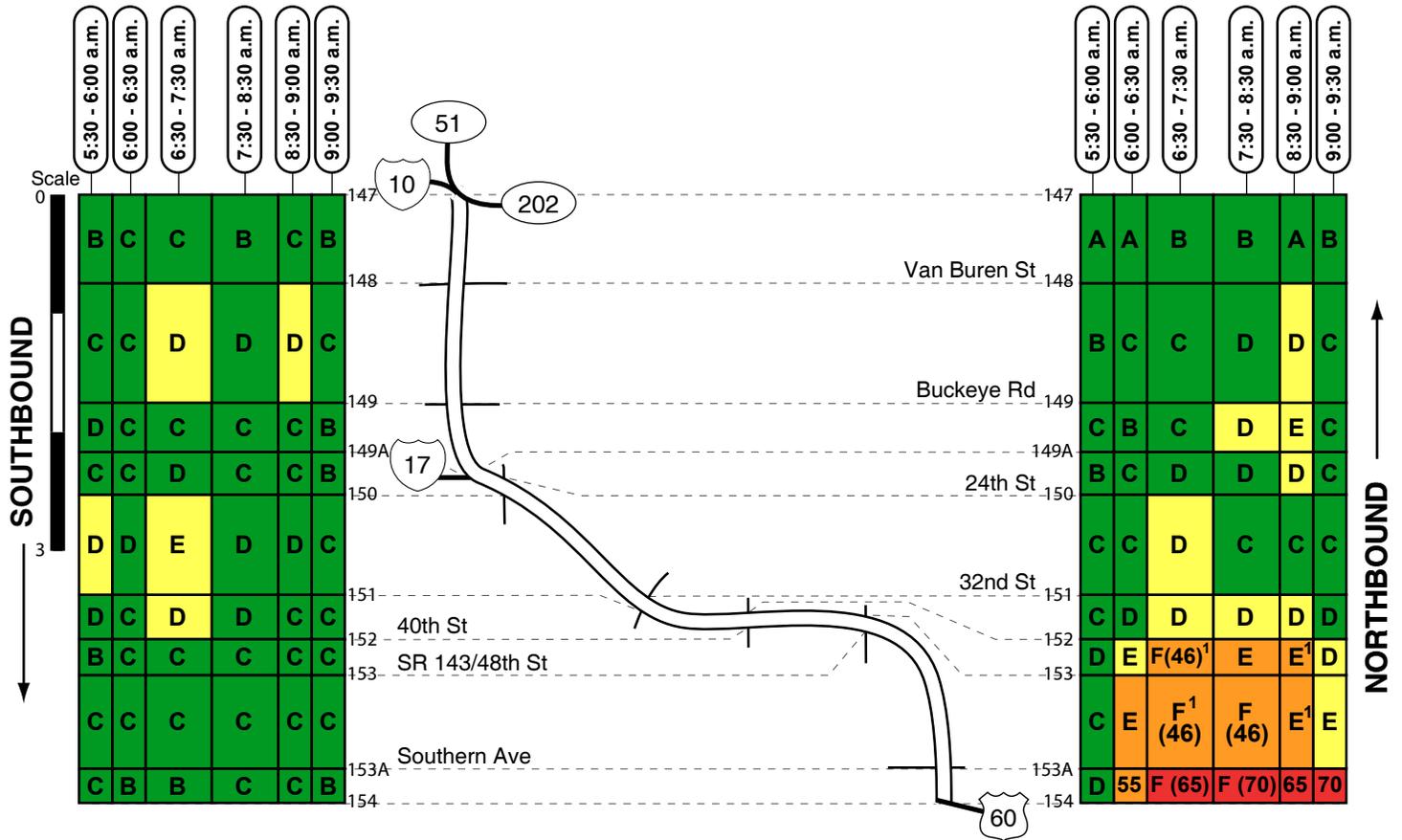


Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

I-10 (SR 51 - US 60)

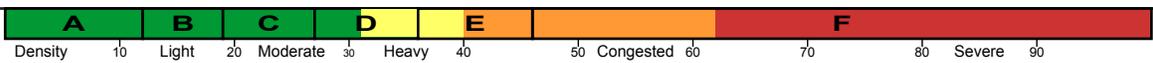
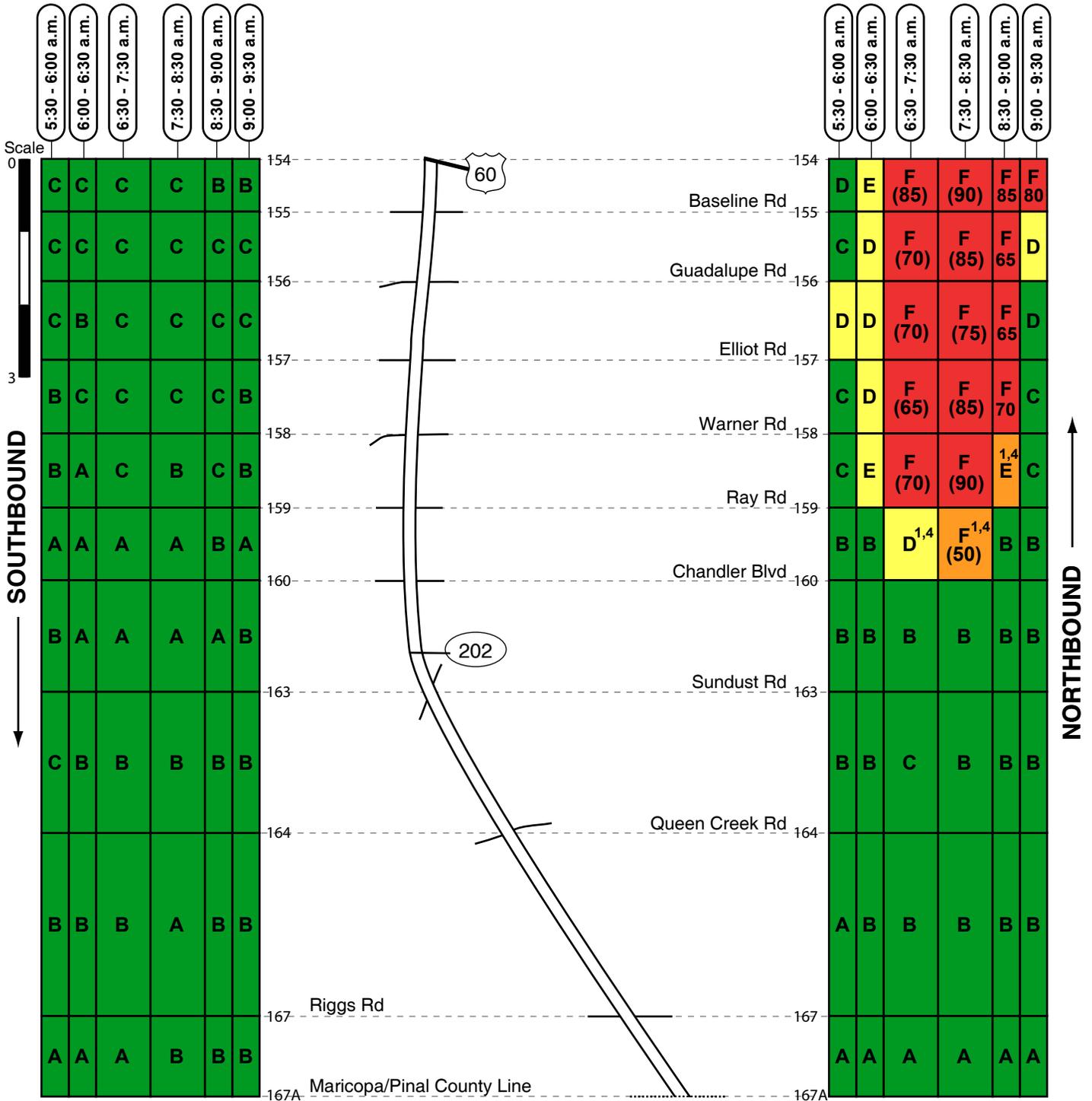
MORNING (5:30 - 9:30 A.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-10 (US 60 - MARICOPA/PINAL CO. LINE)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

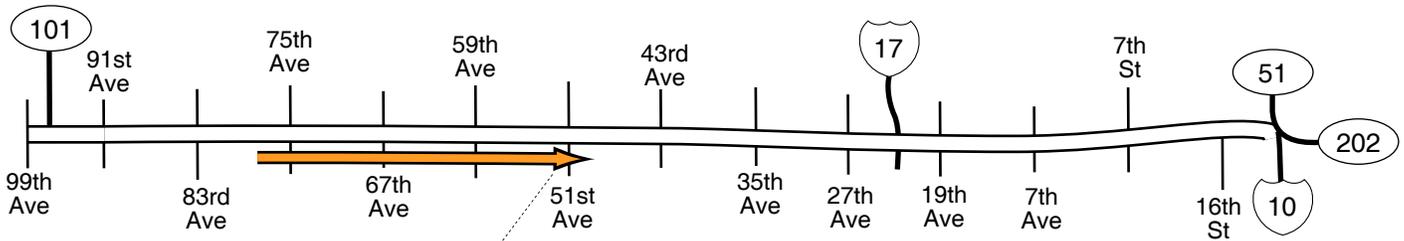


Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-10 HOV (99TH AVE - SR 51)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

[HOV ENFORCEMENT 6:00 - 9:00 A.M.]



During most observations between 6:00 and 8:00 a.m., eastbound congestion was found in the HOV lane on I-10 between 83rd Ave and 51st Ave; congestion may have been caused or exacerbated by high HOV2+ demand. (Photo set: 10hovam1)

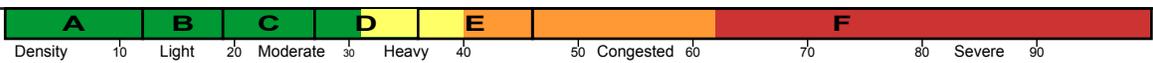
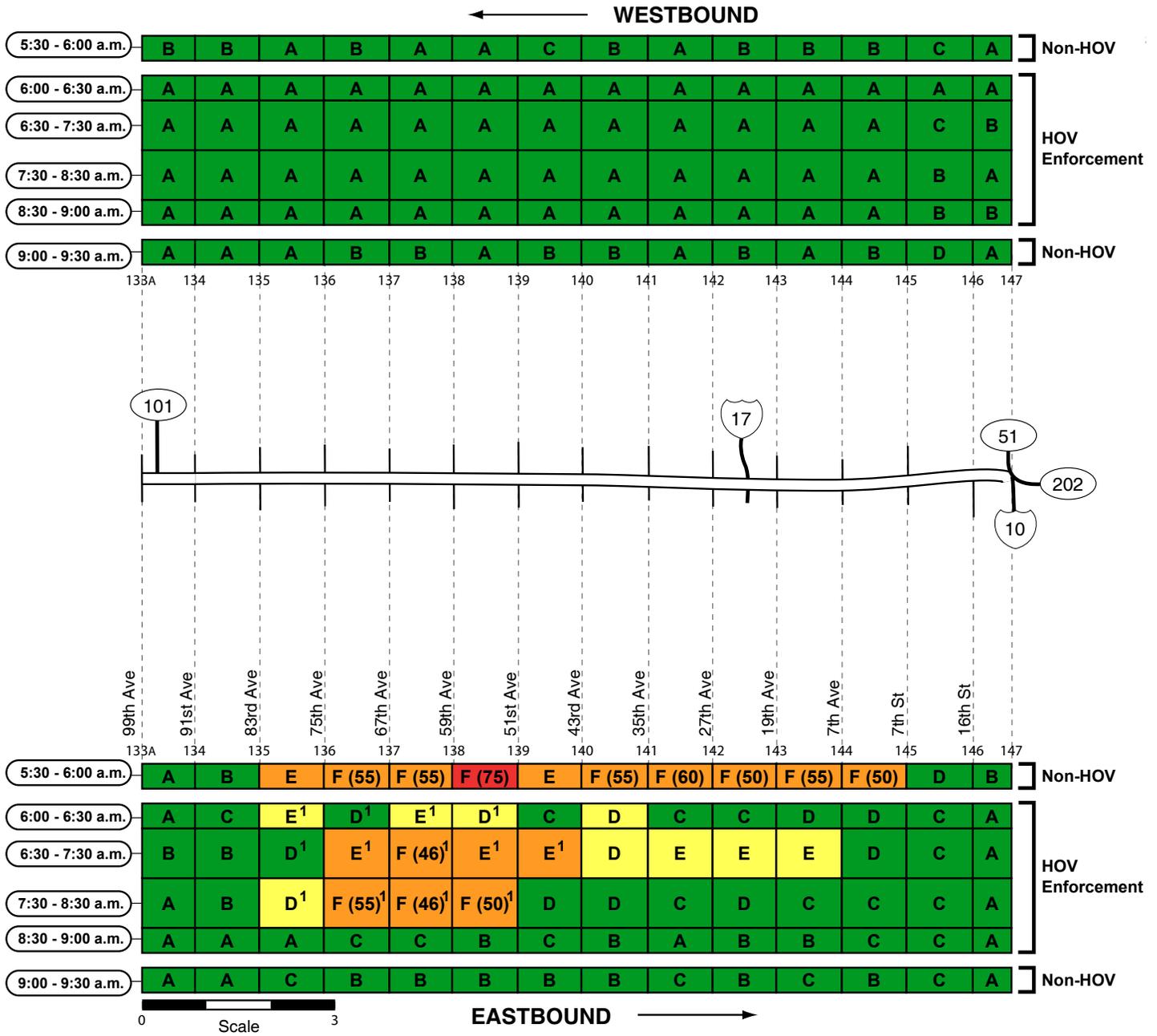
Legend

- | | | | |
|--|--|--|----------------------------|
| | Congested flow (Estimated average speed 30-50 mph) | | Signal Queue - Cross Road |
| | Congested flow (Estimated average speed < 30 mph) | | Entrance / Exit Ramp Queue |

I-10 HOV (99TH AVE - SR 51)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

[HOV ENFORCEMENT 6:00 - 9:00 A.M.]

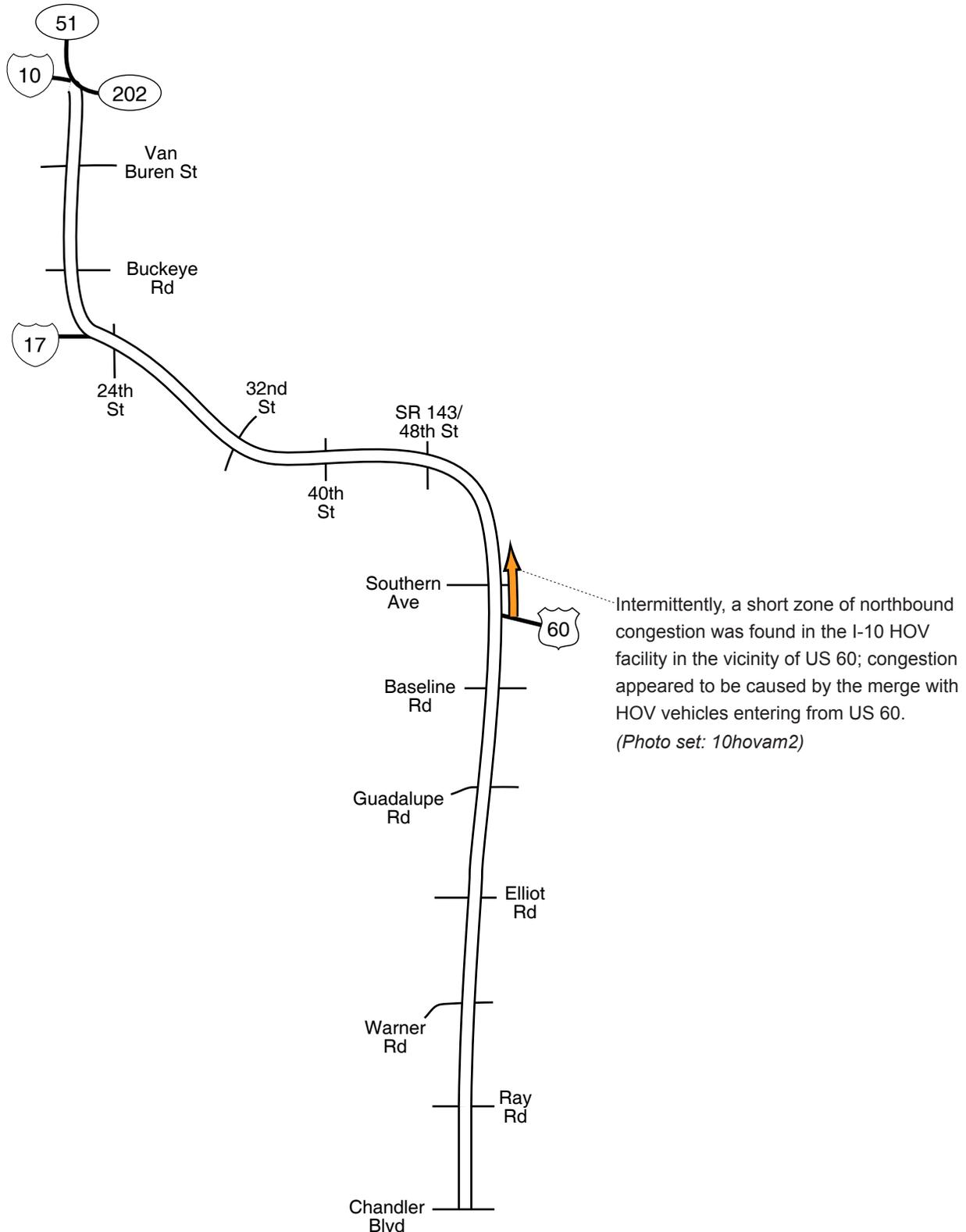


Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-10 HOV (SR 51 - CHANDLER BLVD)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

[HOV ENFORCEMENT 6:00 - 9:00 A.M.]



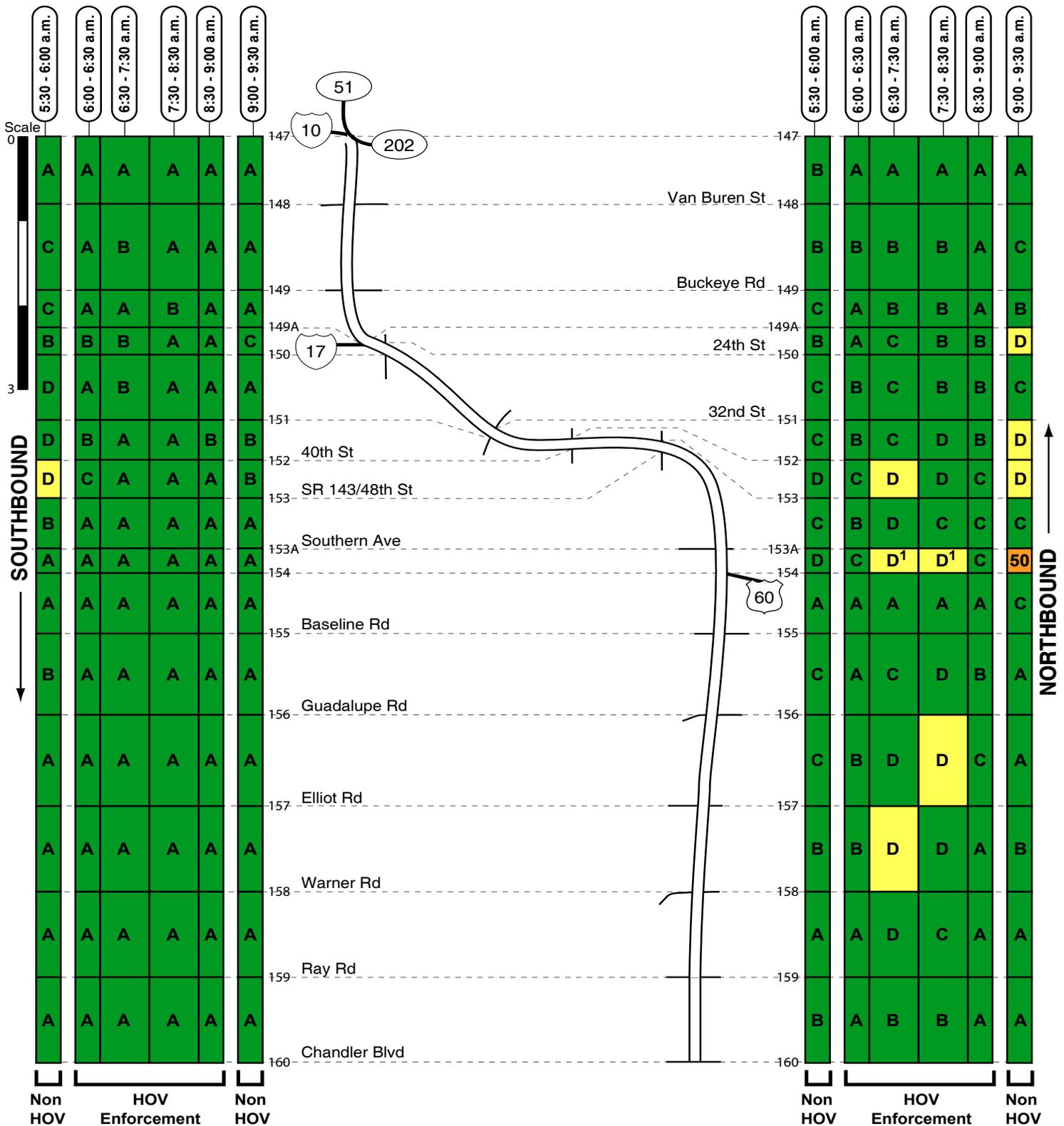
Legend

- | | | | |
|--|--|--|----------------------------|
| | Congested flow (Estimated average speed 30-50 mph) | | Signal Queue - Cross Road |
| | Congested flow (Estimated average speed < 30 mph) | | Entrance / Exit Ramp Queue |

I-10 HOV (SR 51 - CHANDLER BLVD)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

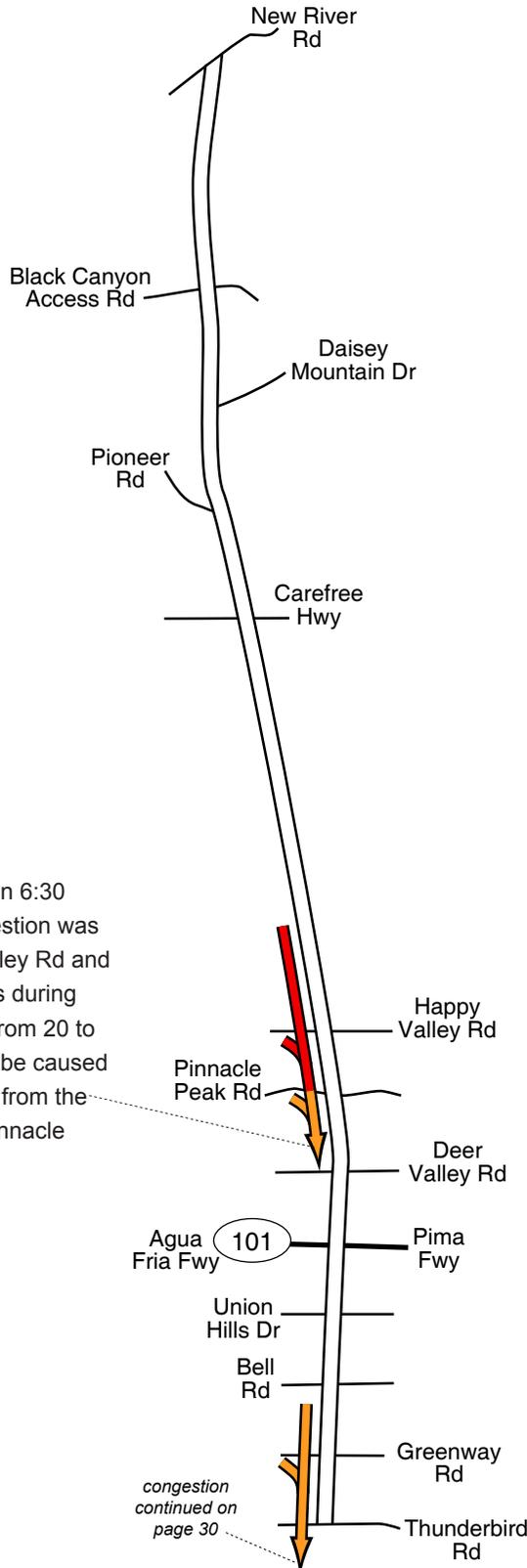
[HOV ENFORCEMENT 6:00 - 9:00 A.M.]



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-17 (NEW RIVER RD - THUNDERBIRD RD)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



During most observations between 6:30 and 9:30 a.m., southbound congestion was found on I-17 between Happy Valley Rd and Deer Valley Rd; estimated speeds during the peak period typically ranged from 20 to 40 mph. Congestion appeared to be caused or exacerbated by traffic merging from the ramps at Happy Valley Rd and Pinnacle Peak Rd. (Photo set: 17am1)

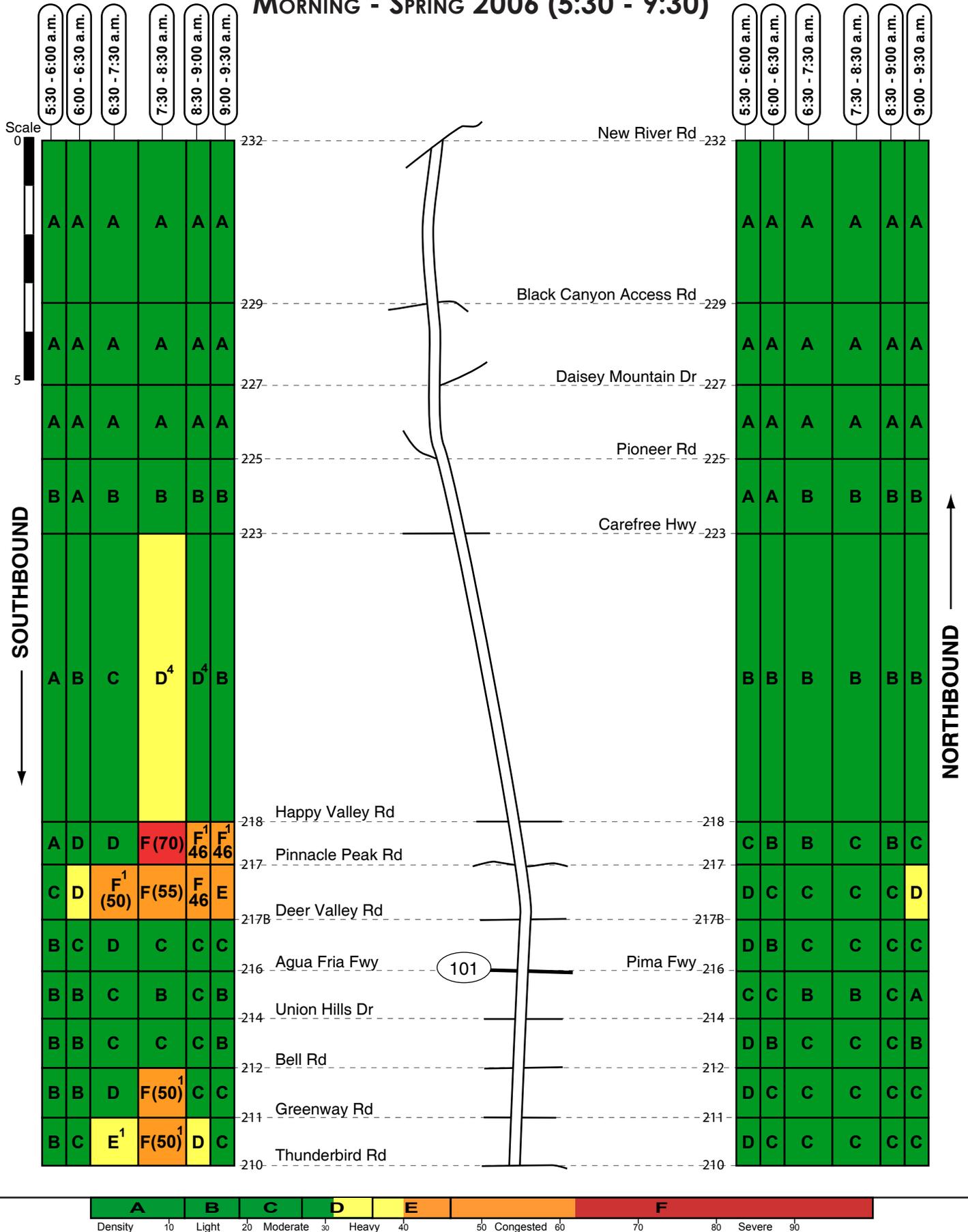
congestion continued on page 30

Legend

	Congested flow (Estimated average speed 30-50 mph)		Congested flow (Estimated average speed < 30 mph)
	Congested flow (Estimated average speed < 30 mph)		Signal Queue - Cross Road
			Entrance / Exit Ramp Queue

I-17 (NEW RIVER RD - THUNDERBIRD RD)

MORNING - SPRING 2006 (5:30 - 9:30)



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-17 (THUNDERBIRD RD - I-10)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

Intermittently, eastbound congestion was found on Thunderbird Rd approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 30 vehicles per lane (two left-turn lanes). (Photo set: 17am5)

Intermittently, eastbound congestion was found on Peoria Ave approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 30 vehicles per lane (three thru-lanes). (Photo set: 17am6)

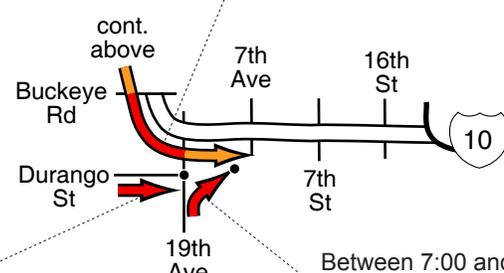
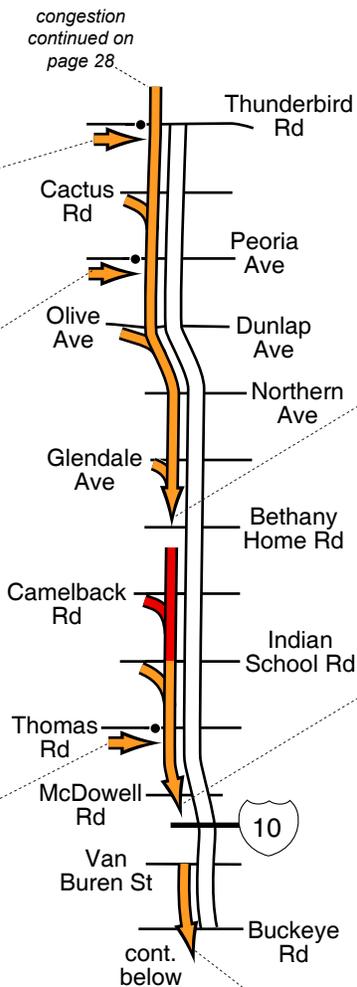
Intermittently, eastbound congestion was found on Thomas Rd approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 30 vehicles per lane (two thru-lanes). (Photo set: 17am7)

During most observations between 5:30 and 7:00 a.m., southeast-bound congestion was found on I-17 between Van Buren St and 7th Ave; estimated speeds during the peak period typically ranged from 30 to 50 mph. Potential factors contributing to the congestion included: 1) traffic merging from the ramp at 19th Ave; 2) roadway geometrics (curve); 3) sun glare. (Photo set: 17am4)

Early in the morning survey period, intermittent eastbound congestion was found on Durango St approaching the signal at 19th Ave; when congested, queue populations in the two thru-lanes ranged from approximately 20 to 25 vehicles per lane (2 lanes). (Photo set: 17am8)

During most observations between 6:30 and 9:00 a.m., southbound congestion was found on I-17 between Bell Rd and Bethany Home Rd; estimated speeds during the peak period typically ranged from 30 to 50 mph. Congestion appeared to be caused or exacerbated by traffic merging into the mainline from some of the interchanges along this seven-mile section of I-17. (Photo set: 17am2)

On both mornings surveyed before 6:00 a.m., southbound congestion was found on I-17 between Bethany Home Rd and I-10; average estimated speeds (two-day average) during this time period ranged from 25 to 35 mph. Congestion appeared to be caused or exacerbated by traffic merging from the ramps at Camelback Rd and Indian School Rd. While congestion persisted later in the survey period, congestion found was less severe and intermittent. (Photo set: 17am3)



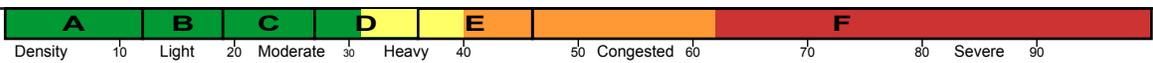
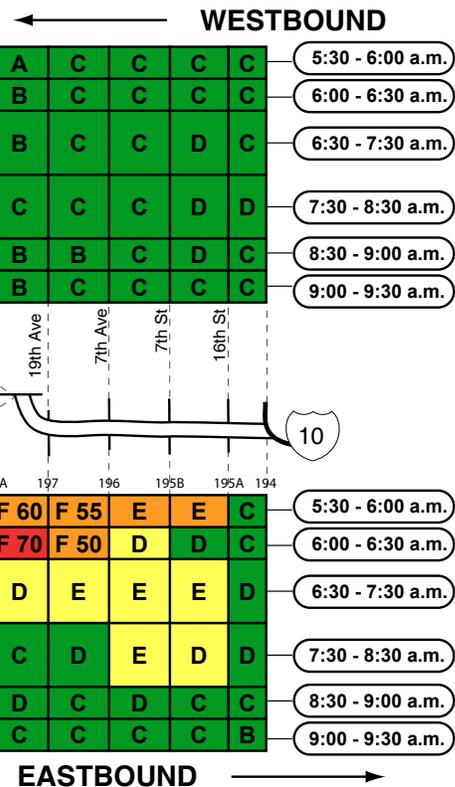
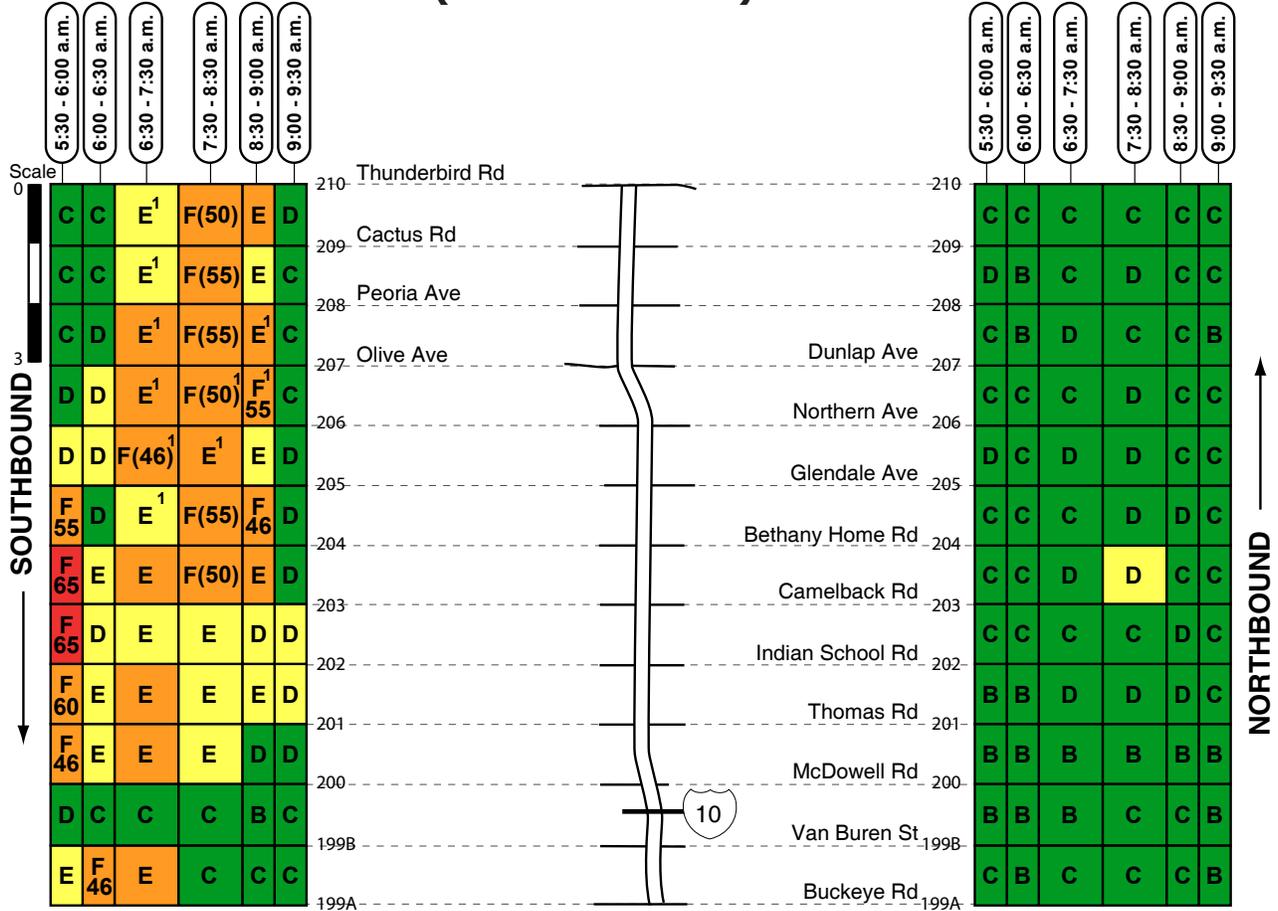
Between 7:00 and 8:00 a.m., intermittent congestion was found on the eastbound entrance ramp at 19th Ave; when congested, queue populations at the ramp meter ranged from approximately 20 to 25 vehicles (1 lane). (Photo set: 17am9)

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

I-17 (THUNDERBIRD RD - I-10)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

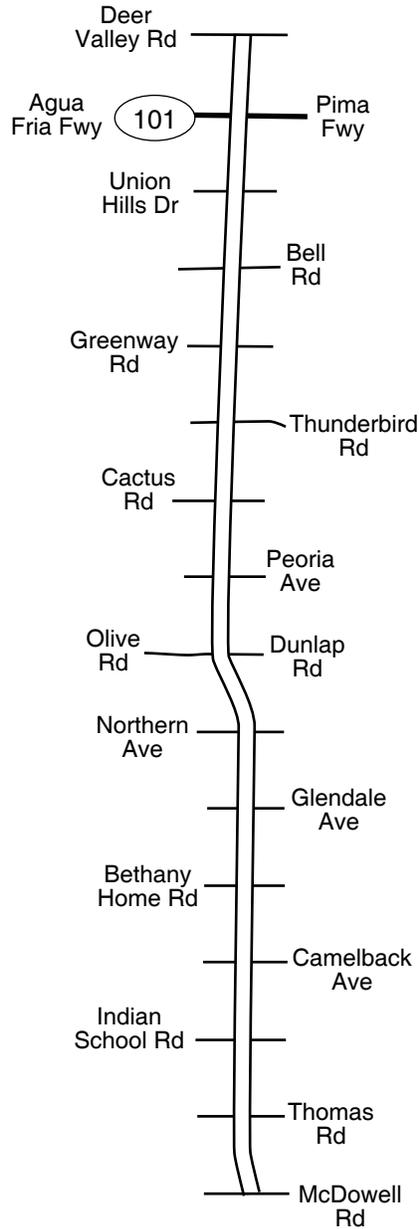


Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-17 HOV

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

[HOV ENFORCEMENT 6:00 - 9:00 A.M.]



No congestion was found on the I-17 HOV facility while HOV2+ was enforced (6:00 - 9:00 a.m).

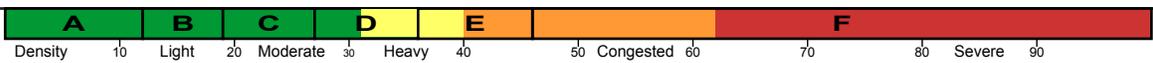
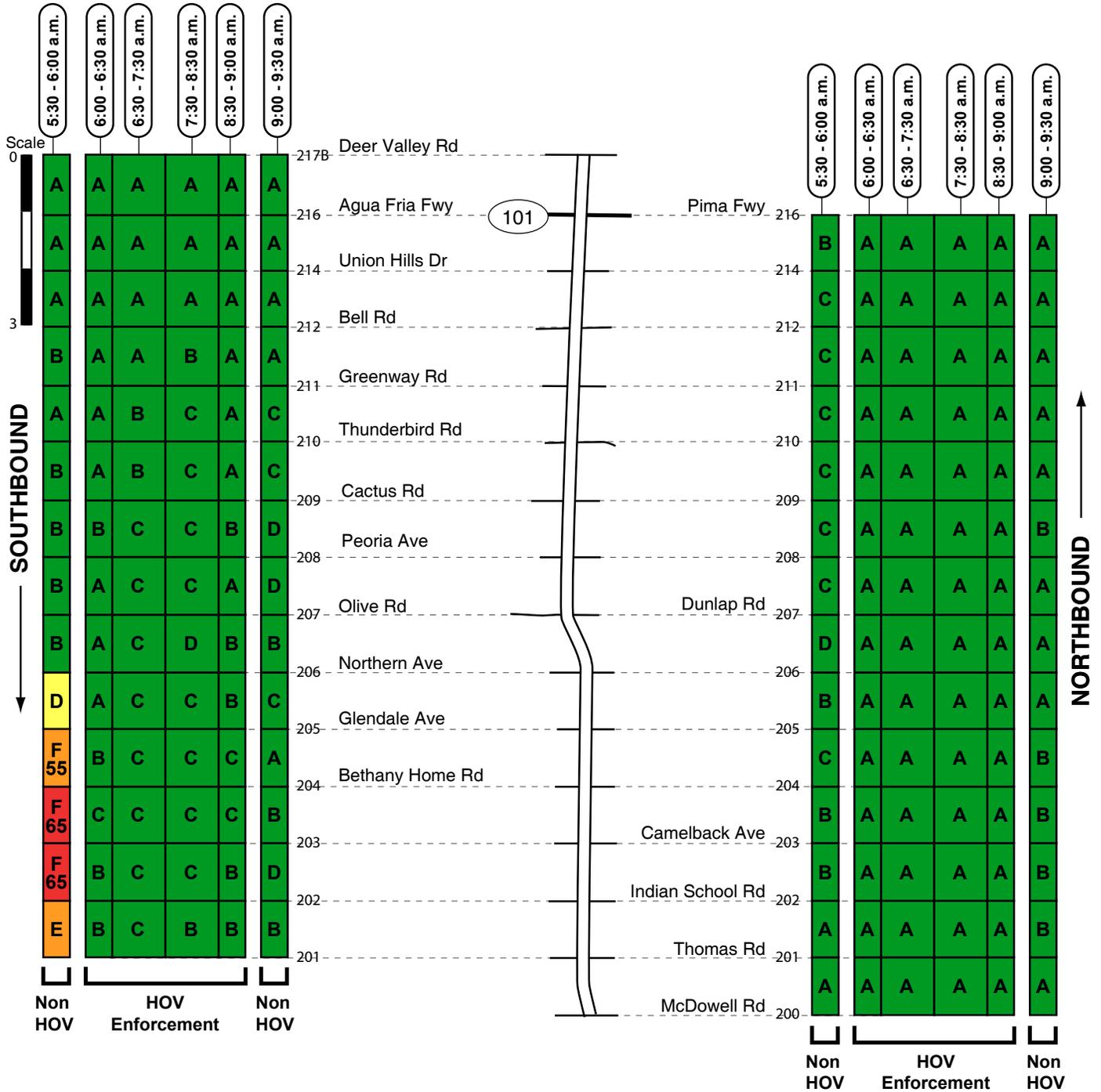
Legend

- | | | | |
|--|--|--|----------------------------|
| | Congested flow (Estimated average speed 30-50 mph) | | Signal Queue - Cross Road |
| | Congested flow (Estimated average speed < 30 mph) | | Entrance / Exit Ramp Queue |

I-17 HOV

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

[HOV ENFORCEMENT 6:00 - 9:00 A.M.]



Nestled Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

SR 51

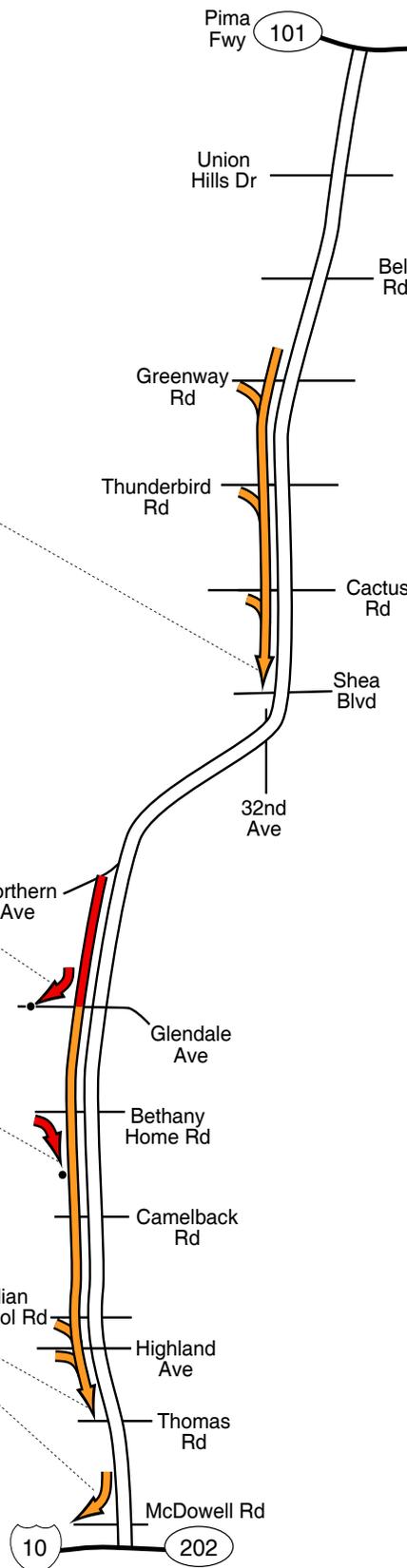
MORNING (5:30 - 9:30 A.M.) - SPRING 2006

During most observations between 6:30 and 8:00 a.m., southbound congestion was found on SR 51 between Greenway Rd and Shea Blvd; estimated speeds during the peak period typically ranged from 30 to 50 mph. Traffic merging from the ramps at Greenway Rd, Thunderbird Rd and Cactus Rd appeared to cause or exacerbate the congestion. *(Photo set: 51am2)*

Between 7:00 and 8:30 a.m., intermittent congestion was found on the southbound exit ramp at Glendale Ave; when congested, queue populations in the left-turn lanes (to eastbound Glendale Ave) at the signal ranged from approximately 40 to 60 vehicles (2 lanes). *(Photo set: 51am4)*

During both observations between 7:30 and 8:00 a.m., congestion was found on the southbound entrance ramp at Bethany Home Rd; the queue populations at the ramp meter ranged from 25 to 35 vehicles per lane (1 lane). *(Photo set: 51am3)*

During most observations between 6:30 and 9:00 a.m., southbound congestion was found on SR 51 between Northern Ave and Thomas Rd; estimated speeds during the peak period typically ranged from 25 to 50 mph. Factors contributing to the congestion included: 1) the lane drop (4 lanes to 3) at Glendale Ave; 2) traffic merging from the ramps at Bethany Home Rd, Highland Ave, and Indian School Rd. Intermittent congestion was also found south of Thomas Rd in the right two lanes approaching the ramps to I-10 / Loop 202. *(Photo set: 51am1)*

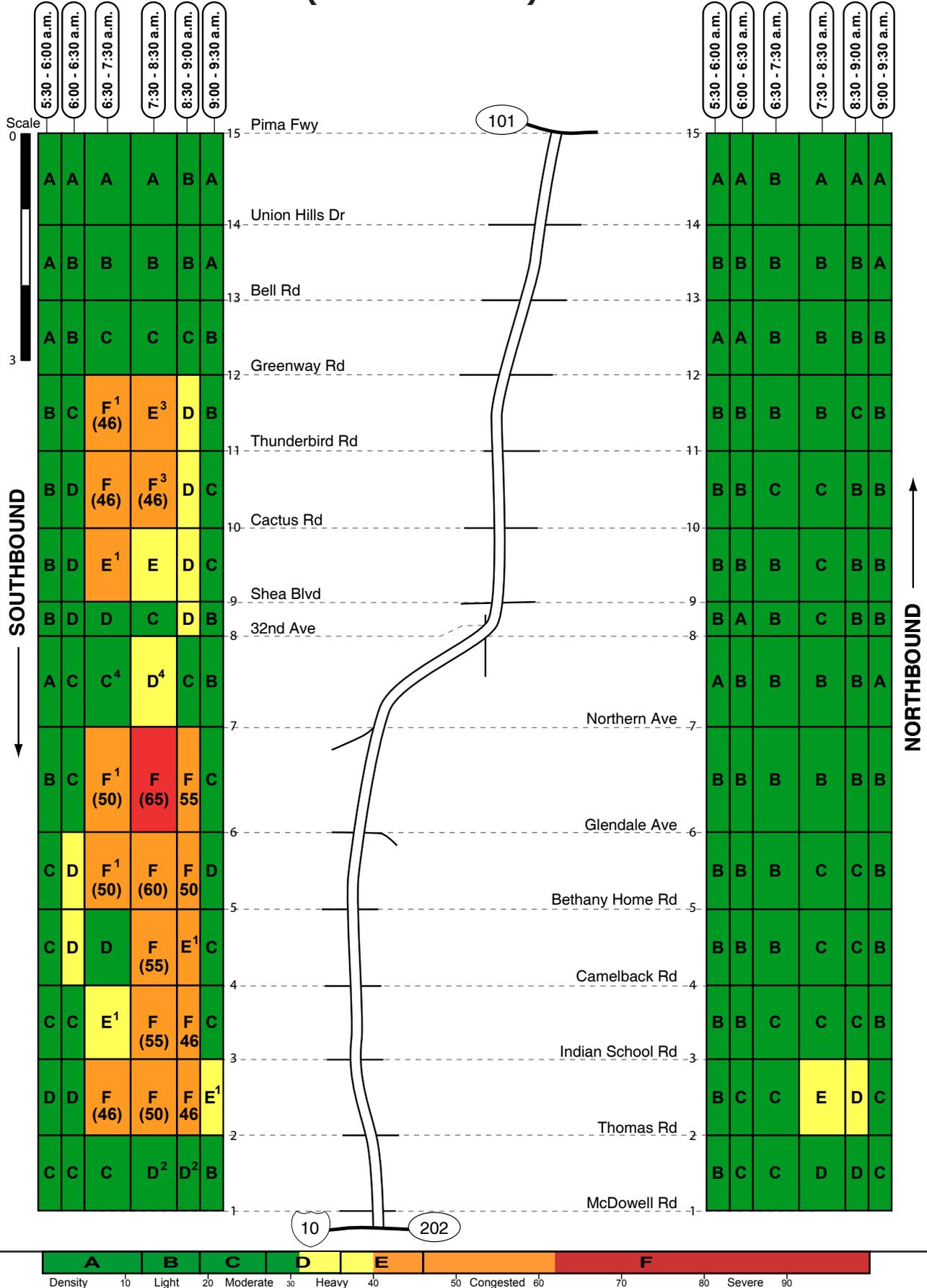


Legend

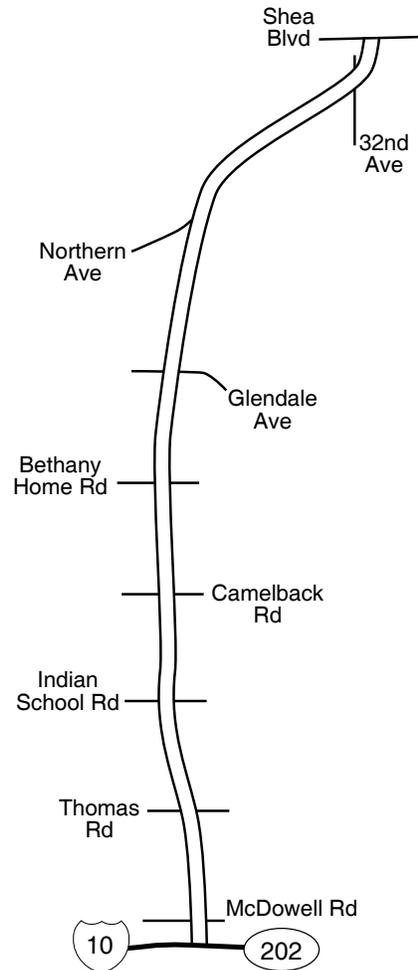
- | | | | |
|--|--|--|----------------------------|
| | Congested flow (Estimated average speed 30-50 mph) | | Signal Queue - Cross Road |
| | Congested flow (Estimated average speed < 30 mph) | | Entrance / Exit Ramp Queue |

SR 51

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

SR 51 HOV**MORNING (5:30 - 9:30 A.M.) - SPRING 2006****[HOV ENFORCEMENT 6:00 - 9:00 A.M.]**

No congestion was found on the SR 51 HOV facility during the morning survey period.

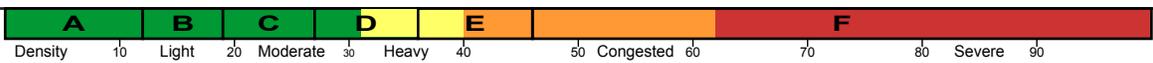
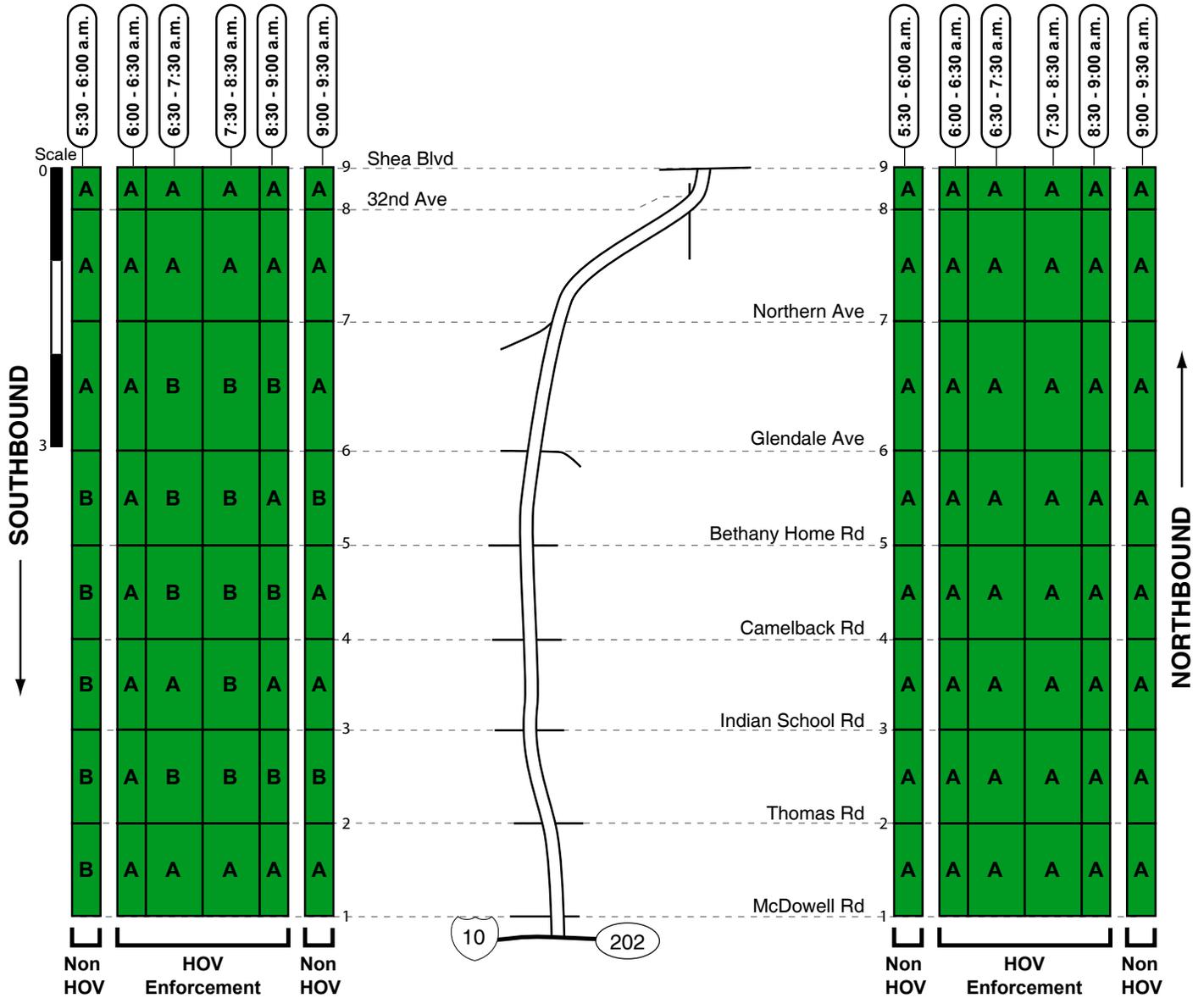
Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

SR 51 HOV

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

[HOV ENFORCEMENT 6:00 - 9:00 A.M.]



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

US 60 (I-10 - GREENFIELD RD)

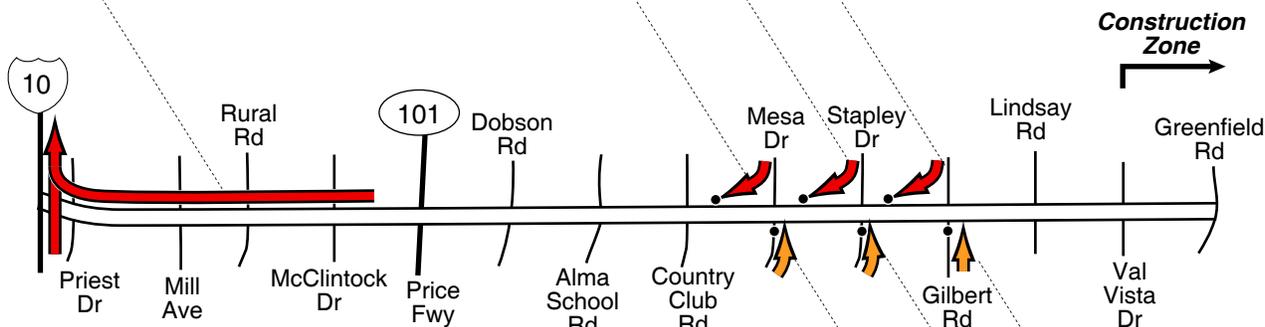
MORNING (5:30 - 9:30 A.M.) - SPRING 2006

During most observations between 6:30 and 8:30 a.m., west-bound congestion was found on US 60 between Loop 101 and the terminus at I-10; during the peak period, estimated speeds typically ranged from 15 to 40 mph. Factors contributing to the congestion included: 1) the lane drop (4 lanes to 3) at Rural Rd; 2) the merge with I-10 traffic. (Photo set: 60am1)

During most observations between 6:00 and 8:30 a.m., congestion was found on the westbound entrance ramp at Stapley Dr; queue populations at the ramp meter ranged from approximately 20 to 35 vehicles per lane (2 lanes). (Photo set: 60am8)

During most observations between 7:00 and 9:00 a.m., congestion was found on the westbound entrance ramp at Mesa Dr; queue populations at the ramp meter ranged from approximately 20 to 30 vehicles per lane (2 lanes). (Photo set: 60am7)

During most observations between 5:30 and 9:00 a.m., congestion was found on the westbound entrance ramp at Gilbert Rd; queue populations at the ramp meter ranged from approximately 25 to 45 vehicles per lane (2 lanes). (Photo set: 60am9)



Intermittently, northbound congestion was found on Mesa Dr approaching the signal at US 60; when congested, queue populations ranged from approximately 20 to 30 vehicles per lane (two left-turn lanes to westbound US 60). (Photo set: 60am6)

Intermittently, northbound congestion was found on Stapley Dr approaching the signal at US 60; when congested, queue populations ranged from approximately 20 to 30 vehicles per lane (two left-turn lanes to westbound US 60). (Photo set: 60am4)

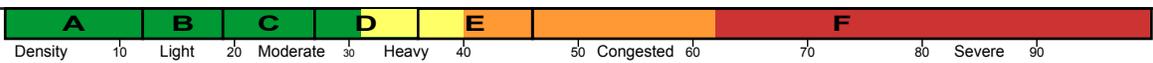
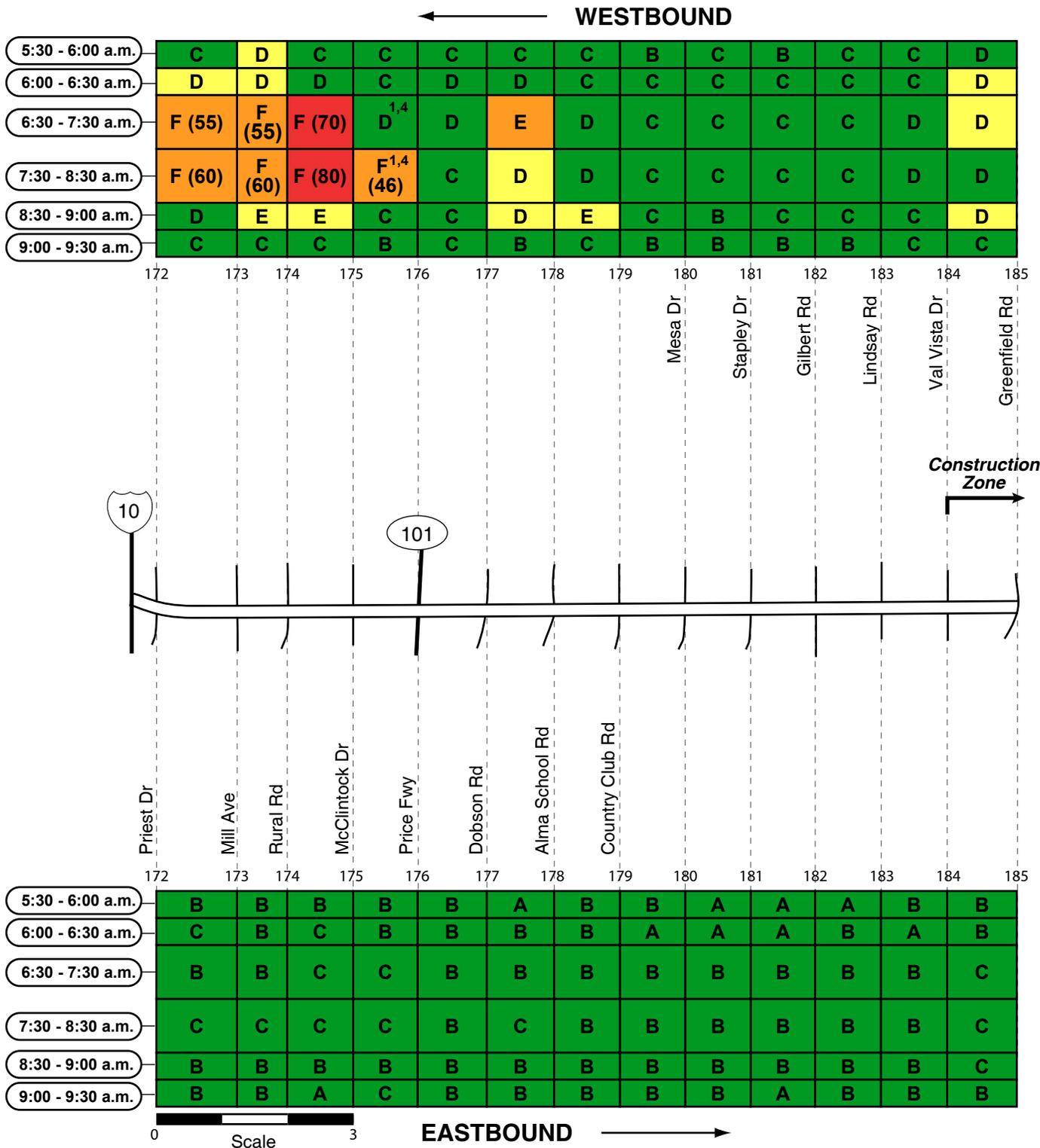
Intermittently, northbound congestion was found on Gilbert Rd approaching the signal at US 60; when congested, queue populations ranged from approximately 20 to 30 vehicles per lane (two left-turn lanes to westbound US 60). (Photo set: 60am5)

Legend

	Congested flow (Estimated average speed < 30 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed 30-50 mph)		Entrance / Exit Ramp Queue

US 60 (I-10 - GREENFIELD RD)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

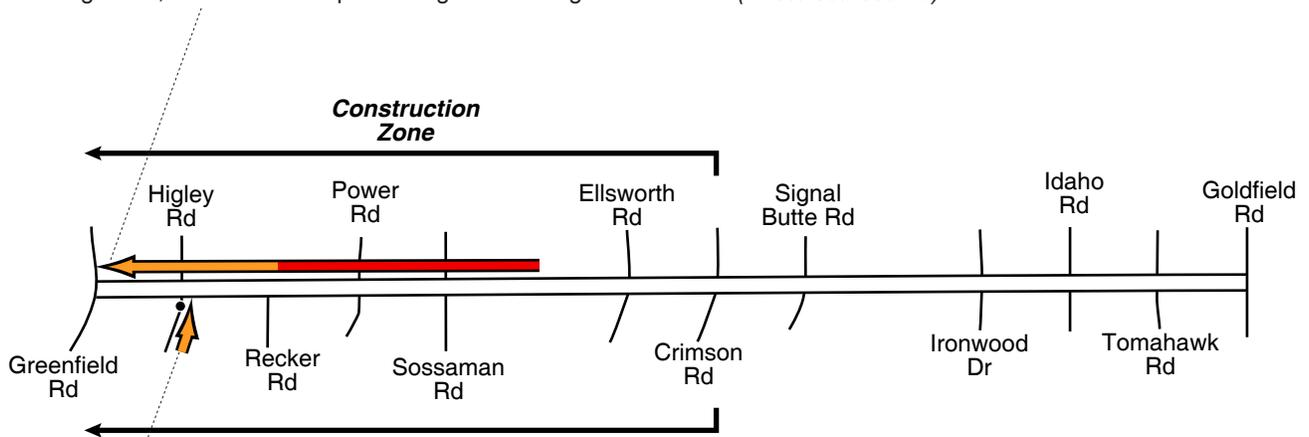


Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

US 60 (GREENFIELD RD - GOLDFIELD RD)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

During most observations between 5:30 and 9:30 a.m., westbound congestion was found on US 60 between Ellsworth Rd and Greenfield Rd; estimated speeds during the peak period typically ranged from 15 to 40 mph. While ongoing construction along this section of US 60 may have contributed to the congestion, all lanes were open during the morning observations. *(Photo set: 60am2)*



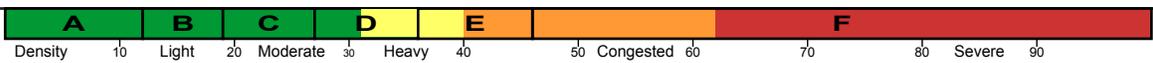
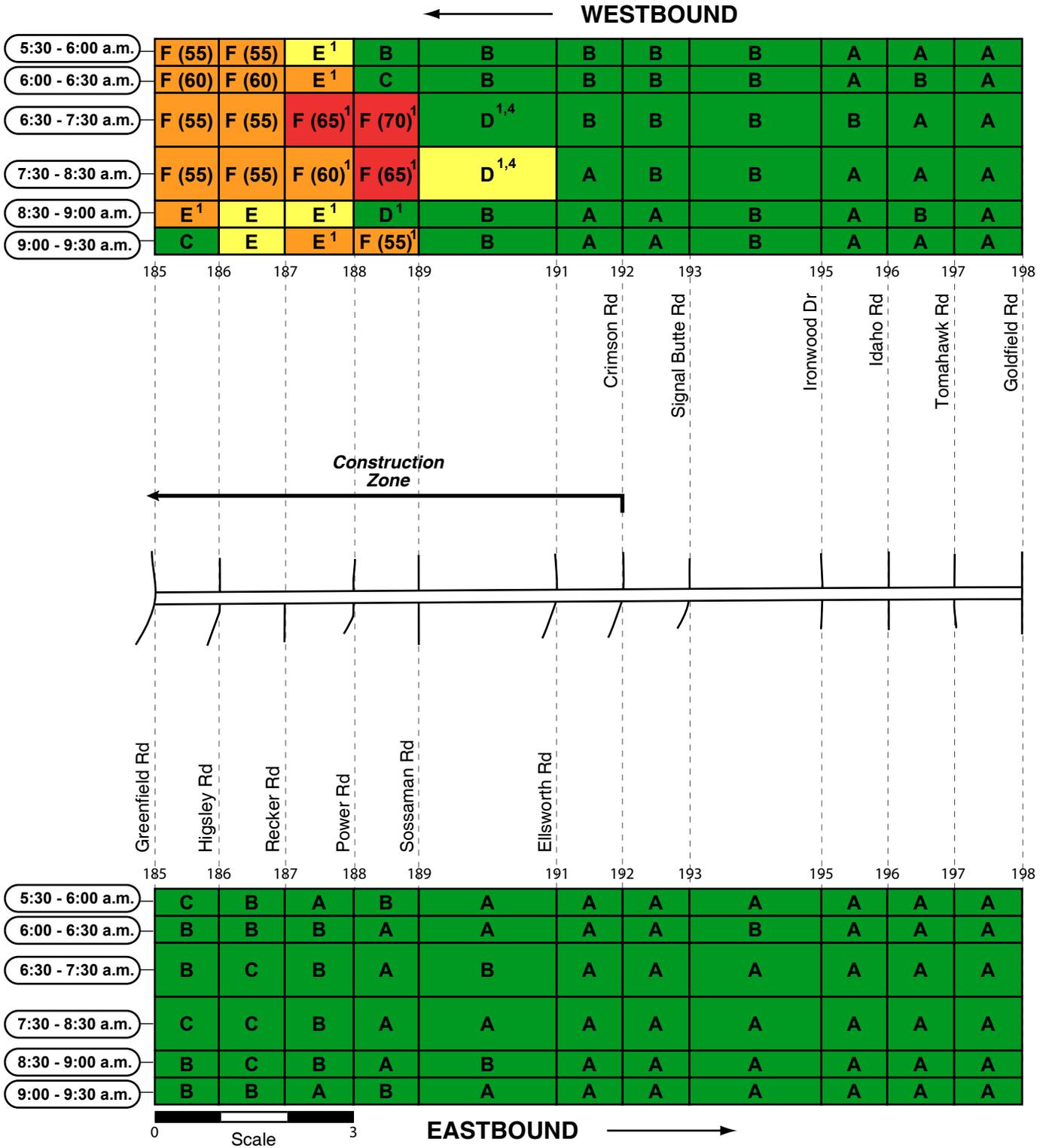
Intermittently, northbound congestion was found on Higley Rd approaching the signal at US 60; when congested, queue populations ranged from approximately 20 to 40 vehicles per lane (two thru-lanes). *(Photo set: 60am3)*

Legend

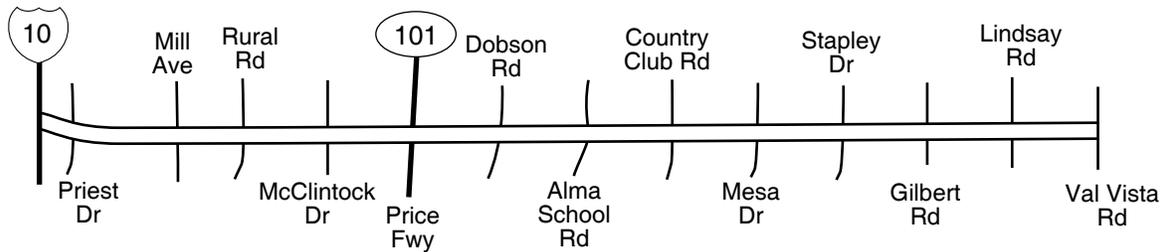
	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

US 60 (GREENFIELD RD - GOLDFIELD RD)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

US 60 HOV**MORNING (5:30 - 9:30 A.M.) - SPRING 2006****[HOV ENFORCEMENT 6:00 - 9:00 A.M.]**

No congestion was found on the US 60 HOV facility during the morning survey period.

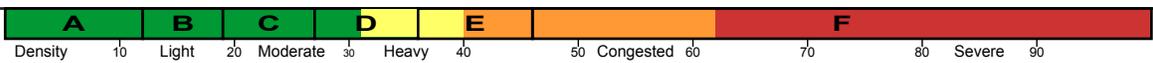
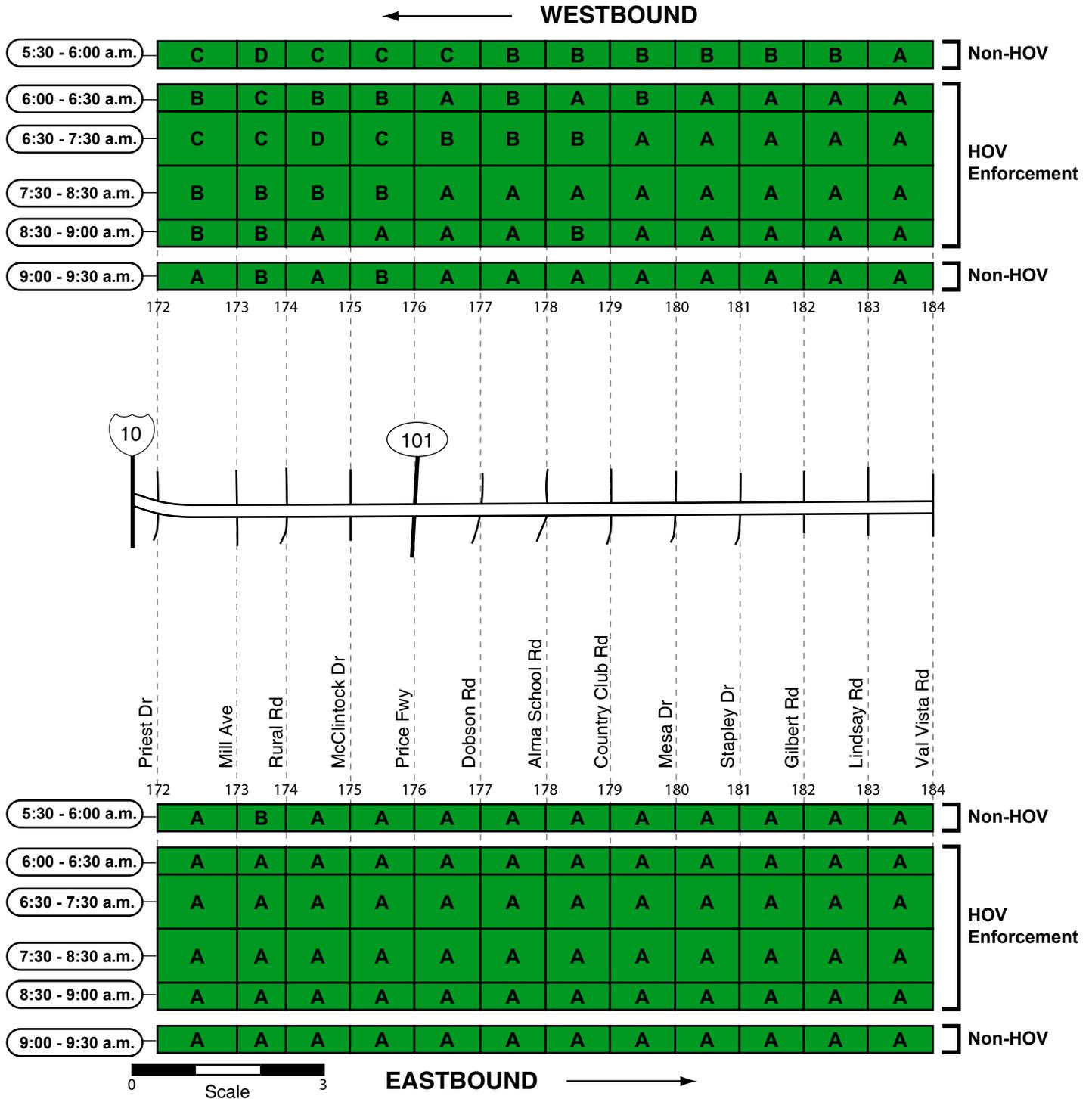
Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

US 60 HOV

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

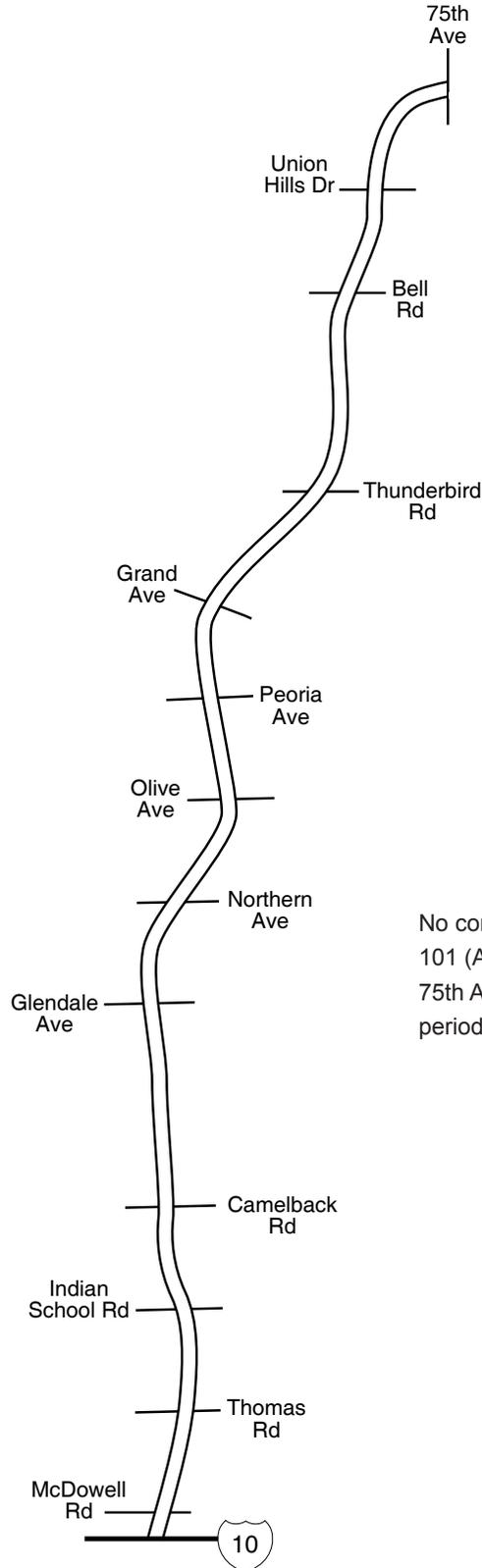
[HOV ENFORCEMENT 6:00 - 9:00 A.M.]



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

Loop 101 (I-10 - 75th Ave)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



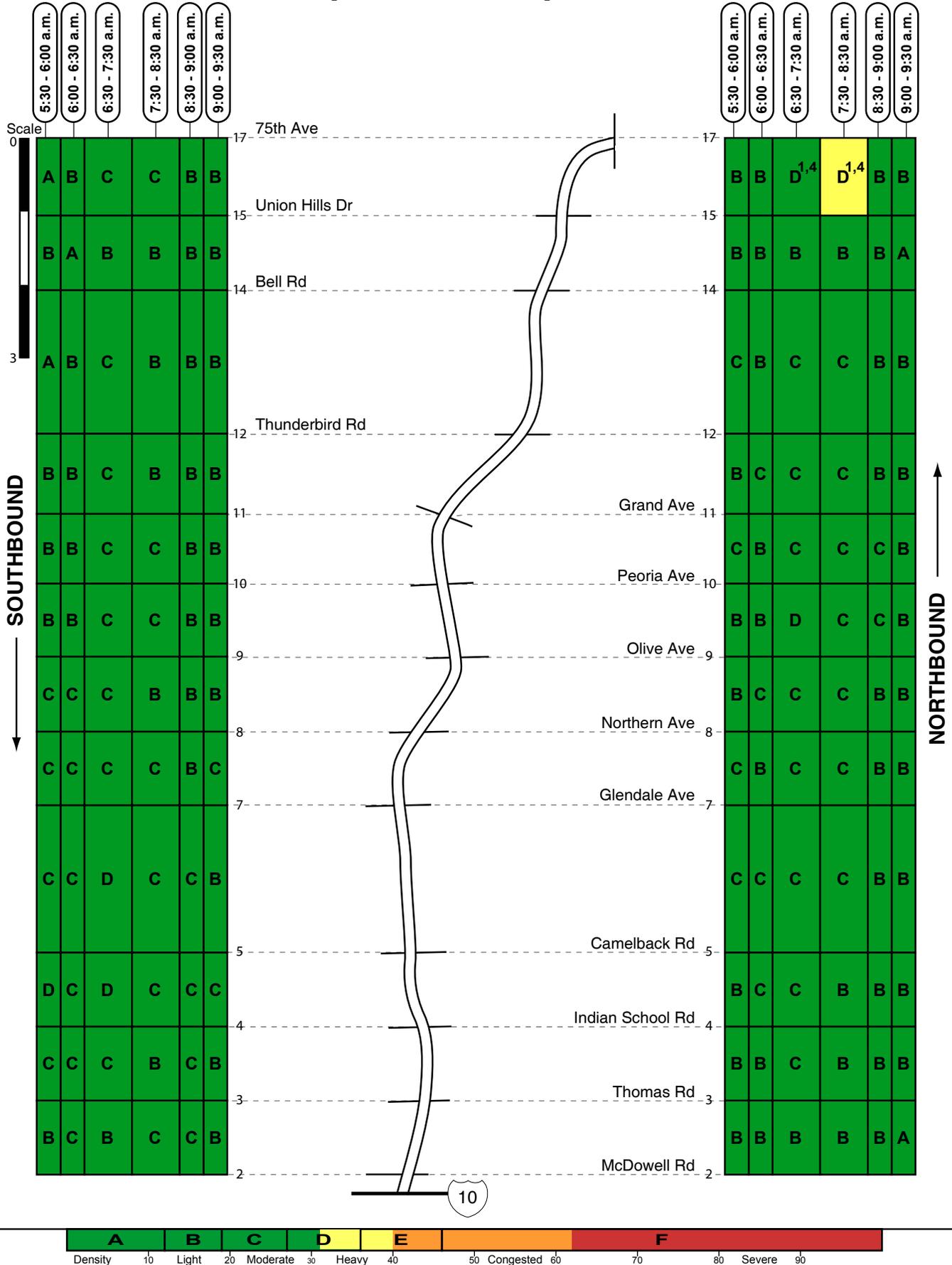
No congestion was found on Loop 101 (Agua Fria Fwy) between I-10 & 75th Ave during the morning survey period.

Legend

- | | | | |
|--|--|--|----------------------------|
| | Congested flow (Estimated average speed 30-50 mph) | | Signal Queue - Cross Road |
| | Congested flow (Estimated average speed < 30 mph) | | Entrance / Exit Ramp Queue |

Loop 101 (I-10 - 75th Ave)

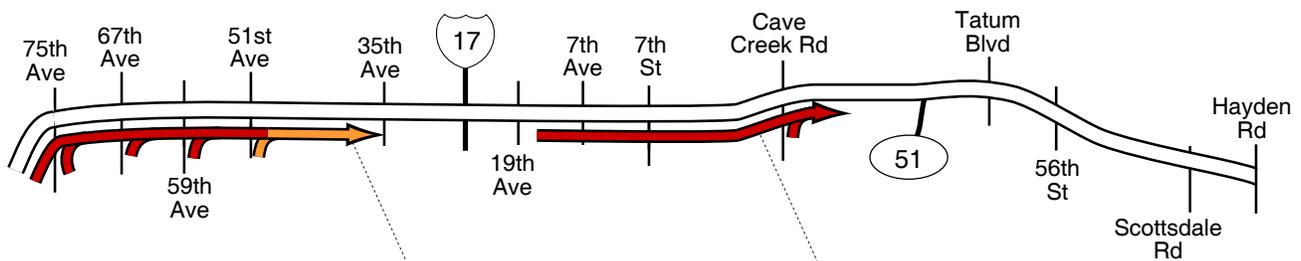
MORNING (5:30 - 9:30 A.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

LOOP 101 (75TH AVE - HAYDEN RD)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



During most observations between 5:30 and 9:00 a.m., eastbound congestion was found on Loop 101 between 75th Ave and 35th Ave; during the peak period, estimated speeds typically ranged from 20 to 40 mph (traffic flow consistently improved east of 51st Ave). Traffic merging from the ramps at the series of interchanges along this section of Loop 101 appeared to cause the congestion.

(Photo set: 101am3)

During most observations between 5:30 and 9:00 a.m., eastbound congestion was found on Loop 101 between 19th Ave and Cave Creek Rd; during the peak period, estimated speeds typically ranged from 20 to 30 mph. Traffic merging from the ramps at 7th St and Cave Creek Rd appeared to cause the congestion.

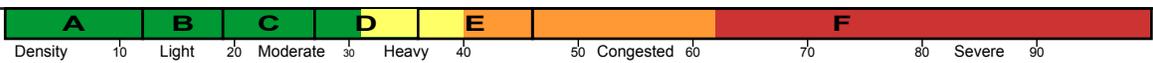
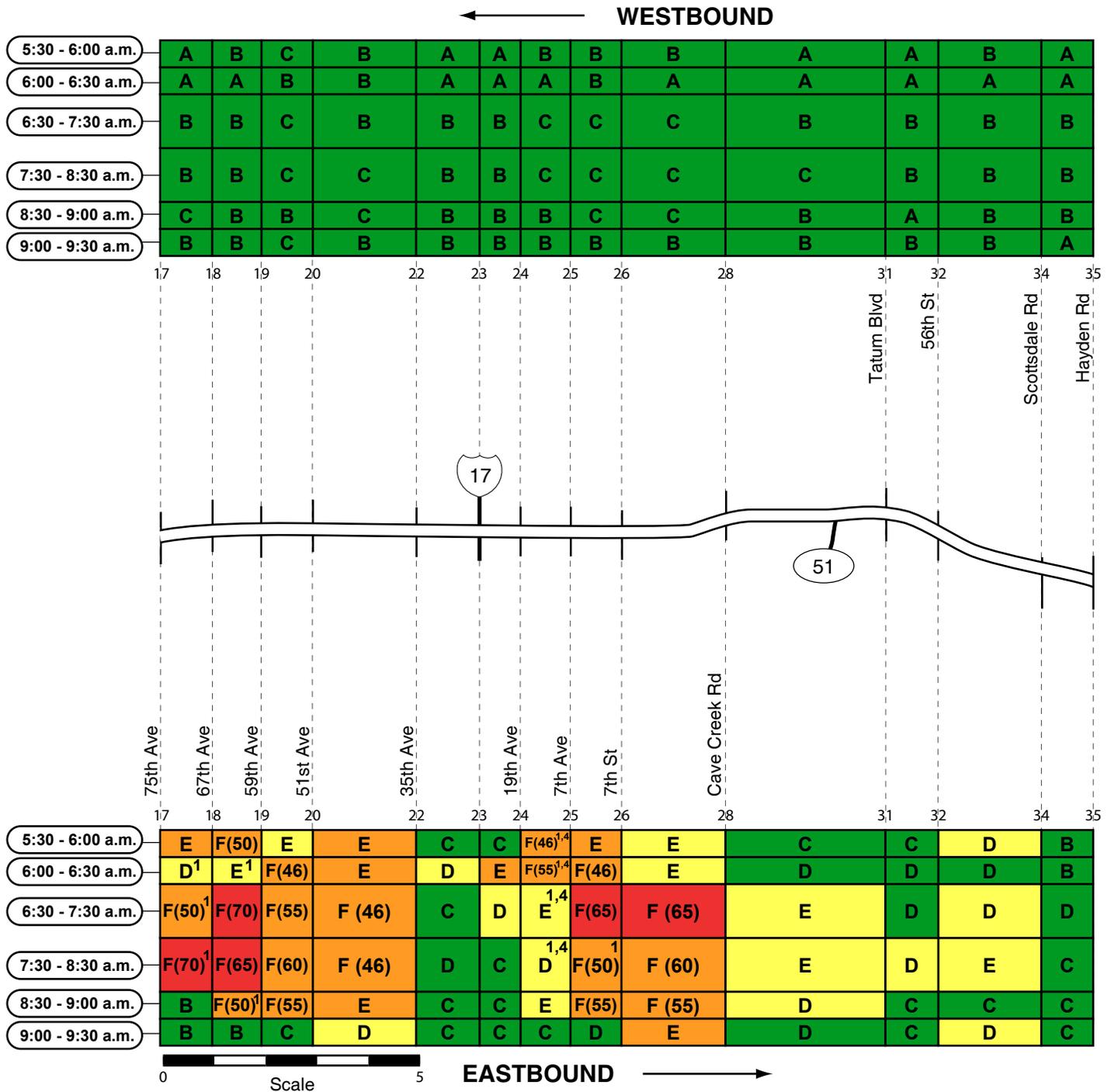
(Photo set: 101am2)

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

LOOP 101 (75TH AVE - HAYDEN RD)

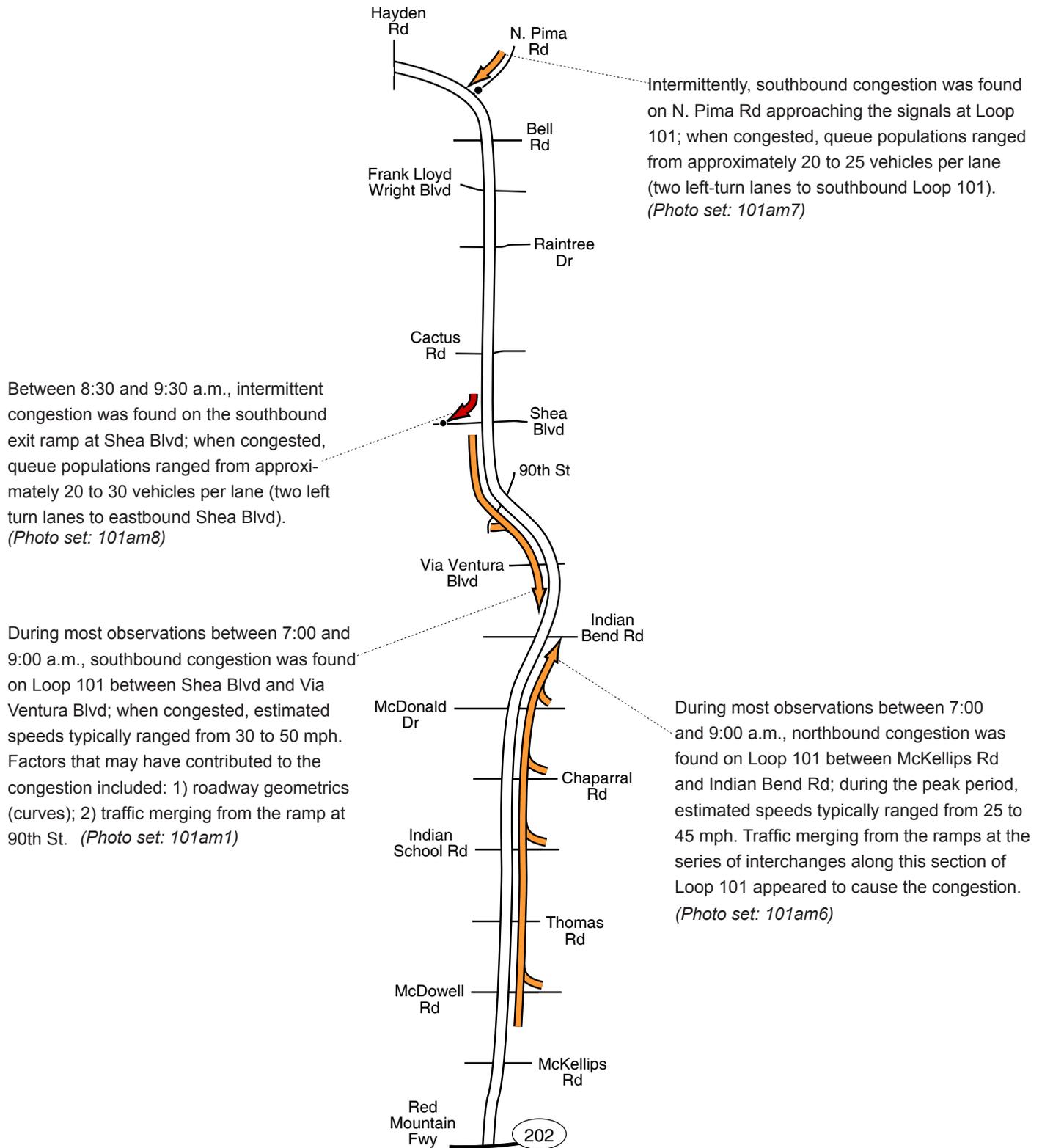
MORNING (5:30 - 9:30 A.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

LOOP 101 (HAYDEN RD - LOOP 202 N)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

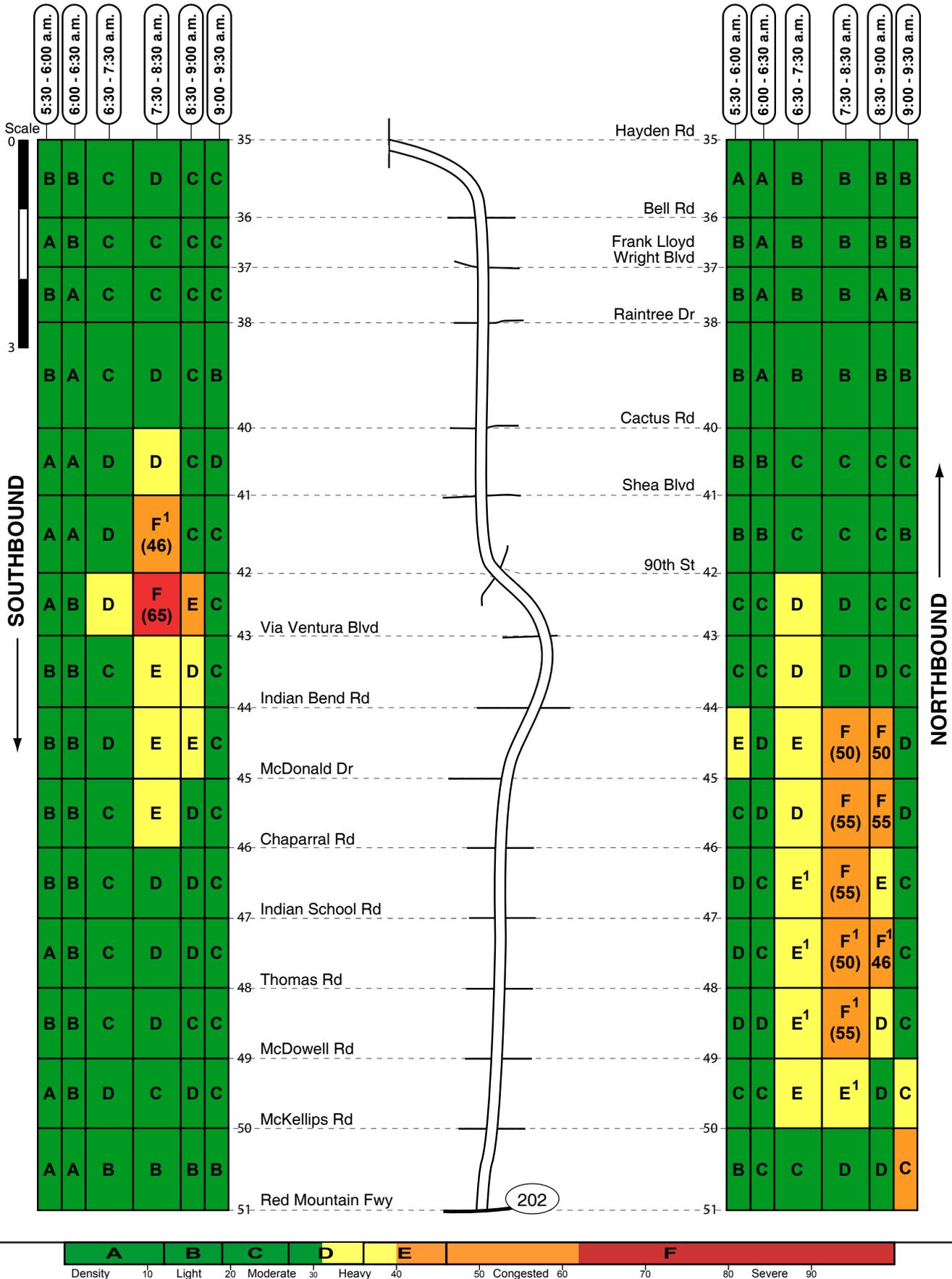


Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

LOOP 101 (HAYDEN RD - LOOP 202 N)

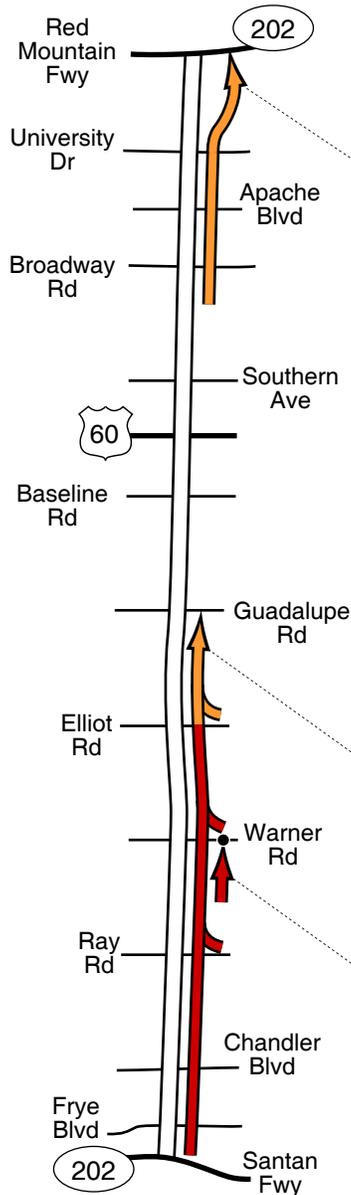
MORNING (5:30 - 9:30 A.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

LOOP 101 (LOOP 202 N - LOOP 202 S)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



On some days, but not others (between 6:30 and 8:00 a.m.), northbound congestion was found on Loop 101 between US 60 and Loop 202 (Red Mountain Fwy). Factors contributing to the congestion included: 1) traffic merging from the ramps at US 60 and Broadway Rd; 2) the lane drop (5 lanes to 4) at Broadway Rd; 3) congestion on the ramp to Loop 202 westbound extending back into the mainline. Congestion approaching the ramp to Loop 202 was more dense in the right-hand lanes where intermittent stop-and-go conditions were found.
(Photo set: 101am5)

During most observations between 7:30 and 9:00 a.m., northbound congestion was found on Loop 101 between Loop 202 (Santan Fwy) and Guadalupe Rd; during the peak period, estimated speeds typically ranged from 15 to 30 mph. Traffic merging from the ramps at the series of interchanges along this section of Loop 101 appeared to cause the congestion. Northbound vehicles consistently resumed free flow speeds at Guadalupe Rd where the roadway widens from three to four lanes.
(Photo set: 101am4)

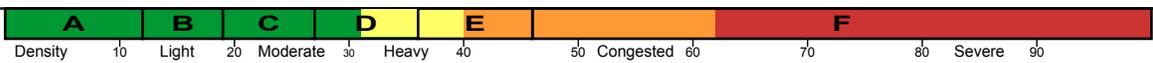
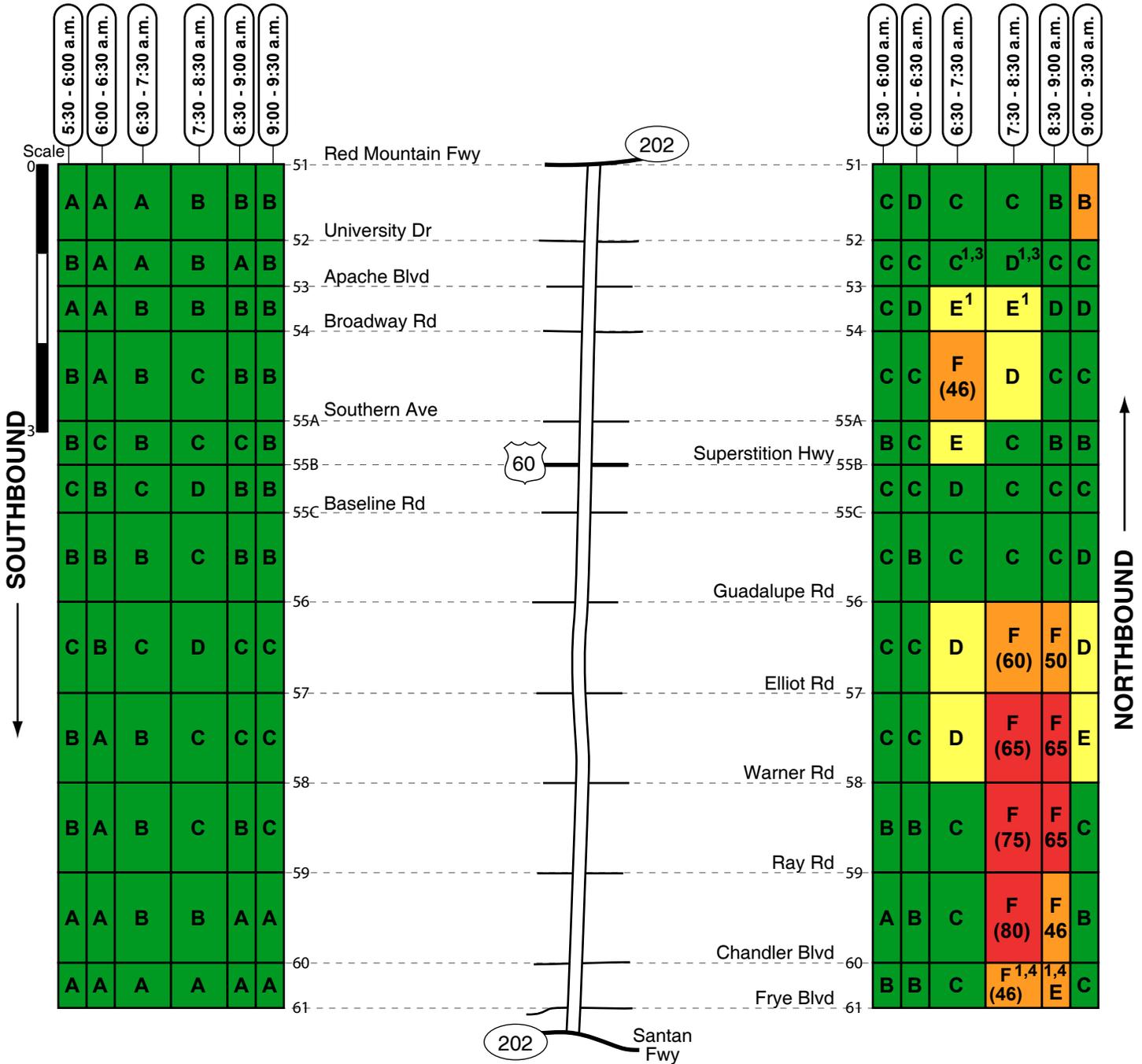
Between 7:30 and 8:30 a.m., intermittent congestion was found on N. Price Rd (service road) approaching the signal at Warner Rd; when congested, approximately 40 to 50 vehicles were queued at the signal (two thru-lanes).
(Photo set: 101am9)

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

LOOP 101 (LOOP 202 N - LOOP 202 S)

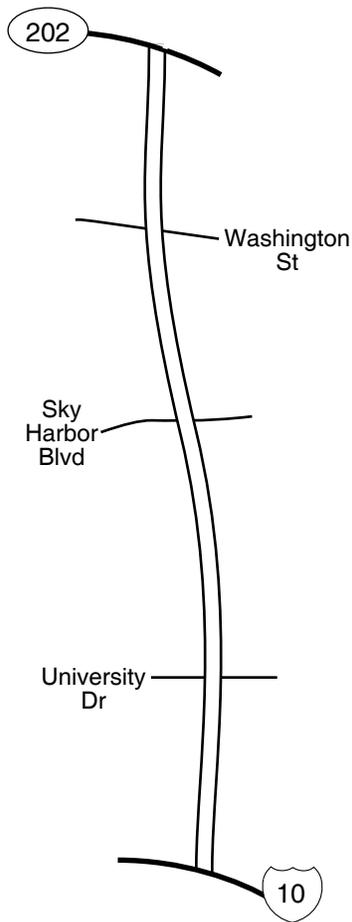
MORNING (5:30 - 9:30 A.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

SR 143

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



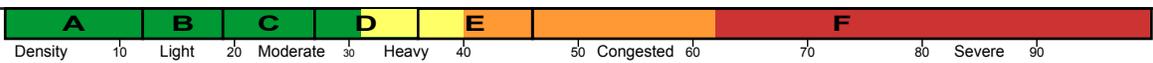
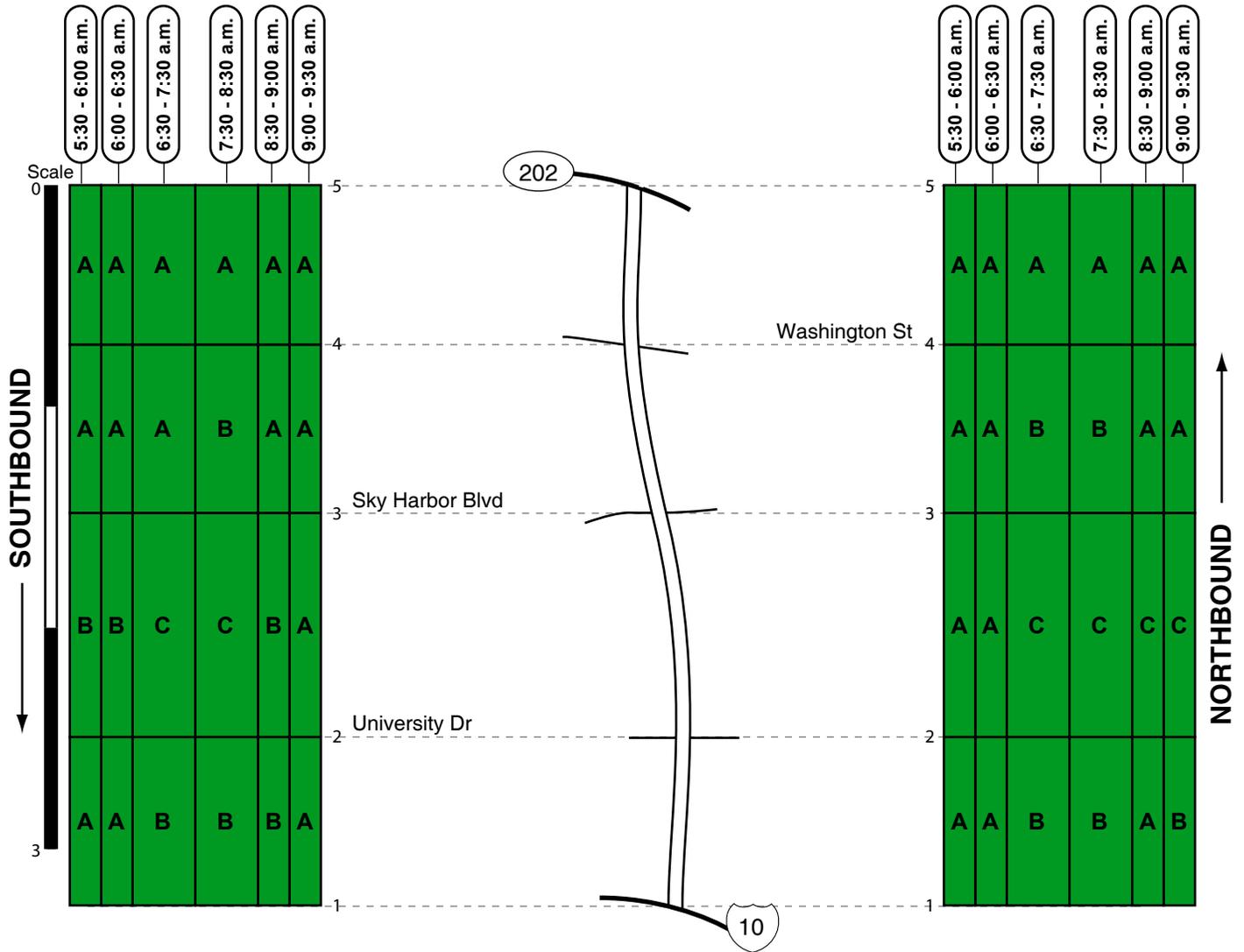
No congestion was found on SR 143 during the morning survey period.

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

SR 143

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

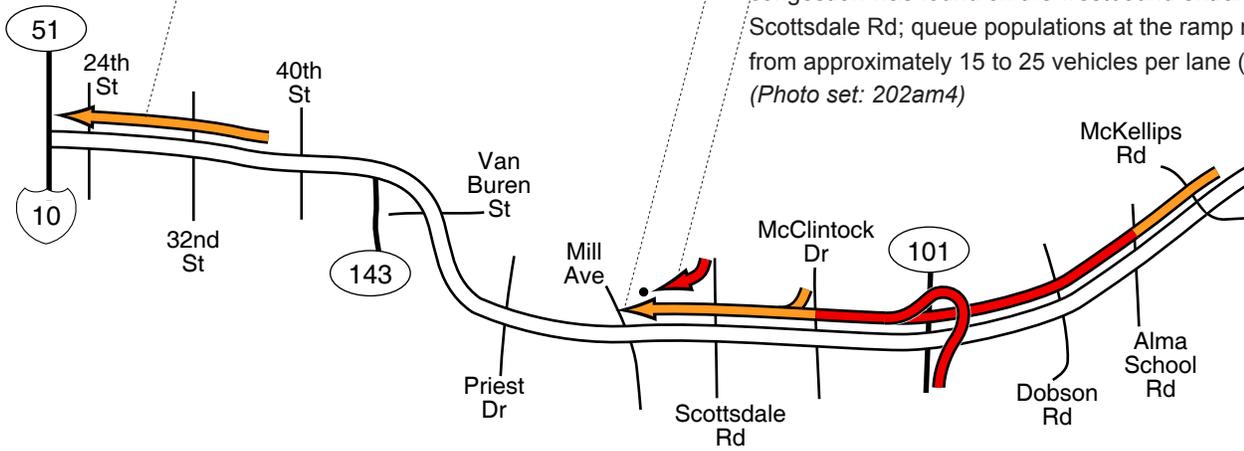
Loop 202 N (I-10 - McKELLIPS RD)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

During most observations between 6:30 and 9:30 a.m., westbound congestion was found on Loop 202 between 40th St and I-10/SR 51; estimated speeds during the peak period typically ranged from 30 to 50 mph. Factors contributing to the congestion included: 1) the lane drop (3 lanes to 2) at I-10/SR 51; 2) congestion in the one dedicated lane to SR 51 and I-10. (Photo set: 202am2)

During most observations between 6:30 and 9:00 a.m., westbound congestion was found on Loop 202 between McKellips Rd and Mill Ave; estimated speeds during the peak period typically ranged from 15 to 40 mph. Congestion appeared to be caused by the lane drop (3 lanes to 2) at Loop 101, and traffic merging from the ramps at Loop 101, McClintock Dr and Scottsdale Rd. (Photo set: 202am1)

During most observations between 7:30 and 9:00 a.m., congestion was found on the westbound entrance ramp at Scottsdale Rd; queue populations at the ramp meter ranged from approximately 15 to 25 vehicles per lane (2 lanes). (Photo set: 202am4)

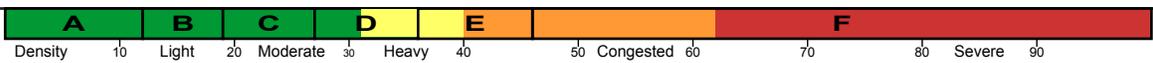
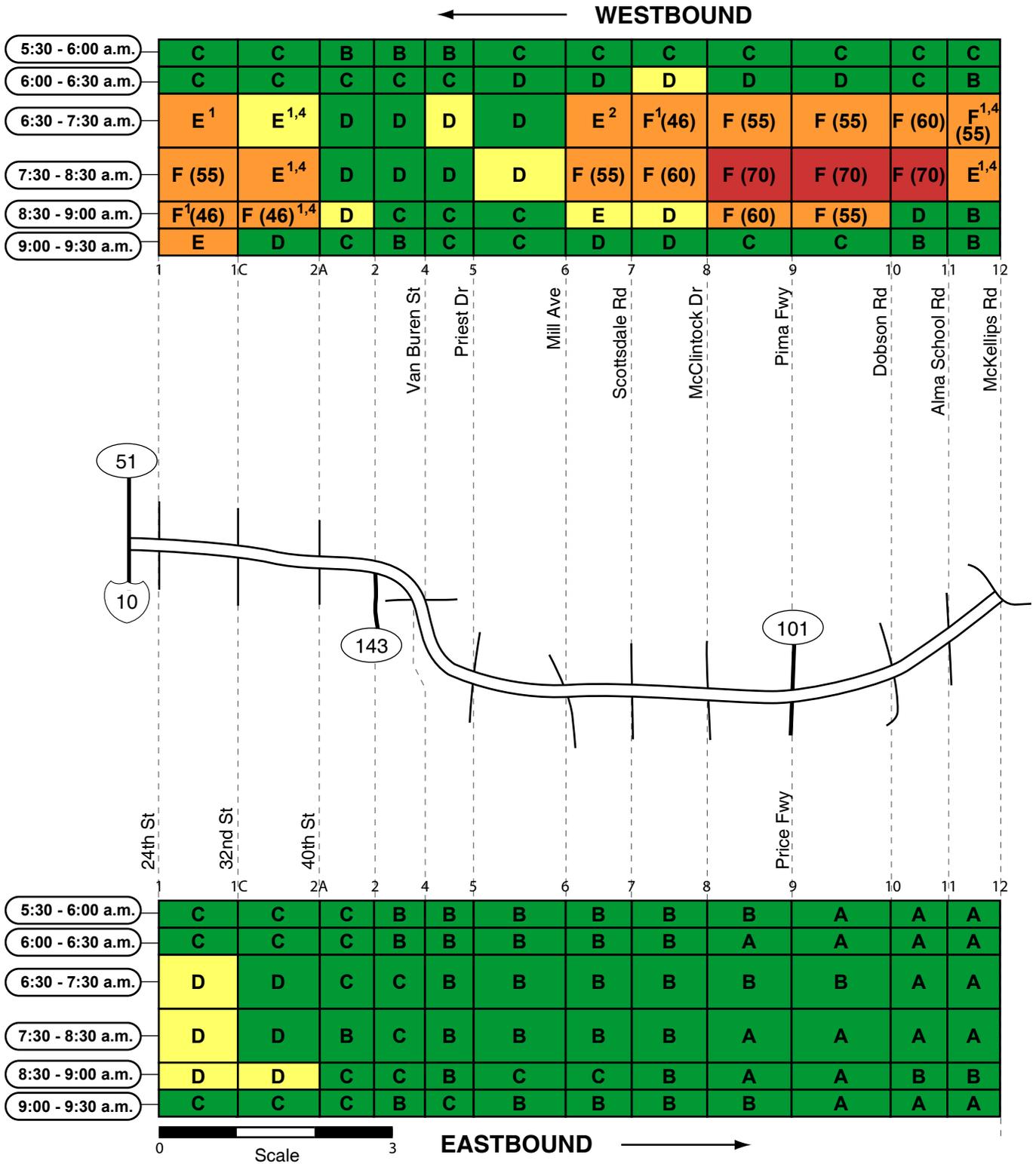


Legend

- | | | | |
|--|--|--|----------------------------|
| | Congested flow (Estimated average speed 30-50 mph) | | Signal Queue - Cross Road |
| | Congested flow (Estimated average speed < 30 mph) | | Entrance / Exit Ramp Queue |

LOOP 202 N (I-10 - McKELLIPS RD)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

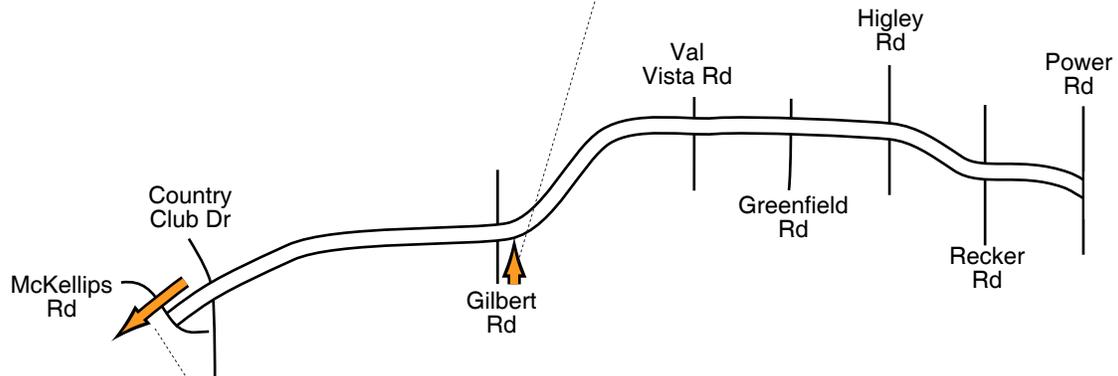


Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 3 - Congestion present only in the first or second half-hour.
 Type 2 - Congestion more severe in left or right-hand lanes. Type 4 - The length of the congested zone within the segment varies.

LOOP 202 (McKELLIPS RD - POWER RD)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

Intermittently, northbound congestion was found on Gilbert Rd approach-
ing the signals at Loop 202; the head
of the queue was typically found at
the signal at the westbound Loop
202 entrance ramp (left-turn bay).
When congested, queue populations
ranged from approximately 20 to 30
vehicles per lane (two lanes).
(Photo set: 202am3)



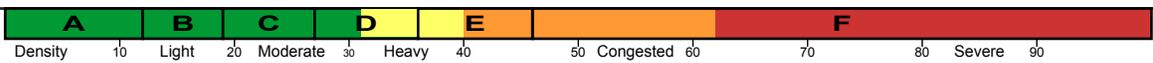
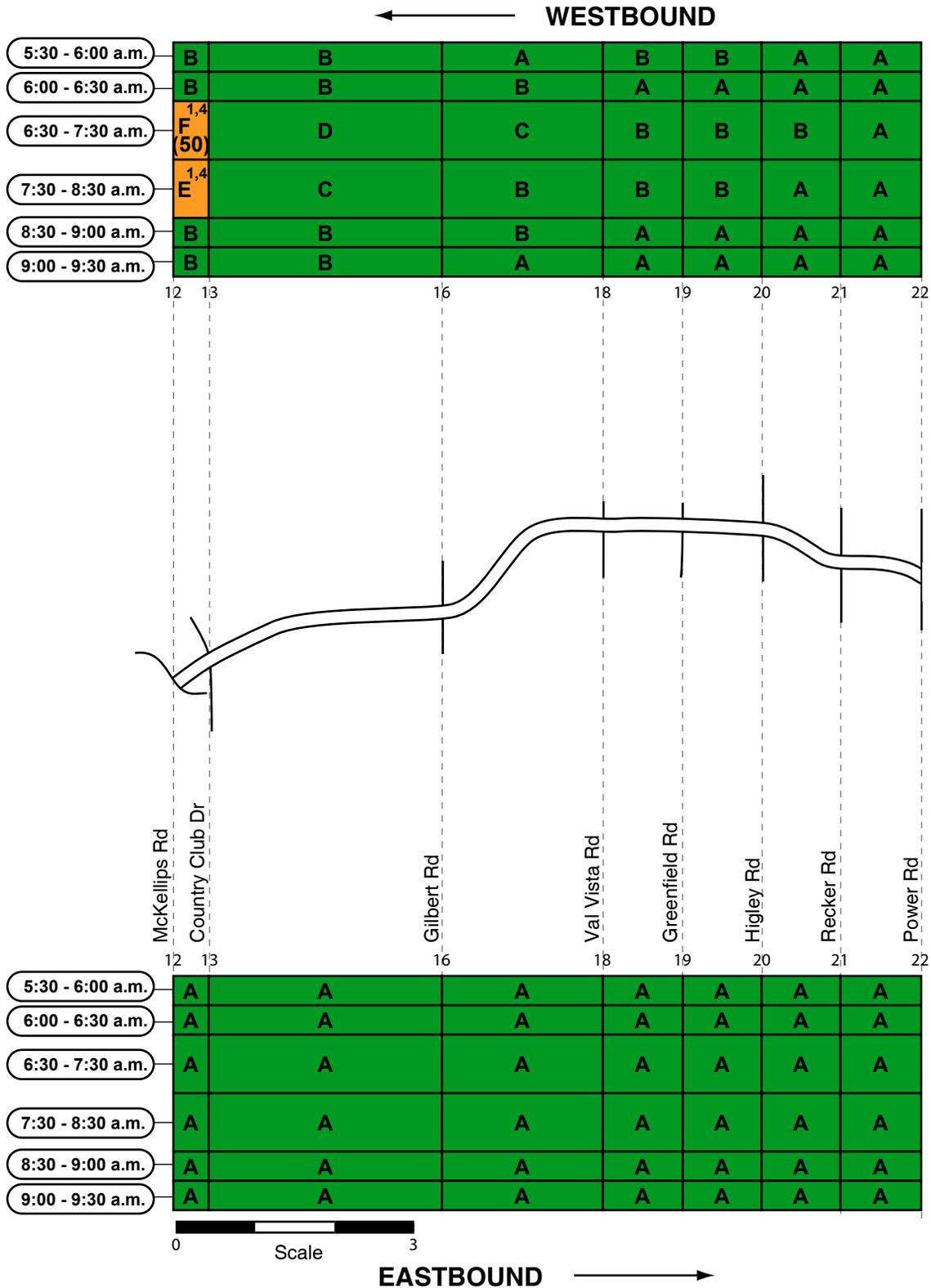
Intermittently, westbound
congestion was found on
Loop 202 between Country
Club Dr and McKellips Rd
(tail of queue). See discus-
sion page 54.

Legend

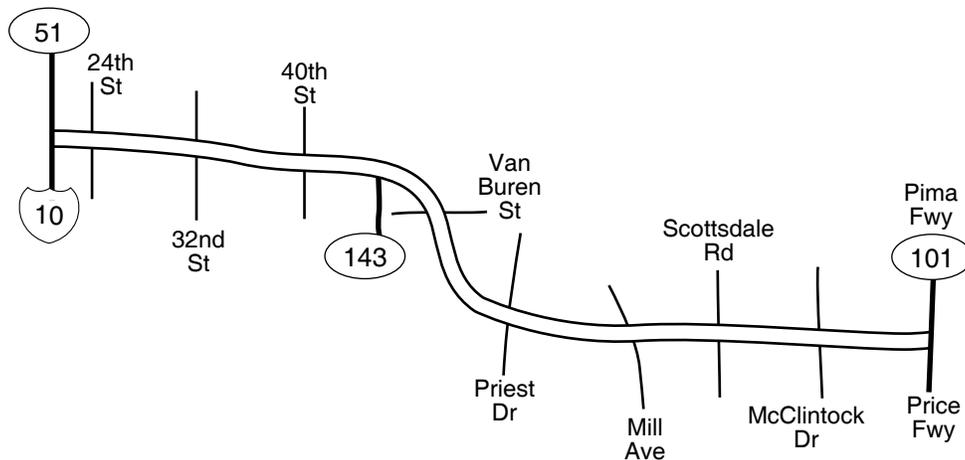
	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

LOOP 202 (McKELLIPS RD - POWER RD)

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

LOOP 202 HOV**MORNING (5:30 - 9:30 A.M.) - SPRING 2006****[HOV ENFORCEMENT 6:00 - 9:00 A.M.]**

No congestion was found on the Loop 202 HOV facility during the morning survey period.

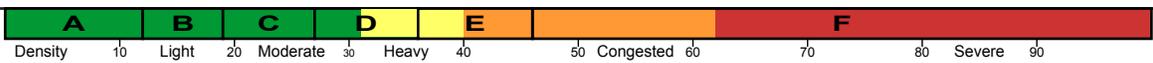
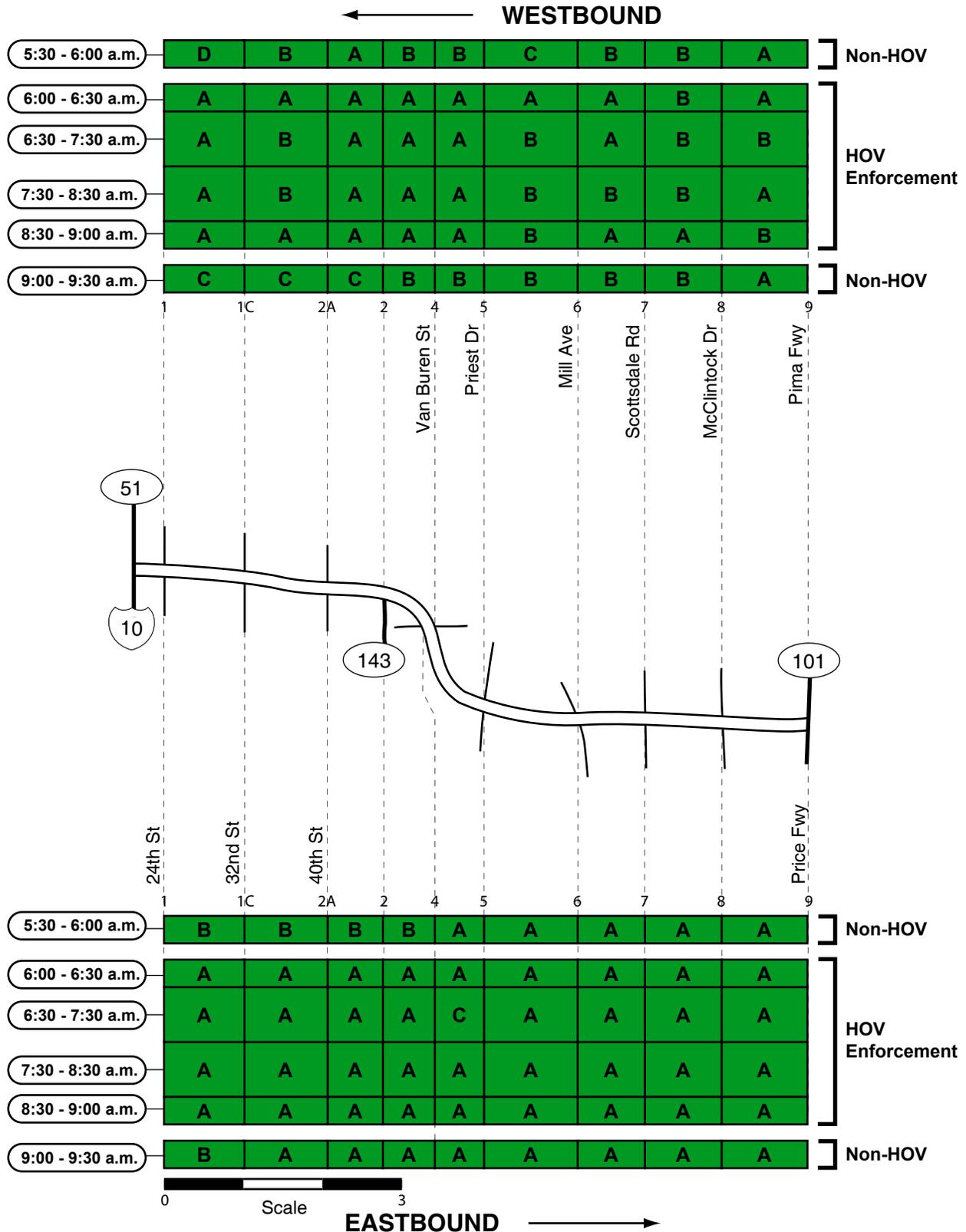
Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

LOOP 202 HOV

MORNING (5:30 - 9:30 A.M.) - SPRING 2006

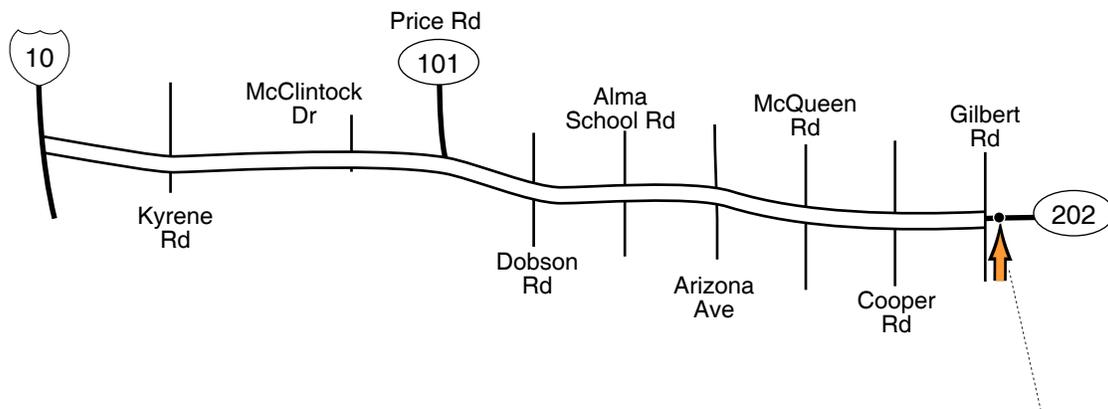
[HOV ENFORCEMENT 6:00 - 9:00 A.M.]



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

LOOP 202 - SANTAN FREEWAY

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



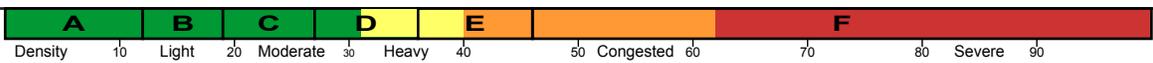
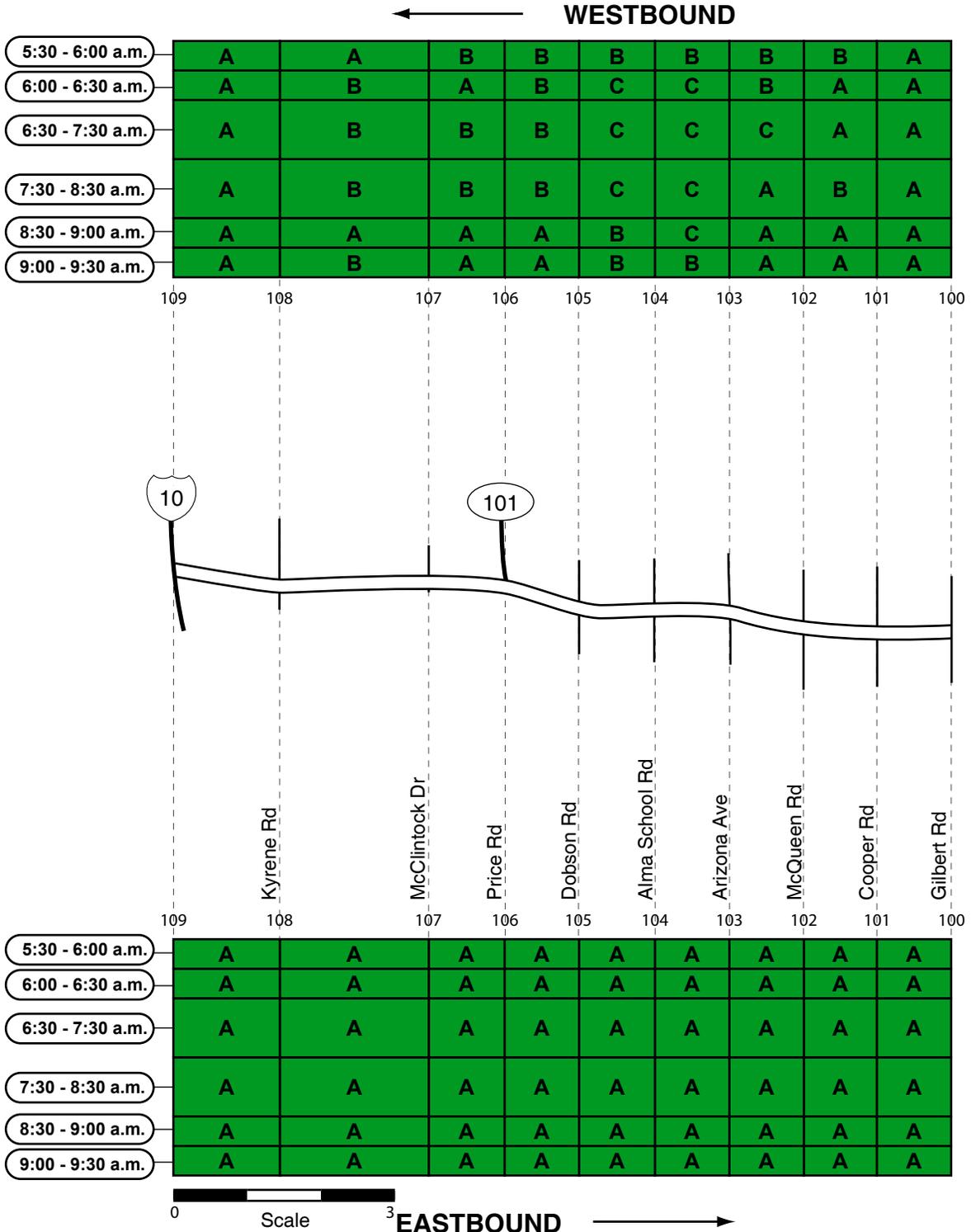
Intermittently, northbound congestion was found on Gilbert Rd approaching the signals at Loop 202; the head of the queue was typically found at the signal at the westbound Loop 202 entrance ramp (left-turn bay). When congested, queue populations ranged from approximately 20 to 30 vehicles per lane (two lanes). (Photo set: 202am1)

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

LOOP 202 - SANTAN FREEWAY

MORNING (5:30 - 9:30 A.M.) - SPRING 2006



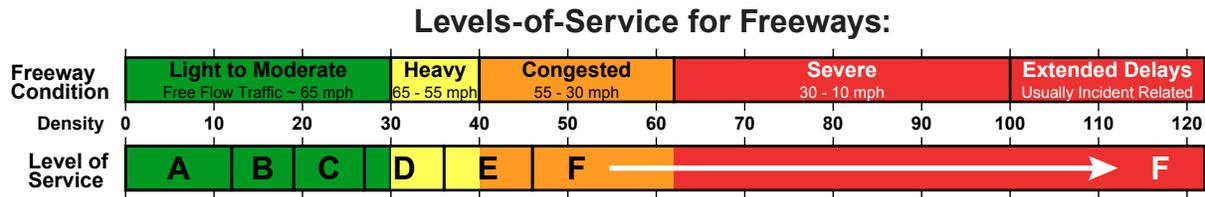
Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

Part Three

Evening - Spring 2006

This section of the report presents findings from the spring 2006 evening survey flights. Each freeway is presented in a set of opposing maps. The maps with the performance rating tables on the right contain average density-based level-of-service ratings, minus the effects of any known or suspected incidents (actual density values are provided for all LOS "F" ratings). Example: F(60).

Performance-Rating Tables



Level-of-Service data for some highway segments represent the mathematical average of densities that varied widely; these data have been tagged with a superscript in the LOS tables. Four types of "nested" congestion that contribute to the variability have been identified as follows:

- Type 1 - Congestion present on some days, but not others.
- Type 2 - Congestion more severe in left or right-hand lanes.
- Type 3 - Congestion present only in the first or second half-hour (hourly averages).
- Type 4 - The length of the congested zone within the segment varies.

Example:

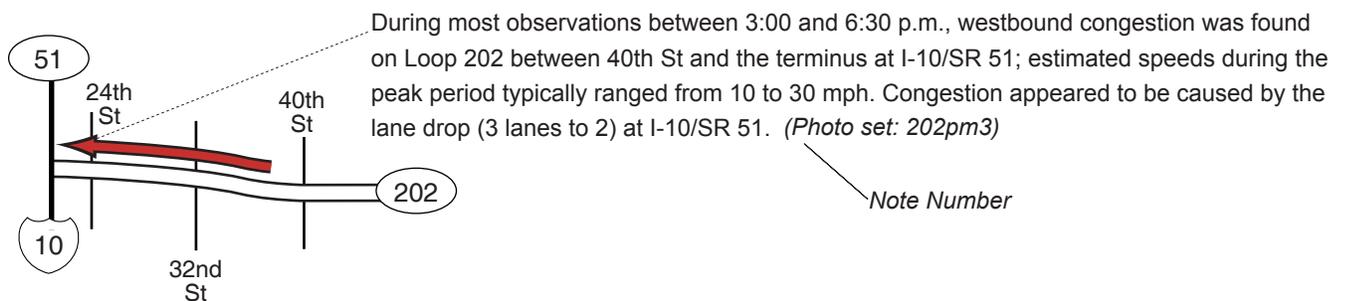


A scale accompanies each rating table in this section of the report.



Freeway Congestion Maps

Freeway maps containing congestion arrows and narratives have been placed opposite each performance-rating table, on the left-hand side. The narratives clarify the severity and frequency of all congestion found along each highway segment. Apparent causes of the congestion are also described where evident. Congestion on cross roads are also depicted and discussed.



Highlight Photographs

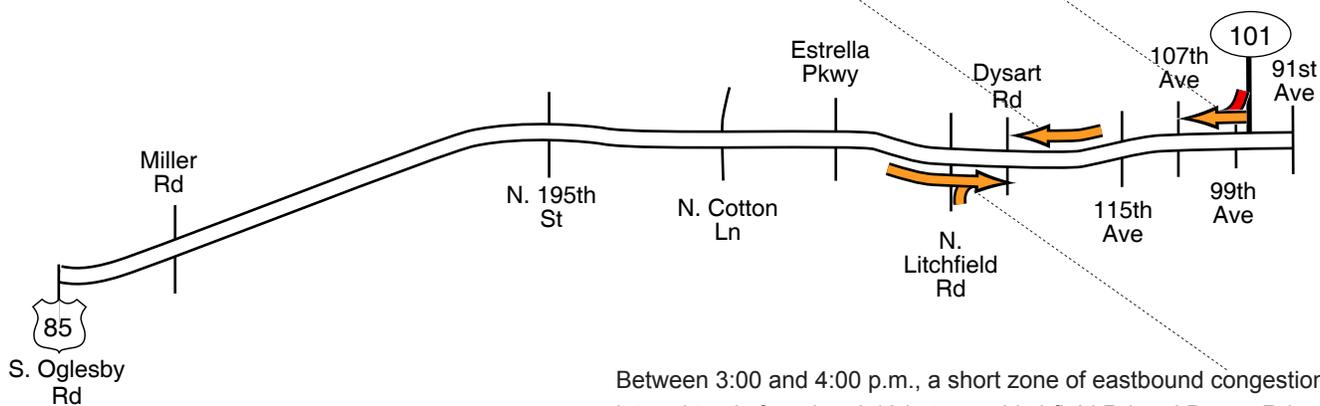
The DVD-ROM included with this report contains highlight photographs for all congested locations (morning and evening). The photographs are assembled in an iView Catalog that allows easy access for viewing. Each of the narratives describing a congested location includes a note number (see example above); to view the corresponding photographs, select the note number in the iView Catalog.

I-10 (OGLESBY RD - 91ST AVE)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

Between 3:00 and 6:00 p.m., intermittent westbound congestion was found on I-10 between 115th Ave and Dysart Rd; when congested, speeds were estimated at 40 to 50 mph. Congestion appeared to be caused by the lane drop (3 lanes to 2) at Dysart Rd. (Photo set: 10pm6)

Throughout the evening survey period, intermittent westbound congestion was found on I-10 between Loop 101 and 107th Ave; when congested, estimated speeds ranged from 30 to 50 mph. Traffic merging from the Loop 101 ramp appeared to cause the congestion. (Photo set: 10pm5)



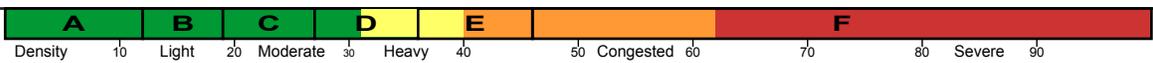
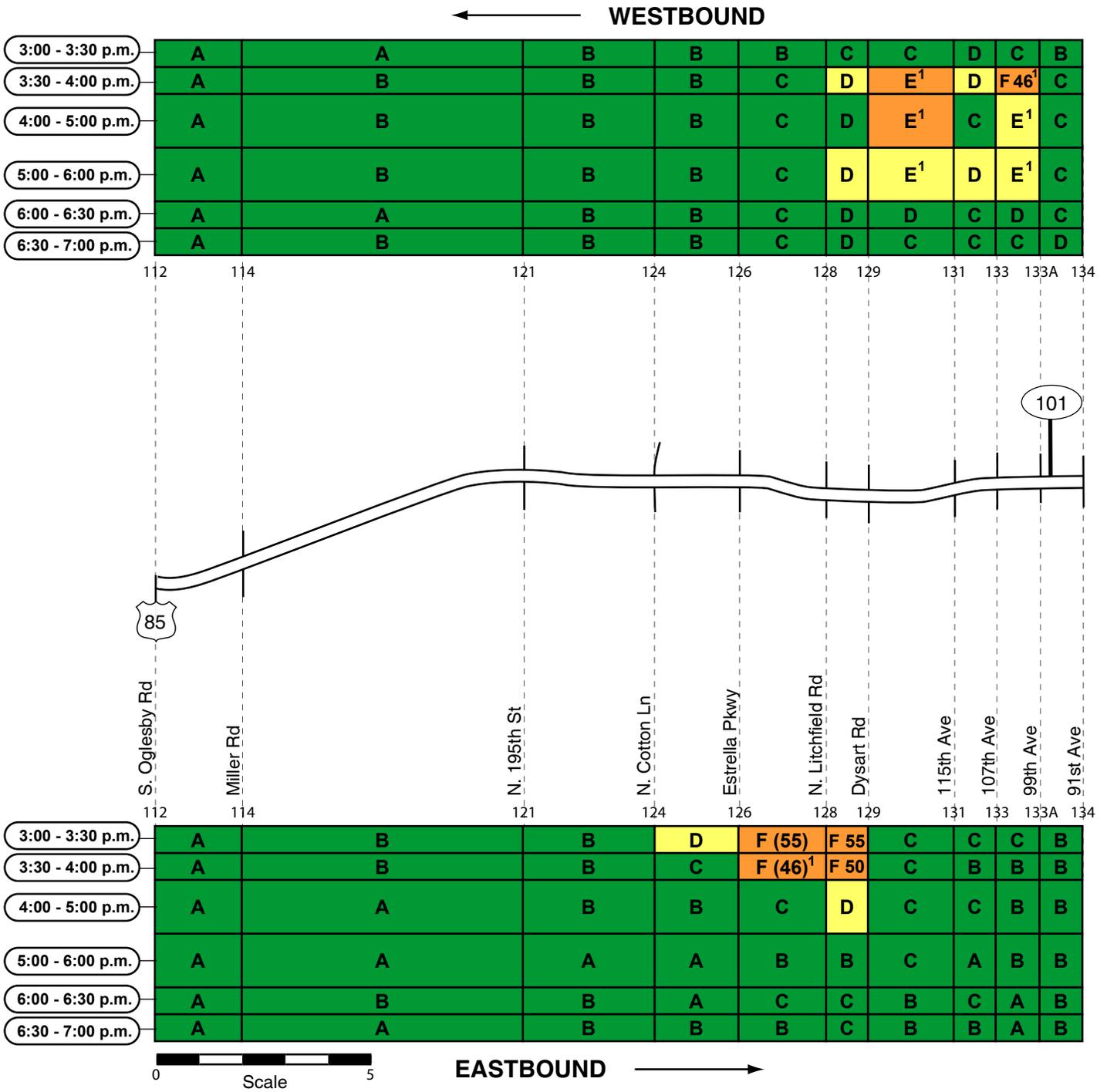
Between 3:00 and 4:00 p.m., a short zone of eastbound congestion was intermittently found on I-10 between Litchfield Rd and Dysart Rd; when congested, estimated speeds ranged from 40 to 55 mph. Congestion appeared to be caused by traffic merging from the ramp at Litchfield Rd. (Photo set: 10pm3)

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

I-10 (OGLESBY RD - 91ST AVE)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



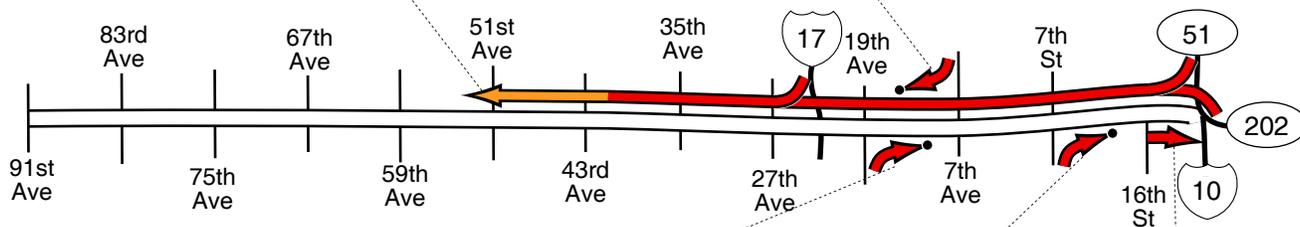
Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-10 (91ST AVE - SR 51)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

During most observations between 3:30 and 6:30 p.m., westbound congestion was found on I-10 between SR 51 and 51st Ave. Congestion was particularly severe approaching I-17 where the lane drop (4 lanes to 3) and the merge from the I-17 ramp appeared to exacerbate the congestion; during the peak period, estimated speeds along this section of I-10 typically ranged from 10 to 30 mph. While congestion persisted west of the merge at I-17, traffic flow typically improved, with speeds estimated at 35 to 50 mph. (Photo set: 10pm7)

During most observations between 4:00 and 5:30 p.m., congestion was found on the westbound entrance ramp at 7th Ave; queue populations at the ramp meter ranged from 20 to 35 vehicles per lane (2 lanes). In some cases, congestion on the ramp extended back into the right lane on southbound 7th Ave. (Photo set: 10pm10)



Intermittently, congestion was found on the eastbound entrance ramp at 19th Ave; when congested, queue populations at the ramp meter ranged from 25 to 35 vehicles per lane (1 lane). (Photo set: 10pm9)

During most observations between 3:00 and 6:30 p.m., congestion was found on the eastbound entrance ramp at 7th St; queue populations at the ramp meter ranged from 40 to 80 vehicles (2 lanes). In some cases, congestion on the ramp extended back into the right lane on northbound 7th St. (Photo set: 10pm11)

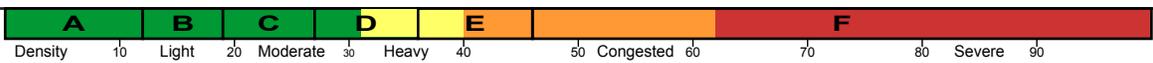
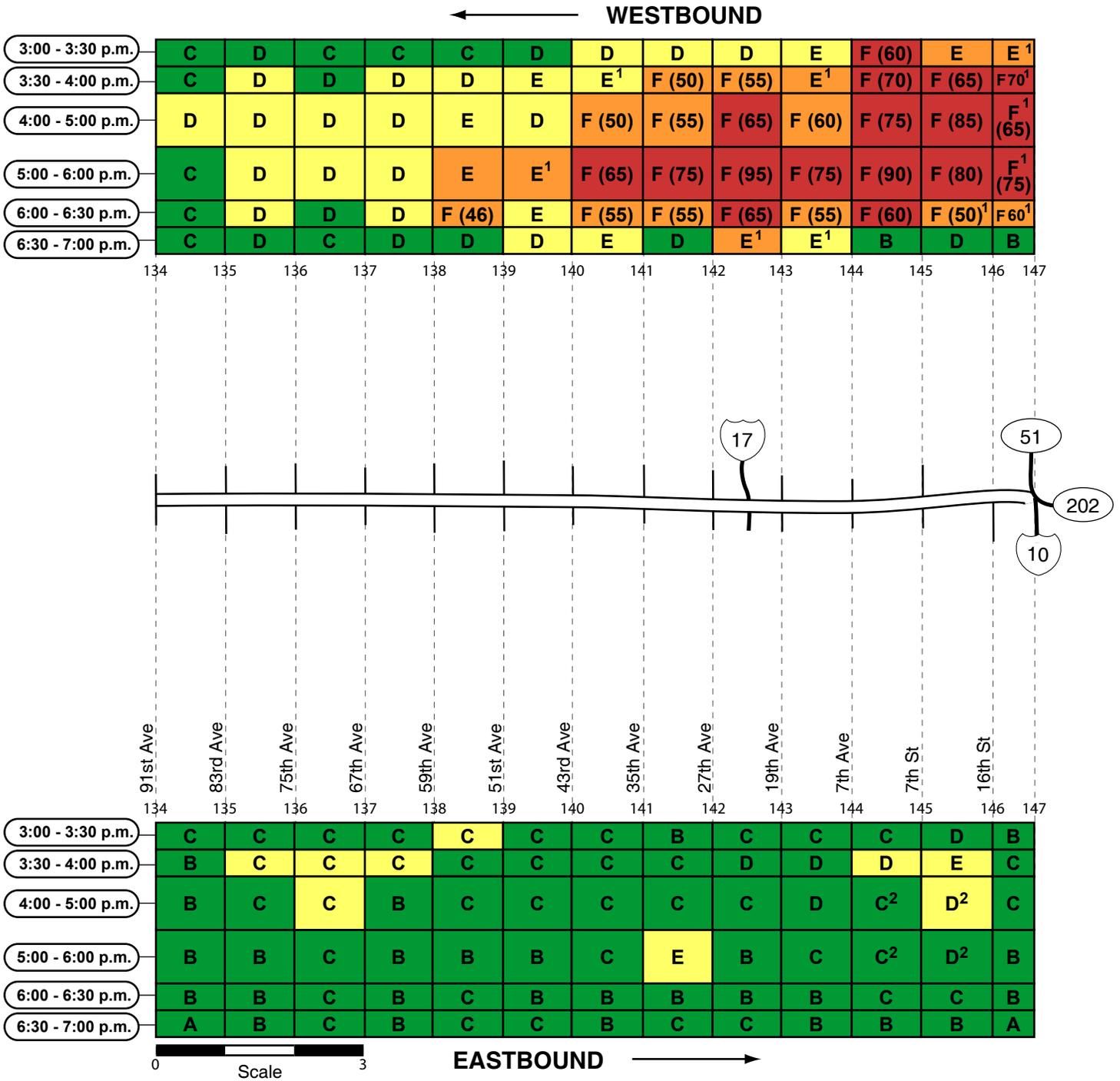
Intermittently, eastbound congestion was found in the right two lanes on I-10 approaching the SR 51/Loop 202 interchange; congestion may have been caused by vehicles merging into these lanes to access the ramps to SR 51 and Loop 202.

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

I-10 (91ST AVE - SR 51)

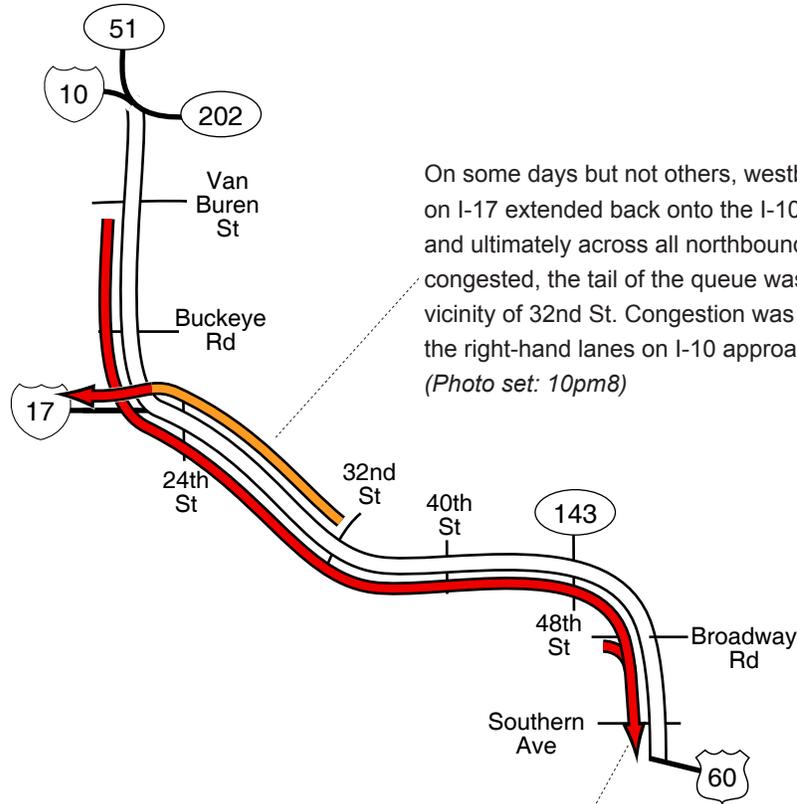
EVENING (3:00 - 7:00 P.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-10 (SR 51 - US 60)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



On some days but not others, westbound congestion on I-17 extended back onto the I-10/I-17 freeway ramp, and ultimately across all northbound lanes of I-10; when congested, the tail of the queue was typically found in the vicinity of 32nd St. Congestion was particularly severe in the right-hand lanes on I-10 approaching the ramp to I-17. (Photo set: 10pm8)

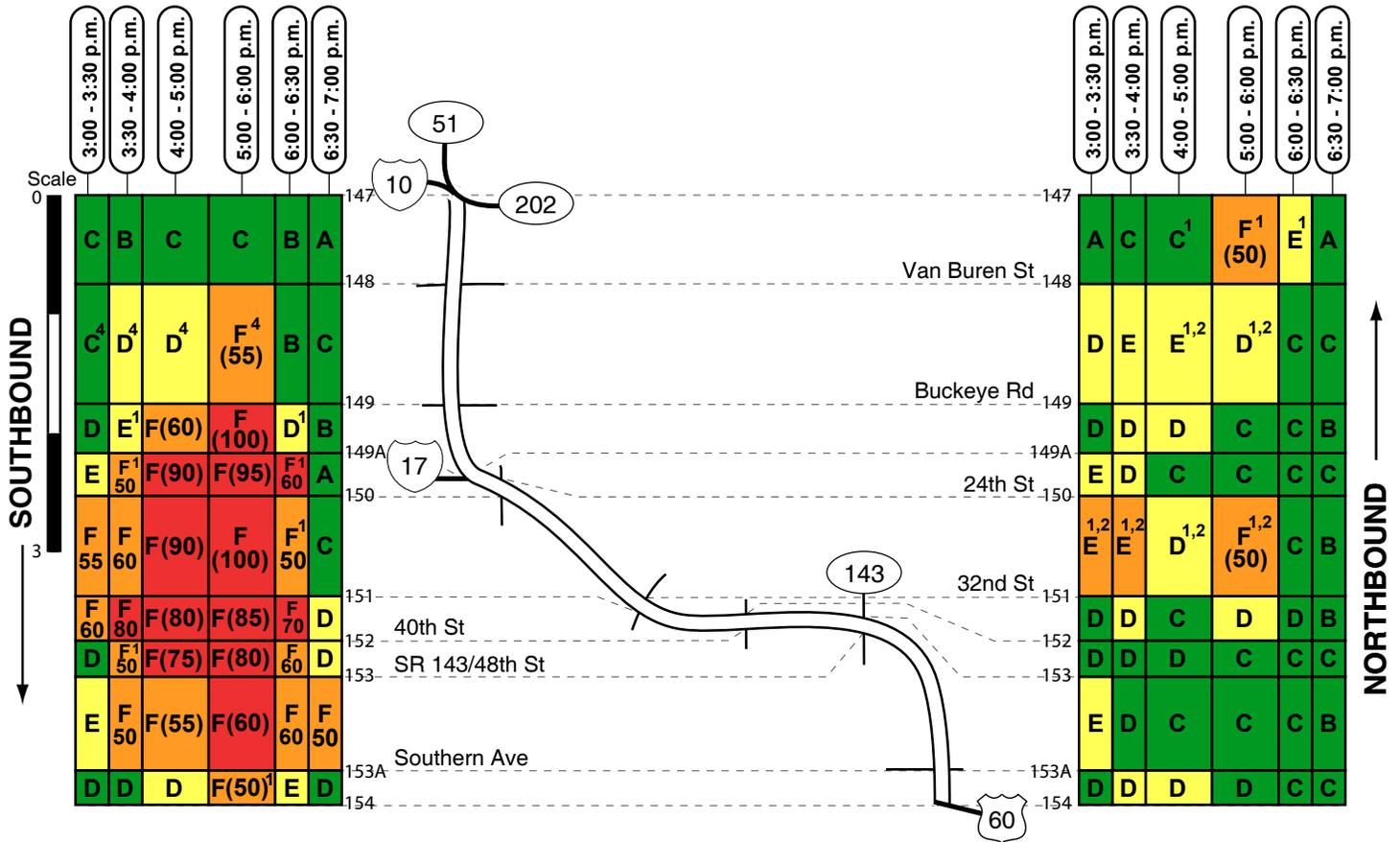
Throughout the evening survey period varying degrees of southeast-bound congestion was found on I-10 between Van Buren St and US 60; during the peak period, estimated speeds typically ranged from 10 to 30 mph. Factors that appeared to contribute to the congestion included: 1) roadway geometrics (curve); 2) traffic merging from the ramp at I-17 (three lane ramp); 3) traffic merging from SR 143 / Broadway Rd; 4) the lane drop (4 lanes to 3) at US 60. (Photo set: 10pm4)

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

I-10 (SR 51 - US 60)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



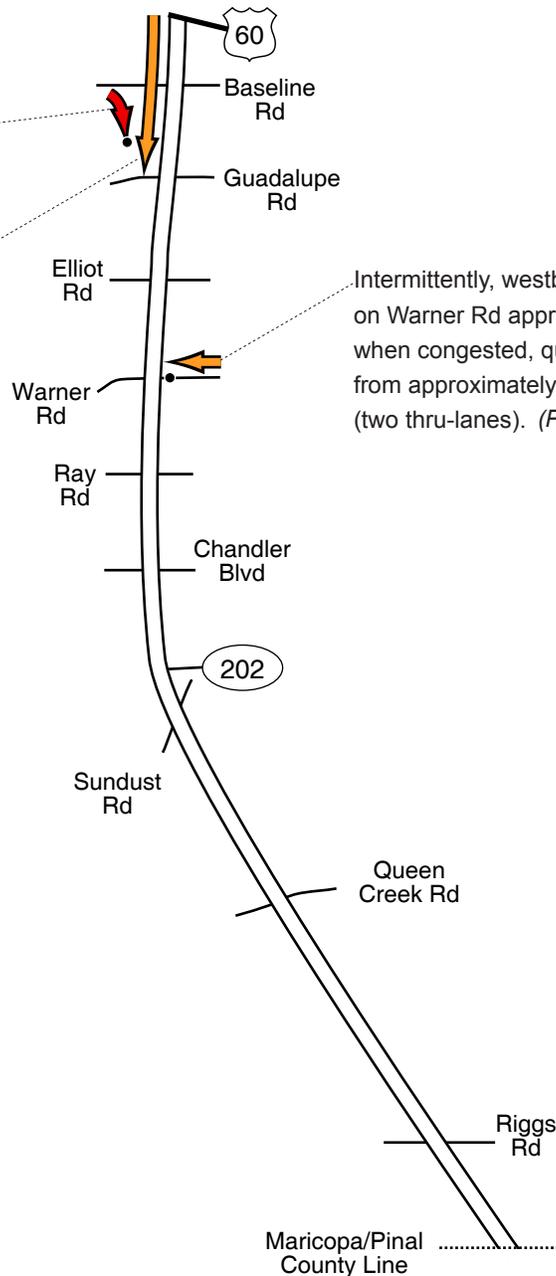
I-10 (US 60 - MARICOPA/PINAL CO. LINE)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

During most observations between 3:30 and 6:30 p.m., congestion was found on the southbound entrance ramp at Baseline Rd; the queue populations at the ramp meter ranged from 20 to 40 vehicles per lane (2 lanes). (Photo set: 10pm12)

During most observations between 4:00 and 6:30 p.m., southbound congestion was found on I-10 between US 60 and Guadalupe Rd; estimated speeds during the peak period typically ranged from 30 to 55 mph. Congestion appeared to be caused or exacerbated by traffic merging from the ramp at Baseline Rd. (Photo set: 10pm1)

Intermittently, westbound congestion was found on Warner Rd approaching the signal at I-10; when congested, queue populations ranged from approximately 20 to 30 vehicles per lane (two thru-lanes). (Photo set: 10pm2)

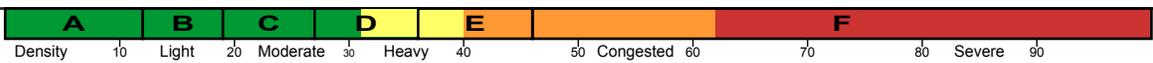
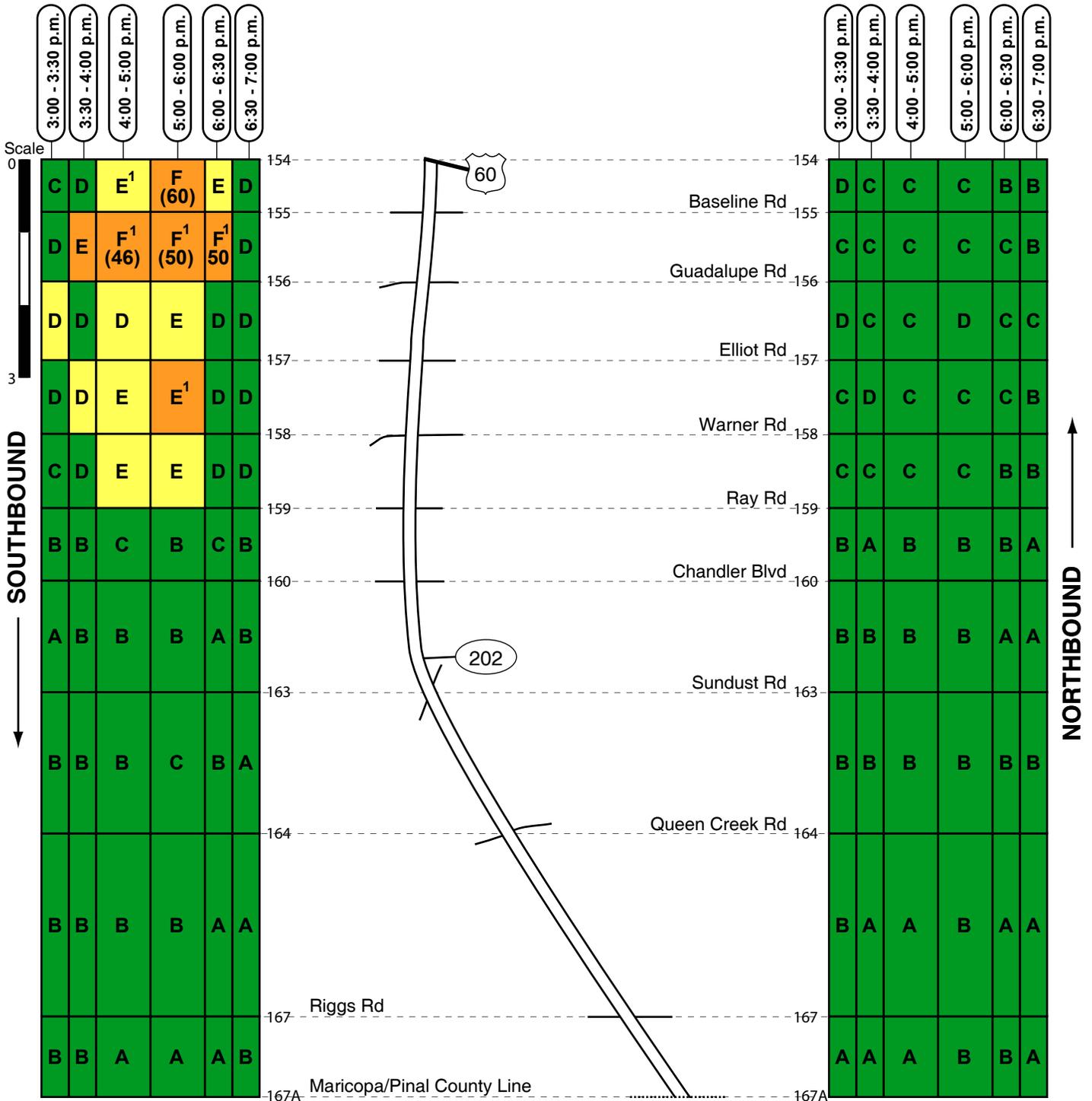


Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

I-10 (US 60 - MARICOPA/PINAL CO. LINE)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



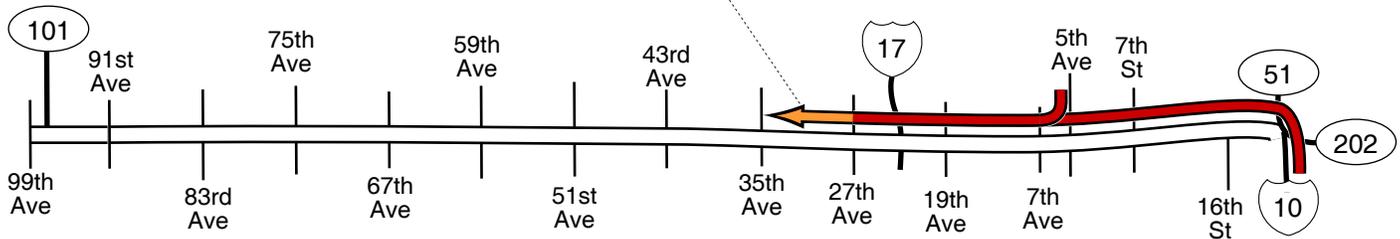
Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-10 HOV (99TH AVE - SR 51)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

[HOV ENFORCEMENT 3:00 - 7:00 P.M.]

During most observations between 3:30 and 6:30 p.m., westbound congestion was found in the HOV lane on I-10 between SR 51 and 35th Ave; estimated speeds during the peak period typically ranged from 15 to 30 mph. Factors that may have contributed to the congestion included: 1) the merge with traffic entering from the Loop 202 HOV facility; 2) traffic merging from the ramp originating at 5th Ave and 3rd Ave; 3) high 2+ occupancy vehicle demand. *(Photo set: 10hovpm2)*



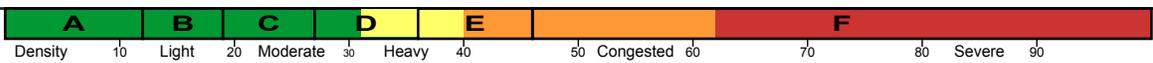
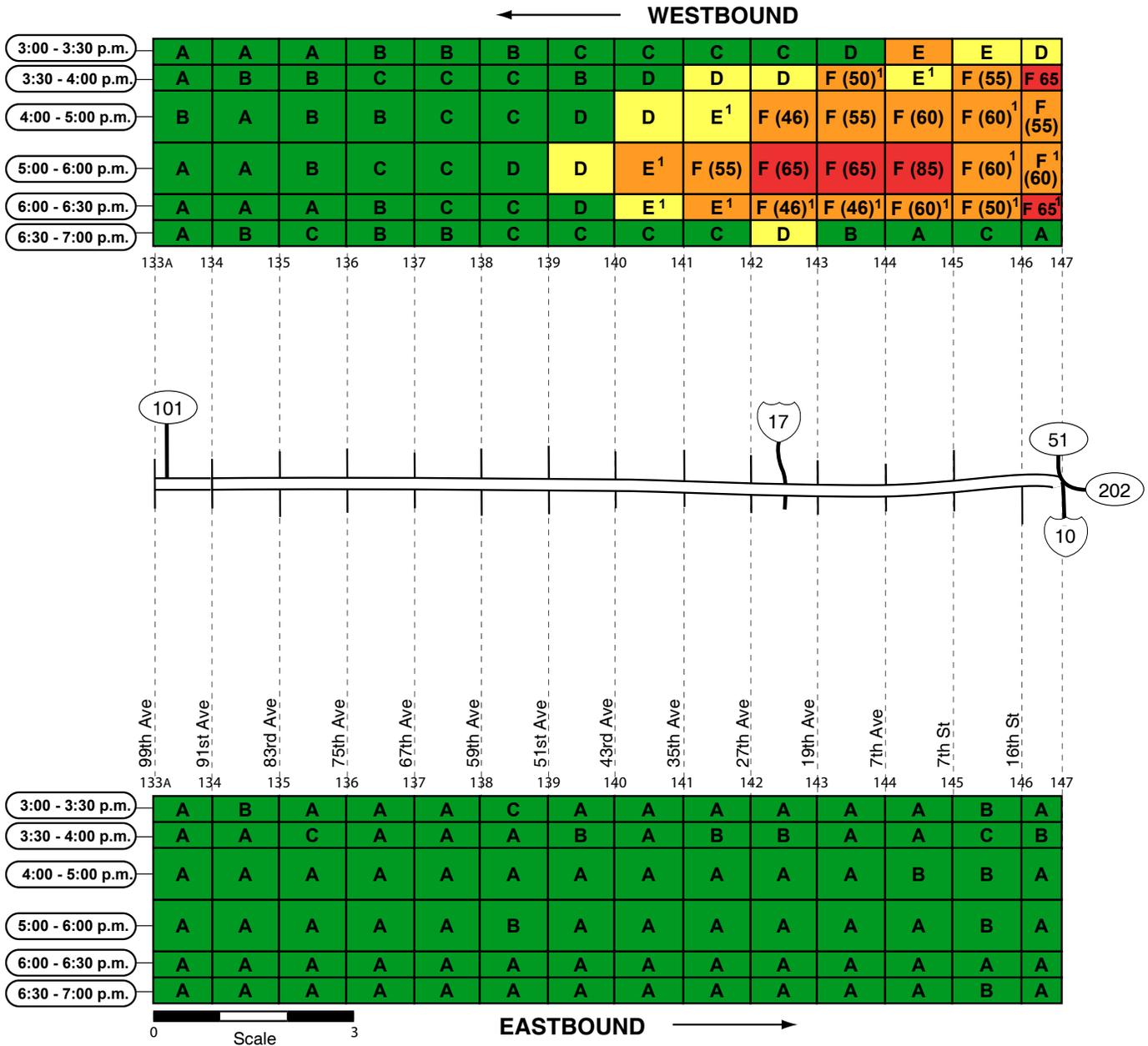
Legend

- | | | | |
|--|--|--|----------------------------|
| | Congested flow (Estimated average speed 30-50 mph) | | Signal Queue - Cross Road |
| | Congested flow (Estimated average speed < 30 mph) | | Entrance / Exit Ramp Queue |

I-10 HOV (99TH AVE - SR 51)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

[HOV ENFORCEMENT 3:00 - 7:00 P.M.]

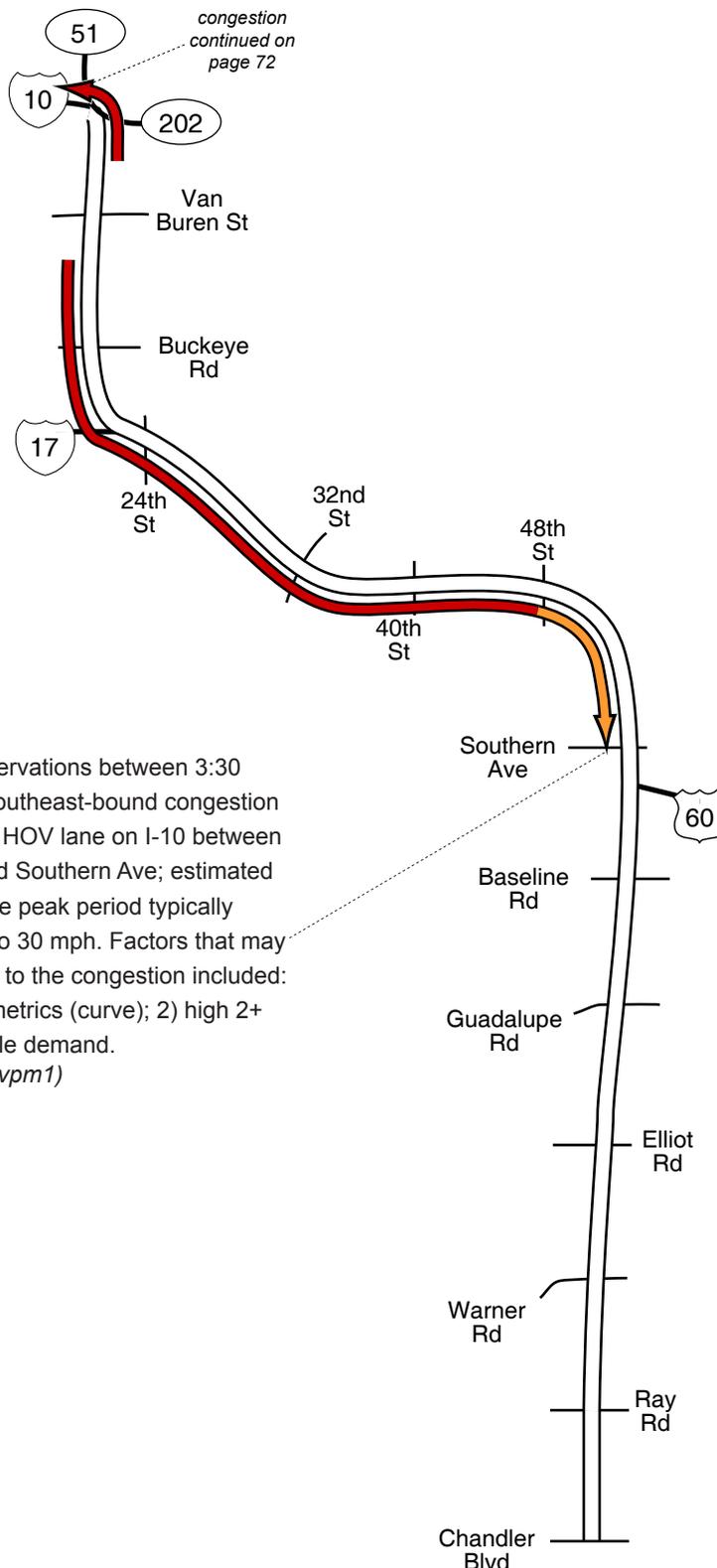


Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-10 HOV (SR 51 - CHANDLER BLVD)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

[HOV ENFORCEMENT 3:00 - 7:00 P.M.]



During most observations between 3:30 and 6:30 p.m., southeast-bound congestion was found in the HOV lane on I-10 between Van Buren St and Southern Ave; estimated speeds during the peak period typically ranged from 15 to 30 mph. Factors that may have contributed to the congestion included: 1) roadway geometrics (curve); 2) high 2+ occupancy vehicle demand.
(Photo set: 10hovpm1)

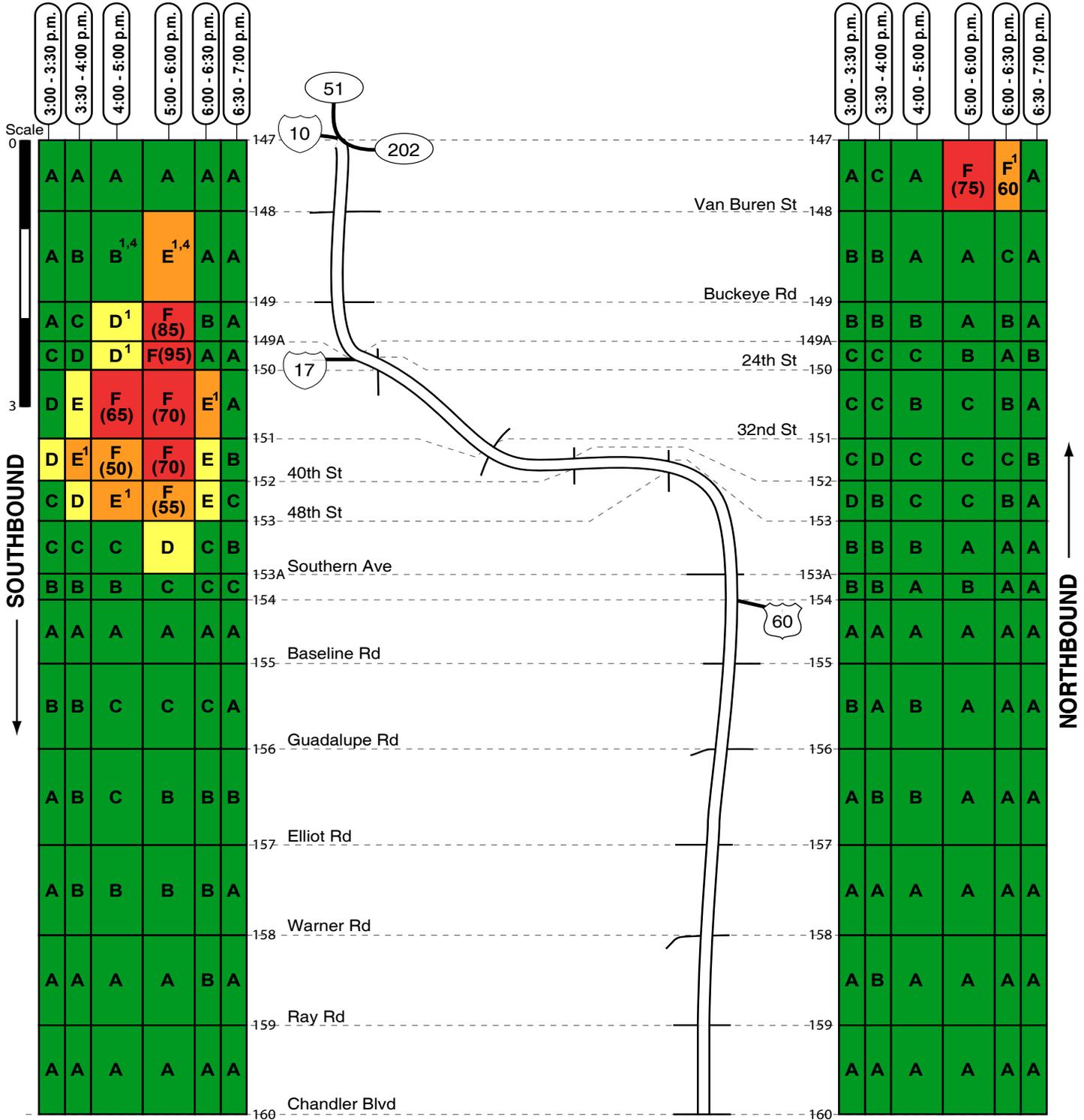
Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

I-10 HOV (SR 51 - CHANDLER BLVD)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

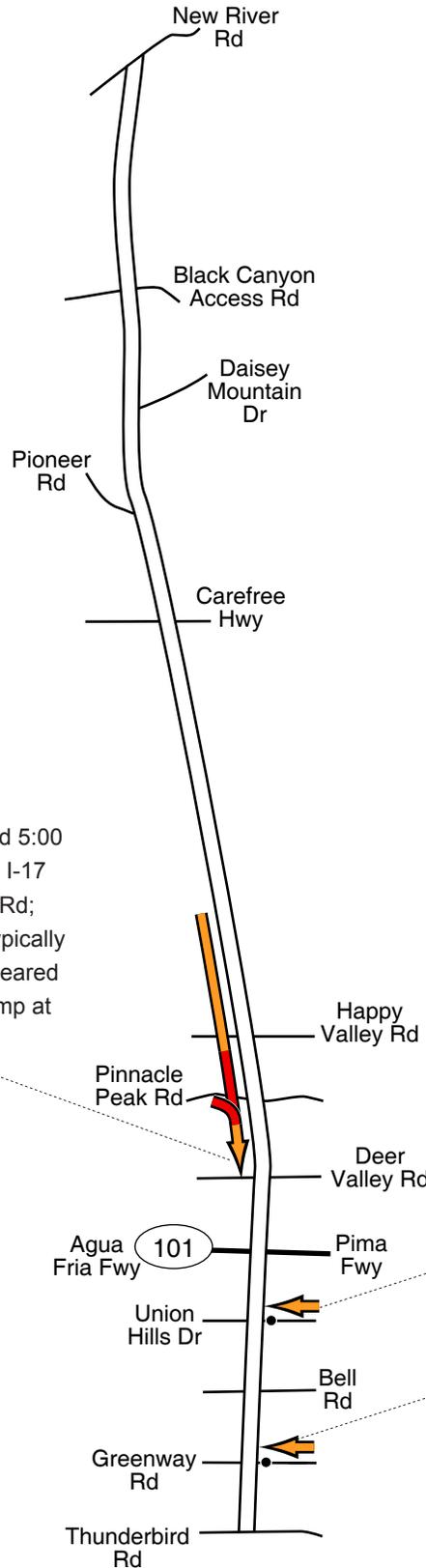
[HOV ENFORCEMENT 3:00 - 7:00 P.M.]



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-17 (NEW RIVER RD - THUNDERBIRD RD)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



During most observations between 3:00 and 5:00 p.m., southbound congestion was found on I-17 between Happy Valley Rd and Deer Valley Rd; estimated speeds during the peak period typically ranged from 25 to 40 mph. Congestion appeared to be caused by traffic merging from the ramp at Pinnacle Peak Rd. *(Photo set: 17pm1)*

Intermittently, westbound congestion was found on Union Hills Dr approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 25 vehicles per lane (two thru-lanes). *(Photo set: 17pm14)*

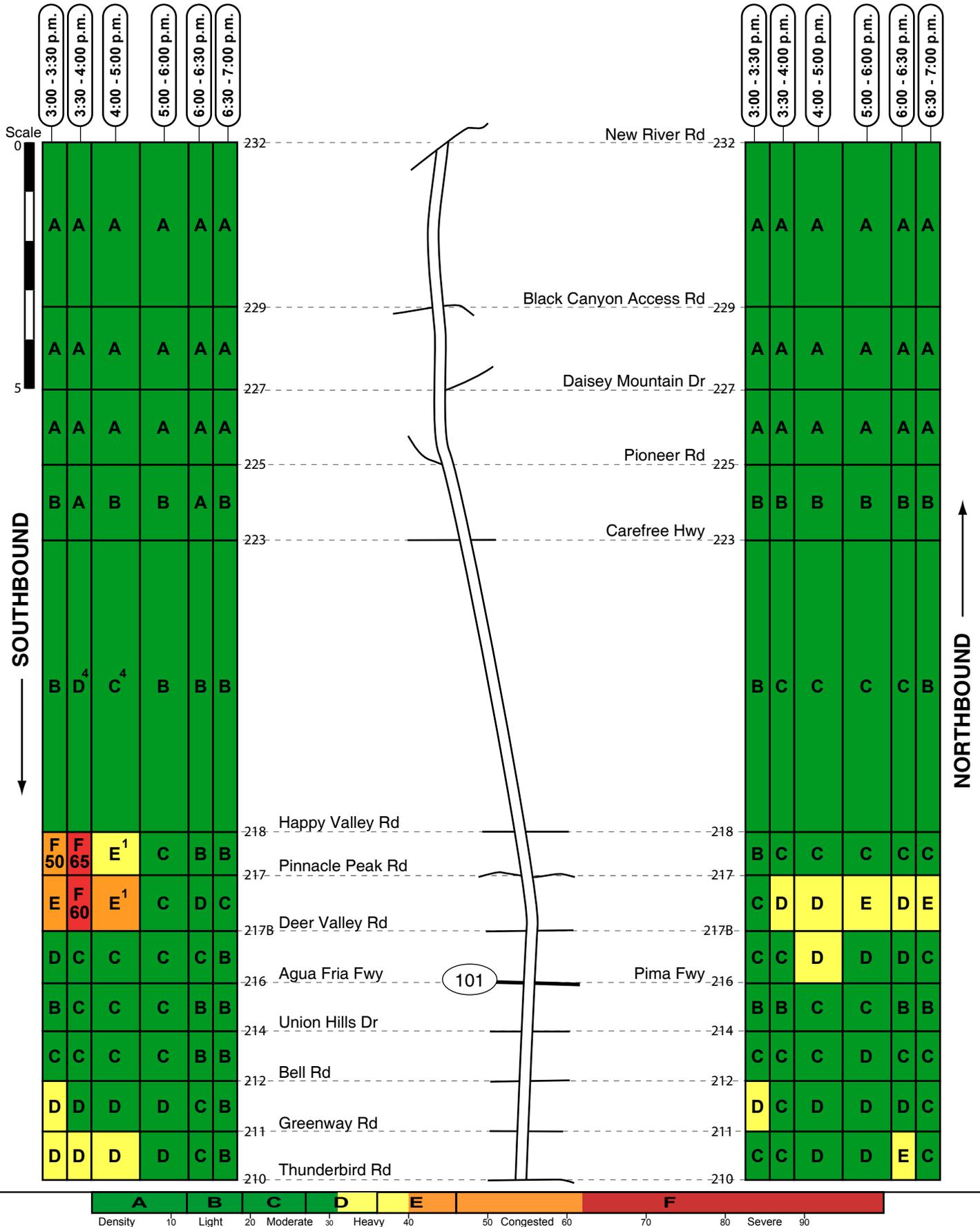
Intermittently, westbound congestion was found on Greenway Rd approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 30 vehicles per lane (two thru-lanes). *(Photo set: 17pm15)*

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

I-17 (NEW RIVER RD - THUNDERBIRD RD)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-17 (THUNDERBIRD RD - I-10)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

Intermittently, westbound congestion was found on Peoria Ave approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 25 vehicles per lane (four thru-lanes).
 (Photo set: 17pm6)

Between 3:00 and 6:30 p.m., intermittent northbound congestion was found on I-17 between Bethany Home Rd and Peoria Ave; when congested, estimated speeds typically ranged from 40 to 55 mph. No apparent cause was found for the congestion along this section of I-17.
 (Photo set: 17pm5)

Between 3:00 and 6:00 p.m., a short zone of southbound congestion was intermittently found on I-17 between Thomas Rd and I-10; when congested, estimated speeds ranged from 30 to 50 mph. Congestion appeared to be caused by the lane drop (4 lanes to 3) at I-10, and vehicles merging into the right lane approaching the I-10 ramps.
 (Photo set: 17pm2)

During most observations between 3:00 and 6:30 p.m., an extended zone of westbound/northbound congestion was found on I-17 between I-10 and Bethany Home Rd; estimated speeds during the peak period along this ten-mile section of I-17 ranged widely, from 15 to 55 mph. Factors contributing to the congestion included: 1) Traffic merging from the ramps at 7th Ave, Grant St, Van Buren St, I-10 and Thomas Rd; 2) the lane drop (3 lanes to 2) at I-10; 3) the lane drop (4 lanes to 3) between McDowell Rd and Thomas Rd.
 (Photo set: 17pm4)

Intermittently, northbound congestion was found on 7th Ave approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 25 vehicles per lane (two thru-lanes).
 (Photo set: 17pm12)

Intermittently, westbound congestion was found on Dunlap Ave approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 30 vehicles per lane (three thru-lanes).
 (Photo set: 17pm7)

Between 5:00 and 6:00 p.m., intermittent congestion was found on the northbound exit ramp at Dunlap Ave; when congested, queue populations in the left-turn lanes at the signal ranged from approximately 40 to 50 vehicles (2 lanes).
 (Photo set: 17pm16)

Intermittently, westbound congestion was found on Northern Ave approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 40 vehicles per lane (four thru-lanes).
 (Photo set: 17pm8)

Intermittently, westbound congestion was found on Glendale Ave approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 50 vehicles per lane (three thru-lanes).
 (Photo set: 17pm9)

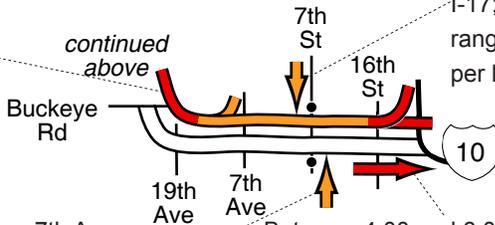
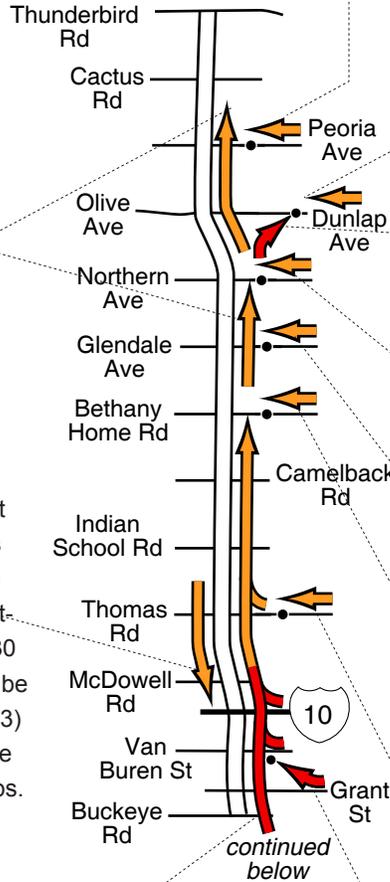
Intermittently, westbound congestion was found on Bethany Home Rd approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 25 vehicles per lane (three thru-lanes).
 (Photo set: 17pm10)

Intermittently (before 5:00 p.m.), congestion was found on the northbound entrance ramp at Grant St; when congested, queue populations at the ramp meter ranged from approximately 20 to 30 vehicles (1 lane).
 (Photo set: 17pm18)

Intermittently, westbound congestion was found on Thomas Rd approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 40 vehicles per lane (three thru-lanes).
 (Photo set: 17pm11)

Intermittently, southbound congestion was found on 7th Ave approaching the signal at I-17; when congested, queue populations ranged from approximately 20 to 25 vehicles per lane (two thru-lanes).
 (Photo set: 17pm13)

Between 4:00 and 6:00 p.m., a short zone of eastbound congestion was intermittently found on I-17 between 16th St and I-10; when congested, the head of the queue was found on the ramp to eastbound I-10.
 (Photo set: 17pm3)

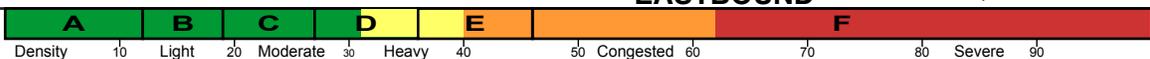
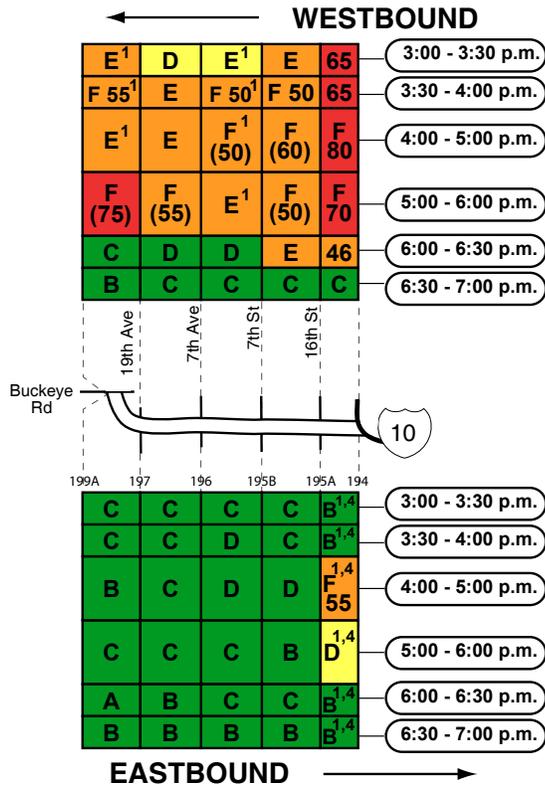
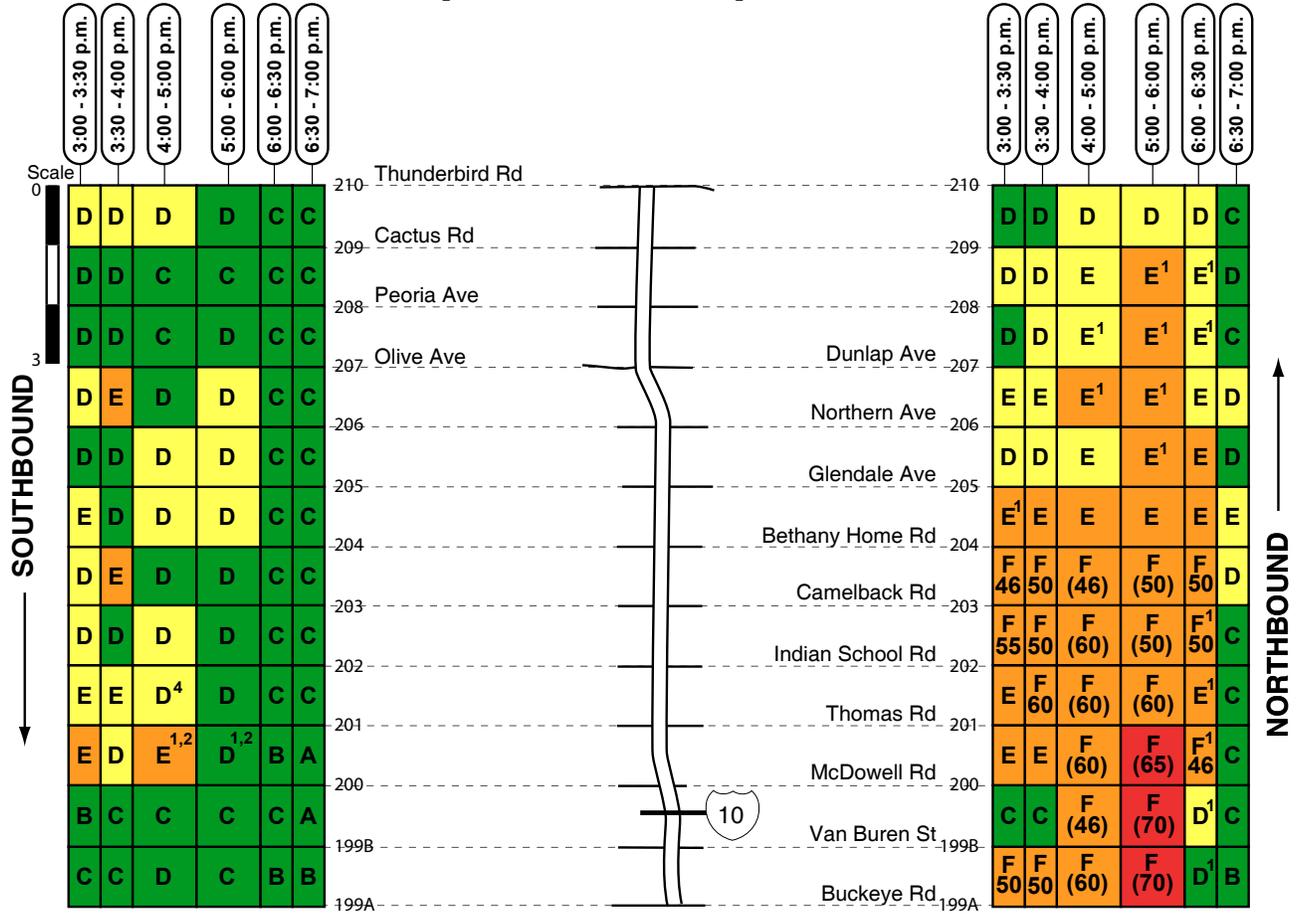


Legend

- Congested flow (Estimated average speed 30-50 mph)
- Congested flow (Estimated average speed < 30 mph)
- Signal Queue - Cross Road
- Entrance / Exit Ramp Queue

I-17 (THUNDERBIRD RD - I-10)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

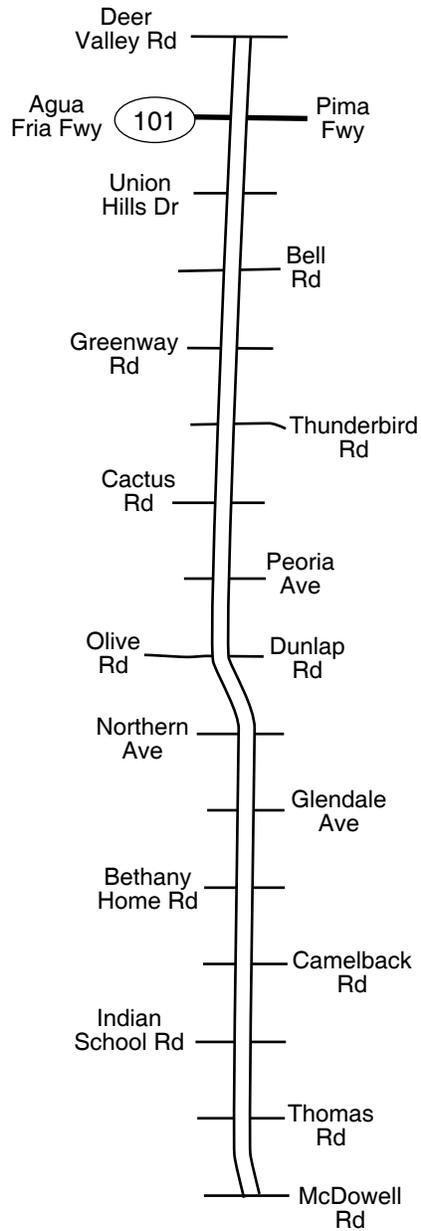


Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

I-17 HOV

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

[HOV ENFORCEMENT 3:00 - 7:00 P.M.]



No congestion was found on the I-17 HOV facility during the evening survey period.

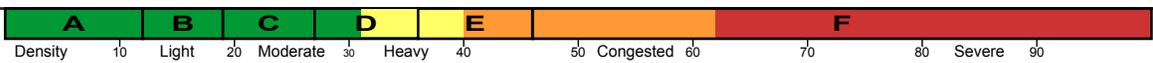
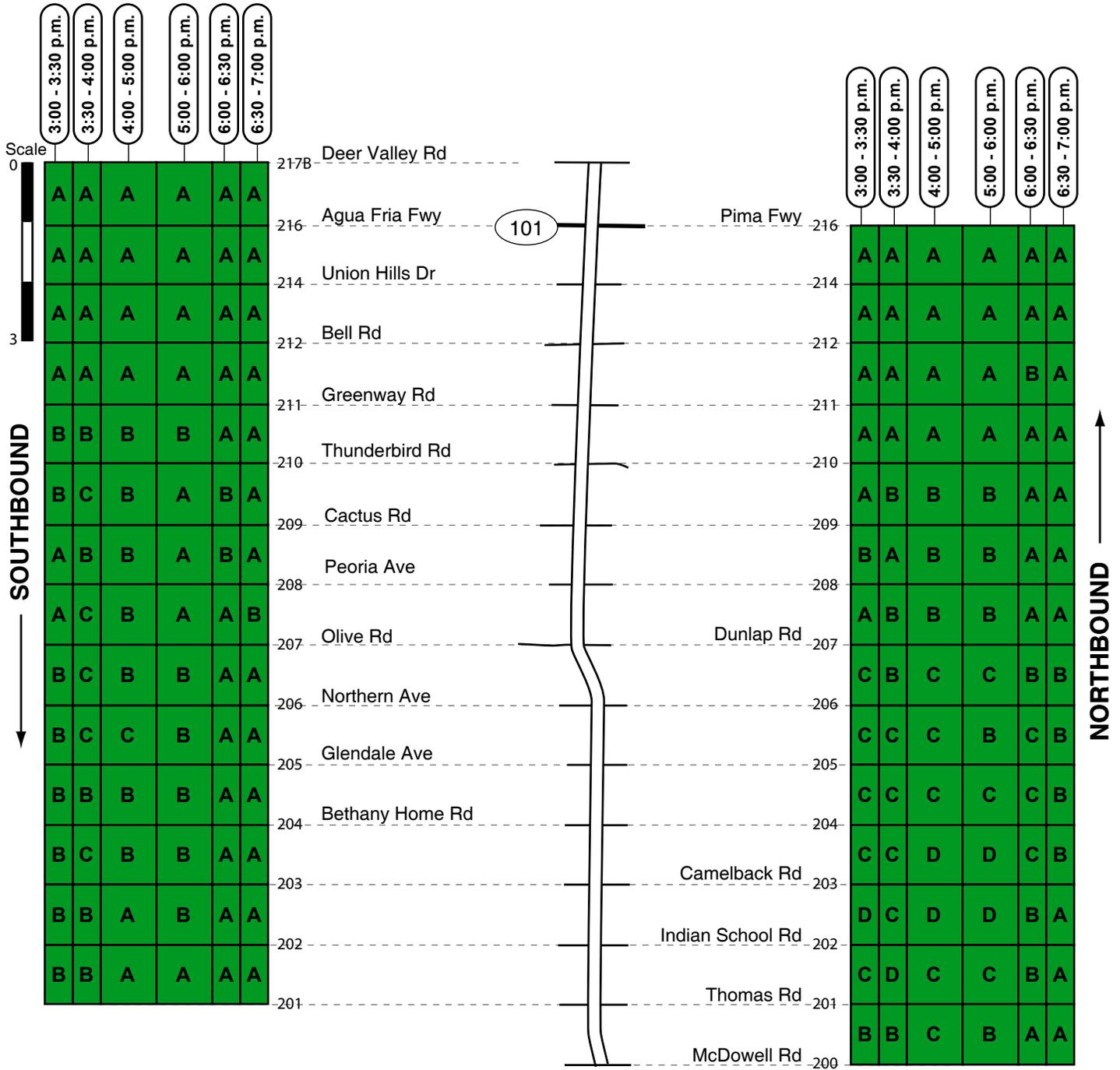
Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

I-17 HOV

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

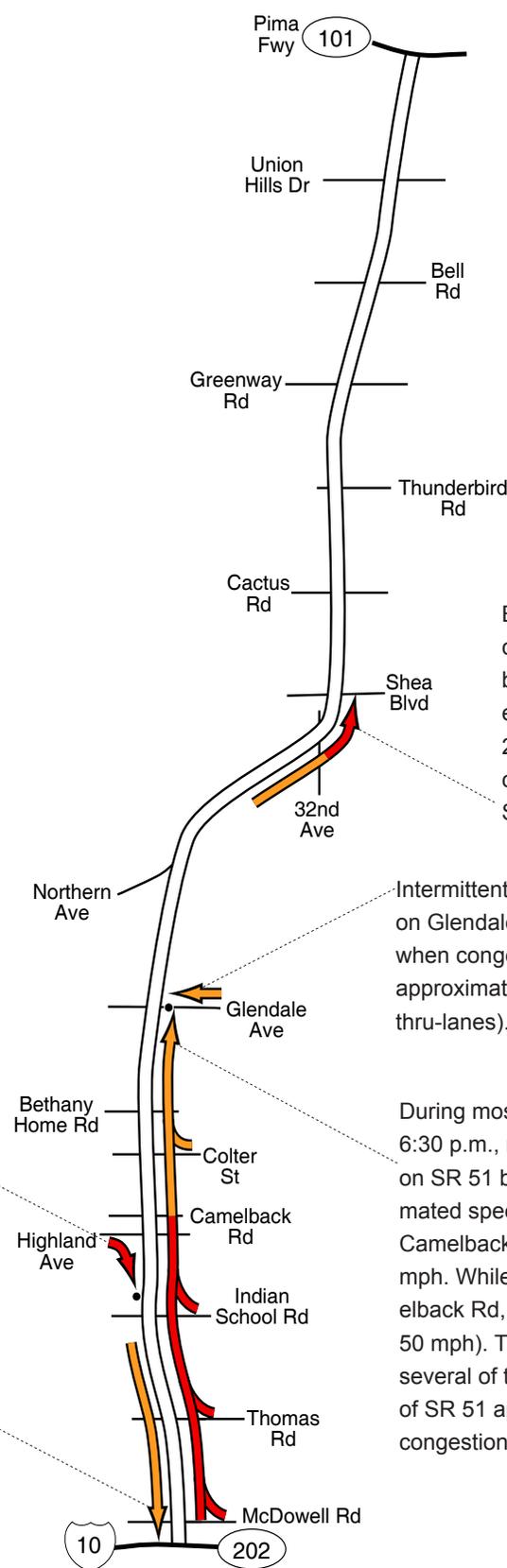
[HOV ENFORCEMENT 3:00 - 7:00 P.M.]



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

SR 51

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



During most observations between 3:00 and 6:30 p.m., congestion was found on the southbound entrance ramp at Highland Ave; queue populations at the ramp meter ranged from approximately 20 to 40 vehicles per lane (2 lanes). (Photo set: 51pm5)

Intermittently, westbound congestion was found on Glendale Rd approaching the signal at SR 51; when congested, queue populations ranged from approximately 20 to 25 vehicles per lane (two thru-lanes). (Photo set: 51pm4)

During most observations between 4:00 and 5:30 p.m., a one to two mile zone of southbound congestion was found on SR 51 approaching the terminus at I-10; estimated speeds typically ranged from 30 to 50 mph. Factors contributing to the congestion included: 1) the lane drop (3 lanes to 2) at I-10; 2) vehicles queuing in the right lanes approaching the ramp to I-10 WB/Loop 202 EB. (Photo set: 51pm1)

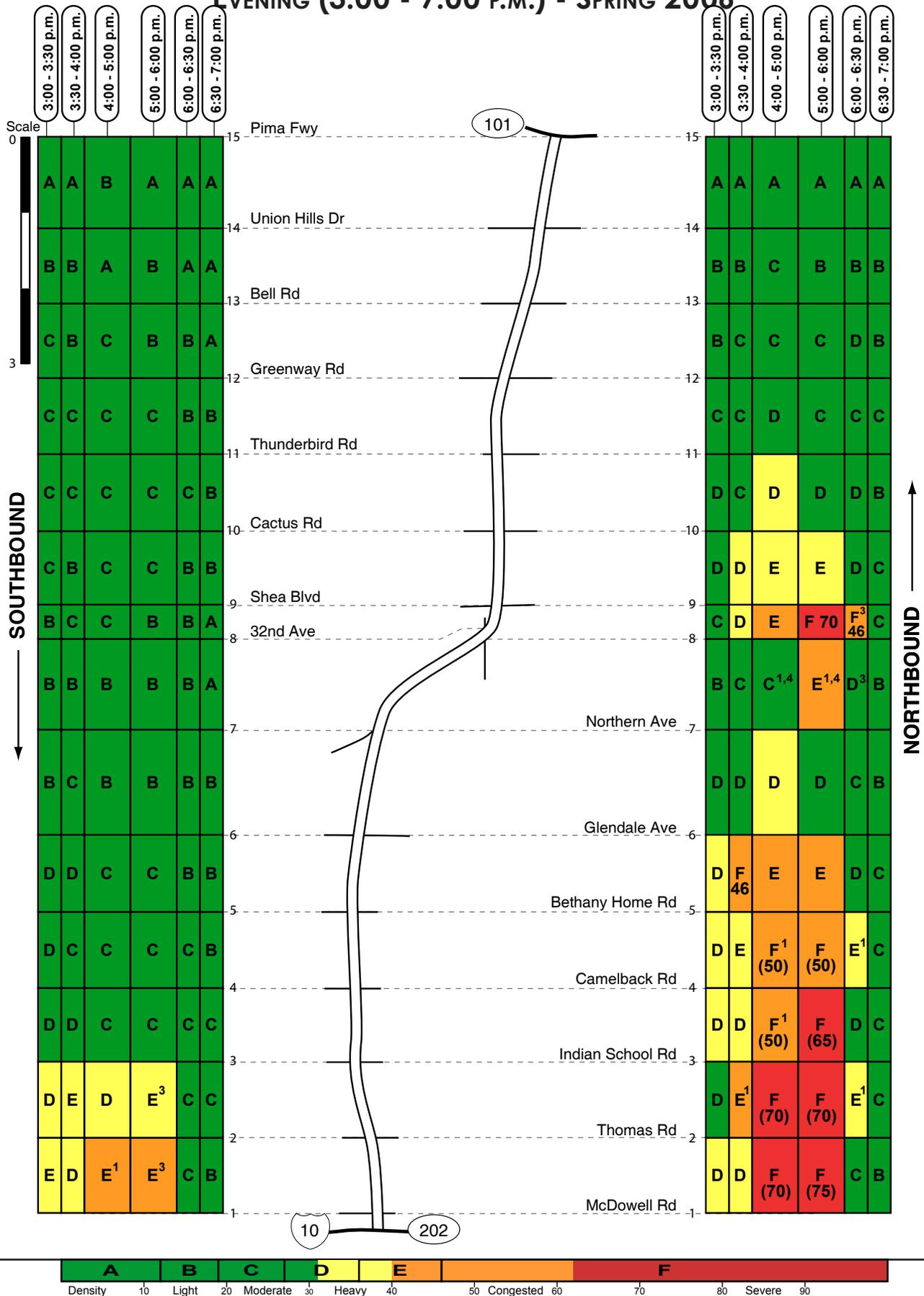
During most observations between 4:00 and 6:30 p.m., northbound congestion was found on SR 51 between I-10 and Glendale Ave; estimated speeds during the peak period (south of Camelback Rd) typically ranged from 15 to 30 mph. While congestion persisted north of Camelback Rd, traffic flow generally improved (30 to 50 mph). Traffic merging from the ramps at the several of the interchanges along this section of SR 51 appeared to cause or exacerbate the congestion. (Photo set: 51pm3)

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

SR 51

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

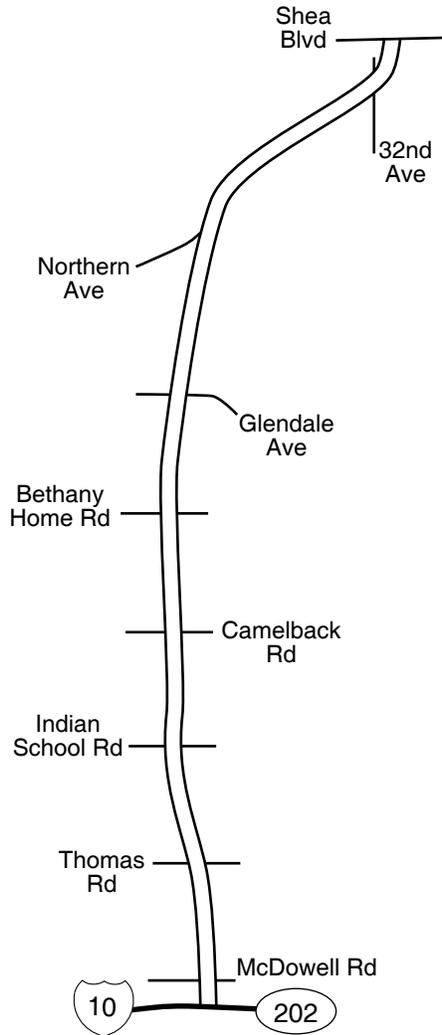


Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

SR 51 HOV

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

[HOV ENFORCEMENT 3:00 - 7:00 P.M.]



No congestion was found on the SR 51 HOV facility during the evening survey period.

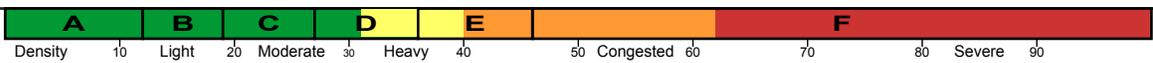
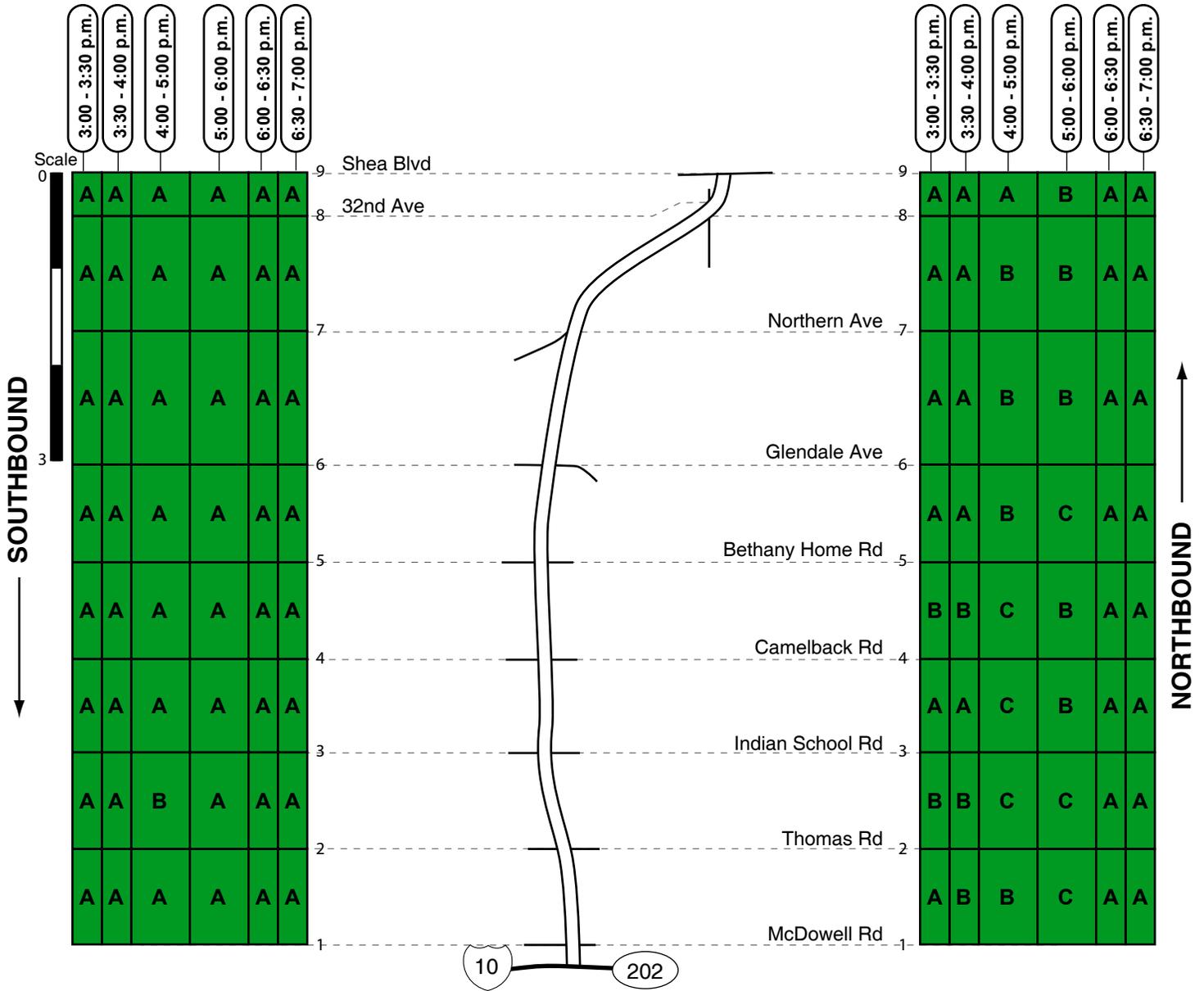
Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

SR 51 HOV

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

[HOV ENFORCEMENT 3:00 - 7:00 P.M.]



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

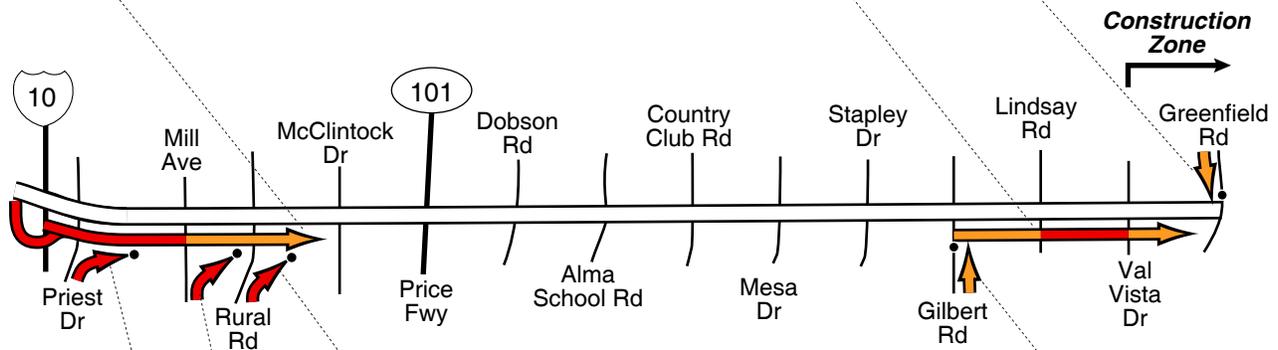
US 60 (I-10 - GREENFIELD RD)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

During most observations between 3:00 and 6:00 p.m., eastbound congestion was found on US 60 between Priest Dr and McClintock Dr; estimated speeds during the peak period ranged widely, from 20 to 50 mph. Traffic merging from the ramps at I-10 and Priest Dr appeared to cause or exacerbate the congestion. (Photo set: 60pm1)

During most observations between 3:00 and 6:00 p.m., eastbound congestion was found on US 60 between Gilbert Rd and Val Vista Dr; estimated speeds during the peak period typically ranged from 25 to 40 mph. Congestion appeared to be caused by the lane drop (4 lanes to 3), and the termination of the HOV facility at Val Vista Dr. (Photo set: 60pm2)

Intermittently, southbound congestion was found on Greenfield Rd approaching the signal at US 60; when congested, queue populations ranged from approximately 20 to 40 vehicles per lane (one lane). In some cases, congestion extended back through the upstream signal at Southern Ave (construction at the US 60 interchange may have exacerbated the congestion). (Photo set: 60pm4)



During most observations between 3:30 and 6:30 p.m., congestion was found on the eastbound entrance ramp at Priest Dr; queue populations at the ramp meter ranged from approximately 20 to 35 vehicles per lane (2 lanes). (Photo set: 60pm5)

During most observations between 4:30 and 6:00 p.m., congestion was found on the eastbound entrance ramp at Rural Rd; queue populations at the ramp meter ranged from approximately 20 to 25 vehicles per lane (2 lanes). (Photo set: 60pm7)

Intermittently, northbound congestion was found on Gilbert Rd approaching the signal at US 60; when congested, queue populations ranged from approximately 20 to 30 vehicles per lane (two left-turn lanes to westbound US 60). (Photo set: 60pm3)

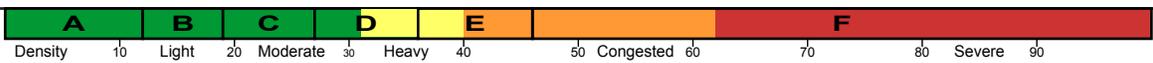
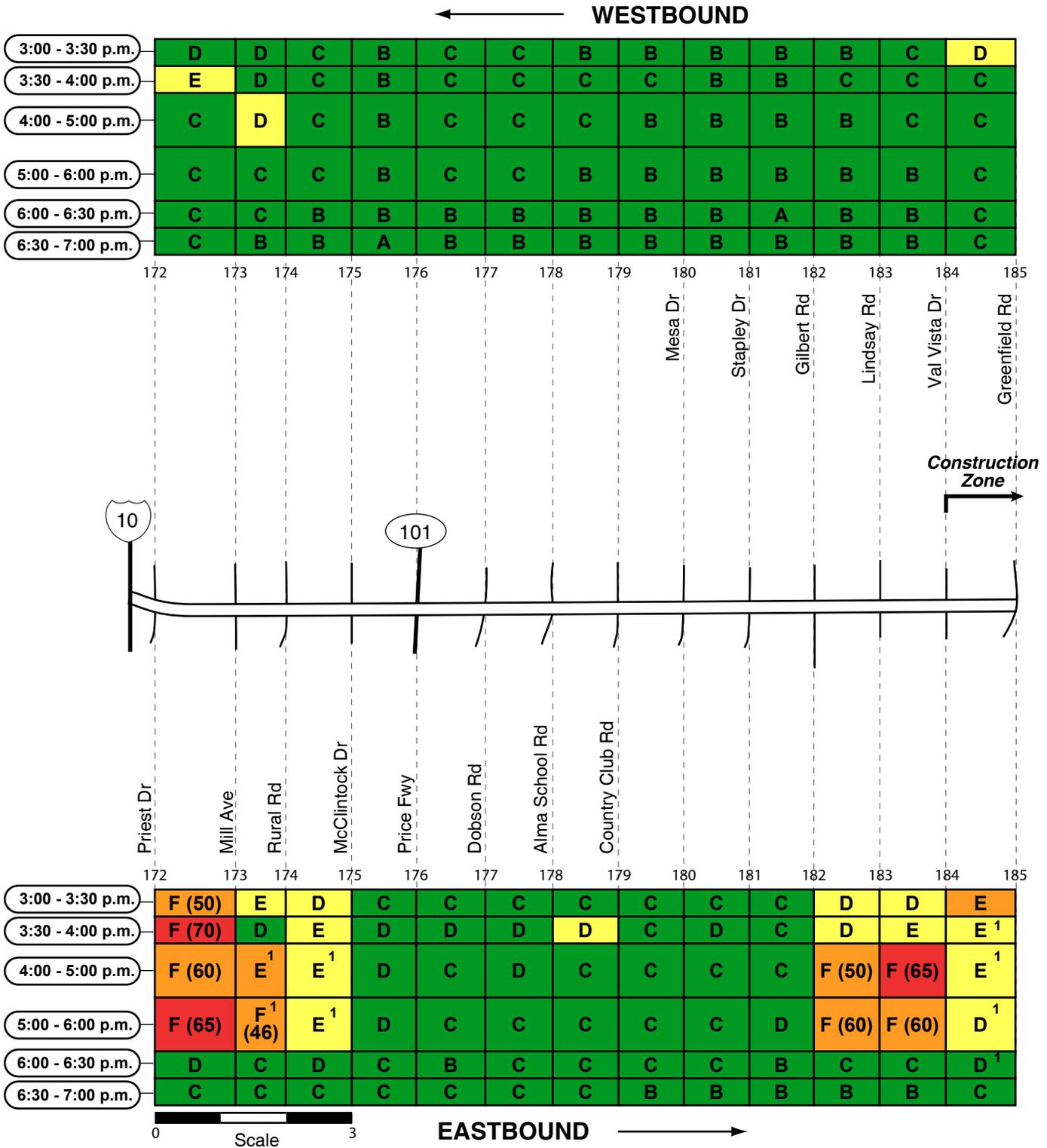
Between 4:00 and 5:30 p.m., intermittent congestion was found on the eastbound entrance ramp at Mill Ave; when congested, queue populations at the ramp meter ranged from approximately 20 to 25 vehicles per lane (2 lanes). (Photo set: 60pm6)

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

US 60 (I-10 - GREENFIELD RD)

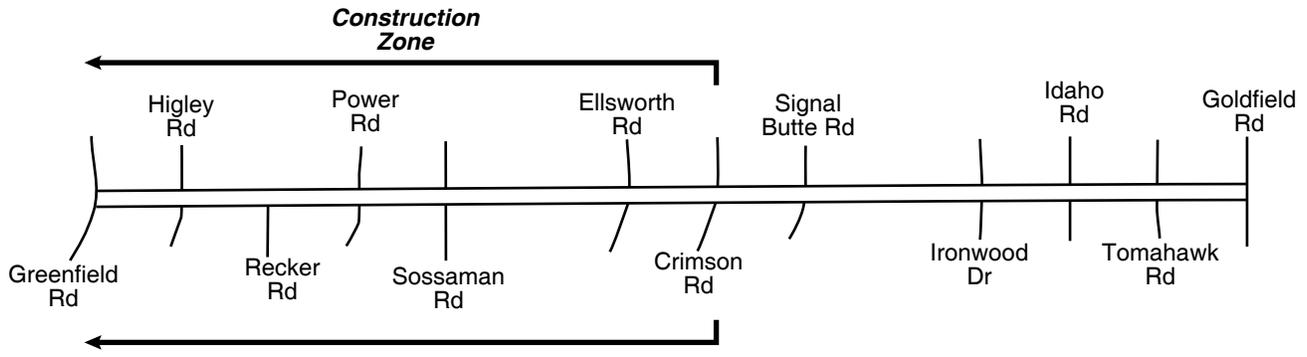
EVENING (3:00 - 7:00 P.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

US 60 (GREENFIELD RD - GOLDFIELD RD)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



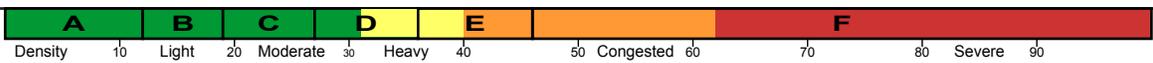
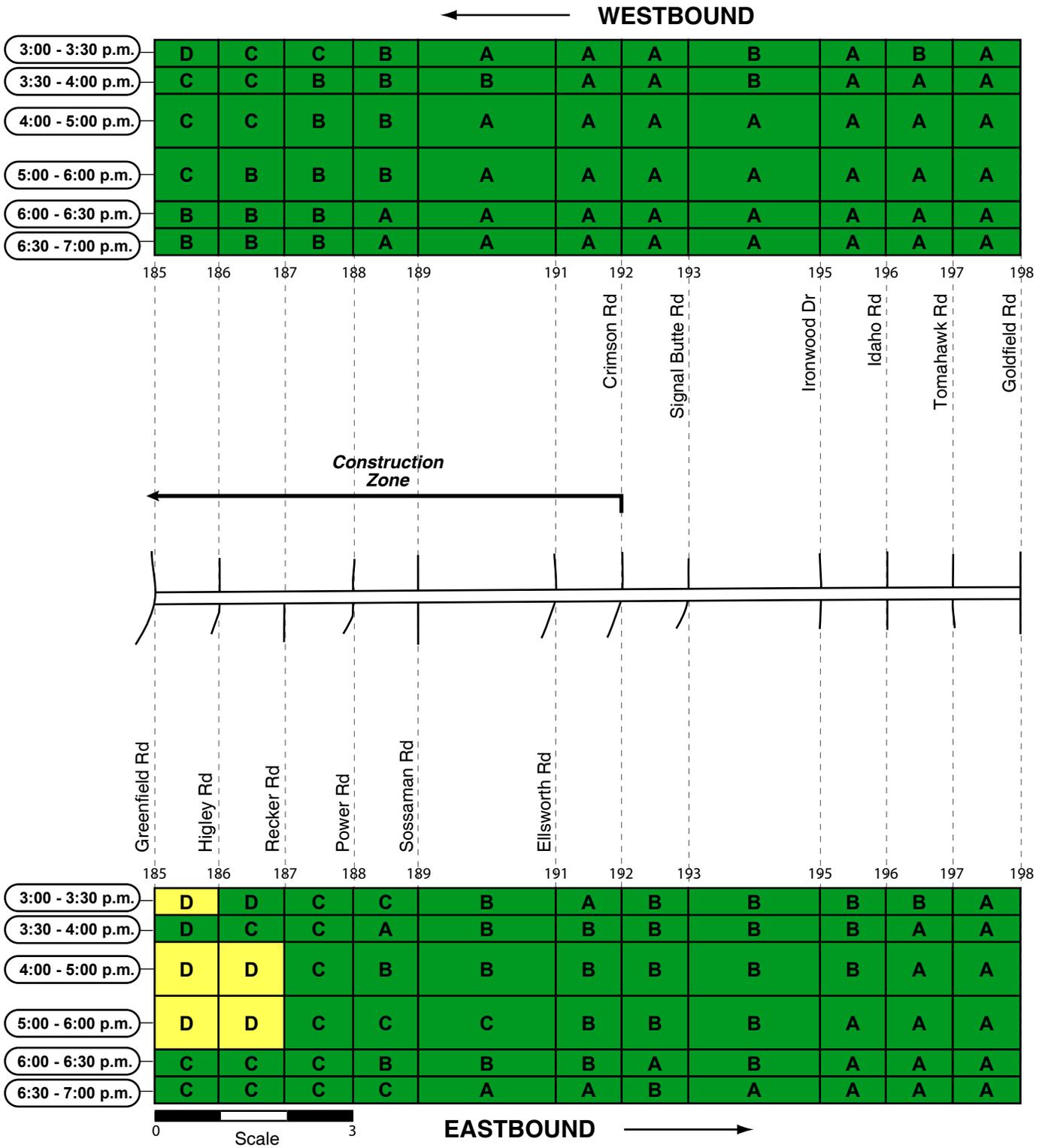
No congestion was found on US 60 between Greenfield Rd and Goldfield Rd during the evening survey period.

Legend

- | | | | |
|--|--|--|----------------------------|
| | Congested flow (Estimated average speed 30-50 mph) | | Signal Queue - Cross Road |
| | Congested flow (Estimated average speed < 30 mph) | | Entrance / Exit Ramp Queue |

US 60 (GREENFIELD RD - GOLDFIELD RD)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

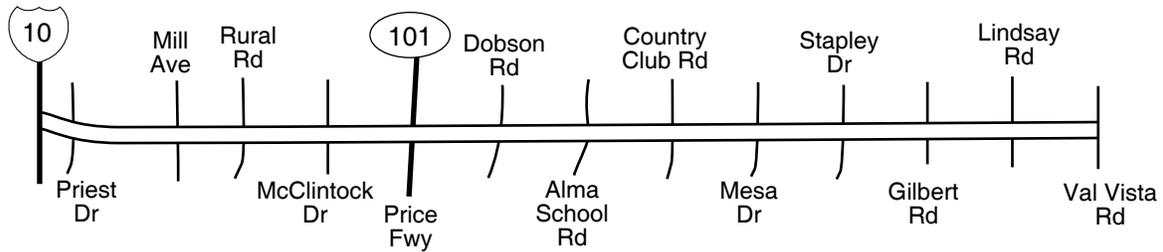


Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

US 60 HOV

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

[HOV ENFORCEMENT 3:00 - 7:00 P.M.]



No congestion was found on the US 60 HOV facility during the evening survey period.

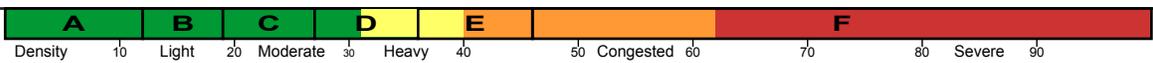
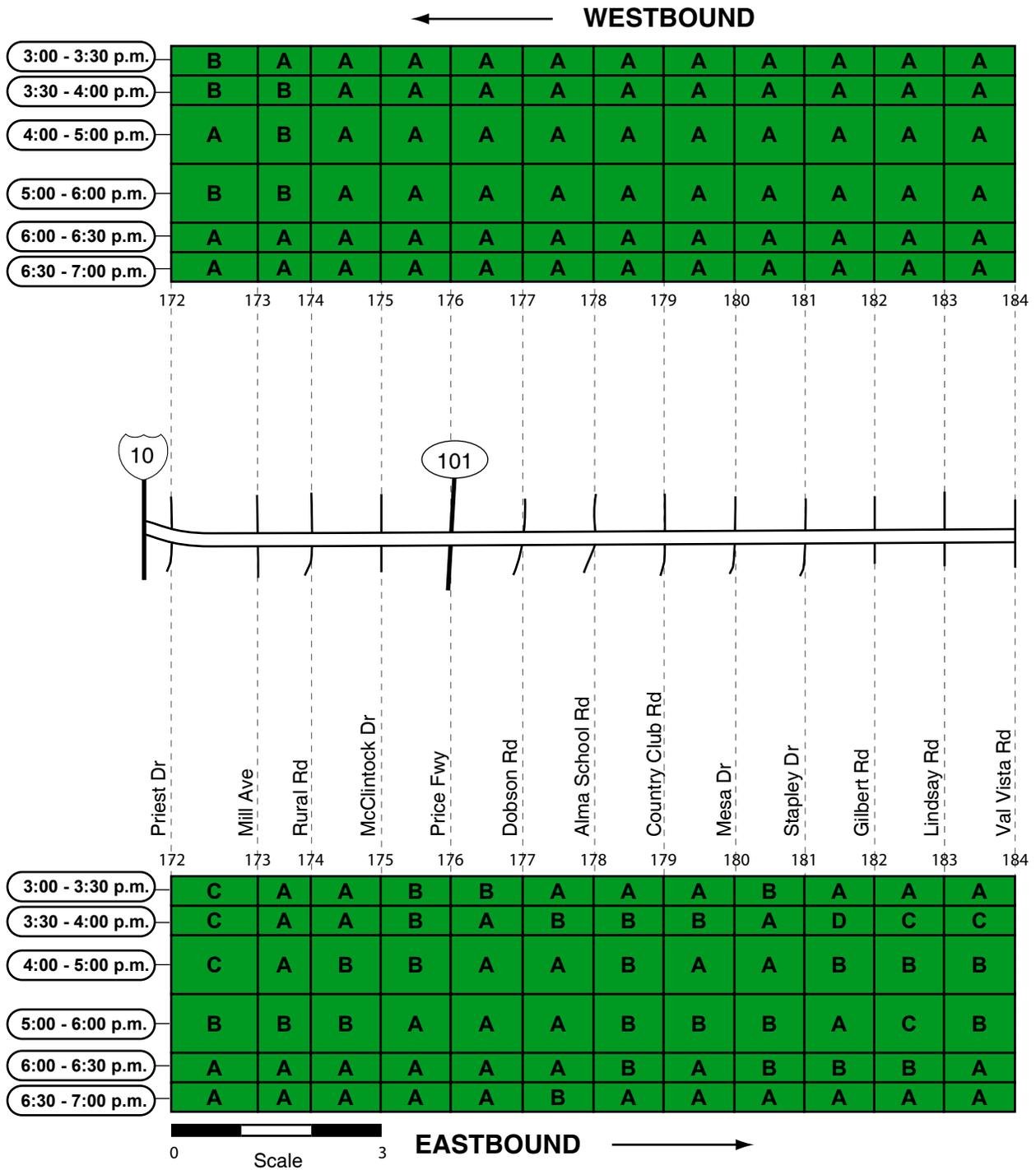
Legend

- | | | | |
|---|--|---|----------------------------|
|  | Congested flow (Estimated average speed 30-50 mph) |  | Signal Queue - Cross Road |
|  | Congested flow (Estimated average speed < 30 mph) |  | Entrance / Exit Ramp Queue |

US 60 HOV

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

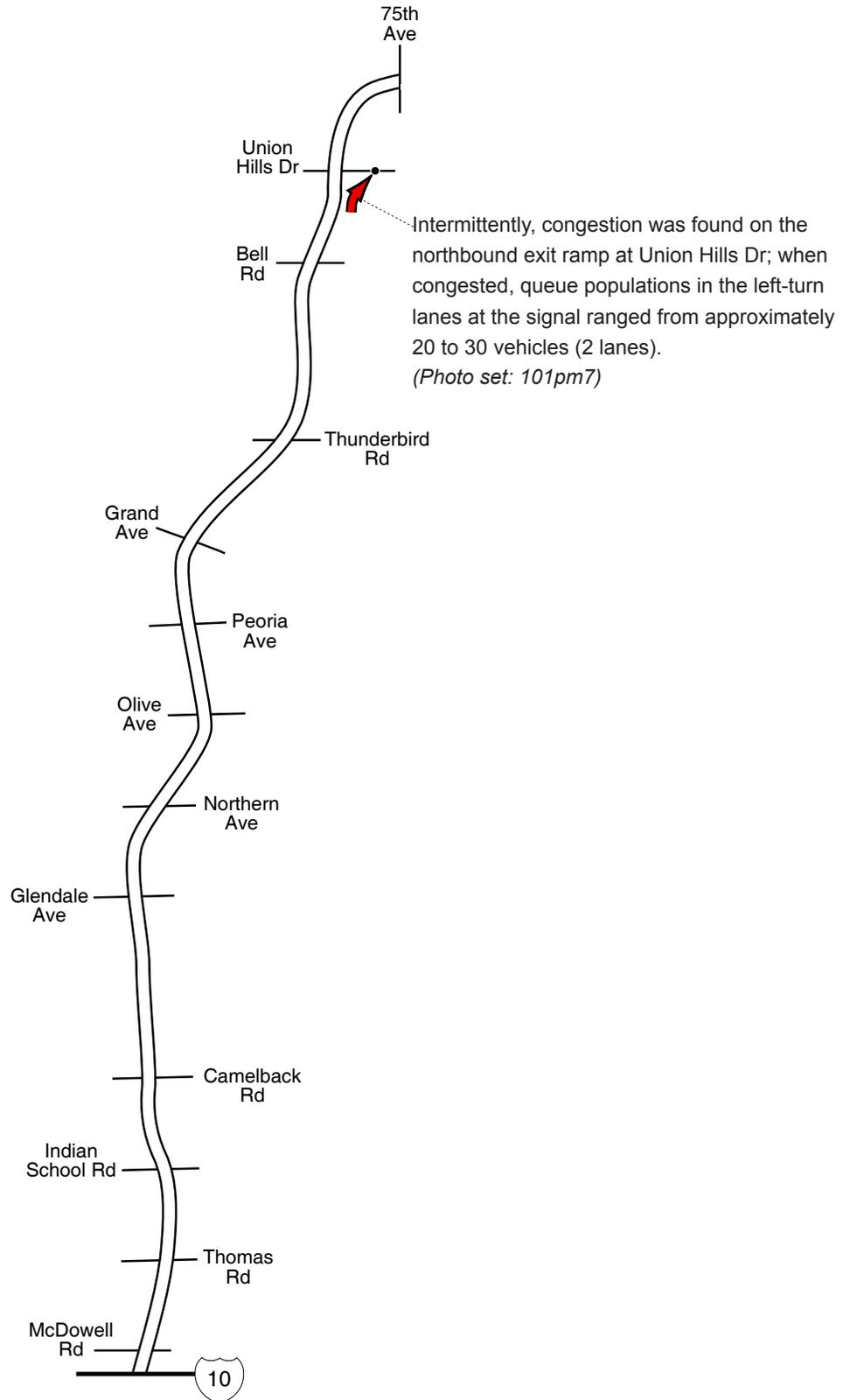
[HOV ENFORCEMENT 3:00 - 7:00 P.M.]



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

Loop 101 (I-10 - 75TH AVE)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

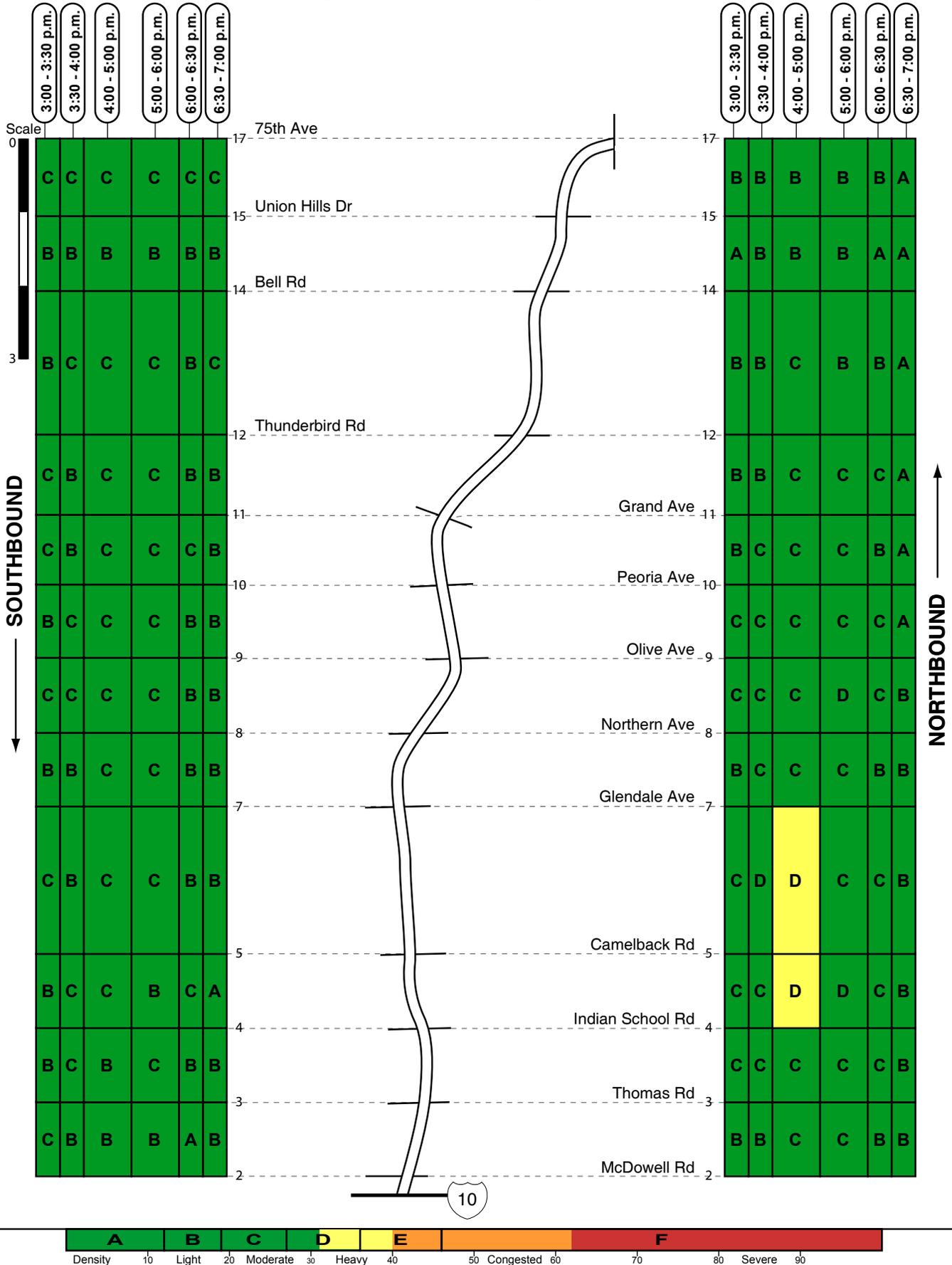


Legend

Congested flow (Estimated average speed 30-50 mph)	Signal Queue - Cross Road
Congested flow (Estimated average speed < 30 mph)	Entrance / Exit Ramp Queue

Loop 101 (I-10 - 75th Ave)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

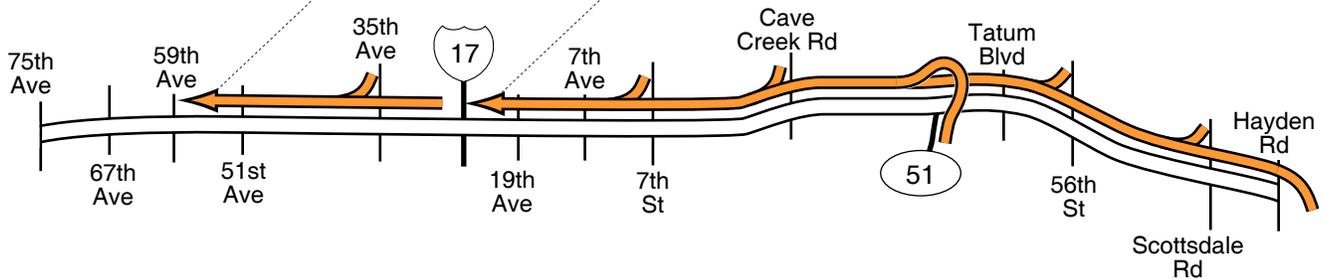


Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

LOOP 101 (75TH AVE - HAYDEN RD) EVENING (3:00 - 7:00 P.M.) - SPRING 2006

During most observations between 4:00 and 6:00 p.m., westbound congestion was found on Loop 101 between I-17 and 59th Ave; estimated speeds typically ranged from 35 to 50 mph. Congestion appeared to be caused by traffic merging from the ramp at 35th Ave, and the lane drop (4 lanes to 3) at 51st Ave. *(Photo set: 101pm6)*

During most observations between 3:30 and 6:00 p.m., westbound congestion was found on Loop 101 between Hayden Rd and I-17; during the peak period, estimated speeds typically ranged from 30 to 50 mph. Congestion appeared to be caused or exacerbated by traffic merging from the ramps at the series of interchanges along this section of Loop 101 (including the freeway ramp at SR 51), and the lane drop (3 lanes to 2) at the ramp to I-17. *(Photo set: 101pm5)*

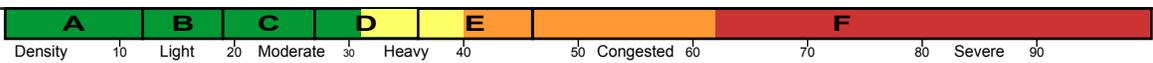
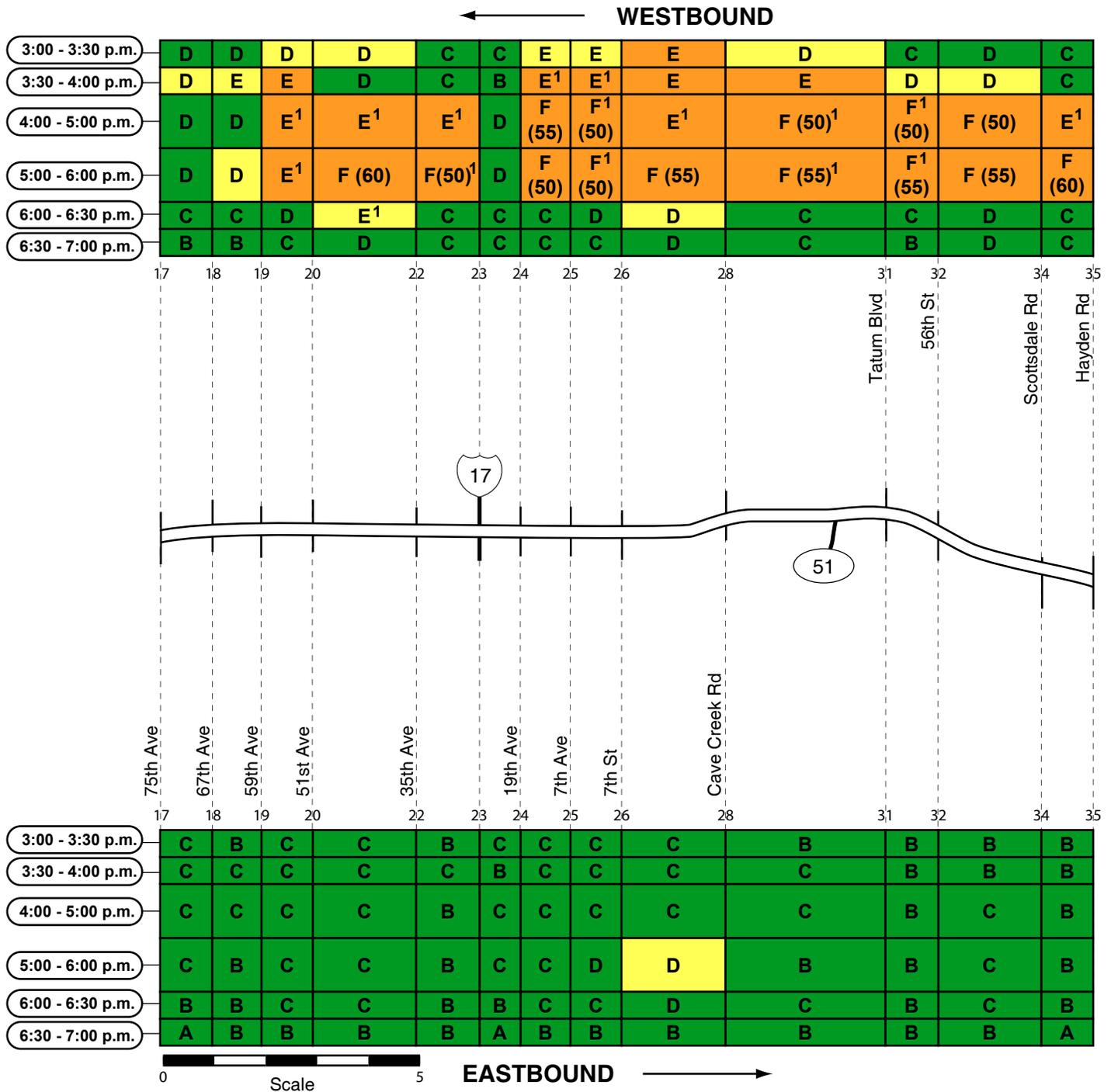


Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

LOOP 101 (75TH AVE - HAYDEN RD)

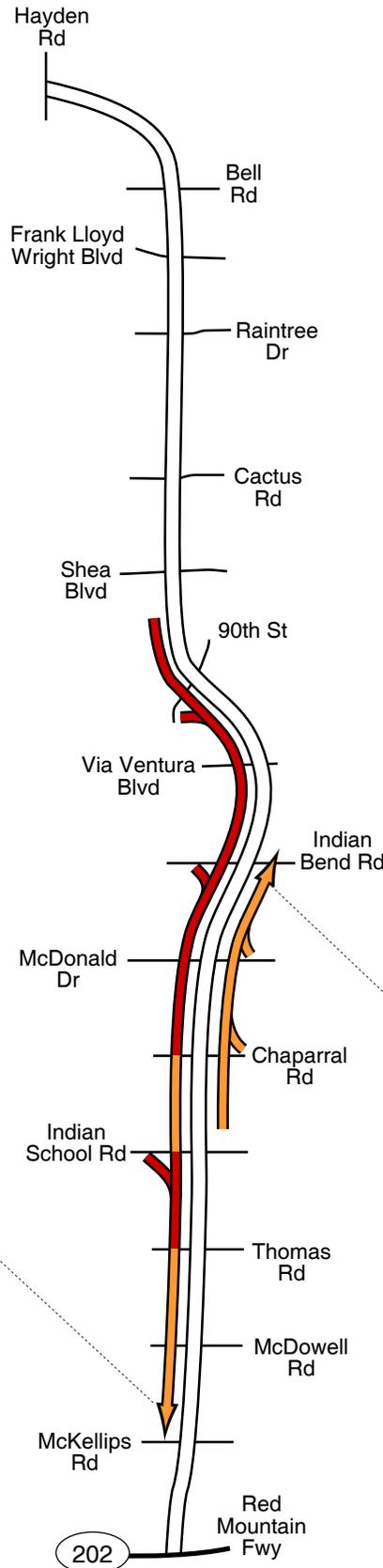
EVENING (3:00 - 7:00 P.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

LOOP 101 (HAYDEN RD - LOOP 202 N)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



During most observations before 6:00 p.m., southbound congestion was found on Loop 101 between Shea Blvd and McKellips Rd; estimated speeds typically ranged from 25 to 50 mph. Traffic merging from the ramps at several of the interchanges along this section of Loop 101 appeared to cause or exacerbate the congestion (90th St, Indian Bend Rd and Indian School Rd). With the exception of a few observations later in the survey period, vehicles typically resumed free flow speeds at McKellips Rd where the roadway widens from three to four lanes. *(Photo set: 101pm1)*

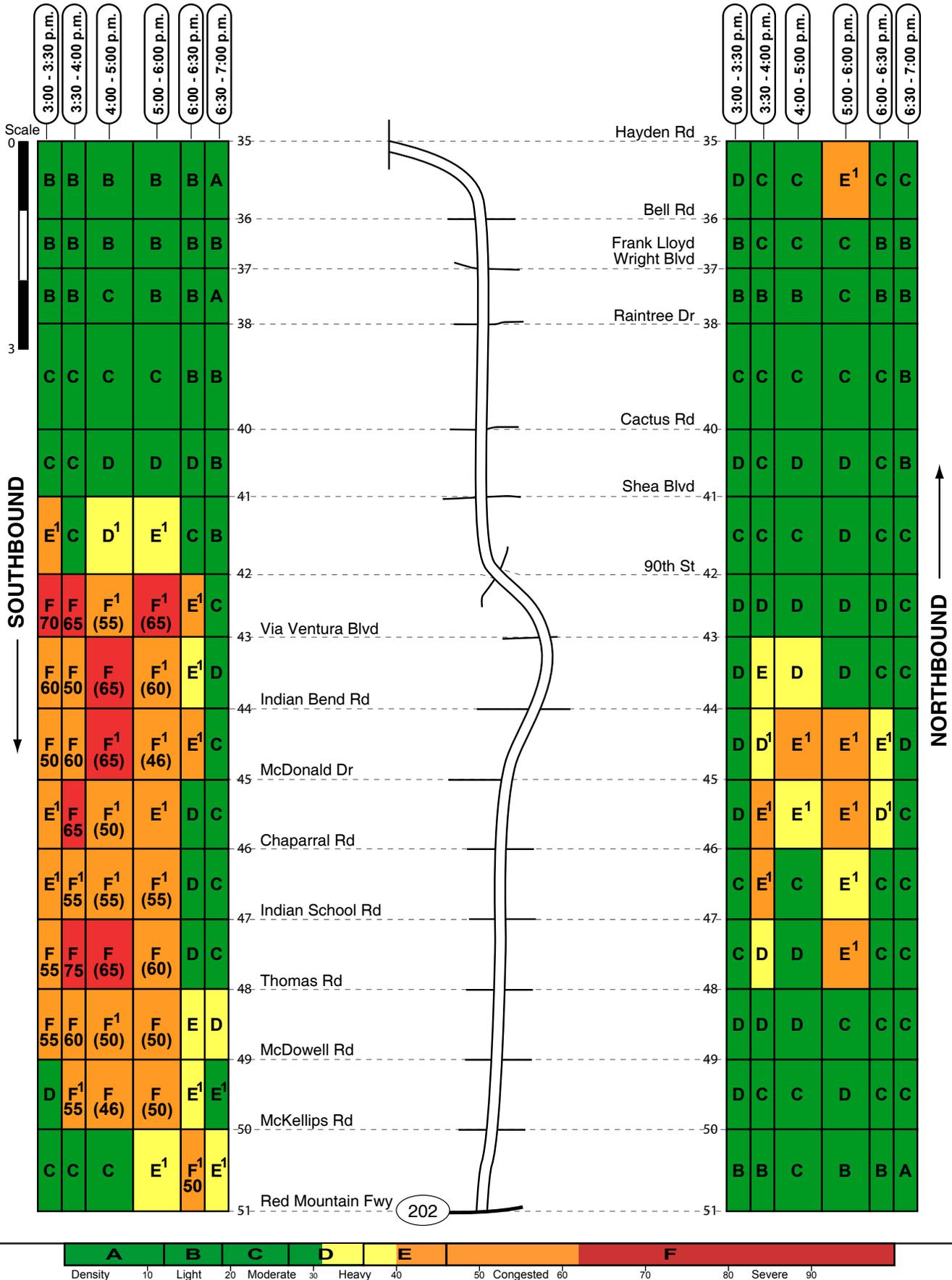
On some days, but not others, northbound congestion was found on Loop 101 between Chaparral Rd and Indian Bend Rd; estimated speeds typically ranged from 35 to 50 mph. Traffic merging from the ramps at Chaparral Rd and McDonald Rd appeared to cause the congestion. *(Photo set: 101pm4)*

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

LOOP 101 (HAYDEN RD - LOOP 202 N)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

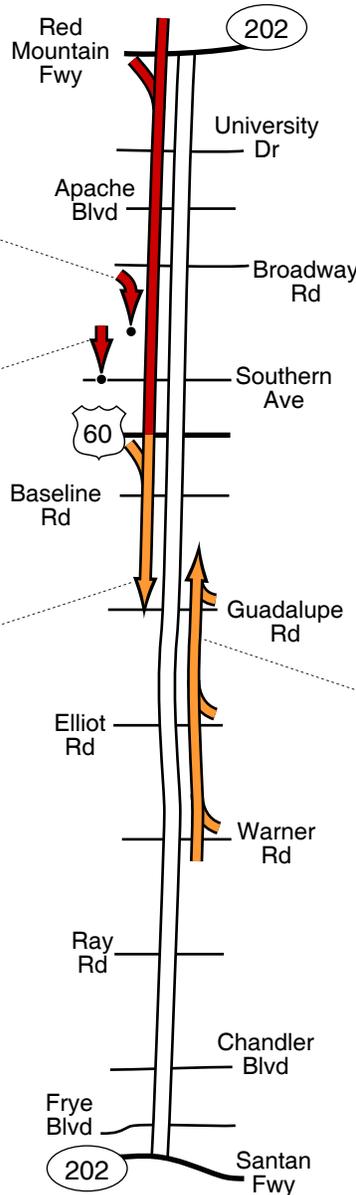
LOOP 101 (LOOP 202 N - LOOP 202) EVENING (3:00 - 7:00 P.M.) - SPRING 2006

During both observations between 3:00 and 6:00 p.m., congestion was found on the southbound entrance ramp at Broadway Rd; the queue populations at the ramp meter ranged from 15 to 40 vehicles per lane (2 lanes).
 (Photo set: 101pm8)

Intermittently, southbound congestion was found on N. Price Rd (service road) approaching the signal at Southern Ave; when congested, queue populations ranged widely, from approximately 20 to 50 vehicles per lane (2 lanes).
 (Photo set: 101pm9)

During most observations after 4:00 p.m., southbound congestion was found on Loop 101 between between Loop 202 and Guadalupe Rd; during the peak period, estimated speeds typically ranged from 15 to 45 mph. Bottlenecks found within this congested zone included a series of lane drops at Loop 202 (4 lanes to 3), US 60 (4 lanes to 2) and Guadalupe Rd (4 lanes to 3); also contributing to the congestion was traffic merging from the interchanges at Loop 202, Broadway Rd and U 60.
 (Photo set: 101pm2)

On some days but not others, north-bound congestion was found on Loop 101 between Warner Rd and Guadalupe Rd; when congested, estimated speeds typically ranged from 30 to 50 mph. Traffic merging from the ramps at Warner Rd, Elliot Rd and Guadalupe Rd appeared to cause the congestion. Vehicles consistently resumed free flow speeds north of Guadalupe Rd where the roadway widens from three to four lanes.
 (Photo set: 101pm3)

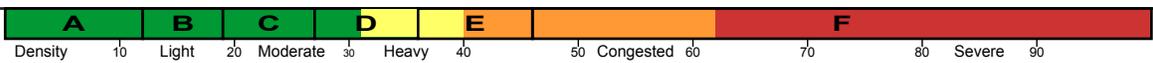
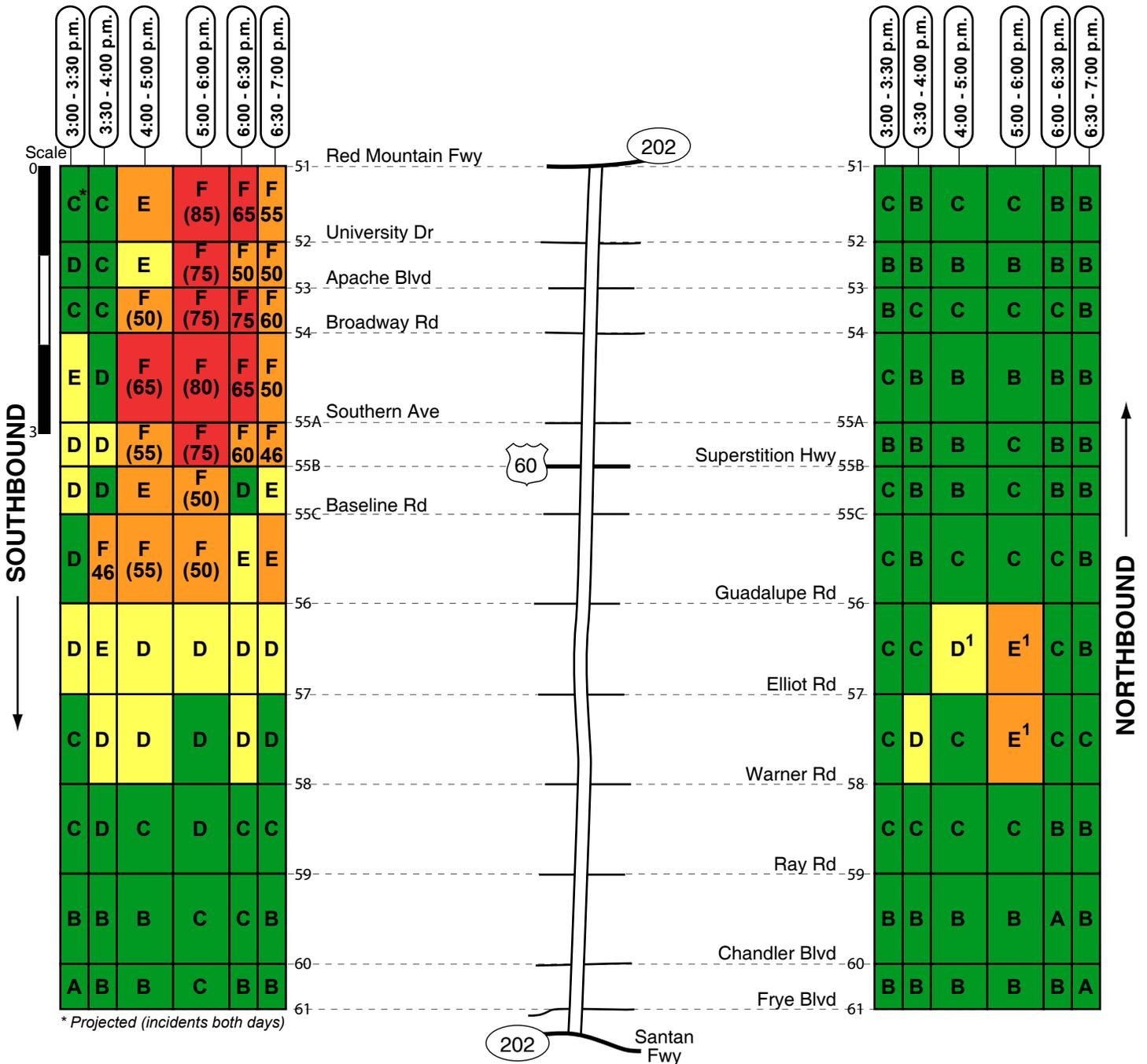


Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

LOOP 101 (LOOP 202 N - LOOP 202)

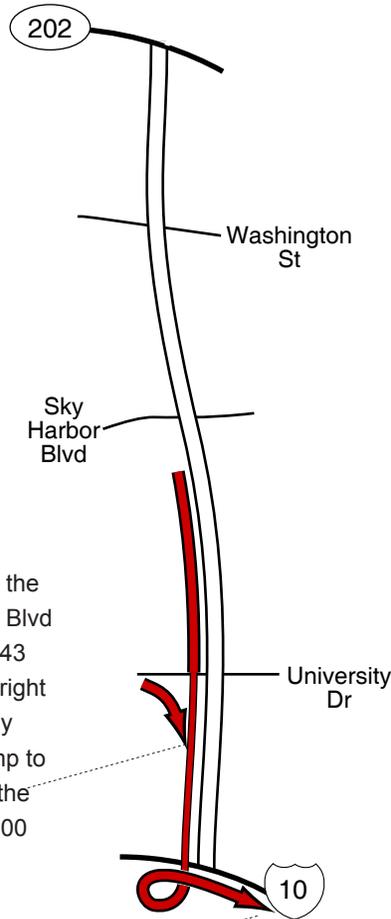
EVENING (3:00 - 7:00 P.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

SR 143

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



During most observations between 4:00 and 6:00 p.m., congestion was found on the southbound entrance ramp at University Blvd (no ramp meter); vehicles entering SR 143 had to merge into congested flow in the right lane (the head of this queue was typically found downstream on SR 143 at the ramp to eastbound I-10). Queue populations on the ramp ranged from approximately 40 to 100 vehicles (2 lanes). *(Photo set: 143pm2)*

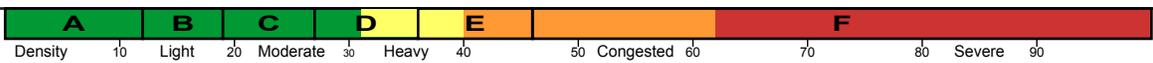
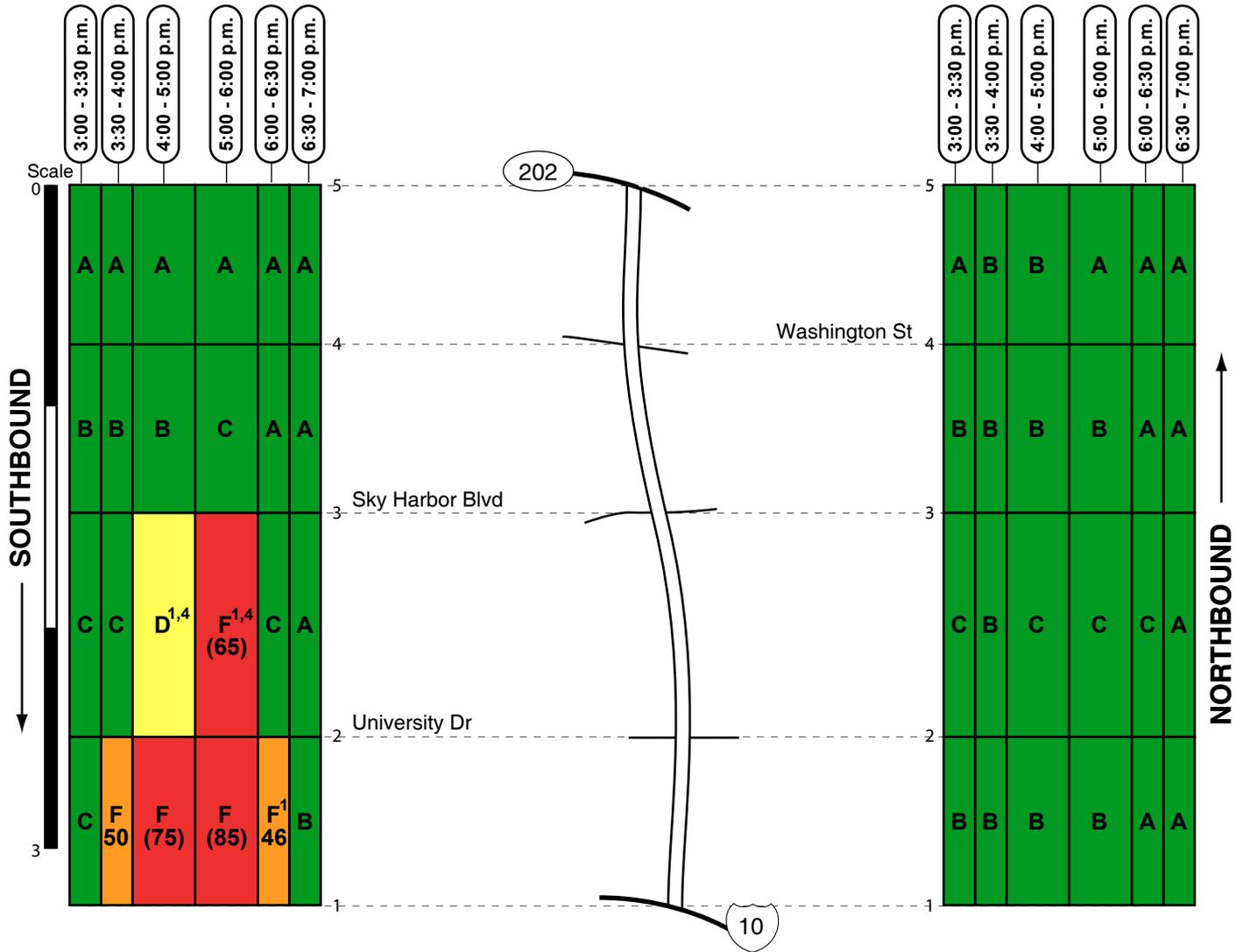
During most observations between 3:30 and 6:30 p.m., southbound congestion was found on SR 143 approaching I-10; congestion on the ramp to I-10 eastbound extended back into the right lane on SR 143, and ultimately across all lanes. During the peak period (4:30-5:30 p.m.), the tail of the queue was typically found in the vicinity of Sky Harbor Blvd; estimated speeds during the peak period ranged from stop-and-go to 30 mph. *(Photo set: 143pm1)*

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

SR 143

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



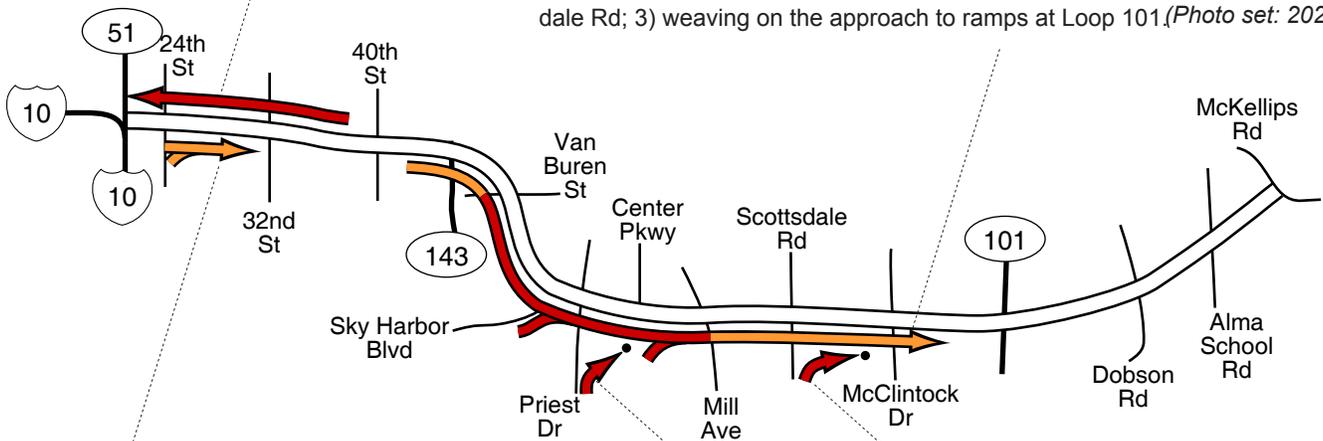
Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

Loop 202 N (I-10 - McKELLIPS RD)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

During most observations between 3:00 and 6:30 p.m., westbound congestion was found on Loop 202 between 40th St and the terminus at I-10/SR 51; estimated speeds during the peak period typically ranged from 10 to 30 mph. Factors contributing to the congestion included: 1) the lane drop (3 lanes to 2) at I-10/SR 51; 2) vehicles weaving on the approach to SR 51 northbound. *(Photo set: 202pm3)*

During most observations between 3:30 and 6:30 p.m., eastbound congestion was found on Loop 202 between SR 143 and Loop 101; estimated speeds during the peak period typically ranged from 15 to 45 mph. Factors contributing to the congestion included: 1) the lane drop (4 lanes to 3) at Loop 101; 2) traffic merging from the ramps at Sky Harbor Blvd, Priest Dr, Center Pkwy and Scottsdale Rd; 3) weaving on the approach to ramps at Loop 101. *(Photo set: 202pm1)*



Between 3:30 and 5:30 p.m., a short zone of marginal eastbound congestion (less than one mile) was intermittently found on Loop 202 between 24th St and 32nd St; when congested, estimated speeds ranged from 40 to 55 mph. Congestion appeared to be caused or exacerbated by traffic merging from SR 51. *(Photo set: 202pm2)*

During most observations between 3:00 and 5:30 p.m., congestion was found on the eastbound entrance ramp at Priest Dr; queue populations at the ramp meter ranged from approximately 20 to 40 vehicles per lane (1 lane). *(Photo set: 202pm4)*

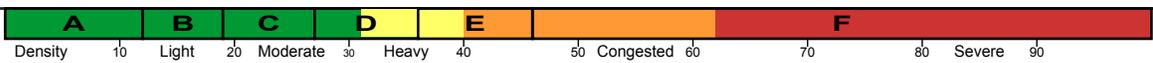
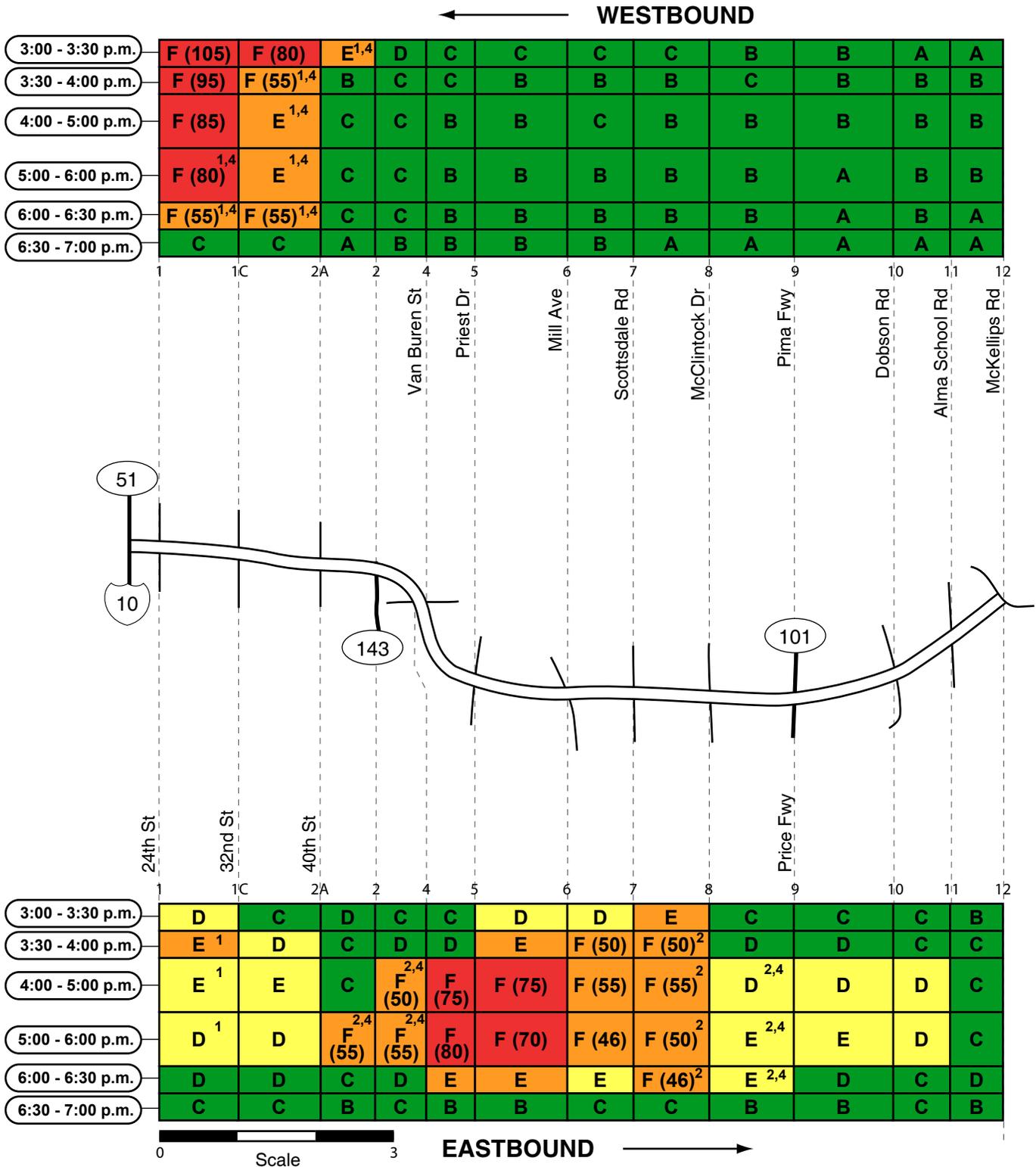
During most observations between 3:30 and 6:00 p.m., congestion was found on the eastbound entrance ramp at Scottsdale Rd; queue populations at the ramp meter ranged from approximately 20 to 35 vehicles per lane (2 lanes). *(Photo set: 202pm5)*

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

Loop 202 N (I-10 - McKELLIPS RD)

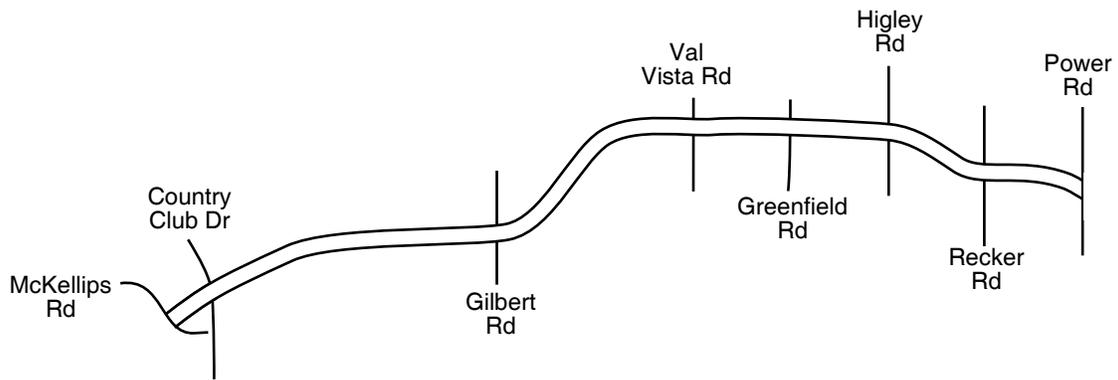
EVENING (3:00 - 7:00 P.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

LOOP 202 (McKELLIPS RD -POWER RD)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



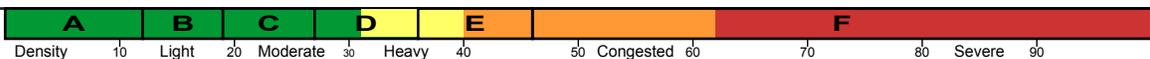
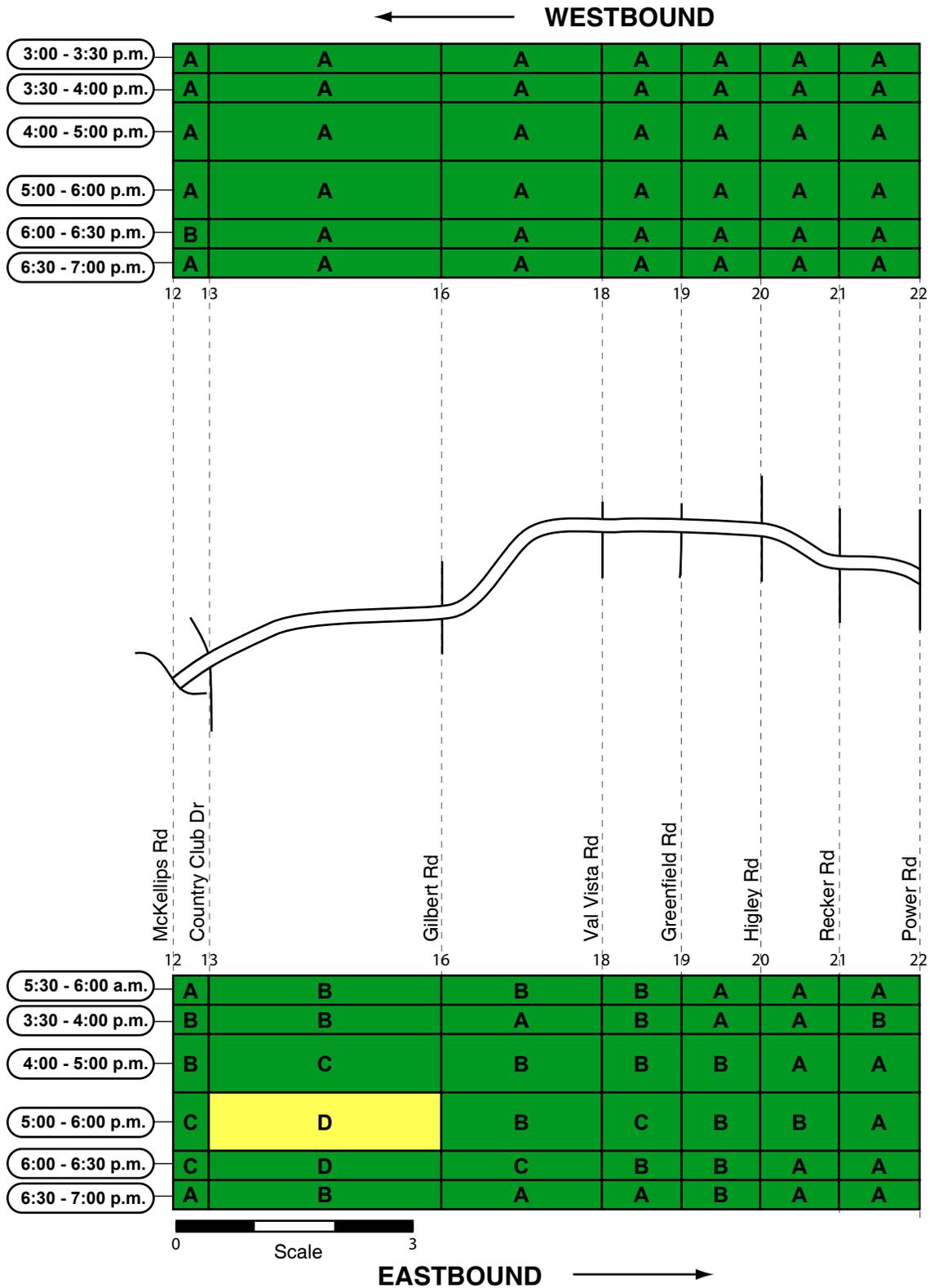
No congestion was found on SR 202 (Red Mountain Fwy) between McKellips Rd and Power Rd during the evening survey period.

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

LOOP 202 (McKELLIPS RD - POWER RD)

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



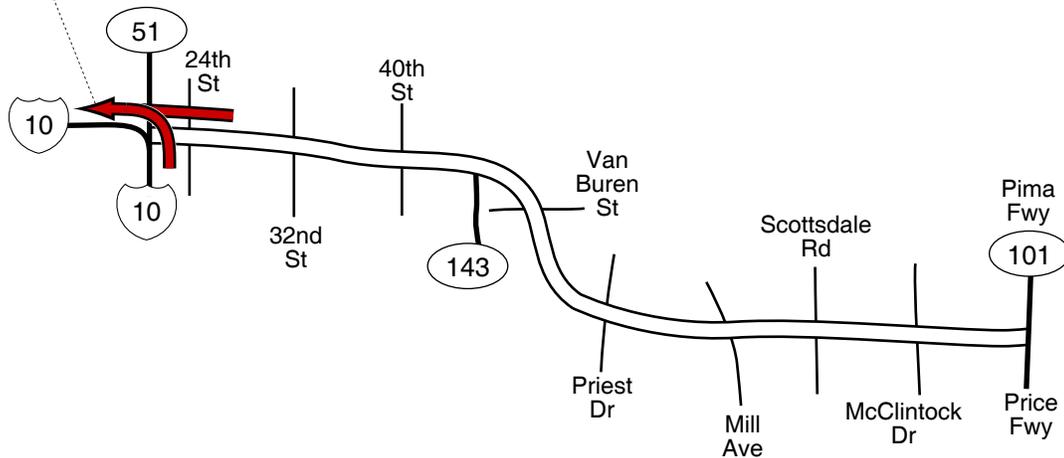
Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 2 - Congestion more severe in left or right-hand lanes. Type 3 - Congestion present only in the first or second half-hour. Type 4 - The length of the congested zone within the segment varies.

LOOP 202 HOV

EVENING (3:00 - 7:00 P.M.) - SPRING 2006

[HOV ENFORCEMENT 3:00 - 7:00 P.M.]

Between 3:00 and 6:30 p.m., intermittent westbound congestion was found in the HOV lane between 32nd St and I-10/SR 51; when congested, estimated speeds typically ranged from 40 to 50 mph. Congestion appeared to be caused by the merge with I-10 HOV traffic (two HOV lanes converge to one).
 (Photo set: 202hov1)

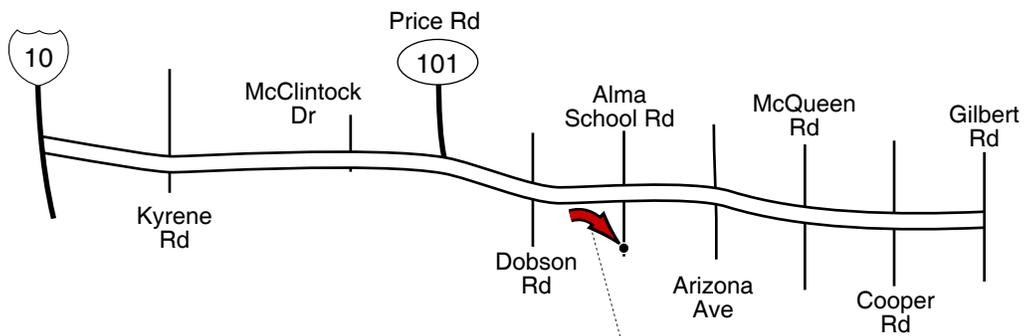


Legend

	Congested flow (Estimated average speed < 30 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed 30-50 mph)		Entrance / Exit Ramp Queue

LOOP 202 - SANTAN FREEWAY

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



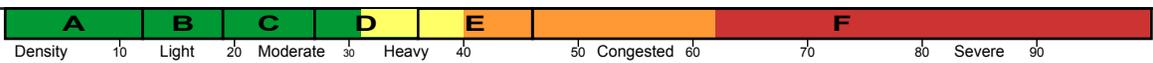
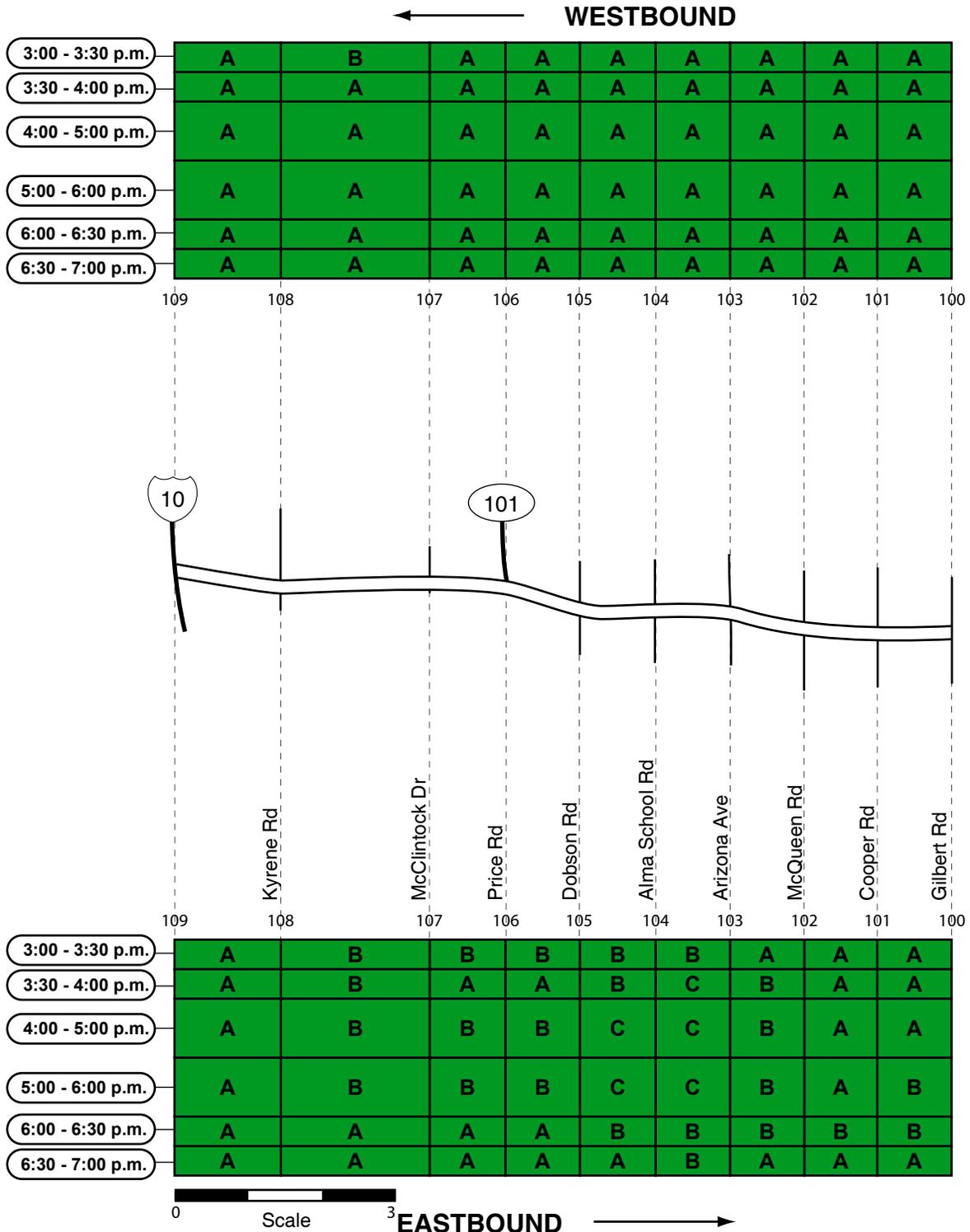
Between 4:30 and 5:30 p.m., intermittent congestion was found on the eastbound exit ramp at Alma School Rd; when congested, queue populations in the right-turn lane waiting to enter Alma School Rd northbound ranged from 25 to 35 vehicles per lane (one lane). (Photo set: 202santanpm1)

Legend

	Congested flow (Estimated average speed 30-50 mph)		Signal Queue - Cross Road
	Congested flow (Estimated average speed < 30 mph)		Entrance / Exit Ramp Queue

LOOP 202 - SANTAN FREEWAY

EVENING (3:00 - 7:00 P.M.) - SPRING 2006



Nested Congestion: Type 1 - Congestion present on some days, but not others. Type 3 - Congestion present only in the first or second half-hour.
 Type 2 - Congestion more severe in left or right-hand lanes. Type 4 - The length of the congested zone within the segment varies.