Arizona Department of Transportation

Transportation Technology Group

Statewide Dynamic Message Sign Masterplan

Guidelines for Location and Placement of Permanent DMS

FINAL REPORT

November 2011

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1.0 BACKGROUND

Dynamic Message Signs (DMS) are signs that display electronically generated illuminated messages for information dissemination to the travelling public.

DMS are used in Arizona, in other states, and around the world to provide drivers with information about traffic and roadway conditions, Amber Alerts, and other approved message sets. They have the ability to display a large number of individual messages for the purpose of informing, warning or guiding road users.

Figure 1 - I-10, Eastbound, South of Eloy

DMS may be used individually to treat a local area or issue, or as part of a system to manage traffic or provide information along a road or within an area. There are several applications for DMS in both rural and urban areas. DMS may be a permanent infrastructure or a temporary device mounted on a trailer or vehicle to meet a short-term requirement. This Plan, and associated guidelines, is specifically designed to be used when considering installations of *permanent* DMS.

2.0 PURPOSE

Since DMS for driver information and roadway conditions is a continually developing technology, there is no standard document or set of criterion that is used nationally for the permanent placement of DMS.

The goal of this document is to provide specific justification warrants, criteria, and consideration of permanent DMS design requirements for the Arizona highway system. These guidelines and the current ADOT adopted MUTCD shall be addressed before DMS design and construction are considered for new highway and freeway projects. DMS analysis shall be included in every Project Assessment (PA) and Design Concept Report (DCR) of roadway projects that overlap sites identified in Section 8 and Appendix B and when otherwise determined to be applicable.

3.0 DMS TYPES

Different sizes and types of signs are available through ADOT procurement contracts, which change on a periodic basis. The type of DMS chosen will generally depend on: the type and width of roadway, travel speed, and the location's environment. Higher speed areas require larger character sizes in order to provide suitable legibility distances. Table 1 provides general details of some DMS types ADOT has used in the past. Appendix A provides a DMS Size Selection Table. These details may aid in the selection of DMS on both urban and rural roadways. The final selection of DMS sign face size, mounting arrangement and support structure shall be recommended by the designer and presented to the Transportation Technology Group project manager for review and approval. Only DMS configurations approved by the TTG project manager shall be shown on the project plans and subsequently deployed. Common design issues are listed in Section 7.1 Common Issues, by DMS type, roadway use, and mounting option.

Table 1: ADOT DMS Types

Type	Size	Roadway Use	Mounting Options	Characteristics
1) Walk-In	31' x 8'	Urban Freeways & Rural Highways	Overhead ADOT Standard Drawings SD 9.20,& SD 9.52	Typical for Overhead Use. Attachment of additional signs to tubular frame is not allowed, per SD 9.52
2) Large	17' x 5'	Rural Highways & Arterials	Overhead or Roadside	Front-Access
3) Medium	10' x 4'	Rural Highways & Arterials	Overhead or Roadside	Front-Access Full Matrix Capability
4) Small	8' x 4'	Rural Highways & Arterials	Overhead or Roadside	Front-Access Full Matrix Capability

Figure 2 - Walk-In DMS

Figure 3 - Medium-Size DMS, Northbound SR 89A, Sedona, Arizona

Figure 4 - Medium-Size DMS, Southbound SR 89A, Flagstaff, Arizona

4.0 DMS POWER AND COMMUNICATIONS

All DMS applications require electrical power to energize the sign and control systems. In an urban environment with an established freeway management system (FMS), power is usually provided via the adjacent FMS infrastructure by adding provisions to power a specific DMS site. In fringe urban areas and most rural areas, pre-existing infrastructure usually does not exist. Establishment of obtaining power will be developed and coordinated by the designer, and may influence the location of the DMS.

Different sizes and types of DMS have different load requirements, thus requiring the designer to identify power needs with the DMS supplier of the type of sign under consideration. In all cases, the designer shall contact the electrical provider (APS, SRP, etc.) at the initiation of design to verify that power can successfully be obtained. Otherwise, reconsideration of the site may be required to accommodate power provision.

In rural applications, availability of power directly influences site selection. Many rural sites encounter design issues as a result of no power within reasonable distance, which forces reconsideration of the site and site adjustment. Either power is beyond the right-of-way line, causing need for obtaining an easement or the cost of a line extension, or power may be visible along a highway but of inappropriate voltage. It may not be possible to successfully (or cost effectively) convert to the appropriate voltage and current drawn by the sign to avoid overloading the source of power.

Rural applications typically avoid the use of step-down transformers, and DMS locations tend to be adjusted to be close enough to a power source to avoid additional transformer equipment. Rural applications typically utilize an ADOT Type II Load Center as the metering and main breaker facility.

Communications to urban DMS located along FMS infrastructure containing existing communications infrastructure will be via the FMS communications system. The designer shall coordinate circuit assignment and specific equipment needs with the ADOT Transportation Technology Group (TTG) Project Manager to insure appropriate provisions are accommodated.

In urban fringe areas where no FMS communications infrastructure is available, or in any rural applications, communications for the DMS shall be accomplished via ADOT TTG approved or specified wireless technology. The current wireless concept being deployed by ADOT involves the use of microwave communications between the DMS control cabinet and equipment ADOT is in the process of deploying statewide on DPS-owned radio towers. The designer shall arrange for a signal strength test to be conducted by the contractor in the presence of an ADOT field inspector at the specific site to insure successful communication between the specific site and the communication towers.

5.0 DMS JUSTIFICATIONS AND WARRANTS

Permanent DMS have a wide range of applications that warrant their installation. Typical justification for urban and rural DMS installations in Arizona is identified in Table 2. Districts may determine other justifications on a case by case basis.

Table 2: DMS Justification

Typical Justification for DMS	Urban	Rural
Traffic Conditions	✓	✓
Route Diversion	✓	✓
Special Events / Sites	✓	✓
Evacuation & Reception Routes	✓	✓
Weather Conditions*	✓	✓
Flood Hazards	✓	✓
Animal Hazards*	-	✓
Fire Hazards	-	✓

Sections 5.1 through 5.5 provide an expanded discussion of the most common justifications of permanent DMS. Most justifications include unique warrants that provide a preliminary analysis of whether permanent DMS is warranted at a candidate location based on needs and conditions. If a device is determined to be warranted, ADOT District Engineers are then encouraged to perform a local engineering and planning analysis to determine whether the deployment is feasible at the candidate location. As part of the analysis, ADOT District Engineers should examine alternatives such as lower cost or less technology-oriented solutions that fulfill the same needs.

The roadway designer must ensure that the ADOT Transportation Technology Group (TTG) Project Manager and ADOT District Engineer reviews and approves DMS site selection to ensure the chosen location's integration and compatibility with ADOT's Freeway Management System and Statewide DMS Master Plan.

5.1 TRAFFIC MANAGEMENT

The purpose of DMS for traffic management is to provide current traffic status information (crashes, road construction, travel time) so drivers can slow their vehicles, choose which lane or exit to take, and remain informed. Permanent DMS tend to demand driver attention due to size and readability.

Travel time messages are not appropriate for every location, or for every hour of the day, but they have proven successful in regions of recurring congestion - not caused by any specific event.

The availability of alternate routes downstream from DMS is important. The intersection of two state roadways offers the opportunity for drivers to divert away from incidents or hazards.

Permanent DMS is warranted for traffic management:

1. If events occurring in the area unexpectedly impact or impede traffic (e.g. close a lane, encounter slow traffic in one or more lanes, or events on the shoulder) an average of at least four times per month; ***And***

2. If the target area is monitored by CCTV cameras, traffic detectors, or another method of monitoring the conditions, or has travel times for the downstream stretch of road; ***And***

3a. If there are acceptable alternate routes with adequate capacity to accept vehicles that may deviate based upon the information; ***Or***

3b. If the location is a stretch of road where no alternate route is possible and drivers would benefit from information describing the cause and/or extent of delays in order to relieve driver frustration; ***Or***

3c. If there are horizontal or vertical curves that create safety issues when traffic is stopped unexpectedly; ***And***

4. The route being considered for the DMS has on average:

    - At least 2 hours of peak period travel where traffic flow exceeds 1,100 veh/hour/lane; ***Or***
    - Experiences conditions considered Level of Service C; ***Or***
    - Experiences a minimum average annual daily traffic (AADT) of:
        - 16,800 for a 2-lane road
        - 33,600 for a 4-lane road;
        - 50,400 for a 6-lane road;
        - 67,200 for an 8-lane road.

Partial Warrant Criteria: If #1 above is met, the warrant is considered 'Partially Met'. If one or more additional purposes are partially met at this location for this device, the device may be considered 'Warranted'.

5.2 SPECIAL EVENTS/SITES

The purpose of DMS for special events is to provide traveler information regarding parking or alternate routes for special events or major venues in order to protect back of queues from rear-end collisions and reduce delay due to unnecessary "circling the block", queues, unfamiliarity with the area, or non-participating drivers being caught in event traffic.

Permanent DMS is warranted for special event venues:

1. If the location contains a venue that hosts ticketed events (typically with rapid and tight arrival and/or departure patterns for a specified start time, such as a sports event); ***And***

2a. If the event venue typically houses at least two weekday ticketed events per week (including seasonal sporting events that only occur during the season); ***Or***

2b. If the event venue, or special site, typically hosts at least one event per year attracting 30,000 visitors or more in one day; ***Or***

2c. If the event venue or special site typically attracts 1,000,000 visitors, or more, per year; ***And***

3. If there is alternate parking or traffic options that could be displayed on a DMS to direct visitors to more preferred options.

Given the increased traffic volumes and congestion levels in urban areas, even minor events could have large impacts on travel. As an alternative to a permanent DMS, transit serving special event venues may lessen these volumes and congestion levels.

Placement of DMS signs should consider the intent of each sign. For example, further upstream signs are more effective at helping non-event attendees avoid traffic congestion, while signs closer to the venue are effective for directing visitors to open parking and roadway capacity.

Particularly in urban areas, permanent DMS may exist on state roadways that could serve a special event site. Existence of a DMS sign location does not guarantee its use for all special events. Use of existing DMS in support of special event traffic management is applied on a case by case basis, and is related many times to the ADOT District's encroachment permit process which may, in turn, require supplemental traffic management devices, such as portable DMS units, depending on magnitude of event and resulting anticipated traffic impacts, and as determined by the District Permit Supervisor, in coordination with the ADOT Transportation Technology Group ITS Support Section Staff.

5.3 EVACUATION & RECEPTION ROUTES

The purpose of DMS for evacuation routes is to provide evacuation or reception route information to drivers during disaster or Homeland Security events.

DMS, used in conjunction with 511 systems, offer the potential to become a valuable medium to provide travel information in support of Homeland Security emergency management. During an emergency, normal travel options may be unavailable, meaning drivers may need very basic and specific information on alternative travel options.

Arizona is a low risk state for emergency management. Neighboring states have higher risk of evacuation; therefore, Arizona has a greater need for reception routes. The impact on planning statewide DMS is to consider permanent reception or inbound DMS within 10 miles of entering the state on interstate highways (I-10, I-40, I-15 and I-19) and US routes (linking significant population zones to Arizona, such as US 93 from the Las Vegas) as warranted.

5.4 WEATHER CONDITIONS

The purpose of DMS for weather conditions is to provide road weather information to drivers so drivers can choose whether to continue travel on their current route or whether to adjust their speed, or divert from the trip in anticipation of an upcoming weather hazard. Roadways in Arizona are susceptible to a variety of weather events or consequences of weather, such as flooding, blowing dust, monsoon storms with high winds/lightning, forest fires/smoke, and sudden snow blizzards and snow drifting.

Permanent DMS is warranted for weather conditions:

1. If the location is prone to weather situations that drivers would not otherwise be forewarned about; ***And***

2. If weather events contribute to a significant number of crashes or road closures such that there are major impacts to drivers (this may include 1 or more annual closures or crashes on a freeway/interstate highway, or 10 or more annual crashes or closures on rural roadways); ***And***

3. If there is road weather information available for the area downstream of the candidate DMS location; ***And***

4. If there is the capability (either manually by staff members or automated through a condition reporting system, such as a linkage to RWIS) to create event-specific descriptions of weather conditions to be displayed on the DMS; ***And***

5a. If there is a recurring need to disseminate event-specific descriptions (rather than a lower technology approach such as activating a flashing warning sign that says “Weather Alert When Flashing”); ***Or***

5b. If there are options for either alternate routes or services, that might be described on the DMS, where drivers may safely wait out extreme conditions; ***Or***

5c. If lower technology mitigations (such as flashing beacon signs) have been tried and not proven to generate responses from drivers.

Partial Warrant Criteria: If either #1 or #2 above is met, the warrant is considered ‘Partially Met’. If one or more additional purposes are partially met at this location for this device, the device may be considered ‘Warranted’.

If the only warrant being met for DMS is the weather information warrant, then it is recommended that less expensive technologies be considered before deploying permanent DMS.

5.5 ANIMAL HAZARDS

Arizona has a large elk population in the higher elevations, spanning from Williams southeastward to the New Mexico border at Alpine. As in all states, vehicle-game collisions take their toll annually. Vehicle collisions involving 600-pound-plus elk can cause substantial vehicle damage and serious human injury or death. State Route 260, east of Payson, has the nation's most advanced game crossing system with wildlife detection, solar-powered flashers, and roadside DMS units (specific to this game crossing traffic safety system).

In addition to elk, deer, open range cattle, bear, mountain lion, big horn sheep, and other mammals on roadways present hazards to drivers. Animals tend to have certain areas they repeatedly use or man-induced crossings (where elk fencing ends) where there may be a need for permanent DMS.

If the only need being met for DMS is an animal hazard, then it is recommended that less expensive technologies be considered before deploying permanent DMS.

6.0 PLACEMENT OF PERMANENT DMS

The designer is to review Section 8.0 DMS Maps and Appendix B to determine if any DMS locations were previously planned. Section 8 DMS locations shall be reviewed against the criteria in Section 6.1 ADOT Permanent DMS Placement Criteria and adjusted, if necessary, based on design changes or site-specific conflicts. Section 6.2 ADOT Permanent DMS Design and Site Considerations should be applied to guide final DMS placement and design. The designer shall submit recommended DMS locations for review and approval to the ADOT TTG Project Manager and ADOT District Engineer.

There will be instances where all of the criteria and considerations in the Plan cannot be met. Reasons for deciding to continue pursuit of a DMS design location with an installation, despite not being able to meet all criteria, should be detailed by the designer and approved by the ADOT Transportation Technology Group Project Manager and ADOT District Engineer.

Analysis of urban and rural permanent DMS application and placement should always be included in every Project Assessment (PA) or Design Concept Report (DCR).

6.1 ADOT PERMANENT DMS PLACEMENT CRITERIA

Determining where to locate a warranted permanent DMS begins by evaluating how a set of criteria apply to a given DMS application or setting. The following set of criteria are the high level evaluation set that is first examined After application of the site selection criteria, the process moves to examining a set of considerations to refine site selection and verification, as detailed in subsequent Sections.

6.1.1 PRIMARY CRITERIA

	Urban	Rural
A. Two DMS are desired within four miles prior to each system interchange	_____	
B. One DMS is desired within one mile prior to an event venue or recurring bottleneck location	_____	
C. One DMS is desired within three miles prior to each intersection of any two state or US highways offering potential as diversion routes		_____
D. One DMS, per direction, is desired within 5 miles of state boundaries		_____
E. Maximum three-mile spacing along urban mainline freeways	_____	

6.1.2 SECONDARY CRITERIA

	Urban	Rural
F. Min. 650’ spacing from major guide signs (1,000’ is desired)	_____	_____
G. Min. 1,000’ vertical and horizontal visibility and 15° cone	_____	_____
H. ¼ mile per lane change upstream of diversion exit	_____	
I. Avoid areas where frequent braking or weaving movements are common	_____	_____
J. Proximity to power and communications	_____	_____

Figure 5 and Figure 6 illustrate the longitudinal placement guidelines.

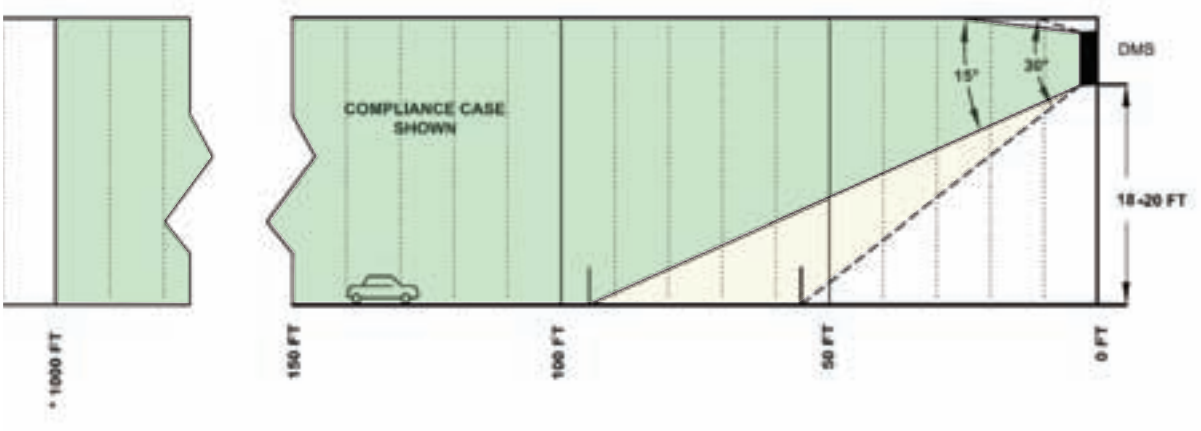
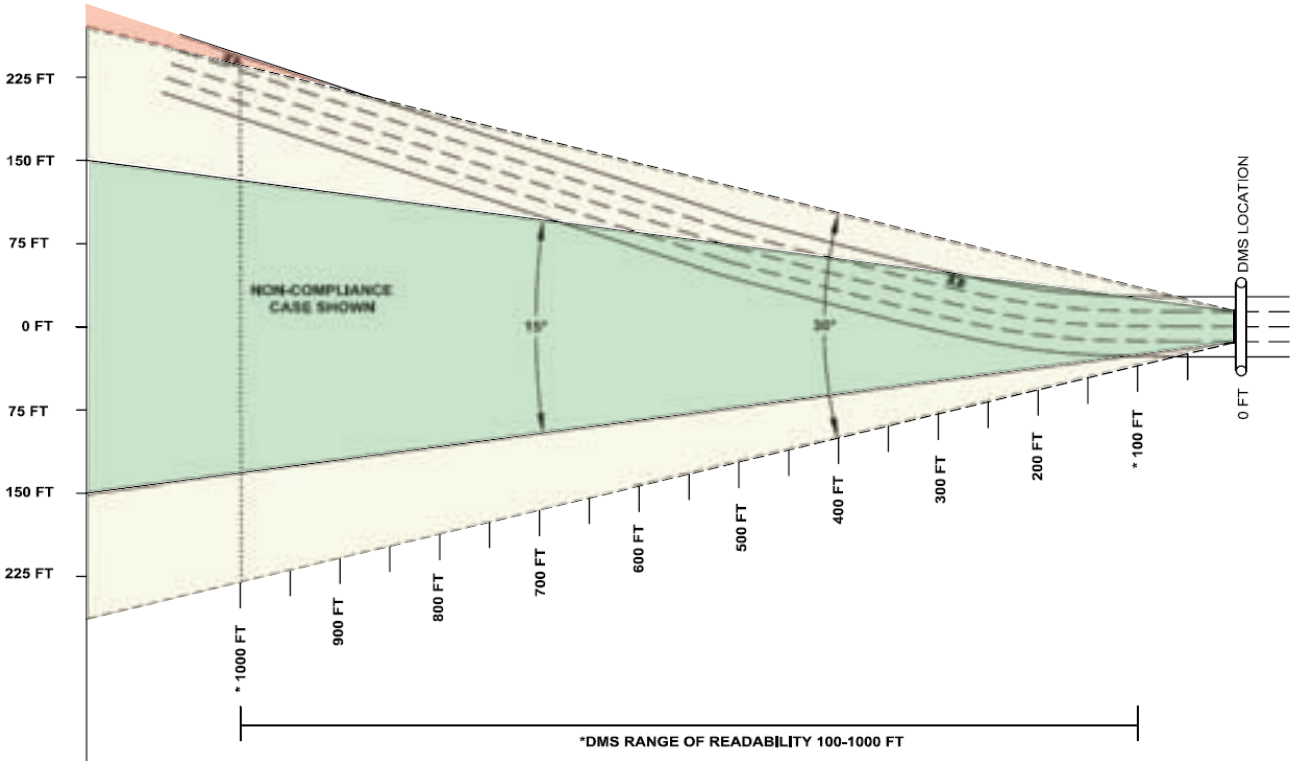


Figure 5 - Overhead Mounted DMS Vertical Clearance Diagram



Note: The 15° and 30° cone of visibility in this diagram applies to ADOT's existing DMS contract. Future signs may be different and need to be verified per DMS manufacturer and type of sign.

Figure 6 - Permanent DMS Horizontal Clearance Diagram

Placement Criteria Notes

A. *Two DMS are desired within four miles prior to each system interchange.* A "system interchange" is defined as a freeway to freeway interchange.
B. *One DMS is desired within one mile prior to an event venue or recurring bottleneck location.* Examples of sites that could be considered special event venues include Phoenix International Raceway (PIR), University of Phoenix Stadium, Chase Field, US Airways Arena, Arizona State University, Tempe Beach Park, Westworld, TPC golf course, Arizona Stadium, and Walkup Skydome.
C. *One DMS is desired within three miles prior to each intersection of any two state or US highways offering potential as diversion routes.* Intersections of "two state or US highways", in the rural context, applies to roadways with the potential of serving as useful diversion routes. Diversion in rural areas of the state tend to be more difficult and lengthy simply due to the remote distribution of alternate routes once outside the urban environments.
D. *One DMS, per direction, is desired within 5 miles of state boundaries.* One DMS, in both directions, is desired within five miles of state/international borders or permanent Ports of Entry or Border Patrol checkpoints, where display of differing rules or regulations on static signs would either not attract enough attention or if the rules or regulations change frequently (e.g. load restrictions).
E. *Maximum three-mile spacing along urban mainline freeways.* DMS placement along urban freeway mainlines provides incident, special event, travel time, and other information, such as Amber Alerts, to the traveling public for congestion management.
F. *Min. 650' spacing from major guide signs (1,000' is desired).* Conflicts between DMS and static signs should be resolved in the earliest stage possible. For roadway projects, conflicts between DMS and static guide signs should be resolved during the DCR phase so that DMS signs are included in the initial traffic signing concept plan. The DMS location should take account of the need for drivers to respond to other important static signs in the area. All overhead and large roadside static signs typically convey important information, and placement of a permanent DMS should not result in information overload to drivers, in a short distance – especially in areas where traffic maneuvers such as weaving and lane changes are occurring. On rural roadways, where travel speeds are less than 55 mph, the minimum distances provided between the DMS and a hazard, decision point, intersection, driveway, or any item of roadside furniture that may take the road user's attention should generally be:

    100 - 350 ft in Business and Residential districts;
    250 - 400 ft for 35-45 mph speed limit zones; and,
    400 - 600 ft for 50-55 mph speed limit zones.

    Where possible, the highest distance within the range should be targeted.
G. *Min. 1,000' vertical and horizontal visibility and 15° cone*. To ensure proper viewing of the DMS, sites should be located on straight roadway sections. In the most restrictive cases, where the 15° cone of vision cannot be met, special accommodation can be made to install DMS with 30° readability, but only with the explicit approval of the ADOT TTG Project Manager, as implementation of a "different" unit implies additional/special maintenance burden and ability to replace "in kind" illuminated modules. The 15° and 30° cone of visibility mentioned here applies

to ADOT's existing DMS contract. Future signs may be different and need to be verified per DMS manufacturer and type of sign. Roadway overpass bridges, pedestrian walkway structures, sign bridges, and horizontal curvature shall not restrict the driver's continuous visibility of the DMS sign. Driver visibility of 1,000' to 2,000' feet in advance of any permanent DMS is recommended. Where the location and structure is suitable, and it is practical, DMS may be mounted on roadway overpass bridge structures. There currently is no ADOT-approved typical design standard support framework for DMS bridge mounting. Each situation is specific per project, based on bridge type and structural design and needs approval from the ADOT Bridge Group (see Figure 5, Figure 6, and Figure 8. Also, see Section 7.0 DMS Design Challenges).

H. *¼ mile per lane change upstream of diversion exit.* After receiving a diversion message, drivers must safely maneuver to the appropriate exit or away from hazards. DMS must be placed a sufficient distance from the point at which action is required to allow adequate time for reading and comprehension of the message and any subsequent action that drivers are required to take, which may include the need to brake and/or maneuver. The distance required will depend on the nature of the site. A recommended practice for roadways with four lanes or less is to locate DMS a minimum of one-quarter-mile upstream of the diversion exit for each lane change that a driver would have to make to merge from the innermost lane to the right-hand lane in order to exit. Freeways with more than four lanes should have DMS placed with fewest conflicts to the criteria and considerations in this Section. (see Figure 7)

   EXAMPLE 1: For a four-lane freeway section in one direction, the DMS location should be approximately: 3 x 1,320 feet, or about 4,000 feet upstream of the exit taper. Often, this rule may lead to an urban freeway DMS sign placement location more than one interchange prior to the potential diversion exit.

   EXAMPLE 2: For a two-lane highway section in one direction, the DMS location should be approximately: 1 x 1,320 feet, upstream of the exit taper.

I. *Avoid areas where frequent braking or weaving movements are common*. DMS should not be permitted within a system or traffic interchange, between the point where an exit ramp diverges or an entrance ramp meets the main or auxiliary lanes, or start of a change in the number of lanes where merging, frequent braking or weaving movements are common.

J. *Proximity to power and communications*. Locating existing power and communication lines along a roadway segment may help in determining how difficult it might be to power and communicate with a potential DMS, taking into account the communications methodology and concepts described in a previous section of this Plan. It is desirable to locate the DMS control cabinet and electrical service load center as close together as possible, when site conditions allow, so maintenance personnel have easy access to power cutoff devices. The designer is responsible for arranging for the provision of power and communications. See Section 4.0 DMS Power and Communications.

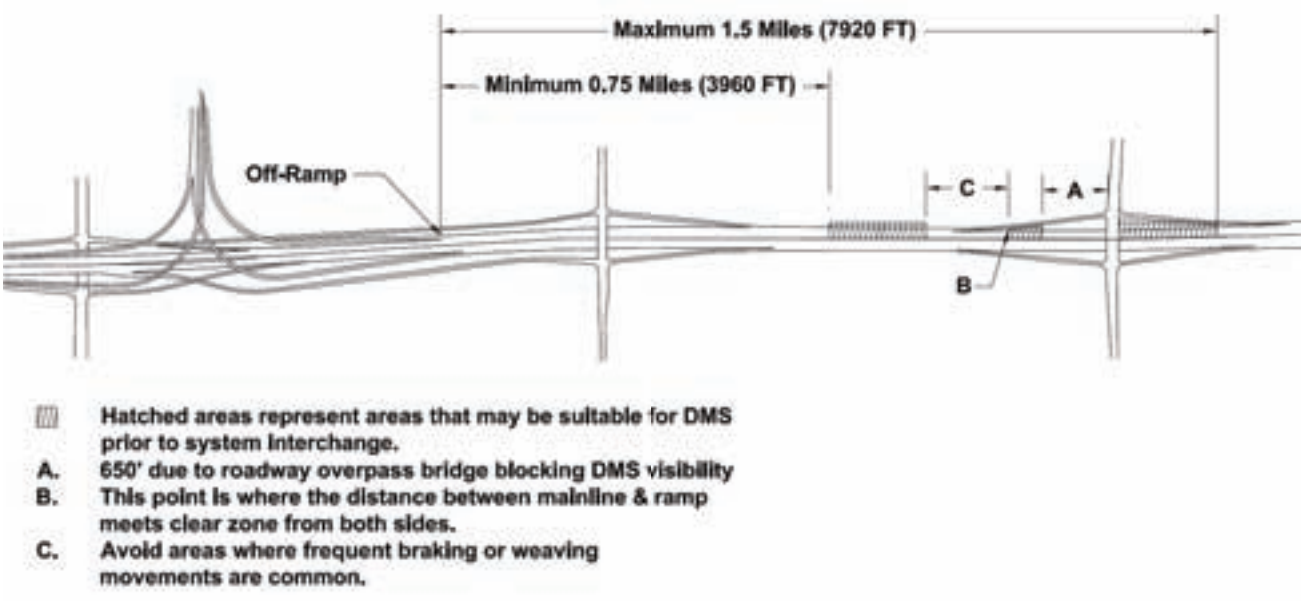


Figure 7 - DMS Placement Area Approaching a System Interchange

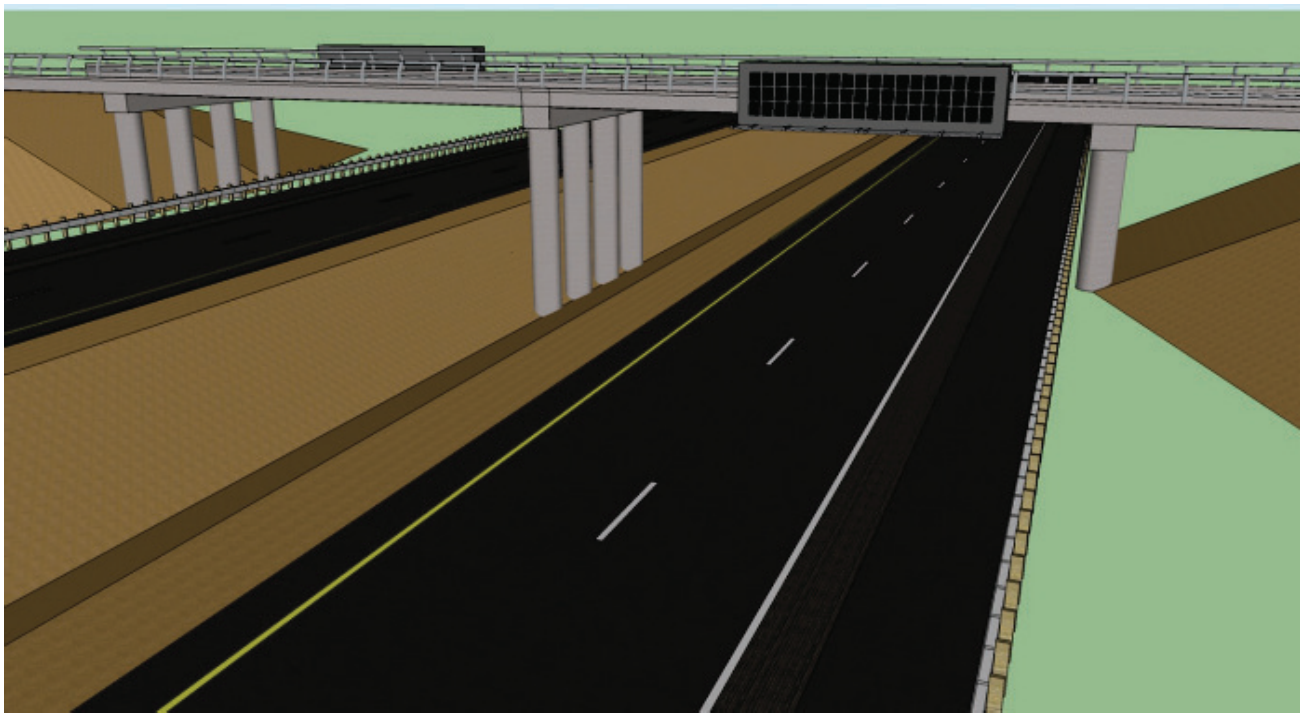


Figure 8 - DMS Mounted on Bridge Structure

6.2 ADOT PERMANENT DMS DESIGN AND SITE CONSIDERATIONS

Upon identifying the applicable DMS location using the criteria from prior Sections of this Plan, the designer then undertakes a detailed site evaluation to determine the following site considerations, and the resulting suitability or need for adjustment to the final DMS site.

6.2.1 CONSIDERATIONS

Design and Site Considerations Notes:

a. *Positioned within the view of a camera, capable of message verification.* It is desirable to select a DMS location that can be viewed by an existing or proposed ADOT camera, in order that operators may verify proper message display. In an urban environment with existing CCTV capability, designers should review the proximity and zoom capability of existing cameras in the vicinity. In cases where cameras do not exist, such as non-FMS instrumented urban freeways or rural highway locations, the DMS installation may require camera installation, as directed by the ADOT TTG Project Manager.

b. *Placement of static signs and DMS not allowed on same support structure.* Selection of DMS locations shall be checked with the ADOT Traffic Engineering for existing and proposed static signs and avoid conflict, assuring that appropriate spacing is maintained between signs. All designers of DMS shall obtain review of proposed DMS locations by ADOT Traffic Engineering, and coordinate a mutually satisfactory resolution to conflicts between DMS and traffic signs. Attachment of static traffic signs to proposed DMS tubular support structures is not allowed, per the current ADOT Standard Details for the tubular sign structures. Any exceptions shall require approval by ADOT Traffic Engineering, ADOT Bridge Group and the ADOT TTG Project Manager. Approval shall require structural analysis and potentially structural design modifications to the standard structure details, depending on size, wind loading and length of the proposed structure. Additional sight distance may be required to read and understand both pieces of information displayed on the two signs.

c. *Place foundations outside of clear zone.* Structural requirements of the support, the specified span length, maintenance access to the sign, and roadside obstacles determine the practical limit for the foundations of the structure. Consideration should be given to probable future widening of the mainline and/or ramps, lane configuration, frontage roads, and available shoulder configuration. All DMS supports must conform to the requirements found in the current ADOT adopted *AASHTO Roadside Design Guide,* Table 3.1, “Clear-zone distances in feet from edge of through traveled way” and the ADOT Roadway Design Guidelines. Although it is preferred to locate DMS foundations out of the clear zone, where DMS foundations qualify as a clear zone obstruction they pose a risk to passing vehicles. Impact attenuation devices, guard rails or concrete traffic barriers are to be designed and installed to provide positive protection when clear zone cannot be achieved (see Figure 9).

d. *Foundation should not impede drainage*. Designers shall be aware of existing or proposed drainage flows that may be in conflict with or disrupted by placement of DMS foundations, pull boxes, load centers or control cabinets. In cases where conflict cannot be avoided, consideration should be given to drainage pipes or rerouting existing graded channels, rerouting

around the DMS feature as necessary to give drainage a new route, and not allow pooling of standing water near DMS features.

e. *Solid and flat shoulder or maintenance pad*. Maintenance catwalks are provided between overhead-mounted DMS signs and the shoulder of the roadway, as illustrated in the ADOT Standard Details for the tubular structures. Designers shall ensure that an adequate solid and flat area is available to park maintenance vehicles, deploy outriggers, and access the catwalk without occupying or booming over live traffic lanes. Desirable design for catwalk-type structures is to extend the catwalk half-way into a 10' to 12' wide vehicle staging area. In some locations, the shoulder may be found to be adequate, while other locations may require the design and implementation of a maintenance pad suitable for vehicle refuge from passing traffic. Designers shall be aware that roadside elements immediately adjacent to the shoulder edge, such as guardrails or concrete barriers may affect the actual available area for staging a vehicle (see Figure 9).

f. *Min. 18' vertical clearance from high point of roadway surface.* Vertical clearances of overhead mounted DMS signs shall be between a minimum of 18 feet and a maximum of 20 feet from the high point of the roadway cross-section at the sign structure to the bottom of the support stringers for the catwalk assembly or, in the case of walk-in signs, at full deflection. This will provide the required clearance for safety and optimal viewing of the messages (see Figure 5). Designers should be aware of oversized loads over 18' height, and that where possible/feasible, consider making design accommodations such as load-bearing shoulders and/or maintenance pad areas, but only if approved by District and TTG.

g. *Avoid conflicts with lighting poles & conduits*. Do not locate permanent DMS in close proximity to lighting poles, existing lighting or FMS conduits, pipe sleeves, or other competing roadside objects.

h. *Minimize physical site challenges with structures, overhead lines, and FAA zones.* Address the impact of DMS placement relative to other physical site challenges such as barriers, walls, bright full-matrix action advertising billboards, and competing features - particularly in urban areas - and overhead utilities, box culverts, and driveways or side roads in rural areas. In both urban and rural areas, DMS placement should address proximity to any active airport runways. Designers should address Federal Aviation Agency requirements for height and placement of objects in and near the "runway trapezoid" that FAA considers extended from the ends of all runways. These rules may limit or preclude DMS placement in certain areas.

i. *Minimize environmental & visual impacts*. DMS are large, brightly illuminated signs, and consideration must be given to the visual impact on an area, particularly when used on rural roads, near culturally significant, residence, or business areas. Sign proliferation can be a concern for "visual pollution", ADOT's public image, and negative impact to the scenic aesthetics of roadways. In urban areas, significant amounts of signage are inevitable and may be appropriate; however it is important for the designer to consider relief from negative visual impacts where possible. Examples of areas deserving additional scrutiny for visual impact include scenic vistas and park areas. The chosen location must also satisfy criteria as part of the Environmental Clearance process, including avoiding conflicts with cultural/historical sites, visual pollution, designated "avoidance areas", conflicts with migrating or protected species, and other criteria. Designers should respond to issues identified through the Environmental Clearance site review and process.

j. *Remain within right-of-way with all components*. Designers shall insure all of the proposed DMS components will be situated within the ADOT right-of-way or ADOT-approved/owned easements. Acquisition of right-of-way or easements in support of the installation of DMS should be avoided, and any such proposed site requiring such items shall be explicitly approved by the ADOT TTG Project Manager. In the event right-of-way or easements are required, unavoidable, and approved by the TTG Project Manager, legal descriptions and field surveys are required in order to generate the necessary documentation for acquisition. Designers should be aware that existing power facility locations may require arrangements to be made with the power utility to situate the power connection element (pole, transformer pad, junction box) inside the public right-of-way, and may influence the final location of the DMS.

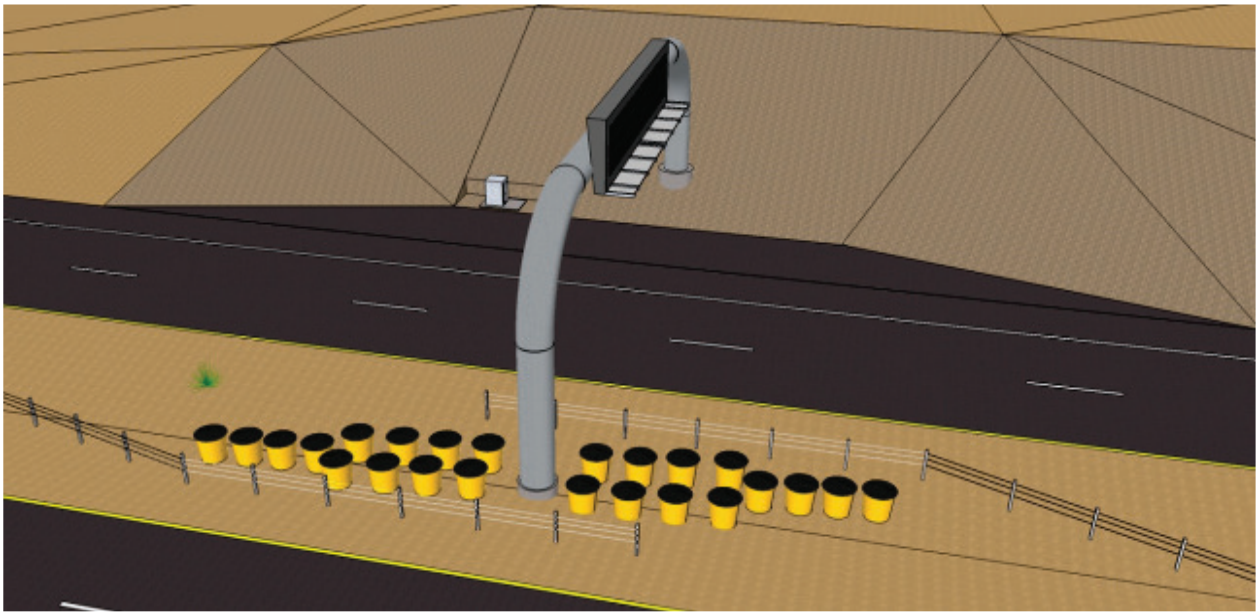
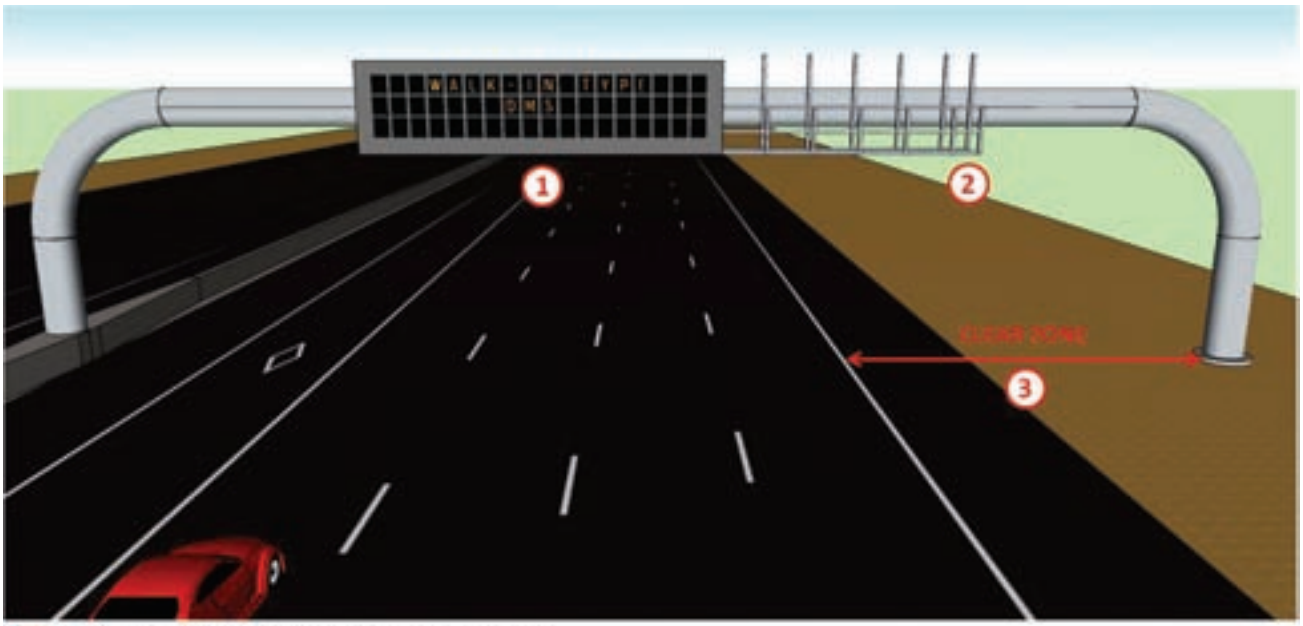


Figure 9 - DMS installation with Maintenance Pad and Impact Attenuation Devices



1. Center DMS over ultimate traffic lanes.
2. Extend the catwalk half-way into vehicle staging area beyond edge stripe of ultimate roadway configuration. Adequate flat and solid shoulder must be provided for maintenance bucket trucks with outriggers.
3. Clear zone per AASHTO Roadside Design Guide. If adequate clear zone is not met, adequate protection shall be provided.

Note: *These drawings are an illustrative reference and should not be used for design or construction. Refer to currently adopted standard drawings on the ADOT website: http://www.azdot.gov/Highways/bridge/DetailDwg/.*

Figure 10 - DMS Mounted Overhead on Tubular Structure

7.0 DMS DESIGN CHALLENGES

Section 7.1 Common Issues, summarizes site location and design issues to be aware of when selecting locations for permanent DMS. Real life urban and rural DMS placement scenarios are documented in Section 7.2 Example DMS to demonstrate how criteria and considerations of Section 6.0 Placement of Permanent DMS are applied.

7.1 COMMON ISSUES

7.1.1 WALK-IN TYPE; URBAN FREEWAY; OVERHEAD ON TUBULAR STRUCTURE

- Per the current ADOT Standard Drawing SD 9.52, additional sign attachments to the tubular frame are not allowed; therefore, the minimum 650' spacing from guide signs is critical.
- Medians and sound walls are prevalent in urban areas (particularly in or near interchanges) causing difficulty for safe maintenance access.
- Anticipate future capacity improvements (ultimate roadway configuration) and possible future permanent structures, where possible and feasible.
- Anticipate future (ultimate roadway configuration) grades, or changes in grade from existing, for cabinet, conduit, and foundation placement.

Figure 11 - Example of Difficult Maintenance Access due to Physical Barrier

7.1.2 WALK-IN TYPE; URBAN FREEWAY; OVERHEAD ON BRIDGE STRUCTURE

- Single Point Urban Interchanges (SPUI) may have a curved bridge face that could present a challenge to mounting static signs or DMS. The SPUI in Figure 12 has only a small section appropriate for sign mounting without needing special frameworks that may extend out from the bridge face more than an acceptable distance.

Figure 12 - Example of SPUI Bridge Structure

- "Closed" underpass bridge structures (those which are fully enclosed, and a designer cannot visually examine the underside to verify or determine bridge structural elements) may be unsuitable for "retrofitting" a DMS mounting assembly due to internal rebar and prestressed components that cannot be severed by sign mounting penetrations. All potential DMS sites on bridge structures will need to be structurally evaluated for DMS overhead mounting suitability and connection method. Special accommodations such as conduit or DMS foundations built on the side of the bridge to serve future DMS should be incorporated during new bridge design. DMS mounting on "Open" bridge structures, those which a structural engineer can visually examine from below, as illustrated in Figure 13, offer a better opportunity to accept DMS mounting assemblies.
- Conflicts with existing or future major static guide signs.

Figure 13 - Example of "Open" Bridge Structure

7.1.3 ALL TYPES; RURAL ROADWAY; OVERHEAD ON TUBULAR OR BRIDGE STRUCTURE

- Availability of power will be a primary consideration. Review Section 4.0 DMS Power and Communications.
- To achieve clear zone requirements, the foundation on the right side may need to be located where an existing drainage depression exists. The DMS designer should consider placing the foundation farther away from the roadway, closer with adequate protection, or accommodate rerouting of the drainage with pipe or other suitable means.
- Sloped or soft shoulders are not adequate for maintenance vehicles to service overhead mounted DMS. Maintenance pads should be considered for access to the DMS catwalk, when no other suitable means is available.
- DMS serving opposite directions of travel can be co-located on a tubular structure; however, would need to be structurally evaluated per DMS type, size and loading.
- Conflicts between guide signing and DMS are common, and should be avoided.

Figure 14 - Example of Opposing DMS Mounted on Same Structure (SD 9.51)

Figure 15 - Example of Rural Overhead DMS Mounted on Bridge Structure

7.1.4 LARGE / MEDIUM / SMALL TYPES; RURAL ROADWAY; ROADSIDE

- Visual aesthetics of the "look" of DMS and visual pollution from night brilliance of DMS may be the greatest challenge in rural installations if DMS is proposed near residences and businesses.
- Snow removal can "throw" snow and ice 25' to 30' from the roadway, making the DMS susceptible to damage if too close to the roadway.
- Roadside DMS shall not be placed on rural roadways with more than one lane approaching the DMS.

7.2 EXAMPLE DMS SITE ANALYSIS

Four sites are included as examples of analysis. The 3 proposed DMS sites on existing urban roadways are:

- SR101L Agua Fria Freeway from I-10 to Tatum Boulevard
- SR202L Red Mountain Freeway from SR101L Price Freeway to Gilbert Road
- SR51 Piestewa Freeway from Bell Road to SR101L Pima Freeway

The proposed DMS site on a rural roadway near the Metropolitan area is:

- SR87 Beeline Highway near Mesa Drive (MP 180)

Each site was visited to apply the ADOT DMS Master Plan Criteria and Considerations and identify existing issues or challenges with these locations that may require special accommodations or DMS relocation. The following subsections contain examples indicating initial proposed location, challenges of the site, new proposed site, and accommodations necessary to meet criteria and considerations.

7.2.1 EXAMPLE DMS SITE ANALYSIS #1: SR101L NB AT GLENDALE AVE

Figure 16 - Aerial View #1 of Initial Proposed DMS Site at Station 403+00

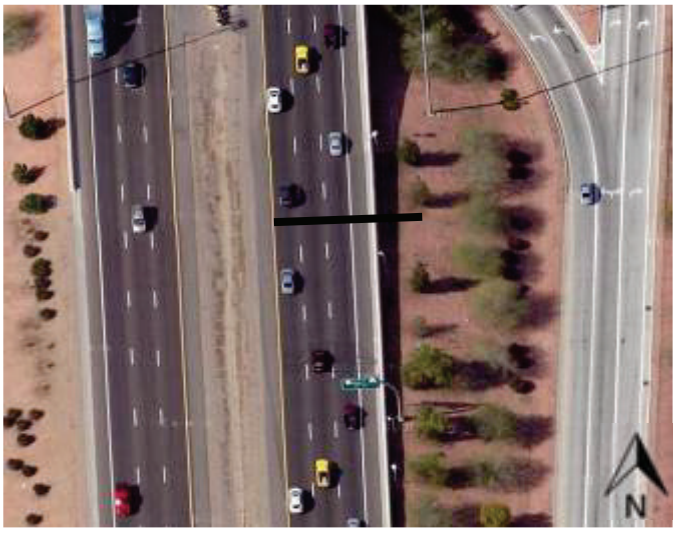


Figure 17 - Aerial View #2 of Initial Proposed DMS Site

Primary Criteria

A. Two DMS are desired within four miles prior to each system interchange

- *N/A; this is a mainline location*

B. One DMS is desired within one mile prior to an event venue or recurring bottleneck location

- *N/A; this location does not serve event venue or recurring bottleneck location*

C. One DMS is desired within three miles prior to each intersection of any two state or US highways offering potential as diversion routes

- *N/A; this is an urban location*

D. One DMS, per direction, is desired within 5 miles of state boundaries

- *N/A; this is an urban location*

E. Maximum three-mile spacing along urban mainline freeways

✘ *Spacing from upstream DMS is 3.1 miles and downstream DMS is 3.2 miles. This is close to meeting criteria.* Submit justification and obtain ADOT TTG PM approval.

Secondary Criteria

F. Min. 650' spacing from major guide signs (1,000' is desired)

✘ *Less than 200' from guide sign. Does not meet criteria.* Explore relocation options.

G. Min. 1,000' vertical and horizontal visibility and 15° cone

✓ *Meets minimum criteria*

H. Min. ¾ mile (3,960') and Max. 1½ mile (7,920') upstream of diversion exit

✓ *This location is approximately 1 mile upstream of next possible diversion exit.*

I. Avoid areas where frequent braking or weaving movements are common

✓ *Meets minimum criteria*

J. Proximity to power and communications

✓ *Meets minimum criteria*

Considerations

a. Positioned within the view of a camera, capable of message verification

✓ *Meets minimum criteria. CCTV 103 at Bethany Home and 104 at Glendale. (http://www.azdot.gov/Highways/TTG/PDF/CCTV-PhxMetro-100201.pdf*)

b. Placement of static signs and DMS not allowed on same support structure

✘ *Less than 200' from guide sign. Guide sign cannot be placed with DMS on tubular structure.* Explore relocation options.

c. Place foundations outside of clear zone

✘ *Left foundation leg does not meet clear zone requirements.* Impact attenuation devices or concrete traffic barriers are needed.

d. Foundation should not impede drainage

✓ *Meets minimum criteria*

e. Solid and flat shoulder or maintenance pad

✘ *Ultimate roadway configuration is unknown. The roadway was striped for construction during site visit and does not meet criteria.* Concrete barrier would prevent mitigation. Explore relocation options.

f. Min. 18’ vertical clearance from high point of roadway surface

✓ *Meets minimum criteria*

g. Avoid conflicts with lighting poles & conduits

✓ *Meets minimum criteria*

h. Minimize physical site challenges with structures, overhead lines, and FAA zones

✘ *Median barrier is a physical site challenge.* Explore relocation options.

i. Minimize environmental & visual impacts

✓ *Meets minimum criteria*

j. Remain within right-of-way with all components

✓ *Meets minimum criteria*

DMS Relocation Option 1: Move 650 feet upstream of existing guide sign

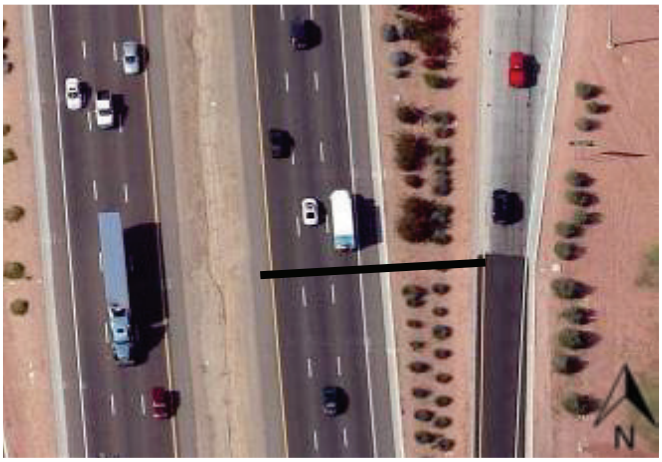


Figure 18 - Aerial View of DMS relocation option 1

Criteria & Considerations that Changed From Initial Location or Need Mitigation:

Primary Criteria

E. Maximum three-mile spacing along urban mainline freeways

✘ *Spacing from upstream DMS is 3.1 miles and downstream DMS is 3.2 miles. This is close to meeting criteria.* Submit justification and obtain ADOT TTG PM approval.

Secondary Criteria

F. Min. 650' spacing from major guide signs (1,000' is desired)

✓ *Meets minimum criteria; DMS is 650' from downstream guide sign and 1,000' from upstream guide sign.*

Considerations

b. Placement of static signs and DMS not allowed on same support structure

✓ *Meets minimum criteria; major guide sign is 650' from DMS and does not need to be co-located*

c. Place foundations outside of clear zone

✘ *Both left and right foundation legs do not meet clear zone requirements.* Impact attenuation devices or concrete traffic barriers are needed. Placement of right foundation between off ramp and freeway travel lanes is a potential challenge.

e. Solid and flat shoulder or maintenance pad

✘ *Ultimate roadway configuration is unknown. The roadway was striped for construction during site visit and does not meet criteria. Unpaved shoulder is sloped.* Maintenance Pad may need to be provided.

h. Minimize physical site challenges with structures, overhead lines, and FAA zones

✓ *Meets minimum criteria; there is no median barrier at this location.*

DMS Relocation Option 2: Move 650 feet or more upstream of existing guide sign

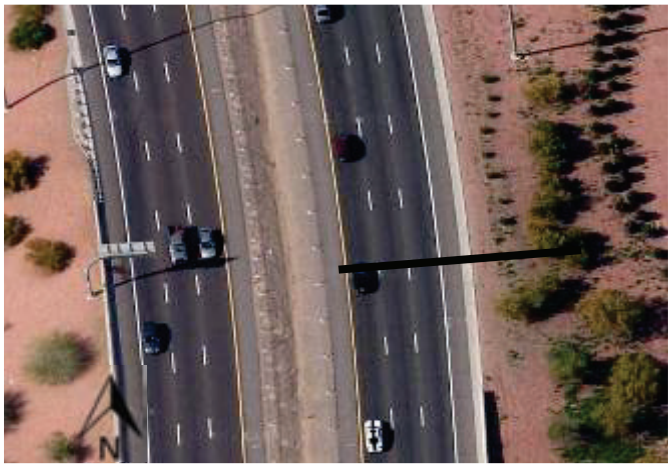


Figure 19 - Aerial View of DMS relocation option 2

Figure 20 - DMS Relocation Option 2 Site Visit Photo looking South (3-24-11)

Criteria & Considerations that Changed From Initial Location or Need Mitigation:

Primary Criteria

E. Maximum three-mile spacing along urban mainline freeways

✘ *Spacing from upstream DMS is 3.1 miles and downstream DMS is 3.2 miles. This is close to meeting criteria.* Submit justification and obtain ADOT TTG PM approval.

Secondary Criteria

F. Min. 650' spacing from major guide signs (1,000' is desired)

✓ *Meets minimum criteria; DMS is 1,060' from upstream guide sign.*

Considerations

b. Placement of static signs and DMS not allowed on same support structure

- ✓ *Meets minimum criteria; major guide sign is 1,060' from DMS and does not need to be co-located*

c. Place foundations outside of clear zone

- ✘ *Left foundation leg does not meet clear zone requirements.* Impact attenuation devices or concrete traffic barriers are needed.

e. Solid and flat shoulder or maintenance pad

- ✘ *Ultimate roadway configuration is unknown. The roadway was striped for construction during site visit and does not meet criteria. Unpaved shoulder is sloped.* Maintenance Pad may need to be provided.

h. Minimize physical site challenges with structures, overhead lines, and FAA zones

- ✓ *Meets minimum criteria; there is no median barrier at this location.*

Overall, DMS Relocation Option 2 adheres to the most criteria and considerations with the fewest design challenges. Placement further upstream was not considered in this situation due to proximity to the Glendale special event activity center. Placement further downstream was not considered in this situation due to curvature of the road.

7.2.2 EXAMPLE DMS SITE ANALYSIS #2: SR 87 SB AT MILEPOST 180

Figure 21 - Aerial View of Proposed DMS Location on SR 87 at MP 180

Primary Criteria

A. Two DMS are desired within four miles prior to each system interchange

- *N/A; this is a rural location*

B. One DMS is desired within one mile prior to an event venue or recurring bottleneck location

- *N/A; this is a rural location*

C. One DMS is desired within three miles prior to each intersection of any two state or US highways offering potential as diversion routes

✓ *Meets minimum criteria; this location is 2.75 miles before the intersection of SR 87 Beeline Highway and SR202L Red Mountain Freeway*

D. One DMS, per direction, is desired within 5 miles of state boundaries

- *N/A; this location does not serve a state boundary*

E. Maximum three-mile spacing along urban mainline freeways

- *N/A; this is a rural location*

Secondary Criteria

F. Min. 650' spacing from major guide signs (1,000' is desired)

✓ *Meets minimum criteria*

G. Min. 1,000' vertical and horizontal visibility and 15° cone

✓ *Meets minimum criteria*

H. Min. ¾ mile (3,960') and Max. 1½ mile (7,920') upstream of diversion exit

- *N/A; this is a rural location*

I. Avoid areas where frequent braking or weaving movements are common

✘ *This location is within an intersection.* Explore relocation options.

J. Proximity to power and communications

✘ *Power is not close.* Explore relocation options.

Considerations

a. Positioned within the view of a camera, capable of message verification

✘ *This is a rural location without CCTV.* A DMS message verification camera may be installed with the DMS sign. A two direction traffic monitoring camera may also be installed. Contact the TTG PM for guidance on what type of cameras should be installed.

b. Placement of static signs and DMS not allowed on same support structure

✓ *Meets minimum criteria*

c. Place foundations outside of clear zone

✘ *No space for left leg foundation in the median due to location within an intersection.* Explore relocation options.

d. Foundation should not impede drainage

✘ *To meet clear zone requirements, right foundation leg would be in a lower elevation drainage area.* Explore relocation options.

e. Solid and flat shoulder or maintenance pad

✓ *Meets minimum criteria*

f. Min. 18' vertical clearance from high point of roadway surface
   ✓ *Meets minimum criteria*

g. Avoid conflicts with lighting poles & conduits
   ✓ *Meets minimum criteria*

h. Minimize physical site challenges with structures, overhead lines, and FAA zones
   ✓ *Meets minimum criteria*

i. Minimize environmental & visual impacts
   ✓ *Meets minimum criteria*

j. Remain within right-of-way with all components
   ✓ *Meets minimum criteria*

DMS Relocation Solution: Relocate on SR 87 southbound at approximately milepost 179.5.

Criteria & Considerations that Changed From Initial Location or Need Mitigation:

Secondary Criteria

I. Avoid areas where frequent braking or weaving movements are common
   ✓ *Meets minimum criteria; no driveways or intersections*

J. Proximity to power and communications
   ✓ *Meets minimum criteria; power is available on other side of road*

Considerations

a. Positioned within the view of a camera, capable of message verification
   ✘ *This is a rural location without CCTV.* Include camera with DMS design.

c. Place foundations outside of clear zone
   ✘ *Median is not wide enough for adequate clear zone for the left foundation leg.* Impact attenuation devices are needed.

d. Foundation should not impede drainage
   ✘ *To meet clear zone requirements, right foundation leg would be in a lower elevation drainage area.* Investigate design solutions.

7.2.3 EXAMPLE DMS SITE ANALYSIS #3: SR202L EB AT DOBSON ROAD

Figure 22 - Aerial View of DMS Blister Location on Loop 202 at Dobson Road

Primary Criteria

A. Two DMS are desired within four miles prior to each system interchange

- *N/A; this is a mainline location*

B. One DMS is desired within one mile prior to an event venue or recurring bottleneck location

- *N/A; this location does not serve event venue or recurring bottleneck location*

C. One DMS is desired within three miles prior to each intersection of any two state or US highways offering potential as diversion routes

- *N/A; this is an urban location. This location is 2 miles upstream of SR87.*

D. One DMS, per direction, is desired within 5 miles of state boundaries

- *N/A; this is an urban location*

E. Maximum three-mile spacing along urban mainline freeways

- ✘ *Spacing from downstream DMS is 3.8 miles.* This location has already been designed and constructed.

Secondary Criteria

F. Min. 650’ spacing from major guide signs (1,000’ is desired)

- ✘ *The DMS blister is located within a few feet of a guide sign.* Explore relocation options.

G. Min. 1,000' vertical and horizontal visibility and 15° cone
   - ✓ *Meets minimum criteria*

H. Min. ¾ mile (3,960') and Max. 1½ mile (7,920') upstream of diversion exit
   - ✓ *This location is ¾ of a mile upstream of next possible diversion exit.*

I. Avoid areas where frequent braking or weaving movements are common
   - ✓ *Meets minimum criteria*

J. Proximity to power and communications
   - ✓ *Meets minimum criteria*

Considerations

a. Positioned within the view of a camera, capable of message verification
   - ✓ *Meets minimum criteria. CCTV 211 at SR202L and SR101L interchange. (http://www.azdot.gov/Highways/TTG/PDF/CCTV-PhxMetro-100201.pdf*)

b. Placement of static signs and DMS not allowed on same support structure
   - ✗ *The DMS blister is located within a few feet of a guide sign. Guide sign cannot be placed with DMS on tubular structure.* Explore relocation options.

c. Place foundations outside of clear zone
   - ✓ *Meets minimum criteria*

d. Foundation should not impede drainage
   - ✓ *Meets minimum criteria*

e. Solid and flat shoulder or maintenance pad
   - ✓ *Meets minimum criteria*

f. Min. 18' vertical clearance from high point of roadway surface
   - ✓ *Meets minimum criteria*

g. Avoid conflicts with lighting poles & conduits
   - ✓ *Meets minimum criteria*

h. Minimize physical site challenges with structures, overhead lines, and FAA zones
   - ✓ *Meets minimum criteria*

i. Minimize environmental & visual impacts
   - ✓ *Meets minimum criteria*

j. Remain within right-of-way with all components
   - ✓ *Meets minimum criteria*

DMS Relocation Option 1: Move green guide sign 650' upstream.

Criteria & Considerations that Changed From Initial Location or Need Mitigation:

Primary Criteria

E. Maximum three-mile spacing along urban mainline freeways

- ✘ *Spacing from downstream DMS is 3.8 miles.* This location has already been designed and constructed.

Secondary Criteria

F. Min. 650' spacing from major guide signs (1,000' is desired)

- ✓ *Meets minimum criteria*

I. Avoid areas where frequent braking or weaving movements are common

- ✘ *Location is within gore point for Dobson Road off ramp.* Explore relocation options.

Considerations

b. Placement of static signs and DMS not allowed on same support structure

- ✓ *Meets minimum criteria*

DMS Relocation Option 2: Move green guide sign 650' downstream.

Criteria & Considerations that Changed From Initial Location or Need Mitigation:

Primary Criteria

E. Maximum three-mile spacing along urban mainline freeways

- ✘ *Spacing from downstream DMS is 3.8 miles.* This location has already been designed and constructed.

Secondary Criteria

F. Min. 650' spacing from major guide signs (1,000' is desired)

- ✓ *Meets minimum criteria*

Considerations

b. Placement of static signs and DMS not allowed on same support structure

- ✓ *Meets minimum criteria*

h. Minimize physical site challenges with structures, overhead lines, and FAA zones

- ✘ *Guide sign would be located on a bridge (freeway over arterial) where foundation could not be placed.* Explore relocation options.

DMS Relocation Option 3: Move green guide sign 800' downstream, past the bridge, and move second green guide sign 150' downstream.

Criteria & Considerations that Changed From Initial Location or Need Mitigation:

Primary Criteria

G. Maximum three-mile spacing along urban mainline freeways

- ✘ *Spacing from downstream DMS is 3.8 miles.* This location has already been designed and constructed.

Secondary Criteria

H. Min. 650' spacing from major guide signs (1,000' is desired)

- ✓ *Major guide signs must be at least 650' apart. Moving the guide sign 800' downstream places it only 500' from a second guide sign.* Moving the second guide sign 150' downstream meets 650' criteria.

Considerations

b. Placement of static signs and DMS not allowed on same support structure

- ✓ *Meets minimum criteria*

DMS Relocation Solution: Relocation Option #3.

Since the blister is constructed, keep the DMS at the original location. Use DMS Relocation Option 3 and move the green guide sign 800' downstream and the 2nd sign 150' downstream from its location to meet 650' criteria.

7.2.4 EXAMPLE DMS SITE ANALYSIS #4: SR51 AT UNION HILLS DR

Figure 23 - Photographs (3-24-11) of Proposed DMS Location on Union Hills Drive Bridge

Primary Criteria

A. Two DMS are desired within four miles prior to each system interchange

- *N/A; this is a mainline location*

B. One DMS is desired within one mile prior to an event venue or recurring bottleneck location

- *N/A; this location does not serve event venue or recurring bottleneck location*

C. One DMS is desired within three miles prior to each intersection of any two state or US highways offering potential as diversion routes

- *N/A; this is an urban location.*

D. One DMS, per direction, is desired within 5 miles of state boundaries

- *N/A; this is an urban location*

E. Maximum three-mile spacing along urban mainline freeways

✘ *Spacing from downstream DMS is 3.5 miles.* Explore relocation options or submit justification and obtain ADOT TTG PM approval.

Secondary Criteria

F. Min. 650' spacing from major guide signs (1,000' is desired)

✓ *Meets minimum criteria*

G. Min. 1,000' vertical and horizontal visibility and 15° cone

✓ *Meets minimum criteria*

H. Min. ¾ mile (3,960') and Max. 1½ mile (7,920') upstream of diversion exit

✓ *This location is ¾ of a mile upstream of next possible diversion exit.*

I. Avoid areas where frequent braking or weaving movements are common

✓ *Meets minimum criteria*

J. Proximity to power and communications

✓ *Meets minimum criteria*

Considerations

a. Positioned within the view of a camera, capable of message verification

✓ *Meets minimum criteria. CCTV 121 and 122 at SR51 and SR101L interchange. (http://www.azdot.gov/Highways/TTG/PDF/CCTV-PhxMetro-100201.pdf*)

b. Placement of static signs and DMS not allowed on same support structure

✘ *The DMS would be co-located on bridge with two guide signs. Guide signs can be placed with DMS on bridge structures with additional analysis and approval. The curved face of the bridge will be a design challenge.* Explore relocation options.

c. Place foundations outside of clear zone

- *N/A; this is a bridge mounted location.*

d. Foundation should not impede drainage

- *N/A; this is a bridge mounted location.*

e. Solid and flat shoulder or maintenance pad

✓ *Meets minimum criteria*

f. Min. 18' vertical clearance from high point of roadway surface

✓ *Meets minimum criteria*

g. Avoid conflicts with lighting poles & conduits

✓ *Meets minimum criteria*

h. Minimize physical site challenges with structures, overhead lines, and FAA zones

✘ *The curved face of the SPUI bridge will be a design challenge.* Explore relocation options.

i. Minimize environmental & visual impacts

✓ *Meets minimum criteria*

j. Remain within right-of-way with all components

✓ *Meets minimum criteria*

Since this is the end of a corridor, the additional distance would allow for one additional interchange to be used for diversion. This location may have fewer braking and weaving movements due to the T-interchange configuration. The DMS would be co-located on bridge with two guide signs. The physical characteristics of the roadway at this location may allow sufficient sight distance to read and understand all three signs. Although the existing "closed" bridge may have difficulty retrofitting, this location has minimal conflicts with the criteria and considerations.

DMS Relocation Option 1: Relocate DMS 650' – 1000' upstream and place foundation in modified median barrier.

Criteria & Considerations that Changed From Initial Location or Need Mitigation:

Primary Criteria

E. Maximum three-mile spacing along urban mainline freeways

✘ *Spacing from downstream DMS is 3.6 miles.* Explore relocation options or submit justification and obtain ADOT TTG PM approval.

Secondary Criteria

H. Min. ¾ mile (3,960') and Max. 1½ mile (7,920') upstream of diversion exit

✓ *This location is approximately 1 mile upstream of next possible diversion exit.*

Considerations

b. Placement of static signs and DMS not allowed on same support structure

✓ *Meets minimum criteria*

h. Minimize physical site challenges with structures, overhead lines, and FAA zones

✓ *Meets minimum criteria*

Overall, this location has no conflicts with criteria and consideration, except for mainline DMS spacing.

DMS Relocation Option 2: Relocate DMS 0.6 miles downstream, 650' south of pedestrian bridge, and place foundation in modified median barrier.

Criteria & Considerations that Changed From Initial Location or Need Mitigation:

Primary Criteria

E. Maximum three-mile spacing along urban mainline freeways

✓ *Meets minimum criteria; spacing from downstream DMS is 3 miles.*

Secondary Criteria

H. Min. ¾ mile (3,960') and Max. 1½ mile (7,920') upstream of diversion exit

✓ *This location is 1.15 miles upstream of next possible diversion exit.*

Considerations

b. Placement of static signs and DMS not allowed on same support structure

✓ *Meets minimum criteria*

h. Minimize physical site challenges with structures, overhead lines, and FAA zones

✓ *Meets minimum criteria*

Overall, this location has no conflicts with criteria and consideration, but may experience more frequent braking and weaving movements that the other location options. With this location only 700' upstream from the off-ramp, Bell Road could not be used as a diversion exit.

DMS Relocation Solution: All three of these locations are suitable. Factors such as ability to retrofit the bridge, cost to modify the median barrier, or desire to provide traffic diversion on Bell Road will contribute to the ultimate decision.

8.0 DMS MAPS

This Master Plan identifies candidate DMS locations within the Phoenix and Tucson FMS areas, and throughout the Statewide Rural areas. It provides working tools for practitioners to use in determining DMS requirements for the Arizona highway system.

Each permanent DMS entry has a spatial location embedded in the GIS data structure and an operational STATUS parameter with the following valid values:

- Proposed – candidate DMS locations
- In Design/Under Construction – locations of DMS currently in design or construction phases
- Existing – existing DMS locations that provide feedback to roadway users

Maps for DMS have been provided in Appendix B and a listing by district is provided in Appendix C. The database is available electronically, upon request, through the ADOT TTG Project Managers.

Since DMS can be in different stages despite having a defined location, the different evolutionary steps from the initial idea to being fully operational have been defined below.

Proposed

These DMS locations can be identified in: planning documents for future new freeways or freeway improvements; older DMS databases; and past studies/reports. These DMS locations were also identified through the ADOT DMS Master Plan process as "gaps" in the urban DMS network on existing urban roadways. These locations were selected based on greatest adherence to the Master Plan criteria and considerations based on existing conditions in the field. Locations that exist as a median or roadside blister also fall into this category. Non-blister locations are still subject to adjustments when in final design.

In Design/Under Construction

These DMS locations are included, or in the process of being included, in design plans for a roadway project and thus close to completion. Or the DMS structure is fully built but not completely operational or under construction. This stage is when the location is finalized and calculations for structures, sight distances, and sign types are performed or test runs are conducted before the sign is fully operational to ensure that it can handle its required operational loading (daily/event based).

Operational

These DMS locations are fully operational and provide feedback to roadway users regarding traffic, incidents, or events.

APPENDIX A – DMS SIZE SELECTION TABLE

DMS SIZE SELECTION TABLE

Facility/Condition	Typical Speed Limit (mph)	Should Use (Size)				May Use (Size)				Do NOT Use (Size)				Remarks
		1	2	3	4	1	2	3	4	1	2	3	4	
Freeway, Divided Highway	55 - 75	X					X					X	X	Typically mounted on overhead tubular structure or face of bridge.
Undivided Rural Highway, 2 or more lanes per direction	45 - 65	X					X					X	X	Typically mounted on overhead tubular structure or face of bridge.
Undivided Rural Highway, 1 lane per direction	45 - 65	X					X	X					X	Size 1 & 2 typically mounted on overhead. Size 3 typically mounted on roadside structure.

NOTE: All size and mounting method selections are subject to designer submission to and approval by the ADOT TTG Project Manager.

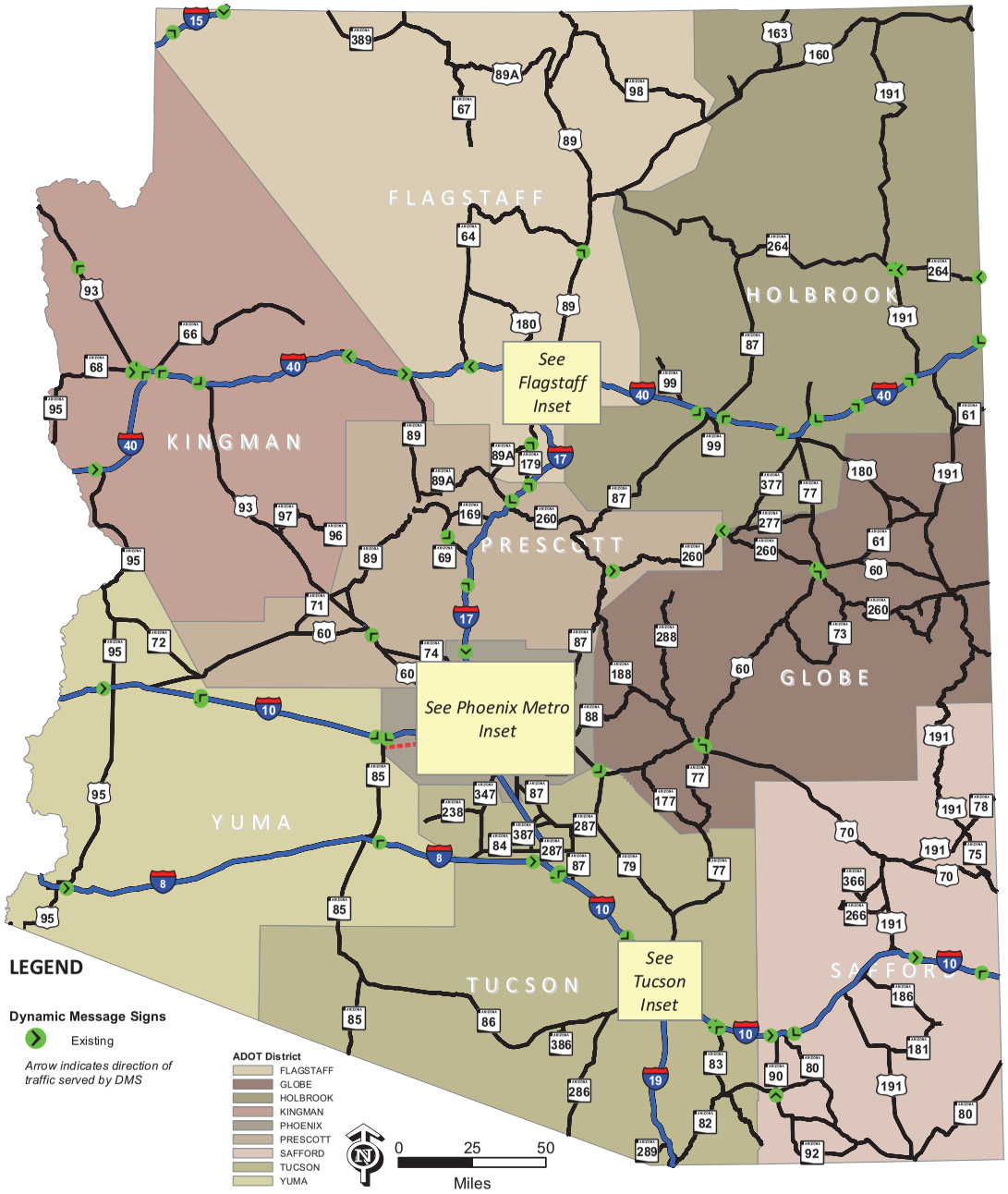
Nominal DMS Sign Sizes:[1]

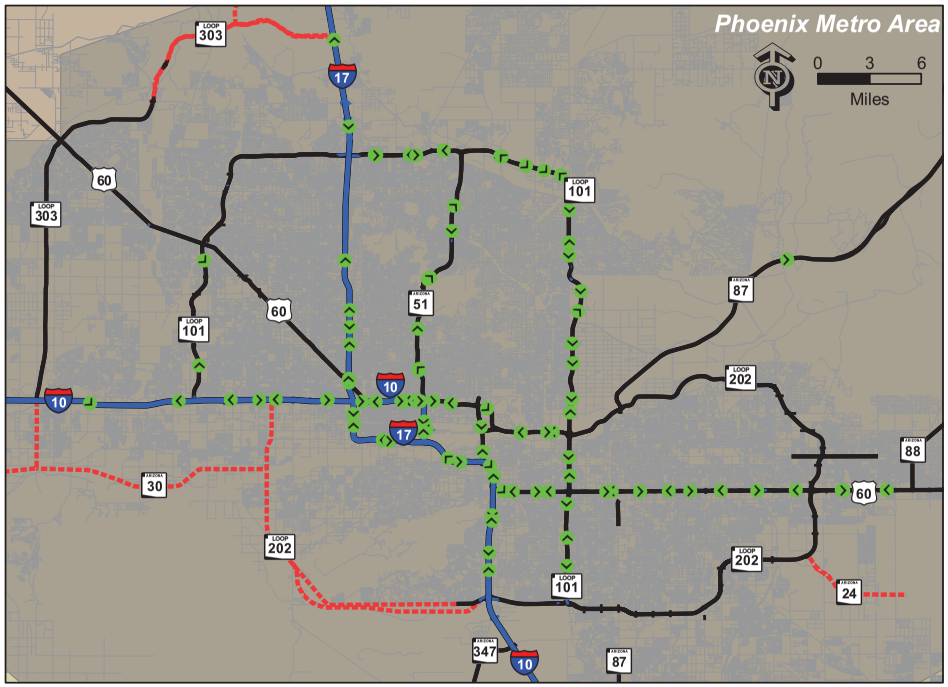
	W x H
Size 1:	31' x 8'
Size 2:	17' x 5'
Size 3:	10' x 4'
Size 4:	8' x 4'

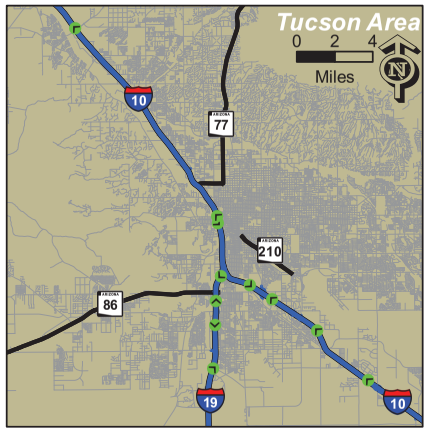
[1] **FOOTNOTES:**

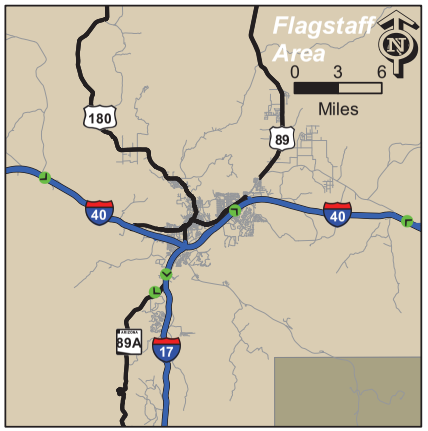
Based on DMS available under the ADOT Procurement contract in effect October 2011.

APPENDIX B – DMS GIS MAPS



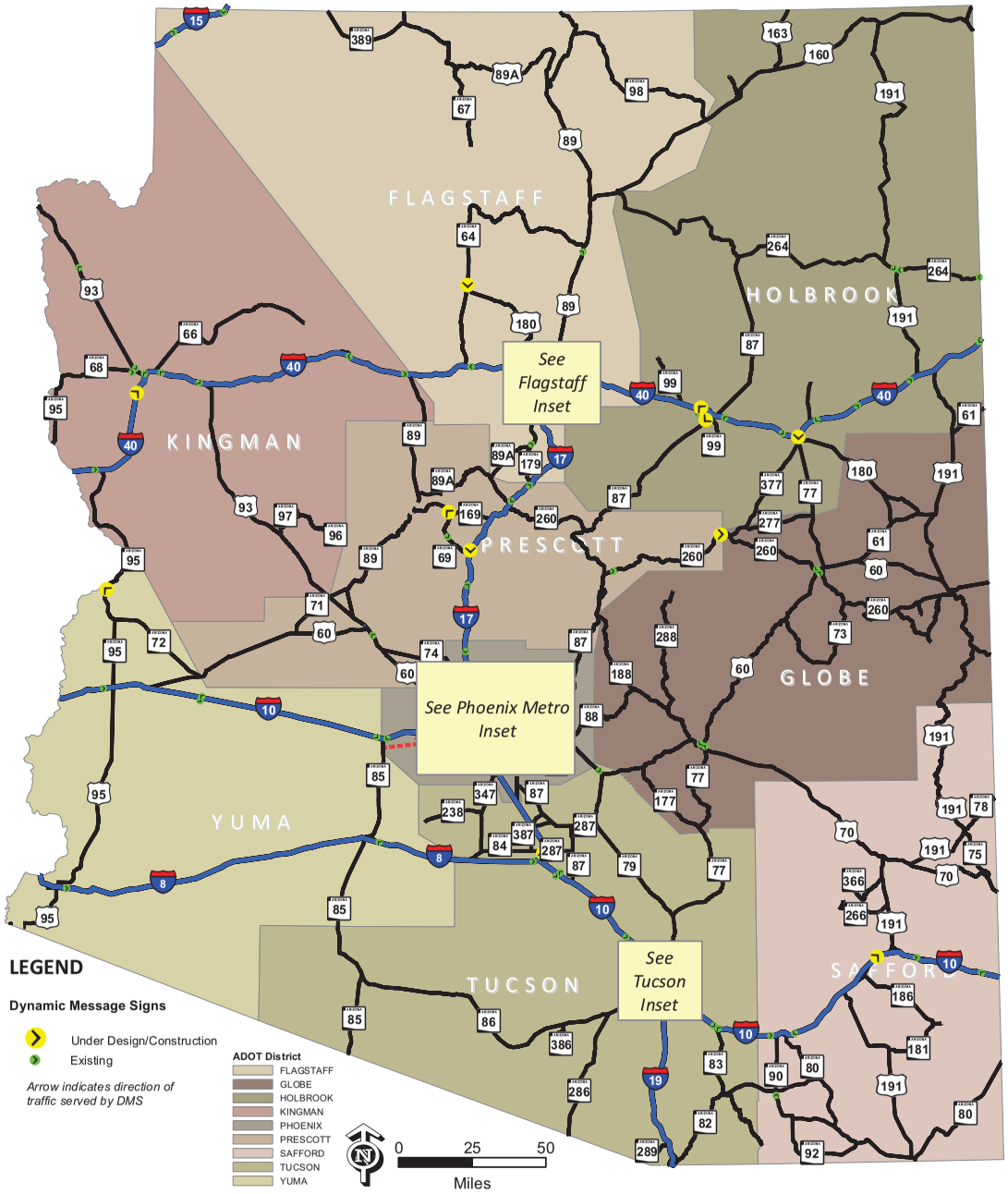


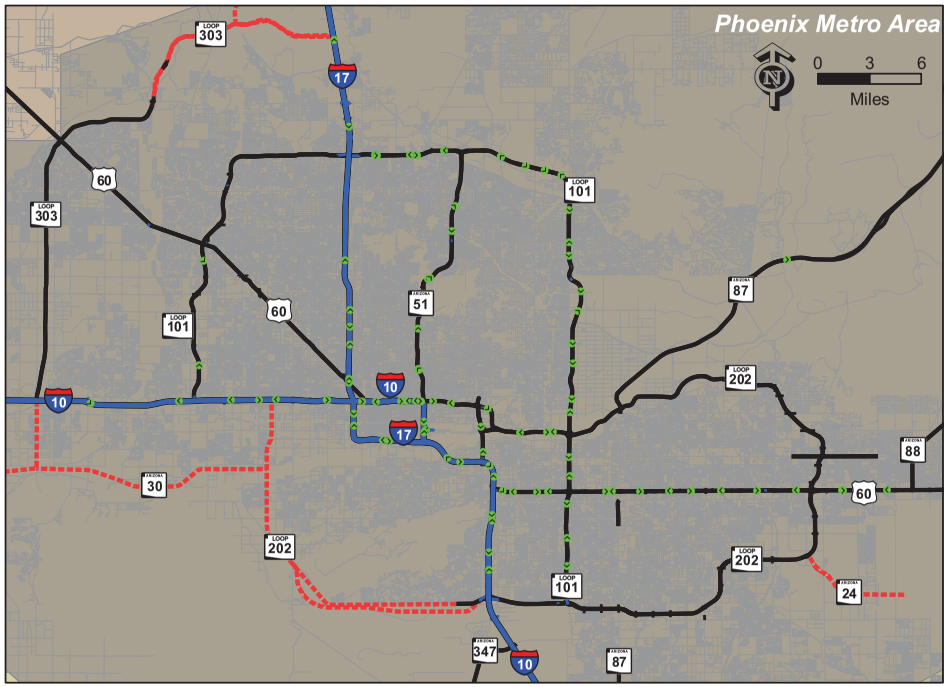


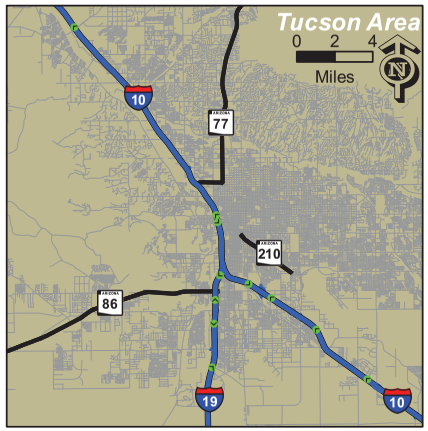


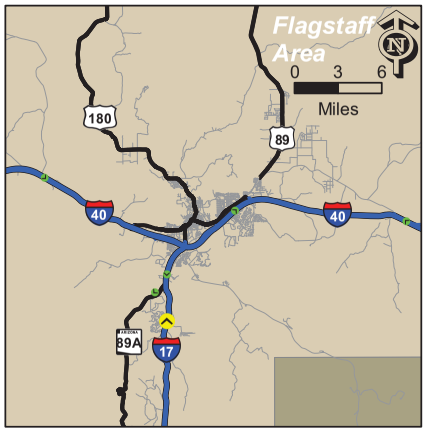
Existing DMS Sites in Arizona

Figure A.1



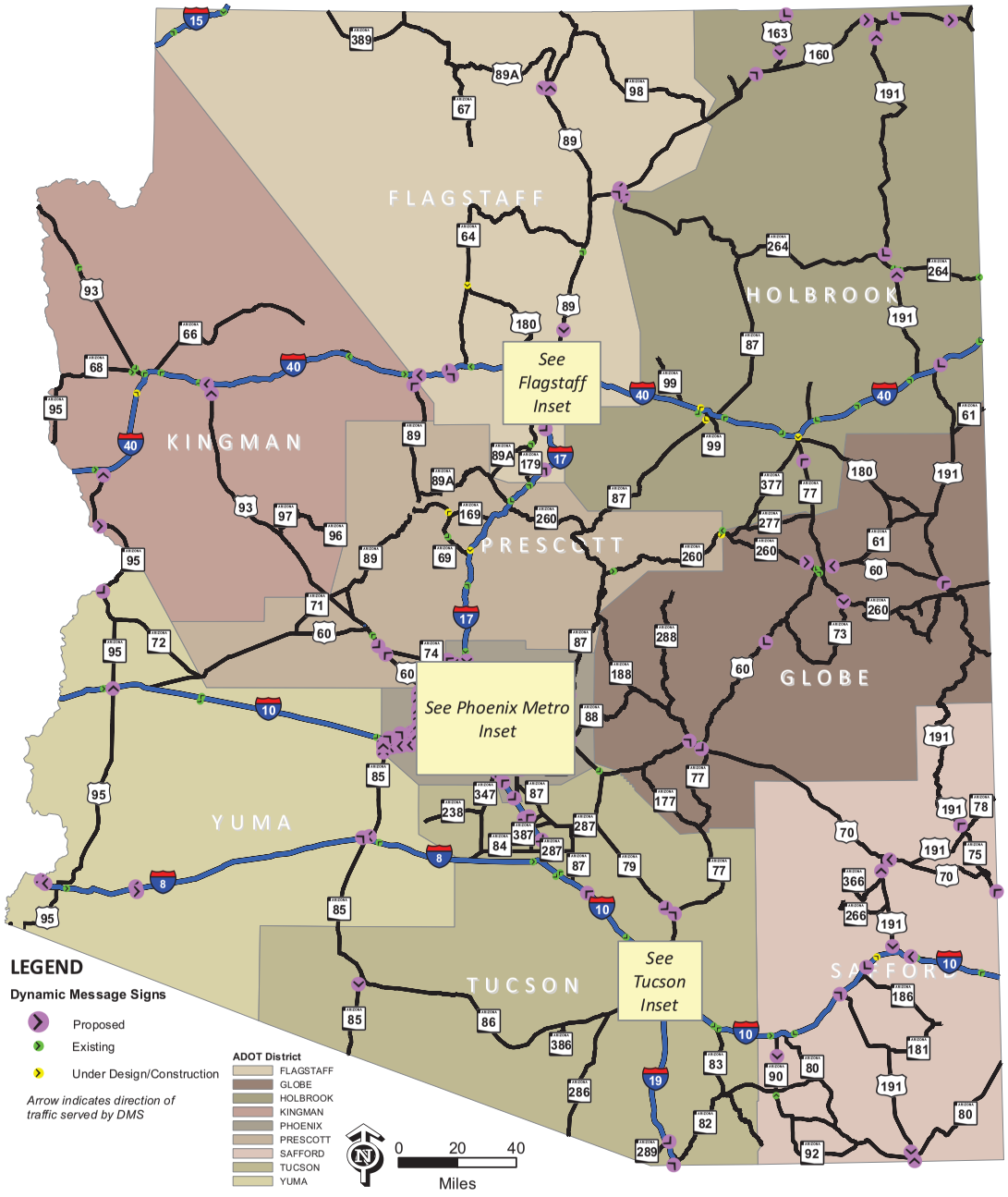


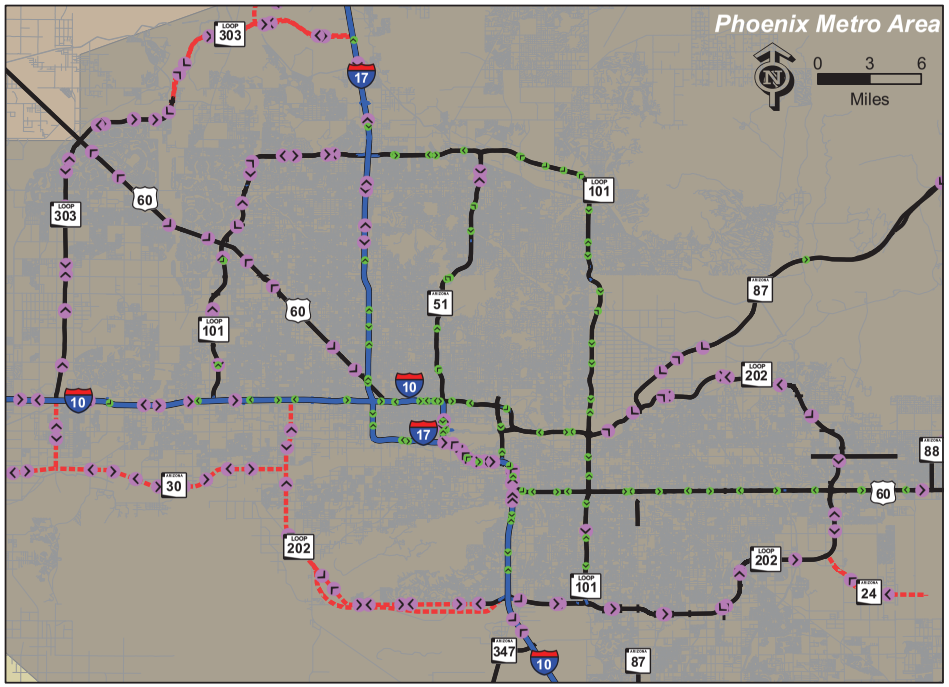


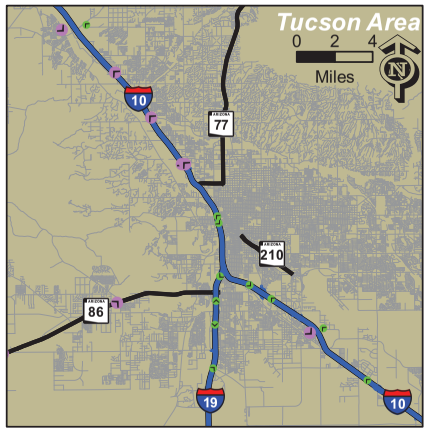


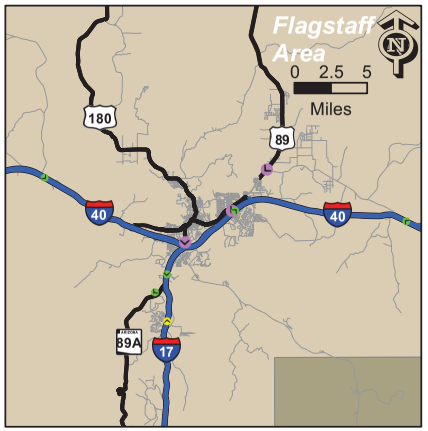
Under Design/Construction DMS Sites in Arizona

Figure A.2



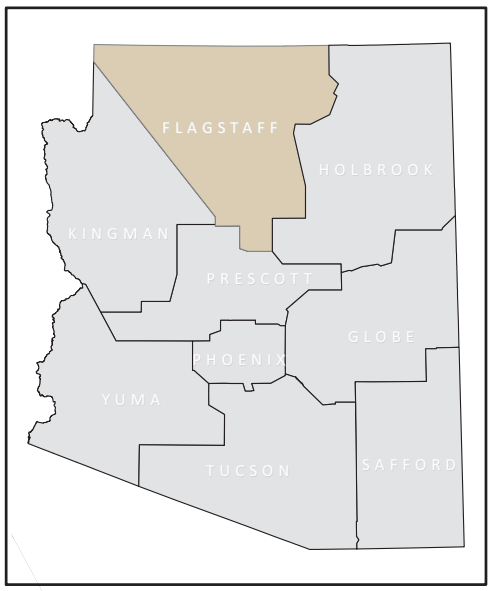






Proposed DMS Sites in Arizona

Figure A.3



LEGEND

Dynamic Message Signs

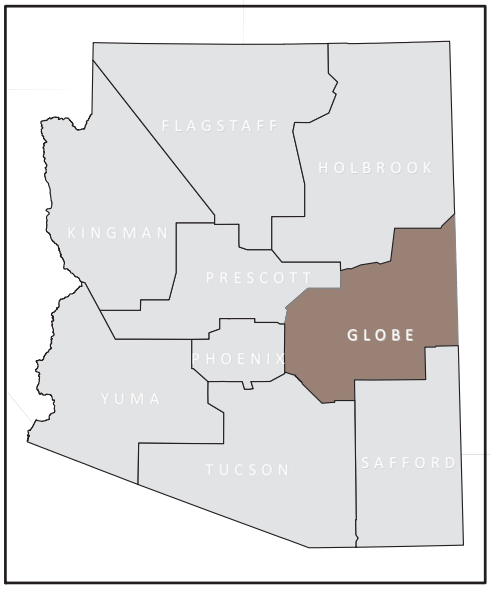
- Existing
- Under Design/Construction
- Proposed

Arrow indicates direction of traffic served by DMS

0 10 20 30 40

Miles

Existing, Pending & Proposed DMS Sites
Flagstaff District
Figure A.4



GLOBE

LEGEND

Dynamic Message Signs

- Existing
- Under Design/Construction
- Proposed

Arrow indicates direction of traffic served by DMS

0 5 10 15 20
Miles

Existing, Pending & Proposed DMS Sites
Globe District
Figure A.5

LEGEND

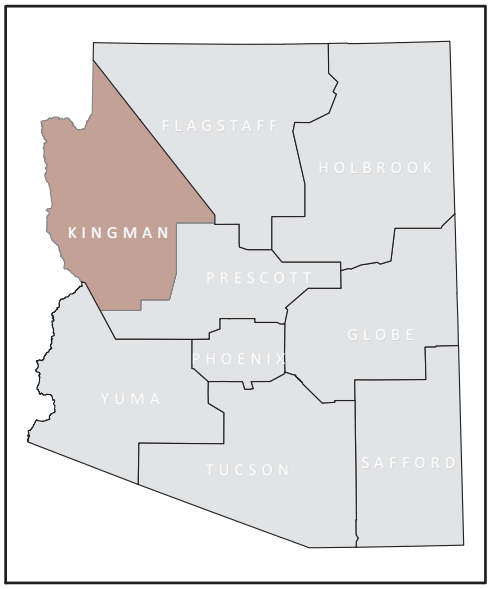
Dynamic Message Signs

- Existing
- Under Design/Construction
- Proposed

Arrow indicates direction of traffic served by DMS

0 5 10 15 20
Miles

Existing, Pending & Proposed DMS Sites
Holbrook District
Figure A.6



KINGMAN

LEGEND

Dynamic Message Signs

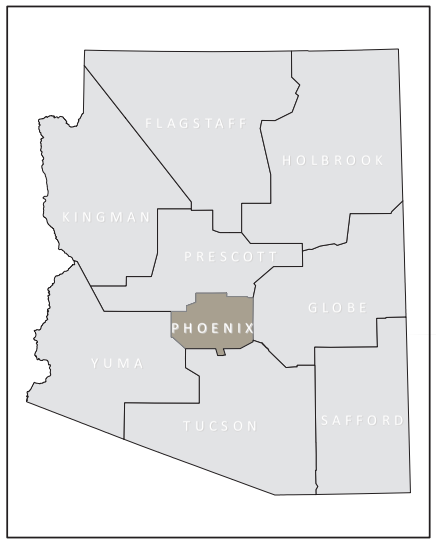
- Existing
- Under Design/Construction
- Proposed

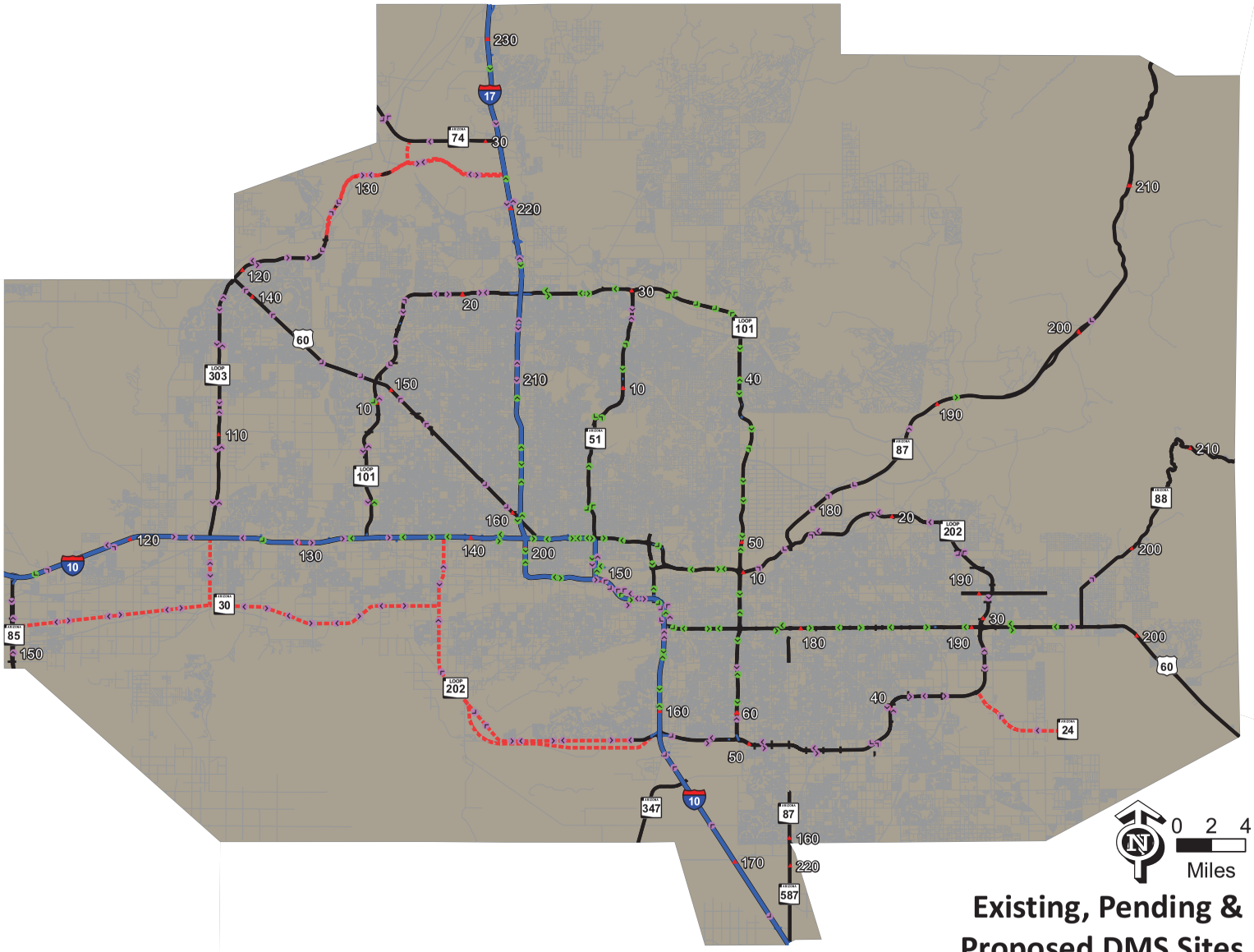
Arrow indicates direction of traffic served by DMS

0 10 20 30 40

Miles

Existing, Pending & Proposed DMS Sites
Kingman District
Figure A.7





LEGEND

Dynamic Message Signs

- Existing
- Under Design/Construction
- Proposed

Arrow indicates direction of traffic served by DMS.

0 2 4
Miles

Existing, Pending & Proposed DMS Sites Phoenix Maintenance District

Figure A.8

PRESCOTT

LEGEND

Dynamic Message Signs

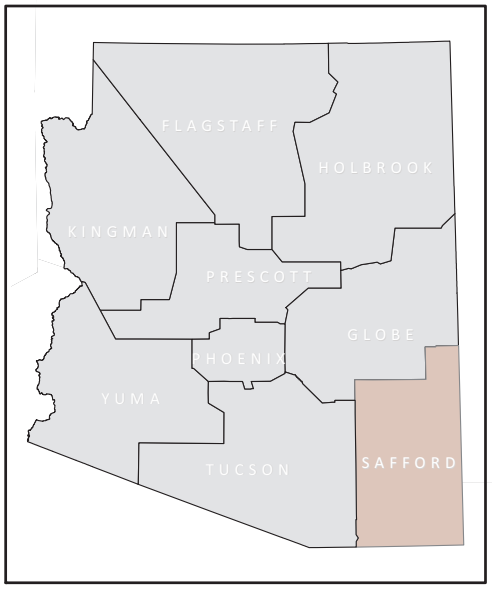
- Existing
- Under Design/Construction
- Proposed

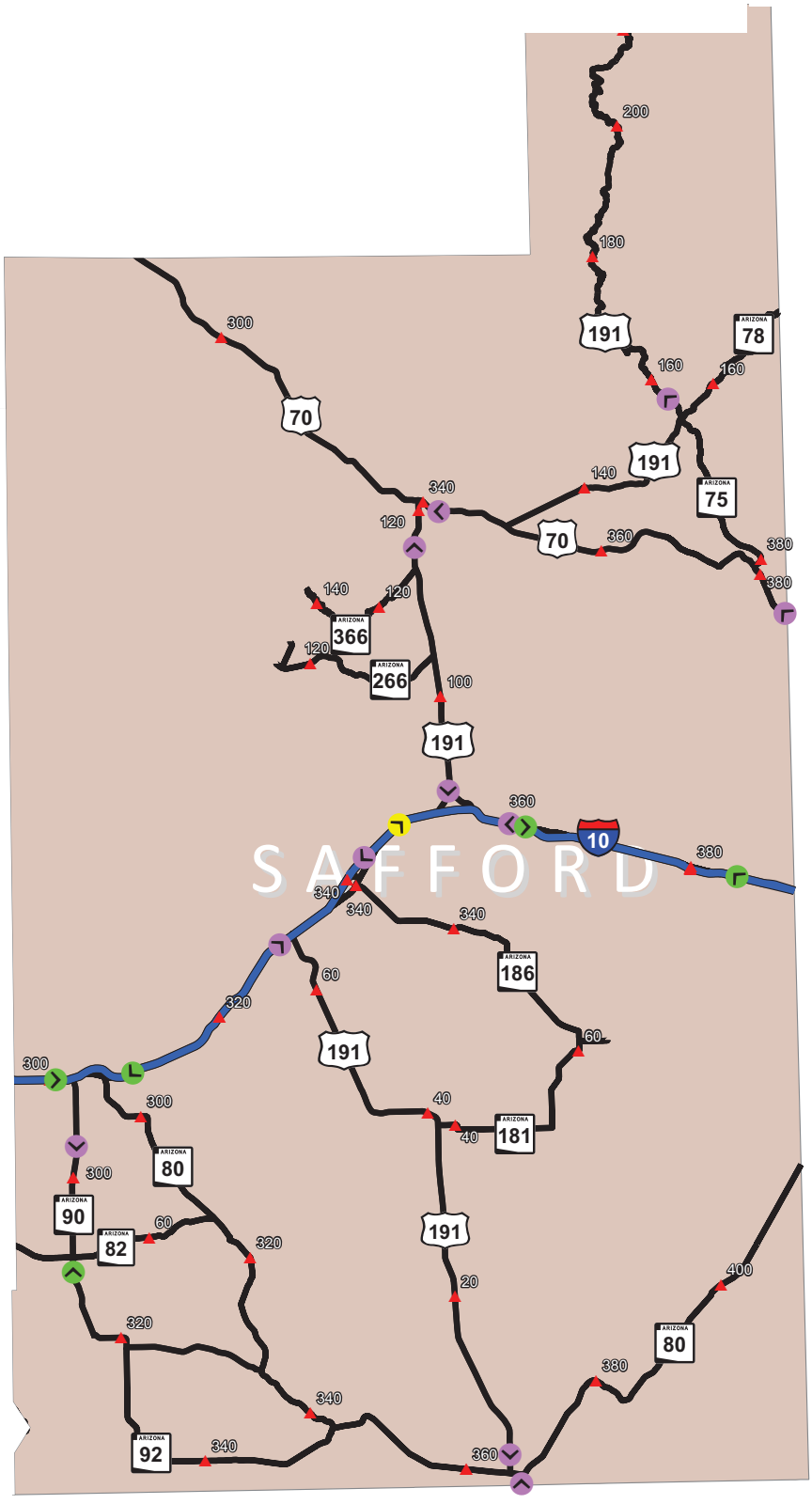
Arrow indicates direction of traffic served by DMS

0 5 10 15 20

Miles

Existing, Pending & Proposed DMS Sites
Prescott District
Figure A.9





LEGEND

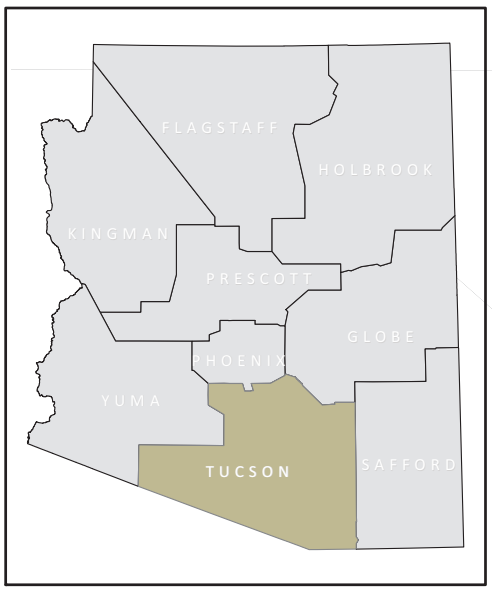
Dynamic Message Signs

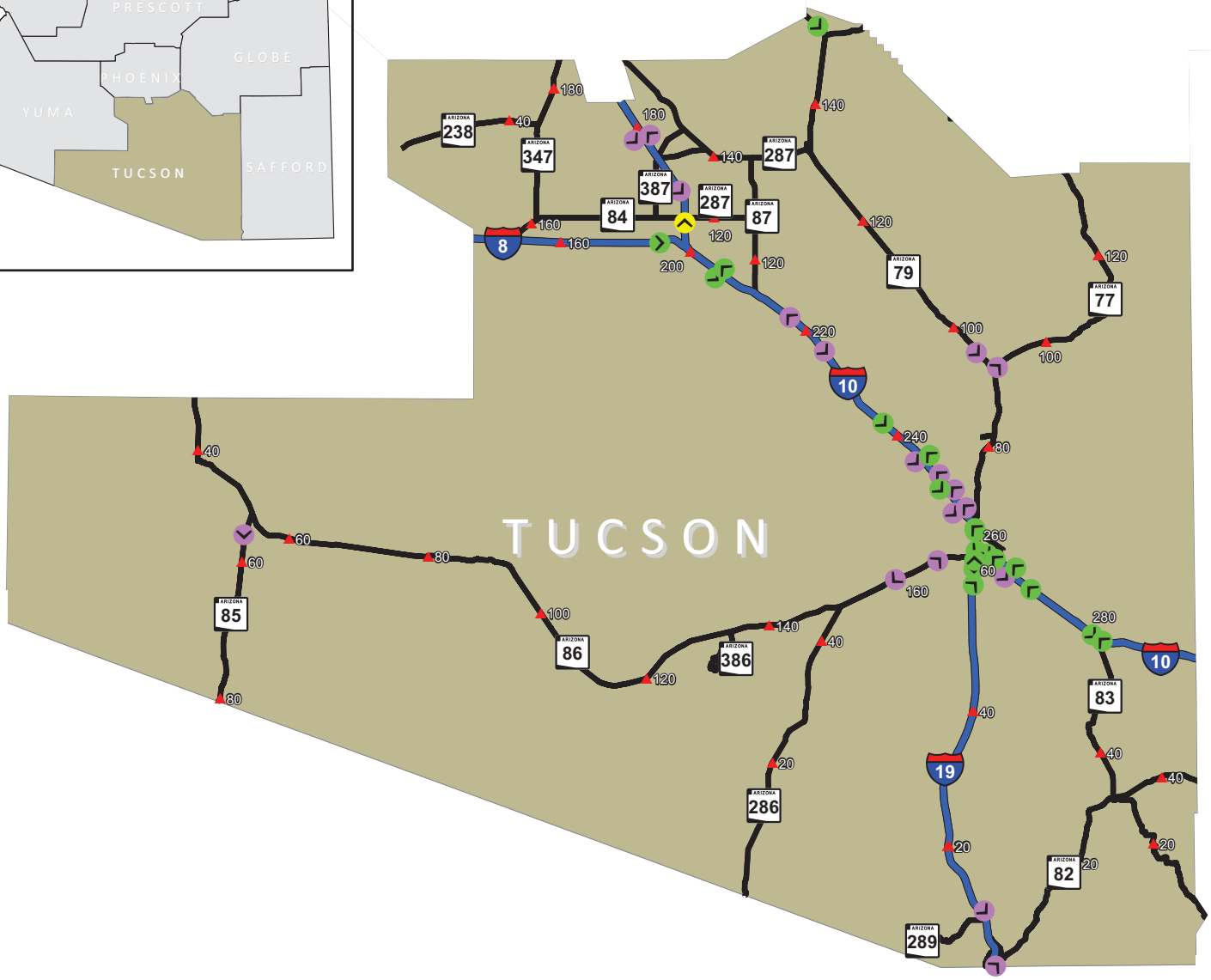
- Existing
- Under Design/Construction
- Proposed

Arrow indicates direction of traffic served by DMS

0 5 10 15 20
Miles

Existing, Pending & Proposed DMS Sites
Safford District
Figure A.10





LEGEND

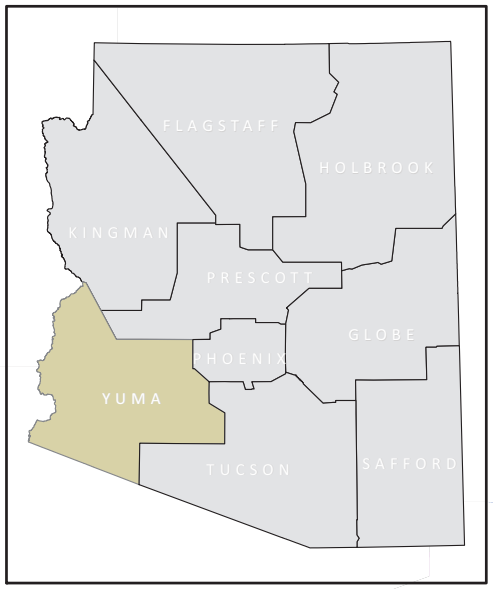
Dynamic Message Signs

- Existing
- Under Design/Construction
- Proposed

Arrow indicates direction of traffic served by DMS

0 5.5 11 16.5 22
Miles

Existing, Pending & Proposed DMS Sites
Tucson District
Figure A.11



LEGEND

Dynamic Message Signs

- Existing
- Under Design/Construction
- Proposed

Arrow indicates direction of traffic served by DMS

Existing, Pending & Proposed DMS Sites
Yuma District
Figure A.12

APPENDIX C – DMS LISTING BY DISTRICT

HWY.	LOCATION	TOWN/CITY	NO.	M/P	DIRECTION	STAT	SUPPORT TYPE	CARDINAL DIRECTION	COMMENT	JUSTIFICATION	DISTRICT	URBAN / RURAL
I-15	Just S of Littlefield/Beaver Dam Exit #8	Littlefield	370	7.7	NB	O	U-Pole	NE	Flagstaff District 7-28-2011	Existing	Flagstaff	Rural
I-15	Approx 1 mile S of Utah Border		371	28.1	SB	O	U-Pole	SW	Flagstaff District 7-28-2011	Existing	Flagstaff	Rural
I-17	1 Mile S of SR179 in Prescott District	Rimrock	389	297.4	NB	O	U-Pole	NE	Flagstaff District 7-28-2011	Existing	Flagstaff	Rural
I-17	S of Stoneman		*	305	NB	P		NE	Flagstaff District 7-28-2011	Weather	Flagstaff	Rural
I-17	N of Munds Park		*	324	SB	P		SE	Flagstaff District 7-28-2011	Incident Management	Flagstaff	Rural
I-17	N of Kachina		357	334.4	NB	D	U-Pole	N	Flagstaff District 7-28-2011 Phase 9 FA-999-A(309)A, H8172 01D	Incident Management	Flagstaff	Rural
I-17	N of Airport TI	Flagstaff	429	337.9	SB	O	U-Pole	SW	Flagstaff District 7-28-2011	Existing	Flagstaff	Rural
I-17	N of 17/40 jct and S of McConnell SB on ramp		*	340.3	SB	P		S	Flagstaff District 7-28-2011	Incident Management	Flagstaff	Rural
I-40	W of SR89 in Kingman District	Ash Fork	372	144	EB	O	U-Pole	E	Flagstaff District 7-28-2011	Existing	Flagstaff	Rural
I-40	E of Devil Dog Exit 157		*	160	WB	P		SW	Flagstaff District 7-28-2011	Incident Management	Flagstaff	Rural
I-40	E of Devil Dog Exit 157		367	160	EB	P		NE	Flagstaff District 7-28-2011	Incident Management	Flagstaff	Rural
I-40	E of Garland Exit 168	Williams	365	168	WB	O	U-Pole	W	Flagstaff District 7-28-2011	Existing	Flagstaff	Rural
I-40	W of Bellemont Exit 185	Coconino	358	184.6	EB	O	U-Pole	SE	Flagstaff District 7-28-2011	Existing	Flagstaff	Rural
I-40	Btwn 4th St and Country Club	Flagstaff	355	199.8	EB	O	U-Pole	NE	Flagstaff District 7-28-2011	Existing	Flagstaff	Rural
I-40	Btwn 4th St and Country Club	Flagstaff	356	199.8	WB	P		NW	Flagstaff District 7-28-2011	Incident Management	Flagstaff	Rural
I-40	E of Winona Exit #211	Flagstaff	354	212.1	WB	O	U-Pole	NW	Flagstaff District 7-28-2011	Existing	Flagstaff	Rural
SR64	N of US180		366	215	WB	D	Roadside	NE	Flagstaff District 7-28-2011	Weather	Flagstaff	Rural
SR89A	Just N of Lomacasi		435	375.3	NB	O	Roadside	NE	Flagstaff District 7-28-2011	Existing	Flagstaff	Rural
SR89A	Just S of Pine Del; S of I-17		436	398	SB	O	Roadside	SW	Flagstaff District 7-28-2011	Existing	Flagstaff	Rural
US160	E of SR 264	Tuba City	*	322.8	EB	P		NE	Flagstaff District 7-28-2011	Incident Management	Flagstaff	Rural
US160	E of SR 264		400	322.8	WB	P		SW	Flagstaff District 7-28-2011 Two Direction Board	Incident Management	Flagstaff	Rural
US89	N of Townsend Winona Rd		359	421	SB	P		SW	Flagstaff District 7-28-2011	Incident Management	Flagstaff	Rural
US89	Before Divide for Weather		*	434.5	SB	P		S	Flagstaff District 7-28-2011	Weather	Flagstaff	Rural
US89	S of 64 Junction		360	462.7	NB	O	U-Pole	NE	Flagstaff District 7-28-2011	Existing	Flagstaff	Rural
US89	S of US89A/89 Junction		*	523.3	NB	P		N	Flagstaff District 7-28-2011 Two Direction Board Have Power and Phone	Weather	Flagstaff	Rural
US89	S of US89A/89 Junction		*	523.3	SB	P		S	Flagstaff District 7-28-2011 Two Direction Board Have Power and Phone	Weather	Flagstaff	Rural
SR260	MP300 - 5 Miles West of Heber	Heber	*	302.4	EB	D		NE	ADOT SPECIAL REPORT 615		Globe	Rural
SR260	W of Main Line Rd	Heber	387	302.4	WB	O	U-Pole	WB	TTG 2011 DATA	Existing	Globe	Rural
SR260			415	335	EB	P		E	TTG 2011 DATA		Globe	Rural
SR260			335	357	EB	P		S	TTG 2011 DATA		Globe	Rural
US60	E of SR77 Junction	Globe	414	252.4	WB	O	U-Pole	N	TTG 2011 DATA	Existing	Globe	Rural
US60	E of SR77 Junction	Globe	333	252.6	EB	O	U-Pole	NE	TTG 2011 DATA	Existing	Globe	Rural
US60	5 Miles South of SR 73 Connection	Cibecue	*	303	WB	P		SW	ADOT SPECIAL REPORT 615		Globe	Rural
US60	E of SR77 Junction	Show Low	334	339.9	EB	O	U-Pole	NE	TTG 2011 DATA	Existing	Globe	Rural
US60	E of SR77 Junction	Show Low	337	339.9	WB	O	U-Pole	SW	TTG 2011 DATA	Existing	Globe	Rural
US60			332	247	EB	P		NE	TTG 2011 DATA		Globe	Rural
US60			398	345	WB	P		W	TTG 2011 DATA		Globe	Rural
US60			336	385	WB	P		SW	TTG 2011 DATA		Globe	Rural
US70			397	253	EB	P		E	TTG 2011 DATA		Globe	Rural
I-40	W of Hipkoe Dr	Winslow	*	250.7	WB	D	U-Pole	NW	Phase 9 FA-999-A(309)A, H8172 01D	Incident Management	Holbrook	Rural
I-40	W of Hipkoe Dr	Winslow	353	250.7	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Holbrook	Rural
I-40	3 Mi E of SR87	Winslow	352	260.2	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Holbrook	Rural
I-40	E of Main St	Holbrook	338	281	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Holbrook	Rural
I-40	E of SR77	Holbrook	339	295.2	WB	O	U-Pole	SW	TTG 2011 DATA	Existing	Holbrook	Rural
I-40	W of US191	Puerco	431	310.1	EB	O	Bridge	NE	TTG 2011 DATA	Existing	Holbrook	Rural
I-40	E of McCarrol Rd	Puerco	340	330.4	EB	O	U-Pole	NE	TTG 2011 DATA	Existing	Holbrook	Rural
I-40	E of US191		341	342	WB	P		SW	TTG 2011 DATA	Incident Management	Holbrook	Rural
I-40	1 Mi W of NM Border	Fort Defiance	342	358	WB	O	U-Pole	SW	TTG 2011 DATA	Existing	Holbrook	Rural
SR264	S of US160		361	325	WB	P		NW	TTG 2011 DATA	Incident Management	Holbrook	Rural
SR264	W of US191	Ganado	432	445.5	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Holbrook	Rural
SR264	E of US191		433	447.5	WB	O	U-Pole		TTG 2011 DATA	Existing	Holbrook	Rural
SR264	W of New Mexico Border	St. Michaels	343	475.8	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Holbrook	Rural
SR77	S of SR377, US180, I-40		401	380	NB	P		NW	TTG 2011 DATA	Incident Management	Holbrook	Rural
SR77	N of US180, S of I-40		*	388.5	SB	D	Roadside	S	Phase 9 FA-999-A(309)A, H8172 01D	Weather	Holbrook	Rural
SR87	S of SR99 & I-40		*	339.9	SB	D	Roadside	SW	Phase 9 FA-999-A(309)A, H8172 01D	Weather	Holbrook	Rural
US160	W of US 163	Kayenta	*	386	EB	P		NE	ADOT SPECIAL REPORT 615	Incident Management	Holbrook	Rural

HWY.	LOCATION	TOWN/CITY	NO.	M/P	DIRECTION	STAT	SUPPORT TYPE	CARDINAL DIRECTION	COMMENT	JUSTIFICATION	DISTRICT	URBAN / RURAL
US160	W of US191		346	430	EB	P		E	TTG 2011 DATA	Incident Management	Holbrook	Rural
~~US160~~	~~E of US191~~		~~348~~	~~440~~	~~WB~~	~~P~~		~~SW~~	Deleted by District 12/11	~~Incident Management~~	~~Holbrook~~	~~Rural~~
US160	W of New Mexico Border		349	460	EB	P		E	TTG 2011 DATA	Incident Management	Holbrook	Rural
~~US163~~	~~N of US 160~~		~~351~~	~~400~~	~~SB~~	~~P~~		~~S~~	TTG 2011 DATA/Deleted by District 12/2011	~~Incident Management~~	~~Holbrook~~	~~Rural~~
US163	S of Utah Border		350	415	SB	P		SW	TTG 2011 DATA	Incident Management	Holbrook	Rural
US191	S of SR264		344	410	NB	P		N	TTG 2011 DATA	Incident Management	Holbrook	Rural
US191	N of SR264		345	420	SB	P		SW	TTG 2011 DATA	Incident Management	Holbrook	Rural
US191	S of US160		347	505	NB	P		N	TTG 2011 DATA	Incident Management	Holbrook	Rural
I-40	W of SR95	Lake Havasu City	406	7.7	EB	O		E	TTG 2011 DATA	Existing	Kingman	Rural
I-40	S of US93		378	42.3	EB	D		NE	Phase 9 FA-999-A(309)A, H8172 01D	Incident Management	Kingman	Rural
I-40	E of SR93/SR66	Kingman	377	55.7	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Kingman	Rural
I-40	E of Blake Ranch Rd	Kingman	376	69.3	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Kingman	Rural
I-40	E of US93		375	72	WB	P		W	TTG 2011 DATA	Incident Management	Kingman	Rural
I-40	W of SR66	Seligman	373	123.9	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Kingman	Rural
I-40	E of SR89		368	149	WB	P		W	TTG 2011 DATA	Incident Management	Kingman	Rural
SR68	W of US93 Junction	Golden Valley	403	26.4	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Kingman	Rural
SR89	S of I-40		369	360	NB	P		NW	TTG 2011 DATA	Incident Management	Kingman	Rural
SR95	S of I-40		382	180	SB	P		E	TTG 2011 DATA	Incident Management	Kingman	Rural
SR95	S of I-40		404	200	NB	P		N	TTG 2011 DATA	Incident Management	Kingman	Rural
US93	Hoover Dam		405	27.6	NB	O	U-Pole	NW	TTG 2011 DATA	Existing	Kingman	Rural
US93	N of SR68 Junction	Golden Valley	379	66.4	SB	O	U-Pole	SE	TTG 2011 DATA	Existing	Kingman	Rural
US93	N of Fort Beale Dr	Kingman	402	70.2	NB	O	U-Pole	NW	TTG 2011 DATA	Existing	Kingman	Rural
US93	S of I-40		374	95	NB	P		N	Not built yet as of 5/19/2008 per photolog TTG 2011 DATA	Incident Management	Kingman	Rural
24th St	Sky Harbor Blvd WB	Phoenix	57	N/A	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	Miller Rd		*	114.9	EB	P		NW	GAP IN DMS SYSTEM		Phoenix	Urban
I-10	e of Watson Rd		*	118.7	WB	P		W	GAP IN DMS SYSTEM		Phoenix	Urban
I-10	W of Airport Rd		*	119	EB	P		NW	Gap in DMS Locations - not part of any project		Phoenix	Urban
I-10	Perryville Rd		*	122.6	EB	P		E	Gap in Urban DMS Locations ~STA 6468+00 I-10/SR303L T.I. TRACS H7139 01C 10/10		Phoenix	Urban
I-10	Citrus Rd		*	123.6	WB	P		W	~STA 6515+00 I-10/SR303L T.I. TRACS H7139 01C 10/10		Phoenix	Urban
I-10	Estrella pkwy		*	126.6	WB	P		W	~STA 6675+00 I-10/SR303L T.I. TRACS H7139 01C 10/10		Phoenix	Urban
I-10	E. of Bullard Ave	Goodyear	81	127.9	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Phoenix	Rural
I-10	Dysart		*	129.8	WB	P		W	GAP IN DMS SYSTEM		Phoenix	Urban
I-10	E of Dysart		*	130.7	EB	P		E	GAP IN DMS SYSTEM		Phoenix	Urban
I-10	107th Ave		*	132.6	EB	P		E	GAP IN DMS SYSTEM		Phoenix	Urban
I-10	E. of 107th Ave	Avondale	80	133	WB	O	Truss Structure	W	TTG 2011 DATA	Existing	Phoenix	Rural
I-10	E. of 91st Ave	Phoenix	*	135.2	EB	P		E	DISTRICT CHOICE		Phoenix	Urban
I-10	W. of 79th Ave.	Phoenix	62	136.1	WB	O	Truss Structure	W	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	67th Ave.	Phx or Glendale	1	137.7	EB	O	Bridge	E	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	59th Ave.	Phoenix	61	138.7	WB	O	Bridge	W	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	35th Ave.	Phoenix	2	141.7	EB	O	Bridge	E	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	35th Ave.	Phoenix	60	141.7	WB	O	Bridge	W	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	19th Ave.	Phoenix	35	143.7	EB	O	Truss Structure	E	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	W. of 7th Ave.	Phoenix	13	144.7	WB	O	Truss Structure	W	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	E. of 7th St.	Phoenix	4	146.2	EB	O	Truss Structure	E	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	13th St.	Phoenix	37	146.7	WB	O	Truss Structure	W	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	E. of 16th St.	Phoenix	33	147	WB	O	Truss Structure	W	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	19th St.	Phoenix	34	147.3	EB	O	Truss Structure	E	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	Jefferson St	Phoenix	*	148.3	WB	P		N	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	MAINLINE DMS	Phoenix	Urban
I-10	S. of Jefferson St.	Phoenix	5	148.6	EB	O	Truss Structure	S	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	S. of Buckeye Rd.	Phoenix	12	148.6	WB	O	Truss Structure	N	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	N of E Buckeye Rd	Phoenix	*	148.7	EB	P		S	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	MAINLINE DMS	Phoenix	Urban
I-10	E of 24th St	Phoenix	*	150.2	WB	P		NW	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	CD ROAD DMS	Phoenix	Urban
I-10	E of 24th St	Phoenix	*	150.7	EB	P		SE	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	MAINLINE DMS	Phoenix	Urban
I-10	30th St	Phoenix	*	151	WB	P		NW	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	CD ROAD DMS	Phoenix	Urban
I-10	W. of 32nd St.	Phoenix	11	151.2	WB	O	Truss Structure	NW	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	W of E University Dr	Phoenix	*	151.3	WB	P		NW	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	MAINLINE DMS	Phoenix	Urban

HWY.	LOCATION	TOWN/CITY	NO.	M/P	DIRECTION	STAT	SUPPORT TYPE	CARDINAL DIRECTION	COMMENT	JUSTIFICATION	DISTRICT	URBAN / RURAL
I-10	E of E University Dr	Phoenix	*	151.9	WB	P		W	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	CD ROAD DMS	Phoenix	Urban
I-10	W of 40th St	Phoenix	*	152	EB	P		E	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	MAINLINE DMS	Phoenix	Urban
I-10	W. of 40th St.	Phoenix	6	152	EB	O	Truss Structure	E	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	40th St	Phoenix	*	152.5	WB	P		W	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	CD ROAD DMS	Phoenix	Urban
I-10	E of 40th St	Phoenix	*	152.9	EB	P		E	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	CD ROAD DMS	Phoenix	Urban
I-10	E. of Broadway Rd	Phoenix	7	153	EB	O	Truss Structure	SE	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	N. of Southern Ave.	Tempe	10	153	WB	O	Truss Structure	N	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	E of 48th St	Phoenix	*	154.3	WB	P		NW	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	CD ROAD DMS	Phoenix	Urban
I-10	N of Southern Ave	Phoenix	*	154.3	EB	P		SE	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	CD ROAD DMS	Phoenix	Urban
I-10	N of W Southern Ave	Phoenix	*	154.9	EB	P		S	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	CD ROAD DMS	Phoenix	Urban
I-10	S of Junction of US60/I-10	Phoenix	*	155.5	WB	P		N	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	CD ROAD DMS	Phoenix	Urban
I-10	Baseline Rd	Phoenix	*	155.8	WB	P		N	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	MAINLINE DMS	Phoenix	Urban
I-10	W. of Elliot	Chandler or tmp	9	156.5	WB	O	Truss Structure	NE	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	N. of Guadalupe	Phoenix	82	156.5	EB	O	U-Pole	SW	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	Warner Rd.	Phoenix	83	158.7	EB	O	Bridge	S	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	Ray Rd.	Chandler or phx	8	159.7	WB	O	Bridge	N	TTG 2011 DATA	Existing	Phoenix	Urban
I-10	S of 202L SanTan		*	163	EB	P		S	ALERT COMMANDER CHOICE	Incident Management	Phoenix	Urban
I-10	N of Queen Creek Rd		*	163.5	WB	P		NW	NECESSARY WHEN SR202L SOUTH MOUNTAIN IS BUILT		Phoenix	Urban
I-10	Riggs Rd		*	167.5	WB	P	Bridge	NW	RIGGS ROAD BRIDGE FASCIA		Phoenix	Urban
I-10			*	174	EB	P		SE	For SR 587 & diversions through Sacaton to SR 87	Incident Management	Phoenix	Urban
I-17	Junction of I-10/I-17	Phoenix	*	194.3	EB	P		E	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	CD ROAD DMS	Phoenix	Urban
I-17	E of Central Ave	Phoenix	32	196.4	SB	O	Truss Structure	E	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	E of 7th Ave	Phoenix	17	196.7	NB	O	Truss Structure	W	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	N of W Grant St	Phoenix	18	199	NB	O	Truss Structure	N	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	Van Buren St.	Phoenix	31	199.8	SB	O	Bridge	S	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	N of Grand Ave	Phoenix	30	201.6	SB	O	Truss Structure	S	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	Thomas Rd	Phoenix	19	201.8	NB	O	Bridge	N	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	Camelback Rd.	Phoenix	20	203.8	NB	O	Bridge	N	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	Bethany Home Rd.	Phoenix	28	204.8	SB	O	Bridge	S	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	W Glendale Ave	Phoenix	21	205.8	NB	O	Bridge	N	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	Northern Ave.	Phoenix	27	206.8	SB	O	Bridge	S	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	S of W Peoria Ave	Phoenix	22	208.8	NB	O	U-Pole	N	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	Cactus Rd		*	209.9	SB	P		S	Gap in Urban DMS Locations - Project H8225		Phoenix	Urban
I-17	Thunderbird Rd		*	210.9	NB	P		N	Gap in Urban DMS Locations - Project H8225		Phoenix	Urban
I-17	Bell Rd		*	212.9	SB	P		S	Gap in Urban DMS Locations - Project H8225		Phoenix	Urban
I-17	N of Bell Rd		*	213.4	NB	P		N	Gap in Urban DMS Locations - Project H8225		Phoenix	urban
I-17	Deer Valley Rd	Phoenix	428	216	SB	O	U-Pole	S	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	Pinnacle Peak Rd		*	217	NB	P		N	APPROX FUTURE LOCATION		Phoenix	Urban
I-17	S of Dixileta Dr		*	220.3	SB	P		S	APPROX FUTURE LOCATION		Phoenix	Urban
I-17	S of Dixileta Dr		*	220.4	NB	P		N	APPROX FUTURE LOCATION		Phoenix	Urban
I-17	S of Carefree Highway	Phoenix	407	221.7	NB	O	U-Pole	N	TTG 2011 DATA	Existing	Phoenix	Urban
I-17	N of Carefre Hwy		*	225	SB	P		S	APPROX FUTURE LOCATION		Phoenix	Urban
I-17	N of Daisy Mountain Rd	Phoenix	420	228.2	SB	O	U-Pole	S	TTG 2011 DATA	Existing	Phoenix	Rural
L101	S of Indian School	Glendale	*	3.8	SB	P	U-Pole	S	SR101L, I-10 TO TATUM; TABLE FROM TTG; LOCATIONS UPDATED	CRITERIA A	Phoenix	Urban
L101	S of Indian School	Phoenix	38	3.9	NB	O	U-Pole	N	TTG 2011 DATA	Existing	Phoenix	Urban
L101	S of W Glendale Ave	Glendale	*	6.9	SB	P	U-Pole	SW	SR101L, I-10 TO TATUM; TABLE FROM TTG; LOCATIONS UPDATED	CRITERIA A	Phoenix	Urban
L101	N of W Glendale Ave	Glendale	*	7.1	NB	P	U-Pole	N	SR101L, I-10 TO TATUM; TABLE FROM TTG; LOCATIONS UPDATED	CRITERIA E	Phoenix	Urban
L101	S of Peoria Ave	Peoria	46	10.2	SB	O	U-Pole	SE	TTG 2011 DATA	Existing	Phoenix	Urban
L101	Peoria Ave	Peoria	*	10.4	NB	P	U-Pole	NW	SR101L, I-10 TO TATUM; TABLE FROM TTG; LOCATIONS UPDATED	CRITERIA E	Phoenix	Urban
L101	S of W Thunderbird Rd	Peoria	*	12.5	SB	P	U-Pole	SW	SR101L, I-10 TO TATUM; TABLE FROM TTG; LOCATIONS UPDATED	CRITERIA E	Phoenix	Urban
L101	S of W Bell Rd	Peoria	*	14.1	NB	P	U-Pole	N	SR101L, I-10 TO TATUM; TABLE FROM TTG; LOCATIONS UPDATED	CRITERIA E	Phoenix	Urban
L101	Union Hills Dr	Peoria	*	15.8	SB	P	U-Pole	SW	SR101L, I-10 TO TATUM; TABLE FROM TTG; LOCATIONS UPDATED	CRITERIA E	Phoenix	Urban
L101	W of Beardsley Rd	Peoria	*	16.5	NB	P	U-Pole	NE	SR101L, I-10 TO TATUM; TABLE FROM TTG; LOCATIONS UPDATED	CRITERIA E	Phoenix	Urban
L101	E of 67th Ave	Peoria	*	18.4	WB	P	U-Pole	W	SR101L, I-10 TO TATUM; TABLE FROM TTG; LOCATIONS UPDATED	CRITERIA E	Phoenix	Urban
L101	59th Ave.	Peoria	*	19.2	EB	P	Bridge	E	SR101L, I-10 TO TATUM; TABLE FROM TTG; LOCATIONS UPDATED	CRITERIA A	Phoenix	Urban
L101	W of 43rd Ave	Phoenix	*	21	EB	P	U-Pole	E	SR101L, I-10 TO TATUM; TABLE FROM TTG; LOCATIONS UPDATED	CRITERIA A	Phoenix	Urban

HWY.	LOCATION	TOWN/CITY	NO.	M/P	DIRECTION	STAT	SUPPORT TYPE	CARDINAL DIRECTION	COMMENT	JUSTIFICATION	DISTRICT	URBAN / RURAL
L101	E of 43rd Ave	Phoenix	*	21.4	WB	P	U-Pole	W	SR101L, I-10 TO TATUM; TABLE FROM TTG; LOCATIONS UPDATED	CRITERIA E	Phoenix	Urban
L101	7th Ave.	Phoenix	108	24.9	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
L101	7th Ave.	Phoenix	84	25.1	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Phoenix	Urban
L101	W of 16th St	Phoenix	109	26.9	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
L101	E of 16th St	Phoenix	85	27.4	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Phoenix	Urban
L101	W of 32nd St	Phoenix	107	28.2	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
L101	56th St.	Phoenix	86	32.4	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Phoenix	Urban
L101	N 56th St	Phoenix	106	32.4	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Phoenix	Urban
L101	W of Scottsdale Rd	Phoenix	87	34.5	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Phoenix	Urban
L101	E of Scottsdale Rd	Phoenix	88	35.5	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Phoenix	Urban
L101	W of N Pima Rd	Scottsdale	105	35.5	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Phoenix	Urban
L101	S of Frank Lloyd Wright Blvd	Scottsdale	89	37.8	SB	O	U-Pole	S	TTG 2011 DATA	Existing	Phoenix	Urban
L101	S of Cactus Rd	Scottsdale	104	40	NB	O	U-Pole	N	TTG 2011 DATA	Existing	Phoenix	Urban
L101	N of Shea Blvd	Scottsdale	90	41	SB	O	U-Pole	S	TTG 2011 DATA	Existing	Phoenix	Urban
L101	N of Via De Ventura Blvd	Scottsdale	91	42	SB	O	U-Pole	S	TTG 2011 DATA	Existing	Phoenix	Urban
L101	S of Indian Bend Rd	Scottsdale	103	44.5	NB	O	U-Pole	NE	TTG 2011 DATA	Existing	Phoenix	Urban
L101	N of Chapparal	Scottsdale	92	46.5	SB	O	U-Pole	S	TTG 2011 DATA	Existing	Phoenix	Urban
L101	S of Indian School Road	Scottsdale	102	47.5	NB	O	U-Pole	N	TTG 2011 DATA	Existing	Phoenix	Urban
L101	S of McDowell Rd	Scottsdale	93	49	SB	O	U-Pole	S	TTG 2011 DATA	Existing	Phoenix	Urban
L101	N of McKellips	Scottsdale	101	50	NB	O	U-Pole	N	TTG 2011 DATA	Existing	Phoenix	Urban
L101	Apache Blvd	Tempe	45	52.5	SB	O	Bridge	S	TTG 2011 DATA	Existing	Phoenix	Urban
L101	N. of Southern Ave.	Phoenix	43	54	NB	O	U-Pole	N	TTG 2011 DATA	Existing	Phoenix	Urban
L101	S.of Baseline	Tempe	44	55	SB	O	U-Pole	S	TTG 2011 DATA	Existing	Phoenix	Urban
L101	N of Elliot Rd		*	57.3	SB	P		S	GAP IN DMS SYSTEM		Phoenix	Urban
L101	S of W Elliot Rd	Chandler	100	57.78	NB	O	U-Pole	N	TTG 2011 DATA	Existing	Phoenix	Urban
L101	S of Warner Rd	Chandler	94	59.41	SB	O	U-Pole	S	TTG 2011 DATA	Existing	Phoenix	Urban
L101	N of Chandler Blvd		*	60.5	NB	P		N	GAP IN DMS SYSTEM		Phoenix	Urban
L202	E of 24th St	Phoenix	50	0.74	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Phoenix	Urban
L202	E of 32nd St	Phoenix	49	1.74	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Phoenix	Urban
L202	E of 48th St	Phoenix	51	4.2	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Phoenix	Urban
L202	E of Mill Ave	Tempe	48	6.39	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
L202	W of McClintock	Tempe	52	8.71	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Phoenix	Urban
L202	McClintock Dr.	Tempe	47	8.78	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
L202	Dobson Rd	Mesa	65	10.9	EB	P	Blister	NE	TTG 2011 DATA	Existing	Phoenix	Urban
L202	McKellips rd	Mesa	66	12.8	WB	P	Blister	SW	TTG 2011 DATA	Existing	Phoenix	Urban
L202	Mesa Dr	Mesa	67	14.9	EB	P	Blister	E	TTG 2011 DATA	Existing	Phoenix	Urban
L202	Stapley Dr	Mesa	68	15.1	WB	P	Blister	W	TTG 2011 DATA	Existing	Phoenix	Urban
L202	Reebs Rd		*	18.9	EB	P		E	GAP IN DMS SYSTEM		Phoenix	Urban
L202	Reebs Rd		*	19.2	WB	P		W	GAP IN DMS SYSTEM		Phoenix	Urban
L202	Recker Rd		*	22.3	EB	P		E	GAP IN DMS SYSTEM		Phoenix	Urban
L202	Recker Rd		*	22.3	WB	P		W	GAP IN DMS SYSTEM		Phoenix	Urban
L202	McKellips rd		*	25.1	SB	P		SE	GAP IN DMS SYSTEM		Phoenix	Urban
L202	McKellips rd		*	25.15	NB	P		NW	GAP IN DMS SYSTEM		Phoenix	Urban
L202	S of Maint St		*	28.74	SB	P		S	SR 202L AND US 60 INTERCHANGE		Phoenix	Urban
L202	Guadalupe Rd		*	32	NB	P		N	GAP IN DMS SYSTEM		Phoenix	Urban
L202	Elliot Rd		*	33	SB	P		S	FOR SR202L AND SR24 INTERCHANGE ~STA3180+00 TRACS NO H6867		Phoenix	Urban
L202	Power Rd		*	36.5	EB	P		E	FOR SR202L AND SR24 INTERCHANGE ~STA2990+50 TRACS NO H6867		Phoenix	Urban
L202	Recker Rd		*	37.7	WB	P		W	GAP IN DMS SYSTEM		Phoenix	Urban
L202	Higley Rd		*	38.5	EB	P		E	GAP IN DMS SYSTEM		Phoenix	Urban
L202	S of Ray Rd		*	40	WB	P		S	GAP IN DMS SYSTEM		Phoenix	Urban
L202	S of Ray Rd		*	40.1	EB	P		N	GAP IN DMS SYSTEM		Phoenix	Urban
L202	Val Vista Dr		*	42.3	EB	P		NW	GAP IN DMS SYSTEM		Phoenix	Urban
L202	Val Vista Dr		*	42.6	WB	P		SW	GAP IN DMS SYSTEM		Phoenix	Urban
L202	E of McQueen Rd	Chandler	*	46	EB	P	U-Pole	E	SanTan TRACS H7058 01C JUL10; RCVD JUL11 TTG; STA 2491+25	CRITERIA E	Phoenix	Urban
L202	W of Cooper Rd	Chandler	*	46.1	WB	P	U-Pole	W	SanTan TRACS H7058 01C JUL10; RCVD JUL11 TTG; STA 2488+50	CRITERIA E	Phoenix	Urban
L202	E of Dobson Rd	Chandler	*	49.1	EB	P	U-Pole	E	SanTan TRACS H7058 01C JUL10; RCVD JUL11 TTG; STA 2327+35	CRITERIA E	Phoenix	Urban

HWY.	LOCATION	TOWN/CITY	NO.	M/P	DIRECTION	STAT	SUPPORT TYPE	CARDINAL DIRECTION	COMMENT	JUSTIFICATION	DISTRICT	URBAN / RURAL
L202	W of Alma School	Chandler	*	49.2	WB	P	U-Pole	W	SanTan TRACS H7058 01C JUL10; RCVD JUL11 TTG; STA 2323+50	CRITERIA A	Phoenix	Urban
L202	W of McClintock	Chandler	*	52.4	WB	P	U-Pole	W	SanTan TRACS H7058 01C JUL10; RCVD JUL11 TTG; STA 2155+50	CRITERIA A	Phoenix	Urban
L202	W of McClintock	Chandler	*	52.6	EB	P	U-Pole	E	SanTan TRACS H7058 01C JUL10; RCVD JUL11 TTG; STA 2141+00	CRITERIA E	Phoenix	Urban
L202	E of 56th Street	Chandler	*	54.6	EB	P	U-Pole	SE	SanTan TRACS H7058 01C JUL10; RCVD JUL11 TTG; STA 2041+00	CRITERIA E	Phoenix	Urban
L202			*	57.4	WB	P		W	STA2110 TRACS H5764 01L		Phoenix	Urban
L202			*	58.2	EB	P		E	STA 2155+00 TRACS H5764 01L BETWEEN 24TH AND 32ND STREETS		Phoenix	Urban
L202			*	61.3	WB	P		W	STA2315 TRACS NO H5764 01L		Phoenix	Urban
L202			*	61.6	EB	P		E	STA2333+00 TRACS H5764 01L BTWN DESERT FOOTHILLS AND 17TH AVE		Phoenix	Urban
L202			*	63.5	WB	P		W	STA2430 TRACS H5764 01L		Phoenix	Urban
L202			*	64	EB	P		E	STA 2460 TRACS NO H5764 01L W OF 17TH AVE		Phoenix	Urban
L202			*	66	WB	P		NW	STA2564 TRACS NO H5764 01L		Phoenix	Urban
L202			*	66.5	EB	P		SE	STA2590+00 TRACS H5764 01L EAST OF IVANHOE		Phoenix	Urban
L202			*	69.9	EB	P		SE	STA3040 TRACS H5764 JUST NORTH OF ELLIOT ROAD		Phoenix	Urban
L202			*	69.9	WB	P		NW	STA3040 TRACS NO H5764 01L JUST NORTH OF ELLIOT RD		Phoenix	Urban
L202			*	72.8	EB	P		S	STA3190 TRACS H5764 01L JUST SOUTH OF SOUTHERN AVE		Phoenix	Urban
L202			*	73	WB	P		N	STA3200 TRACS NO H5764 01L JUST NORTH OF SOUTHERN AVE		Phoenix	Urban
L202			*	75	EB	P		S	STA3310 TRACS H5767 01L LOWER BUCKEYE ROAD BRIDGE FASCIA		Phoenix	Urban
L202			*	76.1	WB	P		N	STA 3365 TRACS NO H5764 01L JUST NORTH OF BUCKEYE RD		Phoenix	Urban
L303	N of Happy Valley Rd		*	0	SB	P		SW	See Map for APPROX FUTURE LOCATION		Phoenix	Urban
L303	N of Happy Valley Rd		*	0	NB	P		NW	See Map for APPROX FUTURE LOCATION		Phoenix	Urban
L303	W of Lake Pleasant Pkwy		*	0	NB	P		E	See Map for APPROX FUTURE LOCATION		Phoenix	Urban
L303	W of Lake Pleasant Pkwy		*	0	SB	P		W	See Map for APPROX FUTURE LOCATION		Phoenix	Urban
L303	E of Lake Pleasant Pkwy		*	0	SB	P		W	See Map for APPROX FUTURE LOCATION		Phoenix	Urban
L303	E of Lake Pleasant Pkwy		*	0	NB	P		E	See Map for APPROX FUTURE LOCATION		Phoenix	Urban
L303	W of I-17		*	0	NB	P		E	See Map for APPROX FUTURE LOCATION		Phoenix	Urban
L303	W of I-17		*	0	SB	P		W	See Map for APPROX FUTURE LOCATION		Phoenix	Urban
L303	S of Indian School		*	106	NB	P		N	~STA415+00 TRACS NO H7872 SHOWN ON FMS PLANS	CRITERIA E	Phoenix	Urban
L303	S of Indian School		*	106	SB	P		S	~STA415+00 TRACS NO H7872 SHOWN ON FMS PLANS	CRITERIA A	Phoenix	Urban
L303	Glendale Ave		*	109.1	SB	P		S	~STA595+00 TRACS H7873 01C		Phoenix	Urban
L303	Glendale Ave		*	109.2	NB	P		N	~STA607+00 TRACS H7873 01C		Phoenix	Urban
L303	N of Olive Ave		*	111.3	NB	P		N	~STA711+00 TRACS H7874 01C		Phoenix	Urban
L303	S of Peoria Ave		*	111.8	SB	P		S	~STA732+00 TRACS 7874 01C		Phoenix	Urban
L303	Greenway Rd.		*	115.15	NB	P		N	~STA910+00 TRACS H7876 01C		Phoenix	Urban
L303	Greenway Rd.		*	115.2	SB	P		S	~sta920+00 TRACS H7876 01C		Phoenix	Urban
L303	S of Clearview Blvd		*	117.3	SB	P		S	APPROX FUTURE LOCATION		Phoenix	Urban
L303	S of Mountain View Blvd		*	118	NB	P		N	APPROX FUTURE LOCATION		Phoenix	Urban
L303	151st Ave		*	120.6	SB	P		W	APPROX FUTURE LOCATION		Phoenix	Urban
L303	151st Ave		*	121	NB	P		E	APPROX FUTURE LOCATION		Phoenix	Urban
L303	W of El Mirage Rd		*	122.8	SB	P		W	APPROX FUTURE LOCATION		Phoenix	Urban
L303	W of El Mirage Rd		*	122.8	NB	P		E	APPROX FUTURE LOCATION		Phoenix	Urban
L303	E of El Mirage Rd		*	124	NB	P		E	APPROX FUTURE LOCATION		Phoenix	Urban
L303	S of Happy Valley Pkwy		*	125	SB	P		SW	APPROX FUTURE LOCATION		Phoenix	Urban
SR143	S of University Dr	Tempe	54	0.6	NB	O	U-Pole	N	TTG 2011 DATA	Existing	Phoenix	Urban
SR143	S of Washington St	Phoenix	53	2.1	SB	O	U-Pole	SE	TTG 2011 DATA	Existing	Phoenix	Urban
SR24			*	0	WB	P		NW	~STA98+85 TRACS NO H6867 01L		Phoenix	Urban
SR24			*	0	WB	P		W	~STA225+00 TRACS NO H6867 01L		Phoenix	Urban
SR30			*	0	NB	P		N	APPROX FUTURE LOCATION		Phoenix	Urban
SR30			*	0	SB	P		S	APPROX FUTURE LOCATION		Phoenix	Urban
SR30			*	0	WB	P		W	SR 30 AND SR 85 INTERCHANGE		Phoenix	Urban
SR30			*	0	WB	P		W	APPROX FUTURE LOCATION		Phoenix	Urban
SR30			*	0	WB	P		W	APPROX FUTURE LOCATION		Phoenix	Urban
SR30			*	0	WB	P		W	APPROX FUTURE LOCATION		Phoenix	Urban
SR30			*	0	WB	P		W	APPROX FUTURE LOCATION		Phoenix	Urban
SR30			*	0	WB	P		W	APPROX FUTURE LOCATION		Phoenix	Urban
SR30			*	0	EB	P		E	APPROX FUTURE LOCATION		Phoenix	Urban

HWY.	LOCATION	TOWN/CITY	NO.	M/P	DIRECTION	STAT	SUPPORT TYPE	CARDINAL DIRECTION	COMMENT	JUSTIFICATION	DISTRICT	URBAN / RURAL
SR30			*	0	EB	P		E	APPROX FUTURE LOCATION		Phoenix	Urban
SR30			*	0	EB	P		E	APPROX FUTURE LOCATION		Phoenix	Urban
SR30			*	0	EB	P		E	APPROX FUTURE LOCATION		Phoenix	Urban
SR30			*	0	EB	P		E	APPROX FUTURE LOCATION		Phoenix	Urban
SR30			*	0	EB	P		E	APPROX FUTURE LOCATION		Phoenix	Urban
SR30			*	0	EB	P		E	APPROX FUTURE LOCATION		Phoenix	Urban
SR51	S. of Indian School	Phoenix	59	2.2	SB	O	U-Pole	SE	TTG 2011 DATA	Existing	Phoenix	Urban
SR51	N of Osborn Rd	Phoenix	55	2.3	NB	O	U-Pole	NW	TTG 2011 DATA	Existing	Phoenix	Urban
SR51	S of Bethany Home Rd	Phoenix	56	4.6	NB	O	U-Pole	N	TTG 2011 DATA	Existing	Phoenix	Urban
SR51	N of Northern Ave	Phoenix	58	7.5	SB	O	U-Pole	SW	TTG 2011 DATA	Existing	Phoenix	Urban
SR51	N. of Northern Ave.	Phoenix	130	7.6	NB	O	U-Pole	NE	TTG 2011 DATA	Existing	Phoenix	Urban
SR51	N of E Sweetwater Ave	Phoenix	131	11.1	SB	O	U-Pole	S	TTG 2011 DATA	Existing	Phoenix	Urban
SR51	Greenway Rd.	Phoenix	132	12.5	NB	O	Bridge	NE	TTG 2011 DATA	Existing	Phoenix	Urban
SR51	Between Union Hills and Bell Rd	Phoenix	*	14.1	NB	P	Blister	N	Update from TTG	URBAN MAINLINE	Phoenix	Urban
SR51	Union Hills	Phoenix	*	14.6	SB	P	Bridge	S	Update from TTG	URBAN MAINLINE	Phoenix	Urban
SR74	W of Lake Pleasant Pkwy		*	23	EB	P		E	ALERT COMMANDER CHOICE	Incident Management	Phoenix	Rural
SR74	E of Lake Pleasant Pkwy		*	27	WB	P		W	ALERT COMMANDER CHOICE	Incident Management	Phoenix	Rural
SR74	W of Lake Pleasant Pkwy		*	23	WB	P		W	DISTRICT CHOICE	Incident Management	Phoenix	Rural
SR85			*	150	NB	P		90	SR 30 AND SR 85 INTERCHANGE		Phoenix	
SR85	S of I-10	Buckeye	309	152	NB	P		N	TTG 2011 DATA	CRITERIA A	Phoenix	Rural
SR85			*	153	SB	P		270	FOR SR 30 AND SR 85 INTERCHANGE		Phoenix	
SR87	N of L202 Red Mountain	Mesa	425	180	SB	P		SW	TTG 2011 DATA	CRITERIA A	Phoenix	Rural
SR87			*	181	NB	P		NE	ALERT COMMANDER CHOICE	Incident Management	Phoenix	Rural
SR87			*	183	SB	P		SW	ALERT COMMANDER CHOICE	Incident Management	Phoenix	Rural
SR87	S of Shea Blvd		*	188	NB	P		NE	DISTRICT CHOICE	Incident Management	Phoenix	Rural
SR87	E of Fort McDowell Rd	Fort McDowell	408	191.2	NB	O	Truss Structure	NE	TTG 2011 DATA	Existing	Phoenix	Rural
SR87			*	201	SB	P		SW	ALERT COMMANDER CHOICE	Incident Management	Phoenix	Rural
SR88			*	197	NB	P		NE	ALERT COMMANDER CHOICE	Incident Management	Phoenix	Rural
US60	Junction of I-10/US60	Phoenix	*	171.8	EB	P		SW	I-10 Corridor Improvement Study TRACS H5454 01L AUG10; RCVD MAR11	CD ROAD DMS	Phoenix	Urban
US60	E. of Priest Dr.	Tempe	16	172.7	EB	O	Truss Structure	SE	TTG 2011 DATA	Existing	Phoenix	Urban
US60	W of Kyrene	Tempe	15	173.1	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
US60	E of Rural Rd	Tempe	39	174.6	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Phoenix	Urban
US60	W of McClintock	Tempe	14	175.4	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
US60	E of Alma School	Mesa	40	178.6	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Phoenix	Urban
US60	S Extension Rd	Mesa	42	178.9	WB	O	Bridge	W	TTG 2011 DATA	Existing	Phoenix	Urban
US60	E of S Mesa Dr	Mesa	69	180.5	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Phoenix	Urban
US60	W of Gilbert Rd	Mesa	41	182.3	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
US60	E of S Lindsay Rd	Mesa	70	183.5	EB	O	Truss Structure	E	TTG 2011 DATA	Existing	Phoenix	Urban
US60	W of Greenfield Rd	Mesa	71	185.1	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
US60	W of Roosevelt WCD	Mesa	63	187.3	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Phoenix	Urban
US60	E of S Sossamon Rd	Mesa	64	189.5	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
US60	S Crimson Rd	Mesa	381	192.2	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
US60	S Crimson Rd	Mesa	380	192.3	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Phoenix	Urban
US60	E of Meridian Rd	Apache Junction	423	194.9	WB	O	U-Pole	W	TTG 2011 DATA	Existing	Phoenix	Urban
US60	E of Meridian Rd	Apache Junction	424	196	EB	P		E	TTG 2011 DATA	CRITERIA E	Phoenix	Urban
US60	W of I-17		*	159	EB	P		SE	DISTRICT CHOICE		Phoenix	Urban
US60	W of I-17		*	157	EB	P		SE	DISTRICT CHOICE		Phoenix	Urban
US60	E of L101		*	153	WB	P		NW	DISTRICT CHOICE		Phoenix	Urban
US60	E of L101		*	151	WB	P		NW	DISTRICT CHOICE		Phoenix	Urban
US60	W of L101		*	148	EB	P		SE	DISTRICT CHOICE		Phoenix	Urban
US60	W of L101		*	146	EB	P		SE	DISTRICT CHOICE		Phoenix	Urban
US60	E of L303		*	141	WB	P		NW	DISTRICT CHOICE		Phoenix	Urban
US60	E of L303		*	139	WB	P		NW	DISTRICT CHOICE		Phoenix	Urban
I-17	8 Miles N of Old Black Canyon Hwy	Black Canyon City	385	251.9	NB	O	U-Pole	NE	TTG 2011 DATA	Existing	Prescott	Rural
I-17	N of SR69		386	264.6	SB	D	U-Pole	S	Phase 9 FA-999-A(309)A, H8172 01D	Incident Management	Prescott	Rural
I-17	1 Mile N of SR260	Camp Verde	390	288.9	SB	O	Bridge	SW	TTG 2011 DATA	Existing	Prescott	Rural

HWY.	LOCATION	TOWN/CITY	NO.	M/P	DIRECTION	STAT	SUPPORT TYPE	CARDINAL DIRECTION	COMMENT	JUSTIFICATION	DISTRICT	URBAN / RURAL
SR260	E of Highline Dr	Star Valley	388	255	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Prescott	Rural
SR69	W of Main St	Mayer	384	272.6	SB	O	U-Pole	SE	TTG 2011 DATA	Existing	Prescott	Rural
SR69	W of SR169		*	282.1	WB	D	U-Pole	NW	Phase 9 FA-999-A(309)A, H8172 01D	Incident Management	Prescott	Rural
US60	N of Echo Hill Rd	Wickenberg	383	113.8	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Prescott	Rural
US60	W of SR74		427	118	EB	P		SE	TTG 2011 DATA	Incident Management	Prescott	Rural
US60	E of SR74		426	122	WB	P		NW	TTG 2011 DATA	Incident Management	Prescott	Rural
I-10	1.5 Mi W of SR-90	Benson	323	300.6	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Safford	Rural
I-10	2 Mi E of N Pomerene Rd	Benson	324	308.8	WB	O	U-Pole	SW	TTG 2011 DATA	Existing	Safford	Rural
I-10	W of US191		394	330	EB	P		NE	TTG 2011 DATA	Incident Management	Safford	Rural
I-10	E of US191		*	343	WB	P		SW	8/2/2011 Safford District Administration	Incident Management	Safford	Rural
I-10	E of US191		*	347.9	EB	D	U-Pole	NE	Phase 9 FA-999-A(309)A, H8172 01D	Incident Management	Safford	Rural
I-10	W of US191		*	360.2	WB	P		W	8/2/2011 Safford District Administration	Incident Management	Safford	Rural
I-10	W of I-10 Business Loop	Bowie	328	362.2	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Safford	Rural
I-10	E of Portal Rd	San Simon	329	385.2	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Safford	Rural
SR191	N of SR75, SR78 Junction	Three Way	*	157.3	NB	P		NW	8/2/2011 Safford District Administration	Incident Management	Safford	Rural
SR90	S of I-10		393	296.7	SB	P		N	TTG 2011 DATA		Safford	Rural
SR90	S of SR82	Huachuca City	392	309.9	NB	O	U-Pole	N	TTG 2011 DATA	Existing	Safford	Rural
US191	N of SR80		*	2	SB	P		S	8/2/2011 Safford District Administration	Incident Management	Safford	Rural
US191	S of SR80, N of Mexico Border		326	2	NB	P		NE	8/2/2011 Safford District Administration	Incident Management	Safford	Rural
US191	N of I-10		327	90	SB	P		S	TTG 2011 DATA	Incident Management	Safford	Rural
US191	S of US70		417	116	NB	P		N	TTG 2011 DATA	Incident Management	Safford	Rural
US70	E of US191		416	342	WB	P		W	Last review Cy08 photolog, still not there TTG 2011 DATA	Incident Management	Safford	Rural
US70	W of New Mexico Border		330	385	WB	P		NW	TTG 2011 DATA	Incident Management	Safford	Rural
I-10			*	182	WB	P		NW	For SR 587 WB Diversions	Incident Management	Tucson	Rural
I-10			*	182	EB	P		SE	For Sr 387/187 EB Diversions	Incident Management	Tucson	Rural
I-10			*	191	EB	P		SE	For SR 84 & I-8 Diversions	Incident Management	Tucson	Rural
I-10	N of I-8		*	195.6	WB	D	U-Pole	N	Phase 9 FA-999-A(309)A, H8172 01D	Incident Management	Tucson	Rural
I-10	N of Battaglia Dr	Eloy	314	205.1	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Tucson	Rural
I-10	N of Battaglia Dr	Eloy	315	205.2	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Tucson	Rural
I-10	6 Miles East of SR87	Picacho	*	217	WB	P		NW	ADOT SPECIAL REPORT 615	Incident Management	Tucson	Rural
I-10			322	224	EB	P		SE	For diversions	Incident Management	Tucson	Urban
I-10	N of W Grier Rd	Tucson	413	237.2	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Tucson	Urban
I-10	E of Avra Valley Rd	Tucson	*	243.5	EB	P		SE	GAP IN DMS SYSTEM		Tucson	Urban
I-10	N of W Twin Peaks Rd	Tucson	412	245.3	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Tucson	Urban
I-10		Tucson	*	245	EB	P		SE	GAP IN DMS SYSTEM		Tucson	Urban
I-10	E of Cortaro Rd	Tucson	*	247.2	EB	P		SE	GAP IN DMS SYSTEM		Tucson	Urban
I-10	E of Cortaro Rd	Tucson	*	247.9	WB	P		NW	GAP IN DMS SYSTEM		Tucson	Urban
I-10		Tucson	*	248	WB	P		NW	GAP IN DMS SYSTEM		Tucson	Urban
I-10	N of W Orange Grove Rd	Tucson	419	249.4	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Tucson	Urban
I-10		Tucson	*	251	WB	P		NW	GAP IN DMS SYSTEM		Tucson	Urban
I-10	N of Prince Rd	Tucson	*	254	EB	P		SE	GAP IN DMS SYSTEM		Tucson	Urban
I-10	N of Prince Rd	Tucson	*	254	WB	P		NW	GAP IN DMS SYSTEM		Tucson	Urban
I-10	Speedway Blvd.	Tucson	422	257.3	WB	O	U-Pole	NW	(VMS_ID_OLD = T9) Tucson FMS 7 @ Prince Rd TTG 2011 DATA	Existing	Tucson	Urban
I-10	St. Mary's	Tucson	421	257.6	EB	O	U-Pole	SE	TTG 2011 DATA - Updated to Operational	FMS	Tucson	Urban
I-10	E of Park Ave	Tucson	430	261.8	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Tucson	Urban
I-10	E of Kino Pkwy	Tucson	418	263.2	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Tucson	Urban
I-10	N of Valencia Rd	Tucson	*	266	EB	P		SE	GAP IN DMS SYSTEM		Tucson	Urban
I-10	N of Valencia Rd	Tucson	434	266.1	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Tucson	Urban
I-10	E of Wilmot Rd	Tucson	317	270	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Tucson	Urban
I-10	SR-83 Jct	Vail	316	280.8	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Tucson	Urban
I-10	E of SR-83 Junction	Vail	320	282.5	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Tucson	Urban
I-19	Prior to I-19		321	Between 1 & 2	NB	P		NE	in Nogales/Location by District 12/2011	Incident Management	Tucson	Rural
I-19			*	9 (14.5 km)	SB	P		SE		Incident Management	Tucson	Rural
I-19	N of San Xavier Rd	Tucson	319	57.9 (93.2 km)	NB	O	U-Pole	NE	TTG 2011 DATA	Existing	Tucson	Urban
I-19	N of W Drexel Rd	Tucson	318	60.1 (96.7 km)	SB	O	U-Pole	S	TTG 2011 DATA	Existing	Tucson	Urban
I-19	N of Irvington Rd		410	61.4 (98.8 km)	NB	O	U-Pole	N	TTG 2011 DATA - Updated to Operational	FMS	Tucson	Urban

HWY.	LOCATION	TOWN/CITY	NO.	M/P	DIRECTION	STAT	SUPPORT TYPE	CARDINAL DIRECTION	COMMENT	JUSTIFICATION	DISTRICT	URBAN / RURAL
I-19	N of Ajo Way		396	62.8 (101.1 km)	SB	O	U-Pole	SW	TTG 2011 DATA - Updated to Operational	FMS	Tucson	Urban
I-8	W. of Trekell Rd.	Casa Grande	313	174.1	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Tucson	Rural
SR 77	S of County Line		409	85	NB	P		NE	TTG 2011 DATA/Moved by District 12/2011	Incident Management	Tucson	Rural
SR79	N of Park Link DR		391	101	SB	P		SE	TTG 2011 DATA/Moved by District 12/2011	Incident Management	Tucson	Rural
SR85	S of SR86		*	56	SB	P		S		Incident Management	Tucson	Rural
SR86	E of SR286		*	159.3	WB	P		SW		Incident Management	Tucson	Rural
SR86	W of I-19/I-10		*	166	EB	P		NE		Incident Management	Tucson	Rural
US60	N of Packary Rd	Gold Canyon	331	210.6	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Tucson	Rural
I-10	3 Miles W of Main St	Quartzsite	305	15.6	EB	O	U-Pole	NE	TTG 2011 DATA	Existing	Yuma	Rural
I-10	3 Miles E of Avenue 51 E	Salome	306	49.4	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Yuma	Rural
I-10	3 Miles E of Avenue 51 E	Salome	411	49.4	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Yuma	Rural
I-10	W of SR85		307	110.3	EB	O	U-Pole	SE	TTG 2011 DATA	Existing	Yuma	Rural
I-10	W of Miller Rd.	Buckeye	308	114	WB	O	U-Pole	SW	TTG 2011 DATA	Existing	Yuma	Rural
I-8	Stateline	Yuma	301	2	EB	P		SE	TTG 2011 DATA	Incident Management	Yuma	Rural
I-8	Yuma	Yuma	302	11.2	EB	O	U-Pole	E	TTG 2011 DATA	Existing	Yuma	Rural
I-8	W of S Ave 36 E		*	36	EB	P		E	for closures and detours on I-9 in Mohawk pass (MP 50 to MP 56)	Weather	Yuma	Rural
I-8	W of S Ave 36 E		*	36	WB	P		W	for closures and detours on I-8 in Telegraph Pass (MP 14 to MP 21)	Weather	Yuma	Rural
I-8	W of SR85		310	115	EB	P		NE	TTG 2011 DATA - Updated to Proposed	Incident Management	Yuma	Rural
I-8	Gila Bend	Gila Bend	312	120.9	WB	O	U-Pole	NW	TTG 2011 DATA	Existing	Yuma	Rural
SR85	N of I-8		311	120	SB	P		W	TTG 2011 DATA	Incident Management	Yuma	Rural
SR95	Yuma	Yuma	303	25	SB	P		E	TTG 2011 DATA	Incident Management	Yuma	Rural
SR95	S of I-10		304	105	NB	P		N	TTG 2011 DATA	Incident Management	Yuma	Rural
SR95	S of Mohave Rd	Parker	*	142.99	SB	P		S	ADOT SPECIAL REPORT 615	Incident Management	Yuma	Rural
SR95	S of Mohave Rd	Parker	*	143	NB	D	U-Pole	N	Phase 9 FA-999-A(309)A, H8172 01D	Incident Management	Yuma	Rural

Operational (O)
Under Design / Under Construction (D)
Proposed (P)
***** **Needs Number Assignment**

APPENDIX D – LITERATURE REVIEW REFERENCES

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