6. STUDY FINDINGS - INFORMATION FUSION AND DISSEMINATION SYSTEMS

The Group B ITI (Information Fusion and Dissemination Systems) include the following:

1. **Highway Condition Reporting System (HCRS) input** is accomplished using an interface available to authorized users via ADOT's Intranet or the Internet. The interface allows entry of information about a variety of events impacting travel on Arizona roadways. HCRS subsequently fuses the information into a database that feeds the 511 and az511.com dissemination systems. This is a statewide system.
2. **511** is ADOT's Traveler Information by Telephone system. The system is highly automated, providing callers with computerized voice prompts, responding automatically to user requests for HCRS-based highway conditions information and other information (such as transit), and recording user comments. This is a statewide system.
3. **az511.com** is ADOT's Traveler Information by Internet system. It provides HCRS-based highway conditions information, RWIS-based weather data and images, and Phoenix area speed map and camera images. This is a statewide system.

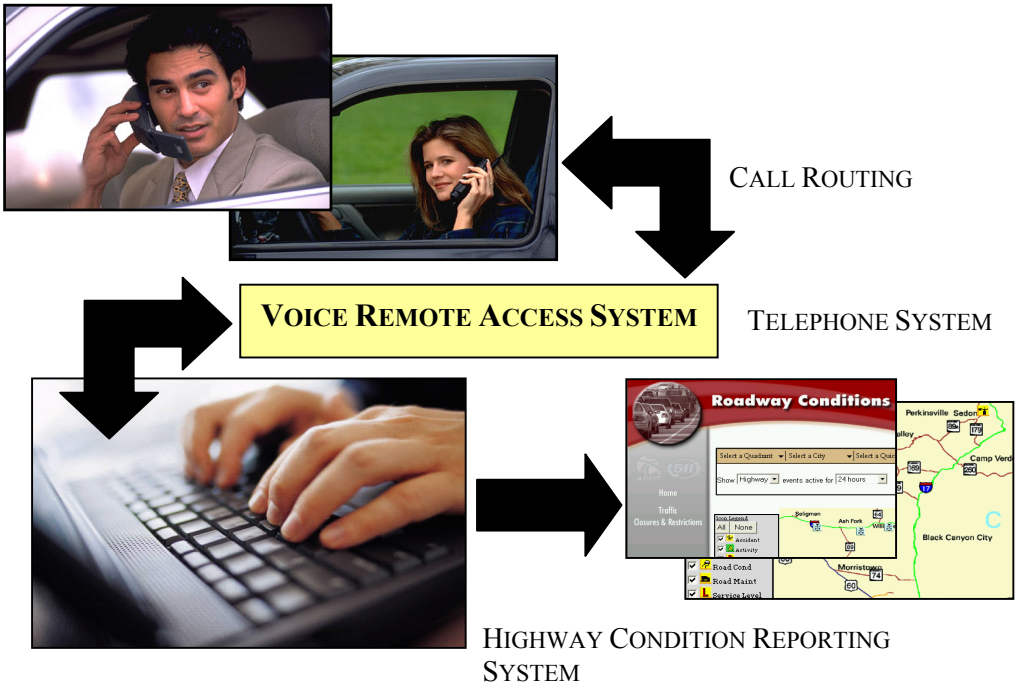

Figure 8: The HCRS-511 System Concept

4. **Overhead Variable Message Signs (VMS)** are large VMS mounted on overhead structures. Overhead VMS have been deployed statewide.

Figure 9: Overhead VMS (Globe District)

5. **Shoulder-Mounted VMS** are small VMS mounted on posts on the roadway shoulder. It is essentially a semi-permanent installation of the same type of sign enclosures used on portable trailer-mounted VMS. These signs have been deployed only on a local basis.

Figure 10: Shoulder-Mounted VMS

6. **Portable Trailer-Mounted VMS** are small trailer-mounted VMS that are temporarily deployed wherever they are needed. These signs have been deployed statewide.

Figure 11: Portable VMS

7. **Highway Advisory Radio (HAR)** is a system that broadcasts traveler information via radio. When used in conjunction with construction projects, these systems typically run in one of two modes: 1) continuous broadcast (providing general project information), or 2) periodic broadcast (providing as-needed information about impending scheduled events such as blasting). Beacons are typically used to indicate new messages for the second mode of operation. Thus far, these systems have been deployed only to meet temporary local construction project needs.

Figure 12: Highway Advisory Radio

Table 13 summarizes typical installation components and system functions and outputs associated with ADOT's information fusion and dissemination systems.

Table 13: Group B ITI – Components and Functions

ITI	Typical Installation Components	System Functions / Outputs
B1. Highway Condition Reporting System (HCRS) Input	Originally, HCRS terminals (dedicated computers) had to be installed wherever a data point of entry was needed. The HCRS input application has most recently been implemented as a Java applet. Authorized users access the applet on ADOT's Intranet or via the Internet. The input program automatically updates the HCRS database, housed on a computer server located at the Phoenix TOC.	The HCRS database forms the information base for ADOT's 511 and az511.com traveler information systems. The system allows the entry of 21 distinct event types. Advanced notice of planned events is limited to two weeks.
B2. Traveler Information by Telephone (511)	The physical components of 511 are grouped into two subsystems: Voice Response Activated System (VRAS) and HCRS (already described above). VRAS, located at the Phoenix TOC, is composed of: 1) Two T-1 data lines accommodating 24 voice channels each; 2) Two Interactive Voice Response (IVR) workstations; and 3) The 511 workstation, housing a multi-user database. The HCRS database feeds the 511 workstation's database.	511 receives commands via voice and/or touch tones and then performs a variety of tasks in response to the input, including: 1) provision of road conditions information; 2) provision of basic transit, airport and tourism information or forwarding of calls to other information centers; and 3) voice recording of customer comments.
B3. Traveler Information by Internet (az511.com)	The az511.com website may be considered to have six subsystems: 1) the website server – presents introductory web page and responds to requests; 2) the HCRS server – provides highway conditions information; 3) RWIS subsystem – provides weather data and images from RWIS stations/VMS; 4) Speed map subsystem – provides Phoenix area speed map; 5) CCTV camera subsystem – provides Phoenix area live and still camera images; and 6) Documents subsystem – provides electronic copies of miscellaneous documents. These subsystems are composed of a wide array of computers, communications equipment, databases and other software and electronic files, video equipment, and so on.	
B4. Overhead Variable Message Signs (VMS)	A typical overhead VMS installation consists of a sign enclosure, an overhead mounting structure with catwalk and foundations, a cabinet and controller, a modem, a voice telephone, and communications and power cabling.	Overhead VMS are used to provide messages on either a planned or unplanned basis. Examples of events for which planned messages are provided are: advanced notice of construction; 511 or az511.com promotion; and event-related traffic. Examples of unplanned events are: Amber Alerts, incidents, and weather.

Table 13: Group B ITI –Components and Functions (Cont'd)

ITI	Typical Installation Components	System Functions / Outputs
B5. Shoulder-Mounted VMS (SM-VMS)	The shoulder-mounted VMS currently in use in the Kingman District are essentially signs from portable trailer-mounted VMS but mounted instead on two posts. Other system components include a cabinet mounted on a concrete pad and a controller, keypad, modem and batteries. All of the signs feature cellular communications, solar power and radar speed detection capability.	- The signs on SR-68 are part of the instrumented truck escape ramp system. They provide a "STEEP GRADES AHEAD" message as a default, with notification of ramp intrusions when they occur, and speed warnings to speeding vehicles. - The signs on US 93 are part of a semi-permanent HAR system. They are used to provide notification of new HAR message and speed warnings.
B6. Portable Trailer-Mounted VMS (PTM-VMS)	A typical PTM-VMS currently consists of a VMS mounted on a trailer. The trailer features an on-board controller with a keyboard for direct setup and cellular communications equipment for remote setup. Leveling jacks provide for sign stability. The units include solar panels to supply power and have radar speed detection capability. Older diesel-powered units are still in use but will be phased out over the next three to five years.	The signs are used for a variety of purposes, including advance warning of planned closures or roadwork, ongoing roadwork, flash flood or road washout warning, accidents, queue warnings, special events, fire warnings, and drug stops and checkpoints.
B7. Highway Advisory Radio (HAR)	A typical HAR system is composed of: (1) a transmitter, complete with antenna, solar power panel, batteries, communications equipment, and recorder; and (2) signage, with or without flashing beacons, to inform the public of the frequency that they can tune into for information. The signage can be static or some type of VMS. A HAR system on US 93 features two transmitters, two beacons, two portable VMS and two shoulder-mounted VMS.	A typical transmitter has a broadcast radius of six to 12 miles. HAR units typically have communications capability to allow them to be updated remotely. HAR is an effective way to provide in-depth project information to the public, although it is normally just part of a multi-pronged public outreach effort. Other potential applications of HAR include providing weather or congestion advisories, detour route, and international border crossing information

Table 14 summarizes the quantity of deployed ITI, deployment plans and maintenance arrangements associated with ADOT's information fusion and dissemination systems.

Table 14: Group B ITI – Quantity Deployed/Planned and Maintenance Arrangements

ITI	Quantity Deployed/Planned	Maintenance Arrangements
B1. Highway Condition Reporting System (HCRS) Input	One system; available to authorized users on ADOT computers via the Intranet; also available via the Internet.	Transportation Technology Group (TTG) performs monthly HCRS maintenance on the second Thursday of each month. TTG and Information Technology Group (ITG) provide demand maintenance as required.
B2. Traveler Information by Telephone (511)	One system, available via two different phone numbers: 511 and 1-888-411-ROAD. ADOT will deploy about 50 static 511 signs in the near future.	The voice system is maintained by the system vendor. TTG and ITG provide demand maintenance on other system components as required.
B3. Traveler Information by Internet (az511.com)	One system.	TTG and ITG provide demand maintenance on system components as required.
B4. Overhead Variable Message Signs (VMS)	115 signs deployed statewide (44 in rural areas). Current plans call for 150 new signs statewide, including 71 in rural areas.	The Regional Traffic Engineering Offices (RTEOs) provide demand maintenance for overhead VMS, with vendor support as required. The RTEOs view VMS as a high priority even though they are not funded for VMS maintenance. The RTEOs are interested in increased funding or an alternative arrangement.
B5. Shoulder-Mounted VMS (SM-VMS)	The Kingman District has installed 4 SM-VMS. Until a recent road realignment project, the Prescott District had two signs. No new deployments are planned.	See comments on highway advisory radio and instrumented truck escape ramps.
B6. Portable Trailer-Mounted VMS (PTM-VMS)	ADOT District maintenance organizations are utilizing 87 PTM-VMS statewide, including 65 solar-powered and 22 diesel-powered. There are no known plans to increase the total number of signs. Many ADOT contractors rent signs during construction projects.	The Districts perform routine preventive maintenance. Equipment Services performs demand maintenance, calling on vendor support as needed. Controller and circuit board problems are common. Equipment Services reported that they rarely have more than one sign in for repairs at any given time.
B7. Highway Advisory Radio (HAR)	There are currently six ADOT construction projects for which HAR is being used. HAR is also used during Phoenix International Raceway events. No known planned deployments.	Turnkey HAR service providers typically agree to include equipment maintenance in their contract. The US 93 contractor is responsible for maintenance of all HAR system components (including SM-VMS and PTM-VMS).

See Appendix J for maps of deployed and planned ITI in Group B.

Table 15 summarizes planned system enhancements and integration and standardization attributes or issues associated with ADOT's information fusion and dissemination systems.

Table 15: Group B ITI – Enhancements, Integration and Standardization

ITI	Planned Enhancements / Integration / Standardization
B1. Highway Condition Reporting System (HCRS) Input	The HCRS Input program is in a sense the center of ADOT's integration efforts. The distributed nature of ADOT's roadway systems and events occurring on them (construction activities, incidents, and so on) necessarily means that information about those events is available only at a local level initially. The HCRS input application allows rapid fusion and dissemination of local, distributed information.
B2. Traveler Information by Telephone (511)	ADOT continues to update the 511 system on a monthly basis. 511 is tightly integrated with HCRS and with existing airport, transit and tourism information services
B3. Traveler Information by Internet (az511.com)	az511.com is integrated with HCRS and computer networks tying into field devices such as RWIS, traffic detectors, and cameras. ADOT is working with local agencies to provide more surface street information. ADOT will incorporate information from additional RWIS stations and VMS-based remote cameras as they come online.
B4. Overhead Variable Message Signs (VMS)	At the Phoenix TOC, a server is set up with Mercure, software allowing central communications with and control of all overhead VMS in Arizona. Authorized users in the Flagstaff, Globe, Holbrook, Kingman and Safford Districts also have control and access to the signs in their respective areas. Plans call for remote cameras to become a standard feature of installed VMS.
B5. Shoulder-Mounted VMS (SM-VMS)	See discussion of highway advisory radio and instrumented truck escape ramp integration.
B6. Portable Trailer-Mounted VMS (PTM-VMS)	Portable trailer-mounted VMS are currently used as stand-alone units. Remote control of units via cellular communications is possible. At least one vendor offers central software that can control as many as 200 units simultaneously; many potential applications are possible. However, ADOT's experience has been that cellular coverage in many rural areas is not reliable.
B7. Highway Advisory Radio (HAR)	ADOT's HAR systems are internally integrated but standalone. It may be desirable to integrate HAR into HCRS; ways to do this could include expanding the HCRS database content to contain the text of HAR scripts or actual recorded audio files.

Table 16 summarizes stakeholder awareness and usage of ADOT's information fusion and dissemination systems.

Table 16: Group B ITI – Stakeholder Awareness and Usage

ITI	Awareness	Usage
B1. Highway Condition Reporting System (HCRS) Input	All ADOT Districts have authorized HCRS users; ADOT staff in general appear to have awareness and appreciation of the value of the system.	ADOT has about 150 to 200 authorized users. Non-ADOT authorized users include DPS, City of Chandler, City of Gilbert, City of Glendale, Maricopa County Department of Transportation, and consultant staff. The Phoenix TOC enters approximately 81% of all events, although all Districts are participating in use of the system. The system records about 12,500 events per year (based on data from 2000-2002).
B2. Traveler Information by Telephone (511)	ADOT staff in general appeared to be aware of 511; internal ADOT promotion of the system has occurred. 86% of Department of Public Safety (DPS) survey respondents reported being aware of ADOT's 511. The figures were 65% for Commercial Vehicle Operators (CVO), and 60% for public from rural Arizona ZIP codes, and 71% for public from urban Arizona ZIP codes.	- The Districts reported use of 511 to verify HCRS input event data. Usage of 511 for other purposes by ADOT staff appears to be low. - The annual number of 511 calls grew from 307,862 in 2002 to 344,468 in 2003, a 12% increase. The first five months of 2003 versus 2004 saw an increase of 80%. The 511 promotion efforts this year have had a dramatic immediate impact and have helped set a course for long-term growth in system use. - 27% of DPS survey respondents reported using ADOT's 511 often or rarely. The figures were 30% for CVO, 41% for public from rural Arizona ZIP codes, and 40% for public from urban Arizona ZIP codes.
B3. Traveler Information by Internet (az511.com)	ADOT staff in general appeared to be aware of 511; internal ADOT promotion of the system has occurred. 70% of DPS survey respondents reported being aware of az511.com. The figures were 56% for CVO, and 67% for public from rural Arizona ZIP codes, and 79% for public from urban Arizona ZIP codes.	- There is some usage of az511.com by ADOT staff. RWIS information available at the website is not complete, so staff typically would check the more complete set of data available on the Intranet when needed. Motor Vehicle Division (MVD) staff checks restrictions in the course of truck permitting. - The website received about 75 million "hits" and about ten million page views in 2003. Through August of 2004, those statistics had already been nearly equaled or surpassed. - 20% of DPS survey respondents reported using az511.com often or rarely. The figures were 26% for CVO, 48% for public from rural Arizona ZIP codes, and 80% for public from urban Arizona ZIP codes.

Table 16: Group B ITI – Stakeholder Awareness and Usage (cont'd)

ITI	Awareness	Usage
B4. Overhead Variable Message Signs (VMS)	All ADOT staff are familiar with overhead VMS. 100% of DPS survey respondents reported being aware of ADOT's overhead VMS. The figures were 93% for commercial vehicle operators (CVO), and 90% for public from rural Arizona ZIP codes, and 75% for public from urban Arizona ZIP codes. Note that the DPS, CVO and public surveys did not distinguish between various types of VMS.	8,761 messages were displayed on VMS statewide in 2003. Of those, 3,585 were planned and 5,176 were unplanned. By August of 2004, those statistics had all been surpassed. 90% of DPS survey respondents reported using ADOT's VMS information often or rarely. The figures were 94% for CVO, 83% for public from rural Arizona ZIP codes, and 81% for public from urban Arizona ZIP codes. Note that the DPS, CVO and public surveys did not distinguish between various types of VMS.
B5. Shoulder-Mounted VMS (SM-VMS)	Some ADOT staff are familiar with shoulder-mounted VMS. The Kingman District's use of the signs is increasing ADOT's level of familiarity. See comments on overhead VMS for VMS awareness survey statistics.	The shoulder-mounted VMS used in the Kingman District have messages displayed continuously. See comments on HAR and instrumented truck escape ramps. See comments on overhead VMS for VMS usage survey statistics.
B6. Portable Trailer-Mounted VMS (PTM-VMS)	All ADOT staff are familiar with portable trailer-mounted VMS. See comments on overhead VMS for VMS awareness survey statistics.	Portable trailer-mounted VMS are used often in all ADOT Districts. See comments on overhead VMS for VMS usage survey statistics.
B7. Highway Advisory Radio (HAR)	All ADOT staff are familiar with HAR. 67% of DPS survey respondents reported being aware of ADOT's HAR. The figures were 79% for CVO, and 57% for public from rural Arizona ZIP codes, and 48% for public from urban Arizona ZIP codes.	The Flagstaff, Holbrook, Kingman, and Prescott Districts are currently using HAR on construction projects. HAR is also used in the Phoenix area for International Raceway events. The Globe District used HAR on a past project. 35% of DPS survey respondents reported using ADOT's HAR information often or rarely. The figures were 61% for CVO, 36% for public from rural Arizona ZIP codes, and 22% for public from urban Arizona ZIP codes.

Table 17 summarizes the costs and perceived and reported benefits associated with ADOT's information fusion and dissemination systems.

Table 17: Group B ITI – Costs and Benefits

ITI	Costs	Perceived and Reported Benefits
B1. Highway Condition Reporting System (HCRS) Input	ADOT spent about $270,000 develop HCRS. ADOT spends about $62,000/year for data entry labor. Unspecified monthly maintenance costs are incurred.	HCRS encourages good project communications between ADOT and contractors and good emergency communications among ADOT, the Department of Public Safety (DPS) and other agencies. The system allows traveler information to be made quickly available to the public.
B2. Traveler Information by Telephone (511)	The original Voice-Response Activated System (VRAS) software development costs totaled $270,000. Annual 511 operating and maintenance costs for 2002 were about $137,000. Labor costs are incurred in system promotion and in working with telephone service providers.	-511 improvement and promotion efforts are good for public relations. -511 answers questions that ADOT and DPS staff might otherwise need to answer. -The 511 number is short/easy to remember. -511 customers enjoy the benefits of real-time information (reduced frustration, ability to make informed travel decisions, time savings, and avoidance of potentially dangerous situations).
B3. Traveler Information by Internet (az511.com)	Unspecified capital costs were incurred for computer and communications equipment. ADOT also incurs operations, maintenance and promotion costs.	- As with 511, ADOT's provision and promotion of the website represent opportunities to build positive public relations. Load restrictions information facilitates the Motor Vehicle Division's (MVD's) issuing of CVO permits. The existence of the website removes some burden from ADOT and DPS in answering calls for travel information from the public. - The website is a good tool for pre-trip planning. The visual interface simplifies information access. The public appreciates advance notice of closures. In general, the information provided allows people to make travel decisions that improve safety, save time and reduce costs.
B4. Overhead (OH) Variable Message Signs (VMS)	A typical rural OH-VMS installation costs $385,000, including design, construction and system integration costs. The PECOS-Intelligent Transportation Infrastructure Report (11:22) estimates an overall annual average operating cost of $1,035 per site, and an annual average maintenance cost of $2,478 per site.	- ADOT and DPS both perceive VMS as a tremendous aid in providing information to travelers. Without VMS, ADOT and DPS would require more resources to respond to congestion. - As with other information dissemination ITS elements, overhead VMS can help travelers make better decisions, improving safety and efficiency and reducing costs. VMS messages, particularly advance warnings, frequently reduce motorist frustration.

Table 17: Group B ITI – Costs and Benefits (cont'd)

ITI	Costs	Perceived and Reported Benefits
B5. Shoulder-Mounted (SM) Variable Message Signs (VMS)	The cost for turnkey installation of the two SM-VMS on SR 68 in the Kingman District was $137,200. Based on this, cost per sign is about $68,600. Unspecified operations and maintenance costs are also incurred.	The shoulder-mounted VMS are important parts of HAR and instrumented truck escape ramps systems. In addition to their primary functions, these radar-equipped signs provide speed warning messages, which are believed to have some impact on traffic speeds.
B6. Portable Trailer-Mounted VMS (PTM-VMS)	Districts pay into the Equipment Services revolving fund for use of portable trailer-mounted VMS. The rates are $925 per month for solar units; and $400 to $500 per month for diesel units. The Districts are charged are an additional charge for the time the diesel units are actually in use. Sign setup and removal requires fairly minor labor costs. The solar-powered models are self-sustaining, while the diesel-powered models require periodic refueling visits during sustained usage.	The signs offer ADOT ease of setup and deployment flexibility. Remote programming is not used often but can be helpful. Preprogrammed messages simplify sign use. It is believed that the signs are effective at reducing vehicle speeds in roadwork zones; this is particularly true when DPS has an enforcement presence. As with other information dissemination ITI, CVO and the general public enjoy improvements in safety and time savings and reductions in costs as they make use of the information provided on the signs.
B7. Highway Advisory Radio (HAR)	A typical "turnkey" HAR service (which includes Federal Communications Commission (FCC) licensing costs, set up and removal of equipment, message updates, and maintenance) costs $1,900 per month.	HAR is ideal for application to construction projects since such projects frequently feature rapidly changing conditions. HAR is capable of providing detailed information about specific project dates, times of day, activities, expected delays, and so on. Project-related and other applications of HAR have the potential, as with other information dissemination ITI, of contributing to reduced driver frustration, increased safety, time savings and cost reductions. Advance notice of construction activity provides opportunity for drivers to make alternate route or trip timing decisions.

Table 18 summarizes the key issues and operational status and element-specific performance measures associated with ADOT's information fusion and dissemination systems.

Table 18: Group B ITI – Key Issues and Operational Status

ITI	Key Issues	Operational Status / Element-Specific Performance Measures
B1. Highway Condition Reporting System (HCRS) Input	- The "event expiration" feature curtails the occurrence of the system having outdated information. - The time commitment to enter HCRS data is not excessive, although it requires consistent effort. Good communication with the contractor and frequent on-site field inspections are critical.	Not counting monthly maintenance, HCRS system is online over 98% of the time (data from Jan. 2003-Oct. 2004). 12,450 entries per year (data from 2000-2002). Districts report system is easy to learn and use.
B2. Traveler Information by Telephone (511)	- People generally prefer to speak to a human being, but 511 seems to be gaining some acceptance among some people and for some types of information. The costs of a system with human operators would be significantly higher. - Effectiveness of voice recognition is highly subject to background noise, but otherwise offers some advantages over keypad navigation (which is still an option). - People would prefer navigation options that would not require them to know route numbers or mileposts. - Cell phone coverage issues impact plans for static 511 sign deployment. - Level of use varies widely, from very regular to occasional to experimental use. - Many people are still unfamiliar with 511. Promotion and system improvements are key to continuing growth in utilization.	- Voice Response Activated System (VRAS) is available over 99% of the time (data from Apr. 2003-Oct. 2004) - 52% of Department of Public Safety (DPS) survey respondents reported strongly or moderately agreeing that 511 information contributes to travel safety. The figures were 53% for Commercial Vehicle Operators (CVO) and 51%/ 28% for public from rural /urban Arizona ZIP codes. - For 511 information contribution to time savings, the figures were 58% (DPS), 40% (CVO), and 48%/30% (public from rural/urban Arizona). - 39% of CVO survey respondents reported strongly or moderately agreeing that 511 information contributes to cost savings.

Table 18: Group B ITI – Key Issues and Operational Status (cont'd)

ITI	Key Issues	Operational Status / Element-Specific Performance Measures
B3. Traveler Information by Internet (az511.com)	- Many people dislike close spacing of HCRS event icons. They don't understand the "list all events" button would rather have the system list the events automatically. - Low bandwidth (dial-up) Internet connections are still common (especially in rural areas) and would benefit having access to a less intensive graphics-intensive interface. - The public would like to have access to messages currently being shown on VMS. - Alternative sources of information exist but are scarcer for rural areas.	-36% of DPS survey respondents reported strongly or moderately agreeing that az511.com information contributes to travel safety. The figures were 64% for CVO and 58%/61% for public from rural/urban Arizona ZIP codes. - For az511.com information contribution to time savings, the figures were 46% (DPS), 44% (CVO), and 59%/65% (public from rural/urban Arizona). - 45% of CVO survey respondents reported strongly or moderately agreeing that az511.com information contributes to cost savings.
B4. Overhead Variable Message Signs (VMS)	- Suggested factors for new locations include response to rapid population growth, better detour information, filling gaps between existing signs, and addressing Mexican border information needs. - VMS have good maintenance support from Regional Traffic Engineering Offices (RTEOs) and equipment vendors. However, the RTEOs lack funding and manpower. A specialized statewide VMS maintenance team has been suggested as a possible alternative. - Lane closures are currently required for maintenance access at some VMS. - Some motorists expect VMS to be used only for "real-time information." Some negative comments were received about 511, az511.com, and bus/carpool promotion. However, it is believed that such messages have a positive overall impact.	- 76% of DPS survey respondents reported strongly or moderately agreeing that VMS information contributes to travel safety. The figures were 74% for CVO, 72% for public from rural Arizona ZIP codes, and 66% for public from urban Arizona ZIP codes. Note that the DPS, CVO and public surveys did not distinguish between various types of VMS. - For VMS information contribution to time savings, the figures were 70% (DPS), 62% (CVO), and 64%/65% (public from rural/urban Arizona). - 50% of CVO survey respondents reported strongly or moderately agreeing that VMS information contributes to cost savings.
B5. Shoulder-Mounted VMS (SM-VMS)	- Shoulder-mounted VMS have lower capital costs than overhead VMS. - Sign size and position makes them suitable for lower-speed/lower-volume facilities - more susceptible to vandalism. - Portable trailer-mounted VMS are less costly and more flexible; shoulder-mounted VMS are more secure.	See Overhead VMS comments.

Table 18: Group B ITI – Key Issues and Operational Status (cont'd)

ITI	Key Issues	Operational Status / Element-Specific Performance Measures
B6. Portable Trailer-Mounted VMS (PTM-VMS)	- The interface for message setup on portable trailer-mounted VMS varies on different units and is perceived as not user-friendly. "Cheat sheets" help people with commonly used features. - Programming the sign prior to deployment is standard procedure. Remote programming is perceived as unreliable. - Portable units deployed for speed reduction are believed to be much more effective with DPS enforcement. - Proper sign placement for sign legibility requires skill and forethought. Portable units should not be placed close to overhead VMS or on extremely sloped shoulders. - Newer solar powered units are greatly preferred over older diesel-powered units. - Portable signs have significantly less target value (are not as easily perceived) as overhead VMS. - Portable signs are tough but are subject to harsh conditions both en-route to deployment and in position.	See Overhead VMS comments.
B7. Highway Advisory Radio (HAR)	- HAR requires an active response from travelers (tuning to a particular radio frequency). An ADOT survey found that only about 10% of drivers passing through a construction project tuned into the HAR station. - Some HAR stations have poor reception quality, often due to mountainous terrain. - HAR is more effective when used in conjunction with flashing beacons. - Some motorists want a wider HAR broadcast radius, more advanced notice of events, more time to react and plan. - Provision of real-time information is a challenge but is key to retaining public trust and interest. - Some people prefer to drive without radio noise – it is perceived as a distraction from driving tasks. - HAR used for construction project information should be viewed as part of an overall public outreach effort.	- 46% of DPS survey respondents reported strongly or moderately agreeing that HAR information contributes to travel safety. The figures were 65% for CVO, 41% for public from rural Arizona ZIP codes, and 14% for public from urban Arizona ZIP codes. - 48% of DPS survey respondents reported strongly or moderately agreeing that HAR information contributes to time savings. The figures were 44% for CVO, 36% for public from rural Arizona ZIP codes, and 15% for public from urban Arizona ZIP codes. - 45% of CVO survey respondents reported strongly or moderately agreeing that HAR information contributes to cost savings.

Table 19 summarizes the performance evaluation of ADOT's information fusion and dissemination systems, based on universal performance measure composite scores.

Table 19: Group B ITI – Evaluation Based on Universal Performance Measures

ITI	Composite Goal Area Scores				Composite Overall Score (Overall / Group Rankings)
	Safety	Mobility	Costs	Reliability/ Usefulness	
B1. Highway Condition Reporting System (HCRS) Input	60	60	60	64	244 (12 of 18 / 6 of 7)
B2. Traveler Information by Telephone (511)	60	60	64	60	244 (12 of 18 / 6 of 7)
B3. Traveler Information by Internet (az511.com)	60	60	68	67	255 (9 of 18 / 5 of 7)
B4. Overhead Variable Message Signs (VMS)	100	100	100	94	394 (1 of 18 / 1 of 7)
B5. Shoulder-Mounted VMS (SM-VMS)	80	80	84	84	328 (4 of 18 / 3 of 7)
B6. Portable Trailer-Mounted VMS (PTM-VMS)	80	80	84	94	338 (2 of 18 / 2 of 7)
B7. Highway Advisory Radio (HAR)	80	80	84	60	304 (7 of 18 / 4 of 7)