Arizona Department of Transportation

Transportation Technology Group

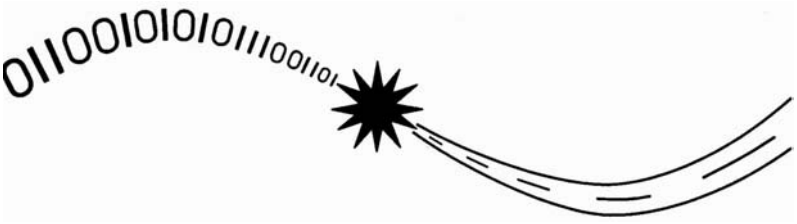
Traffic Operations Center

Operations Manual

Prepared for ADOT

by

ITS Engineers and Constructors Inc.



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1. INTRODUCTION

The purpose of this manual is to provide reference information for Traffic Operations Center (TOC) operators and others who may need to operate the TOC systems or maintain the statewide incident management program for the Arizona Department of Transportation (ADOT). This manual is a basic reference manual and is intended to provide information to allow the operator to become familiar with the typical TOC operations duties.

For the successful operation of the systems, the operator should follow the procedures given below:

1. Refer to Table of Contents to find information on a particular subject.
2. Read the specific section for more details about the subject.
3. Ask a supervisor for guidance if the manual does not cover a specific question.
4. Notify the supervisor if there is a discrepancy in the manual.

Operators should follow the guidelines presented in this manual for guidance in handling all types of TOC operations responsibilities. This will promote consistency in handling TOC operations duties.

This manual is not intended to replace or supersede the State law, ADOT policies or the regulations of the Arizona State Department of Administration. Should this manual conflict with a policy or regulation in the *ADOT Procedures Manual* or *State law*, the *ADOT Procedures Manual* or *State law* takes precedence.

1.1. Manual Updates

The ADOT TOC and statewide incident management program are constantly evolving. This manual will be updated as new policies, procedures, devices, and features are added.

OPERATIONAL GUIDELINES

1. TOC personnel are encouraged to participate in the process of developing policies and procedures.

2. The TOC Manager will arrange for this manual to be updated when operational policies and procedures change significantly.

3. When new freeway segments are brought on-line, operators will be notified. Information about the new segments will be included in the next scheduled update of the manual.

4. All minor updates should be compiled into a binder for the designatedl manual revision cycle.

PROCEDURE

1. Notify a supervisor if the manual requires an update.

2. Submit suggestions to the Operations Supervisor and TOC Manager by e-mail.

3. All policies and procedures will be provided to TOC operations staff for review and comment before implementation.

4. Policies and procedures will be reviewed by the Operations Supervisor and TOC Manager to confirm that they are clear, concise, and consistent with actual operations.

5. Comment resolution meetings may be held by the TOC Manager to review recommendations.

6. Insert updated manual pages when they are provided.

1.2. TOC Functions

The functions of the TOC are based on its mission to manage and operate the ADOT transportation system. This is accomplished by using available technology in conjunction with a well-trained staff that is committed to excellence in service and performance. The primary functions of the TOC are:

1. Incident Management

2. Traffic Management

3. Traveler Information

These functions are served by systems controlled and operated within the TOC. These functions are performed for both urban and rural environments. One of the main components of the TOC is the ADOT Freeway Management System (FMS). The elements of the FMS include closed-circuit television (CCTV) monitoring systems, variable message signs (VMSs), vehicle detectors, and communications systems. Additional systems include the I-10 Deck Tunnel monitoring system, an upcoming traffic signal control system and the Highway Condition Reporting System (HCRS). A brief overview of each function follows.

1.3. Incident Management Function

One of the main purposes of the Traffic Operations Center is to respond to incidents by contacting and dispatching crews to the site. The TOC operators can help improve the safety of motorists, road construction and maintenance workers, and

emergency crews during incidents by informing travelers through the use of VMSs and by providing information to commercial radio and television traffic reporters.

An incident is usually defined as any event that impacts traffic. Incidents include accidents, disabled vehicles, spilled loads, construction, and maintenance activities, and presence of vehicles or people on the shoulder.

1.3.1. Traffic Management Function

Traffic management is accomplished through the use of the systems (e.g., ramp metering, VMSs, traffic interchange signals) available to the TOC. Traffic management is also accomplished institutionally through cooperation with other agencies providing public service, public safety, and emergency management services. The traffic management functions are:

1. To reduce the occurrence of recurring congestion on the freeway system.

2. To minimize the duration and effects of non-recurring congestion on the freeway system.

3. To maximize the operational safety and efficiency for the traveling public using the freeway system.

4. To provide travelers with information necessary to aid them in making informed use of the freeway system.

5. To provide traveler assistance to those who encounter problems (crashes, breakdowns, etc.) while using the freeway system.

1.3.2. Traveler Information Function

Providing high quality motorist information is the TOC operator's second highest priority duty -- second only to incident management. ADOT has a responsibility to provide accurate and timely information to the public on road and traffic conditions, closures, detours, and restrictions.

1.4. Vision, Mission, and Goals

The sections below summarize the vision, mission and goals of ADOT and the Transportation Technology Group.

1.4.1. Arizona Department of Transportation

The vision of ADOT is to be the standard of excellence for transportation systems and services.

The mission of ADOT is to provide a safe and efficient transportation system, together with the means of revenue collection and licensing for Arizona.

ADOT Goals are:

1. To improve the movement of people and products throughout Arizona.
2. To increase the quality, timeliness, and cost-effectiveness of the products and services provided by ADOT.
3. To develop and retain a high-performing, successful workplace.
4. To optimize the use of all resource.
5. To improve public and political support necessary to meet Arizona's transportation needs.

1.4.2. Transportation Technology Group

The vision of the Transportation Technology Group is to be an international leader in Intelligent Transportation Systems.

The mission of the Transportation Technology Group is to manage and operate the ADOT transportation system.

Goals of the Transportation Technology Group are:

1. Assist in maintaining the security and safety of the traveling public.
2. Reduce congestion in urban areas.
3. Provide statewide incident management.
4. Improve commercial vehicle operations.
5. Provide quality and timely information to the traveling public.
6. Design and construct quality ITS projects in a timely manner.
7. Develop and retain a high performing, successful workforce.
8. Support, maintain, and operate ITS infrastructure.
9. Improve public and political support.ROLES & RESPONSIBILITIES

1.5. Urban Characteristics

One of the primary responsibilities of the TOC is to address the urban congestion in the metropolitan Phoenix and Tucson area. Urban freeway congestion is a major problem in the United States. Lost productivity due to congestion is estimated to be $100 billion each year in the U.S.[1] Traffic accidents, many caused by congestion, drain another $70 billion per year. Congestion is characterized by slower-than-desired speeds, increased travel times, increased accident frequencies, and

[1] AZFMS.COM

increased operating costs. Congestion is caused either by excessive demand or reduction in capacity.

The TOC mitigates urban congestion by performing the following:

1. Monitoring freeway traffic flow using electronic sensors
2. Detecting incidents
3. Verifying incidents
4. Coordinating incident response activities
5. Controlling freeway access using ramp meters
6. Providing motorist information.

Congestion is either recurring or non-recurring. The recurring congestion occurs at regular, predictable times, such as daily rush hours. The most common factors contributing to non-recurring congestion are incidents.

In 1997, the Phoenix area was home to 2.4 million people living in an area of 1,090 square miles.[2] There were nearly 870 lane miles of freeway. Vehicle miles traveled per day were 13,925,000. The Phoenix area was the 17th most congested city in the nation with a Travel Rate Index (TRI) of 1.28 in 1997. In 2000, the TRI was 1.11. The index represents a ratio of peak travel time to free-flow travel time. For example, an index of 1.3 would indicate that a 20-minute off-peak trip would take 26 minutes during the peak period.

Specific findings regarding congestion in the Phoenix area are:

1. A significant portion of the delay occurs on instrumented sections of I-10
2. Southbound I-17 incurs significant delays during the AM Peak
3. The PM peak lasts longer than the AM Peak
4. One-quarter of the delay occurs during the mid-day period.
5. The percentage of travel affected by delay peaks is 70%.
6. The winter months tend to be more congested than the summer months.

[2] Puget Sound Regional Council, Arterial & Freeway Networks in Major Metropolitan Areas, Puget Sound Trends No. 113 June 2000.

Data is based on 53 miles of instrumented freeway in the Phoenix area. Data was collected using the FMS detection system of inductive loops and passive acoustic detectors.[3]

1.6. Rural Characteristics

Another responsibility of the TOC is to support and assist the rural ADOT districts (outside the Phoenix area) with various highway operations functions. This section provides an overview of rural traffic operations and the functions performed by the TOC.

Rural Arizona accounts for a small and dispersed portion of the State's population, but has a majority of the roadway centerline miles in the State. Typically rural areas account for 80 percent of the roadway mileage and 40% of the vehicle miles traveled.[4] Although approximately 20 percent of total crashes occur on rural highways, over 60 percent of all traffic fatalities occur in rural areas. Rural travel is typified by:

1. Long distance travel
2. Fewer convenient detour options
3. Secondary roads with less frequent maintenance
4. Roadways with lower design speeds due to steep grades, blind curves, and limited safe passing opportunities
5. Very dispersed systems with high unit costs for service delivery, maintenance and operations
6. Relatively low traffic volumes
7. Large variance in travel speeds resulting in frequent passing
8. Less frequent traffic congestion
9. Traffic congestion more frequently associated with recreational travel or incidents
10. Travelers unfamiliar with surroundings
11. Rugged terrain in remote areas
12. Adverse road surface and weather conditions
13. More severe collisions: more deaths with higher frequency of accidents/vehicle-miles traveled and more severe single-vehicle accidents than found in urban areas
14. Less developed ITS infrastructure.

[3] Texas Transportation Institute and Cambridge Systematics Inc., Mobility Monitoring Program, Monitoring Urban Roadways in 2000, Appendix H, May 2001.
[4] U.S. Department of Transportation, Federal Highway Administration, Tech Brief on Rural ITS, Publication # FHWA-RD-99-102, April 1999.

The Traffic Operations Center supports the rural districts performing the following operations functions:

1. Support the Tucson area, as needed, during the day, and during night and weekend hours.

2. Assist with VMS message display in accordance with individual district policy.

3. Assist Road and Weather Information System (RWIS) monitoring in accordance with each individual district's policy.

4. Assist with monitoring of truck escape ramps.

2. ROLES & RESPONSIBILITIES

This policy describes the roles and responsibilities of those individuals and agencies that are actively involved in traffic operations. Clear delineation of roles and responsibilities is essential to effectively operate the TOC and statewide incident management program. Additional coordination is required when agency roles and responsibilities overlap. Also, roles and responsibilities often change based on the location and type of the occurrence. As a result, it is important to understand how the TOC must interact with other ADOT groups or agencies, and what procedures are in place for notification.

2.1. TOC Operations Roles & Responsibilities

ROLES

The Transportation Technology Group is comprised of five sections:

1. Project Development Section
2. Control Room Section
3. Traffic Analysis Section
4. Information Technology Section
5. Administration Section.

Three Orgs are represented in the Transportation Technology Group:

1. Org 9060: Administrative
2. Org 9064: Construction
3. Org 9068: Maintenance.

The Transportation Technology Group staff includes 29 full-time equivalent positions, 2 limited positions, 2 interns and 1 student aid. In addition, five full time consultants provide IT support and one full time consultant provides public information. The primary role of the Control Room Section is to provide statewide operations 24 hours per day, 365 days per year.

RESPONSIBILITIES

1. The TOC Operator is the principal ADOT contact for many agencies and members of the public. The operator's telephone manners and image will directly reflect on the image of the TOC and ADOT.

2. The operator will often act as a switchboard and should learn how to transfer calls promptly and courteously.

3. The operator should focus on resolving issues with one phone call.

4. The operator must be familiar with the following:

a. The State highway system
b. Current incidents
c. Construction closures
d. General traffic conditions
e. Weather related conditions.

5. Good manners are essential. The operator should remain calm if callers are disgruntled, unhappy or combative. Operators should learn to manage these conversations and remain calm.

6. Employees should not tolerate verbal abuse. If a caller uses profane language or makes insulting or derogatory remarks, the operator should calmly inform the caller that the remark was inappropriate and that the operator will have to hang up if the caller continues to make inappropriate or profane remarks. The operator should hang up, as appropriate, and log the call for the supervisor.

2.2. Tucson Traffic Control Center (TTCC) Roles & Responsibilities
2.3.

The Tucson FMS covers I-10, from Ina Road to 6th Avenue, and B-19, from Valencia Road to I-10. The system includes 12 CCTV cameras, 8 VMSs, and a dedicated fiber optic communications system. The TTCC has direct links with the TOC in Phoenix, as well as the Arizona Department of Public Safety (DPS) and 911 in Tucson.

ROLES

1. The TTCC will monitor the Tucson FMS on weekdays from 6:00 AM to 6:00 PM.

2. The ADOT TOC in Phoenix will monitor the Tucson FMS at all other times.

3. DPS has the highest priority in controlling the Tucson CCTV at all times.

4. The TTCC also monitors traffic signals for several cities in the Tucson area.

RESPONSIBILITIES

Refer to the following table for delineation of responsibilities by time of day.

Function	6:00 AM to 6:00 PM Monday through Friday	Other Times
Identify Incidents	911/DPS/Metro Networks	911/DPS
Notify DPS/Police	911/DPS/Metro Networks	911/DPS
Notify Other Authorities	DPS	DPS
Dispatch ADOT Crews	Phoenix TOC	Phoenix TOC
Request VMS for DPS Action	DPS	DPS
Request VMS for Other Purposes	TTCC	City Communications or 911
Post VMS Message	Phoenix TOC/Grant Rd.	Phoenix TOC
Enter HCRS	Phoenix TOC	Phoenix TOC
Update ADOT Log	Phoenix TOC	Phoenix TOC
Update Metro Network Log	Metro Networks	Not Applicable
Continued Coordination	DPS/TTCC/TOC	DPS/TOC
Advance Traffic Signal Change	TTCC	Not Applicable
Emergency Traffic Signal Change	TTCC	City Communications or 911

2.4. ADOT District Roles & Responsibilities

ROLES

1. ADOT has ten engineering districts. Each district covers a specific geographic area.

2. In rural areas, each district has a role in operating its own VMSs during normal working hours.

3. VMS operations revert to the TOC during non-working hours of the District offices.

RESPONSIBILITIES

1. As applicable, each district is responsible for VMS operations during normal working hours.

2. Each district is responsible for maintaining accurate data in the Highway Condition Reporting System (HCRS). Districts may request assistance from the TOC in entering and updating this data.

NOTIFICATION PROCEDURES

1. When calling for maintenance services or making required notifications, it is important to accurately identify in which district the event or incident has occurred.

2. Each district has unique requirements for notification and call out. District call-out and information books for each of the ten districts are located near each operator console.

3. Refer to the books for each district's unique notification and call out procedures when an incident in the district occurs.

The following subsections summarize attributes of each district.

2.4.1. Flagstaff District

District Name:	**Flagstaff**
Major Highways	I-17 & I-40
Major Cities & Towns	Flagstaff
Area:	18,310 Square Miles
Notes:	Elevation ranges from 7,000 to 12,000 feet.
	The Phoenix TOC is the after-hours contact point for the Flagstaff District.
	With an annual snowfall of 110 inches, snow plowing is a major winter maintenance activity.

2.4.2. Globe District

District Name:	**Globe**
Major Highways	US-60
Major Cities & Towns	Globe & Showlow
Roadway Maintained:	2,681 Lane Miles
Notes:	Serves Northeastern Arizona
	Winter maintenance includes snowplowing.

2.4.3. Holbrook District

District Name:	**Holbrook**
Major Highways	Interstate 40
Major Cities & Towns	Holbrook & Winslow
Roadway Maintained:	2,755 Lane Miles

2.4.4. Kingman District

District Name:	**Kingman**
Major Highways	Interstate 15, Interstate 40, US 93
Major Cities & Towns	Kingman, Bullhead City, Lake Havasu City
Area:	13,749 Square Miles
Roadway Maintained:	2620 Lane Miles
Notes:	Elevation Ranges from 800 to 6,100 feet.
	The district operates 16 snowplows.

2.4.5. Phoenix Maintenance District

District Name:	**Phoenix Maintenance District**
Major Highways	Interstate 10, Interstate 17, US 60, SR-51, Loop 101, Loop 202
Major Cities & Towns	Phoenix, Mesa, Scottsdale
Area:	3,750 Square Miles
Roadway Maintained:	3,476 Lane Miles
Notes:	Construction and maintenance are handled by separate districts in the Phoenix metropolitan area.

2.4.6. Phoenix Construction District

District Name:	**Phoenix Maintenance District**
Major Highways	Interstate 10, Interstate 17, US 60, SR-51, Loop 101, Loop 202
Major Cities & Towns	Phoenix, Mesa, Scottsdale
Area:	3,750 Square Miles
Notes:	Construction and maintenance are handled by separate districts in the Phoenix metropolitan area.

2.4.7. Prescott District

District Name:	**Prescott**
Major Highways	Interstate 17, US 60, US 93
Major Cities & Towns	Prescott, Wickenberg
Area:	10,000 Square Miles
Roadway Maintained:	2,260 Lane Miles
Notes:	Elevation Ranges from 1,080 to 7,700 feet.

2.4.8. Safford District

District Name:	**Safford**
Major Highways	Interstate 10, US 70
Major Cities & Towns	Safford, Wilcox, Bisbee

Roadway Maintained:	3,000 Lane Miles
Notes:	Elevation Ranges from 2,950 to 9,650 feet.
	District serves Southeastern Portion of Arizona

2.4.9. Tucson District

District Name:	**Tucson**
Major Highways	Interstate 10, Interstate 19
Major Cities & Towns	Tucson
Area:	19,000 Square Miles
Roadway Maintained:	3,870 Lane Miles
Notes:	Elevation Ranges from 1,145 to 6,775 feet.
	District Serves a Population of 1.1 Million
	The District's Web based map has direct links to the responsible maintenance org for each roadway segment.

2.4.10. Yuma District

District Name:	**Yuma**
Major Highways	Interstate 8
Major Cities & Towns	Yuma
Area:	13,000 Square Miles
Notes:	Elevation Ranges from 1,145 to 6,775 feet.

2.5. DPS and Other Law Enforcement Roles & Responsibilities

ROLES

The role of DPS is to enforce state laws; deter criminal activity; assure highway and public safety, and provide vital scientific, technical and operational support to other criminal justice agencies in furtherance of the protection of human life and property.

RESPONSIBILITIES

1. DPS has the primary responsibility for enforcing laws and investigating accidents on the State highways.

2. Special arrangements may be made for DPS officers to monitor construction zones, to enhance safety.

3. Common goals of ADOT and DPS include:

    a. Making optimum use of the freeway system by employing effective freeway management techniques.

    b. Providing a safe environment for freeway users.

c. Making efficient use of each agency's resources.

4. DPS uses 1,500 law enforcement professionals in 30 offices to patrol the Arizona's state highway system.

5. DPS refers callers seeking roadway information to HCRS using the 511 phone number.

6. Users of the DPS Web server can link to the Phoenix FMS cameras.

NOTIFICATION PROCEDURES

1. Report incidents requiring investigation or law enforcement to the DPS immediately.

2. Serve as the ADOT point of contact for assistance requests from DPS and other law enforcement agencies, and dispatch appropriate ADOT resources based on incident characteristics.

3. If DPS arrives at the scene of a construction site and reports no activity, the officer will call the TOC.

   a. The TOC operator will instruct the officer to call the DPS 24 hour paging line.

   b. The TOC operator will also contact the appropriate construction org.

   c. The TOC operator does not have authority to tell the DPS officer to leave the site.

2.6. Phoenix District ALERT Roles & Responsibilities

ROLES

Arizona Local Emergency Response Team (ALERT) has been established to provide rapid response in order to relieve traffic congestion or hazards caused by incidents. ALERT is associated with the Phoenix Maintenance District and consists of eight units. Four of the units are dedicated to serve the West part of Phoenix, and four units are dedicated to serve the East part of the Phoenix metropolitan area.

RESPONSIBILITIES

The responsibilities of ALERT are to improve safety at incident scenes, reduce congestion caused by incidents, reduce the duration of incidents, and provide assistance to the involved parties at the incident site.

NOTIFICATION PROCEDURES

1. The ALERT is normally dispatched when an incident results in the closure of one or more traffic lanes, or when the duration of an incident is two hours or more.

2. Call out the ALERT when requested by DPS using these call-out procedures:

    a. Call two team members for closures of ramps and frontage roads.

    b. Call four members for freeway lane closures

    c. Call all eight members for full freeway closures

3. Obtain the following information from the DPS dispatcher for an ALERT call-out:

    a. The route, direction, and milepost location of the incident

    b. The type of incident

    c. Number of lanes blocked by the incident

    d. Name and call-sign of the officer-in-charge and, if possible, the cellular telephone number

    e. Location of the incident command post and best route to it

    f. Name and telephone number of the dispatcher

4. Other law enforcement agencies should request the ALERT through DPS.

5. An officer should remain at the scene until the arrival of ALERT.

6. The ALERT may also be dispatched by the ADOT TOC based on the type of incident as reported by reliable sources or verified on cameras.

7. The ALERT will respond to incidents which have occurred on frontage roads when the incident may have adverse traffic impacts on the freeways.

8. The TOC will advise the local Traffic Management Centers (TMCs), or the city or county police agencies when ALERT is being used on frontage roads or ramps that will impact traffic in their jurisdictions.

2.7. Fire, Rescue and Emergency Medical Roles & Responsibilities

ROLES

Fire departments in Arizona provide fire suppression services, hazardous materials response, rescue services and emergency medical services. Some fire departments also provide ambulance service for patient transport. In other communities, fire departments arrange for patient transport through the use of private ambulance services.

The Phoenix Fire Department is one of the busiest fire departments in the United States. Phoenix currently has 46 fire stations, 53 engine companies in service, 13 ladder companies, and 29 rescue ambulances. Average fire department response time in Phoenix is less than five minutes.

An example of a rural fire department is the Winslow Fire Department serving a community of 9,500 with six full-time fire fighters, three pumpers and one rescue unit. Small community fire departments rely extensively on mutual aid agreements for handling major emergencies. Most small community fire departments will respond to calls that are substantial distance outside the community limits to serve the public.

RESPONSIBILITIES

1. The public normally contacts the fire department through a Public Service Answering Point (PSAP) by dialing 911.

2. Although the TOC is not a PSAP, the TOC may become aware of incidents that require Fire Department assistance.

3. The TOC serves as a point of contact for fire departments requiring assistance with road closures or assistance with incidents involving ADOT property.

NOTIFICATION PROCEDURES

1. Report emergencies in the tunnel and at the TOC building directly to the Phoenix Fire Department using the Direct Fire Department Line in the TOC.

2. The State of Arizona is served by more than 40 fire departments, each serving a different geographic area. If the operator is unsure which Fire Department to contact, notify DPS of the incident location and details.

3. Dispatch ADOT resources in response to requests from the fire department to inspect damage to ADOT property, provide traffic control, or close state roadways.

2.8. Towing & Recovery Roles & Responsibilities

ROLES

1. Private businesses regulated by DPS provide general and heavy duty towing and recovery services throughout the State of Arizona.

2. DPS determines which towing company should be contacted based on the location of the incident and rotational criteria.

RESPONSIBILITIES

1. DPS administers the rotational towing program.

2. DPS contacts the appropriate towing company during an incident.

NOTIFICATION PROCEDURES

1. If a citizen needs towing or recovery service, contact DPS. DPS will arrange for the next rotational tow.
2. Do not recommend any specific towing company to citizens.

3. If a state vehicle needs towing services, refer to the District Books for ADOT-approved contract garages and arrange for towing service from the most convenient garage.

4. When requesting towing or recovery service, identify the location and type of problem.

2.9. Freeway Service Patrol Roles & Responsibilities

ROLES

Freeway Service Patrol is an incident response tool that complements the TOC's activities in the area of incident response. The Freeway Service Patrol provides the following services:

1. Locate and assist stranded motorists.
2. Make minor vehicle repairs.
3. Change flat tires.
4. Arrange for towing service.
5. Remove roadway debris.
6. Move stranded vehicles away from the traffic.

RESPONSIBILITIES

1. The Freeway Service Patrol operates 18 hours a day, six days a week on the Phoenix area freeways.

2. Eight service patrol vans provide assistance to stranded motorists and help with traffic control, debris removal and other functions related to minor collision scenes.

3. The roving patrols have the ability to respond to and clear incidents rapidly, thereby reducing congestion and delay.

NOTIFICATION PROCEDURES

1. If the operator needs to contact a Freeway Service Patrol unit, advise the DPS dispatcher serving the location.

2.10. REACT Roles and Responsibilities

ROLE

1. The purpose of the Regional Emergency Action Coordination Team (REACT) is to assist with surface street traffic management by setting up emergency closures, installing signed detour routes and providing directional information to motorists.

2. The main objective of REACT is to provide traffic management for emergency traffic situations on arterial roadways.

3. REACT is versatile and able to assist with other types of traffic control when needed.

4. On call service is provided by a team of twelve REACT members with the eventual goal of emergency traffic management to all jurisdictions in Maricopa County that request assistance.

RESPONSIBILITES

1. MCDOT is the lead agency responsible for the operation of REACT

2. REACT responds to incidents when requested by local police, fire, or street transportation agencies.

3. REACT team members are on-call 24-hours per day, seven days a week and are alerted to call outs through the use of alphanumeric pagers.

4. Each REACT team member is assigned a specially designed response truck. These REACT trucks are equipped with traffic control equipment such as reflectorized cones and vinyl roll-up type signs. REACT trucks also are equipped with programmable two-line variable message sign (VMS) boards and all required communication and safety equipment.

NOTIFICATION PROCEDURES

1. Contact the McDOT TMC to request REACT.
2. The first REACT member that arrives on-scene reports to the command post and assumes the duties of the MCDOT Incident Commander.
3. The MCDOT Incident Commander consults with other incident commanders and formulates a consolidated action plan to:
    a. Determine overall incident objectives
    b. Select strategies for implementation
    c. Maximize the use of available resources
4. The MCDOT Incident Commander informs other responding REACT team members of the action plan, assigns team members tasks, and coordinates with the MCDOT Traffic Management Center.

2.11. Hazardous Material (Haz Mat) Incident Roles & Responsibilities

ROLES

1. The Arizona Department of Environmental Quality (ADEQ) oversees the cleanup of hazardous materials on a statewide basis.
2. ADOT's Safety and Health Group (Org 0100) is responsible for cleaning up hazardous sites on the State highway right-of-way.

RESPONSIBILITIES

Identification of hazardous materials is an important responsibility. A hazardous material is a material that, in any quantity, poses a threat to life, health or property. More than four billion tons of materials classified as hazardous are shipped throughout the United States each year. Hazardous materials commonly shipped in the United States include:

1. Explosives (materials that combust or detonate)
2. Compressed gases (pressurized flammable or nonflammable gas)
3. Flammable liquids (those with a flash point of less than 100 degrees Fahrenheit)
4. Combustible liquids (those with a flash point greater than 100 degrees Fahrenheit)

5. Flammable solids (non-explosive solid material that burns vigorously and can be ignited readily)
6. Oxidizers (substances that give off oxygen or act like oxygen and stimulate combustion)
7. Poisonous gases
8. Corrosives (materials that destroy skin)
9. Radioactive materials

There are three common ways of identifying hazardous materials during shipment:

1. Placard: a four-sided, diamond-shaped sign displayed on the trucks, railroad cars and large containers that are carrying hazardous materials. Many placards are red or orange, while a few are white or green. The placard will contain a four-digit identification number as well as a class or division number that indicates whether the material is flammable, radioactive, explosive or poisonous.

2. Shipping Papers: bills of lading showing the name of the substance, the classification (such as flammable or explosive), and the four-digit identification number. Shipping papers identifying hazardous materials are required to be in the cab of a motor vehicle within the reach of the driver, in the possession of a train crewmember in the engine or the caboose, in a holder on the bridge of a vessel or in the aircraft pilot's possession.
3. Labels: on containers and packages containing hazardous materials, which name the substance, the classification and the four-digit identification number.

NOTIFICATION PROCEDURES

1. ADOT field employees may be the first individuals to encounter hazardous materials. The general rule in working with hazardous materials is to act quickly and to isolate and deny access to the area. Time is critical, but actions should not be so quick that the first persons on the scene endanger themselves or others at the scene.
2. If an ADOT employee is first on the scene of a hazardous materials incident:

    a. Notify DPS and the Fire Department Immediately

    b. Advise the employee to STAY UPWIND AND ON A HIGHER TERRAIN THAN THE INCIDENT SITE, AND PREVENT OTHERS FROM ENTERING THE HAZARDOUS AREA WHEN POSSIBLE.

3. Small quantities of diesel fuel (less than 50 gallons) may be cleaned up by the ADOT maintenance staff. The ADOT maintenance staff may not clean up any

other materials, which appear to be hazardous, until the material has been inspected and determined to be non-hazardous.

4. Once a site has been identified as a hazardous materials incident, the first step is to isolate the site. DPS may request the ADOT assistance in closing roads and restricting access to the site. Notify the appropriate Maintenance Org to arrange for the required closures.
5. Obtain information to identify the hazard and contact the ADOT Safety & Health Org. Provide as much information as possible. The following checklist published by the Chemical Transportation Emergency Response Center serves as a useful guide.

    a. The identification number or the name of the product.
    c. The nature of the problem
    d. Operator's name and contact telephone number.
    e. Operator's location
    f. The Department of Transportation Response guide number the operator is using.
    g. The shipper or manufacturer of the product.
    h. The type of container.
    i. The rail car or truck number.
    j. The carrier's name.
    k. Local conditions (weather, terrain, etc.).

6. The Safety and Health Org will respond to the scene and arrange for an ADOT on-call contractor to perform the clean up operation. Current on-call contractors include:

    a. Environmental Response Inc.
    b. Safety-Kleen Southwest Inc.
    c. Southwest Hazard Control
    d. RMCAT Environmental Services

7. Only when directed by the ADOT Haz Mat person at the scene, using the phone numbers listed in the appropriate call out book, notify the following agencies:

    a. The Resource Conservation and Recovery Act (RCRA) Hotline
    b. The Storm Water Hotline
    c. The Safewater Drinking Act Hotline
    d. The Toxic Substances Control Act (TSCA) Hotline

e. The National Response Center
f. CHEMTREC
g. Arizona Department of Environmental Quality Emergency Response
h. Poison Control
i. The Occupational Safety and Health Administration. (OSHA)

2.12. Media Role & Responsibilities

ROLE

The role of the TOC-based media is to report traffic information at regular intervals during the morning and afternoon peak periods.

RESPONSIBILITIES

1. Currently Metro Networks and Total Traffic staff the TOC with traffic reporting personnel.

2. Off-site members of the traffic reporting media may access the TOC's congestion map and camera images using az511.com.

3. Members of the traffic reporting media are permitted in the ADOT TOC through participation in a public-private agreement.

4. Media traffic reporters must adhere to all policies established in the signed agreements.

5. Television crews are permitted in the operations room to perform live broadcasts of traffic conditions. Coordination of these broadcasts should be through ADOT's Community Relations Office. Currently one local television station has agreed to broadcast live traffic information from the TOC.

6. During major incident conditions, media access may be restricted to the conference room to observe the TOC from the viewing window.

NOTIFICATION PROCEDURES

1. Any contact with media, excluding on-site approved traffic reporters, should be coordinated through the ADOT Community Relations Office

2. At all times, be courteous and professional in all communications.

3. TOC operators should answer media questions regarding routine events that affect the flow of traffic.

4. Limit discussion with traffic reporting media staff to incident location, basic description, estimated delay, and official detours.

5. Operators must not speculate on the estimated time of clearance or the cause of an incident.

6. Requests for information regarding law enforcement closures or other law enforcement activities should be referred to the appropriate law enforcement agency.

7. Unusual requests for information and non-routine complaints should be referred to a shift supervisor, operations supervisor, or the TOC Manager.

8. If an ADOT employee is involved in an accident or is the victim of a crime, media inquiries must be referred to the law enforcement agency conducting the investigation.

2.13. ADOT Community Relations Roles & Responsibilities

ROLES

The role of the Community Relations Office is to manage and coordinate interaction with the public in regard to ADOT activities. This may involve handling public inquiries, disseminating information and coordinating various information programs. ADOT press releases are published by many local newspapers and serve as a valuable tool for conveying information that is detailed but does not require immediate dissemination.

RESPONSIBILITIES

1. To receive inquiries about ADOT and to disseminate these inquiries to appropriate groups.

2. To issue press releases regarding ADOT activities. The office commonly issues press releases regarding construction closures and road construction contract awards.

NOTIFICATION PROCEDURES

1. Notify the Community Relations Office when the TOC becomes aware of a situation that requires a press release.

2. Be prepared to describe the facts of the incident, including who, what, when and where.

3. The Community Relations Officer should be notified of all Level 1 incidents.

3. INCIDENT MANAGEMENT

The main responsibility of the TOC is to respond to incidents. The TOC operators can help improve the safety of motorists, road construction and maintenance workers, and emergency crews during incidents. This is accomplished by informing travelers through the use of VMS and by providing information to law enforcement, ADOT staff, and the media.

Every incident requires an appropriate response. While each incident is unique and requires varying actions, it is the responsibility of the operator to judge the various circumstances and additional impacts resulting from incidents. Operators must always use common sense. If the appropriate response is unclear, ask for advice or help from the supervisor. All incidents should be evaluated based on their severity and on:

1. Location
2. Time of day
3. Day of week

Appendix C contains definitions of incident related terminology.

3.1. Incident Classification

Incidents near the roadway, which may affect traveler safety, cause congestion, or require road closures and detours shall be classified based on level of severity criteria:

Level 1 Incident Criteria

1. All fatalities (code 963)
2. Unplanned closure of one or both directions of the highway, even if traffic can be re-routed, or if the closure is due to weather conditions.
3. Any bridge failure
4. Any incident involving hazardous materials spills, homicide, train, school bus, helicopter or airplane
5. All reports from DPS or other sources alerting of past 963's or other level 1 criteria

Level 2 Incident Criteria

1. Traffic flow is restricted
2. ADOT presence is requested (for example, lanes blocked due to accident, spilled load, debris, etc. cut fences, livestock present on roadway, guardrail damage)
3. Red traffic signal lamp out
4. Stop sign knocked down
5. Large dead animal blocking lane(s)

6. Roadway damage, including large potholes or gravel spilled on the roadway
7. Code 34 (stranded vehicle) blocking traffic
8. Structural damage that does not close the freeway
9. Threat of a jumper that does not close the freeway

Level 3 Incident Criteria

1. Yellow or green traffic signal lamp out
2. Dead animal not blocking the roadway
3. Debris not blocking the roadway
4. Code 34 not blocking the flow of traffic
5. Anything that can be handled at the maintenance supervisor's discretion
6. Anything that does not require immediate ADOT assistance

Construction that interferes with traffic is a planned event and is not to be entered as an incident. Incidents that occur near major interchanges or during peak commute hours may affect multiple routes or cause much longer than usual delays. In such cases, it may be appropriate to increase the incident classification level to the next higher level.

3.2. Incident Detection and Verification

Detection and verifications are the first steps in the incident management process.

The most common means of detecting an incident are:

1. Notification by a DPS dispatcher
2. Notification by ADOT personnel
3. Notification by local agencies
4. Monitoring of DPS and ADOT radio frequencies
5. Congestion level monitoring using the FMS
6. Visual observation using CCTV

PROCEDURES

1. No verification is required when the means of detection is a DPS dispatcher or any reliable report from ADOT or public agency personnel.

2. Following the detection of an incident from other sources, verification should be obtained.

3. For DPS call outs, the TOC operator must determine whether the incident requires ADOT involvement and, if so, make the appropriate contact.

4. Obtain a Document Record Number (DR #) from the DPS dispatcher for each incident.

3.3. Incident Logging

Incident logging procedures are required to track incidents and record incident details. The procedure also explains incident logging using the automated incident log. The following terms are used to describe the incident lifecycle.

Time Incident Received is the time when an operator is made aware that the incident has occurred. This time stamp is automatically generated when the operator opens the IM log screen. Currently this time cannot be altered. In the future, manual override of this field may be enabled to allow entry of past incidents.

Response Team Callback Time is the time when a TOC operator makes actual verbal contact with the incident responder from ADOT, DPS, or the responsible local agency. This time is also referred to Acknowledgement Time or Time ADOT Calls TOC Back.

Response Team On-Scene Time is the time when the incident responders arrive at the incident location and notify the TOC of the arrival. This is also referred to as Time ADOT Reports On-Scene.

Incident Cleared Time is the time when all lanes are open and traffic can move through. This time is also referred to as Time ADOT Reports Incident Clear.

OPERATIONAL GUIDELINES

1. Incidents reported by a reliable source such as an ADOT field unit or DPS dispatcher are self verifying and do not require further verification.

2. CCTV is the primary tool available to the TOC operator for incident verification for those sections that are on the FMS. Personnel on the scene should verify incidents on other sections of the highway.

3. Log all incidents using the automated logging system.

PROCEDURES

1. When verifying an incident obtain, incident details and complete an automated incident log record.

2. Enter the incident type, characteristic, level of severity, route, reporting party, lanes involved, and vehicle types.

3. Record additional data in the “Comments” section. Additional data may include: the beginning and ending time of posted messages with corresponding locations, and the names and agencies of the responders.

4. Record the incident response time parameters as defined above.

5. Read the message to verify the system has responded and make any needed corrections.

6. Terminate the incident, which will time and date stamp the incident log.

7. Notify all parties originally contacted that the incident has been cleared.

8. All incidents reported to the TOC will be documented in the Automated Incident Log.

9. Enter "unknown" or "not applicable" into data fields when the information is unknown or not applicable.

10. Record each incident event as it occurs.

11. Each incident log will be completed before the end of each shift unless the incident is still on going.

12. Handwritten logs will not be maintained except for notes taken to support the completion of the incident.

13. In the event that the automated logging system is down, or otherwise unavailable, record the incident details in e-mail addressed, to the next shift operator, Operations Supervisor, and the TOC Manager. When the system is back on-line, the on-duty shift operator will enter the information in the “Comments” section and list which employees actually worked the incident.

3.4. Incident Response

OPERATIONAL GUIDELINES

1. TOC Operators must evaluate incident characteristics, select appropriate responders based on incident characteristics, and notify, call out, or dispatch the appropriate responders.

2. Provide traveler information, as needed, using VMS, HCRS and the media.

3. Update district contact information in the call-out books as information changes.

4. The Shift Supervisor will assign a TOC operator to check that all of the books in the TOC have consistent information once per week.

PROCEDURES

1. Refer to the District Map to determine the appropriate district.

2. Make the appropriate notifications based on the incident conditions, location and time of day per the call-out books.

3. Notification and response procedures are unique to each district and provided in the call-out books located at each console.

4. District contact information is constantly changing and these books need to be updated continuously.

5. Primary and back-up contact names are normally provided in the District Notification Books.

6. Notify members of the ADOT Admin Pager Group all Level 1 incidents.

7. Make appropriate additional notifications based on incident characteristics:

    a. DPS
    b. Other Law Enforcement
    c. ALERT (Phoenix District, East or West)
    d. Fire, rescue and Emergency Medical Services (EMS)
    e. Hazardous Materials
    f. ADOT Community Relations
    g. ADOT Risk Management
    h. ADOT Admin Group
    i. FHWA

8. Refer to roles and responsibilities and notification sections of this manual to determine when notification is required.

9. Check e-mail for updates to the contact information at the beginning of the shift and post updates to the assigned book before the end of the shift.

3.5. Site Management

Site management will be accomplished in accordance with the Unified Command Structure, which is used by ADOT, DPS and other responders within the State of Arizona. In Unified Command, each agency responding has an incident commander and the incident commanders work together as a team. The incident commander with the primary responsibility at scene will serve as the team leader. In a typical major traffic collision, this will initially be the fire department or law enforcement

agency. As the incident progresses, and the injured are treated and transported, the incident command may be shifted to the law enforcement agency for the duration of the evidence gathering, investigation, and clearance phase.

A typical injury accident starts with the first responder being the incident commander, until relieved by a higher authority. It may be a fire crewmember, law enforcement officer, ADOT worker, ambulance crewmember, or other official responder who arrives first.

In general, DPS is in charge of the incident site, and ADOT is in charge of the highway approaching the site. Although the TOC is not directly involved in site management, the TOC operators will often be involved in coordinating resources for site management.

OPERATIONAL GUIDELINES

1. The highest priority in site management is the protection and safety of the emergency response personnel, victims and bystanders.

2. Another priority involving severe incidents, fatalities or law enforcement-activity is preservation of the scene. Preservation of the scene includes protecting the site while evidence is gathered and investigations are performed.

3. Protection of private and public property from further damage is also an important priority.

4. As the scene stabilizes and incident conditions allow, re-opening as much of the roadway and dissipating the queue becomes a priority.

PROCEDURES

1. Site management decisions are made at the scene under the Unified Command structure.

2. TOC operators should assist in site management by notifying and calling out the appropriate response resources upon law enforcement or ADOT field personnel request.

3. TOC operators should monitor the scene and length of queue using CCTV cameras when available.

4. TOC operators should consider providing end of queue warnings, when appropriate, to prevent secondary accidents as high-speed traffic approaches stopped vehicles. End of queue warnings may be provided with fixed or portable VMS.

5. TOC operators should provide appropriate traveler information to support site management.

3.6. Incident Clearance

The purpose of incident clearance is to re-open the roadway as soon as possible in effort to return to normal traffic flow conditions.

OPERATIONAL GUIDELINES

1. Towing and recovery is normally arranged by DPS using rotational tow company call out lists.

2. TOC operators should convey any requests for towing service to DPS providing details on:

    a. Incident location & direction
    b. Number and description of vehicles involved

3. ADOT assistance may be required for clearance of some incidents involving spilled loads, structural damage or extended traffic control needs.

PROCEDURES

1. Call DPS for basic towing and recovery requests.

2. Use the District Contact Information books to make notifications required for ADOT response.

3. An MUTCD-compliant traffic control plan should be implemented at the scene of an incident, when the incident is anticipated to last more than two hours.

3.7. Incident Notification Procedures

Notification procedures vary depending on the level of incident and its location. This section provides specific detail for response procedures based on the type of incident. In all cases, the location of the incident will determine specifically who, within each district, is to be contacted, and this information is available in the district call-out books located at each operator console.

3.7.1. ADOT Administration

The ADOT Administration group should be notified in the case of all Level 1 incidents. The following is a list of those who make up the group:

a. Director of ADOT
b. Deputy Directors

c. State Engineer
d. Deputy State Engineers
e. Assistant State Engineer - TTG
f. Risk Management
g. Public Information Officers
h. TOC Manager
i. Legislative Liaison
j. TOC Operations Room Supervisor
k. TOC Shift Supervisors

3.7.2. Construction Area Notification Procedures

PURPOSE

This policy describes how to coordinate the response to incidents occurring in construction zones.

NOTIFICATION PROCEDURES

1. The TOC will maintain a list of the Resident Engineers for all construction projects.

2. If DPS requests an ADOT response for incidents occurring in construction zones, the Resident Engineer will be notified.

3. The Resident Engineer will contact the contractor to initiate a response.

4. ALERT may also be used if the Resident Engineer is unable to obtain a proper response from the contractor.

5. The Resident Engineer will advise the TOC if the roadway is blocked, a significant traffic hazard exists, and/or the resident engineer cannot get a sufficient response in a timely manner.

6. The operator will notify the shift supervisor who will work with the appropriate maintenance supervisor to determine how to resolve the issue. See call out books for maintenance supervisor contact information.

The contractor is responsible for sweeping and repairing the damages to construction traffic control devices and to the roadway and barriers within the construction zone.

3.7.3. ADOT Risk Management Notification

OPERATIONAL GUIDELINES

1. TOC Operators shall notify Risk Management of every Level 1 incident as specified in the call-out books.

2. Report traffic crashes in which there is a fatality or a person has sustained an injury that is likely to result in a fatality (e.g. Level 2 incidents that evolve into Level 1 incidents).

3. Report all crashes that occur in construction zones.

4. Report crashes or injuries that involve state vehicles or on-duty state employees.

NOTIFICATION PROCEDURES

1. To report situations or incidents that occur during normal working hours call the Risk Management office and advise a Risk Management Investigator of the following details:

    a. Date of Occurrence.
    b. Location of the incident by route and milepost.
    c. Number of fatalities, serious injuries and amount of damage.
    d. Police Agency Report Numbers.
    e. Incident Management System Log #.
    f. For crashes, include number of vehicles involved and direction of travel.
    g. Note the name of the Risk Management Investigator contacted in the log.

2. For situations that occur after hours or on weekends or holidays:

    a. Risk Management Investigators will respond to active incidents occurring within 75 miles of Phoenix.
    b. Refer to the call-out books to determine how to contact the on-call risk management investigator.
    c. For inactive incidents and situations, notify the Risk Management Investigator by e-mail.

3.7.4. FHWA Requirements for Notification

PURPOSE

The purpose of the policy is to define the situations that require FHWA notifications and to provide guidance for such notifications.

NOTIFICATION PROCEDURES

1. FHWA notification is to be in accordance with ADOT policy SAF 01-1, effective February 6, 2001.

2. All reports originating from ADOT field personnel will be directed to the TOC, so that the TOC can coordinate FHWA notification.

3. The TOC will then make all required notifications to the FHWA officials at the earliest possible time following the incident occurrence.

4. Specific Level 1 incidents require FHWA notification:
    l. Highway crashes involving the death of five or more persons.
    m. Any accident involving a school bus which results in fatalities and/or disabling injuries.
    n. Any incident that causes a major highway to be closed for more than 24 hours, except for closures (maintenance, construction, etc.) where the public has been notified in advance via newspaper, radio or television announcements.
    o. All bridge failures or closures. Advise if the closure resulted from bridge inspection.
    p. Significant property damage resulting from fire, explosion or release of hazardous materials necessitating the evacuation of the immediate area and the closing of roads, streets, or highways.
5. When FHWA notification is made, the ADOT Admin page group shall also be notified.

FHWA Area Engineers may elect to respond to the scene to coordinate FHWA response to selected incidents.

3.7.5. Metro Phoenix City/County TMC Notification

OPERATIONAL GUIDELINES

1. For any Level 1 incident on a freeway or state route in the Phoenix Metropolitan area, the appropriate local government TMC should be notified.

2. Local governments that do not have a TMC will not be contacted.

3. Adjoining cities should be contacted if an incident impacts their streets.

4. ADOT will not dispatch city personnel; city personnel will decide whether to respond.

PROCEDURES

1. Locate incident on map.

2. Identify appropriate local government.

3. Contact City/County TMC using City/County TMC contact information binder.

3.7.6. Capitol Police Notification

The ADOT headquarters facilities are located on the Capitol Complex and are under Capitol Police jurisdiction. In the event the Capitol Police notifies the TOC about unusual conditions at the ADOT Headquarters, the following actions are to be taken.

OPERATIONAL GUIDELINES

1. If an after-hours emergency occurs at the ADOT Headquarters Complex, the Capitol Police will attempt to notify ADOT management directly.

2. The Capitol Police will contact the TOC if they are unable to contact anyone on their call list.

PROCEDURES

1. When Capitol Police notification is received, the TOC operator will page the following personnel in the order given. If a page is not answered in ten minutes, the next person on the list will be paged and given the information.

    a. Head of ADOT Facilities
    b. State Engineer
    c. Deputy Director
    d. Director

3.7.7. Bridge Group Notification

The Bridge Group conducts biannual bridge inspections for all state owned bridges.

OPERATIONAL GUIDELINES

1. The Bridge Group is responsible for bridge design, bridge construction assistance, and bridge management necessary to provide and maintain safe and functional bridges and drainage facilities on Arizona highways.

PROCEDURES

1. Emergency call-out of the ADOT Bridge Management Group is required whenever, structural damage to a bridge structure is suspected. The TOC notifies the appropriate maintenance org to report bridge damage. The contact numbers for this group are located in the call-out books.

2. Additional notifications will be required in the event of a bridge closure. TOC will notify FHWA (see FHWA Notification at 3.7.4).

3.7.8. School Bus Incident Notification

Any incident involving a school bus is a Level 1 incident. This policy describes the notifications that are required for school bus accidents on state roadways.

OPERATIONAL GUIDELINES

1. DPS is responsible for investigating school bus accidents.
2. DPS conducts regular school bus safety inspections to decrease the likelihood of school bus accidents.

PROCEDURES

1. If the TOC becomes aware of a school bus accident, the DPS will need to be notified.

2. Notify the Federal Highway Administration, Phoenix Office, whenever a school bus accident results in injuries.

When injuries require FHWA notification, the ADOT Admin page group shall also be notified.

3.7.9. Roadway Damage Notification

This policy describes roadway damage notifications that TOC operators are required to make. The definition of roadway damage is broad and may include actual roadway damage such as potholes, slides and rock falls. Damage to roadway appurtenances such as signs, guardrails, and crash attenuators also require notification.

OPERATIONAL GUIDELINE

1. Repairs fall into two categories:

a. **Emergency Repairs** due to hazardous conditions, such as severely damaged or fallen stop signs, warning signs (e.g. “Slippery when Wet”) or other damages that could potentially be a hazard to motorists

b. **Scheduled repairs** for damage not presenting an immediate hazard to motorists.

PROCEDURE

1. For emergency repairs obtain the following information:

   a. Date
   b. Time
   c. Location
   d. Type of Damage
   e. Calling Party Information
   f. DR #
   g. Reporting Agency, Contact Name and Phone Number
   h. Law Enforcement Agency Report #

2. Use the call-out books to call out the appropriate Maintenance Org.

3. If emergency repairs are required, ask the response agency to stay at the location until the appropriate maintenance supervisor can respond or send assistance.

4. If DPS or ALERT has been utilized and can affect minor repairs, then maintenance can repair the damage on a scheduled basis.

5. For non-emergency repairs where no immediate hazard exists, an e-mail may be sent to the appropriate Maintenance Org.

6. If the damage report appears to be for a roadway that belongs to another agency, notify the appropriate agency.

3.7.10. Roadway Mainline, Ramp & Bridge Closure Notification

This describes how the TOC disseminates information on planned closures of roadway, mainline, ramp and bridge closures using the HCRS system.

PROCEDURES

1. When the TOC is notified by an ADOT contractor that the contractor will be implementing the closure or restriction, obtain the following information:

   a. Project Location

b. Closure dates and times

c. 24-hour Telephone Number

d. Contact Name

e. Permit Number

2. Enter the information into HCRS.

3. Permit road closure notification must be received 24 hours in advance.

4. Road closure requests for weekends and before 9:00 a.m. on Mondays must be received by 7:00 a.m. the preceding Friday.

3.7.11. Snow Removal

OPERATIONAL GUIDELINE

1. DPS or ADOT personnel usually report snow and ice problems to the TOC.

2. The operator will advise on-duty DPS and ADOT personnel in the affected area that snow removal is being done.

3. If a call-out is necessary, refer to the district procedure for guidance.

4. The snow desk will notify the TOC when snow removal assignments have been completed.

PROCEDURES

1. Contact the maintenance supervisor in the appropriate District to determine whether a snow desk will be opened at the District Office.

2. If a snow desk has been established and is taking calls, all future calls will go to that location.

3. Provide the DPS with the contact information for the district snow desk and refer all future calls to the Snow Desk, during the hours of snow desk's operation.

4. If emergency road closures are implemented by law enforcement, enter the call sign and name of the officer in the comments section of the log.

5. If ADOT is not at the scene of the closure, notify the appropriate maintenance supervisor.

3.7.12. Animals on the Roadway

OPERATIONAL GUIDELINE

1. TOC operators should evaluate whether the reported animal presents an immediate hazard.

2. An attempt to locate the owner of the livestock may be requested; a good source for this information is the County Agriculture Extension Agent or County Sheriff's Office.

PROCEDURES

1. Reports of livestock along highways in areas other than open rangeland require verification by DPS or other agencies.

2. Report dead livestock to the State Livestock Commission.

3. Advise the responder of the location by route, direction, milepost, which side of roadway, and type of animal.

4. Emergency Maintenance Call-outs

    a. If DPS considers the animal to be a hazard, notify the appropriate district contact.
    b. For large domestic animals within the right-of-way, notify the appropriate district contact.
    c. For large dead animals such as deer or elk, notify the appropriate district contact.

5. Non-Emergency Maintenance Call-outs

    a. Handle small animals along the highway that do not appear to be a hazard as a non-emergency call to maintenance.

3.7.13. Rocks and Debris on the Roadway

OPERATIONAL GUIDELINES

1. Calls regarding rocks or other debris on roadway may come from the public, DPS, or police agencies.

2. Reports of debris on a roadway from a law enforcement agency must be forwarded to ADOT maintenance for response.

3. Notify DPS of citizen reports of rocks and debris for further evaluation.

4. If DPS officers are not available, inform the maintenance supervisor of the citizen report.

PROCEDURES

1. If the report is from a law enforcement officer, obtain the name and call sign of the reporting officer.

2. Obtain an accurate location, including route number, milepost, and direction of travel.

3. Determine the size and approximate amount of debris requiring immediate removal.

4. Determine if any roadway or guardrail was damaged and is in need of repair.

5. Ascertain if the officer has established any type of traffic control or if traffic control is needed.

6. Try and ascertain what, if any, equipment will be needed and notify maintenance.

7. If traffic is obstructed or restricted, enter the information in the HCRS.

8. Rocks that have been cleared from a roadway without calling upon maintenance personnel may indicate a problem location that needs to be evaluated by maintenance during normal working hours.

9. Rocks cleared from the roadway by officers or others still must be reported to the appropriate maintenance facility by e-mail.

3.7.14. Traffic Control Requests

OPERATIONAL GUIDELINE

1. Law enforcement agencies may request ADOT assistance with traffic control and emergency roadway closures.

2. If an incident is anticipated to last more than 2 hours, applicable procedures and devices set forth in part 6 of the MUTCD should be followed in implementing traffic control.

PROCEDURE

1. In the Phoenix area, notify the ALERT unit.

2. Outside the Phoenix area, notify the appropriate Maintenance Org.

3. Update HCRS as appropriate.

3.7.15. Crash Involving ADOT Vehicle or Personnel

This describes the required notifications for collisions involving ADOT vehicles.

OPERATIONAL GUIDELINE

1. ADOT employees reporting accidents to the TOC will be asked to follow the procedures given here. The radio code 10-33 will be used for emergencies.

PROCEDURE

1. Notify DPS or the appropriate local law enforcement agency.

2. Make Department notifications:

    a. Employee Supervisor
    b. Safety Office
    c. District Engineer

3. If the employee has sustained serious or life threatening injuries, notify the ADOT Admin paging group.

4. The supervisor responding to the location will determine if any other response is required.

3.7.16. Statewide Radio Communications System

A network of mountaintop repeaters provides statewide communications for the Department. A detailed training manual on the radio system prepared by the radio equipment supplier (Motorola) is available to describe how to operate the radio console.

OPERATIONAL GUIDELINE

1. The TOC has four radio scanners, one at each operator workstation. These consoles are to be used to monitor DPS operations.

2. Use the Motorola radio console to contact ADOT field crews, as needed.

3. Keep all radio calls brief, concise and professional at all times.

4. Limit use of the Motorola radio to business use only. Radio traffic is regularly monitored by the media and interested individuals.

5. Use the ADOT 10 Code system to convey information.

6. Use each unit's assigned call sign when making contact with a field unit.

PROCEDURE

1. Monitor all radio frequencies assigned to the operator's console position (Rural or Metro).
2. Operators are normally asked to monitor at least two frequencies; a selected channel and an unselected channel. Monitoring the selected channel takes priority over the unselected channel.
3. Keep the volume on the selected channel high.
4. Keep the volume on the unselected channel low.
5. Additional radio monitoring tasks may be assigned during specific events, major incidents, and snow removal operations.

3.8. Post-Incident Evaluation

Post incident evaluation serves as a forum to identify which incident management strategies are working well and to identify which incident management strategies have room for improvement.

OPERATIONAL GUIDELINES

1. Effective debriefings serve as a forum in which conflicts and inefficiencies are identified and steps are taken to mitigate the conflicts or inefficiencies.

2. Major incident debriefings may include the TOC, DPS, fire EMS, freeway service patrol, ADOT District personnel, tow truck operators, hazardous material responders, local and County agencies.

3. The facilitator of an incident debriefing must set a matter of fact non-confrontational environment for the meeting.

4. Incident debriefings should be held as soon after the incident as possible, while the information is still fresh in the participants' minds.

PROCEDURES

The District Engineer and the DPS Lieutenant will call for post-incident debriefings when needed, and will facilitate discussions. The TOC traffic analyst will provide each district with a list of incidents that lasted more than four hours. The District Engineer will be responsible for arranging the debriefing.

4. TRAFFIC MANAGEMENT

4.1. Closed Circuit Television (CCTV) System

CCTV surveillance allows evaluation of operational freeway characteristics by detecting and verifying incidents, and monitoring levels of congestion. CCTV surveillance also supports the determination of appropriate operational control strategies to manage traffic.

OPERATIONAL GUIDELINES

1. Use CCTV cameras to monitor roadway incidents and facilities only.
2. Avoid pointing CCTV cameras at private property.
3. TOC operators are the highest-priority user of all ADOT CCTV cameras, except for the cameras in the Tucson area.
4. DPS is the highest priority user of the cameras in the Tucson area.
5. CCTV images are not to be recorded, unless otherwise directed by a supervisor for training and other purposes. Traffic Analysts may record images for traffic studies.

PROCEDURES

1. When an incident is reported, and the incident is within the range of instrumented freeways, attempt to locate the incident using CCTV camera(s).
2. Report pertinent details, not already known to the DPS dispatcher, to DPS.
3. Avoid zooming in on details such as license plates and individuals.
4. After initial evaluation of the scene, use the cameras to monitor incident related congestion.
5. Video recording will be limited to special requests from DPS or upon approval of the Shift Supervisor, Operations Supervisor, or by a Traffic Analyst for traffic studies.

4.2. Ramp Meters

OPERATIONAL GUIDELINES

1. Ramp meters are traffic control signals that control the flow of traffic entering a freeway facility.

2. Ramp metering is a traffic management strategy for operating freeways at or near capacity.

PROCEDURES

1. The TOC Traffic Analysis Section is responsible for ramp meter timing.
2. Monitor ramp meter rates and make changes to the metering rate only upon request from the Traffic Analysis Section.
3. Operations should forward any complaints to the Traffic Analysis Section.

4.3. Traffic Signal Control System

This system will be used to develop coordinated signal progression, which allows motorists to travel with limited stopping at traffic signals, thus reducing congestion. Coordination may be accomplished for all signals in the system, or for individual groupings of signals. The control of traffic signals, including signals operated by local jurisdictions, is beneficial to managing traffic that is diverted to frontage roads or arterials as part of a route diversion plan during the occurrence of incidents on the freeway. At the time of this writing, the TOC is implementing the Icons Traffic Signal Control System. The system is being furnished by Siemens ITS.

OPERATIONAL GUIDELINES

1. The traffic signal system will monitor traffic signals owned and operated by ADOT.
2. The traffic signal system allows coordination of traffic flows between adjacent intersections.
3. The traffic signal system allows monitoring of intersection operations from the TOC.
4. Timing plans are typically selected on a time-of-day, day-of-week basis.
5. The signal system allows manual selection of timing plans from the TOC.
6. The traffic signal system allows download of new timing plans to intersections.
7. Special timing plans may be implemented for events (i.e. sporting events, fairs, concerts, etc.)

PROCEDURES

1. Signal timing plans are developed by traffic engineers and require certain minimum clearance intervals.
2. Do not modify or change signal timing plans.
3. Notify the region traffic engineer of any alarms generated by the signal system.

4.4. I-10 Deck Tunnel System

The Department schedules regular closures of the Tunnel for maintenance and cleaning of the tunnel during off-peak weekend hours twice per year. This section describes operational policies and guidelines for the I-10 Deck Tunnel Monitoring and Control System.

OPERATIONAL GUIDELINES

1. Monitor the operation of the I-10 Deck Tunnel from the Metro 1 or Metro 2 consoles.

2. The TOC serves as the answering point for emergency telephones within the tunnel.

PROCEDURES

1. The capabilities of the Tunnel control system include the following:

    a. Monitor tunnel CCTV cameras
    b. Monitor tunnel loop detectors (not part of the ADOT FMS)
    c. Monitor lighting level
    d. Monitor utility power system
    e. Monitor and operate back-up generator system
    f. Monitor and operate ventilation fans
    g. Operate lane use control signals at the tunnel entrances
    h. Monitor emergency telephones

2. Refer to the Instruction Manual for the Tunnel Control System and Phoenix Fire Department Tunnel Emergency Plan for actions to take when tunnel incidents occur.

4.5. Paging System

ADOT maintains paging systems for contacting staff during normal and after normal working hours. This section describes procedures for contacting staff using the paging system.

OPERATIONAL GUIDELINES

1. ADOT staff responsible for after-hour response can be contacted using the Webgate paging system. The Webgate paging system has been set up to simultaneously page appropriate groups of ADOT staff for various notifications.

PROCEDURES

1. Refer to the sections in this manual regarding Roles and Responsibilities and Notification procedures to determine whom to page.

2. Use the Webgate paging computer to page the appropriate group of responders for the incident. Examples of some Webgate groups include:
    a. Administration- Major
        i. Director of ADOT
        ii. Deputy Directors
        iii. Public Information Officers
        iv. State Engineer
        v. Assistant State Engineer (TOC)
        vi. TOC Manager
        vii. Legislative Liaison
        viii. TOC Operations Supervisor
        ix. TOC Shift Supervisor
    b. ALERT (by area)
    c. Administration (by District)
    d. Maintenance (by District and Maintenance Station)
    e. Haz Mat
    f. Landscape
    g. Phoenix VMS
    h. Phoenix Troubleshooters
    i. Risk Management
    j. TOC IT Section

3. If a response is not received in 10 minutes, check the district contact books to determine whom to page next. Also, check the call-back book to see if home or cell numbers are available.

4. Paging service throughout Arizona is provided by multiple providers including, Air Touch, Handy Page, Page-Net, Verizon and Network Services. Some areas do not currently have pagers and paging service. Refer to the Webgate user list and the District Call Out books for alternate contact procedures.

4.6. Internet

The TOC places relevant traffic information on the Internet so the media and the public can access it for pre-trip planning purposes; this includes snapshot images and streaming video from the CCTV camera system available on az511.com. Access to a real-time freeway congestion map for the Phoenix area, and HCRS are also available on the Internet.

OPERATIONAL GUIDELINES

1. Real-time traffic data is available to the public through az511.com.

2. Real-time FMS camera image snapshots are available to the public through the Web site. The cameras update about once every seven minutes.

PROCEDURES

1. The Web-based data is driven from HCRS and the FMS software. Check to make sure that the systems are on-line and functional at least once per shift.

2. The images captured for the Web site are the same images available in the TOC.

3. Check to make sure that cameras are aimed at the roadway at all times and correctly focused.

4. Check the Web-page URL at least once per shift to make sure that the Web-server is on-line and functional.

4.7. 511 Telephone

PURPOSE

The 511 traveler information system provides access to roadway condition and closure information by calling 511 anywhere in Arizona or 1-888-411-ROAD (7623) anywhere in the nation. This section describes the operation of the system.

OPERATIONAL GUIDELINES

1. The 511 system receives its highway condition information from HCRS.

2. Data is updated every five minutes.

3. Callers may access highway condition information by pressing “1” on a touch-tone phone.

4. The system may contain multiple events for each highway. In such cases, the system will state log #1 of “y,” #2 of “y” and so forth.

5. Callers may access transit information by pressing “2” on a touch-tone phone.

6. Callers may access weather information by dialing NWS followed by the * key.

PROCEDURES

1. Callers may access route information by entering the route number followed by the # key.
2. Callers may access city information by entering the first three characters of the City name followed by the * key. City information is available for the following cities:
    a. Phoenix
    b. Chandler
    c. Flagstaff
    d. Gilbert
    e. Glendale
    f. Mesa
    g. Paradise Valley
    h. Peoria
    i. Scottsdale
    j. South Tucson
    k. Tempe
    l. Tucson
3. The volume of the call may be decreased using the “7” key. The volume of the call may be increased using the “9” key.
4. Records may be skipped by pressing the “3” key
5. The previous record may be repeated by pressing the “1” key.
6. To hear the current record again, press the “2” key.
7. Messages may be repeated by pressing the “*” key.
8. TOC operators should check the system at least once per shift. To verify that the system is operating properly, the operator should call 511. During major events, the system should be checked every hour.

4.8. AZTech Model Deployment Initiative (MDI)

The AZTech Model Deployment Initiative is a multi-agency effort to coordinate traffic operations on both the arterial and freeway systems. Public members of the public private partnership include:

1. ADOT 2. City of Chandler 3. City of Glendale 4. City of Mesa 5. City of Peoria 6. City of Phoenix 7. City of Scottsdale 8. City of Tempe 9. Maricopa Association of Governments 10. Maricopa County Transportation Department 11. Mesa Police Department 12. Mesa Fire Department	13. Phoenix Fire Department 14. Phoenix Sky Harbor International Airport 15. Regional Public Transit Authority 16. Rural Metro Fire Department 17. Town of Gilbert 18. Town of Paradise Valley 19. United States Department of Transportation, FHWA 20. Valley Metro Public Transit

OPERATIONAL GUIDELINES

1. The AZTech partnership seeks to share traffic information and closure data between multiple public agencies responsible for the operation of the roadway network.

2. The AZTech partnership attempts to make the traffic data available to the public through a series of private partners who offer value-added services in packaging or bundling the information.

3. AZTech also makes traffic information available at kiosks at select locations.

PROCEDURES

Monitor the operation of the AZTech interties at least once per shift.

5. TRAVELER INFORMATION

Providing timely and accurate information to travelers is essential in order to enable them to make informed decisions on route choice. An added benefit is the reduction in secondary accidents as travelers become alerted to the existence of congested conditions. The following are several methods for providing information to motorists:

1. Variable Message Signs
2. Highway Condition Reporting System
3. Internet
4. 511
5. Local Commercial Television Stations
6. AZTech Model Deployment Initiative

5.1. Variable Message Sign System

The purpose of a Variable Message Sign (VMS) is to communicate real-time traffic information to travelers, as conditions warrant, so they may react to those conditions in a safe, timely and appropriate manner. The following operational guidelines describe the desired practices for using permanent VMSs in connection with incident management, traffic management, and traveler information. The intent of these guidelines is to encourage consistent use of the signs so the public will come to recognize these devices as a reliable source of traffic information.

OPERATIONAL GUIDELINES

1. VMSs are traveler information devices used for warning, regulating, routing, and managing the motoring public in order to improve the traffic flow.

2. VMSs inform the driver of impending conditions with up-to-date information. The overall goal of the VMS application is to provide permanently located signs that can be programmed remotely to communicate with the drivers the necessary information such that the driver can choose or be directed to the most appropriate route.

3. VMSs are able to convey a variety of information, which make them more effective in presenting current information on changing traffic conditions.

4. Motorists are less frustrated and aggravated when they are provided with information on the location of congestion and the expected length of delay to be encountered. This in itself tends to increase the safety and comfort of their trips as well as improve the overall efficiency of the system.

5. In the urban areas of Phoenix and Tucson, the Phoenix Traffic Operations Center (TOC) is responsible for the operation of the VMSs by providing messages for motorists.

6. In rural areas, each ADOT engineering district is responsible for the operations of its own VMS during the normal working hours.

7. The TOC has the responsibility for displaying messages for the rural districts after normal working hours.

GENERAL PROCEDURES

1. The TOC operator is responsible for remotely displaying appropriate messages on permanent VMSs to inform the motoring public of congestion, incidents, and other events, which impact the traffic.

2. If the DPS requests the TOC operator to display a message after normal working hours, the operator must inform the District Maintenance Supervisor of that task either before or after displaying the message.

3. The TOC operator must always receive notification that the message is no longer required so he/she can deactivate the VMS.

4. When the message is no longer required, the TOC operator must deactivate the VMS as soon as possible.

PROCEDURES FOR MAINTAINING VMS MESSAGE CREDIBILITY

1. A VMS must provide reliable, accurate, and up-to-date information to motorists so that credibility is maintained. Unlike static regulatory, warning, and guide signs, which always provide the same messages regardless of the traffic conditions, VMS messages elicit different driver expectations.

2. VMS messages should be displayed when unusual conditions exist and some responses by the drivers are required (i.e., change of speed or route).

3. Retaining a message on a VMS when an accident has been cleared will result in loss of credibility with motorists. The VMS system will work only if the drivers believe in its operational credibility; otherwise, they will ignore the messages.

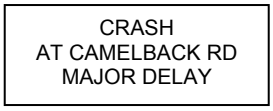
4. If an alternate route is recommended by a reliable source, the operator should assure that it will result in significant improvement in travel.

5. The drivers should not be informed of something they already know; for example, a message stating that there is congestion ahead (when the drivers are experiencing the problem) will result in drivers ignoring the VMS messages even when important information is provided.

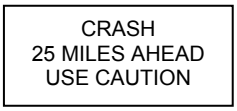
6. The operator should first make an attempt to use an existing message stored in the library, which is appropriate for the desired VMS and its location.

7. When messages are requested by other parties to be created by the TOC, the operator should review the message format with the shift supervisor prior to displaying the message.

8. For urban freeways, the incident location reference should be the nearest cross street, as shown below.



9. For rural highways, the incident location reference should be the route and milepost designation, as crossroads are usually nonexistent in rural areas. If a milepost reference is not known, the operator may identify the distance from the VMS to the incident.

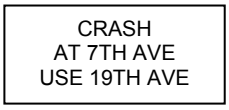


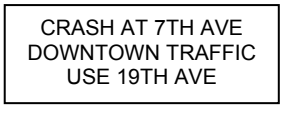
MESSAGE COMPOSITION PROCEDURES

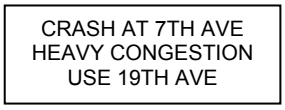
1. Consider including the following elements in a VMS message.

Question	Statement	Example
What happened?	Problem	Crash
Where?	Location	At 7th Avenue
What effect on traffic?	Effect	Heavy congestion and delay
For whom is the message intended?	Attention	Downtown traffic
What is advised?	Action	Exit at 19th Avenue

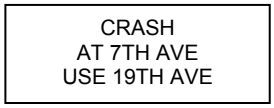
2. Permanent ADOT VMS displays feature 18 characters per line (including spaces), with three lines per display; thus a total of 54 characters may be used to display a message on a VMS. It is therefore obvious that a single message could not display all of the information shown in the preceding example. In a situation such as the one shown above, one of the following single messages could be displayed depending on circumstances:



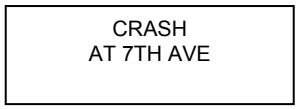


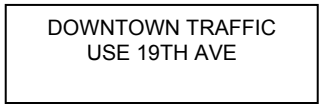


3. Compatibility must be maintained between words within a line and between message units on a VMS.
4. Because of limitation of the permanent ADOT VMS, which allows only three lines of messages to be displayed (18 characters per line), the following message represents the preceding condition.



5. Message splitting may be used to avoid overwhelming drivers with too much information. A long message may be broken (split) into compatible informational units. The preceding example can be split into the following compatible phrases:





6. Occasionally, the required message may be too long to be processed by drivers viewing the VMS at high speeds.
7. Effort must be made to create as short a message as possible, which, at the same time, always conveys the desired intent.
8. Reading time is the length of time it actually takes a driver to read a VMS message.
9. Exposure Time is the length of time a driver is within the legibility distance of the VMS message; that is, it is the maximum available time to the driver to read a message.
10. The exposure time, therefore, must always be equal or greater than the reading time, and is directly related to message legibility distance and driving speed.
11. An 18-in.-high character VMS will provide approximately 8 seconds of exposure time when the freeway operating speed is 55 miles per hour.
12. As the conditions change, such that the driver has less time to read the VMS message, the message length must be reduced accordingly.

13. Viewing Time: The following is a summary of guidelines related to viewing time.
    a. The VMS message must be legible at a distance that allows sufficient exposure time for drivers to view it sufficient number of times to read and comprehend it.
    b. Studies show that an 8-word message (about four to eight characters per word), excluding prepositions such as “to,” “for,” “at,” etc., approaches the processing limits of drivers traveling at high speeds.
    c. On the average, a minimum exposure time of one second per short word (excluding prepositions) or two seconds per line, whichever is greatest, should be used for unfamiliar drivers.

PROCEDURES FOR CHOOSING VMS MESSAGE WORDING

1. Action verbs for use in VMS messages must be chosen carefully because each word has slightly different connotations. The following discussion relates to the use of action verbs typically associated with alternate routing, but a similar thought process applies when choosing nouns and to describe traffic conditions.

2. Although the verbs USE, TAKE, and FOLLOW can have similar meanings, they should be used based on the following criteria:

    a. The verb USE should be used when the suggested route will take the driver to his/her destination. USE is also a preferred word because it is slightly shorter.

        Example: USE SR-89
        FOR BYPASS

    b. The verb TAKE should be used when the driver is informed to take the first segment or leg of a route.

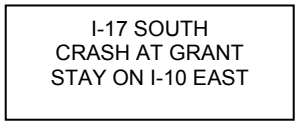
        Example: TAKE NEXT EXIT

    c. The verb FOLLOW should be used when subsequent reference signs and trailblazers will guide the driver.

        Example: FOLLOW
        MARKED ROUTE

    d. The verb STAY should be used when the driver is advised to continue traveling on a route.

        Example:



e. The verb EXIT should always be followed by the name of the freeway exit number or the crossroad.

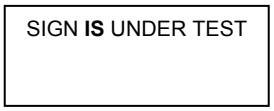
Example: USE EXIT 223

3. The verbs GO and TURN should not be used.

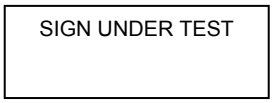
4. The word BYPASS generally implies that the driver will eventually return to the primary route.

5. Punctuation marks <u>should not</u> be used in VMS messages.

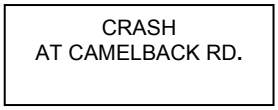
6. Prepositions may be used depending on the circumstances, as shown below.



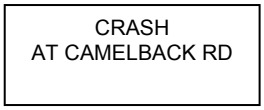
Not Recommended
(IS is not necessary)



Recommended



Not Recommended
(Period after RD is not required)



Recommended
(Note that AT is used)

7. The use of abbreviations is to be avoided, when possible, unless a desired message can only fit within the limits of the character spacing with abbreviations. When abbreviations must be used, choose abbreviations from the following standard list.

Word	Abbreviation
Access	ACCS
Ahead	AHD
Blocked	BLKD
Boulevard	BLVD
Bridge	BRDG
Center	CNTR
Chemical	CHEM
Clear	CLR
Condition	COND
Congestion	CONG
Construction	CONST
Delay	DLY
Downtown	DWNTN
Eastbound	EAST
Emergency	EMERG
Enter	ENTR
Exit	EX, EXT
Expressway	EXPWY
Freeway	FWY

Word	Abbreviation
Entrance	ENT
Frontage	FRNTG
Hazardous	HAZ
Highway	HWY
Information	INFO
Interstate	I
Left	LFT
Local	LOC
Lower	LWR
Maintenance	MAINT
Mile	MI
Minute	MIN
Major	MAJ
Minor	MNR
Normal	NORM
Northbound	NORTH
Oversized	OVRSZ
Parking	PRKG
Parkway	PKWY
Pavement	PVMT
Pollution	POLL
Quality	QLTY

Word	Abbreviation
Prepare	PREP
Reduce	RED
Right	RT
Road	RD
Roadwork	RDWK
Route	RTE
Service	SRVC
Shoulder	SHLDR
Slippery	SLIP
Southbound	SOUTH
Speed	SPD
Stadium	STAD
Temporary	TEMP
Traffic	TRAF
Travelers	TRVLRS
Turnpike	TPK
Upper	UPR
Vehicle	VEH
Warning	WARN
Westbound	WEST

PROCEDURES FOR DETERMINATION OF VMS USAGE PRIORITY

1. A VMS should be used whenever pertinent messages will assist motorists to make helpful decisions.

2. If a situation arises, which requires the usage of a specific VMS for more than one ongoing condition, the following priority criteria should be used for displaying messages, in the order listed:

   Priority 1: Safety

   A. Any VMS message that is necessary to provide safety to the motoring public has the highest priority. Examples include failure of a highway bridge, roadway, tunnel, or any major incident that impacts traffic safety.

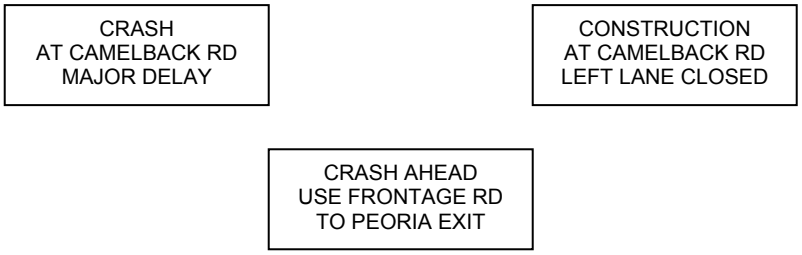
   B. The drivers should be informed about the nature and location of the incident.

   C. The severity of an incident should be described in terms of number of lanes blocked, delay (e.g., major or minor), or congestion.

   D. Based on the available information from the field personnel, it may be useful to use the words MAJOR DELAY or MINOR DELAY in a message. Although such descriptions do not provide precise delay information to motorists, they will nevertheless imply the severity of the congestion to the majority of the drivers.

   E. General terms such as CRASH, CONSTRUCTION, or ROADWORK should normally be used, as these words will eliminate the need for a library of messages for every conceivable incident.

   F. For urban freeways, the incident or congestion location reference should be the nearest cross street, as shown below.



   G. In urban areas, the message may inform freeway motorists to use a cross street as an alternate route.

H. In urban areas, a message may inform freeway motorists of a crossroad closure. In rural areas, an incident location may be referenced relative to the VMS on which the message is displayed.

CRASH 25 MILES AHEAD USE CAUTION

I. In rural areas, an alternate route may be displayed on a VMS message to guide the drivers. The alternate route should primarily be on a State highway system and its route number must be provided in the message.

CRASH AHEAD USE SR 89 AS DETOUR

J. The local name of a rural highway should not be provided as a replacement for the route number; for example, GENERAL CROOK RD should not be used for SR 260.

K. If city names are used in a VMS message, they should be identical to those used on the highway static signs.

L. When the incident is <u>not</u> on the same highway where the VMS is located, the highway name on which the incident is located, must be displayed, as shown in the following examples:

Example 1:

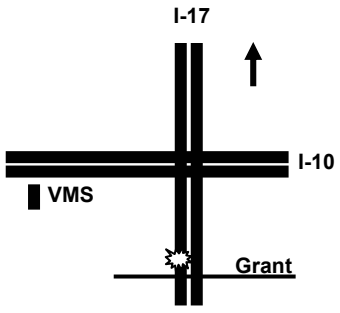
Line 1: Location
Line 2: Problem
Line 3: Action

I-17 SOUTH CRASH AT GRANT STAY ON I-10 EAST

Example 2:

Line 1: Location
Lines 2: Problem
Line 3: Effect

I-17 SOUTH AT GRANT RIGHT LANE CLOSED



M. When the incident is <u>on</u> the same highway where the VMS is located, the highway name is not displayed in the message, as shown in the following examples:
Example 1:

Line 1: Problem
Line 2: Location
Line 3: Effect

Example 2:

Line 1: Effect
Line 2: Effect
Line 3: Location

N. Do not display messages for incidents, which do not block the roadway (e.g., spilled load or dead animal on the shoulder).

O. When the highway has two or three lanes in one direction and there is a blockage, the following texts should be used in the message, as applicable:

- LEFT LANE BLOCKED
- RIGHT LANE BLOCKED
- CENTER LN BLOCKED or CNTR LANE BLOCKED

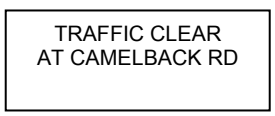
P. The word BLOCKED should be used for temporary blockage; the word CLOSED should be used for extended closure.

Q. The phrase FREEWAY BLOCKED must not be used unless all the lanes are blocked, either in one direction or both.

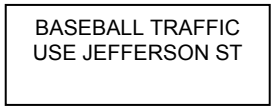
R. When the roadway has four or more lanes in one direction, and there is a blockage, the words LEFT, RIGHT, or CENTER are applicable if the incident has occurred in the corresponding lane; otherwise, the following texts may be used in the message, as applicable:

- KEEP LEFT
- KEEP RIGHT
- STAY IN CENTER

S. It is best to use positive words rather than negative statements in the message; for example, once the congestion has been cleared, a message, such as the one below, may be used:



T. The word TRAFFIC should be used in conjunction with specific traffic generators, as shown in the example below.



U. When incidents occur, high-speed traffic should be alerted of stoppages and queues of slow-moving traffic in order to reduce rear-end collisions. In these situations, the recommended VMS message could be as shown below.

V. In general, safety messages should be kept current and relate to a specific safety campaign. The period of time that a specific message is displayed for a safety campaign should be limited to a few weeks. Motorists tend to ignore messages that are displayed for long periods of time.

Priority 2: Roadway Closure

A. A VMS message that informs motorists regarding the roadway closure is important because such a closure directly affects the route a driver would take.

B. The same message development guidelines that apply for safety and incident messages apply to this category.

Priority 3: Special Event

A. Special events include ballgames, parades, motor sports and concerts, which are pre-planned and have specific schedules defining starting and ending times.

B. Activate and de-activate the appropriate VMS per the pre-planned special event plan. It is important that those VMSs, which must be used to inform motorists, be activated and deactivated accordingly.

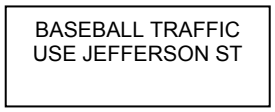
C. During the annual baseball games, the City of Phoenix monthly informs the TOC of the dates and times the games start and end.

D. The City of Phoenix contact-person completes the schedules of VMS activation and deactivation every month and sends the request to the TOC.

E. A typical sign for event traffic is shown below.

Example:

Line 1: Attention
Line 2: Action
Line 3: Blank



F. The TOC operator has the discretion to modify city-requested messages, if the message is toolarge (i.e., greater than 18 characters per line) or does not comply with the accepted TOC format.

Priority 4: Minor Traffic Impact

A. This category includes construction lane closures, blocking-incidents, and delay information.

B. The same message development guidelines that apply for safety and incident messages apply to this category.

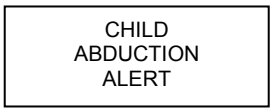
Priority 5: Amber Alert

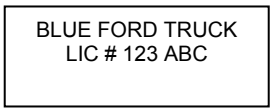
A. The Arizona Governor has directed ADOT, in cooperation with DPS, to implement an Amber Alert System to publicize any child abduction in Arizona.

B. The Amber Alert system will be initiated by Department of Public Safety headquarters in Phoenix. ADOT will be notified via an Emergency Alert System, which is scheduled to be installed in the TOC.

C. If no suspect vehicle information is available, the following sign display will be used:

D. If suspect vehicle information is available use a two panel message with the suspect vehicle information:





E. For an Amber Alert to be issued, the victim must be in imminent danger of bodily harm or death.

F. The victim must be 17 years of age or younger.

G. Suspect vehicle or suspect description information must be available.

H. When an abduction is reported, DPS will inform local radio and television stations, which will report information every quarter-hour for the first two hours and every 30 minutes for the next three hours.

Priority 6: Pre-Warning

A. A pre-warning message should generally be used for planned full closures of major highways.

B. Within the urban area, single-lane closures do not require a pre-warning message.

C. A pre-warning message should be displayed for planned major roadway restrictions before 11:00 PM. Major roadway restrictions include the closure of multiple lanes or any freeway-to-freeway connector.

D. The message should be displayed no more than four days prior to the closure.

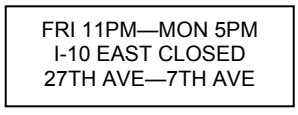
E. Pre-warning for freeway off-ramp closures shall be displayed 24 hours prior to closure.

F. The message must be immediately replaced with an appropriate message when the closure commences.

G. The TOC requests 48 hours advanced notice prior to message display.

H. The three lines of the VMS will display the message based on the following example:

Example:
Line 1: Duration
Line 2: Effect
Line 3: Location



Priority 7: Test

A. Test messages may be used to verify sign operation and prior to placing a VMS into service.

Priority 8: Public Service Information

B. Public service information messages do not require the drivers to make any unexpected maneuvers with regards to upcoming traffic conditions. Some examples include “Buckle Up,” “Speed Kills,” and “Don’t Drink and Drive.”

C. As stated by the FHWA, ITS Joint Program Office, the use of a VMS for the display of public service information or other nonessential messages is discouraged. Only essential messages should be displayed on VMS when unusual conditions exist.

D. Public service messages are made at the request of the Governor’s Office of Highway Safety. The messages must be approved by the Operations Room Supervisor, who tracks the duration a sign is displayed.

E. Display message only during specific time periods.

F. Determine which VMSs are the best candidates to display the message; in other words, do not display the message on all VMSs.

G. The operator will speak to the shift supervisor if there is a question about whether a message is appropriate.

H. Make sure the information displayed is different from an incident-related message; i.e., motorists should not consider the message as information that requires an immediate decision.

PROCEDURES FOR MAINTAINING VMS LOGS

1. Records should be kept of the total number of messages displayed, as well as the types of messages (e.g., incident; pre-planned, such as construction, maintenance, special event; emergency; and public information). In addition, documentation should be made of the date and time messages are activated, deactivated, changed, closed, duration, etc.

2. Information regarding the VMS location; date and time of message activation, deactivation, duration; and responsible operator should be recorded.

3. Any sign malfunctions and date of repair should be noted and kept on file for three years.

4. All information should be stored electronically in a database so that the information can be used for future analysis and evaluation.

PROCEDURES FOR USING RURAL VMSs

The TOC currently communicates to the rural district VMS through dial-up telephone, using one of the following methods:

1. Through the district master VMS computer, which keeps the historical records of the messages in the district system database.

2. Through direct dial-up communications to the sign itself, which bypasses the district master VMS computer.

3. Technicians also can display messages on VMSs using a laptop computer at sign control cabinet.

5.2. Highway Condition Reporting System

This section describes the operation of the Highway Condition Reporting System (HCRS). HCRS is a Windows-based, real-time information system designed to collect statewide roadway information from a variety of sources. Information from HCRS is available to the public through the az511.com Web site and the 511 traffic information line. Detailed instructions regarding the operation of HCRS are available in the HCRS training manual.

OPERATIONAL GUIDELINES

1. The TOC has the primary responsibility for operating the HCRS.

2. Each district should enter its own information into HCRS when performing maintenance or implementing other closures.

3. The DPS has HCRS consoles in its dispatch centers. If DPS handles the closure without response from ADOT, DPS is responsible for entering the information.

4. If ADOT responds or initiates closures, ADOT is responsible for entering the information into the HCRS.

5. The TOC operator will enter the HCRS information for construction closures initiated by Contractors. Contractors are requested to complete a data form and provide 48 hours notice.

6. The TOC operator will routinely check closures in the HCRS to assure the information has been correctly entered and that there are no duplicate entries.

PROCEDURES

1. Enter the following information into HCRS:

a. Current and planned road closures and alternate routes
b. Current restrictions, such as closed lanes and speed reductions
c. Incident location and status
d. Current roadway conditions, including weather information
e. All Level 1 and Level 2 incidents

2. Update HCRS within five minutes of the occurrence of a traffic-affecting incident.

3. Update the HCRS database as conditions change. Delete stale information from the database. This may require follow-up with field crews responsible for closures at the scheduled closure ending times.

6. CONTROL ROOM ADMINISTRATION

This section describes the TOC operations administration. An organization chart is provided in the Appendix.

6.1. General Administration

OPERATIONAL GUIDELINES

1. An Assistant State Engineer heads the ADOT Transportation Technology Group.

2. The TOC manager, the Administrative Services Officer and the ITS Project Development Engineer Report to the Assistant State Engineer.

3. The TOC Manager is responsible for the following sections:
    a. TOC Operations
    b. Traffic Analysis Section
    c. Information Technology Section

4. The Operations Supervisor heads the TOC control room, where the dispatch operators respond to incidents 24 hour per day. Each shift has a supervisor, who reports to the Operations Supervisor.

5. TOC operators report to their respective shift supervisor.

6. The Traffic Analysis Section includes Transportation Engineering Specialists responsible for adjusting ramp meter timings and monthly reporting of incidents.

7. The Information Technology Section, headed by an IT Manager, is responsible for PC/LAN/WAN Support, UNIX/Network Support, and Software Programming.

PROCEDURES

Consult a supervisor on questions regarding roles or responsibilities.

6.2. Staffing Guidelines

1. At least two operators should be on duty at all times. At least one of the operators on duty should be a full-time employee. Interns should not staff the operations room alone.
2. A supervisor should be on duty or call-back at all times. The supervisor may be a shift supervisor or the operations supervisor.

3. A shift is eight hours long. Shifts start at 6:00 am (day), 2:00 pm (evening), and 10:00 pm (graveyard).

4. All operations room employees are hired to work one of three shifts (day, evening, or graveyard). The shift supervisor for that shift will be responsible for supervising the activities of those employees. This includes training, certification, employee planners, performance appraisals, leave approval, and personnel issues.

5. Shift supervisors are responsible for determining which days of the week their designated operators will work, as well as, any changes in their shift. They should use their own operators whenever possible. If for some reason, the designated operators are unavailable for any shift, then the Shift Supervisor should work the other Shift Supervisors to use operators from other shifts

6. Shift supervisors shall notify the Operations Supervisor of any scheduling changes.

7. Interns shall work eight-hour shifts and will start the same time as full-time operators. While school is in session, interns shall be limited to three shifts (24 hours) per week. When school is not in session, interns may work five shifts (40 hours) per week.

8. A schedule for each week will be posted by 10:00 am on Friday, prior to the start of the next week. All leave and training will be shown on the weekly schedule. Any request for annual leave or scheduled sick leave shall be made prior to the schedule being posted. Employees scheduled for training should notify their supervisor prior to the schedule being posted.

9. Employees may not work overtime without approval from the Assistant State Engineer, or the TOC Manager in his absence.

10. The Operations Supervisor is responsible for the overall schedule and has the final authority on scheduling conflicts.

11. If an emergency arises in which an employee cannot work part or all of his or her shift, he or she should immediately contact the on-duty supervisor. The shift supervisor will then be responsible to see that staffing is adequate. Whenever possible, the Shift Supervisors must resolve conflicts using operators within their own shift.

12. To minimize overtime pay, shift supervisors should attempt to flex schedules during weeks with a holiday.

6.3. Summer Dress Code

Following are the TOC summer dress code guidelines:

1. Shorts are acceptable provided they are long enough and in good taste. No short-shorts or cutoffs. Many public employees (i.e., police officers, postal workers and delivery personnel) are allowed to wear shorts in the summer. Shorts comparable to those worn by other public employees are appropriate on Fridays only.

2. T-shirts are acceptable, but should not contain logos, pictures, or phrases that might be considered offensive.

3. No bare abdomens, armpits, or thighs. No tank tops, tube tops or sleeveless shirts.

4. No flip-flops, beach shoes or other footwear that is not appropriate for an office environment.

The summer dress code will be in effect from Memorial Day to Labor Day.

6.4. Leave Approval

7. BUILDING SECURITY

This section describes procedures for maintaining a safe and secure working environment at the TOC and its parking lot facility. Layouts of the TOC main floor and basement are provided for reference at the end of this section. These layouts contain critical information regarding location of alarms, fire suppression systems, and security and electrical panels.

OPERATIONAL GUIDELINES

1. The safety and security of state employees is of the highest priority.

2. All employees are to be vigilant and aware of their surroundings.

3. Suspicious activity should be reported to law enforcement.

GENERAL SECURITY PROCEDURES

1. All ADOT employees must wear employee ID badges while on the premises.

2. The employees are issued a key fob that can be used to gain access to authorized sections of the building, using electronic locks.

3. Visitors will be asked to sign in at the front desk and will be given a visitor pass prior to accessing the TOC facility.

4. A TOC operator will tour the building daily between the hours of 6:00pm and 7:00pm to verify all doors and gates are closed and locked, and that unauthorized persons are not present in the building. Employees who are still present in the building will be reminded they are responsible for ensuring that the building exit doors are locked upon their departure.

5. After the tour, operators shall check the alarm panel in the control room to verify that all doors are latched.

6. After-hours TOC visits should be arranged in advance with the Operations Supervisor.

7. After-hours visitors will be identified by the operations room staff and entered on the Visitor Log.

CONTROL ROOM PROCEDURES

1. A construction field office representative shall accompany all contractors into the control room for all actions requiring access to the control room.

2. Entrance into the control room by visitors requires a 24 hour advance notice.

3. Any assistance required from the operators for VMS testing or camera-related testing/viewing will be cleared with the Operations Supervisor. The Operations Supervisor will make sure an adequate number of operators are on duty to assist.

4. Access to the control room will be limited during daily rush hours (Monday – Friday, 6:00am – 9:00am and 3:00pm – 7:00pm).

BACK ROOM TOC - IT PROCEDURES

1. 24 hours advance notice is required for scheduled construction work.

2. System outages shall be scheduled Monday – Thursday, between 10:00am–2:00pm.

3. The control room operators can contact the TOC call-back technicians if unexpected issues arise.

4. The TOC IT technicians will be available for no more than 2 hours of call-back per pay period before requiring IT Section Manager's approval.

TOC PARKING PROCEDURES

1. Access to the TOC parking areas is controlled for security purposes by two electric gates. Both gates have key fob-activated access and a buzzer that alerts the operations room staff of the presence of visitors.

2. The parking area is monitored by CCTV camera from the TOC.

3. Selected spaces have been reserved for handicapped and carpools. Employees should only park in these spaces if they meet the criteria.

4. All employees have key fobs for use during non-business hours when the gates are kept locked.

5. Employees entering the gates during non-business hours will ring the bell in addition to using the keypad to notify the operations room staff that they will be entering the building.

6. The first day-shift employee to arrive at the TOC will open the parking lot gate on Durango Street. It will remain open between the hours of 6:00am and 3:30pm.

7. The gate will be locked at 3:30pm.

FIRE PROTECTION & EVACUATION PROCEDURES

In the event that the building needs to be evacuated, the following procedures are to be followed:

1. Immediately activate the building fire alarm and dial 911 to report the fire. This will automatically notify the fire department and get help on the way. It will also sound the fire alarm bells to evacuate the building and shut down the air-handling units to prevent the spread of smoke. It is best to have the fire department respond and not be needed than to have them arrive too late for potential rescue.

2. Assist any person in immediate danger, if it can be accomplished without risk to oneself.

3. In the event of a false fire alarm, call the private contractor that monitors the fire alarm system to cancel the fire response the contractor may have initiated.

4. If the fire is small enough, use a nearby fire extinguisher or the on-site fire suppression system to control and extinguish the fire.

5. Do not fight a fire if any of the following conditions exist:

    a. Burning materials are unknown.
    b. The fire is spreading rapidly.
    c. The proper equipment is not available.
    d. The fire might block the means of escape.
    e. Toxic smoke might be inhaled.
    f. Operator's instincts tell him or her not to fight the fire.
    g. If the first attempts to put out the fire do not succeed, evacuate the building immediately.

6. Doors, and if possible, windows, should be closed as the last person leaves a room or area.

7. Do not use elevators. Use building stairwells.

8. Upon evacuation of the building, all persons should proceed to the main parking lot where head counts can be taken.

9. Never re-enter the building without permission from the fire department.

BACKUP FLOOR MONITOR PROCEDURES

1. The TOC Operator is the designated "backup floor monitor" for fire drills or for actual fire alarm purposes. The TOC will always have an operator on duty even if other designated monitors are not present.

2. In an emergency, it is the operator's duty to quickly check both floors to verify that everyone is out of the building. Special attention should be directed to handicap refuge areas.

3. Open the gate for the fire department and meet the fire department at the front of the building to provide incident details.

4. Upon verifying that the building has been evacuated, or upon activation of the halon suppression system, the operator will make additional notifications from a safe location:

    a. Inform the DPS Communications Center that the TOC will be down until further notice.
    b. Notify the Assistant State Engineer for Transportation Technology.

COMPUTER SYSTEM SECURITY PROCEDURES

The Business Software Institute is a trade group funded by major software publishers. The group aggressively enforces the copyright laws related to software and has been successful in obtaining significant monetary damages against businesses and government agencies suspected of software copyright violations.

1. Unauthorized copying of copyrighted software programs is prohibited. Federal law prohibits reproducing, transmitting, transcribing, storing in any retrieval system, or translating material into any language by any means without the written permission of the author.

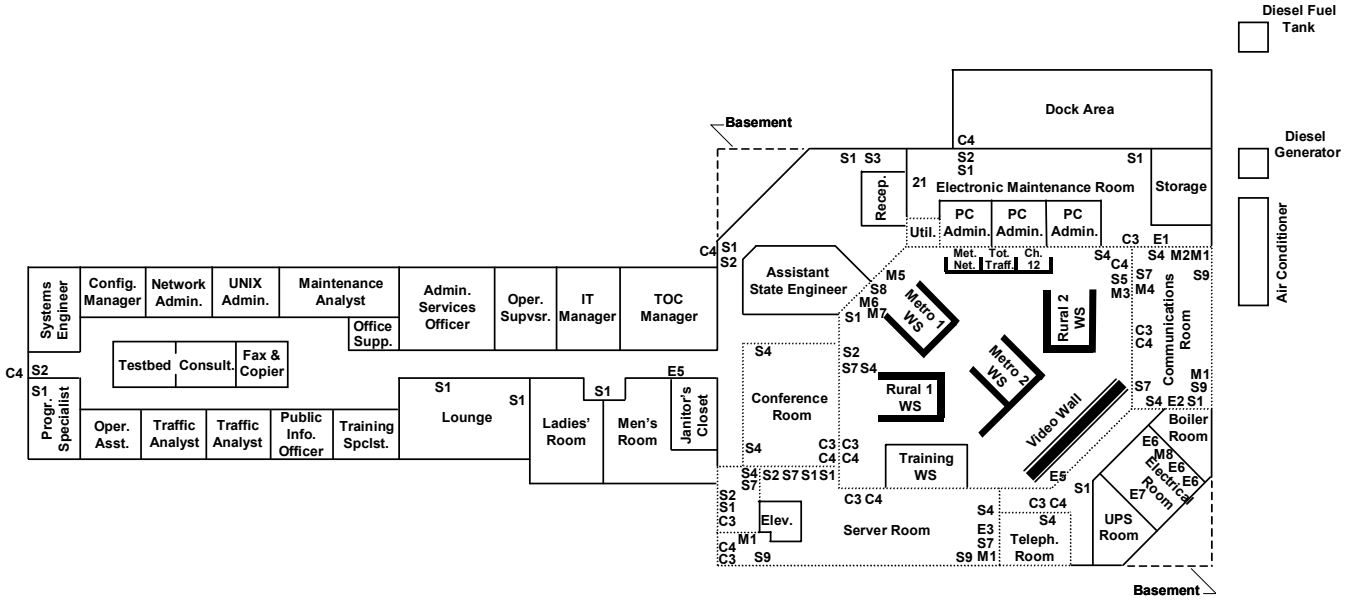
2. Department employees are not to use computer software in violation of the law. They are not to copy, possess, or use illegally copied (pirated) software in any department facility nor on any department owned or issued computer equipment. This policy includes any copyrighted software purchased by a section or division of the agency that is restricted to a single site.

3. To safeguard against viruses, all TOC staff will use the anti-virus program on all files received from outside sources, new programs, and files imported from floppy disks. Backing up data on a regular basis will allow storage of files away from the possibility of virus contamination.

4. Computer access requires a personal user ID and password. Passwords are not to be shared with anyone.

5. Use a password that is difficult to guess.
6. Include a combination of numbers and letters in passwords.
7. Change passwords frequently.
8. Use State-issues computers and the Internet for business purposes only.
9. Do not visit sites that contain inappropriate or non-work related information.
10. Be advised that management may monitor Internet usage and will take disciplinary actions if misuse is detected.

TOC Main Floor
Safety & Alarm Systems



Electrical Panels:

E1 Electrical Panel-1
E2 Electrical Panel-2
E3 Electrical Panel-3
E4 Electrical Panel-4
E5 Electrical Panel-5
E6 Electrical Panel
E7 Electrical Service Box

Switches:

S1 ABC Fire Extinguisher
S2 Fire Alarm Pull-Switch
S3 Fire Alarm Control Panel
S4 Halon Alarm Pull-Switch
S5 Halon Control Panel
S6 Transfer Switch
S7 Emergency Shutdown Switch
S8 Gates and Doors Switches
S9 Air Conditioner Pull-Switch

Monitoring & Control Equipment:

M1 Air Conditioner
M2 Air Conditioner Control PC
M3 Generator Monitoring System
M4 Heating Ventilation Air-conditioning System
M5 Building Security System
M6 Gates Intercom System
M7 Building Intercom System
M8 UPS Switch

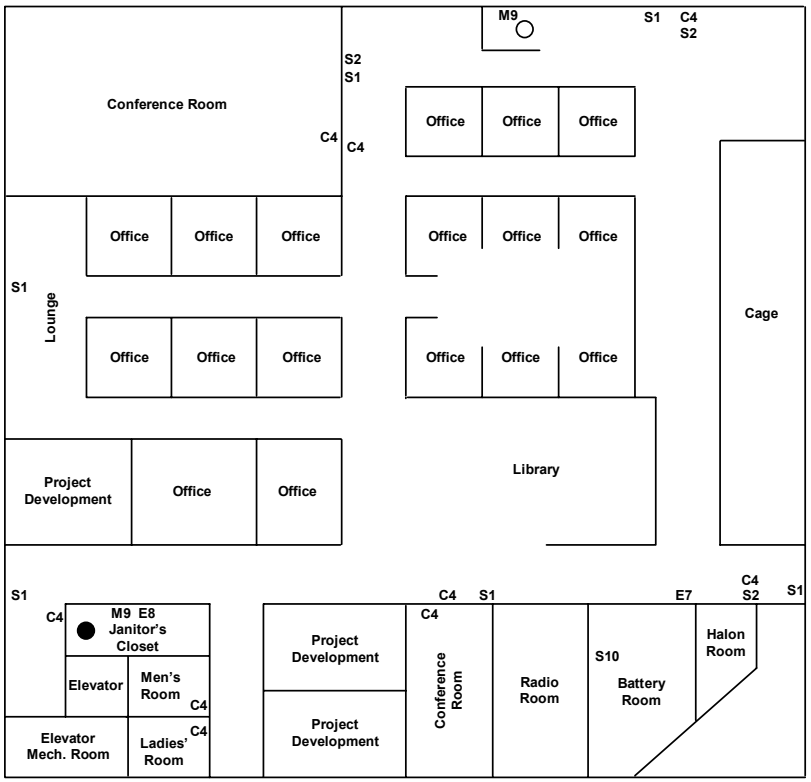
Ceiling Alarms:

C3 Halon Alarm Annunciator
C4 Fire Alarm Annunciator

Halon-Protected Area

2/03/03 mma

TOC Basement
Safety & Alarm Systems



Storm Water Sump Pump

Sewage Sump Pump

Electrical Panels:

E7 Electrical Panel-7
E8 Electrical Panel-8

Switches:

S1 ABC Fire Extinguisher
S2 Fire Alarm Pull-Switch
S10 UPS Battery Shutdown Switch

Monitoring & Control Equipment:

M9 Sump Pump Control System

Ceiling Alarms:

C4 Fire Alarm Annunciator

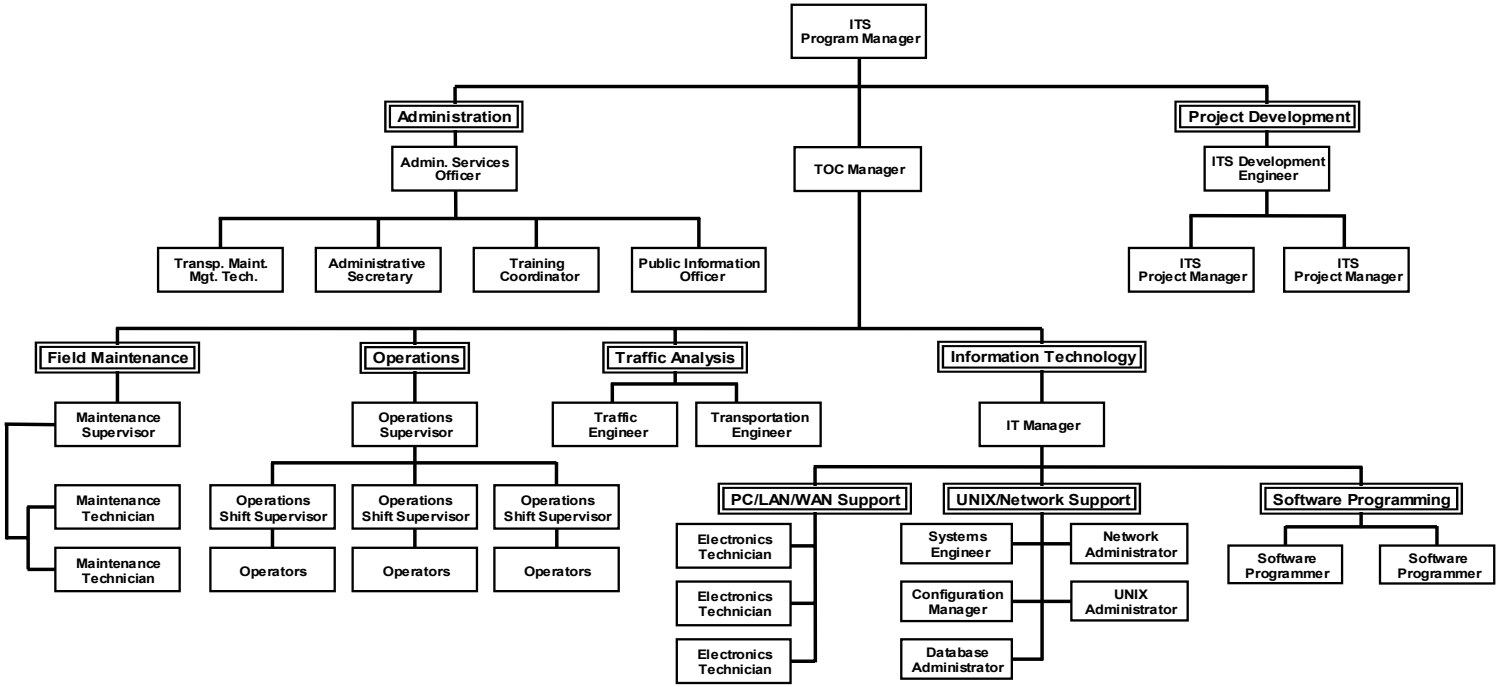
2/03/03 mma

APPENDIX A: INTERAGENCY DOCUMENTATION

1. Intergovernmental Agreement (IGA) Between MCDOT and ADOT
2. Intergovernmental Agreement (IGA) Between City of Scottsdale and ADOT
3. Memorandum of Understanding (MOU) Between DPS and TOCM
4. Memorandum of Understanding (MOU) Between KPHO and TOC

APPENDIX B: TOC ORGANIZATIONAL CHART

TOC Staff
Generic Org Chart



APPENDIX C: INCIDENT MANAGEMENT-RELATED DEFINITIONS

Acknowledgment Time: See Response Team Callback Time.

Character Matrix Sign: A VMS that uses character matrixes (e.g., 5X7) with a fixed amount of blank space (no pixels present) between character matrixes to achieve the inter-character spacing. Blank space (no pixels present) exists between lines of characters to achieve the inter-line spacing.

Character Module: A 5 X 7 set of pixels and shutters mounted onto a common surface to form one light-emitting character.

Comprehensibility: A measure of how readily a driver can understand the VMS message.

Credibility: The extent to which motorists believe that a VMS has a message that is reliable, accurate, and up-to-date.

Conspicuity (Target Value): Distance at which drivers first notice the presence of a sign.

Contrast Ratio: Ratio of the luminance of an object to the luminance of the background. In the case of VMS, contrast ratio is the ratio of the sign legend luminance to the sign background luminance.

Detection: An electronic means to determine that an incident or delay of some nature has occurred. This information is processed by computers and compared to historical data.

Dial-Up Communications: Remote communications with the VMS from a computer using modem and normal twisted-pair dial-up telephone circuit provided by the telephone company.

Freeway Management: Control, guidance, and warning of traffic in order to improve flow of people and goods safely and efficiently, using predetermined goals and objectives, including those related to impacts on and the influence of surrounding communities.

Freeway Management System: Utilization of infrastructure elements to accomplish goals and objectives of freeway management. Freeway management system elements include cameras, variable message signs, ramp meters, traffic interchange signals, traffic operations center, hardware and software, operating staff, and policies and procedures.

Incident: Any non-recurring event that affects the flow of traffic. Such events include traffic crashes, disabled vehicles, spilled cargo, highway maintenance and construction activities, and special non-emergency events (e.g., ball games, concerts, parades, or any other event significantly affects roadway operations).

Incident Cleared Time is the time when all lanes are open and traffic can move through. This time is also referred to as Time ADOT Reports Incident Clear.

Incident Management: Systematic, planned, and coordinated use of human, institutional, mechanical, and technical resources to reduce the duration and impact of incidents, and improve the safety of motorists, crash victims, and incident responders.

Irradiation: A phenomenon resulting from extremely high luminance contrast where the lighter surface tends to "bleed" onto the darker surface.

Legibility Distance: The greatest distance from a VMS at which people with normal (20/20) visual acuity can read a message.

Light-Emitting VMS: A VMS that generates its own light on or behind the viewing surface. This sign requires power at all times when a message is displayed.

Line Matrix Sign: A type of VMS with no fixed blank (no pixels) spaces between characters. The entire line contains columns of pixels with a constant horizontal pitch across the entire line.

Full Matrix Sign: A type of VMS without fixed lines or characters. The entire display area contains equally spaced pixels.

Informational Unit: Each separate data item given in a message, which a motorist could recall and use for decision-making.

Lumen: The unit of luminous flux emitted in a solid angle of one steradian by a uniform point source that has an intensity of one candela.

Luminance: The intensity of light per unit area at its source. This is usually measured in candela per square foot or square meter. Luminance is a measure of light coming from a surface. The luminance of a light source (e.g., lamp) is an exact measure of the light it emits. Illumination, on the other hand, is a measure of light falling on a surface.

Lux: A measurement of light. A unit of luminance produced on a surface area of one square meter by a luminous lux of one lumen uniformly distributed over the surface. (1 lux = 1 lumen per sq. meter).

Message Format: Arrangement of units of information on a sign to form the message.

Message Unit: Units of information; e.g., USE NEXT EXIT is a three-word unit.

Message Length: Number of words or characters in a message; e.g.,

Non-Recurring: An event that does not recur; a single event such as a traffic incident.

Pitch: The center-to-center distance between two adjacent pixels that can be measured either horizontally or vertically.

Pixel: The smallest independent controllable visual element of a VMS display.

Recurring: happening repeatedly. Recurring conditions are mainly peak-period traffic congestion where demand exceeds capacity for relatively short periods of time.

Response: The activation, coordination and management of the appropriate personnel, equipment, and communication links and motorist information media.

Response Team Callback Time is the time when a TOC operator makes actual verbal contact with the incident responder from ADOT, DPS, or the responsible local agency. This time is also referred to Acknowledgement Time or Time ADOT Calls TOC Back.

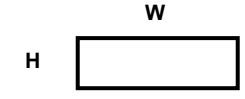
Response Team On-Scene Time is the time when the incident responders arrive at the incident location and notify the TOC of the arrival. This is also referred to as Time ADOT Reports On-Scene.

Shutter: A device that completely prohibits and/or allows the emission of light from the optical fibers when the lamps are on.

Shuttered Fiber-Optic VMS: A VMS that uses optical fibers to direct light (from halogen lamp) to form 5 X 7 character modules on the sign face. Each pixel with two fiber-optic dots has a corresponding shutter that rotates to either permit light from the halogen lamps to pass through the fibers to form the message, or to block the light.

Sign Height: The height of a sign including borders.

Sign Width: The width of a sign including borders.



Stored Message: All messages (i.e., permanent, changeable, and volatile) located in a sign controller.

Stroke: The width or diameter of a pixel.

Text: The characters used to create a message.

Time ADOT Calls TOC Back: See Response Team Callback Time.

Time ADOT Reports Incident Clear: See Incident Cleared Time.

Time ADOT Reports On-Scene: See Response Team On-Scene Time.

Time Incident Received is the time when an operator is made aware that the incident has occurred.

Variable Message Sign: A type of sign in which the message to be displayed can be created by changing each pixel independently. It includes the VMS case, contrast shields, point-to-point-wiring system between character modules, termination points for wiring to the VMS controller cabinet, service outlets, and photo sensors.

VMS Assembly: The VMS assembly shall include the VMS, VMS case, sign controller unit (SCU) and associated equipment, an SCU roadside cabinet, ambient light photo sensor system, and all control and power cables between the VMS and the SCU.

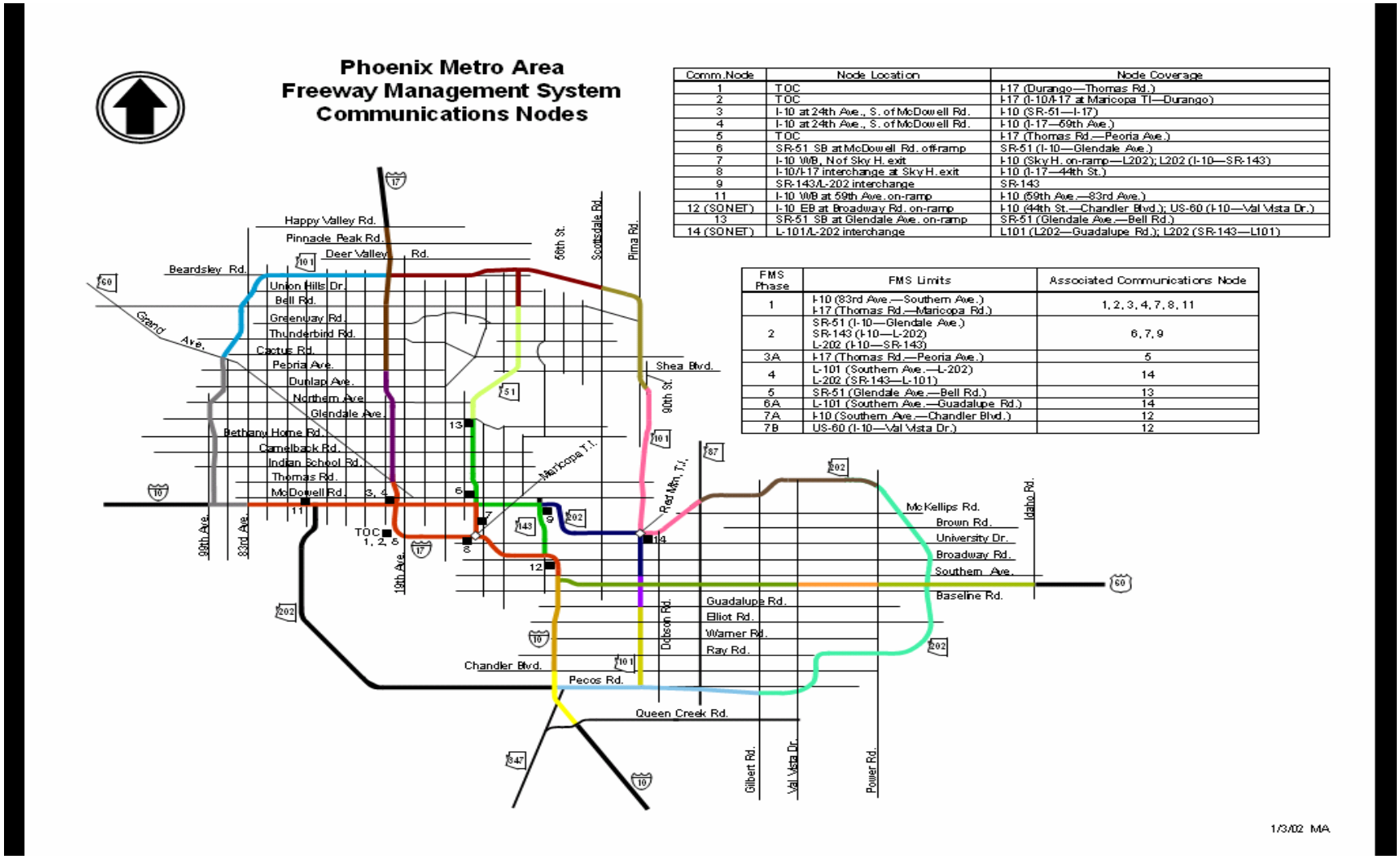
APPENDIX D: ACRONYMS

ADES	Arizona Department of Emergency Services
ADOT	Arizona Department of Transportation
ALERT	Arizona Local Emergency Response Team
ATMS	Advanced Traffic Management Systems – includes traffic control systems, incident detection systems, highway and corridor control systems and ramp metering systems.
ATRC	Arizona Transportation Research Center
AVCS	Automatic Vehicle Control Systems – technological displays to help drivers perform certain vehicle control functions.
AVI	Automatic Vehicle Identification
AZTech	A partnership of public agencies and private companies using federal and private funds to develop transportation technology.
CB	Citizens Band Radio; channel 9 is the emergency channel.
CCTV	Closed-Circuit Television Camera
C/M	Congestion Management; managing recurring congestion along interstate and arterial networks.
DM	Demand Maintenance (Unscheduled Maintenance)
DMAC	I-10 Deck Tunnel communications interface
DPS	Department of Public Safety
DR	Document of Record Control/Number; a number assigned to each entry in the DPS computer-aided-dispatch system.
EMS	Emergency Medical Services
ETA	Estimated Time of Arrival
FHWA	Federal Highway Administration

FMS	Freeway Management System
F/O	Fiber-optic cable, tiny individual fibers bundled together to permit communications, video and light transmission.
GIS	Geographical Information Systems – databases tied to maps, and large amounts of data referenced to geography. For example, a map could be displayed locating all construction zones in the state, or all slat domes, or all signal systems.
HAR	Highway Advisory Radio – also called TRA
HAZ MAT	Hazardous Material
HCRS	Highway Condition Reporting System
HOV	High-Occupancy Vehicle
ILD	Inductive Loop Detector
I/M	Incident Management; managing non-recurring incidents such as crashes, spills, environment hazards, disabled vehicles, etc.
ITI	Intelligent Transportation Infrastructure
ITS	Intelligent Transportation Systems
MDI	Model Deployment Initiative
MP	Mile Post
N/A	Not Applicable
O&M	Operations and Maintenance
OPS	Operations
OW	Operator Workstation
ORG.	Maintenance Organization
PECOS	Performance Evaluation Cost System
PSA	Public Service Announcement

Placards	A uniform signing and marking program for use on vehicles and containers containing dangerous goods
REACT	Regional Emergency Action Coordination Team; a team that provides arterial traffic control within Maricopa County
RMI	Risk Management Investigator
RWIS	Road Weather Information System
TMC	Traffic Management Center
UNK	Unknown
VDS	Vehicle Detection System
VMS	Variable Message Sign, a message can be infinitely changed to display on a sign any configuration of characters or symbols, within the limits of the sign. Also called Changeable Message Sign.
WIM	Weigh-In-Motion

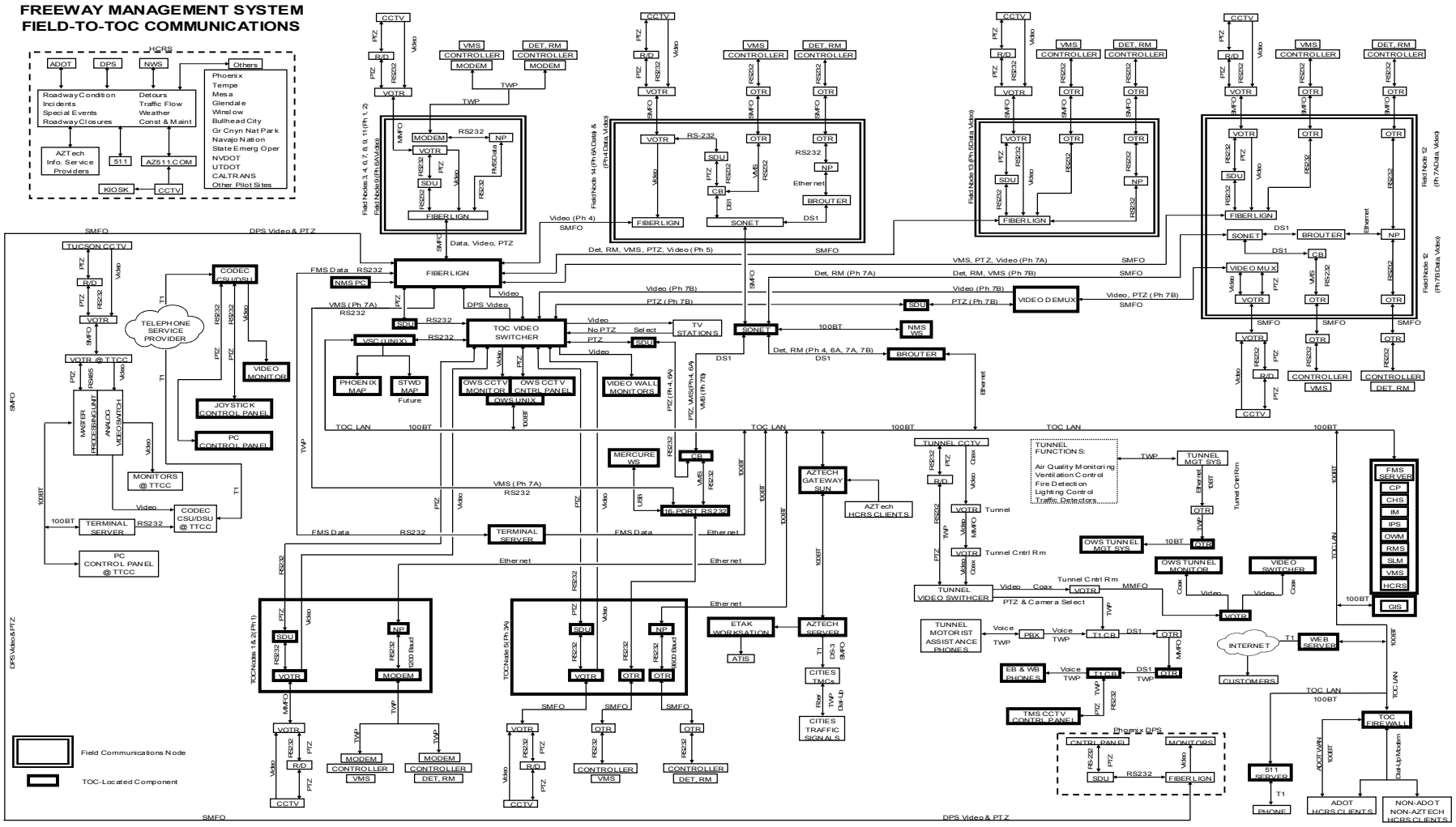
APPENDIX E: PHOENIX AREA COMMUNICATIONS NODE MAP



Comm.Node	Node Location	Node Coverage
1	TOC	I-17 (Durango—Thomas Rd.)
2	TOC	I-17 (I-10/I-17 at Maricopa TI—Durango)
3	I-10 at 24th Ave., S. of McDowell Rd.	I-10 (SR-51—I-17)
4	I-10 at 24th Ave., S. of McDowell Rd.	I-10 (I-17—59th Ave.)
5	TOC	I-17 (Thomas Rd.—Peoria Ave.)
6	SR-51 SB at McDowell Rd. off-ramp	SR-51 (I-10—Glendale Ave.)
7	I-10 WB, N of Sky H. exit	I-10 (Sky H. on-ramp—L202); L202 (I-10—SR-143)
8	I-10/I-17 interchange at Sky H. exit	I-10 (I-17—44th St.)
9	SR-143/L-202 interchange	SR-143
11	I-10 WB at 59th Ave. on-ramp	I-10 (59th Ave.—83rd Ave.)
12 (SONET)	I-10 EB at Broadway Rd. on-ramp	I-10 (44th St.—Chandler Blvd.); US-60 (I-10—Val Vista Dr.)
13	SR-51 SB at Glendale Ave. on-ramp	SR-51 (Glendale Ave.—Bell Rd.)
14 (SONET)	L-101/L-202 interchange	L101 (L202—Guadalupe Rd.); L202 (SR-143—L101)

FMS Phase	FMS Limits	Associated Communications Node
1	I-10 (83rd Ave.—Southern Ave.) I-17 (Thomas Rd.—Maricopa Rd.)	1, 2, 3, 4, 7, 8, 11
2	SR-51 (I-10—Glendale Ave.) SR-143 (I-10—L-202) L-202 (I-10—SR-143)	6, 7, 9
3A	I-17 (Thomas Rd.—Peoria Ave.)	5
4	L-101 (Southern Ave.—L-202) L-202 (SR-143—L-101)	14
5	SR-51 (Glendale Ave.—Bell Rd.)	13
6A	L-101 (Southern Ave.—Guadalupe Rd.)	14
7A	I-10 (Southern Ave.—Chandler Blvd.)	12
7B	US-60 (I-10—Val Vista Dr.)	12

APPENDIX F: FMS IMPLEMENTATION BLOCK DIAGRAM



APPENDIX G: VMS INFORMATION

Introduction

VMSs are used during the following conditions:

Recurring Conditions

Recurring conditions are mainly peak-period traffic congestion where demand exceeds capacity for relatively short periods of time.

Non-recurring Conditions

Non-recurring conditions are caused by random or unpredictable incidents. An "incident" is defined as any non-recurring event that affects the flow of traffic. Such events include traffic crashes, disabled vehicles, spilled cargo, highway maintenance and construction projects, adverse weather conditions, and special non-emergency events (e.g., ball games, concerts, parades, or any other event that significantly affects roadway operations).

VMS Benefits

1. Reduction of speeds as vehicles approach congested areas, resulting in fewer accidents.

2. Increased diversion from primary routes during downstream incidents.

3. Increased lane changes away from lanes that are closed downstream.

4. Increased throughput for toll plazas and ports-of-entry

5. Improved traffic operations during special events.

Sign Location and Installation

The most critical locations for installing permanent VMSs are in advance of interchanges or highways where drivers can have the opportunity to take some action in response to messages displayed on a VMS. A VMS should not compete with existing roadway signs. At times, relocation of some static signs may be required in order to install a VMS at a critical location.

Drivers generally do not anticipate using a different route until they see and read a VMS message. Drivers who are traveling in the inside lanes need ample time to read the message and change lanes to exit.

In general, a VMS should be permanently installed at the following locations:

1. Upstream from major decision points (e.g., exit ramps, freeway-to-freeway interchanges, or intersection of major routes that will allow drivers to take an alternate route).

2. Upstream of bottlenecks, high-accident areas, and/or major special event facilities (e.g., stadiums, convention centers).

3. Where regional information concerning weather conditions such as snow, ice, fog, wind, or dust is essential.

VMS Classifications by Display Technology

VMSs are classified into the following three different categories:

Light-Reflecting

This type of VMS (e.g., reflective disk, rotating drum) reflects light from some external light source such as vehicle headlights or the sun. This sign needs power only when the message is changed or for the operation of environmental equipment such as fan and heater.

Light-Emitting

This type of VMS generates its own light on or behind the viewing surface, requiring power at all times when a message is displayed. The more common types of light-emitting VMSs are bulb matrix, fiber-optic matrix, and light-emitting diode (LED) matrix.

Hybrid

This type of VMS combines the technologies of the two aforementioned VMSs; for example, some manufacturers have integrated fiber-optic or LED with reflective disk matrix technologies.

VMS Classification by Display Format

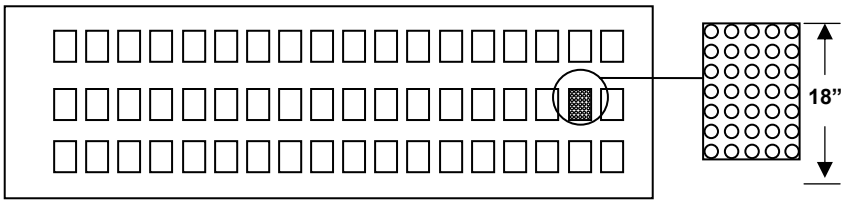
VMSs display characters and symbols in a matrix format, which are generally designed in the following three patterns:

Character Matrix

In this format, each character of the desired message is composed of a 5 X 7 matrix of pixels. The number of character per line varies, depending on the manufacturers and the desired usage, although most transportation agencies deploy three-line, 18-

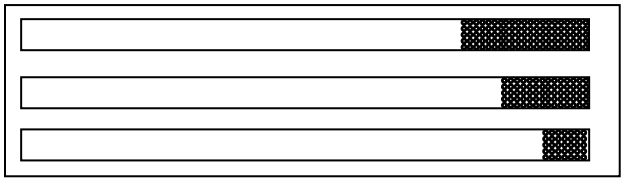
character VMSs. Practically all highway VMS display messages which use capital letters because the configuration of the 5 X 7 matrix does not lend itself to displaying lower-case letters.

ADOT uses fiber-optic character matrix VMSs with three lines of display, each line consisting of eighteen 18-in.-high characters, as shown in the following illustration. The maximum viewing distance is approximately 900 feet.



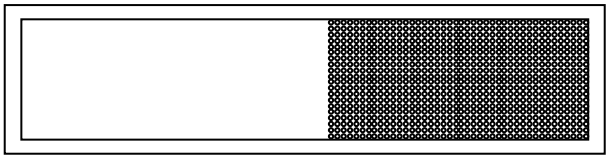
Line Matrix

In this format, the display lines are separate from each other, with each line consisting of continuous matrix of pixels, as shown in the following illustration.



Full Matrix

In this format, the entire display consists of continuous matrix of pixels, as shown in the following illustration.



Although line matrix and full matrix VMSs provide flexibility in displaying different characters and symbols varying in sizes, it has been shown that in many cases, fewer characters can be displayed on a line of continuous matrix or full matrix VMSs than can be displayed on a line with character matrix because of the width required for proportional characters.

Visibility and Legibility Criteria

The ease with which a sign can be detected in the environment (conspicuity) and the ease with which the message can be read (legibility) will enhance the effectiveness of motorists' visibility of the VMS and its message. In addition, the manner in which the message is displayed must be considered; e.g., if the message is too luminous, it can be easily detected but difficult to read because of glare.

Factors that affect the legibility of a light-emitting VMS include the character height; font style; character width (spacing and size of pixels); spacing of characters, words and lines; size of sign borders; and contrast ratio.