

**State of Arizona  
Office  
of the  
Auditor General**

**PERFORMANCE AUDIT**

**ARIZONA  
DEPARTMENT OF  
TRANSPORTATION**

**CONSTRUCTION  
MANAGEMENT  
FUNCTION**

**Report to the Arizona Legislature  
By Douglas R. Norton  
Auditor General  
October 1997  
Report # 97-17**



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October 29, 1997

Members of the Arizona Legislature

The Honorable Jane Dee Hull, Governor

Mr. Larry Bonine, Director  
Arizona Department of Transportation

Transmitted herewith is a report of the Auditor General, A Performance Audit of the Arizona Department of Transportation construction management function. This report is in response to a May 29, 1995, resolution of the Joint Legislative Audit Committee. The performance audit was conducted as part of the Sunset review set forth in A.R.S. §§41-2951 through 41-2957.

This report is the final in a series of four reports issued on the Arizona Department of Transportation. This audit focused primarily on the Arizona Department of Transportation's (ADOT) construction management function. It addresses the need for ADOT to better manage construction cost increases. Because of the large amount of monies involved with construction, every percentage point of unnecessary cost increases that the Department can avoid equates to significant dollar savings. In addition, ADOT needs to fully implement its Project Management Process to help minimize cost increases that occur during construction that are design-related. The audit also addresses steps ADOT should take to improve its partnering program to ensure the program operates consistently for each construction project. Finally, the report recommends that ADOT take advantage of opportunities to use value engineering and design-build contracting to save money and reduce project completion times.

The audit also followed up on concerns identified previously in ADOT's Equipment Services Section. The audit found that ADOT needs to better monitor vehicle utilization and control fleet size, and that ADOT needs to establish vehicle utilization standards as was recommended in 1987. Although ADOT has made improvements in equipment preparation timeliness, the Department should explore options that may further reduce equipment preparation time and costs.

As outlined in its response, ADOT agrees with all of the recommendations.

My staff and I will be pleased to discuss or clarify items in the report.

This report will be released to the public on October 30, 1997.

Sincerely,

Douglas R. Norton  
Auditor General

Enclosure

# SUMMARY

The Office of the Auditor General has conducted a performance audit and Sunset review of the Arizona Department of Transportation, pursuant to a May 29, 1995, resolution of the Joint Legislative Audit Committee. The audit was conducted as part of the Sunset review set forth in Arizona Revised Statutes §§41-2951 through 41-2957. This audit addresses the Department's construction management function and is the fourth and final audit of the Department conducted in response to the resolution. Previous audits addressed the Department's Motor Vehicle Division revenue functions, its highway planning and engineering functions, and the Motor Vehicle Division.

The Arizona Department of Transportation's (ADOT) mission is to provide a transportation system that meets the needs of Arizona's citizens. In 1995, ADOT reorganized its planning, design, construction, and maintenance functions into the Intermodal Transportation Division (Division). In fiscal year 1996, the Division employed 2,732 full-time equivalent staff (FTE) and spent more than \$1 billion, including monies paid to contractors for road construction. During the next five fiscal years, ADOT plans to start approximately \$3 billion worth of statewide construction projects.

Since the last series of audits in 1987 and 1990, ADOT has done much to address problems and improve its performance related to construction. For example, ADOT has decreased its construction oversight costs and has met its construction staffing cost goals for the last four fiscal years. In addition, ADOT has increased its use of the private sector to design and oversee construction projects. Since 1991 ADOT has used a "partnering" process to improve working relationships with contractors. In 1992, ADOT began to implement total quality management to evaluate and improve its performance. In 1995, ADOT began implementation of its Project Management Process to address problems with project design. This audit recommends further improvements to the Project Management and partnering processes, and also addresses the need to improve the monitoring of construction costs, and expand the use of value engineering and design-build contracting, as well as the need for more effective management of its vehicle fleet.

## **The Department Needs to Better Manage Construction Cost Increases (See pages 5 through 9)**

ADOT can improve its management of construction costs. Over the last 4.5 years, construction completion costs have exceeded original contract amounts by 2.9 to 7.6 percent annually. Because of the large amount of monies involved, every percentage point of unnecessary cost increases that ADOT can avoid equates to significant dollar savings. For example, for projects

planned to begin construction during the next 5 years, a 1 percent overall unnecessary cost avoidance equals more than \$30 million.

ADOT can take steps to better control construction cost increases. Although some construction cost increases are hard to avoid, such as changes in federal specifications, others are more manageable, such as omissions in designs and quantity changes. A basic action ADOT can take to minimize future cost increases is clarifying to construction project managers that the original contract amount is the completion cost target. Currently, it appears ADOT construction managers' target is the contract amount plus the 5 percent contingency ADOT budgets for to cover unforeseen, necessary costs. To further reduce construction cost increases, ADOT needs to better collect, classify, and evaluate construction cost increase data and communicate reasons for increases to staff originally responsible for those parts of the project.

### **Improvements to the Project Design Phase Can Better Control Construction Cost Increases (See pages 11 through 14)**

Improving the project design process can help minimize cost increases that occur during construction due to design-related problems. During 1996, most of the documented cost increases on ADOT projects were design related. National studies conclude that improvements made during design and pre-construction can have a great impact on controlling construction costs and minimizing project overruns. Recently, ADOT adopted the Project Management Process (Process) to address problems with the design phase. The Process involves a team of experts from various areas such as design, materials, and maintenance who can provide a comprehensive review of designs as they are developed. However, the Process lacks full participation by all parties and is not yet fully operational. To make the Process effective in minimizing cost increases, ADOT needs to ensure all team members participate in the Process, and track how the major decisions the team makes impact cost increases.

### **Partnering Program Improvements Needed (See pages 15 through 19)**

ADOT should take steps to make its partnering program more effective. Partnering involves a formalized process to resolve issues or disputes between the Department and contractors that arise during the construction phase, emphasizing quick resolution at the project level. The Department currently partners all construction projects with private contractors. While it is difficult to assess partnering's impact on costs and completion times, since partnering has been implemented, construction claims have been virtually eliminated. However, the De-

partment can improve its partnering program by developing clear dispute resolution guidelines, improving feedback and training, and enhancing evaluations of partnering relations.

**Use of Value Engineering and Design-Build Contracting Can Help Reduce Project Costs and Completion Times**  
**(See pages 21 through 23)**

ADOT should take advantage of opportunities to use value engineering and design-build contracting to save money and reduce project completion times. Value engineering, which allows contractors to propose cost and time saving project modifications, has the potential to save several million dollars each year. Although value engineering generated savings of over \$3.7 million on projects completed between late 1991 and December 1995, cost savings decreased sharply in 1996, accounting for only \$115,000. Contractors stated that they have been reluctant to develop value engineering proposals because ADOT sometimes took too long to review the plans. However, ADOT recently incorporated review time standards for value-engineering proposals that may increase the use of value engineering. ADOT also should monitor successful value engineering proposals and incorporate them into future projects. Additionally, to further control costs and reduce completion times, if given legislative approval, ADOT should explore options to design-build contracting, in which a contractor is responsible for both the design and construction of a project.

**ADOT Still Has Many Light Vehicles with Low Mileage Use and Is Also Experiencing Equipment Preparation Delays**  
**(See pages 25 through 29)**

ADOT continues to have many light vehicles with low mileage use and should also explore options to further reduce equipment preparation time. In 1996, 144 of ADOT's 1,002 permanently assigned light vehicles, or 14 percent, were driven under 500 miles per month. A 1987 audit found similar low mileage problems. The Department could better monitor vehicle utilization by establishing formal utilization standards, identifying vehicles not meeting utilization standards, and reassigning or eliminating underutilized vehicles. In addition, although ADOT has reduced the amount of time it takes some specialty vehicles to be prepared and issued to ADOT units, the Department should explore other options that could further address preparation delays and/or reduce costs.

**Other Pertinent Information—  
Arizona’s Roads and Bridges  
Are in Good Condition  
(See pages 31 through 34)**

Road pavements and bridges in Arizona are in better condition than those nationally and compare favorably to other Western states according to Federal Highway Administration assessment standards. Roads remain in good condition through the efforts of a fully funded Pavement Preservation Program or road rehabilitation program. The State Transportation Board has approved the start of road rehabilitation projects worth approximately \$76 million in fiscal year 1997 to \$98 million in fiscal year 2000. Arizona bridges rank second nationally, and also benefit from a fully funded Bridge Preservation Program, which provides for bridge inspections, emergency repairs, and upgrading.

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# INTRODUCTION AND BACKGROUND

The Office of the Auditor General has conducted a performance audit and Sunset review of the Arizona Department of Transportation, pursuant to a May 29, 1995, resolution of the Joint Legislative Audit Committee. The audit was conducted as part of the Sunset review set forth in Arizona Revised Statutes §§41-2951 through 41-2957. This audit addresses the Department's construction management function and is the fourth and final audit of the Department conducted in response to the resolution. Previous audits addressed the Department's Motor Vehicle Division revenue functions, its highway planning and engineering functions, and the Motor Vehicle Division.

The Arizona Department of Transportation (ADOT) spends the majority of its revenues for highway construction projects. From fiscal year 1995 to 1997, highway construction projects worth \$454 million to \$768 million were approved to begin construction in the respective fiscal years. Additionally, in June 1997, construction projects worth approximately \$1 billion were approved to begin construction in fiscal year 1998.

## **Intermodal Transportation Division Organization and Staffing**

ADOT's Intermodal Transportation Division is responsible for planning, designing, constructing, and maintaining the state highway system. To carry out its functions, the Division is divided into three branches: Operations, Planning and Engineering, and Valley Transportation, with a total of 2,732 FTEs in fiscal year 1996.

The Operations Branch is responsible for materials tests, highway construction outside of the Phoenix metropolitan area, and statewide highway maintenance. Until recently, Equipment Services, which provides transportation and maintenance equipment to ADOT and other state agencies, was part of the Operations Branch. Now equipment services is part of the Support Services Office responsible to the Department Director. The Planning and Engineering Branch is responsible for bridge, roadway, right-of-way, traffic, statewide project management, planning and design, transit, and aeronautics functions. Finally, Valley Transportation is responsible for design and construction in the Phoenix metropolitan area.

## **Budget**

The Intermodal Transportation Division receives both appropriated and nonappropriated monies. Unlike many other state agencies, the Division receives only a small amount of General Fund appropriations. Rather, the State Highway Fund (Fund) is the Division's major funding source. The Fund receives a portion of money generated from vehicle registration,

title, license and related fees, and fuel and motor carrier taxes. Additionally, approximately 50 percent of construction expenditure reimbursements are received from the federal government. Monies from Arizona cities and counties, and other state agencies, are also deposited in the Fund. The Fund also receives interest income and other revenues. ADOT disburses Fund monies primarily for engineering, construction, improvement, and maintenance of state highways.

## **Follow-up to Previous Auditor General Reports**

As part of the current audit, concerns previously identified in the Auditor General's 1990 and 1987 performance audits of the Arizona Department of Transportation were reviewed. The reports raised issues concerning ADOT's Highway Design Process and Contractor Claims Process (Auditor General Report 90-3), and ADOT's Equipment Management (Auditor General Report 87-9).

- **Design review process needs to be strengthened**—The 1990 audit found that ADOT had not routinely performed timely design reviews. Design reviews provide assurance that roads are built as ADOT intended and function safely. To correct this problem, ADOT was developing uniform procedures and guidelines to address responsibility and expectations at each design review stage. The report recommended that ADOT also consider adopting a more realistic scheduling system to encourage broader participation in the review process.

**Follow-up:** ADOT recently began implementing its Project Management Process, which includes detailed procedures and guidelines for project reviews at designated stages. However, ADOT needs to enforce participation in the Process to better control construction cost increases (see Finding II, pages 11 through 14).

- **Changes needed to ensure timely resolution of claims**—The 1990 audit found that ADOT lacked specific claims procedures, which resulted in delayed claims resolution. Claims arise from unresolved contractual disputes between ADOT and private contractors concerning such matters as delays, additional work, and differing site conditions. Additionally, vague claims resolution specifications and lack of claims monitoring further burdened the process. The report recommended that ADOT continue its efforts to formalize the claim submission process, implement a system to monitor the process, and establish procedures requiring written decisions for every formal claim.

**Follow-up:** During the period 1990 through 1993, ADOT implemented a detailed reporting and tracking system for claims processing. In addition, ADOT implemented a partnering program in 1991 to improve contractor relations. Since that time, construction claims have been virtually eliminated. However, ADOT can further improve the effec-

tiveness of its partnering program by developing clear guidelines for issue resolution, improving feedback and training, and enhancing evaluations of partnering relationships (see Finding III, pages 15 through 19).

- **Light fleet vehicle utilization needs improvement**—The 1987 audit found that approximately 195 light fleet vehicles could be eliminated from ADOT’s fleet if ADOT improved efficiency and did not replace underutilized vehicles. ADOT’s lack of formal utilization standards, inadequate monitoring of vehicle utilization, and lack of clear authorization to Equipment Services’ management to recall or transfer unjustified, underutilized vehicles contributed to low utilization. The audit recommended that ADOT reduce its fleet by 195 light vehicles, develop formal utilization standards, use the equipment management system to monitor vehicle utilization, and clarify who has the authority to remove or reassign vehicles that do not meet utilization criteria.

**Follow-Up:** ADOT still has many vehicles with low mileage use. In 1996, 144 of ADOT’s permanently assigned light vehicles, or 14 percent, had low mileage use. ADOT has yet to develop formal utilization standards to help identify underutilized vehicles and control fleet size (see Finding V, pages 25 through 29).

- **Unnecessary delays in issuing new equipment must be eliminated**—The 1987 audit found that ADOT had allowed \$1 million worth of new equipment to sit idle for up to 2.5 years before being placed into service. This equipment was comprised of truck chassis, which required attachment of specialized bodies and other equipment before they could be issued to ADOT users. The audit recommended that ADOT better plan for new equipment issuance, and monitor new equipment through the preparation process.

**Follow-Up:** Since 1987, ADOT’s Equipment Services Section has improved planning for new equipment issuance by completing body specifications, issuing solicitations, and selecting vendors to perform fabrication and attachment needs before the truck chassis are expected to be delivered to ADOT. Furthermore, Equipment Services’ management now monitors each vehicle from the date ADOT issues the requisition to purchase the chassis to the date Equipment Services issues the completed unit to the user. Although ADOT has addressed the most serious new equipment preparation delays, ADOT should explore options that may further reduce equipment preparation time and/or costs (see Finding V, pages 25 through 29).

## **Audit Scope and Methodology**

The purpose of this audit was to evaluate ways ADOT can better control construction cost increases, the status of the Project Management Process, the effectiveness of ADOT’s partnering program, follow-up on previous audit recommendations concerning fleet management, and the condition of Arizona’s roadways and bridges. This report presents findings and recommendations in five areas:

- The need to better control unnecessary construction cost increases;
- The need to make the Project Management Process fully operational;
- The need for ADOT to improve its partnering program;
- The need to increase use of value engineering and design-build contracting; and
- The need to monitor vehicle utilization and explore options that may reduce equipment preparation time and/or costs.

In addition to these audit areas, the report contains Other Pertinent Information regarding the condition of Arizona's roads and bridges (see pages 31 through 34) and responses to the 12 Sunset Factors that should be considered in determining whether the Arizona Department of Transportation should be continued or terminated (see pages 35 through 42).

This performance audit focused on ADOT's construction and fleet management. To evaluate construction management, this audit reviewed 216 completed construction projects and corresponding State Engineer Reports for calendar year 1996 and January through June 1997. ADOT's cost-tracking database for construction was analyzed to determine reasons for cost increases. Further, 4 ADOT process manuals were examined to determine ADOT's current policies and procedures. Additionally, department officials and staff, transportation staff from 6 other states, members of Associated General Contractors, private contractors, a U.S. Army Corps of Engineering staff member, and other construction experts and consultants were interviewed to learn about their construction management processes. Finally, magazine and journal articles, recent legislation, reports from other states, and Federal Highway Administration and National Cooperative Research Program reports were reviewed to identify construction management trends.

In addition, this audit focused on ADOT's vehicle use and equipment preparation time. Calendar year 1996 data for 1,002 light vehicles was analyzed to determine vehicle use. Preparation time data for 61 vehicles issued in 1996 that needed attachments was also analyzed to determine if preparation delays had been reduced. Finally, ADOT equipment services officials and staff, transportation staff from 5 other states, and the Director of the Arizona Correctional Industries were interviewed to determine current fleet management practices and the feasibility of various options to reduce vehicle underutilization and equipment preparation delays.

This audit was conducted in accordance with government auditing standards.

The Auditor General and staff express appreciation to the Department's Director, the State Engineer, and their staff for their cooperation and assistance throughout the audit.

## **FINDING I**

### **THE DEPARTMENT NEEDS TO BETTER MANAGE CONSTRUCTION COST INCREASES**

The Department needs to address increasing construction project costs. Cost management is critical to the efficient use of construction monies because each 1 percent of unnecessary costs that ADOT can avoid during the next five fiscal years equals more than \$30 million. To help ensure that construction projects are completed as close to the original contract amount as possible, ADOT management needs to clearly communicate a challenging construction cost target to construction managers. ADOT can also minimize future construction cost increases by evaluating factors that have caused cost increases and incorporating the resulting information into future projects.

#### **Construction Costs of \$3 Billion During the Next Five Fiscal Years**

Controlling construction project costs is vital to ensure that highway construction monies are used most efficiently. While some cost increases are difficult to avoid, such as changes in federal specifications, others, such as omissions in designs and quantity changes, can be better managed. During the next five fiscal years, the Department has planned to start more than \$3 billion in statewide construction projects. Because every percentage point increase in unnecessary costs that ADOT can avoid would reduce taxpayer expense by more than \$30 million, it is essential that ADOT better manage construction cost increases now to help minimize future expenses.

#### **Project Completion Costs Have Exceeded Original Contract Amounts**

The availability of future construction monies could be impacted if ADOT project completion costs continue to exceed original contract amounts. During the last 4.5 years, construction projects have exceeded their original contract amounts by an overall difference of 5.3 percent.

**Project costs exceed original contract amounts**—During the last 4.5 years, construction projects were completed at a cost of more than \$61.5 million, or 5.3 percent, over original contract amounts. During this period, original contract amounts totaled approximately \$1.16 billion, but projects were completed at a cost of more than \$1.23 billion. As illustrated in Table 1, construction projects have exceeded their original contract amounts by 2.9 to 7.6 percent annually. Construction projects completed in 1997 to date have the greatest increase, 7.6 percent more than original contract amounts.

Table 1

**Arizona Department of Transportation  
Completed Construction Projects  
Calendar Years 1993 through 1997  
(Unaudited)**

Year	Projects	Original Contract Amount	Final Amount	Dollar Difference	Percentage Difference
1997 *	76	\$ 150,477,816	\$ 161,944,933	\$11,467,117	7.6%
1996	151	248,765,709	262,608,295	13,842,586	5.6
1995	131	262,261,453	278,579,773	16,318,320	6.2
1994	97	178,015,778	188,531,146	10,515,368	5.9
1993	<u>115</u>	<u>324,429,088</u>	<u>333,880,371</u>	<u>9,451,283</u>	2.9
Total	<u>570</u>	<u>\$1,163,949,844</u>	<u>\$1,225,544,518</u>	<u>\$61,594,674</u>	
Overall percentage difference					5.3

\* Only projects completed in January through June 1997 are included.

Source: Auditor General staff summary of data presented in Arizona Department of Transportation State Engineer Reports for 1996 through June 1997.

**Similar cost increases could impact future construction monies**—Similar construction cost increases could impact the availability of future construction monies. As mentioned previously, ADOT has planned to start \$3 billion worth of construction projects during the next five fiscal years. Project completion cost increases ranging from 2.9 to 7.6 percent during the next 5 fiscal years will equal \$87 million to \$228 million. Therefore, any unnecessary cost increases ADOT can avoid on these projects could provide monies for other projects.

### Clear Project Cost Target Needed

To help ensure that projects are completed at a cost as close to their original contract amounts as possible, ADOT management needs to clearly communicate to construction managers a

challenging construction cost target. This target should be completing all projects within their original contract amounts. Highway construction consultants have stated that, although cost increases are not uncommon or unexpected during construction, project engineers should always target completion costs at the original contract amount. However, ADOT construction project managers indicated that keeping construction costs within 105 percent of the original contract amount is acceptable. One reason for this perception is that some Department policies appear to validate a 105 percent target. For example, ADOT has a formal construction cost objective of 105 percent. This cost objective includes an additional 5 percent of the original contract amount to cover unavoidable cost increases that may occur during construction, such as changes in federal requirements. Further, project cost increases that surpass the 105 percent construction cost objective require additional approval from ADOT central management. Although these policies are appropriate for budgeting and controlling construction costs, they should not be misconstrued by project managers to establish a 105 percent target. Therefore, ADOT senior management needs to clearly communicate this distinction to its construction managers to help ensure maximum concern for cost management at the project level.

ADOT management supports a construction cost target within the original contract amount. Department management acknowledged the need to communicate this cost target to construction managers. Both ADOT management and construction managers stated that the challenge to complete projects on time has been their primary concern and construction cost management has been secondary. ADOT is in the midst of its largest construction effort ever, with a primary focus on completing the Phoenix metropolitan freeway system. Because of this system's impact on traffic and business, ADOT is under great pressure to complete construction as soon as possible.

## **Evaluation of Project Cost Increases Can Help Minimize Future Expenses**

In addition to adopting a challenging construction cost goal, ADOT needs to evaluate why construction cost increases have occurred and use that information to determine cost-saving measures for future projects. To determine cost-saving measures, first ADOT needs to collect, classify, and evaluate cost increase information for each construction project. Then evaluation results need to be communicated to other ADOT employees who can use the information to invoke cost-saving measures. Specifically:

- **Collect information**—Collecting information on project cost increases will allow projects to be more effectively evaluated and lead to possible process improvements. The Department currently collects some information concerning project cost increases by reviewing project change orders, which are formal documents that add or delete work in the contract and adjust the contract amount accordingly. However, ADOT does not

currently collect all project cost increase information involving quantity changes. A project can experience a significant increase in cost through a quantity change. For example:

A construction contract to add a passing lane to an existing state road called for the removal of 60 trees. By the time construction was completed, however, 563 trees had been removed. This increased quantity added \$176,060 to the project's cost. However, this cost increase information was not recorded on a change order for future analysis by the Department.

- **Classify information**—Due to the complexity of highway construction, many factors can contribute to a project's increased completion costs; therefore, categorizing project cost increase information needs to be very specific. However, ADOT currently uses only ten classifications, resulting in some categories too broad to adequately define the exact nature of the cost increase. In addition, the Department classified only \$5.7 million of almost \$14 million in project cost increases occurring in 1996 completed projects. Incomplete and poorly classified project information impedes the Department's ability to fully understand and evaluate the factors impacting construction cost increases.
- **Evaluate information**—Once the factors that contribute to construction project cost increases have been collected and classified, ADOT management needs to carefully review this information to determine future construction process improvements. Currently, the Department does not evaluate the information it collects regarding cost increases. During the course of the audit, however, the Assistant State Engineer-Construction began to informally review all construction project change orders to better understand the factors contributing to project cost increases. However, this process is incomplete because all information is not collected and the evaluation results are not communicated to appropriate personnel.

In addition to evaluating factors directly impacting project costs, the Department should also collect and analyze other information that could influence a project's completion costs, such as which contractor was used, or which ADOT construction staff and project engineers were assigned to the project. By collecting cost increase information in conjunction with other project demographic information, patterns may emerge that suggest the need for further review or closer scrutiny in future projects.

- **Improve communication**—Finally, project cost evaluation results need to be communicated to planners, designers, construction managers, and others who can use the information to minimize costs on future projects. For example, changes to a traffic control plan during construction should be communicated to the original traffic design engineer. Without knowing this information, the traffic design engineer may not realize the original design was deemed unworkable, and could unknowingly repeat the mistake.

## Recommendations

1. The Department should clearly communicate to project managers that the target for completing highway construction projects is within the original contract amount.
2. The Department should take the following steps to better manage construction project cost increases:
  - a. Collect all information related to construction project cost increases;
  - b. Classify the information into well-defined, specific categories;
  - c. Formalize the process for reviewing project-specific information to identify construction-related factors that cause cost increases; and
  - d. Effectively communicate the reasons for all contract revisions to those originally responsible for affected parts of the construction project.

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## FINDING II

### IMPROVEMENTS TO THE PROJECT DESIGN PHASE CAN BETTER CONTROL CONSTRUCTION COST INCREASES

The Department can better control the construction cost increases previously discussed by improving the operation of its Project Management Process. Most cost increases can be traced to the design phase. To ensure coordination and oversight of design phase activities, ADOT management needs to reaffirm the importance of the Process to its employees and implement two tools.

A construction project has four main development phases: concept development, design, construction, and operation/maintenance. A project's design phase involves preparing comprehensive design and construction documents suitable for competitive bidding. This phase includes a wide variety of activities, such as material analysis, roadway design, environmental permitting, traffic analysis, and developing contract specification documents.

#### **Most Cost Increases Are Related to the Design Phase**

Most construction cost increases over the contract amounts are related to design phase factors, which reflects highway construction experiences nationally. For calendar year 1996, approximately 65 percent of documented cost increases over the contract amounts were due to design errors and omissions, contract specification problems, and extra work not originally identified in the design phase.<sup>1</sup> The following projects all experienced design phase-related cost increases:

**TONTO NATURAL BRIDGE STATE PARK:** During construction, a \$327,546 change order was approved to correct inaccurate specifications. The contract documents indicated that the roadway excavation material was of sufficient quality to build an embankment when, in fact, it was not.

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<sup>1</sup> The Department collected information related to less than \$5.7 million of the nearly \$14 million in cost increases over the original contract amounts in calendar year 1996. Of the less than \$5.7 million, more than \$3.6 million, or almost 65 percent, was related to design phase factors.

**DW RANCH ROAD—Junction US 93:** During construction, a \$99,469 change order was approved to replace existing guardrail locations that were not included in the project plans.

**US 60 at Milepost 227:** During construction, a \$68,382 change order was approved to correct an error in the project plans. The project plans required the top elevation of a retaining wall to match the cross slope of the existing highway but did not specify enough concrete and steel to accomplish the match.

Nationally, construction industry representatives indicate that 70 to 75 percent of problems encountered during construction are generated in the design phase. Additionally, a 1995 National Cooperative Highway Research Program (NCHRP) Synthesis evaluated 42 states' highway practices and concluded that problems that lead to additional compensation for the contractor often can be minimized by actions taken in the design phase.<sup>1</sup>

## **Project Management Process Needs to Be Fully Operational**

Although ADOT recently instituted the Project Management Process (Process) to actively coordinate and monitor design phase activities, it needs to fully execute the Process to better control construction costs. The Process provides for the management of design phase activities and can help minimize cost increases during construction. However, the Process is not fully operational, and in order to improve its operation, ADOT needs to take several actions.

As discussed earlier, a project's design phase involves many different activities and has significant influence over the project's final cost. All of these activities must be coordinated and incorporated into one comprehensive design package before the project can be advertised for bids. Failure to do so may lead to omissions, overlaps, and other deficiencies in the design package and contract documents. These deficiencies are often resolved by change orders during construction, which can result in construction cost increases.

***Project Management Process created to minimize loss***—The Project Management Process enables ADOT to focus on design phase activities so that it can produce projects with minimal errors and omissions and fewer construction problems or design changes that result in projects that exceed budgets. Between 1993 and 1994, an ADOT process development team developed an extensive Project Management Process. Under this Process, ADOT technical experts and other local area representatives form a project team to develop comprehensive

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<sup>1</sup> NCHRP Synthesis 214, A Synthesis of Highway Practice, 1995.

project design and contract specification documents for each construction project.<sup>1</sup> In order for the Process to succeed, team members must participate in or respond to several design phase key events, such as four design review stages.

***Project Management Process not fully operational***—Interviews with ADOT staff and an ADOT internal survey indicated that the Process is not fully executed. A recent ADOT survey of 69 project team members and follow-up interviews indicated that project team members do not consistently participate in design phase key events, particularly the four design review stages. In addition, ADOT staff indicated that sometimes when one team member provides information late or does not participate in key events, the other team members may have to estimate missing data or cut corners in order to meet project schedule dates. According to the NCHRP Synthesis mentioned earlier, a lack of team member participation during the design phase can result in design deficiencies that may result in additional costs during construction.

***Several actions needed to improve the Project Management Process***—In order to improve the Process, ADOT needs to take several actions. To address participation problems, ADOT upper management needs to reaffirm the importance of the Process to its employees. Interviews with various ADOT project team members indicated a variety of reasons for nonparticipation, including workload, lack of supervisory support, and other duties. A clear upper-management message to both staff and first-line supervisors regarding the importance of the Process could help overcome these barriers to participation. Additionally, the Department needs to develop and implement two tools that can better facilitate the Process and affirm the importance management places on it.

**Management Information**

Pertinent management information is needed to identify and resolve issues that hinder staff's participation in the Process. Currently, ADOT management does not have a process in place to monitor whether all team members participate in the Process, what major decisions were made related to the project, and how major decisions were made. As a result, management does not know where to focus its improvement efforts. Better information about the Process could help identify specific reasons why a project exceeded its contract amount. Once useful management information is identified and collected, management needs to use the information to identify problem areas and resolve issues that limit the usefulness of the Process.

**Project Priority Guidance**

ADOT needs to provide better guidance to staff regarding project priorities. Currently, some projects compete for project team member input because each team member has multiple projects they are assigned to at one time. As a result, a team member may have limited or late

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<sup>1</sup> Project team members include various ADOT technical units, such as materials, roadway design, construction, and maintenance staff, as well as other interested parties such as state, federal, and local government representatives.

input in one project's design phase activities because the team member has chosen to focus on one of his/her other assigned projects. Better guidance provided to team members could help them properly allocate their time among their assigned projects and result in better coordination of design phase activities.

## **Recommendations**

1. ADOT upper management needs to reaffirm to its employees the importance of fully implementing the Project Management Process.
2. ADOT needs to improve the operation of its Project Management Process by:
  - a. Compiling project management information to document decisions made related to projects, identify specific problem areas within the Project Management Process, and resolve issues that limit the usefulness of the Process; and
  - b. Providing better project priority guidance to staff to improve allocation of team member time resources and coordination of project design phase activities.

## **FINDING III**

### **PARTNERING PROGRAM IMPROVEMENTS NEEDED**

ADOT should take steps to improve its partnering program. ADOT established a partnering program in 1991 to improve its relationships with construction contractors. Although a reduction in contractor claims and accompanying litigation appears to coincide with ADOT's establishment of partnering, it is difficult to measure partnering's impact on project costs and completion times. Therefore, ADOT should focus its efforts on improving several aspects of its partnering program to ensure the program operates consistently for each construction project.

#### **What Is Partnering?**

Partnering is a teamwork-oriented construction management method that attempts to eliminate adversarial relationships between State Departments of Transportation (DOTs) and construction contractors for the benefit of both parties. Historically, state DOT's, including ADOT, and contractors have had adversarial relationships because each party sought to protect its own interests. Partnering's team-oriented approach is a means to improve relationships with contractors, and it generally entails workshops, meetings, and a formal conflict resolution process to develop and sustain collaborative teamwork between Department and contractor staff. The potential benefits to be gained from improved relationships include reduction or elimination of contractor claims and accompanying litigation, as well as project cost and timeliness improvements.

Since ADOT began partnering in the early 1990s, use of partnering among state transportation agencies has expanded rapidly. ADOT began using the partnering approach to construction management in 1991. Since 1992, ADOT reports that all construction projects have been partnered and as of March 31, 1997, there have been 384 projects completed. In addition, a 1996 survey of state transportation departments conducted by a private consulting firm found that 44 of 46 states responding to the survey had direct experience with partnering, and 37 of these states had established formal partnering programs.

## **Measuring Partnering Impact Is Difficult**

Although a reduction in contractor claims appears to coincide with the establishment of ADOT's partnering program, it is difficult to measure partnering's impact on project costs and completion times. Since partnering was implemented, ADOT has virtually eliminated formal construction claims. However, it is difficult to obtain numerical evidence of partnering's success related to project cost and timeliness improvements.

Since partnering was adopted, ADOT has virtually eliminated formal construction claims. When the partnering concept was adopted in 1991, ADOT had 60 active claims valued at over \$23 million. Claims are contractors' formal requests for payment for additional work performed or other increased costs to complete construction projects. Contractors file claims when ADOT and the contractor are unable to resolve the cost issues informally. Claims are resolved through formal methods such as mediation, arbitration, or litigation. The Department reports that only two formal claims have been filed on partnered projects. All other cost issues have been resolved using the partnering process.

In contrast, partnering's impact on construction costs and time are difficult to measure. Nationally, researchers have found it difficult to measure partnering's impact on project cost and completion time. Some studies have noted that it is difficult to quantitatively measure the impacts of partnering, and report that there is little numerical evidence of partnering's success. One method of evaluating partnering suggested by researchers is to compare partnered projects with nonpartnered projects in terms of cost growth, completion time, contract administration cost, value engineering savings, and interpersonal attitudes. However, because all ADOT construction projects since 1992 have been partnered, there is currently no way to compare projects using this approach.

## **ADOT Can Take Steps to Improve the Partnering Process**

Although measuring impact is difficult, the Department should focus efforts on improving its partnering program process. As a starting point, ADOT should address four concerns raised by ADOT staff and contractor personnel. The Department should: 1) develop guidelines to ensure greater consistency in issue resolution statewide; 2) provide better feedback to ADOT staff and contractors regarding decisions made when issues are forwarded to higher levels of management; 3) continue efforts to customize its initial partnering workshops and develop additional training on critical partnering skills and procedures; and 4) improve ongoing evaluations of its partnering relations.

Department staff and contractors have expressed concerns about ADOT's partnering program. Since October 1996, ADOT has solicited feedback on its partnering program from its

own staff and private contractors through focus group meetings and a one-day partnering conference. A 1997 ADOT partnering conference summary document states that “The initial success enjoyed over the past 4 years is wearing thin in some aspects of partnering causing mistrust, lack of commitment to partnering concepts and a general feeling that the other factions are either not partnering or using partnering to their own advantage.” Despite these problems, a majority of ADOT staff and private contractors participating in these meetings believe partnering is working as intended and is preferable to the more adversarial approach to construction that preceded it. Focus group and partnering conference participants identified several ways to strengthen ADOT’s partnering program, which are discussed below.

***Guidelines needed for issue resolution***—The Department could improve the consistency of decisions ADOT staff make by developing clear guidelines for issue resolution and monitoring their application statewide. Currently, there is a multi-step process the Department follows to resolve contract issues that arise with the contractor during construction. First, the ADOT project engineer tries to resolve the issue at the local project level. If the issue remains unresolved at the local project level, the issue is immediately escalated, or forwarded, to the next level, the District Engineer’s Office. If still unresolved, the issue is escalated to the highest level, the State Engineer’s Office.

In October 1996, ADOT’s local project resident engineers submitted a report to the Department’s management team that outlines problems with the escalation process. Resident engineers expressed concern that the escalation process, as currently practiced, varied statewide. Concerns ADOT’s resident engineers noted included:

- Proper escalation channels occasionally are not followed;
- Frivolous escalations and small-dollar issues are escalated to management;
- The contractor sometimes reintroduces previously resolved issues at a later date; and
- The escalation process is abused at times, with some contractors manipulating the system to achieve additional compensation.

Developing issue resolution guidelines could help ensure greater consistency in decision-making. Resident engineers recommended that ADOT clearly define the escalation process and develop specific guidelines so the process is better understood and more consistently followed. Department staff and contractor personnel who participated in a January 1997 partnering conference also recommended the escalation process be standardized and issue resolution efforts be monitored to encourage decision-making consistency.

***Improved feedback needed***—Feedback mechanisms need to be developed to communicate the rationale for decisions made in the escalation process. A 1994 review of ADOT’s part-

nering program by the Federal Highway Administration (FHWA) found that “the full rationale for a decision is frequently not provided.” The FHWA reported that receiving the rationale for decisions is very important to staff, and recommends that ADOT take steps to assure the timely dissemination of such information. The Department’s resident engineers also stressed the importance of feedback concerning decisions made in the escalation process. They suggested establishing a newsletter or information center to communicate information about issues that have been escalated. The resident engineers feel that knowing the outcomes of escalated issues can help them learn what types of issues are typically decided in the Department’s favor, rather than the contractor’s, for future reference.

***Improved training needed***—Initial partnering workshops need to be customized to better meet the needs of project teams, and additional training in partnering concepts and related skills needs to be developed. Partnering workshops are held at the beginning of each construction project. ADOT and contractor staff who participated in an October 1996 focus group meeting identified the need to tailor partnering workshops based on a variety of factors, including the project’s nature and complexity and the mutual familiarity of the project team. They recommended that both ADOT and contractor staff play a role in planning the workshop. ADOT has since initiated efforts to customize initial partnering workshops.

While the initial partnering workshops provide some discussion of partnering concepts, additional training is needed. The Department has developed little formal training in partnering concepts, skills, and procedures. Those who participated in the October 1996 focus group meeting identified the need for training in such areas as negotiations, the issue resolution process, and conducting monthly evaluations.

***Enhancements to evaluations of partnering relationships needed***—Another way partnering can be improved is by enhancing the ongoing evaluation of partnering relationships. Although it is difficult to assess partnering’s impact on project cost and time, the Department can do more to evaluate partnering relationships. ADOT’s current efforts are hampered because information from monthly project evaluations and project close-out workshops is incomplete. Although each project team is supposed to submit a monthly evaluation to ADOT’s Partnering Section, the Partnering Section currently receives monthly evaluations from only 10 to 15 percent of all project teams.

In addition, although project teams are generally required to hold project close-out meetings at the end of construction, only 74 close-out workshops of 384 partnered projects have been held since 1991. Close-out workshops are important because they provide an opportunity to assess project performance and discuss lessons learned.

## **Recommendation**

1. The Department should take the following steps to improve its partnering program for highway construction projects:
  - a. Develop clear guidelines for the issue resolution process and routinely monitor their application statewide to ensure greater consistency in decision-making;
  - b. Develop feedback mechanisms to communicate the rationale for decisions made in the escalation process;
  - c. Continue efforts to customize initial partnering workshops and begin to develop training courses for both ADOT and contractor staff concerning basic partnering concepts, essential partnering skills, and ADOT partnering procedures; and
  - d. Strengthen ongoing evaluation of partnering relationships by ensuring that monthly evaluations and project close-out workshops are held consistently, and that the information gathered is used to assess needed changes.

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## FINDING IV

### USE OF VALUE ENGINEERING AND DESIGN-BUILD CONTRACTING CAN HELP REDUCE PROJECT COSTS AND COMPLETION TIMES

Use of value engineering and design-build contracting can help reduce project costs and completion times. Recent changes ADOT has made to its value engineering program may increase its use by contractors. Further, design-build contracting may prove to be cost beneficial and reduce project completion times.

#### **Recent Changes to Value Engineering Program May Increase Its Use**

The use of value engineering has declined and recent value engineering results are disappointing. However, recent changes ADOT has made to its value engineering program may increase its use.

Value engineering proposals modify projects' plans or specifications to reduce construction costs without sacrificing quality or safety standards. The Department also considers value engineering proposals that provide a better product at a higher initial cost if the overall project lifecycle cost will be lower. Contractors submit value engineering proposals to ADOT for review and approval. According to ADOT, most proposals are submitted before construction begins. When value engineering results in cost savings, the savings are split equally between the contractor and ADOT.

***Recent value engineering results disappointing***—Value engineering and its cost savings have declined substantially. Since late 1991, when ADOT implemented its partnering program, ADOT reported value engineering savings of over \$3.7 million on projects completed through the end of calendar year 1995. However, projects completed during calendar year 1996 only accounted for \$115,000 in value engineering savings. A Department report estimated that value engineering proposals could potentially save 1 to 2 percent of the original contract amount for every construction project, which would equal \$2.1 million to \$4.3 million for fiscal year 1996 projects. A 1995 Maryland State Highway study reported an average value engineering cost savings of 6 percent.

***Recent changes may increase use of value engineering***—Recently, ADOT has made some changes to its value engineering program that may increase its use. Contractors indicated

that they have been reluctant to invest valuable time and money developing proposals because the Department sometimes took too long to review and analyze the plans. In addition, contractors stated that increased value engineering savings would be realized if ADOT more quickly evaluated proposals. In October 1996, ADOT incorporated into its contract specifications book a 10-day review period to determine whether a contractor's initial value engineering submittal has merit and should be submitted formally. Within 30 days of the proposal's submission, ADOT must accept or reject it. Contractors indicated it is still too early to determine whether these review time frames are acceptable. Therefore, ADOT should monitor the use of value engineering since incorporation of the review standards and determine if any further modifications are needed to further encourage the use of value engineering.

Additionally, the Department should ensure that successful proposals are incorporated into future projects. A 1997 ADOT internal audit found "There is currently no formalized process to ensure that [value engineering] proposals are incorporated into the design of future projects." As a result, ADOT may pay contractors more than once for repeat value engineering proposals. However, monitoring these engineering proposals would allow ADOT to realize 100 percent of the future savings.

### **Design-Build Methods Could Impact Construction Costs and Time**

Another option that could potentially help control costs and reduce construction time is the use of design-build contracts. Design-build contracts are innovative contracting alternatives to the conventional design-bid-build contracting system. Other states have experimented with design-build contracts and report reduced costs and/or time savings for particular types of projects. In 1996, ADOT received legislative authorization to conduct two design-build pilot projects and the final evaluation report is due by December 1998. If design-build proves to be an effective contracting alternative, other design-build variations should be explored for further cost and time savings.

The construction industry is experimenting with design-build contracts. A design-build contract is an alternate contracting method in which the contractor is responsible for both the design and construction phases of the project. However, ADOT still approves the design before construction begins and all changes to the design during construction. In contrast, the more traditional contracting method ADOT uses is one in which a project design is developed by ADOT or a design company and then advertised to obtain construction contractor bids.

***Other states report positive results***—Other state Departments of Transportation have tested design-build programs and report positive results for certain types of projects. A 1996 Federal Highway Administration draft paper reports that Pennsylvania, Florida, and Colorado

realized cost and/or time savings with design-build contracts.<sup>1</sup> For example, Pennsylvania reported that design-build construction project costs were comparable to conventionally designed projects with a reduction in the Department's design costs. This suggests that design-build projects may be more cost-effective than conventionally designed projects. Additionally, Florida's experience with an 11-project pilot design-build program indicated that design-build projects produced a significant reduction in after-bid change orders, which contribute to construction cost increases. Also, Florida reported that an average design-build project takes 35.7 percent less time to construct than a nondesign-build project. However, Florida reported design-build contracts to be more successful with projects such as bridges, raised pedestrian walkways, and canals than with roadways.

***ADOT authorized for two design-build pilot projects***—Laws 1996, Chapter 146 permits ADOT to use design-build contracting methods for two transportation projects. One project, the I-10 interchange at Cortaro Road, went out for bid on July 3, 1997, and is currently under construction. ADOT has not yet identified the second project.

A legislative committee will evaluate the design-build contracting method and submit a final report by December 1998 that includes a recommendation as to whether design-build should be a permanent contracting alternative for ADOT. In order to assist the committee, ADOT has contracted with Arizona State University to develop and collect project evaluation data.

***Variations of design-build being tested***—Some other states are experimenting with variations of design-build contracting. Michigan and Utah have awarded design-build-warranty and design-build-maintenance contracts in attempts to better manage project costs. These contracts require contractors to design, construct, and maintain or warranty the projects for time periods ranging between two and five years. If design-build becomes a permanent contracting option, ADOT should investigate the potential these variations have to further control costs and improve completion times.

## Recommendations

1. The Department should monitor its value engineering program to determine if any further modifications are necessary to encourage its use by contractors.
2. The Department should monitor successful value engineering proposals and incorporate them into future projects.

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<sup>1</sup> *Assessment of Contract Management Techniques for Improving Construction Quality*, Trauner Consulting Services Inc., April 1996.

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## **FINDING V**

### **ADOT STILL HAS MANY LIGHT VEHICLES WITH LOW MILEAGE USE AND IS ALSO EXPERIENCING EQUIPMENT PREPARATION DELAYS**

The Arizona Department of Transportation should monitor vehicle utilization and explore options to further reduce equipment preparation time and costs. One hundred forty-four of ADOT's light fleet vehicles have very low mileage use. Additionally, although ADOT has addressed serious equipment preparation delays, further improvements may be possible.

ADOT's light fleet vehicle inventory includes sedans, station wagons, pickups, and vans. As of March 1997, ADOT had approximately 1,300 permanently assigned light fleet vehicles, about the same number as there were in 1987.

#### **Light Vehicles Continue to Have Low Mileage Use**

ADOT still has many vehicles with low mileage use. In 1996, 144 light fleet vehicles had low mileage use. ADOT needs to take steps to better identify whether these low mileage use vehicles are underutilized to help control fleet inventory. ADOT has a history of vehicle utilization difficulties. Office of the Auditor General Reports in both 1983 (Auditor General Report No. 83-2) and 1987 (Auditor General Report No. 87-9) found ADOT's light vehicles were underutilized.

Although ADOT has no formal mileage use standard for its light fleet vehicles, Equipment Services' management consider vehicles driven under an average of 800 miles per month to have low use. This audit considered vehicles driven under 500 miles per month to have low mileage use.

All vehicles assigned to billable organizations as of February 1997 that reported monthly mileage use in calendar year 1996 were analyzed. For each vehicle reporting use, the yearly mileage total was divided by the number of months in which use was reported, rather than 12 months.

**One hundred forty-four light vehicles have very low mileage use**—Usage figures for 1996 were available for only 1,002 of ADOT’s permanently assigned light vehicles.<sup>1</sup> Of these 1,002 vehicles, 144, or 14 percent, averaged less than 500 miles per month. In the absence of ADOT having any formal utilization standards and a system in place to justify vehicles not meeting utilization standards, these 144 vehicles appear to be underutilized.

Using ADOT’s informal standard of 800 miles per month to determine low mileage use, 334, or 33 percent, of the permanently assigned vehicles appear to be underutilized. Until ADOT develops and implements valid vehicle utilization standards, the extent of actual vehicle underutilization cannot be determined.

**ADOT should take steps to monitor vehicle utilization**—ADOT should take the following steps to ensure adequate monitoring of its light vehicle fleet inventory:

- ADOT should establish formal utilization standards for its light vehicles, combining miles driven with frequency of use requirements. Officials from California’s Department of Transportation (CALTRANS) and Colorado’s State Fleet Management stated that vehicle utilization should be measured by reviewing both mileage and frequency of use. For example, California state policy requires that, where pool vehicles are available, permanently assigned passenger vehicles should accumulate more than 6,000 miles and/or be used on at least 70 percent of the workdays the vehicle is available in a six-month period. Where pool vehicles are not available, permanently assigned passenger vehicles should accumulate more than 4,000 miles and/or be used on at least 70 percent of the workdays the vehicle is available in a six-month period.
- ADOT should use its automated Equipment Management System to identify and report on all vehicles not meeting the utilization standards. For example, twice a year, CALTRANS identifies for its districts all underutilized vehicles based on data collected for the prior six months.
- ADOT should establish a formal process for justifying those vehicles that do not meet utilization standards. Supervisors should be responsible for justifying the vehicle assignment for all vehicles in their organizations that do not meet utilization standards. CALTRANS uses a standard form to document the user’s reasons for underutilization and whether the vehicle was found to be justified. If justified, the vehicle is retained on assignment; otherwise, the vehicle is reassigned to another cost center or the motor pool.

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<sup>1</sup> Calendar year 1996 usage data was readily available for only those light vehicles used in 1996 that were assigned to billable units within ADOT at the time of this audit. Some vehicles used in 1996 have since been replaced with new vehicles, while others have been transferred to nonbillable units. Further, some vehicles assigned to billable units at the time of this audit are new vehicles and therefore were not used in 1996.

- ADOT Equipment Services management should be given clear authority to reassign underutilized, unjustified vehicles to other organizations within the Department that can better use them. If they cannot be better used by another organization, ADOT should not replace them at their scheduled time of replacement, but should continue to use either the ADOT motor pool or the Arizona Department of Administration motor pool to meet peak vehicle demands.

**1983 and 1987 audits identified same problems**—Office of the Auditor General reports in 1983 and 1987 on ADOT’s Equipment Services Section (see Report 83-2 and 87-9) found the same problems that exist today. The 1983 report found 50 percent of ADOT’s automobiles and light trucks were driven less than ADOT’s informal mileage use standard. The 1987 report found some improvement, although more than 15 percent of ADOT’s light vehicles continued to have low mileage use. Both reports found the absence of utilization standards and inadequate monitoring of vehicle utilization to have contributed to the low utilization figures.

### **Most Serious Equipment Preparation Delays Addressed, but Further Improvements May Be Possible**

ADOT has rectified some specialty equipment preparation delays identified in the 1987 audit; however further improvements may be possible. ADOT has addressed the most serious equipment preparation delays, but some lengthy preparation delays still occur. ADOT’s Equipment Services Section now monitors the preparation process and follows proper procedures in planning for new equipment issuance, which has helped ADOT address serious equipment preparation delays. However, ADOT should explore other options that could further improve specialty equipment preparation timeliness and/or reduce costs.

ADOT’s Equipment Services Section is responsible for preparing and issuing new equipment to all ADOT users. Equipment preparation ranges from minimal (applying decals and lights to passenger cars) to more major effort (attaching specialized bodies and other components to chassis). The Department frequently contracts with vendors to fabricate and attach the specialized bodies and components to the chassis. The vehicles in this review include those vehicles issued in 1996 for which ADOT contracted with vendors for fabrication and attachment needs.

**Most serious preparation delays have been addressed, but lengthy delays still occur**—The most serious preparation delays identified in the 1987 audit have been addressed, but some lengthy delays still occur. Preparation time is measured from the date Equipment Services accepts the chassis to the date it issues the completed vehicle to the user. The 1987 report found that from 1984 to 1987, 11 vehicles took 18 months or longer to be issued to users, with

5 of the 11 vehicles taking 2 years or more. This audit did not find any vehicle issued in calendar year 1996 for which ADOT contracted with vendors for fabrication and attachment needs to take as long as 18 months to be issued; however, some lengthy delays still exist. For example, of the 61 vehicles issued in calendar year 1996 requiring attachments from vendors, 48 took over 6 months to be issued to users. Further, 12 of these vehicles took over 1 year to be issued to users.

***Implementation of previous audit recommendations has helped ADOT address serious equipment preparation delays***—As was recommended in the 1987 audit, Equipment Services' management now monitors the preparation process and follows procedures for planning new equipment issuance that have helped ADOT address serious equipment preparation delays. Previously, Equipment Services' management was unaware of the extent of equipment delays because they did not monitor new equipment preparation. Now, using a project management database, Equipment Services monitors each vehicle from the date ADOT issues the requisition to buy the chassis to the date Equipment Services issues the completed unit to the user.

Additionally, Equipment Services' management follows procedures that were recommended in the 1987 audit in planning for new equipment issuance. Previously, poor planning was found to have contributed to the excessive delays. For example, Equipment Services' management waited to complete the specifications for the chassis' specialized bodies until after the chassis were received. Now, management completes body specifications, issues solicitations, and selects vendors to perform fabrication and attachment needs before the chassis are expected to be delivered to ADOT.

***ADOT should explore other possibilities for improvement***—ADOT may be able to further reduce equipment preparation time frames and/or reduce costs by 1) addressing a problem with vendor contracts; and 2) considering a process used by some other states to prepare equipment.

ADOT should change a practice that unnecessarily extends the amount of time given vendors to prepare equipment. Currently, prior to sending out to vendors the formal solicitation to bid on equipment preparation jobs, ADOT contacts several prospective vendors to identify estimated delivery time frames. ADOT routinely selects the longest time frame estimate provided to include in the formal bid document. According to ADOT, this is done to allow smaller vendors the opportunity to bid on these jobs.

However, ADOT routinely adds an *additional* 30 days to the contract to ensure that contractors have sufficient time to complete the work. This practice is unnecessary and contributes to equipment preparation delays.

To further reduce equipment preparation time, ADOT should explore participating in a program with Arizona Correctional Industries (ACI) in which inmates would be responsible for truck and trailer fabrication, attachments, and refurbishment for ADOT. Similar

programs have been established in Ohio and Texas. According to Ohio DOT officials, Ohio Penal Institutions (OPI) has a vehicle preparation time of approximately six months with cost savings comparable to using private industry vendors. However, unlike Arizona, Ohio state law requires state agencies to purchase goods from OPI. According to ACI's director, ADOT would have to exhibit a committed interest before this capital-intensive program could be established. Management from both ADOT's Equipment Services Section and ACI are interested in the benefits such a program could provide; therefore, an ad-hoc committee should be formed to further explore program implementation.

## **Recommendations**

1. ADOT should take steps to monitor vehicle utilization by:
  - a. Establishing formal utilization standards for its light fleet vehicles;
  - b. Using its automated Equipment Management System to identify and report on all vehicles not meeting the utilization standards;
  - c. Establishing a formal process for justifying those vehicles that do not meet utilization standards; and
  - d. Giving authority to Equipment Services management to reassign and eventually reduce ADOT's fleet size by not replacing underutilized, unjustified vehicles.
2. ADOT should eliminate the 30-day cushion it currently adds to the delivery time frame for the completed unit in order to reduce equipment preparation delays.
3. ADOT should study whether participating in a program with Arizona Correctional Industries in which inmates would be responsible for truck and trailer fabrication, attachments, and refurbishment would improve vehicle preparation timeliness and be cost-effective.

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## OTHER PERTINENT INFORMATION

During the course of the audit, other pertinent information was developed relating to the condition of Arizona roadways and bridges.

### **Arizona Roads Are Well Maintained**

Arizona pavement conditions are better than those nationally and compare favorably to other Western states. ADOT has established a Pavement Preservation Program to keep roadways in good condition. To help achieve this goal, the State Transportation Board approves sufficient funding for this program to maintain roads in accordance with current standards. In addition, maintaining pavement conditions is a top priority for ADOT Districts' maintenance staff.

**Arizona roads rank favorably**—As shown in Table 2 (see page 32), Arizona's roads are in better condition than roads nationally and compare favorably to the five contiguous states. Urban interstates and arteries in Arizona are in better condition than those in California, Colorado, Nevada, New Mexico, and Utah. Further, Arizona rural roadways are in better condition than those in California, Colorado, and New Mexico.

To evaluate pavement conditions, the Federal Highway Administration (FHWA) annually collects data indicating road conditions from each state. The FHWA uses the International Roughness Index (IRI) to determine pavement conditions. The IRI is an objective measure of pavement roughness developed by the World Bank, and is accepted as a standard in pavement evaluation. States report rural and urban roadways' pavement conditions. These roadways are divided into interstate, other freeway, other principal arteries, and minor arteries. The FHWA uses the IRI measurement to rank roadways accordingly.

**Arizona identifies and funds roadway needs**—To ensure that roadway conditions remain in favorable condition, ADOT established the Pavement Preservation Program. This program is designed to monitor the condition of Arizona highways and identify rehabilitative actions needed to maintain or improve the condition of Arizona roads. Pavement Preservation staff inspect each mile of state highway annually to assess ride roughness, cracking, and other factors such as rutting, friction, flushing, and faulting.<sup>1</sup> This data is analyzed by the Network Optimization System (NOS), a statistical modeling program that determines the most cost-effective method to allocate resources for pavement rehabilitation projects. Sections of road-

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<sup>1</sup> "Friction" represents the amount of asphalt on the roadway surface, which may be smooth, shiny, or even sticky in the summer. "Flushing" represents the ability of pavement to stop a vehicle. "Faulting" represents the difference in elevation of two concrete slabs on each side of a concrete pavement joint.

ways are then identified for rehabilitation to keep an adequate number of roadway miles in good condition. Finally, Pavement Preservation and District staff prioritize rehabilitation projects and submit a five-year plan to the State Transportation Board for approval.

The State Transportation Board approves sufficient funding for the Pavement Preservation Program to maintain roads in accordance with current standards. For fiscal year 1996, the Board approved the start of approximately \$66.4 million worth of pavement preservation projects. Additionally, the Board has approved the start of projects totaling approximately \$76 million in fiscal year 1997 to \$98 million in fiscal year 2000. NOS predicts that annual funding needs should remain constant once funding reaches approximately \$100 million. This amount should fund a sufficient number of rehabilitation projects to keep an adequate number of roadway miles in good condition.

**Table 2**

**Pavement Condition Comparison Rankings  
for Arizona, Five Contiguous States, and Nationwide  
Urban and Rural Roadways  
Calendar Year 1995**

<b>URBAN</b>			
<b>Comparison Rank</b>	<b>Interstate Highways</b>	<b>Other Freeways</b>	<b>Other Principal Arteries</b>
1	Arizona	Utah	Arizona
2	Utah	Nevada	Utah
3	Nevada	Arizona	Nevada
4	Nationwide	California	California
5	New Mexico	Nationwide	New Mexico
6	California	Colorado	Nationwide
7		New Mexico	Colorado

<b>RURAL</b>			
<b>Comparison Rank</b>	<b>Interstate Highways</b>	<b>Other Principal Arteries</b>	<b>Minor Arteries</b>
1	Nevada	Utah	Utah
2	Utah	Nevada	Nevada
3	Arizona	Arizona	Arizona
4	Nationwide	Nationwide	Nationwide
5	New Mexico	California	California
6	California	New Mexico	New Mexico
7	Colorado	Colorado	Colorado

Source: Auditor General staff analysis and summary of data in *Highway Statistics 1995*, U.S. Department of Transportation, Federal Highway Administration.

***Roadway conditions are a maintenance priority***—In addition to the Pavement Preservation Program’s rehabilitative efforts, ADOT’s District maintenance staff are responsible for maintaining roadway surface conditions. District maintenance staff perform such activities as pot-hole and crack filling, sand sealing, chip sealing, and flush coating. For fiscal year 1996, approximately 18 percent of the Districts’ maintenance budgets was spent on road surface maintenance activities.

## **Arizona Bridges Rank No. 2 in the Nation**

Data compiled by the Federal Highway Administration (FHWA) show that in 1996, Arizona bridges were ranked No. 2 in the nation when compared to all other states.<sup>1</sup> Only Nevada, which has 943 bridges to maintain compared to Arizona’s 4,225 bridges, ranks higher. Table 3 (see page 34) shows the percentage of bridges in Arizona ranked “good” and “substandard” compared to contiguous states and the national total.

ADOT’s Bridge Preservation Program is managed by the Department’s Bridge Management Section, which is responsible for providing the FHWA with bridge inspection reports. This section is also responsible for identifying and prioritizing all bridge repair and rehabilitation projects.

The State Transportation Board approves sufficient funding for the Bridge Preservation Program. Annual funding provides for bridge inspection programs, emergency repairs, and upgrading. Funding for the Bridge Preservation Program has increased from \$1 million in fiscal years 1995 and 1996 to \$1.5 million in fiscal year 1997. Additionally, for fiscal years 1998 and 1999, approved funding levels increase to \$4 million to repair bridge girders damaged by oversized trucks.

Bridge replacement projects are primarily funded by federal dollars. Depending upon the FHWA’s assessment of Arizona’s bridges, the State generally receives enough federal funding to replace two to three bridges per year.

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<sup>1</sup> The FHWA annually rates the condition of bridges nationwide. In consultation with the states, the FHWA assigns sufficiency ratings to all bridges 20 feet or longer. The federal government then provides each state with a list of substandard bridges.

**Table 3**  
**Bridge Condition Comparison Rankings**  
**for Arizona, Five Contiguous States, and Nationwide**  
**Calendar Year 1996**

	Percentage of Good Bridges <sup>1</sup>	Percentage of Substandard Bridges <sup>2</sup>	Total Interstate and State Bridges <sup>3</sup>
Nevada	96.1%	3.9%	943
Arizona	94.5	5.5	4,225
California	86.7	13.3	12,730
Colorado	84.8	15.2	3,722
Nationwide	75.1	24.9	281,398
Utah	70.2	29.8	1,730
New Mexico	66.5	33.5	2,947

<sup>1</sup> Bridges not requiring repair, rehabilitation, or replacement.

<sup>2</sup> Bridges requiring repair, rehabilitation, or replacement, but not considered unsafe.

<sup>3</sup> Located on state and interstate highways.

Source: Auditor General staff summary of data in *Better Roads*, November, 1996.

# SUNSET FACTORS

In accordance with A.R.S. §41-2954, the Legislature should consider the following 12 factors in determining whether the Arizona Department of Transportation should be continued or terminated.

## 1. The objective and purpose in establishing the agency.

The Legislature established the Arizona Department of Transportation (ADOT) in 1974 by combining the functions of the Highway Department, originally established in 1927, and the Department of Aeronautics, originally established in 1962. The Department's mission is "To provide a transportation system, together with the means of revenue collection, licensing, and safety programs, which meets the needs of the citizens of Arizona." ADOT's key responsibilities include:

- Planning, designing, constructing, and maintaining a statewide transportation system;
- Providing vehicle title, registration, and licensing services;
- Testing and licensing motor vehicle operators; and
- Providing automobile and aircraft user and fuel revenue collection and distribution services.

The Department's responsibilities are carried out by its four operational units: Intermodal Transportation, Administrative Services, Motor Vehicle, and Transportation Support.

The Department receives guidance in capital planning and program development from the seven-member State Transportation Board appointed by the Governor. The Board is responsible for annually updating and adopting the Five-Year Transportation Facilities Construction Program and awarding contracts each month for highway projects. The Board also has authority to issue highway revenue and transportation excise tax bonds.

**2. The effectiveness with which the agency has met its objective and purpose and the efficiency with which it has operated.**

Although the Department has met its prescribed objectives and purpose, our reviews identified several areas where ADOT could improve its effectiveness and efficiency in fulfilling its responsibilities. Specifically:

- The Motor Vehicle Division (MVD) needs to improve its collection and handling of fees and taxes collected from the general public and the motor carrier industry. Specifically, MVD could improve its efficiency and effectiveness in revenue collection and oversight by better protecting cash and valuables in field offices and continuing recent efforts to enhance collection of delinquent taxes. While the report also noted deficiencies in the Division's enforcement of taxes on motor carriers, legislation passed in 1997 significantly changed the method of collecting such taxes. Specifically, the Legislature created a motor carrier fee that is paid at the time of vehicle registration, which the Department believes will help eliminate tax evasion. (Auditor General Report 97-4).
- Although the majority of its customers are satisfied with its services, the Motor Vehicle Division could further improve the delivery of driver licensing and title and registration services in several ways. First, it needs to improve its method of measuring service timeliness to further address long wait lines at MVD offices. Second, it needs to improve telephone service provided to customers calling to obtain information. Finally, MVD needs strengthened oversight of private contractors who perform various motor vehicle transactions to ensure that such transactions are accurately processed and that access to MVD driver information is appropriately used (Auditor General Report 97-13).
- In addition, ADOT can improve the effectiveness of its highway planning function. Specifically, ADOT should better incorporate criteria and data into the decision-making process for recommending funding allocations and project selections for the Five-Year Transportation Facilities Construction Program to ensure the most needed highway projects are constructed. In addition, ADOT should follow federal or state regulations regarding relocation assistance in order to reduce relocation expenditures for persons displaced due to highway projects. Finally, ADOT should develop a formal process for identifying and disposing of right-of-way property purchased but not needed for highway projects (Auditor General Report 97-9).
- Further, ADOT should better manage the construction process. First, ADOT should take steps to better control future project cost increases by communicating to construction managers the target for completing construction projects is within

the original contract amount and by fully implementing its Project Management Process (See Finding I, pages 5 through 9).

Second, while the Department has virtually eliminated construction claims since implementing a partnering program in 1991, ADOT should improve the effectiveness of its partnering efforts. Third, to further control costs, ADOT should monitor its value-engineering program and determine if any further modifications are necessary to increase its use (See Finding III, pages 15 through 19).

- Finally, ADOT should take steps to better manage its fleet. In order to better identify and monitor underutilized vehicles, ADOT should establish utilization standards, require supervisors to justify those vehicles that do not meet utilization standards, and reassign and eventually eliminate vehicles that are underutilized and unjustified. Additionally, ADOT should explore various options that may decrease costs and/or shorten the time needed to prepare equipment requiring specialized attachments (See Finding V, pages 25 through 29).

### **3. The extent to which the agency has operated within the public interest.**

The Department of Transportation has operated within the public interest by planning, designing, constructing, and maintaining a statewide transportation system; providing automobile title, registration, and licensing services; and providing automobile and aircraft user revenue collection and distribution services. The Department estimates Highway User Revenue Fund collections in fiscal year 1997 will total approximately \$875.5 million, with the Department receiving approximately \$436.5 million. The remainder is allocated to counties, cities, towns, and other transportation-related funds. The Department also estimates total fiscal year 1997 collections of the Maricopa Transportation Excise Taxes at \$190 million.

However, the Motor Vehicle Division may not have operated in the public's interest by revaluing over 400,000 vehicles registered in the State in a manner which made it difficult for the public to detect such changes. Therefore, the Legislature should consider establishing statutory provisions requiring MVD to notify taxpayers of changes in vehicle values and to provide an opportunity for taxpayers to appeal any revaluation errors (Auditor General Report 97-13).

### **4. The extent to which rules adopted by the agency are consistent with the legislative mandate.**

The Department has review procedures for all rules and regulations to ensure consistency with statutes and the Department's mission. Additionally, the Attorney General's Office and Governor's Regulatory Review Council (GRRC) further ensure that

all rules and regulations promulgated by ADOT are consistent with its statutory authority.

GRRC reviewed ADOT's statutes per the Office of the Auditor General's request and determined that the Department has not promulgated all rules mandated by statutes. The Department should work with GRRC to adopt the rules required by A.R.S. §§28-108(A)(6) relating to the expenditure of money in the State Highway Fund; (A)(8) relating to closing state highways under construction or repair; and (A)(12) relating to application for and expenditure of mass transit monies.

**5. The extent to which the agency has encouraged input from the public before adopting its rules, and the extent to which it has informed the public as to its actions and their expected impact on the public.**

According to an ADOT official, the Department informs the public of proposed rules by holding public meetings and publishing impact statements before rules are heard at the Governor's Regulatory Review Council.

ADOT recently expanded its outreach efforts by obtaining additional input from key transportation stakeholders and the public regarding the State's transportation system. The Five-Year Transportation Facilities Construction Program outlines ADOT's commitment as to what will be constructed in the coming five years. ADOT initiates numerous efforts to inform the public of its intentions, and to obtain input prior to final adoption of the Five-Year Program, by holding:

- Monthly State Transportation Board meetings at different locations throughout the State, which are open to the public;
- Focus sessions with local government officials to discuss ADOT's Five-Year Program and 20-Year Plan and to obtain input on regional transportation priorities; and
- One annual formal public hearing each in Tucson, Flagstaff, and Phoenix regarding ADOT's proposed Five-Year Program.

Finally, the Department of Transportation has not fully complied with the Open Meeting Law requirements. As of July 7, 1997, ADOT had not notified the Secretary of State where public meeting notices for the Priority Planning Committee, Medical Advisory Board, Overdimensional Permit Advisory Council, and License Plate Commission are posted, as required by A.R.S. §38-431.02(A)(1).

**6. The extent to which the agency has been able to investigate and resolve complaints that are within its jurisdiction.**

ADOT's Legislative Services Office (LSO) is responsible for coordinating responses to all complaints concerning the Department, except those that are media-related, which are forwarded to Community Relations. According to an LSO staff member, the Legislative Services Office receives three to ten telephone complaints passed on from the Legislature each day, mainly from constituents. The nature of the complaints varies from concerns with current highway projects to complaints about driver's license revocations related to DUI citations. LSO reports it typically responds to these complaints within ten minutes.

Further, the Legislative Services Office is responsible for coordinating responses to written complaints addressed to legislators, the Governor's Office, the congressional delegation, the Director of ADOT, and the State Transportation Board. The Legislative Services Office ensures that the complaints are researched and responded to by the appropriate level of authority. ADOT's goal is to respond in writing to complainants within 3 to 10 days. As of September 18, 1997, there were 20 outstanding complaints that had not received written responses within 3 to 10 days, with some complaints dating as far back as September 1996.

Finally, ADOT's Office of Special Investigations provides investigative services for the Department in matters relating to automobile dealer licensing and complaints, criminal and administrative investigations, and employee and dealer background investigations, and processes criminal information research requests for law enforcement agencies worldwide. This office, while organizationally within the Motor Vehicle Division, provides services to the entire Department, as well as law enforcement agencies, government entities, news media, and the general public.

**7. The extent to which the attorney general or any other applicable agency of state government has the authority to prosecute actions under the enabling legislation.**

A.R.S. §§28-109 and 28-2408 authorize the Attorney General's Office to serve as legal advisor to the Department and provide legal services and enforcement as required by the Department. In addition, statutes identify civil and criminal violations related to ADOT's regulatory authority and establish penalties for noncompliance. Finally, the Executive Hearing Office in the Motor Vehicle Division is empowered to impose civil penalties or initiate prosecutions.

**8. The extent to which the agency has addressed deficiencies in its enabling statutes which prevent it from fulfilling its statutory mandate.**

The Department has sought numerous technical and administrative changes and additions to agency statutes over the years. Annually, ADOT develops a comprehensive legislative program in conjunction with the Governor's Office, other state agencies, legislators, and key stakeholders. In the past few years, many of ADOT's program bills have been enacted. For example:

- Laws 1994, Chapter 317 allows third parties to offer driver's license application processing;
- Further, Laws 1996, Chapter 146 allows ADOT to use design-build contracts for two pilot projects; and
- Finally, Laws 1997, Chapter 8 repealed the weight-distance tax and replaces these revenues by creating an annual motor carrier fee for vehicles weighing between 26,001 and 80,000 pounds; increasing the highway user fee for commercial vehicles weighing between zero and 80,000 pounds; increasing the use fuel tax rate; and increasing single-trip permit fees.

**9. The extent to which changes are necessary in the laws of the agency to adequately comply with the factors listed in the Sunset Law.**

The Legislature should consider amending state laws to align them with federal regulations regarding relocation assistance. Specifically, the Legislature should consider amending A.R.S. §28-7141 to include the definition of "small business" that follows the definition in the federal regulations: "A business having not more than 500 employees working at the site being acquired or displaced by a program or project, which site is the location of economic activity." According to the Department, however, conforming Arizona's definition to the federal definition will increase the cost to relocate certain persons.

Additionally, the Legislature should consider establishing statutory provisions requiring MVD to notify taxpayers of changes in vehicle values and to provide an opportunity for taxpayers to appeal any revaluation errors.

**10. The extent to which termination of the agency would significantly harm the public health, safety, or welfare.**

Termination of the Department of Transportation could harm the public health, safety, and welfare. If ADOT were terminated, alternatives would be needed for li-

censing drivers, registering vehicles and aircrafts, building and maintaining the State's transportation infrastructure, and collecting Highway User Revenue Fund monies used to fund ADOT's activities.

**11. The extent to which the level of regulation exercised by the agency is appropriate and whether less or more stringent levels of regulation would be appropriate.**

The current level of regulation appears generally appropriate. However, the Motor Vehicle Division could strengthen its enforcement of collecting motor carrier taxes and fees by increasing the use of mobile enforcement crews to ensure taxpayers not currently checked by the port-of-entry system are adequately monitored (Auditor General Report 97-4).

Additionally, the Motor Vehicle Division could strengthen its oversight of third-party contractors who are authorized to perform various motor vehicle transactions. Specifically, MVD needs to adequately monitor the performance of these private contractors to ensure accurate transaction processing and expand audit coverage of third-party operations to ensure compliance with Division policies and procedures (Auditor General Report 97-13).

**12. The extent to which the agency has used private contractors in the performance of its duties and how effective use of private contractors could be accomplished.**

ADOT extensively uses private contractors to assist in the performance of its duties. For example:

- Private contractors perform all ADOT highway construction. In fiscal year 1996, 119 projects were under construction for which contractors had earned more than \$475.6 million.
- ADOT has also been given authority to pilot two design-build projects in which a single contractor is responsible for both the project design and construction. A legislative committee will evaluate the design-build contracting method and by December 1998 recommend whether it should be a permanent contracting option for ADOT (See Finding IV, pages 21 through 23).
- In addition, almost 70 percent of construction projects have design consultant involvement, according to ADOT. As of December 31, 1996, design consultant contracts totaled more than \$350 million.

- Moreover, ADOT's Right-of-Way unit contracts with the private sector for several important functions including property appraisals, negotiations to acquire property, maintenance of properties not immediately needed, and demolition of properties prior to construction. However, Right-of-Way management fails to collect all the necessary data to determine whether cost savings result from these privatization efforts (Auditor General Report 97-9).
- Further, over the years ADOT has expanded its use of maintenance contracts. In fiscal year 1987, ADOT expended approximately \$2.6 million for maintenance contracts. For fiscal year 1997, this amount has increased to an estimated \$8.6 million. ADOT uses maintenance contracts for such services as rest area maintenance, landscape maintenance, highway/curb sweeping, and highway striping.

Finally, the Motor Vehicle Division has sought the use of private contractors in an effort to improve customer service. Specifically, MVD uses third-party contractors to perform various motor vehicle transactions including titling vehicles, updating vehicle registrations, processing driver's license applications, and inspecting vehicles. Typically, companies who contract with MVD to perform these services include automobile dealerships, title services, and trucking companies. In fiscal year 1996, MVD contracted with 12 third parties who processed 3 percent of all state motor vehicle transactions, generating over \$18.5 million in revenue (Auditor General Report 97-13).

## **Agency Response**

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**ARIZONA DEPARTMENT OF TRANSPORTATION  
RESPONSE TO AUDITOR GENERAL PERFORMANCE  
AUDIT OF CONSTRUCTION MANAGEMENT FUNCTIONS**

ADOT's response is organized to address each finding and the headings and subheadings are all in the same order as in the report.

**FINDING I  
THE DEPARTMENT NEEDS  
TO BETTER MANAGE CONSTRUCTION  
COST INCREASES**

**Construction Costs of \$3 Billion During the Next Five Fiscal Years.**

**Project Completion Costs have exceeded Original Contract Amounts.**

In both of these paragraphs the Auditor General has used the wording "increase in unnecessary costs that ADOT can avoid". This wording infers that unnecessary costs have been incurred, which has not been the case. Any change that results in additional cost is evaluated to assure that value is added to the project. While it is true that changes could be eliminated in the design stage of a project, but the costs still would be incurred. It also is true that many changes are accomplished without additional cost, which is the first goal when changes are negotiated. However, it is necessary on occasion to negotiate revised prices for new work.

**Clear Project Cost Goal Needed**

We agree that in an ideal world, all projects would be completed at the bid cost. But given the nature of highway construction, it would be unreasonably expensive to spend the design time necessary to investigate and eliminate every possible variance that might affect plans and specifications. All specifications - - including those of both ADOT and AASHTO - - include provisions for making necessary revisions to accomplish additional work. Site conditions, acts of God, changes in the character of the work, quantity variations, errors and omissions, payment for quality incentives and disincentives, and asphalt quantities in project -developed mixes, are among the factors that can add to project costs.

We agree, however, that every effort should be made to stay within bid amounts.

We also agree that construction personnel must be taught that the 5 percent budgeted contingency is to be used as intended, not as a source of funds available for additional, unplanned project improvements.

We do not agree with the auditors' assertion that "construction cost management is secondary" to project completion. We always strive to complete our projects within the intended scope, schedule and budget.

### **Evaluation of Project Cost Increases Can Help Minimize Future Expense**

Processes are being implemented to collect, classify and evaluate information with the goal of improving the development of plans, specifications and processes to reduce inefficiencies and costs.

Final estimates that tabulate variances in individual bid items are being reviewed in an effort to detect areas where estimating may be improved. We regularly expect to find quantity variations in contingency items such as dust palliatives, asphalt contents, quality incentive payments and traffic-related items.

Change orders are being analyzed in 10 areas . Efforts will be made to more carefully analyze these categories and to determine if a more detailed breakdown is needed.. (Copy Attached)

We also are working on a Quality Index program to evaluate contractors on completion time, quality of work and materials and change orders.

A new process improvement has been implemented that is designed to address most of the recommendations made in this section by addressing change order review, final quantity review, project close out comments and resolution of partnering issues. The goal is to implement improvements through modifications of plans, standards, policies and specifications.

## **Recommendations**

1. The Department should clearly communicate to project managers that the target for completing highway construction projects is within the original contract amount.
2. The Department should take the following steps to better manage construction project cost increases.
  - a. Collect all information related to construction project cost increases;
  - b. Classify the information into well defined, specific categories;
  - c. Formalize the process for reviewing project specific information to identify construction-related factors that cause cost increases; and
  - d. Effectively communicate the reasons for all contract revisions to those originally responsible for affected parts of the construction project.

ADOT agrees with the above recommendations, all of which are already being implemented through the new process improvement.

## FINDING II

### IMPROVEMENTS TO THE PROJECT DESIGN PHASE CAN BETTER CONTROL CONSTRUCTION COST INCREASES

**Most Cost Increases Are Related to the Design Phase**

**Project Management Process Needs to Be Fully Operational**

**Project Management Process created to minimize loss--**

**Project Management Process not fully operational--**

**Several actions needed to improve the Project Management Process--**

ADOT agrees with the comments in the above sections.

#### MANAGEMENT INFORMATION

Performance measures have already been revised to improve management data to better monitor performance, identify problem areas and lead to issue resolution. Further system improvements, generated by suggestions from project managers and staff currently are being collected and collated for implementation.

#### PROJECT PRIORITY GUIDANCE

ADOT agrees with the comments of the auditor general in this section. Group Managers have been advised to assign project priorities when it becomes necessary for a team to divide available resources among different projects. Timely completion of all projects remains as the goal.

## **Recommendations**

1. ADOT upper management needs to reaffirm to its employees the importance of fully implementing the Project Management Process.
2. ADOT needs to improve the operation of its Project Management Process by:
  - a. Compiling project management information to document decisions made related to projects, identifying specific problem areas within the Project Management Process, and resolving issues that limit the usefulness of the process; and
  - b. Providing better project priority guidance to staff to improve allocation of team member time resources and coordination of project design phase activities.

ADOT agrees with and will implement all of the above recommendations.

## **FINDING III**

### **PARTNERING PROGRAM IMPROVEMENTS NEEDED**

#### **FINDING III PARTNERING PROGRAM IMPROVEMENTS NEEDED**

We agree with the findings in this section of the report. ADOT has taken major steps to improve its partnering program during the past year. The issues discussed by the Auditor General have all been addressed and are being implemented at the present time. We do believe it is possible to measure the impact partnering process on the time it takes to complete projects and we are generally completing projects in 95% of the allotted time or less.

#### **Recommendations:**

1. The Department should take the following steps to improve its partnering program for highway construction projects:
  - a. Develop clear guidelines for the issue resolution process and routinely monitor their application statewide to ensure greater consistency in decision-making;
  - b. Develop feedback mechanisms to communicate the rationale for decisions made in the escalation process;
  - c. Continue efforts to customize initial partnering workshops and begin to develop training courses for both ADOT and contractor staff concerning basic partnering concepts, essential partnering skills, and ADOT partnering procedures; and
  - d. Strengthen ongoing evaluation of partnering relationships by ensuring that monthly evaluations and project close-out workshops are held consistently, and that the information gathered is used to assess needed changes.

ADOT agrees with the auditors' findings and will implement those recommendations that have not already been implemented (see attached partnering exhibits.).

## FINDING IV

### USE OF VALUE ENGINEERING AND DESIGN-BUILD CONTRACTING CAN HELP REDUCE PROJECT COSTS AND COMPLETION TIMES

#### **Recent Changes to Value Engineering Program May Increase Its Use**

A continuous improvement process initiated recently within the Value Analysis Section will enable ADOT to collect and analyze data from a number of sources, with the goal of identifying and implementing improvements in our products and services. The process also will create a continuing measurement and record of our efforts to improve quality and enhance value. Value Engineering will be one of the most important sources of information for the continuous improvement process. One of the principal goals of this new process is to eliminate repetitive value engineering proposals to ensure that ADOT receives 100% percent of future savings from these proposals.

This process is just getting started and we have not as yet collected enough data to generate meaningful reports. We plan to distribute our reports, and other information about the process, widely throughout the organization, in order to generate interest and to encourage all employees to participate. With widespread employee and strong management support, the process will become a powerful tool for quality and value enhancement. ( Copy Attached).

#### **Design-Build Methods Could Impact Construction Costs and Time**

We agree with this section.

The Pima County project at I 10 & Cortaro Road is progressing well and completion is anticipated by March 1, 1998.

ADOT is presently evaluating several projects as candidates for the design build process in Phoenix. It is the desire of ADOT that the two initial projects demonstrate the validity of design build and that its use will be permitted by future legislation.

## **Other new Innovative Contracting Ideas**

Legislation passed in 1997 permits the use of cost + time bidding (a + b) . This allows selection of a contractor to be based on cost plus a time charge for inconveniencing motorists. Experience in other states has shown that contractors have been able to complete projects much quicker when they are required to consider the value of time in their bid submittal. The department plans to issue up to twenty projects using this method.

## **Recommendations**

The findings of the Auditor General are agreed to and the audit recommendations will be implemented.

1. The Department should monitor its value engineering program to determine if any further modifications are necessary to encourage its use by contractors.
2. The Department should monitor successful value engineering proposals and incorporate them into future projects.

The findings of the Auditor General are agreed to and the audit recommendations will be implemented.

## FINDING V

### **ADOT STILL HAS MANY LIGHT VEHICLES WITH LOW MILEAGE USE AND IS ALSO EXPERIENCING EQUIPMENT PREPARATION DELAYS**

#### **Light Vehicles Continue to Have Low Mileage Use**

The Agency has implemented utilization standards for the light fleet using both mileage and frequency of use. In response to the audit finding, the Agency conducted a one-time survey to baseline usage reporting. The results of that survey indicated that in 1996 only 14 vehicles would not have met utilization standards based on either mileage or frequency of use. Those fourteen vehicles have been reassigned to higher use applications or have been disposed of.

#### **Most Serious Equipment Preparation Delays Addressed, but Further Improvements May be Possible**

Auditor General's Report cites twelve (12) vehicles (Traffic Control/Cone Retrieval Trucks) which took over one year to process. The audit language does not, however, differentiate between delays and total processing time. Cone trucks are very complex and require a very long build/fabrication window.

The twelve (12) trucks were prepared in-house after two (2) unsuccessful solicitation attempts to award the body fabrication and ancillary equipment installation to the private sector. The savings realized to ADOT Equipment Services and the State in building this unique equipment in-house was \$299,343.55 with no incurred cost or delays to the customer.

A summary documenting this build project was submitted to the Auditor General's Office on September 10, 1997.

**Recommendations:**

1. ADOT should take steps to monitor vehicle utilization by:
  - a. Establishing formal utilization standards for its light fleet vehicles;
  - b. Using its automated Equipment Management System to identify and report on all vehicles not meeting the utilization standards;
  - c. Establishing a formal process for justifying those vehicles that do not meet utilization standards; and

ADOT agrees with the findings of the Auditor General on Items 1 a, b, c, above and the audit recommendation will be implemented. A policy addressing this area has already been issued from the Director. ( Copy Attached)

ADOT agrees with the finding 1. d. below and has already implemented this finding (Copy attached). However; a different method of implementing the finding will be followed in that the current policy will be further refined to consider the operational needs of the user as well as Equipment Management.

- d. Giving authority to Equipment Services management to reassign and eventually reduce ADOT's fleet size by not replacing underutilized, unjustified vehicles

2. ADOT should eliminate the 30-day cushion it currently adds to the delivery time frame for the completed unit in order to reduce equipment preparation delays.

ADOT agrees with finding No. 2 of the Auditor General and the audit recommendation will be implemented

- .3. ADOT should study whether participating in a program with Arizona Correctional Industries in which inmates would be responsible for truck and trailer fabrication, attachments, and refurbishment would improve vehicle preparation timeliness and be cost effective..

ADOT agrees with Finding Number 3 of the Auditor General and will study where use of the Arizona Correctional Industries could be cost effective.

## OTHER PERTINENT INFORMATION

ADOT agrees with all of the positive facts and information in this section. However, the references to “sufficient funding” (2 times) in this section are misleading. The Transportation Board approves adequate funding to maintain the roads and bridges in accordance with current standards. There are still deficiencies needing attention as traffic volumes increase, road use goes up, and pavements deteriorate.

## SUNSET FACTORS

ADOT generally agrees with the Auditor General’s comments addressing the twelve sunset factors. However, the following comments are provided to clarify and/or address issues raised by the Auditor General to help to present a complete assessment.

### **1. The objective and purpose in establishing the agency.**

ADOT agrees with the narrative on this factor.

### **2. The effectiveness with which the agency has met its objectives and purpose and the efficiency with which it has operated.**

With respect to the comments from Auditor General Report 97-4, ADOT is addressing the issues presented. Specifically, the Motor Vehicle Division is developing cash control policies and procedures and developing additional procedures for the Collection Unit. The division is also implementing the legislative changes affecting the motor carrier and fuel tax Areas.

With respect to the comments from Auditor General Report 97-13, ADOT is implementing various technical solutions to evaluating and reducing the time customers spend in our offices and obtaining information over the telephone. The Division is also increasing its service capacity in the Communications Units and revising procedures to better sort and prioritize customer calls. With regard to oversight of private contractors who perform motor vehicle transactions, the division is improving its monitoring activities and security over computer records. These improvements include password protection, operator identification numbers and the establishment of a Quality Assurance Unit whose task is to monitor the work of all third party operators employed by contractors.

With respect to comments from the Highway Planning and Engineering functions audit (Auditor General Report 97-9), ADOT does not concur that greater use of “objective” criteria and data in the program selection process will improve the quality of project selection. Since the audit report was issued, ADOT has received the results of a study conducted by a consultant hired by the department to recommend program process improvements. Several of the Transportation Board members and ADOT district engineers have expressed concern about certain aspects of the consultant’s recommendations regarding increased use of formulas in the project selection process. The subject is still under review. Relative to the right-of-way findings, ADOT has

followed federal and state regulations regarding relocation assistance and performed those functions in a cost-effective manner

With regard to comments from Highway Construction Audit, ADOT will implement all of the recommendations contained therein.

- An education program will be instituted to emphasize the importance of completing projects within the bid amount whenever possible. There are always contingency items of work when the ‘units of work’ type bidding is used. Many items are dependent on the time of completion, such as Traffic Control, and contents of product mixes, such as the percent of asphalt in pavement mixes which cannot be determined until the material source has been developed by the contractor. Any increases above the bid amount will be measured and monitored to assure there is “value added” to the completed project.
- The Partnering Program has recently been further improved and through measurement of costs, time savings and relationships, and the program continues to gain in effectiveness. An analysis of value -engineering procedures and specifications is being implemented at the present time to look for opportunities for increased use.
- ADOT has established utilization standards which will enable the agency to determine whether light duty vehicles are underutilized. In addition, a systematic review and rotation process has been put in place to effectively use vehicles identified as underutilized. Authority to transfer vehicles has been granted to the Equipment Administrator. ADOT has eliminated the 30 day extension of time formally added to bid delivery dates in order to tighten up delivery times for new equipment. Finally, ADOT has entered into discussions with Arizona Correctional Industries to determine if any fabrication can be accomplished by inmate labor to reduce costs and perhaps improve delivery times.

### **3. The extent to which the agency has operated within the public interest.**

The Department disagrees with the Auditor General’s statement, “... the Motor Vehicle Division may not have operated in the public’s interest by revaluing over 400,000 vehicles registered in the State ...”

MVD sought and received legal advice from the Attorney General’s Office. The advice from the Attorney General was:

- that MVD’s purpose in making the list price corrections was statutorily authorized; and
- that MVD would be remiss in its duties if it did not rely on the correct data when making assessments for succeeding license year registrations.

With regard to the Auditor General's recommendation to the Legislature, MVD will comply with any legislatively established statutory provisions regarding notifying and providing for taxpayer appeals.

**4. The extent to which rules adopted by the agency are consistent with the legislative mandate**

ADOT will review the areas identified by the Auditor General for which the Department has not promulgated all rules mandated by statutes and develop such rules if necessary.

However, with respect to the prescription of rules for expenditure of State Highway Fund monies, we believe a number of various specific statutes exist which relate to the expenditure of highway funds which take precedent over general language of the powers and duties of the Director. Specific references which relate to these rules are ARS 28-1822, 28-1824, 28-1826, 28-1827 and 28-1828. Of particular relevance is ARS 35-131 which places all control relating to expenditures under the direction of the Director of the Department of Administration.

Also, with regard to promulgating rules relating to the closure of state highways under construction or repair has been accomplished by establishing a regulation which through the delegation of authority, authorizes the District Engineer to regulate the closing of state highways under construction or repair. Traffic is maintained through construction areas and roads are closed for emergency conditions following a district plan or a statewide emergency plan. If necessary they are closed on a priority basis.

**5. The extent to which the agency has encouraged input from the public before adopting its rules, and the extent to which it has informed the public as to its actions and their expected impact on the public.**

The Department will ensure that in the future ADOT notifies the Secretary of State where public meeting notices are posted.

**6. The extent to which the agency has been able to investigate and resolve complaints that are within its jurisdiction.**

The Auditor General noted that the Legislative Services Office had, as of September 18, 1997, not responded to 20 outstanding complaints within its ten-day goal. It should also be noted that because a complaint is beyond the ten-day goal, does not mean the complainant has not received a response or resolution to his or her problem. Often these written complaints are resolved before being delegated to the appropriate level within the department. For example, vehicle registration tags may be received by the complainant before the complaint is received and motor carrier or

driver records may be updated before correspondence is received. Also, complainants do not always include return addresses in their correspondence and such complaints are left in the system until the department is able to respond.

**7. The extent to which the attorney general or any other applicable agency of state government has the authority to prosecute actions under the enabling legislation.**

The Auditor General states, "...the Executive Hearing Office and the Motor Vehicle Division is empowered to impose civil penalties or initiate prosecutions." The Executive Hearing Office conducts hearings on contested matters which begin within other agencies. To further clarify this statement, it should be noted the Executive Hearing Office does not directly order the civil sanctions that are available. The Executive Hearing Office issues recommended orders that can be accepted or modified by the director.

**8. The extent to which the agency has addressed deficiencies in its enabling statutes which prevent it from fulfilling its statutory mandate.**

ADOT agrees with the narrative on this factor.

**9. The extent to which changes are necessary in the laws of the agency to adequately comply with the factors listed in the Sunset Law.**

With respect to amending state's relocation assistance laws to align them with federal regulations, the department is in the process of creating rules for the relocation program that should address this issue.

With regard to establishing statutory provisions requiring MVD to notify taxpayers of changes in vehicle values and to provide opportunities for taxpayers to appeal any revaluation errors, the department will comply with any legislatively established statutory provisions.

**10. The extent to which termination of the agency would significantly harm the public health, safety, or welfare.**

ADOT agrees with the narrative on this factor.

**11. The extent to which the level of regulation exercised by the agency is appropriate and whether less or more stringent levels of regulation would be appropriate.**

The Auditor General's Report notes that the Department "...could strengthen its enforcement of collecting motor carrier taxes and fees by increasing use of mobile enforcement crews to ensure the taxpayers not currently checked by the port-of-entry system are adequately monitored..." The Motor Vehicle Division has acquired portable scale equipment and has begun a systematic plan to use mobile scale units to enforce motor carrier laws and to collect taxes when appropriate.

In addition, the department has entered into an intergovernmental agreement with DPS to establish a joint motor carrier enforcement task force and has acquired portions of its special enforcement mobile unit which will be used to target vulnerable locations to ensure motor carrier safety and tax laws are adhered to.

With respect to a Auditor General's recommendation to enhance the monitoring and auditing of third party operations for compliance with division policies and procedures, the department has established a Quality Assurance Unit whose task is to monitor the work of all third party operators employed by contractors. In addition, the department is in the process of hiring more auditors to expand its audit coverage of third party operations.

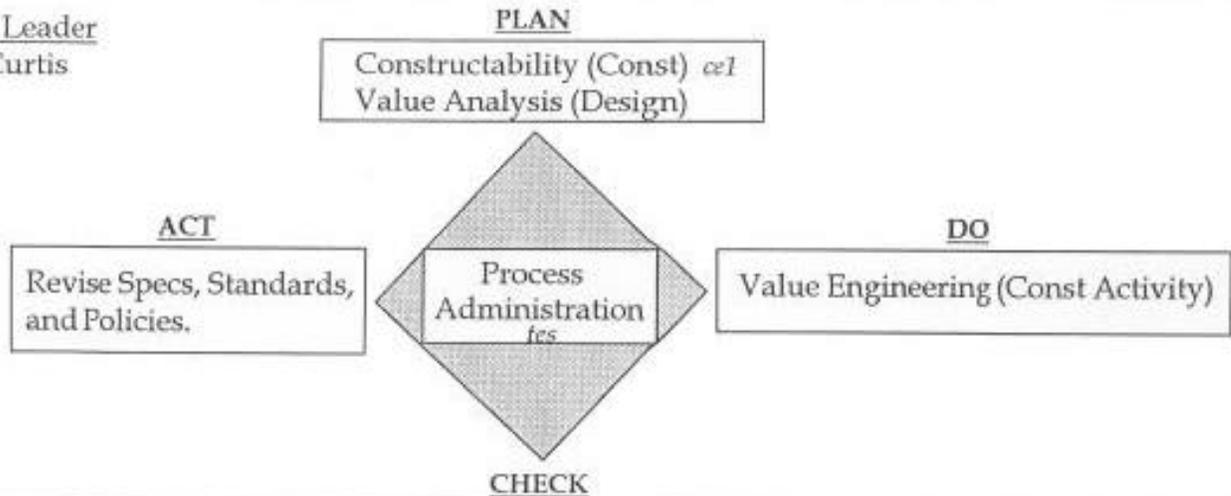
**12. The extent to which the agency has used private contractors in the performance of its duties and how effective use of private contractors could be accomplished.**

The Auditor General Report notes the "... Right-of-Way Unit contracts with the private sector for several important functions including property appraisal... However, right-of-way management fails to collect all necessary data to determine whether cost savings result from these privatization efforts..." The department is in the process of gathering information to determine whether cost savings have resulted from these privatization efforts.

# PROCESS IMPROVEMENT

Sponsors: Ron Williams (Assistant State Engineer - Construction)  
Dallis Saxton (Assistant State Engineer - Support Services)

Team Leader  
Rod Curtis



- \* Change Order Review (Const)
- \* Final Quantity Review (Const)
- \* Close Out and Post Construction Review (Partnering)
- \* Plans Report @ Final (Design)
- \* Operations Quality Reports (Const)
- \* Resolved Issues (Partnering)

## GOAL:

To **implement changes** to Standard Drawings, Specifications, Policy, and Procedures that will reduce cost and improve quality.