

ARIZONA STATE SENATE  
RESEARCH STAFF



TO: JOINT LEGISLATIVE AUDIT COMMITTEE  
Senator Robert Blendu, Chair  
Representative John Nelson, Vice-Chair

**RYAN DEMENNA**  
LEGISLATIVE RESEARCH ANALYST  
TRANSPORTATION COMMITTEE  
Telephone: (602) 926-3171  
Facsimile: (602) 926-3833

DATE: November 30, 2007

SUBJECT: Sunset Review of the Arizona Department of Transportation

---

Attached is the final report of the sunset review of the Arizona Department of Transportation (ADOT), which was conducted by the Arizona State Senate Transportation and House Transportation Committee of Reference. A performance audit of ADOT, consisting of three reports, was conducted by the Arizona Office of the Auditor General (report nos. 06-05, 07-03 and 07-04).

This report has been distributed to the following individuals and agencies:

Governor of the State of Arizona  
The Honorable Janet Napolitano

President of the Senate  
Senator Timothy Bee

Speaker of the House of Representatives  
Representative James Weiers

Senate Members  
Senator Ron Gould, Cochair  
Senator Robert Blendu  
Senator Pamela Gorman  
Senator Rebecca Rios  
Senator Victor Soltero

House Members  
Representative Marian McClure, Cochair  
Representative Sam Crump  
Representative John Nelson  
Representative Tom Prezelski  
Representative Jackie Thrasher

Arizona Department of Transportation  
Arizona State Library, Archives and Public Records  
Office of the Auditor General

Senate Majority Staff  
Senate Minority Staff  
Senate Research Staff  
Senate Resource Center

House Majority Staff  
House Minority Staff  
House Research Staff  
Chief Clerk

RD/jas  
Attachment

**Senate Transportation and House of Representatives Transportation  
Committee of Reference Report**

**ARIZONA DEPARTMENT OF TRANSPORTATION  
Victor Mendez, Director**

**BACKGROUND**

Pursuant to A.R.S. § 41-2953, the Joint Legislative Audit Committee (JLAC) assigned the sunset review of the Arizona Department of Transportation (ADOT) to the Senate Transportation and House Transportation Committee of Reference for review. The Office of the Auditor General (OAG) completed three reports that comprise the performance audit (report nos. 06-05, 07-03 and 07-04).

ADOT was established in 1974 pursuant to A.R.S. § 28-331 and is statutorily charged under A.R.S. Title 28 with providing an integrated and balanced state transportation system. ADOT has exclusive control and jurisdiction over state highways, state routes, state-owned airports and all state-owned transportation systems. Additionally, under Arizona law, ADOT is required to register motor vehicles and aircraft, license drivers, collect revenues, enforce motor vehicle and aviation statutes, perform multi-modal state transportation planning, design and construct transportation facilities, and maintain and operate state public transportation systems. In order to carry out these responsibilities and others, ADOT is organized into six divisions: Motor Vehicle (MVD); Transportation Planning; Highways; Aeronautics; Public Transit; and Administrative Services.

In accordance with A.R.S. § 41-3008.17, ADOT terminates on July 1, 2008, unless continued.

**COMMITTEE OF REFERENCE SUNSET REVIEW PROCEDURES**

The Committee of Reference held one public hearing on Tuesday, November 6, 2007, to review the performance audit prepared by the OAG, receive testimony regarding the OAG's findings and recommendations from Victor Mendez, the Director of ADOT, and allow an opportunity for public testimony.

The presentation summarized the OAG's findings and recommendations as follows:

**Arizona Department of Transportation – Aspects of Construction Management Audit (July 2006, Report No. 06-05)**

**Finding 1:** ADOT has increasingly used consultants to provide services traditionally provided by ADOT employees. ADOT should evaluate its use of consultants and identify ways to reduce their use.

**Recommendations:**

ADOT should:

1. Fill existing vacancies.
2. Continue to develop strategies to recruit and retain employees.
3. Develop criteria for deciding when to use consultants.
4. Perform more work in-house when appropriate and staff are available.
5. Track and monitor consultant usage.

**Finding 2:** ADOT should improve inspection consistency, documentation and follow-up to ensure compliance with construction standards.

**Recommendations:**

ADOT should:

1. Ensure that field inspectors document inspection results and consistently complete checklists.
2. Provide training to inspectors and ensure that field inspectors and Quality Assurance (QA) inspectors similarly apply standards.
3. Require follow-up for major and critical noncompliant items found by QA inspections.

**Finding 3:** ADOT should address its backlog of consultant and construction contract audits.

**Recommendations:**

ADOT should:

1. Fill audit staff vacancies.
2. Ensure that the highest-risk projects are audited.
3. Re institute performance measures for its audit unit.

**Arizona Department of Transportation – Highway Maintenance Audit (June 2007, Report No. 07-03)**

**Finding:** Money for highway maintenance represents about 10 percent of ADOT’s highway funding, supporting about 250 maintenance activities throughout the state. Arizona’s highway system has mostly smooth and good-quality pavement and was in better condition in 2005 than in 1995. ADOT’s Intermodal Transportation Division (ITD), which is responsible for highway design, construction and maintenance, could better measure and identify annual maintenance work needed to maximize the state highway system’s life, efficiency, appearance and safety.

**Recommendations:**

ADOT’s ITD should:

1. Develop and implement guidelines to identify and prioritize needed annual maintenance work.
2. Identify, quantify and prioritize all annually needed maintenance work.
3. Identify work that cannot be done with existing resources to quantify any maintenance funding gap.
4. Develop and implement a methodology that ensures systematic allocation of resources based on statewide needs and priorities, and districts’ or regions’ needs and responsibilities.

**SUNSET REPORT REQUIREMENTS PURSUANT TO A.R.S. § 41-2954**

**Arizona Department of Transportation – Sunset Factors ( July 2007, Report No. 07-04)**

*Complete responses to all 12 sunset factors are contained in the Performance Audit, Arizona Department of Transportation – Sunset Factors, July 2007, Report No. 07-04. Sunset Factors 2 and 4 received the following amplifications and comments from Director Mendez:*

**Finding:** Overall, ADOT generally operates effectively and efficiently and has operated within the public interest.

**Factor 2. The effectiveness with which ADOT has met its objectives and purposes and the efficiency with which the agency has operated.**

**ADOT's Response:** ADOT is in the process of implementing all of the recommendations from the *Highway Maintenance* and *Aspects of Construction Management* audits.

Regarding the use of consultants, ADOT uses a management level process to determine consultant needs based on project schedule, availability of in-house staff and expertise requirements on the project. ADOT uses this process to evaluate the need for consultants on any given project.

Also, ADOT would like to draw a clear distinction between the contractors that are utilized for highway construction versus consultants that are utilized in the design, development, project management, inspection and testing processes. The Arizona Revised Statutes require ADOT to utilize private contractors to construct the highways.

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

**ADOT's Response:** ADOT has formed a committee to review the areas identified by the Auditor General and will develop such rules as necessary.

**Agency Responses to the Four Agency Factors:**

**1. Identify the problem or the needs that the agency is intended to address.**

ADOT was established by A.R.S. § 28-331 to provide for an integrated and balanced state transportation system. ADOT serves as the state's public agency to plan, build and maintain the state multimodal transportation infrastructure throughout Arizona.

MVD has its own sunset date and was separately reviewed by the Auditor General; therefore, it is not included in this sunset.

**2. State, to the extent practicable, in quantitative or qualitative terms, the objectives of the agency and its anticipated accomplishments.**

ADOT's mission is to plan, build and maintain Arizona's multimodal transportation infrastructure. That infrastructure includes operating the Grand Canyon Airport and assisting local communities to provide public transportation services.

ADOT's main objectives are to:

- Coordinate and cooperate with metropolitan planning organizations, counties and local communities to identify multimodal transportation needs and prioritize improvements to meet the needs of the citizens of Arizona.
- Construct, on time and on budget, improvements and enhancements to the transportation infrastructure in accordance with the identified priorities.
- Maintain the state's transportation infrastructure through a comprehensive preservation program.

## ***Planning***

State Transportation planning is accomplished by working with ADOT's planning partners to facilitate multimodal transportation planning. These partners include Arizona's metropolitan planning organizations, councils of governments, federal agencies, tribes, counties, cities, the public and other stakeholders. ADOT anticipates continuing to perform transportation studies (such as the Interstate 17 Alternative Study and Multimodal Freight Analysis Study) to identify transportation needs and multimodal solutions to those needs.

ADOT also anticipates continuing to assist the State Transportation Board in prioritizing transportation infrastructure improvement projects in accordance with the "Priority Programming Law" (A.R.S. 28-6951) that culminates in the annual update of the Five Year Transportation Facilities Construction Program for highways and airports.

## ***Construction***

Transportation infrastructure construction and preservation is accomplished by contracting all projects above \$189,000 as required by statute to private construction companies. ADOT provides project oversight and inspection to ensure quality. ADOT's Five Year Transportation Facilities Construction Program for 2008 through 2012 totals \$6.6 billion for highways and \$762 million for airports. Included in the \$6.6 billion is \$120 million for bridge preservation.

Significant anticipated accomplishments include the award of 100 percent of the total construction dollars planned to be awarded and the construction of 816 travel lane miles by December 31, 2012.

## ***Maintenance***

Arizona taxpayers have a significant investment in the state's transportation infrastructure. The cost of highway pavement preservation is funded through the Five Year Transportation Facilities Construction Program. The cost of all other maintenance is included in ADOT's operating appropriation (\$129 million for FY 2007-2008).

As the state's transportation infrastructure continues to grow, additional funding is required to maintain landscaping, pickup litter, repair cable barriers, sweep roadside debris, maintain signs and pavement striping, repair guardrail and crash attenuators, maintain drainage facilities, pay for electricity for lighting and signals, and to respond to motor vehicle accidents.

ADOT has been challenged to meet the needs of maintaining new features while preserving the existing system. The recent sharp increase in the cost of materials and fuel has diminished ADOT's ability to maintain the transportation infrastructure. The most visible result has been public concerns and comments relative to litter, landscaping and vegetation control, while less visible maintenance activities such as pavement repair, drainage repair and roadside work, when safe to delay, have been reduced in frequency.

ADOT anticipates continuing challenges meeting the public's expectation for transportation infrastructure maintenance.

**3. Identify any other agencies having similar, conflicting or duplicative objectives, and an explanation of the manner in which the agency avoids duplication or conflict with other agencies.**

The ADOT mission is unique from other state agencies. No other state agency is able to carry out ADOT's mission as effectively and efficiently. Federal agencies rely heavily on state departments of transportation to carry out national transportation programs.

The technical expertise and knowledge that is required to plan, build and maintain the state transportation infrastructure are confined to ADOT.

There is no conflict or duplication of effort within state government for these functions.

**4. Assess the consequences of eliminating the agency or of consolidating it with another agency.**

Termination of ADOT would harm the public welfare and place the public's safety at significant risk. One of our strategic issues is to make Arizona's transportation infrastructure safe. ADOT plays an important role to ensure the safe and efficient transport of people and goods through and within the State of Arizona. Elimination of the agency would seriously impact that movement. Furthermore, federal law requires state transportation departments to adequately maintain transportation improvements funded by federal monies.

Likewise, the consolidation of a large agency, such as ADOT, with another would have serious repercussions that could not only jeopardize the public's safety, but also impact the maintenance of the state's investment in our transportation systems and seriously delay the planned construction that the public expects. At approximately 4,600 employees, ADOT is one of the largest state agencies in Arizona. It would be difficult for another agency to be able to absorb ADOT and provide the internal services needed to continue operations without a significant decline in the quality and efficiency of those services, and to allow ADOT to continue to serve the citizens of Arizona at the same level of service currently provided.

**ATTACHMENTS**

1. Meeting notice
2. Minutes from the Committee of Reference meeting
3. ADOT's response to the four agency questions outlined in A.R.S. § 41-2954
4. OAG staff's PowerPoint presentation handout
5. ADOT – Aspects of Construction Management Performance Audit, July 2006, Report No. 06-05
6. ADOT – Highway Maintenance Audit, June 2007, Report No. 07-03
7. ADOT – Sunset Factors, July 2007, Report No. 07-04

## ARIZONA STATE LEGISLATURE

### INTERIM MEETING NOTICE OPEN TO THE PUBLIC

#### SENATE TRANSPORTATION COMMITTEE AND HOUSE TRANSPORTATION COMMITTEE OF REFERENCE

**Date:** Tuesday, November 6, 2007

**Time:** 1:30 P.M.

**Place:** SHR 109

#### AGENDA

1. Call to Order
2. Roll Call and Introduction of Members
3. Arizona Department of Transportation Sunset Audit  
    Presentation by the Office of the Auditor General  
    Response by the Arizona Department of Transportation
4. Public Testimony
5. Recommendations by the Committee of Reference
6. Adjourn

#### Members:

Senator Ron Gould, Co-Chair  
Senator Robert Blendu  
Senator Pamela Gorman  
Senator Rebecca Rios  
Senator Victor Soltero

Representative Marian McClure, Co-Chair  
Representative Sam Crump  
Representative John Nelson  
Representative Tom Prezelski  
Representative Jackie Thrasher

10/23/07

sp

Research

## ARIZONA STATE LEGISLATURE

### SENATE TRANSPORTATION COMMITTEE AND HOUSE TRANSPORTATION COMMITTEE OF REFERENCE

Minutes of the Meeting  
Tuesday, November 6, 2007  
1:30 P.M., Senate Hearing Room 109

#### Members Present:

Senator Ron Gould, Co-Chair  
Senator Rebecca Rios  
Senator Victor Soltero

Representative Marian McClure, Co-Chair  
Representative Sam Crump  
Representative John Nelson  
Representative Tom Prezelski  
Representative Jackie Thrasher

#### Members Excused:

Senator Robert Blendu  
Senator Pamela Gorman

#### Staff:

Ryan DeMenna, Senate Transportation Research Analyst  
John Halikowski, House Transportation Research Analyst

Chairman Gould called the meeting to order at 1:43 p.m. and attendance was noted.

#### Arizona Department of Transportation Sunset Audit

Shan Hays, Performance Audit Manager, Office of the Auditor General, distributed the following handouts:

- "Arizona Department of Transportation – Highway Maintenance" (Attachment A)
- "Arizona Department of Transportation – Aspects of Construction Management" (Attachment B)
- "Arizona Department of Transportation – Sunset Factors" (Attachment C)
- "Arizona Department of Transportation – Performance Audit and Sunset Review" (Attachment D).

Ms. Hays explained the procedures of the audit, their findings and recommendations.

**Response by the Arizona Department of Transportation**

**Victor Mendez, Director, Arizona Department of Transportation**, distributed "Arizona Department of Transportation, Office of the Director" (Attachment E) and explained that the department agrees with the audit's findings and how the department is implementing the audit's recommendations.

**Recommendations by the Committee of Reference**

**Senator Soltero made the motion to extend the Department of Transportation for 10 years. Senator Rios seconded the motion. The motion PASSED by voice vote.**

There being no further business, the meeting was adjourned at 2:34 p.m.

Respectfully submitted,



Shelley Ponce  
Committee Secretary

(Tapes and attachments on file in the Secretary of the Senate's Office/Resource Center, Room 115.)



# Arizona Department of Transportation

## Office of the Director

206 South Seventeenth Avenue Phoenix, Arizona 85007-3213

Janet Napolitano  
Governor

Victor M. Mendez  
Director

Richard Travis  
Deputy Director

September 21, 2007

Mr. Ryan DeMenna  
Assistant Research Analyst  
Arizona State Senate  
1700 West Washington  
Phoenix, AZ 85007

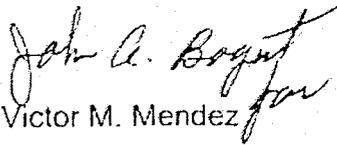
Subject: Arizona Department of Transportation  
Sunset Review Questions

Dear Mr. DeMenna:

Thank you for the opportunity to respond to questions related to the Arizona Department of Transportation's sunset review. Our response is attached.

If you need additional information or further clarification, please contact Dian Work at 602-712-8533 or me at 602-712-7227.

Sincerely,

  
Victor M. Mendez

Attachment

## The Arizona Department of Transportation Sunset Review Responses

### 1. Identify the problem or the needs that the agency is intended to address.

The Arizona Department of Transportation (ADOT) was established by A.R.S. §28-331 to provide for an integrated and balanced state transportation system. ADOT serves as the state's public agency to plan, build and maintain the state multi-modal transportation infrastructure throughout Arizona.

The Motor Vehicle Division has its own sunset date and was separately reviewed by the Auditor General; therefore, it is not included in this sunset.

### 2. State, to the extent practicable, in quantitative and qualitative terms, the objectives of the agency and its anticipated accomplishments.

The Department mission is to plan, build and maintain Arizona's multimodal transportation infrastructure. That infrastructure includes operating Grand Canyon Airport and assisting local communities to provide public transportation services.

The Department's main objectives are to:

- Coordinate and cooperate with metropolitan planning organization, counties and local communities to identify multimodal transportation needs and prioritize improvements to meet the needs of the citizens of Arizona.
- Construct, on time and on budget, improvements and enhancements to the transportation infrastructure in accordance with the identified priorities.
- Maintain the state's transportation infrastructure through a comprehensive preservation program.

### Planning

State transportation planning is accomplished by working with the Department's planning partners to facilitate multimodal transportation planning. These partners include Arizona's Metropolitan Planning Organizations (MPOs), Councils of Governments (COGs), federal agencies, tribes, counties, cities, the public, and other stakeholders. The Department anticipates continuing to perform transportation studies (such as the Interstate 17 Alternative Study and Multimodal Freight Analysis Study) to identify transportation needs and multimodal solutions to those needs.

The Department also anticipates continuing to assist the State Transportation Board in prioritizing transportation infrastructure improvement projects in accordance with the

"Priority Programming Law" (ARS 28-6951) that culminates in the annual update of the Five Year Transportation Facilities Construction Program for highways and airports.

## **Construction**

Transportation infrastructure construction and preservation is accomplished by contracting all projects above \$189,000 as required by state statute to private construction companies. ADOT provides project oversight and inspection to ensure quality. The Department's Five Year Transportation Facilities Construction Program for 2008 through 2012 totals \$6.6 billion for highways and \$762 million for airports. Included in the \$6.6 billion is \$120 million for bridge preservation.

Significant anticipated accomplishments include the award of 100% of the total construction dollars planned to be awarded, and the construction of 816 travel lane miles by December 31, 2012.

## **Maintenance**

Arizona taxpayers have a significant investment in the State's transportation infrastructure. The cost of highway pavement preservation is funded through the Five Year Transportation Facilities Construction Program. The cost of all other maintenance is included in the Department's operating appropriation (\$129 million for fiscal 2008).

As the state's transportation infrastructure continues to grow, additional funding is required to maintain landscaping, pickup litter, repair cable barriers, sweep roadside debris, maintain signs and pavement striping, repair guardrail and crash attenuators, maintain drainage facilities, pay for electricity for lighting and signals, and to respond to motor vehicle accidents.

ADOT has been challenged to meet the needs of maintaining new features while preserving the existing system. The recent sharp increase in the cost of materials and fuel has diminished ADOT's ability to maintain the transportation infrastructure. The most visible result has been public concerns and comments relative to litter, landscaping and vegetation control, while the less visible maintenance activities such as pavement repair, drainage repair, and roadside work, when safe to delay, have been reduced in frequency.

The Department anticipates continuing challenges meeting the public's expectation for transportation infrastructure maintenance.

**3. Identify any other agencies having similar, conflicting or duplicative objectives, and an explanation of the manner in which the agency avoids duplication or conflict with other such agencies.**

The ADOT mission is unique from other state agencies. No other state agency is able to carry out ADOT's mission as effectively and efficiently. Federal agencies rely heavily on state departments of transportation to carry out national transportation programs.

The technical expertise and knowledge that is required to plan, build and maintain the state transportation infrastructure are confined to ADOT.

There is no conflict or duplication of effort within state government of these functions.

**4. Assess the consequences of eliminating the agency or of consolidating it with another agency.**

Termination of ADOT would harm the public welfare and place the public's safety at significant risk. One of our strategic issues is to make Arizona's transportation infrastructure safe. ADOT plays an important role to ensure the safe and efficient transport of people and goods through and within the state of Arizona. Elimination of the agency would seriously impact that movement. Furthermore, federal law requires state transportation departments to adequately maintain transportation improvements funded by federal monies.

Likewise, the consolidation of a large agency, such as ADOT, with another would have serious repercussions that could not only jeopardize the public's safety, but also impact the maintenance of the state's investment in our transportation systems and seriously delay the planned construction that the public expects. At approximately 4,600 employees, ADOT is one of the largest state agencies in Arizona. It would be difficult for another agency to be able to absorb ADOT and provide the internal services needed to continue operations without a significant decline in the quality and efficiency of those services, and to allow the Department to continue to serve the citizens of Arizona at the same level of service currently provided.

# Arizona Department of Transportation

## Performance Audit and Sunset Review

Shan Hays  
November 6, 2007

---

---

---

---

---

---

---

---

### Audit reports

- Aspects of Construction Management (July 2006)
- Highway Maintenance (June 2007)
- Sunset Factors (July 2007)

---

---

---

---

---

---

---

---

### Aspects of Construction Management

June 2006

---

---

---

---

---

---

---

---

### Construction management

- ADOT responsible for highway infrastructure
- Projects based on 5-year plan
  - State Transportation Board approves
  - FY 2006-2010 plan total: \$5.1 billion

---

---

---

---

---

---

---

---

### Use of contractors

- Construction contractors build roads
- Consultants perform several functions:
  - Design
  - Engineering services
  - Construction management

---

---

---

---

---

---

---

---

### Finding 1

ADOT should optimize internal resources to reduce consultant usage

---

---

---

---

---

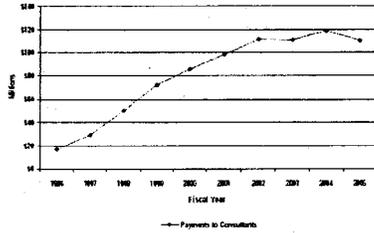
---

---

---

### External consultant usage

Figure 2: Payments to Consultants  
Fiscal Years 1996 through 2006



---

---

---

---

---

---

---

---

---

---

### Factors affecting consultant use

- Increasing workload
  - 5-year plan more than doubled in 10 years
  - Accelerated urban freeway construction
- Staff vacancies (Feb. 2006)
  - 27% of all engineering jobs
  - 46% of resident engineers

---

---

---

---

---

---

---

---

---

---

### Recommendations

- Consultant use can be costly, reduce staff competency
- Recommendations
  - Optimize in-house resources
  - Develop criteria for consultant use
  - Track and monitor consultant use

---

---

---

---

---

---

---

---

---

---

**Finding 2**

ADOT should improve implementation and documentation of inspection process

---

---

---

---

---

---

---

**Inspections key to quality**

- 220 field inspectors do daily monitoring
- 9 independent Quality Assurance inspectors review all projects at least once

---

---

---

---

---

---

---

**Improvements needed**

- Incomplete documentation of results of inspections
- Inconsistent application of inspection standards
- Deficiency follow-up lacking

---

---

---

---

---

---

---

### Recommendations

- Ensure field inspectors:
  - Document observations
  - Use checklists
- Include field inspectors in checklist revision process
- Follow up on independent quality assurance inspection results

---

---

---

---

---

---

---

---

### Finding 3

ADOT needs to improve audits of design and construction contracts

---

---

---

---

---

---

---

---

### Audits important

- Check contractor's accounting system
- Determine overhead rates
- Avoid over- or underpayments
- Verify contract requirements met

---

---

---

---

---

---

---

---

**Several problems**

- Inadequate audit planning
- Too few audits
- Audit backlogs
  
- Causes included vacancies, inadequate management

---

---

---

---

---

---

---

---

**Recommendations**

- Improvements needed:
  - Fill vacancies, implement performance measures, replace database, prioritize workload, revise audit manual
- New chief auditor hired January 2006
- 6-month follow-up
  - All recommendations were implemented

---

---

---

---

---

---

---

---

**Highway Maintenance**

June 2007

---

---

---

---

---

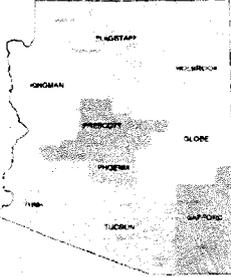
---

---

---

### Maintenance districts

Infrastructure Value:  
\$9 billion  
6/30/06



The map shows the state of Arizona divided into several maintenance districts. The districts labeled are Flagstaff, Sedona, Prescott, Phoenix, Tucson, and Yuma. The Phoenix district is the largest and is shaded in a darker gray. Other districts are shown in lighter gray.

---

---

---

---

---

---

---

---

### Finding 1

Maintenance monies support numerous activities

---

---

---

---

---

---

---

---

### Maintenance monies

- Maintenance monies in FY07:
  - \$118.6 million (10% of highway monies)
  - \$5.7 million Proposition 400
- Not included: \$103.3 million for pavement preservation from 5-year plan

---

---

---

---

---

---

---

---

### Maintenance expenditures

- 70% allocated to districts
- Contractor expenditures increased
  - \$17.5 m FY06 from \$4.1m FY97
  - FTEs dropped 951 to 922

---

---

---

---

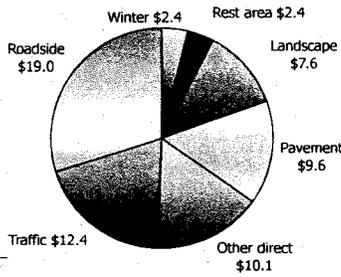
---

---

---

---

### FY06 direct expenditures \$63.5m



---

---

---

---

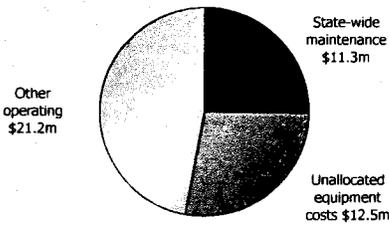
---

---

---

---

### FY06 other expenditures \$45m



---

---

---

---

---

---

---

---

**Finding 2**

**Most Arizona pavement rated satisfactory**

---

---

---

---

---

---

---

---

**Pavement rated satisfactory**

- ADOT rates on several criteria
  
- Arizona's roads
  - Compared favorably to other states
  - Improved from 1995 to 2005
  - Interstates better than other roads
  - Residents generally satisfied

---

---

---

---

---

---

---

---

**Finding 3**

**ADOT should improve method to determine maintenance needs and allocate maintenance dollars**

---

---

---

---

---

---

---

---

### Maintenance needs up

- Expenditures up 56% FY97-06
- Costs up (ex: asphalt up 171%)
- Demands up (lane miles, traffic volume)

---

---

---

---

---

---

---

### Planning inadequate

- Inadequate planning process
  - Needed work not identified
  - Allocations not based on needs
- ADOT can further improve needs measurement
  - 4 computerized systems in development
  - More can be done

---

---

---

---

---

---

---

### Recommendations

- Identify and prioritize maintenance needs
  - Develop guidelines
  - Identify needs
  - Determine needed funding
- Allocate based on state-wide priorities

---

---

---

---

---

---

---

**Sunset Factors**  
July 2007

---

---

---

---

---

---

---

---

**Overall conclusions**

- ADOT generally operations effectively and efficiently.
  
- ADOT has operated within the public interest

---

---

---

---

---

---

---

---

**Performance Audit and Sunset Review**

**Arizona Department of Transportation**

Shan Hays  
November 6, 2007

---

---

---

---

---

---

---

---



A REPORT  
TO THE  
ARIZONA LEGISLATURE

Performance Audit Division

---

Performance Audit

# Arizona Department of Transportation—

Aspects of Construction  
Management

---

JULY • 2006  
REPORT NO. 06 – 05



STATE OF ARIZONA  
OFFICE OF THE  
**AUDITOR  
GENERAL**

Debra K. Davenport  
Auditor General

The Auditor General is appointed by the Joint Legislative Audit Committee, a bipartisan committee composed of five senators and five representatives. Her mission is to provide independent and impartial information and specific recommendations to improve the operations of state and local government entities. To this end, she provides financial audits and accounting services to the State and political subdivisions, investigates possible misuse of public monies, and conducts performance audits of school districts, state agencies, and the programs they administer.

## The Joint Legislative Audit Committee

---

Representative **Laura Knaperek**, Chair

Senator **Robert Blendu**, Vice Chair

Representative **Tom Boone**

Senator **Ed Ableser**

Representative **Ted Downing**

Senator **Carolyn Allen**

Representative **Pete Rios**

Senator **John Huppenthal**

Representative **Steve Yarbrough**

Senator **Richard Miranda**

Representative **Jim Weiers** (*ex-officio*)

Senator **Ken Bennett** (*ex-officio*)

## Audit Staff

---

**Melanie Chesney**, Director

**Shan Hays**, Manager and Contact Person

**Brent Nelson**, Team Leader

**Lori Babbitt**

**Mark Haldane**

Copies of the Auditor General's reports are free.  
You may request them by contacting us at:

### **Office of the Auditor General**

2910 N. 44th Street, Suite 410 • Phoenix, AZ 85018 • (602) 553-0333

Additionally, many of our reports can be found in electronic format at:

**[www.azauditor.gov](http://www.azauditor.gov)**

**REPORT HIGHLIGHTS**  
PERFORMANCE AUDIT

Subject

The Arizona Department of Transportation (ADOT) relies heavily on engineering consultants to design, develop, and manage highway projects, and on contractors to build and maintain the roads, bridges, and landscaping.

Our Conclusion

ADOT has increasingly used consultants to provide services traditionally provided by ADOT employees. ADOT should evaluate its use of consultants and identify ways to reduce use of consultants. To help ensure construction standards are complied with, ADOT should improve inspection consistency, documentation, and followup. ADOT also should address its backlog of consultant and construction contract audits.



2006

**ADOT Should Optimize Internal Resources To Reduce Consultant Usage**

ADOT's Intermodal Transportation Division (ITD) constructs and manages the State's highway system in five phases:

- **Scoping**—studies of where and when highways should be built;
- **Design**—project design, environmental studies, and right-of way acquisition;
- **Bidding**—selecting contractors to build highways;
- **Construction**—oversight of contractors building highways; and
- **Operation and maintenance**—oversight of maintenance, preservation, and landscaping once the highway is completed.

**ITD relies heavily on consultants**

ITD relies on consultants to provide services during the scoping, design, and construction phases. A 2003 national survey reported that almost all state departments of transportation use private consultants for the design and management of highway projects.

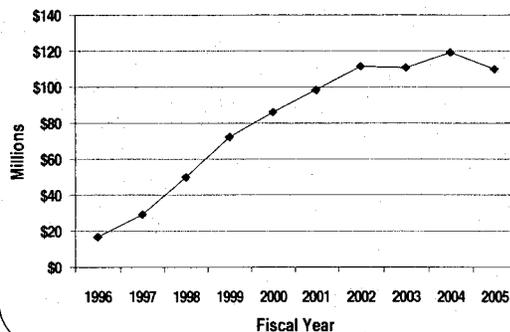
As of January 2006, ADOT had 430 contracts with 121 private consultants worth \$559 million. This included 72 contracts worth \$78 million with "supplemental consultants" who perform the duties of vacant employee positions, including resident engineers, field inspectors, and design engineers.



ADOT logo from Arizona Department of Transportation Web site.

The Governor's Efficiency Review Team reported that ADOT spends more on consultant contracts and uses more consulting services than all other Arizona state agencies combined.

Payments to consultants

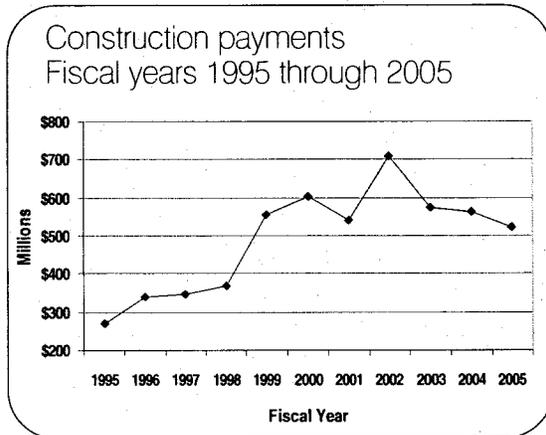


**Increased consultant use**—ADOT's use of consultants has increased by 424 percent over the last 10 years.

ADOT gives several reasons for the increased use of consultants, including:

- increased highway construction;
- increased complexity of construction projects; and
- high ADOT staff vacancies caused by low salaries.

**Increased construction**—The highway construction workload, as measured by construction payments, increased by about 76 percent from fiscal year 1999 to 2005, requiring more use of consultants.



**28 percent vacancy rate**—As of February 2006, almost 28 percent (79 of 286) of ADOT's engineering positions were vacant. ADOT attributes the high vacancy rate to employees retiring or leaving for the higher salaries paid by private consulting firms. A November 2005 ADOT salary survey disclosed that ADOT technical and engineering salaries were 13 to 26 percent lower than comparable public and private positions, even after a 5 percent pay increase.

**Risks**—The risks of using consultants include higher costs and lost competency. Most studies on the use of consultants in state departments of transportation agree that using consultants increases the cost of services.

Further, national research also shows that high consultant use can affect the ability to maintain employee core competencies, because state employees may not get enough experience with core functions and must spend more time monitoring consultant activities and contracts than performing core functions. Adding to this concern is a decline in experience levels among ADOT's engineers. For example, from 2000 to 2006, the average experience level for ADOT engineers has decreased by 2 years.

### Need to evaluate consultant use

In addition to continuing its efforts to fill its vacancies, ITD needs to collect data to evaluate consultant usage. Better information can help ITD identify consultant work that could be done by in-house staff if sufficient in-house resources were available, and to analyze whether doing more in-house work could be cost-effective.

### Recommendations

ADOT should:

- Fill existing vacancies;
- Continue to develop strategies to recruit and retain employees;
- Develop criteria for deciding when to use consultants;
- Perform more work in-house when appropriate and staff are available; and
- Track and monitor consultant usage.

## ADOT Should Improve Highway Construction Inspections

More than 220 ADOT field inspectors observe contractors' compliance with construction specifications and standards. These inspectors have the authority to reject work or materials that

do not comply with plans and specifications. In addition to daily inspections, ADOT conducts at least one independent quality assurance (QA) inspection of each project.

## ADOT can improve field inspections

ADOT can take several actions to improve its field inspections.

**Inspections not fully recorded**—Although field inspectors conduct daily inspections, they do not consistently record their observations and whether work met specifications. They also do not record whether problems were resolved. For example, in one instance, an inspector rejected 10 feet of concrete pipe and the contractor later removed 6 feet of the pipe. However, there was no documentation explaining the problem, nor why only part of the 10 feet of pipe was removed.

**Checklists not used**—Inspectors are given checklists to ensure that contractors complete the most critical aspects of construction properly. There are over 80 checklists that cover various parts of construction, such as concrete curing, grading, and concrete box culverts. However, we reviewed 9 projects and found that 27 of 47 inspectors failed to fill out any checklists.

ADOT has taken steps to make it easier to use checklists. Online database checklists are available on inspectors' laptop computers, and ITD has formed teams to create new checklists.

**Application of inspection standards varies**—Inspection results vary between field inspectors and QA inspectors. QA inspectors appear to apply a stricter

interpretation of quality standards than do field inspectors. As a result, based on two projects:

- Field inspectors determined work met standards 66 percent of the time, and
- QA inspectors found work met specifications only 35 percent of the time.

**Field inspectors lack experience**—An ADOT official stated that inspectors need about 5 years' experience to become fully proficient, and inspectors with less experience are usually assigned less-technical work. However, many field inspectors are relatively inexperienced.

### Quality assurance inspections lack followup

Although QA inspectors may apply stricter standards, they cannot reject or change work in progress as the field inspectors are empowered to do. They can only recommend to ADOT project personnel that the work processes be changed.

Further, ITD does not require followup when QA inspections have significant findings. Of 1,970 QA inspections, 1,586 (80 percent) identified one or more critical or major noncompliant items. Critical noncompliant items include some that may potentially pose risks to human life, while major noncompliant items can have an impact on the quality of a project. ADOT does not require follow up on these noncompliant items.

#### ADOT Field Inspectors:

- 34 percent of inspectors had fewer than 5 years' experience
- 29 percent of inspectors were hired into lower-level positions because ADOT could not recruit someone who met the minimum position qualifications
- 32 percent of the positions were vacant.

## Recommendations

ADOT should:

- Ensure that field inspectors document inspection results and consistently complete checklists;
- Provide training to inspectors and ensure that field inspectors and QA inspectors similarly apply standards; and
- Require followup for major and critical noncompliant items found by QA inspections.

## ADOT Needs To Improve Its Contract Audits

ADOT is required to audit its consulting and construction contracting processes. ADOT uses audits to help it:

- Determine if consultant overhead billing rates are appropriate;
- Ensure that costs that are charged are proper;
- Ensure contractors comply with contract requirements governing payments, change orders, materials testing, etc.; and
- Ensure that ADOT staff follow ADOT's contract management requirements.

### Audits help protect state dollars

Auditing helps detect overcharges and/or failures to deliver services. For example, one audit completed in September 2003 questioned \$272,500 in payments made to a contractor. Another audit completed in July 2004 found errors in the quantities of concrete delivered and questioned the payment of \$300,000.

### Audits severely backlogged

ADOT has a 16-person unit within its Office of Audits and Analysis (Office), which is responsible for contract audits. However, the Office has hundreds of backlogged audits dating back to 2001. Of particular concern, many of the

backlogged audits involve large construction projects. The Office has only conducted about 74 percent of the required audits for the 10 largest construction projects, which range in value from \$15.7 to \$221 million.

Further, when the Office conducts audits it does not always issue its reports in a timely manner. At least 14 of 17 construction cost and administrative compliance audit reports issued in the first half of FY 2006 were issued, on average, 371 days after the reports were drafted.

### Poor management and other problems

Several factors have contributed to the audit problems. The Office has not been able to fill 7 of its 16 positions. However, it has also not adequately managed the staff it has. For example, it has not followed its own policy to prioritize audits to ensure the projects with the highest risks are audited. Also, it has not tracked basic information such as the number of audits scheduled, in progress, and completed for recent fiscal years. In fact, the previous chief auditor suspended the use of performance measures and tracking reports. A new chief auditor hired in January 2006 is taking actions to correct the problems.

### Recommendations

ADOT should:

- Fill audit staff vacancies;
- Ensure that the highest-risk projects are audited; and
- Reinstigate performance measures for its audit unit.

#### TO OBTAIN MORE INFORMATION

A copy of the full report can be obtained by calling  
**(602) 553-0333**



or by visiting our Web site at:  
[www.azauditor.gov](http://www.azauditor.gov)

Contact person for this report:  
Shan Hays



DEBRA K. DAVENPORT, CPA  
AUDITOR GENERAL

STATE OF ARIZONA  
OFFICE OF THE  
AUDITOR GENERAL

WILLIAM THOMSON  
DEPUTY AUDITOR GENERAL

July 20, 2006

Members of the Arizona Legislature

The Honorable Janet Napolitano, Governor

Mr. Victor Mendez, Director  
Arizona Department of Transportation (ADOT)

Transmitted herewith is a report of the Auditor General, A Performance Audit of the Arizona Department of Transportation, Aspects of Construction Management. This report is in response to a May 24, 2005, resolution of the Joint Legislative Audit Committee. The performance audit was conducted as part of the sunset review process prescribed in Arizona Revised Statutes §41-2951 et seq. I am also transmitting with this report a copy of the Report Highlights for this audit to provide a quick summary for your convenience.

As outlined in its response, ADOT agrees with all of the findings and plans to implement 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 July 21, 2006.

Sincerely,

Debbie Davenport  
Auditor General

Enclosure

# SUMMARY

---

The Office of the Auditor General has conducted a performance audit of the Arizona Department of Transportation (ADOT) pursuant to a May 24, 2005, resolution of the Joint Legislative Audit Committee. This is the first in a series of three reports on ADOT and was conducted as part of the sunset review process prescribed in Arizona Revised Statutes (A.R.S.) §41-2951 et seq. This audit focuses on the Intermodal Transportation Division's (ITD) use of consultants to design and manage construction projects, the process for inspecting projects under construction, and the audits conducted by ADOT's Office of Audit and Analysis on consultant and construction contracts. The other audit reports will focus on the highway maintenance program and the 12 statutory sunset factors.

ADOT was established in 1974 to plan, develop, maintain, and operate Arizona's highway transportation infrastructure to move people and goods by surface and air throughout the State. ITD relies on private consultants to help design and contractors to construct highway projects. In fiscal year 2005, ADOT paid consultants \$110 million for transportation corridor-related studies, pre-design, design, and construction administration. In fiscal year 2005, ITD awarded 126 construction contracts valued at \$510 million. ITD field inspectors and independent quality assurance (QA) inspectors inspect construction work to verify quality construction and compliance with specifications. ADOT internal auditors review consultant and construction contracts to verify that payments are proper.

## ADOT should optimize internal resources to reduce consultant usage (see pages 9 through 17)

The Intermodal Transportation Division (ITD), which plans, designs, constructs, maintains, and operates the State's highway transportation infrastructure for the movement of people and goods throughout Arizona, should evaluate consultant usage and complete project design, construction management, and other similar functions in-house when appropriate to control costs and maintain employee core competency levels. ITD has had to meet an increased workload, including an accelerated urban freeway construction program that reduced 14 years of

construction to 7-½ years, while simultaneously dealing with reduced FTE counts, vacancies, and an inability to fill many of its engineering and technical positions. ADOT attributes these vacancies to employees retiring or leaving for higher salaries offered by private consulting firms and local governments. For example, ITD surveyed nine consulting firms that provide services to ITD and found that 45 percent of these consultants' employees were former ADOT employees. Also, in November 2005, an ADOT salary comparison found that even after a recent 5 percent pay increase, ADOT engineer salaries were 13 to 26 percent lower than comparable private and public positions in the Phoenix area. The amount of work planned in ADOT's 5-year construction program more than doubled in the past 10 years, but ITD has been unable to fill nearly one-fourth of its engineering positions. As a result, ITD has substantially increased its use of private consultants to supplement its staff in providing project design, construction management, inspection, and other services. ADOT's payments to consultants increased 424 percent after adjusting for inflation, with payments increasing from \$17 million in fiscal year 1996 to \$110 million in fiscal year 2005. In June 2005, the Governor's Efficiency Review Team reported that ITD's consultant spending and usage was more than all other state agencies combined.

ITD must use consultants because of its workload and the difficulty in hiring and retaining experienced staff. However, filling vacant positions and completing more project design, construction management, and other similar functions in-house can reduce reliance on consultants and maintain and develop internal core competencies. One risk of high consultant usage as demonstrated in professional literature is that consultants can cost more than internal staff for design work. Another is that excessive consultant usage can reduce internal staff competence. ITD's engineering employee experience levels have declined in recent years. ITD has attempted to stem its turnover and vacancy rates by making counter-offers to some employees who receive offers of higher-salary jobs and by higher utilization of an Engineer in Training program to attract new hires. Additional actions needed include establishing criteria to evaluate whether consultants are necessary and maintaining adequate management information to evaluate consultant usage and identify where project design, construction management, and other similar functions could be more appropriately provided by lower-cost, in-house staff.

## ITD should improve implementation and documentation of inspection process (see pages 19 through 25)

To ensure contractors meet construction standards for highway projects, ITD should improve construction inspection quality. ADOT employs more than 220 field inspectors who visit construction sites daily as a means of ensuring construction quality and compliance with specifications. As an additional quality control measure, ITD independent QA inspectors inspect the same construction sites at least once

using the same inspection standards. However, auditors identified three problems with the inspection and review processes:

- **Documentation of inspection results is incomplete**—ITD inspectors do not consistently document the results of their observations. For example, auditors' review of 9 projects determined that 43 of 47 inspectors' diaries showed the type of work observed, but not whether the work met specifications. Lack of documentation may affect ADOT's ability to determine the progress and quality of work and to identify problem areas and determine if sufficient action has been taken to resolve identified problems. Additionally, 27 of 47 inspectors whose records were reviewed did not fill out any of the required checklists, which are based on standard specifications and important to ensure the product meets quality requirements of workmanship and testing. To comply with ADOT policy and help ensure the quality of work inspected, ADOT should ensure that field inspectors complete and submit checklists as part of their daily diaries, and that diaries document work quality, problems found, and problem resolutions.
- **Inspection standards are not consistently applied**—When ITD's independent QA inspectors conduct periodic reviews, they appear to apply a stricter interpretation of the standards than field inspectors do during their daily visits. Auditors' analysis of two construction projects where both field inspectors and independent QA inspectors conducted inspections during July 1, 2005 through December 19, 2005, found that field inspectors determined work met specifications 66 percent of the time, while independent QA inspectors found work met specifications only 35 percent of the time. ITD should ensure that checklist results are consistent among field inspectors and independent QA inspectors by identifying reasons for differences and providing training and/or developing guidelines to help inspectors interpret the checklist items in a similar manner.
- **Followup on important deficiencies is lacking**—Although field inspectors' findings may be resolved at once, making followup unnecessary, ITD has not developed any follow-up procedures for deficiencies identified by the independent QA inspectors even when they identify critical or major noncompliance that in some cases may potentially put human life at risk, or have a substantial impact on operability, durability, cost, or the environment. Auditors' analysis of 1,970 reviews revealed that 80 percent identified one or more of these types of noncompliance. For example, one independent QA inspection found noncompliance with rebar spacing and size that, if not corrected, could result in a shorter lifespan or failure of the roadway structure. ADOT could better use the results of independent QA inspections by requiring a followup for critical and major deficiencies.

## ADOT needs to improve its audits of design and construction contracts (see pages 27 through 34)

ADOT has not adequately planned and managed the audits of its highway design and construction contracts. The Office of Audit and Analysis (Office) is required to conduct audits covering the full range of consulting and construction contracting practices. The Office conducts several types of audits to ensure that contractors set rates appropriately, comply with contract requirements, and do not overcharge. However, office productivity has diminished in recent years. The Office does not conduct the number of audits required by its own policies and, according to internal reports, had backlogs of each audit type. Even those contracts with the largest dollar amounts, as much as \$221 million, had insufficient audits.

Several factors have contributed to the low productivity, including ongoing, long-term vacancies and inadequate workload planning and management. In December 2005, the Office's unit responsible for consultant and construction audits had vacancies in 7 of 16 positions, 4 of which had been unfilled for over 3-½ years. In addition, the Office has not complied with its policy to develop an annual audit plan or select construction progress audits based on a department-wide audit risk assessment.

These problems continue to exist, but they show signs of being addressed under a new chief auditor hired in January 2006. The chief auditor has announced plans for filling vacancies, reinstating performance measures, revising the audit manual, prioritizing audit projects using a risk-based approach, and obtaining an automated audit management system. In addition to these efforts, the Office should measure the number and types of audit requests it receives and audits it conducts, the timeliness of its audits, and its audit results.

# TABLE OF CONTENTS



Introduction & Background	1
Finding 1: ADOT should optimize internal resources to reduce consultant usage	9
ITD relies on consultants to deliver transportation program	9
Workload and vacancies increase consultant use	11
Consultant use may have unintended consequences	12
ITD should take further actions	14
Recommendations	17
Finding 2: ITD should improve implementation and documentation of inspection process	19
ITD monitors contractor activities	19
ITD can improve field inspections	20
Independent quality assurance inspections lack followup	23
Recommendations	25
Finding 3: ADOT needs to improve audits of design and construction contracts	27
Audits required during all construction phases	27
Office fails to complete audits or completes them late	29
Several factors contribute to low productivity	31
Department has begun to address problems	32
Recommendations	34

♦ continued



# TABLE OF CONTENTS

Endnotes:	a-i
Tables:	
1 ADOT's Project Development Process	2
2 Intermodal Transportation Division Schedule of Appropriations and Expenditures, in Thousands Fiscal Years 2004 through 2006 (Unaudited)	5
3 Average Years' Experience for Selected ITD Engineer Positions as of December 31, 2000 through February 6, 2006	14
4 Status of Required Audits Ten Largest Completed Projects Fiscal Year 2005	30
5 Status of External Audit Unit Positions As of December 31, 2005	31
Figures:	
1 ITD Engineering Districts As of April 2006	3
2 Payments to Consultants Fiscal Years 1996 through 2005	10
3 Payments to Construction Contractors Fiscal Years 1995 through 2005 (Unaudited)	11
4 Comparison of Responses on Checklists July 1 through December 19, 2005	22

continued •

# TABLE OF CONTENTS



## Photos:

1	View of U.S. 60 from SR 202 overpass under construction	1
2	Paving the San Tan Freeway	19
3	Pouring a retaining wall footing	24

• concluded

# INTRODUCTION & BACKGROUND

The Office of the Auditor General has conducted a performance audit of the Arizona Department of Transportation (ADOT) pursuant to a May 24, 2005, resolution of the Joint Legislative Audit Committee. This is the first in a series of three reports on ADOT and was conducted as part of the sunset review process prescribed in Arizona Revised Statutes (A.R.S.) §41-2951 et seq. This audit focuses on the use of consultants to design and manage construction projects, the process for inspecting projects under construction, and the audits conducted on consultant and construction contracts. The other audit reports will focus on the highway maintenance program and the 12 statutory sunset factors.

ADOT responsible for the State's transportation infrastructure—ADOT was established in 1974 and is statutorily charged under A.R.S Title 28 with planning, developing, designing, constructing, maintaining, and operating the State's highway transportation infrastructure for the movement of people and goods by surface and air throughout Arizona. The Intermodal Transportation Division (ITD) is primarily responsible for designing, constructing, and maintaining the state highway system that includes operating interstate highways and state highway routes. ITD has highway management activities throughout the highway life cycle, from conceptual design and scoping to roadway maintenance.

New highways and existing highway improvement projects are based upon an annually updated 5-year Transportation Facilities Construction Program approved by the seven-member State Transportation Board. As shown in Table 1 (see page 2), highway construction projects go through a Project Development Process, which includes all the engineering, construction, and administrative functions required to advance a project from conception, through design and construction, and into the operation and maintenance of the highway. The scoping phase includes studies and analysis to determine where and when highways should be built or improved and what features should be included. The design phase includes project design,

Photo 1: View of U.S. 60 from SR 202 overpass under construction

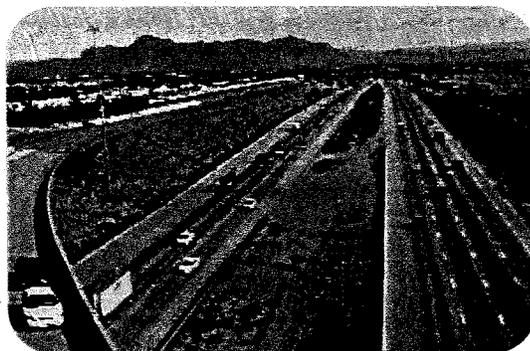


Photo: Courtesy of the Arizona Department of Transportation.

environmental studies, and right-of-way acquisition. The bidding phase includes preparing and advertising the project for bidding. After contract award, the construction phase involves oversight of contractor work, inspecting work progress and quality, and resolving any construction problems. Finally, when construction projects are completed, additional work occurs during the operation and maintenance phase. In addition, ITD district maintenance crews are also responsible for the day-to-day maintenance of the districts' highways.

**Table 1: ADOT's Project Development Process**

<b>Phase</b>	<b>Description of Activity</b>
Scoping	Corridor studies help define individual projects to meet transportation needs. Additional studies help determine project alignment, engineering, and environmental issues that must be addressed; estimated costs for project development; and time estimates necessary for project completion. Prioritized projects are included in the 5-year program for approval by the State Transportation Board.
Design	Approved projects in the 5-year program advance to design and preconstruction activities where a number of design, environmental, utility, and right-of-way activities take place.
Bidding	Once design is completed, the project is prepared for bidding and awarded to a contractor to complete construction.
Construction	After the contract is awarded, the contractor is responsible for constructing the project in accordance with specifications and contract provisions. ADOT and its consultants administer construction contracts and conduct inspections of contractor work. Design consultant contracts continue during the construction phase to address any design issues.
Operation and Maintenance	Once completed, ADOT provides maintenance to new or improved highway facilities to ensure continued utility and useful life.

Source: Auditor General staff analysis of the *ADOT Project Development Process Manual*, February 2004.

## ITD contracts for project planning, design, and construction

ITD uses the services of private consultants and contractors. ADOT uses independent contractors to construct roadway projects, while consultants have been increasingly used to provide services traditionally provided by in-house employees.

Consultants provide services such as project design, construction management, and various engineering services during the scoping, design, and construction phases of project development, while contractors perform construction. A national survey reported in 2003 that virtually all state departments of transportation use contracts with private consultants and contractors to complete some functions of highway programs. ADOT's Office of Audit and Analysis (Office) is responsible for auditing many of these contracts to ensure appropriate payment, in addition to completing other internal functions.

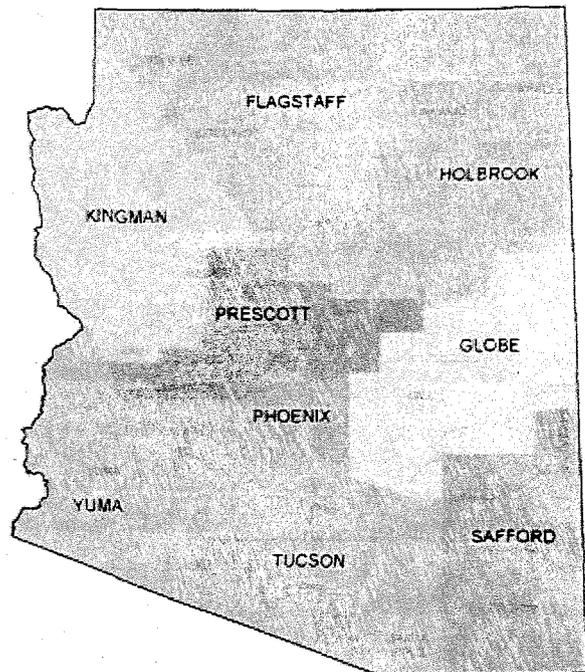
In fiscal year 2005, ITD awarded 126 contracts for construction projects at a value of \$510 million to contractors for building roadway projects. According to an ADOT official, these contracts do not include monies paid to consultants who provide design, inspection, and construction management services. Many of these construction projects take several years to construct. For example, a construction contract for a portion of the Loop 202 freeway in Maricopa County was awarded in April 2002 and the project was completed in August 2004.

## Organization and staffing

Both ITD and the Office in ADOT's Transportation Services Group have responsibilities related to consulting and construction contracts. ITD administers construction projects through district offices, as shown in Figure 1. Uniquely, Phoenix, because of its size, has two districts, one for construction and one for maintenance, while the other districts combine both functions into one physical location for a total of ten districts. Each district office is headed by a district engineer and staffed with other employees assigned to organizational units and sub-units called "orgs." As of February 2006, ITD had 2,218 FTE, of which 316 were vacant (14 percent), as follows<sup>1</sup>:

- **ITD-State Engineer's Office (23 FTE, 8 vacant)**—The State Engineer's Office is responsible for the administration of ITD and provides overall division support in the areas of management, budget, personnel, and training.
- **ITD-Development (529 FTE, 84 vacant)**—ITD-Development is responsible for project development and design. For example, once the State Transportation Board

Figure 1: ITD Engineering Districts  
As of April 2006



Source: ADOT Web site graphic of construction and maintenance districts.

approves a highway project, ITD-Development coordinates pre-construction engineering functions including roadway and bridge design, compliance with environmental laws, and the design of traffic control plans. It also acquires right-of-way needed for highway construction. According to ADOT officials, ITD-Development designs some projects when sufficient staff is available, but employs consultants for design work in order to meet increasing workload demands. After design, ITD-Development is responsible for preparing construction projects for bidding by construction contractors and overseeing the bidding process. ITD-Development is organized into seven groups: Environmental & Enhancement Group, Statewide Project Management Group, Right-of-Way Group, Engineering Technical Group, Roadway Engineering Group, Traffic Engineering Group, and the Bridge Group.

- **ITD-Operations (1,234 FTE, 128 vacant)**—ITD-Operations oversees roadway construction, maintenance, testing and evaluation of materials, pavement design strategies for new and old pavements, and emergency maintenance response. It includes the Construction, Maintenance, Transportation Technology and Materials groups, and eight of the ten state-wide districts. Districts are responsible for highway operations, construction, and maintenance in their respective geographical areas. ITD-Operations also include some of the field inspectors who inspect daily construction work and the Construction Operations section that conducts independent reviews of construction projects.
- **ITD-Valley Transportation (421 FTE, 93 vacant)**—The Valley Transportation Program provides and coordinates pre-construction, construction, and maintenance functions for the urban highway systems in Maricopa County. The Valley Transportation Program contains the Phoenix Construction District, the Phoenix Maintenance District, the Regional Freeway System Office, and the Valley Project Management Group.
- **Transportation Services Group-Office of Audit and Analysis External Audit Unit (16 FTE, 7 vacant as of December 31, 2005)**—The Office of Audit and Analysis, an internal auditing office, conducts audits of consultant and construction contracts to aid in managing and overseeing both design and construction contracts, and conducts administrative audits of ADOT's highway construction organizations. The Office also has other audit duties related to information technology, revenue, and third-party collections.

## Budget

ITD spends most ADOT monies earmarked for its highway program. Table 2 (see page 5) shows ITD operating budget information for fiscal years 2004 through 2006. As shown by Table 2, ITD's expenditures totaled approximately \$220.7 million in fiscal

**Table 2: Intermodal Transportation Division  
Schedule of Appropriations and Expenditures, in Thousands<sup>1</sup>  
Fiscal Years 2004 through 2006  
(Unaudited)**

	2004 (Actual)	2005 (Actual)	2006 (Estimated)
<b>Appropriations:</b>			
State Highway Fund <sup>2</sup>	\$190,269.0	\$220,185.4	\$230,730.1
Safety Enforcement and Transportation Infrastructure Fund <sup>3</sup>	<u>558.7</u>	<u>558.7</u>	<u>558.7</u>
Total revenues	<u>190,827.7</u>	<u>220,744.1</u>	<u>231,288.8</u>
<b>Expenditures:</b>			
Personal services and related benefits	103,613.5	106,406.2	113,692.2
Professional and outside services <sup>4</sup>	6,824.8	5,919.8	6,766.4
Travel	1,811.7	1,936.6	2,188.0
Other operating <sup>5</sup>	70,352.1	94,859.1	100,729.0
Equipment	<u>7,968.8</u>	<u>11,602.6</u>	<u>7,913.2</u>
Total expenditures	<u>190,570.9</u>	<u>220,724.3</u>	<u>231,288.8</u>
Excess of appropriations over expenditures	<u>\$ 256.8</u>	<u>\$ 19.8</u>	<u>\$ -0-</u>

<sup>1</sup> This table includes only department appropriations and expenditures relating to the Intermodal Transportation Division's operating budget and is presented on a budgetary basis, in which expenditures are reported in the budget year incurred.

<sup>2</sup> Consists of the Division's portion of the Department's appropriation from State Highway Fund monies used to pay for its operations. The State Highway Fund receives monies from the Highway User Revenue Fund, and fuel and motor carrier taxes.

<sup>3</sup> Consists of the Division's portion of the Department's appropriation from Safety Enforcement and Transportation Infrastructure Fund monies used to pay for its operations. This Fund receives monies primarily from motor vehicle licenses and registration fees.

<sup>4</sup> Consists of payments made to external parties for services provided to the Division, such as temporary services; preliminary engineering costs; and various consultants. For example, the Division contracts for pre-design and design, bridge inspection, environmental, and asbestos abatement work.

<sup>5</sup> Consists of various costs for division operations, including utilities; landscaping; cable barrier and guardrail repair; rest area maintenance; traffic control; equipment, building, and land rental; general repair and maintenance; and materials. In addition, the 2005 amount costs increased significantly primarily because the Department began paying the risk management premium of \$16.1 million, effective July 1, 2005, from division monies since the Division actually incurred the associated risk.

Source: Auditor General staff analysis of financial information provided by the Arizona Department of Transportation for fiscal years 2004 through 2006.

year 2005, and estimated expenditures for fiscal year 2006 are \$231.3 million. Table 2 contains the operating expenses of ITD and does not include highway construction costs. About 48 percent of ITD's annual operating budget is spent on salaries and benefits, while another 43 percent is spent on other operating costs, including utilities, landscaping, cable barrier and guardrail repair, and rest area maintenance.

In addition to its operating budget, ITD expends state monies and federal grant funds for highway construction and improvement projects that are approved by the State

Transportation Board. According to ADOT, a total of approximately \$834 million was expended in fiscal year 2005 on highway projects.

## Scope and methodology

This audit focused on ITD's use of consultants, construction inspection practices, and ADOT's audits of consultants and construction projects. This audit includes three findings and associated recommendations as follows:

- ITD should optimize its internal resources to reduce consultant usage when appropriate during completion of project design, construction management, and other similar functions to control costs and maintain employee core competency levels. This will require establishing division-wide criteria for deciding when to use consultants, maintaining better consultant usage information, and implementing strategies to recruit and retain employees.
- ITD should improve the consistency and documentation of daily field inspections and follow up on deficiencies found by independent quality assurance (QA) inspections.
- The Office of Audit and Analysis should continue to take several steps to increase productivity, improve audit management, and provide an effective program for auditing consultant and construction contracts.

Auditors used a variety of methods to review and study the issues addressed in this audit. Audit methods included interviews with management and staff at ADOT, ITD, the Audit and Analysis group, the Federal Highway Administration, and private consulting firms; a review of agency-prepared documents, such as the salary comparison for engineers; and a review of various policies and procedures regarding project inspection and ADOT contract-auditing requirements. Auditors analyzed data provided by ITD to determine the number of filled employee positions and to compare and evaluate employee vacancies, under-filled positions, and employee experience levels for the period of December 31, 2000 through February 6, 2006.

Auditors also used the following methods to perform more specific audit steps:

- To evaluate ADOT's use of consultants, auditors summarized annual payments ADOT made to private consulting firms between fiscal years 1995 and 2005. This data was obtained from ITD's Contract Management System (CMS). Auditors verified the accuracy and completeness of CMS data by comparing it to 41 payment requests submitted by private consulting firms. To evaluate trends in ITD workload changes and its impact on staffing issues, auditors compared 5-year Transportation Facilities Construction Programs from 1987 to

2006, and analyzed data provided from ITD on annual payments made to contractors from fiscal years 1995 to 2005. To determine the impacts of using large amounts of consultant services instead of conducting work by in-house staff, auditors reviewed ten state and national reports that addressed core competency and consultant cost comparisons at several state transportation agencies. (See Endnotes on pages a-iii through a-v.)

- To examine the inspection process, auditors observed the activities of four field inspectors and two independent QA inspectors. In addition, to determine if field inspectors and independent QA inspectors were adequately documenting their quality control activities over construction projects, auditors examined Certification Acceptance Procedure agreements between ADOT and the Federal Highway Administration (FHWA); the ITD *Construction Manual* containing inspection procedures; FHWA's *Construction Program Management and Inspection Guide*; and ADOT's *Standard Specifications for Road and Bridge Construction*. To examine the documentation of inspections, auditors compared electronic and paper construction inspection checklists completed by both field inspectors and QA inspectors. Additionally, auditors assessed the level of inspection documentation contained in 47 field inspectors daily diaries for 9 projects.
- To evaluate consultant and construction auditing activities and determine the number of audits backlogged, auditors first analyzed records maintained on the ADOT Help Desk Expert Automation Tool (HEAT) Audit database for audits that were shown as being open between July 1, 2003 and December 31, 2005. HEAT is primarily used as the incident and service request tracking tool of ADOT's Information Tracking Group (ITG) and was modified to track audits for the Office of Audit and Analysis (Office). Auditors examined 94 audit files to determine the database's reliability and found that the data was not sufficiently reliable to determine audit backlogs. Therefore, to determine audit backlogs, auditors:
  - Reviewed pre-award audit data from the Office's HEAT Audit database, which was revised and expanded by individual office auditors. The Office provided three different reports of the pre-award backlog between February 9, 2006 and May 31, 2006. However, auditors could not validate the accuracy of the source data, and could only estimate the backlog based on the Office's assertions.
  - Matched a list of pending incurred cost audits provided by the Office, which was extrapolated from HEAT Audit data, with a list of incurred cost audits provided by ITD's Engineering Consultants Section from its Contract Management System database to determine the minimum backlog. The Office was unable to produce reliable data that would allow auditors to determine the actual incurred cost audit backlog.

- Compared office spreadsheets of construction cost audits completed to the Office's audit files for each project and audits scheduled with data from the Construction Operations database. The data was sufficiently reliable to determine the number of completed audits, the minimum number of projects that should have been audited, and the minimum backlog.
- Compared office spreadsheets of administrative compliance audits completed and in progress to office audit files for each of ADOT's 26 construction field offices. The data was sufficiently reliable to determine which audits were completed and to extrapolate the administrative compliance audit backlog.

Auditors also reviewed the Construction Operations database to identify the ten largest dollar value construction projects completed in fiscal year 2005 and reviewed associated audit and contract files to determine whether the Office had completed audits in accordance with its policies and procedures. In addition, auditors examined internal reports and associated audit files to determine the number of construction cost and administrative audits requested but not yet completed. To determine how the Office of Audit and Analysis should ensure appropriate audit coverage of design and construction contracts, auditors reviewed the Office's Audit and Analysis Audit Manual, a Memorandum of Understanding between ADOT and FHWA, an article on governmental contract auditing from the *Journal of Government Financial Management*,<sup>2</sup> and an article on construction auditing from *The Internal Auditor*.<sup>3</sup>

- To complete the Introduction and Background section of the report, auditors compiled unaudited information from ADOT's Web site and other agency-prepared documents and interviews with the agency.

The audit was conducted in accordance with government auditing standards.

The Auditor General and staff express appreciation to the director of the Arizona Department of Transportation, the state engineer, and their staff for their cooperation and assistance throughout the audit.

# FINDING 1

---

## ADOT should optimize internal resources to reduce consultant usage

The Intermodal Transportation Division (ITD) should optimize its internal resources to reduce consultant usage when appropriate during completion of project design, construction management, and other similar functions to control costs and maintain employee core competency levels. ITD relies heavily on consultants for project design and management, largely because consultants provide additional expertise and enable ITD to complete projects in a timely manner when ITD's internal resources are insufficient to complete the construction program. ITD also uses consultants where staff positions are vacant. However, relying on consultants can be costly, and too much usage can erode staff competency. ITD has a number of initiatives under way to address staffing issues, but reports that recruitment and retention are difficult because current salary levels are below market. ITD should continue its efforts and pursue additional ways to identify and maintain the proper level of consultant usage.

### ITD relies on consultants to deliver transportation program

ITD hires private consultants to provide project design, construction management, and various engineering and other services. These consultants are separate from the contractors who complete actual construction of projects. See text box at right for examples of services consultants provide. As of January 2006, ITD had 430 contracts with 121 private consulting firms at a total value of \$559 million. Consultant contracts are for multiple years, and payments are made as work is completed.

The practice of using consultants is common among transportation agencies in other states, as well. According to a

ADOT hired consultants to perform the following functions:

- Design highways;
- Complete right-of-way acquisition;
- Perform environmental reviews;
- Manage construction projects;
- Prepare projects for bidding to contractors; and
- Perform other services related to the design and management of highway construction.

2003 national survey report, most state transportation agencies use consultants for some of the design and management of highway projects.<sup>4</sup> The report found agencies were increasingly using consultants to deliver services driven by growth in highway programs coupled with the same number of or fewer people in their workforces. The major factors influencing states' decisions to contract out were staff constraints, specialty skills, and equipment. A 2003 review of literature of other state transportation agencies prepared for the Georgia Department of Transportation found that of the respondents, 79 percent used consultants for design, 53 percent for construction management, and 50 percent for right-of-way work.<sup>5</sup>

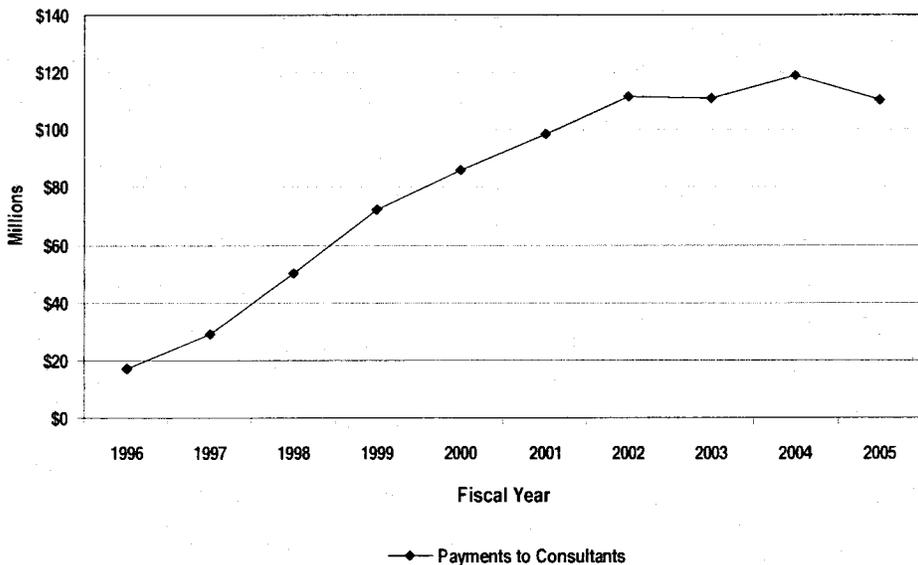
ADOT's use of consultants is by far the largest of any state agency. The Governor's Efficiency Review Team (Team) reported in June 2005 that ADOT spent more on consultant contracts and used more consulting services than all other state agencies combined.<sup>6</sup> The Team attributed this reliance in part to state salaries too low to attract qualified professionals from the private sector. ADOT's use of consultants for one type of work—project design—also appears to be one of the highest among states. Specifically, during an on-site interview in 2000 with members of the Federal Lands Highway Bench Marking Study Team of the Federal Highway Administration, ADOT reported using consultants for 80 to 90 percent of its project design work.<sup>7</sup> Of the 11 other states that were sent a questionnaire in preparation for an on-site interview, the 10 that responded to the question reported consultant use for preconstruction

engineering ranging from a low of 3 to 6 percent to a high of 80 percent. In the same year, the Federal Highway Administration also conducted an e-mail survey of 32 states and Puerto Rico, where the average consultant use for the design phase was closer to 60 percent for those responding with a percentage. The range extended from a low of 15 percent in Wyoming to 95 percent in New Jersey.

In addition to hiring consultants for specific projects, ITD also hires "supplemental consultants" to perform duties of ITD vacant positions. As of January 2006, ITD had 72 contracts for supplemental consultants at a value of \$78 million.

The Governor's Efficiency Review Team reported that ADOT spent more on consultants than all other state agencies combined.

Figure 2: Payments to Consultants  
Fiscal Years 1996 through 2005



Source: Auditor General staff analysis of actual payments made to consulting firms for fiscal years 1996 through 2005 obtained from ITD's Engineering Consultant Section.

Consultant use has increased—ITD's dependence on consultants has substantially increased over the past 10 years. Although ITD paid consultants \$17 million in fiscal year 1996, in fiscal year 2005 the consultant payments totaled \$110 million. This is a 424 percent increase since 1996 after adjusting for inflation using the Consumer Price Index. As shown by Figure 2, payments to consultants have remained above \$110 million for the past 4 fiscal years and were as high as \$119 million for fiscal year 2004. ITD was unable to quantify the percentage of its total workload completed by consultants. However, ITD reported that it used consultants for approximately 28 percent of construction administration and 90 percent of design work.

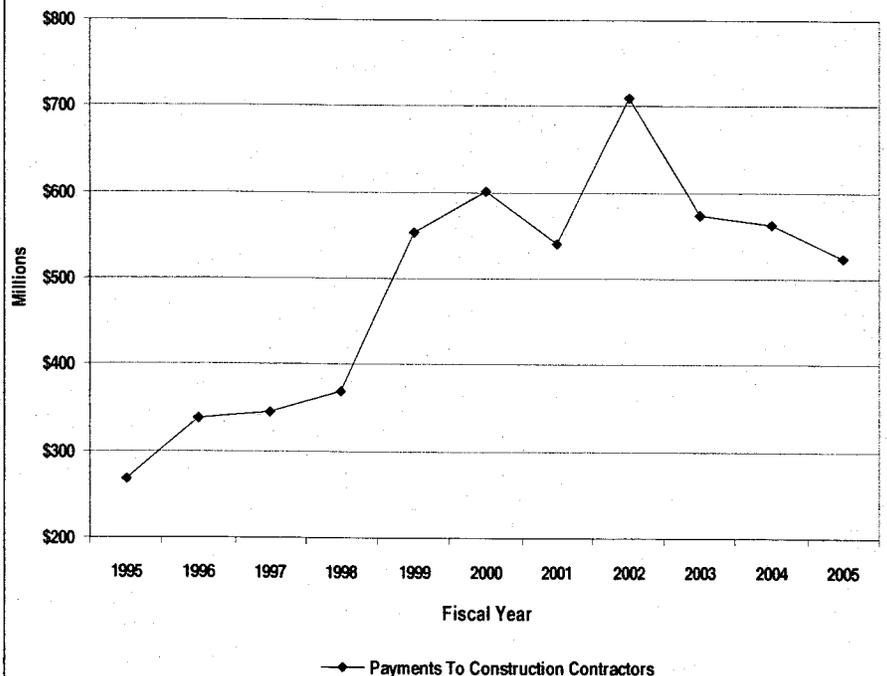
## Workload and vacancies increase consultant use

ITD has increased its use of consultants over the past 10 years to keep up with an expanding workload and high staff vacancies. The State's demand for highway construction, including the Regional Freeway System in Maricopa County, has significantly increased ITD's workload. At the same time, ITD has experienced vacancies close to or exceeding one-fourth of its engineer positions.

## Workload has increased—

Between fiscal years 1995 and 1998, ITD paid contractors an average of \$331 million annually for the construction of highway projects. This amount increased 76 percent to an average of \$581 million between fiscal years 1999 and 2005. Figure 3 illustrates payments to contractors for fiscal years 1995 through 2005. In addition, the amount of work planned in ADOT's 5-year construction programs more than doubled in the past 10 years, from \$1.9 billion to \$5.1 billion.<sup>8</sup> According to ADOT, an acceleration of regional freeway construction in response to population growth has contributed to the increased activity. For example, the 2006 through 2010, 5-year program allocates \$2.8 billion, or 55 percent, of total funding to the Maricopa Regional Freeway System. ADOT reported that since 2000, ITD has been on track to deliver 14 years of urban freeway construction in 7-½ years.

**Figure 3: Payments To Construction Contractors**  
Fiscal Year 1995 through 2005  
(Unaudited)



Source: Auditor General staff analysis of agency documents on construction contractor payments for fiscal years 1995 through 2005.

Further, the workload increase has been accompanied by an increase in project complexity. According to ADOT officials, increased project complexity contributes to ITD's use of consultants. They stated that ADOT builds projects differently now than it did 10 years ago. Specifically, they noted that environmental assessments, interaction with other state agencies, utility conflicts, plant salvage, noise barriers, and wildlife fencing requirements all increase the complexity of highway construction. For example, ADOT reported that environmental impact studies may take 5 to 7 years, much longer than they took 10 years ago.

**Staff vacancies are high**—Staff vacancies and reduced FTEs have forced ADOT to increase its use of consultants. According to ITD records, vacancies among ITD engineers have not dropped below 23 percent in 5 years. As of February 2006, 79 of 286, or 27.6 percent, of engineering positions were vacant. Vacancies are particularly acute for resident engineers who provide oversight of the construction projects. Forty-six percent of resident engineer and senior resident engineer positions were vacant as of February 6, 2006, and ITD hires consultants to serve as resident engineers (see text box). In January 2006, ITD's Operations Division also had 135 supplemental services consultants in other technical positions, such as field inspectors. According to ADOT, the supplemental services consultants function as ITD staff and are physically located in ADOT facilities. In addition to staff vacancies, the number of ITD-authorized employee positions was 10.9 percent lower in fiscal year 2006 than in fiscal year 1995.

ADOT attributes its high engineer vacancies to employees retiring or leaving for higher salaries offered by private consulting firms and local governments. In 2005, ITD surveyed nine consulting firms that provide services to ITD and found that altogether, 45 percent of the consultants' employees were former ADOT employees (see text box). Based on exit surveys and interviews of employees departing ADOT in fiscal year 2005, ADOT reported that 18.6 percent cited retirement, and 14.9 percent reported receiving a better job or salary as reason for leaving. Also, in November 2005, ADOT completed a salary comparison of ITD's engineer positions and found that salaries were 13 to 26 percent lower than comparable private and public positions in the Phoenix area. This comparison was completed after a 5 percent pay increase had taken effect.

As of February 2006, 27.6 percent of ITD's engineering positions were vacant.

**Resident Engineer:**

Oversees the construction of the project according to the scope and within the schedule and budget.

As of February 2006, ITD had the following resident and senior resident engineer positions:

- 28 Filled
- 24 Vacant
- 52 Total Positions

15 consultants serve as resident engineers on projects.

Source: Auditor analysis of unaudited data provided by ITD from January and February 2006.

ADOT survey of employees at nine consulting firms to determine employees' ADOT experience (2005)

Category	Number	Percent
ADOT retirees	64	26
Other former ADOT employees	<u>46</u>	<u>19</u>
Subtotal (Firm employees with ADOT link)	110	45
Firm employees without ADOT link	<u>137</u>	<u>55</u>
Total firm employees	<u>247</u>	<u>100</u>

**Consultant use may have unintended consequences**

Although ITD needs to use consultants to complete its growing workload and to meet a project schedule, research shows that using

consultants may be more costly than using highway department staff and can pose risks to the department's level of core competency.

Consultants are usually more expensive than in-house staff.

**Higher cost may be one outcome**—Most studies that focus on use of consultants in state departments of transportation agree that consultants increase the cost of services, according to a 1999 report.<sup>9</sup> The report reviewed 17 studies since 1977, including reports conducted by state departments of transportation, other public bodies, universities, and private firms. Thirteen studies found consultants were generally more expensive, while three found no difference in cost, and one found that consultants were less expensive. Overall, literature reviewed for this audit suggests that although consultants give departments more flexibility to handle their workloads while managing staff size, they do not provide cost savings and in fact may be more expensive than performing work in-house, in part because of the added cost of administering consultant contracts. However, studies differ in their estimates of the cost differential.<sup>10</sup> Further, legislative audits in other states have raised questions about the accuracy of data used to perform cost comparisons.<sup>11</sup>

**Loss of core competency another potential outcome**—Consultant use may also pose a risk to the core competency needed to manage projects. According to state and national reports, use of consultants by state transportation agencies may have other effects besides increasing project costs. Some state transportation agencies recommend limiting the amount of work outsourced in order to retain in-house expertise and the ability to review consultants' work, according to a national survey published in 2000.<sup>12</sup> Another report states that maintaining technical expertise within the agency may become more difficult as the percentage of projects contracted out increases and that it is important to keep interesting and challenging projects in-house to maintain some level of expertise.<sup>13</sup> A 2003 report for the Georgia Department of Transportation states that state departments of transportation are now relying on consultant services for functions that have traditionally been performed in-house, requiring managers to learn new sets of skills.<sup>14</sup> According to ADOT officials, the Arizona Chapter of the Associated General Contractors lobbied for a pay plan to increase ADOT salaries in July 2005 to reduce turnover of ADOT staff. The contractors were concerned with a lack of experience, competency, and slower decision-making by consultant resident engineers and inspectors.

**Core competency:**

Specialized technical or scientific activities that must be conducted by an organization and its employees in order to fulfill its mission and execute its responsibilities.

In addition to these outcomes, the 2003 report for the Georgia Department of Transportation stated that the use of consultants may also result in the loss of accountability, less control of the quality and timing of projects, and less capacity to serve a traditional role of hiring and training entry-level engineers.<sup>15</sup>

Although it was impossible to measure staff competency as part of auditors' review, the length of time employed is generally one indicator of competence. ITD

ITD experience levels are declining.

**Table 3: Average Years' Experience for Selected ITD Engineer Positions As of December 31, 2000 and February 6, 2006**

Position	Number of filled positions	Average years of experience		
		December 31, 2000	February 6, 2006	5-yr change
Engineer I	95	11.23	8.50	(2.73)
Engineer II	67	13.78	13.36	(0.42)
District Engineer	10	25.01	15.25	(9.76)
Average of all 207 engineering positions	—	14.31	12.24	(2.07)

Source: Auditor General staff analysis of ADOT's Human Resource Management System and Human Resource Information System data for ITD engineer positions as of December 31, 2000 and February 6, 2006.

experience levels are declining. Although ITD's 207 engineers had an average of more than 12 years of experience at ADOT as of February 2006, this represents a decline of 2.07 years since December 2000 (see Table 3). The average years of experience among Engineer I employees, who represent the bulk of ITD engineer positions, decreased from more than 11 years to about 8-½ years. According to an ITD official, an Engineer I employee must be a registered engineer who has an engineering degree, a passing score on a written engineering registration test, and 4 years of work under a registered engineer. As of February 2006, 50 percent of the engineer positions have fewer than 10 years' experience. Auditors could not verify or measure construction project inspectors' experience levels because inspectors share employee classes with other employee groups, and separate data on inspectors was unavailable.

## ITD should take further actions

Although ITD has developed strategies to reduce vacancies and increase retention, research and additional information shows that ITD should continue to develop strategies to address staffing issues, develop criteria for deciding when to use a consultant, and monitor the use of consultants.

**ITD working to address vacancies**—ITD has taken steps to increase retention and improve its ability to attract qualified personnel:

- In some cases, ITD has made counter-offers when engineers were offered higher-paid positions in the private sector. For example, in August 2005, an ITD engineer was offered a private consulting position with a \$24,000 annual salary increase. ITD counter-offered with a salary increase over \$7,000 and the engineer accepted ITD's offer. In eight of ten cases where ITD made counter-

offers, the employees elected to remain employed at ITD. However, according to ADOT, many employees are not receptive to receiving a counter-offer once an external offer has been made, or the difference between the two salaries is too high for ADOT to bridge.

- ITD has hired more people into its 18-24-month Engineer in Training (EIT) program to allow individuals to experience all areas of ITD.
- In July 2005, ITD's engineers and other technical positions received a 5 percent pay increase.

Even with recent pay plan increases, ADOT salary surveys show salaries below market. The success of ITD's counter-offers indicates that higher salaries may help stem turnover rates in engineering positions. ITD should continue to develop strategies to recruit and retain employees by filling existing vacant employee positions with competent staff.

**Other states' efforts to recruit and retain**—A national report and a report on the Minnesota Department of Transportation identified that the development of core competencies was a concern among many state transportation agencies and offered examples of methods used to increase recruitment and retention of quality employees.<sup>16</sup> These include:

- **The Wyoming Department of Transportation** developed a mentoring program where a senior administrator mentors two employees. Wyoming also uses a training program to prepare employees for future positions.
- **The Minnesota Department of Transportation** developed a succession planning model that identifies the core competencies needed for essential executive-level positions and reviews potential internal candidates with a 360-degree assessment to identify the person's work experience and potential to fill a position.
- **The Louisiana Department of Transportation and Development (DOTD)** works with universities in a cooperative program that allows college students to complete a 30-week rotation through 17 different functions in DOTD. This program is similar to ADOT's EIT program.

Although ADOT reports that its EIT program has helped to attract talented employees, ADOT may also want to consider mentoring, succession, and other programs to help reduce the impact of employee turnover and retirements. According to ADOT, it is exploring and piloting a talent management program.

**ITD should establish criteria and monitor consultant usage**—ITD does not have formal division-wide criteria for when and how to use the various types of consultants. According to an ADOT official, each group manager or the district management team makes the decision to hire consultants based on whether they

believe in-house staff has the expertise and time to complete the work. However, reasons for using consultants, such as lack of staff or time constraints, are not documented. State and national reports found that using criteria to decide when work must be done by outside consultants is important.<sup>17</sup> In some cases, such as cyclical workload and projects requiring one-time or infrequently used expertise or equipment, consultant usage is usually warranted. However, in other situations, consultants may be used to provide ongoing, recurrent work that could be provided more cheaply by in-house staff. Louisiana's Department of Transportation has developed a computerized model to systematically evaluate both qualitative and cost aspects of contracting out.<sup>18</sup>

ITD should establish division-wide criteria for deciding when to use a consultant to complete projects and tasks. Possible criteria should include: needed skill can't be utilized on a full-time basis; consultants have equipment or other assets for work that is not cost-effective to purchase; and consultants can provide needed higher-quality services or services at a lower cost, or workload is temporary, short-term, or seasonal. Having criteria to determine when consultants should be used instead of in-house staff will allow managers to document consultant workload that could be redirected to internal staff. For example, the Governor's Efficiency Review Team reviewed individual consultant contracts, and ADOT officials reported that \$80 million in contracts were for work that regular employees could provide if ITD had sufficient authorized and filled positions. ITD should identify ongoing, recurrent work related to project design, construction management, and other functions currently provided by consultants and perform these services in-house when appropriate. ADOT currently prepares a weekly manpower roll-up report to identify projected manpower needs on current projects throughout the State. Further development of such tools could help ITD to identify where internal staffing could provide work now done by consultants.

In addition to lacking formal criteria for the appropriate use of consultants, ITD does not keep adequate data on consultant usage to identify where internal staff resources can reduce consultant usage. ITD's administrative office and most groups within ITD's development section do not keep records of the number or type of projects that consultants complete and reasons justifying consultant contracts. Specifically, bridge construction groups document the number and percentage of projects completed by consultants in annual strategic plans, but other groups, including ITD administration, do not keep similar records. ITD should develop a method of tracking and monitoring consultant usage, such as compiling data on the dollar amount, quantity, and type of projects completed by consultants, and also which consultant services did not meet established criteria, but were obtained because of inadequate staffing. Such information can be used to quantify and evaluate reasons for using consultants, and to identify strategies, such as identifying consultant services that could be more cost-effectively provided by in-house employees. Such information could also be used to demonstrate how higher salaries combined with more in-house work and less consultant usage could reduce total costs while also improving core competency.

## Recommendations:

1. To better ensure that it develops competency internally and reduces costs, ITD should aggressively seek to:
  - a. Fill existing vacant employee positions with competent staff;
  - b. Identify ongoing, recurrent work related to project design, construction management, and other similar functions currently provided by consultants and perform these services in-house when appropriate; and
  - c. Continue to develop strategies to recruit and retain staff, and consider mentoring, succession, and other programs to help reduce the impact of employee turnover and retirements.
  
2. To better ensure that it identifies and maintains the proper level of consultant usage, ITD should:
  - a. Develop division-wide criteria for deciding when to use a consultant to complete projects or tasks; and
  - b. Develop methods of tracking and monitoring consultant usage, such as compiling data on the dollar amount, quantity, and type of projects or services completed by consultants, and reasons for using consultants or other relevant information, and evaluate information to identify consultant services that could be more cost-effectively provided by in-house employees.

# FINDING 2

## ITD should improve implementation and documentation of inspection process

To ensure that contractors meet construction standards, ITD should improve inspection quality. ITD conducts both daily field inspections and periodic independent quality assurance (QA) inspections of construction activities. However, ITD could improve consistency and documentation in daily field inspections. In addition, ITD should implement follow-up procedures on deficiencies found by independent QA inspections.

### ITD monitors contractor activities

In order to ensure that roads are safe and durable, ADOT has established Standard Specifications for Road and Bridge Construction. (See text box at right for an example of applicable specifications.) Contractors must adhere to these specifications and each project's special contract provisions. ITD monitors contractors' compliance with all of these requirements by conducting daily inspections and periodic independent QA inspections. Inspections also enable ADOT to make correct payments to contractors based upon actual material quantities used and work completed.

ITD employs both field inspectors and independent QA inspectors to ensure compliance with roadway construction quality specifications.

- **Field inspectors monitor on a daily basis**—Daily inspections by more than 220 field inspectors, as of February 6, 2006, monitor ongoing contractor activities. Under the supervision of resident engineers and

#### Example: Asphalt specifications

ADOT's Standard Specifications provide standards for asphalt paving such as the asphalt temperature, placement of the asphalt in front of the paving machine, and how to place joints (a narrow space separating two slabs or sections of pavement) in the asphalt.

Photo 2: Paving the San Tan Freeway

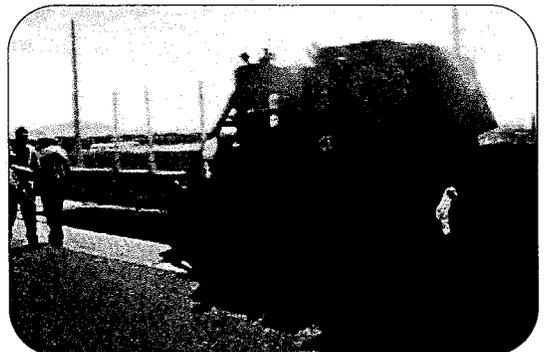


Photo: Arizona Office of the Auditor General.

project supervisors, these inspectors observe contractors' daily work and compare it to specifications. Field inspectors communicate with contractor staff on construction requirements and any problems they observe. Field inspectors must document their observations in daily diaries for the project supervisor's review. Further, for most types of work observed, field inspectors must complete a checklist indicating whether various aspects of the work met specifications. Field inspectors are authorized to reject work or materials that do not comply with plans and specifications.

- **Independent QA inspectors review all projects at least once**—Independent QA inspections by nine inspectors, as of March 8, 2006, in ITD's construction operations section provide further assurance that construction work is completed according to all specifications and requirements. The Federal Highway Administration (FHWA) conducted these reviews until 1992, when it transferred this responsibility to ADOT. ITD employees in the construction operations section conduct the independent QA inspections. According to an agency official, each construction project receives at least one QA inspection, and some larger projects receive up to five. Similar to field inspectors, the QA inspectors observe the work conducted and determine its conformance with plans and specifications. Independent QA inspectors document their observations on construction inspection checklists and nonconformities are compiled in a Certification Acceptance report to project management staff.

## ITD can improve field inspections

Although inspections provide important assurance of construction quality, the field inspection process could be made more effective by consistently documenting inspection results. Not all inspectors document in their daily diaries whether construction work met specifications and whether there were problems identified and resolved as required by ADOT policies. In addition, ADOT's *Construction Manual* requires inspectors to follow checklists to help ensure quality goals are met, but not all inspectors use the checklists effectively. To ensure its inspection processes are effective, ITD should ensure that its inspectors follow the requirements.

**Inspectors do not consistently record observations in accordance with policy**—Although documentation is critical to ensuring problems are resolved and payments are accurate, ITD inspectors do not consistently document the results of their observations. As a result, it is unclear whether the work met specifications, whether there were problems or if problems were resolved, and whether payments are accurate. For example, during one inspection an auditor observed, the inspector determined that approximately 10 feet of concrete pipe did not meet specifications. The auditor observed the inspector discussing the problem with the contractor, but the inspector's diary entry for that day indicated

that the pipe met specifications. When asked about this, the inspector explained that the contractor removed 6 feet of the problematic pipe and the payment was reduced. However, the inspector did not document the problem in the daily diary and did not indicate that the 6 feet of pipe was removed later. Because no entry was made concerning this problem, there was no documentation indicating why the inspector required only 6 feet be removed instead of the approximately 10 feet that was found in noncompliance on the day of the auditor observation. Without an accurate record of the problem and its resolution, ADOT cannot ensure that the pipe met specifications and that the payment was accurate.

Inspectors vary in the type and level of documentation they maintain. Auditors' review of nine projects determined that 43 of 47 inspectors' diaries showed the type of work observed, but not whether work met specifications. This practice does not conform to documentation requirements. ADOT's *Standard Specifications for Road and Bridge Construction* states that inspectors' documentation should include the level or degree of conformance of the work with plans and specifications. Further, ADOT's *Construction Manual* states that historical information on how work was constructed is valuable in the future if a project has to be modified or rebuilt. Finally, the FHWA's *Construction Program Management and Inspection Guide* states that documentation is essential to define the progress and quality of work, inspectors should identify problem areas and document resolution of concerns, and that inspectors should follow up on previous inspection findings and draw conclusions on the finished product's acceptability.

**Checklists not used consistently**—In addition to not completing diaries, field inspectors do not always use required checklists. ADOT policy requires field inspectors to complete checklists applicable to work observed. According to an independent QA inspector, ITD has developed approximately 80 checklists to cover the variety of construction work observed by field inspectors and QA inspectors. For example, separate checklists address traffic control, concrete curing, grading, and concrete box culverts. The checklists include "critical" items, some where noncompliance may potentially put human life at risk, and "major" items, where noncompliance could cause substantial reduction of highway operability or durability, increased cost, or major environmental impact. According to ADOT, it is planning to revise the definition of "critical" items because some may not put human life at risk. The checklists, based on standard specifications, are meant to affirm quality requirements at the beginning of a project and to ensure the product meets quality goals. In addition, they may help less-experienced staff feel more confident to approach contractors with solid evidence of noncompliance.

#### Inspection checklist item examples:

- There are no unprotected edges of 2 inches or greater. (Critical item)
- Side slopes conform to current OSHA requirements. (Critical item)
- Curing the concrete has begun immediately following the required finishing operations. (Major item)
- Sediment control berms are properly constructed at the specified locations. (Major item)

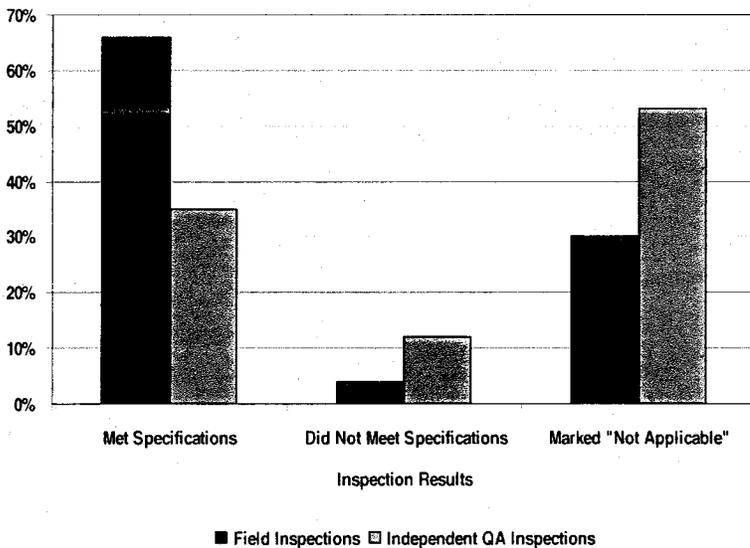
Source: ADOT *Guidelines for Weighting Attributes on Quantified Checklists* and checklist attributes.

For nine projects, 27 out of the 47 inspectors did not fill out any inspection checklists.

Despite the importance of checklists, in a review of nine projects, auditors determined that 27 out of 47 inspectors did not fill out either electronic or paper checklists. When asked why checklists were not used, a supervisor and a resident engineer said they had difficulty enforcing the requirement. Another supervisor said checklists could be improved by removing unnecessarily labor-intensive items. Auditors' analysis of checklist results from April 5, 2001 through December 19, 2005, showed that of 2,788 checklist items, 276, or approximately 10 percent, were never used because they were marked not applicable every time the checklist was used.

**Application of inspection standards varies**—Field inspectors report fewer deficiencies than independent QA inspectors when using mandatory inspection checklists. According to managers who auditors interviewed in both areas, independent QA inspectors apply a stricter interpretation of the quality standards than field inspectors. Results of independent QA inspections suggest that when a strict interpretation of the standards is applied, work does not meet specifications as often as field inspection results show. Specifically, as shown in Figure 4, field inspectors determined that work met specifications 66 percent of the time while independent QA inspectors found work met specifications only 35 percent of the time, based on an analysis of two projects where both field inspectors and independent QA inspectors conducted inspections. It should be noted that field inspectors and independent QA inspectors were not observing the projects at the same time and the independent QA inspectors had a very high level of "not applicable" responses for the standards. However, the two groups were using the same checklists to observe the same type of work on the same projects, and the "not applicable" responses have no effect on the checklist items marked as failed, but may have an impact on the items that passed. The probability that the two groups' conforming results would be so different is less than 1 in 100, based on statistical analysis. The result suggests that the two groups may be applying different standards when determining what conforms. To ensure that the checklist results are determined in a consistent manner, ITD should assess how field inspectors and independent QA inspectors are interpreting the checklist items. Further, ITD should provide training and/or develop guidelines to help field inspectors and QA inspectors interpret the checklist items in a similar manner.

**Figure 4:** Comparison of Responses on Checklists July 1 through December 19, 2005



Source: Auditor General staff analysis of checklist inspection records for two projects reviewed by both field inspectors and independent QA inspectors.

Knowledgeable persons have questioned whether ITD field inspector experience levels are sufficient. For example, an FHWA official expressed concern about inspection quality because he had observed a drain on ADOT inspector expertise and believed that inspectors were "spread too thin." This official stated that he was familiar with

the ADOT situation because although no longer conducting the independent reviews, FHWA personnel monitor most ADOT highway projects to help ensure that projects are being built within the design scope proposed when approved for federal aid. Additionally, an ITD supervisor believed that many contractor firms had more experienced staff than ADOT, which caused some inspectors to be intimidated and hesitant to tell contractors about observed problems. ITD records show that 34 percent of its inspectors had fewer than 5 years' experience with ADOT as of February 6, 2006. An ITD official stated that about 5 years' inspecting experience was needed to become fully proficient and that inspectors with less experience were usually assigned to perform less technical inspection work until they gained adequate experience. Additionally, 29 percent of the inspector positions were under-filled, and 32 percent of the positions were vacant. An under-filled position means that ITD could not recruit someone who meets the minimum experience and qualifications required for the position and instead hired someone without those qualifications at a lower-level position to perform the job duties. ITD reported that it has a recruitment strategy to develop inspectors by providing a technical training and certification program, combined with on-the-job work experience, to allow people hired at other experience levels to advance to the desired position level.

**ADOT should take steps to increase effectiveness**—To better ensure that inspections serve their intended purposes, ADOT should ensure that inspectors document pertinent information about their observations, including whether work conforms to requirements, any problems encountered, and problem resolution. In addition, to comply with policy and help ensure the quality of work inspected, ADOT should ensure that field inspectors complete and submit checklists as part of their daily diaries and document that critical and major checklist items were addressed.

ADOT has begun taking steps to make it easier for field inspectors to use the checklists. First, in July 2005, ITD began providing field inspectors access to an online checklist database previously used only by independent QA inspectors and began training them on how to use it. Once trained, field inspectors can enter checklist responses and supporting comments directly onto the checklists in the database using laptops in the field. Second, according to ADOT, new checklists are developed and updated with a committee that includes the district's most experienced technical and engineering staff. However, an ITD official stated that field staff has not been consistently involved in the creation and revision of the checklists. To help ensure the checklists meet the needs of field inspectors and include appropriate and most applicable content, ADOT should consider a checklist revision process that includes knowledgeable field inspectors.

## Independent quality assurance inspections lack followup

Followup on noted deficiencies would enhance the effectiveness of the independent QA inspections. Specifically, ADOT could better use the results of independent QA

inspections by requiring formal responses from the field organizations and followup for critical and major deficiencies.

ITD does not require followup on important areas of noncompliance identified by independent QA inspectors. As previously described, independent QA inspectors from the construction operations section provide periodic independent inspections of construction work and determine its conformance with plans and specifications by observing the work and filling out the inspection checklists. According to an agency official, independent QA inspectors do not have the authority to change work in progress, but they can recommend to ADOT project personnel that work be rejected or processes be changed. Any deficiencies they find are documented in a Certification Acceptance report that is provided to project management staff.

Photo 3: Pouring a retaining wall footing

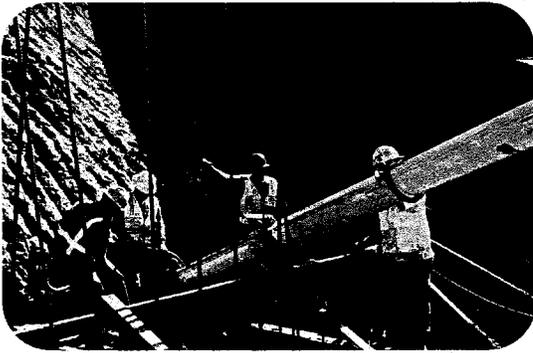


Photo: Arizona Office of the Auditor General.

As discussed previously, ITD classifies inspection checklist items according to importance, with risks to human life included as "critical" items and important quality factors considered "major." Auditors' analysis of 1,970 independent QA inspections determined that in 1,586 cases (80 percent), inspectors identified one or more critical or major noncompliant item. For example, during one inspection, an independent QA inspector found two major items to be noncompliant. One item concerned the placement of rebar used to reinforce a concrete structure, and the other item concerned the size of the rebar used to reinforce a concrete structure. According to ADOT, if a smaller size rebar or larger rebar spacing occurs, cracks could develop in the concrete

resulting in a shorter lifespan, and if the rebar placement deviates greatly from the specifications, it may result in a complete failure of the structure. However, ADOT reported that industry design standards provide safety factors for critical specifications to ensure that minor variations do not cause failures.

Although critical and major noncompliance items are reported to project managers through Certification Acceptance reports, ITD has not developed any follow-up provisions and requirements. According to an agency official, ITD does not require that resident engineers or project supervisors respond to or specifically address independent QA inspection results, and while some project staff indicated that they may respond informally to specific deficiencies, they are not required to do so. As a result, critical and major items may not receive adequate attention to correct them and to reduce future occurrences. ADOT could better use the results of independent QA inspections by requiring followup for critical and major deficiencies. Following up on QA inspections would supplement existing ADOT quality control practices that include resident engineers' consideration of sampling and testing results prior to final acceptance of a project as well as use of information obtained in daily inspections by field inspectors.

## Recommendations:

1. To ensure that the checklist results are determined in a consistent manner, ITD should assess how field inspectors and independent QA inspectors are interpreting the checklist items. Further, ITD should provide training and/or develop guidelines to help field inspectors and independent QA inspectors interpret the checklist items in a similar manner.
2. To comply with department policy and FHWA inspection practices, ADOT should ensure that field inspectors document inspection results, including:
  - Whether work conforms to plans and specifications;
  - Whether problems occurred; and
  - Problem resolution.
3. To comply with department policy, ADOT should ensure that field inspectors complete and submit checklists as part of their daily diaries, and document that critical and major items were addressed.
4. To help ensure that checklists meet field inspectors' needs and contain applicable content, ADOT should consider a checklist revision process that includes knowledgeable field inspectors.
5. ADOT should require followup on independent QA inspection results that identify critical or major noncompliance.

# FINDING 3

---

## ADOT needs to improve audits of design and construction contracts

ADOT has not adequately planned and managed the audits of its highway design and construction contracts. The Office of Audit and Analysis (Office) should audit all phases of ADOT's construction projects. However, the Office has not completed the number of audits required by its own policies, and many completed audits have not been issued in a timely manner. Several factors have contributed to these problems, including ongoing, long-term vacancies and inadequate audit management. ADOT hired a new chief auditor in January 2006 who has begun taking steps to address problems.

### Audits required during all construction phases

The Office is required to conduct audits covering the full range of consulting and construction contracting practices. Under an intergovernmental agreement with the Federal Highway Administration, ADOT must provide total operational audit coverage of both design and construction contracts for all projects with federal funding. Federal law also requires audits of engineering design contracts to ensure that they comply with cost principles in Federal Acquisition Regulations. ADOT adopted a policy to audit all contracts similarly, whether or not federal money is involved.

The Office conducts four types of audits to comply with its auditing mandate. These audits are described in the text box (see page 28) and are important to ensure that ADOT pays the correct amount for construction and consulting work. For example, a highway design engineering contract with compensation paid on a cost-reimbursement basis and valued at more than \$250,000 would require a pre-award audit before the contract is awarded to ensure that the contractor has an acceptable accounting system and to determine an overhead rate that will apply to the contract

## Construction audit types:

### Engineering services (design) contracts:

- **Consultant Pre-award**—Review consultant records to ensure that it has an acceptable accounting system for indirect and direct costs, and to determine an overhead rate that will apply to the contract. Required for all contracts over \$250,000 and for some smaller contracts. Should be completed before contract award.
- **Incurred cost**—Review records after contract completion to ensure that all costs, including overhead, were properly applied. ADOT does not conduct incurred cost audits, but contracts them to private firms. Required for all cost reimbursement contracts over \$250,000 and optional for smaller contracts. Provided on a sample basis for lump-sum contracts, but required for all lump-sum contracts over \$250,000 that are terminated for convenience or for default.

### Construction contracts:

- **Construction cost**—Review projects that are completed or at least 50 percent complete to ensure contract compliance with payments, contract documents, change orders, labor compliance, materials testing, and other items. Required for all projects over \$10 million and judgmentally selected for smaller projects. Required at \$20 million intervals on projects over \$20 million.

### Construction administration:

- **Administrative**—Review ADOT's highway construction organizations to determine compliance with contract management requirements, including purchase orders, construction schedules, pay and timekeeping, accountable assets, and computer security. Required once per year for each of 26 construction field offices.

(see text box, page 29). A subsequent incurred-cost audit is later required after contract completion.

Audits are important to ensure contract compliance and proper payments. Ineffectively monitoring consultants' and contractors' performance can result in failing to detect:

- **Overcharges and underpayments**—Failure to perform *pre-award audits* may result in improper payments because provisional rates may vary from audited rates. Additionally, if *incurred-cost audits* are not conducted or completed in a timely manner, overpayments owed to ADOT or underpayments owed to the consultant may be undetected or delayed. Moreover, failure to perform *construction-cost audits* increases the risk that incorrect payments will be made to contractors. For example, one construction progress audit completed in

September 2003 questioned \$272,500 in payments made to a contractor, but the report was not issued until October 2005, delaying any required corrective action.

- **Whether contractors have delivered all services**—Not conducting construction-cost audits can mean paying for services not delivered. For example, a construction progress audit completed in July 2004 and issued in October 2005 found errors in contract quantities for delivered concrete and questioned over \$300,000 in invoices that ADOT had paid without verifying that the contractor provided the equipment, labor, and materials.

In addition, according to the state construction engineer, audits of construction administration are valuable in identifying areas for improvement that could result in better project management, decreased cost overruns, and better quality. The state construction engineer reported that district and resident engineers and the State Engineer's Office use audit results to identify trends in consultant and staff compliance with requirements.

## Office fails to complete audits or completes them late

Office productivity has diminished in recent years. Specifically, because the Office has not issued the number of audits required by policy, it has backlogs of each audit type. Additionally, some of ADOT's highest-cost projects have not received all the audits that office policy requires. Finally, completed audits have often not been issued for at least 6 months after audit work was finished.

**Some audits not conducted**—The Office does not conduct the number of audits required by its own policies. The Office had backlogs of each audit type:

- The Office estimates it had approximately 500 pre-award audits in its backlog as of May 31, 2006.<sup>19</sup> The Office could not provide verifiable data regarding the size of its pre-award backlog.

### Overhead rate facts

- Overhead consists of allowable indirect costs, such as rent and insurance costs. The overhead rate is calculated by dividing indirect costs by direct costs, such as labor.
- In a cost-reimbursement contract, ADOT pays the contractor for its direct costs plus a percentage of the direct costs to cover the contractor's overhead. The percentage that ADOT pays is determined by the pre-award audit. If no audit has been performed, ADOT and the contractor negotiate a provisional rate.
- Overhead rates accepted by audits were typically between 150 and 160 percent, with a range between 120 and 184 percent.

### Estimated Audit Backlogs as of February 9, 2006:

Pre-award	500 <sup>1</sup>
Incurred cost	40
Construction cost	47
Administrative	17

<sup>1</sup> Office of Audit and Analysis estimate.

Source: Auditor General staff analysis of ADOT data and Office audit files.

- A minimum of 40 incurred cost audits dating back to March 2001 have not been done as of March 19, 2006. Additionally, the Office did not conduct 17 other audits because they were not begun before a statutory record-keeping time limit expired or because the company was no longer in business. No projects started after July 1, 2002, have received the required incurred-cost audit.
- Auditors' review of office spreadsheets of scheduled and completed construction cost audits and completed audit files identified that 47 required construction cost audits dating back to 2003 were backlogged as of December 31, 2005. Productivity in this area declined from 23 audits completed in fiscal year 2003 to only 5 completed in fiscal year 2005, but has increased in fiscal year 2006, with 12 audits completed in the first 6 months.
- Auditors' review of the Office's audit files found that 17 of 26 ITD construction organizations have not received an administrative compliance audit in the 2005 calendar year, and 7 have not been audited since July 2003. The organizations should receive 1 audit per year, and altogether, 41 of 78 such audits were not conducted in the 3 years ending June 30, 2005.

**Table 4:** Status of Required Audits  
Ten Largest Completed Projects  
Fiscal Year 2005

Audit Type	Required	Issued	Not done
Pre-award <sup>1</sup>	52	51	1
Incurred cost	1	0	1
Construction	<u>25</u>	<u>7</u>	<u>18</u>
Total	<u>78</u>	<u>58</u>	<u>20</u>

<sup>1</sup> In addition to the required audits shown in this table, contract files revealed that the Office of Audit and Analysis was not notified to conduct 17 audits and conducted 2 pre-award audits on subcontractors that were approved but not used on the projects.

Source: Auditor General staff analysis of audit reports issued by Office of Audit and Analysis for projects identified by analyzing ADOT's checklist system.

Projects missing audits include ADOT's largest construction projects—The Office has not conducted all required audits on its largest construction project contracts. To evaluate the amount of audit coverage that the Office provided, Auditor General staff selected the ten largest projects by dollar bid amount that ADOT completed in fiscal year 2005. Those projects ranged in size from \$15.7 million to \$221.1 million. As shown by Table 4, the Office did not conduct the minimum number of audits required by its policies in any of the three audit categories for these ten projects. Pre-award audits are required for each of 52 consultants on these ten projects. Multiple audits for each project are often required because a prime contractor and multiple subcontractors provide services for each project. An incurred cost audit was also required for the one project with a cost plus fixed-fee contract, though not for the nine other projects completed under lump-sum contracts. Additionally, because office policy requires construction-cost audits at \$20 million intervals, these projects should have received at least 25 construction-cost audits.

**Some audit reports issued late**—In addition to not conducting some audits, the Office has not issued some reports in a timely manner. In the first half of fiscal year 2006, the Office issued 17 construction cost and administrative compliance reports. At least 14 were issued 6 months or more after the audit exit conference.<sup>20</sup> Those 14 reports were issued from 183 to 769 days after the exit conference, with the average being 371 days. Office policy requires issuing the report within 20 days after the draft report date. According to office management, the original draft report is discussed at the exit conference. Thus, it appears these reports were issued substantially later than the policy requires.

Some audits were issued 6 months to 2 years after the audit exit conference.

Issuing reports late delays recovery of overpayments. In addition, because contractors are required to retain records for only 5 years after the final payment, ADOT may be unable to conduct audits after that time. As a result, long delays before ADOT conducts audits may prevent ADOT from recovering monies paid in error. For example, one project was completed in March 2001, but the Office did not conduct an incurred cost audit within 5 years. Further, the 5-year period will expire on 21 other projects in calendar year 2006. In addition, long delays hinder project accounting because ADOT closes completed project accounts and transfers any excess funds to other accounts, making it more difficult to process any underpayments identified by untimely audits.

## Several factors contribute to low productivity

The Office's low productivity has resulted from management's failure or inability to fill vacant positions, adequately plan and manage its workload, and other factors. The Office lacked a chief auditor for several months, until January 2006. In addition, an inadequate database and other problems contribute to the Office's failure to meet requirements. Specifically:

- Ongoing, long-term vacancies**—The Office has not ensured that staffing is adequate to meet audit requirements. As of December 31, 2005, the Office had only 9 of 16 positions filled in the unit responsible for consultant and construction audits, as shown in Table 5. Of the unit's 7 vacancies, 4 were unfilled for over 3-½ years, since before July 2002.

Four of the Office's seven vacancies are over 3-½ years old.

The Office has not been able to reduce staff vacancies. Although the Office has filled recent departures with new hires, it has only recently reduced its vacancy level. According to office managers, it was difficult to find candidates with the cost accounting experience necessary to conduct audits in accordance with the Federal Acquisition Regulations. The Office had not sought applicants without that experience because understaffing inhibited its ability to provide training.

- Audit management inadequate**—The Office is not complying with its policy requiring an annual audit plan that projects the number of audit requests, considers other audit requirements, and prioritizes audits based on available resources. For example, the policy requires that audits be selected based on a department-wide audit risk assessment. This approach to selecting and

**Table 5:** Status of External Audit Unit Positions  
As of December 31, 2005

Position	Total Positions	Filled	Vacant
Manager	1	1	
Audit Supervisor	3	2	1
Construction Auditor	4	1	3
Consultant Auditor	<u>8</u>	<u>5</u>	<u>3</u>
Total	<u>16</u>	<u>9</u>	<u>7</u>

Source: Auditor General staff analysis of ADOT's Office of Audit and Analysis Organizational Chart and vacancy data.

conducting audits is intended to ensure that projects with the highest risk factors are audited. The risk assessment should identify characteristics of contracts and projects that have a higher probability of errors and may demand more audit attention. However, the Office does not select these audits based on a risk assessment approach.

Additionally, the Office lacks information needed to manage its workload and staff resources. First, it has an inadequate database system for tracking and monitoring its work. For example, the Office could not provide auditors with numbers of audits scheduled, in progress, and completed for recent fiscal years. As a result, auditors could not confirm the reported backlogs. Although the Office could use other methods to monitor audit functions, such as spreadsheets and manual calculations, one manager stated that increasing workloads and staff shortages made these methods impracticable. Second, the Office stopped using performance measures and producing annual reports and various activity reports in 1998.

Although ADOT upper management indicated awareness of the Office's declining productivity and other problems in December 2004, significant actions to change Office operations were not taken until 2005. Such actions included beginning recruitment for a new chief auditor in August 2005 and his subsequent appointment in January 2006. However, upper management's closer, ongoing review of the Office may have resulted in more timely actions to correct the longstanding deficiencies.

## Department has begun to address problems

Although problems identified in this audit remain, ADOT has begun to take steps to address those issues. ADOT's new chief auditor indicated that the Office plans to:

- **Fill staff vacancies**—Between January and March 2006, the Office hired three auditors. Additionally, the Office has established an internship program for college students who would gain experience and might eventually be employed with the Office. In April 2006, the Office participated in the State Job Fair with hopes to fill entry-level auditor and intern positions. The Office hopes to fill all of its vacancies by July 2006.
- **Reinstitute annual reporting**—The Office plans to issue a *Fiscal Year 2006 Annual Report* based on available data and expand that report to incorporate additional information in fiscal year 2007.

The Office could not provide the number of audits scheduled or completed.

The Office hopes to fill all of its vacancies by July 2006.

- **Reinstitute performance measurement practices**—By July 1, 2006, the Office plans to reinstitute performance measures it used in 1998 and implement any appropriate additional measures.
- **Revise the Office's audit manual**—By July 31, 2006, the Office plans to revise its audit manual to reflect current business practices and ensure sufficient audit coverage. For example, office policy requires construction cost audits in \$20 million intervals and does not require audits of all lump-sum contracts. This does not reflect the monetary growth of projects or changing department contracting practices. According to ADOT management, very few projects were over \$20 million when that interval was established. Now, however, many projects exceed that amount, and a higher interval may be appropriate. Similarly, ADOT's contracting practices have changed. In contrast to prior years when few contracts were paid on a lump-sum basis, these contracts now account for more than 60 percent of new design and construction contracts. Risks associated with lump-sum contracts include contractors using lower-quality materials or less-skilled employees, or charging unreasonable change order amounts.
- **Implement a risk-based approach to audit selection**—By July 1, 2006, the Office plans to apply a risk-based approach to prioritizing audit projects with its existing resources.
- **Replace the Office's database system**—The Office plans to obtain and implement by December 31, 2006, a computer-based audit management system for audit scheduling, work papers, and reporting.

As the Office proceeds with its efforts to fill vacancies and improve its audit planning, it should also consider:

- Filling positions, if necessary, with auditors who lack cost accounting experience but meet other requirements, and provide needed job training;
- Preparing an annual audit work plan that estimates its workload and prioritizes its audits based on available resources, and revise it as circumstances change;
- Measuring the number and types of audits requested and conducted, and audit timeliness and results; and
- Revising its audit procedures to reflect changes in ADOT's business practices.

## Recommendations:

1. The Office should continue its efforts to:
  - a. Fill vacant positions and, if necessary, develop new recruitment strategies. If the Office cannot fill positions with experienced auditors, it might consider hiring auditors without cost accounting experience and providing training or offering an internship program.
  - b. Implement performance measurements to monitor its production and work activities. This should include the number and types of audit requests received and conducted, the timeliness of completing audits, and audit results.
  - c. Ensure that the highest-risk projects are audited by applying a risk-based approach to selecting and conducting audits that considers items such as staffing available to complete audits, dollar thresholds at which audits should be conducted, and office audit requirements for each type of contract.
  - d. Replace its database system and obtain a system that can track and schedule workload and measure production.
  - e. Annually estimate its workload and prioritize its audits based on available resources. This plan should be documented in an annual audit work plan and revised with changing circumstances.
  - f. Revise its audit manual to reflect changes in business practices and ensure that it provides adequate audit coverage of department projects.

# ENDNOTES

---

## Endnotes:

1. ITD also funds 11 positions (3 vacant) that are not located in an ITD group.
2. Aldhizer III, George R., James D. Cashell. Government Contract Auditing: Best Practices from New York City's Metropolitan Transportation Authority. *The Journal of Government Financial Management*. 2003. 44-49.
3. Aldhizer III, George R., James D. Cashell, and Rick Eichmann. Construction Auditing. *Internal Auditor*, Feb. 1999.
4. Warne, Thomas R., *State DOT Outsourcing and Private Sector Utilization: A Synthesis of Highway Practice*. Washington D.C.: National Cooperative Highway Research Program for the Transportation Research Board of the National Academies, 2003.
5. Kingsley, Gordon, Sheldon Gen, Sue Gosnell, Cliff Lipscomb, Dara O'Neil, and Patrick Wolfe. *Strategies to Strengthen Consultant Management in the Georgia Department of Transportation, Task Report 1: A Literature Review of Consultant Management*. Atlanta: Georgia Institute of Technology, Oct. 2003.
6. In January 2003, Governor Janet Napolitano established the Efficiency Review Initiative to improve the state government's performance and efficiency. The Governor's Efficiency Review team is charged with finding practical and sensible ways for state agencies to (1) reduce costs, (2) cut bureaucracy, (3) eliminate duplication, and (4) improve customer service.
7. Calderon, Eduardo, Rick West, Terri Jurkofsky, Howe Crockett, and Daniel Alexander II. *Contracting Out: Bench Marking Study*. Washington D.C.: Federal Lands Highway, Executive Quality Council of the Federal Highway Administration, Department of Transportation, Sept. 2000.
8. ADOT 5-year Transportation Facilities Construction Programs reports for fiscal years 1995 through 1999, and for fiscal years 2006 through 2010.
9. Wilmot, Chester G., Donald R. Deis, Helmut Schneider, and Charles H. Coates, Jr. *In-House Versus Consultant Design Costs in State Departments of Transportation*. Paper No. 99-1403. Baton Rouge, LA: Transportation Research Record, 1999.

• continued

## Endnotes (continued):

10. Wilmot, Chester G., *Investigation into the Cost-Effectiveness of Using Consultants Versus In-house Staff in Providing Professional Engineering Services for Louisiana's Department of Transportation and Development*. Baton Rouge, LA: Louisiana Transportation Research Center, June 1995.
11. Warne, Thomas R., *State DOT Outsourcing and Private Sector Utilization: A Synthesis of Highway Practice*. Washington D.C.: National Cooperative Highway Research Program for the Transportation Research Board of the National Academies, 2003.
12. Smith, Larry, Tony Welch, Rick West, Patrick Wlshchin, Eduardo Calderon, Scott Rustay, Bill Pollock, and Ron Recker. *Phase II: Benchmarking Study*. Washington, D.C.: Federal Lands Highway, Executive Quality Council of the Federal Highway Administration, Department of Transportation, Nov. 2000.
13. Rogge, David F., Tomas Carbonell, and Randy Hinrichsen. *Evaluation of Oregon Department of Transportation Project Delivery: Outsourcing Project Delivery in State Departments of Transportation*. Corvallis, OR: Department of Civil, Construction and Environmental Engineering at Oregon State University, Dec. 2003.
14. Kingsley, Gordon, Sheldon Gen, Sue Gosnell, Cliff Lipscomb, Dara O'Neil, and Patrick Wolfe. *Strategies to Strengthen Consultant Management in the Georgia Department of Transportation, Task Report 1: A Literature Review of Consultant Management*. Atlanta: Georgia Institute of Technology, Oct. 2003.
15. Kingsley, Gordon, Sheldon Gen, Sue Gosnell, Cliff Lipscomb, Dara O'Neil, and Patrick Wolfe. *Strategies to Strengthen Consultant Management in the Georgia Department of Transportation, Task Report 1: A Literature Review of Consultant Management*. Atlanta: Georgia Institute of Technology, Oct. 2003.
16. Transportation Research Board. *The State of Transportation: Findings from the Transportation Research Board's 2004 Field Visit Program*. TR News, Jan.-Feb. 2005. Federal Highway Administration Office of Professional Development. *Innovative Practices in State DOT Workforce Management: Minnesota Succession Planning*.
17. Deis, Donald R., Edward Watson, and Chester G. Wilmot. *Designing a Comprehensive Model to Evaluate Outsourcing of Louisiana DOTD Functions and Activities*. Baton Rouge, LA: Louisiana Transportation Research Center, June 2002. Warne, Thomas R., *State DOT Outsourcing and Private Sector Utilization: A Synthesis of Highway Practice*. Washington D.C.: National

continued

## Endnotes (concluded):

Cooperative Highway Research Program for the Transportation Research Board of the National Academies, 2003. Joint Legislative Audit and Review Commission of the Virginia General Assembly. *Review of the Use of Consultants by the Virginia Department of Transportation*. Richmond, VA: State of Virginia, Nov. 1998. Wilmot, Chester G., *Investigation into the Cost-Effectiveness of Using Consultants Versus In-house Staff in Providing Professional Engineering Services for Louisiana's Department of Transportation and Development*. Baton Rouge, LA: Louisiana Transportation Research Center, June 1995. Hancher, Donn E., April Brenneman, Robin Meagher, and Paul Goodrum. *Outsourcing of KyTC Project Delivery Functions*. Lexington, KY: Kentucky Transportation Center at the University of Kentucky's College of Engineering, June 2005.

18. Deis, Donald R., Edward Watson, and Chester G. Wilmot. *Designing a Comprehensive Model to Evaluate Outsourcing of Louisiana DOTD Functions and Activities*. Baton Rouge, LA: Louisiana Transportation Research Center, June 2002.
19. The Office estimated this number by preparing a list of open pre-award audit requests from its HEAT Audit system and distributed the list among office staff to eliminate duplicate entries and audits previously issued. Office of the Auditor General staff analysis had determined that data in the Office's HEAT Audit system was incomplete and unreliable, and auditors could not verify the Office's estimate of backlogged pre-award audits.
20. The Office could not locate the files for the remaining three reports, and therefore their timeliness cannot be determined.

• concluded

# AGENCY RESPONSE



# Arizona Department of Transportation

## Office of the Director

206 South Seventeenth Avenue Phoenix, Arizona 85007-3213

Janet Napolitano  
Governor

David P. Jankofsky  
Deputy Director

Victor M. Mendez  
Director

July 17, 2006

Debbie K. Davenport  
Auditor General  
2910 North 44<sup>th</sup> Street  
Phoenix, Arizona 85008

Dear Mrs. Davenport:

Thanks to you and your staff for the professionalism displayed during the Sunset Review of the Arizona Department of Transportation, Intermodal Transportation Division and the Office of Audit and Analysis.

### Finding 1: ADOT should optimize internal resources to reduce consultant usage.

#### Recommendation 1:

1. **To better ensure that it develops competency internally and reduces costs, ITD should aggressively seek to:**
  - a. Fill existing vacant employee positions with competent staff;
  - b. Identify ongoing, recurrent work related to project design, construction management, and other similar functions currently provided by consultants and perform these services in-house when appropriate; and
  - c. Continue to develop strategies to recruit and retain staff, and consider mentoring, succession, and other programs to help reduce the impact of employee turnover and retirements.

#### Recommendation:

- a. **Fill existing vacant employee positions with competent staff;**

#### Agency Response:

The finding of the auditor general is agreed to and the audit recommendation will be implemented.

We concur with the Report's emphasis on optimizing use of internal resources to reduce consultant usage, while keeping our focus on the goal of meeting the increasing demand for new highway construction as the population grows.

However, the current salary structure has made it difficult to hire and retain staff in the engineering and technical positions. Vacancies in ADOT's engineering positions have



2001 Award Recipient

ranged between 23% and 28%. We acknowledge that it is probably unreasonable to try to compete directly with the private sector on salary in the current economy where the demand for engineering services is so high. However, ADOT continues to lose junior and journey level staff to the cities, counties, and the private sector.

In the FY 2002 budget, ADOT requested, and was granted a new salary structure for engineers and certain other technicians. However, to fully implement that Plan, legislative appropriations are needed. Those appropriations have not happened.

In the meantime, the workload increase, as a result of delivering the highway construction program in 7.5 years instead of the planned 14 years, has made it critical and necessary to utilize consultants in the absence of adjustments to the current salary structure. ITD has been performing twice the work with 3/4 of the authorized staff, ultimately requiring the increased use of consultants.

Hence, ADOT will continue to try to fill vacancies and develop recruit and retain strategies, but without adequate funding for these positions, the prospects for success are problematic. For a list of strategies ADOT has employed, see the Agency Response for recommendation 1c.

**Recommendation:**

- b. Identify ongoing, recurrent work related to project design, construction management, and other similar functions currently provided by consultants and perform these services in-house when appropriate;**

**Agency Response:**

The finding of the auditor general is agreed to and the audit recommendation will be implemented.

ITD uses a management level process to determine consultant needs based on project schedule and the availability of in-house staff, as well as the expertise requirements on the projects. ITD uses this process to evaluate the need for consultants on any given project. Additionally, one clear distinction must be drawn in this analysis, specifically with regard to the contractors that are utilized to construct the highways versus the consultants that are utilized in the design, development, project management, inspection and testing processes. The statutes require ADOT to utilize private contractors to construct the highways.

**Recommendation:**

- c. Continue to develop strategies to recruit and retain staff, and consider mentoring, succession, and other programs to help reduce the impact of employee turnover and retirements.**

**Agency Response:**

The finding of the auditor general is agreed to and the audit recommendation will be implemented.

ADOT has utilized the following strategies in an attempt to improve recruitment and retention efforts:

- Adjusting engineering entry-level salaries.
- Summer intern program to recruit college engineering students (pre-Engineering In Training).
- Advertising engineering positions during the winter in the mid-west and east coast newspapers (sunshine ads).
- Making counteroffers to employees who have received offers of employment from external agencies or companies in an effort to retain valuable employees.
- Piloting a talent management effort in an attempt to identify and develop core competencies.
- Hiring a recruitment specialist to focus on recruitment of engineers and technical staff.
- Providing individual salary adjustments for engineers exhibiting exceptional performance in an effort to retain them.
- Hiring return-retirees who have valuable skill sets.
- Recruiting and developing construction technicians by providing a technical training and certification program to hire individuals at their appropriate level of experience. If positions are underfilled, the training and certification program and On the Job Training (OJT) work experience allows inspectors to advance as the requirements are completed at each level.
- EIT's and Summer Engineering Interns are part of ITD's mentoring and OJT training programs. The intent of these programs is to expose engineering students and new engineering graduates to multiple facets of the transportation environment and identify their specific interests and skill set. The hope is that by helping them self-direct to an area suited to them, ADOT will be able to improve retention.
- A requirement for coaching (mentoring) has been built into the technical training programs as identified in the training matrices for the Construction Technicians series.

**Recommendation:**

**2. To better ensure that it identifies and maintains the proper level of consultant usage, ITD should:**

- a. Develop division-wide criteria for deciding when to use a consultant to complete projects or tasks, and
- b. Develop methods of tracking and monitoring consultant usage, such as compiling data on the dollar amount, quantity, and type of projects or services completed by consultants, and reasons for using consultants or other relevant information, and evaluate information to identify consultant services that could be more cost effectively provided by in-house employees.

**Recommendation:**

- a. **Develop division-wide criteria for deciding when to use a consultant to complete projects or tasks.**

**Agency Response:**

The finding of the Auditor General is agreed to and the audit recommendation will be implemented.

ITD uses a management level process to determine consultant needs based on project schedule, availability of in-house staff and expertise requirements on the project. ITD uses this process to evaluate the need for consultants on any given project.

ITD has utilized a construction manpower management program for over 25 years. The current program, Construction Manpower Program (CMP), projects personnel needs based on the 5-year construction program requirements. This tool is used to determine what level of outside consultant assistance may be required beyond authorized Construction FTE (Full Time Equivalent) positions. Based on that analysis, the Construction Group works with Engineering Consultant Services to determine the types of contracts necessary to assist the Districts in their construction contract administration and construction materials testing assistance.

Presently four types of contracts have been identified in our Departmental Strategic Plan:

- Temporary Technical Engineering Personnel.
- On-Call Construction Contract Administration (\$5 million maximum contract estimate).
- Acceptance Materials Testing (\$750,000 contract value).
- Contracts over \$5 Million bid estimate are advertised for competitive selection of qualified consultant firms.

This program is administered statewide for ITD. Additionally, ITD will also work with local jurisdictions not certified by FHWA to administer their own projects to ensure that supplemental consultant services are procured for those projects.

**Recommendation:**

- b. **Develop methods of tracking and monitoring consultant usage, such as compiling data on the dollar amount, quantity, and type of projects or services completed by consultants, and reasons for using consultants or**

**other relevant information, and evaluate information to identify consultant services that could be more cost effectively provided by in-house employees.**

**Agency Response:**

The finding of the Auditor General is agreed to and the audit recommendation will be implemented.

The consultant contract program is used only when the workload in ADOT precludes an in-house effort or when a special expertise is required.

ITD tracks and monitors consultant usage in great detail. These contract expenditures are tracked multiple ways (i.e., by task, by firm, by TRACS number, and by individual employee).

Tracking begins as the District communicates their need. If no internal resources are available to meet the need, statewide requests are pooled and the Construction Group evaluates the services required and retains the consultant best able to provide the needed services.

Throughout the life of the contract, multiple levels of review, approval and evaluation are employed. The Construction Org assigns the work and approves the timesheet. District reviews all billings and is aware how the consultant personnel are being utilized, projects being charged and progress in completing assigned work. The Construction Group reviews and approves monthly consultant billings to determine that proper rates are being charged, back-up supporting documentation is complete, ADOT policy is followed and project funding is sufficient to process the billing. A detailed log record tracks the progress of the billing from receipt to payment.

The Construction Org evaluates the performance of the individual consultant at the end of each assignment. The Construction Group compiles and utilizes that data to determine future assignments.

ITD, Development Group, through ECS' Consultant Contract Management application, tracks and monitors consultant and contract information from "cradle to grave". Currently this application is being reviewed for maintenance and enhancement of its capabilities. The maintenance portion should be complete by the end of this calendar year.

Our present application, captures contract dollars, contract time, type of services, compensation type, contract modifications, and payment information. As a result, we are able to monitor and report project expenditures by consultant, by service, by contract or by TRACS number. Other relevant information currently being captured are as follows: consultant firm information, overhead/audit history, contract wage rates by classification, consultant evaluations and work assignments as a prime or as a

subconsultant, etc. Quantity information may be found in hard copy format in the contract file.

**Finding 2: ITD should improve implementation and documentation of inspection process.**

**Recommendation:**

1. To ensure that the checklist results are determined in a consistent manner, ITD should assess how field inspectors and independent QA inspectors are interpreting the checklist items. Further, ITD should provide training and/or develop guidelines to help field inspectors and independent QA inspectors interpret the checklist items in a similar manner.
2. To comply with department policy and FHWA inspection practices, ADOT should ensure that field inspectors document inspection results, including:
  - Whether work conforms to plans and specifications;
  - Whether problems occurred; and
  - Problem resolution.
3. To comply with department policy, ADOT should ensure that field inspectors complete and submit checklists as part of their daily diaries, and document that critical and major items were addressed.
4. To help ensure that checklists meet field inspectors' needs and contain applicable content, ADOT should consider a checklist revision process that includes knowledgeable field inspectors.
5. ADOT should require follow-up on independent QA inspection results that identify critical or major noncompliance.

**Agency Response:**

The finding of the auditor general is agreed to and the audit recommendation will be implemented.

1. ITD will correlate the checklist scoring between the two groups to ensure that there is consistency. Additionally, training courses will be assessed to ensure that they provide appropriate guidelines to interpret the checklist items.
2. The Construction Group will work with the individual Orgs and through training to emphasize the importance of proper documentation of all pertinent data that daily diaries should include, as detailed in the Construction Manual.
3. The Assistant State Engineer, Construction, will issue a Construction Bulletin by August 1, 2006, directing checklist compliance. Additionally, training will be developed that clearly outlines how to properly document daily diaries.
4. The Construction Group will formalize the process of documenting checklist revision procedures, including the inclusion of knowledgeable field inspectors on checklist revision teams.

**Finding No. 3: ADOT needs to improve audits of design and construction contracts.**

**Auditor General Recommendations:**

**1. The Office should continue its efforts to:**

- a. Fill vacant positions and, if necessary, develop new recruitment strategies. If the Office cannot fill positions with experienced auditors, it might consider hiring auditors without cost accounting experience and providing training or offering an internship program.
- b. Implement performance measurements to monitor its production and work activities. This should include the number and types of audit requests received and conducted, the timeliness of completing audits, and audit results.
- c. Ensure that the highest-risk projects are audited by applying a risk-based approach to selecting and conducting audits that considers items such as staffing available to complete audits, dollar thresholds at which audits should be conducted, and office audit requirements for each type of contract.
- d. Replace its database system and obtain a system that can track and schedule workload and measure production.
- e. Annually estimate its workload and prioritize its audits based on available resources. This plan should be documented in an annual audit work plan and revised with changing circumstances.
- f. Revise its audit manual to reflect changes in business practices and ensure that it provides adequate audit coverage of department projects.

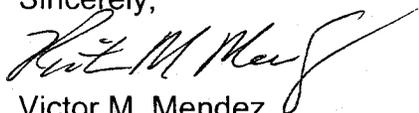
**Agency Response:**

The finding of the Auditor General is agreed to and the audit recommendation will be implemented.

As indicated on page 32 of the report, the Department is taking steps to address the findings of the Auditor General. All vacant positions in the Office of Audit and Analysis are being filled, performance measurements are under development, a new audit management system is being implemented, and audits have been prioritized based on risk and incorporated into the draft 2007 audit plan. That plan will be periodically reviewed and modified, as circumstances require. In addition, the Department will be exploring the use of Certified Public Accountants to expedite the completion of required audits.

Implementation of all corrective actions is on schedule, except two positions in the Office of Audit and Analysis remain vacant. Although the Office is staffed at 92% of capacity, efforts are continuing to fill those positions.

Sincerely,



Victor M. Mendez

## Performance Audit Division reports issued within the last 24 months

---

<b>04-05</b>	Department of Environmental Quality—Water Quality Division	<b>05-05</b>	Department of Economic Security—Service Integration Initiative
<b>04-06</b>	Department of Environmental Quality—Waste Programs Division	<b>05-06</b>	Department of Revenue—Audit Division
<b>04-07</b>	Department of Environmental Quality—Air Quality Division	<b>05-07</b>	Department of Economic Security—Division of Developmental Disabilities
<b>04-08</b>	Department of Environmental Quality—Sunset Factors	<b>05-08</b>	Department of Economic Security—Sunset Factors
<b>04-09</b>	Arizona Department of Transportation, Motor Vehicle Division— State Revenue Collection Functions	<b>05-09</b>	Arizona State Retirement System
<b>04-10</b>	Arizona Department of Transportation, Motor Vehicle Division—Information Security and E-government Services	<b>05-10</b>	Foster Care Review Board
<b>04-11</b>	Arizona Department of Transportation, Motor Vehicle Division—Sunset Factors	<b>05-11</b>	Department of Administration—Information Services Division and Telecommunications Program Office
<b>04-12</b>	Board of Examiners of Nursing Care Institution Administrators and Assisted Living Facility Managers	<b>05-12</b>	Department of Administration—Human Resources Division
<b>05-L1</b>	Letter Report—Department of Health Services—Ultrasound Reviews	<b>05-13</b>	Department of Administration—Sunset Factors
<b>05-01</b>	Department of Economic Security—Division of Employment and Rehabilitation Services—Unemployment Insurance Program	<b>05-14</b>	Department of Revenue—Collections Division
<b>05-02</b>	Department of Administration—Financial Services Division	<b>05-15</b>	Department of Revenue—Business Reengineering/Integrated Tax System
<b>05-03</b>	Government Information Technology Agency (GITA) & Information Technology Authorization Committee (ITAC)	<b>05-16</b>	Department of Revenue Sunset Factors
<b>05-04</b>	Department of Economic Security—Information Security	<b>06-01</b>	Governor's Regulatory Review Council
		<b>06-02</b>	Arizona Health Care Cost Containment System—Healthcare Group Program
		<b>06-03</b>	Pinal County Transportation Excise Tax
		<b>06-04</b>	Arizona Department of Education—Accountability Programs

## Future Performance Audit Division reports

---

Arizona Department of Education—Administration and Allocation of Funds

Arizona Department of Education—Information Management Function



A REPORT  
TO THE  
ARIZONA LEGISLATURE

Performance Audit Division

---

Performance Audit

# Arizona Department of Transportation— Highway Maintenance

---

JUNE • 2007  
REPORT NO. 07-03



---

Debra K. Davenport  
Auditor General

The Auditor General is appointed by the Joint Legislative Audit Committee, a bipartisan committee composed of five senators and five representatives. Her mission is to provide independent and impartial information and specific recommendations to improve the operations of state and local government entities. To this end, she provides financial audits and accounting services to the State and political subdivisions, investigates possible misuse of public monies, and conducts performance audits of school districts, state agencies, and the programs they administer.

## The Joint Legislative Audit Committee

---

Senator Robert Blendu, Chair

Representative John Nelson, Vice-Chair

Senator Carolyn Allen

Representative Tom Boone

Senator Pamela Gorman

Representative Jack Brown

Senator Richard Miranda

Representative Peter Rios

Senator Rebecca Rios

Representative Steve Yarbrough

Senator Tim Bee (ex-officio)

Representative Jim Weiers (ex-officio)

## Audit Staff

---

Melanie M. Chesney, Director

Shan Hays, Manager and Contact Person

Brent Nelson, Team Leader

Brian Miele

Jay Rasband

Copies of the Auditor General's reports are free.  
You may request them by contacting us at:

### **Office of the Auditor General**

2910 N. 44th Street, Suite 410 • Phoenix, AZ 85018 • (602) 553-0333

Additionally, many of our reports can be found in electronic format at:

[www.azauditor.gov](http://www.azauditor.gov)

**REPORT  
HIGHLIGHTS  
PERFORMANCE AUDIT**

**Subject**

ADOT was established in 1974 and is charged with planning, designing, constructing, maintaining, and operating the State's highway transportation infrastructure. The Intermodal Transportation Division is responsible for highway design, construction, and maintenance.

**Our Conclusion**

Money for highway maintenance represents about 10 percent of ADOT's highway funding, supporting about 250 maintenance activities throughout the State. Arizona's highway system has mostly smooth and good-quality pavement and was in better condition in 2005 than in 1995. The Division could better measure and identify annual maintenance work needed to maximize the state highway system's life, efficiency, appearance, and safety. The report also provides information on litter control.



**2007**

**Maintenance monies support numerous activities**

The Division maintains an expanding state-wide road system that includes interstate highways and U.S. and state routes. The Division maintains more than 27,000 maintenance lane miles that include all travel lanes, ramps, passing lanes, paved shoulders, and unpaved roads.

The State's transportation infrastructure was worth more than \$9 billion as of June 30, 2006.

**Nine districts**—The State is divided into nine districts that handle most highway maintenance for their geographical areas. Maintenance of a highway extends from the right-of-way fence on one side of the road to the other side. This work includes:

- Surface maintenance, such as filling potholes and sealing cracks;
- Shoulder maintenance, such as repair and blading;
- Roadside maintenance, such as guardrail and fence repair;
- Drainage maintenance, such as clearing drains and ditches; and
- Removing obstructions, debris, snow, and ice.

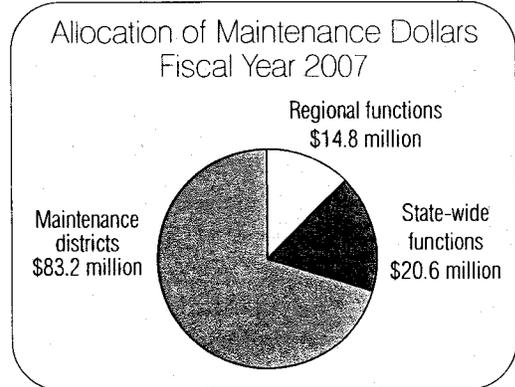
Some functions, such as highway striping, lighting, and traffic signals, are conducted on a regional basis.

Further, the Division paid more than \$17.5 million to private contractors who provided some maintenance services.



Photo courtesy of Valley Slurry Seal Co.

**Maintenance expenditures**—Maintenance constitutes about 10 percent of ADOT's highway expenditures. ADOT's Highways Program has almost \$1.2 billion available for fiscal year 2007, of which the Legislature appropriated \$118.6 million for highway maintenance—materials, equipment, contractors, and facilities. Most of these monies go to the nine maintenance districts.



The Division has identified and tracks expenditures for 250 highway maintenance activities, which we grouped into general categories. Although many people may equate the term "highway maintenance" with maintaining pavement—such as filling

potholes—paved surfaces account for slightly less than 9 percent of ADOT's total maintenance expenditures. The major maintenance expenditure categories include:

- Roadside (\$19 million)—Mowing, litter pickup, guardrails, fences
- Traffic (\$12.4 million)—Signs, signals, pavement markings
- Other (\$10.1 million)—Materials handling, building and yard maintenance, contracts for prison labor
- Paved surfaces (\$9.6 million)—Crack/pothole filling, seal coats
- Landscaping and plants (\$7.6 million)
- Rest areas (\$6 million)
- Winter (\$2.4 million)—Snow removal and deicing

In addition to the legislative appropriation for maintenance, the Division also expends money from two other sources. One is from nonappropriated highway construction monies for

pavement preservation projects. Highway preservation involves grinding (milling) off the top 1-3 inches of the pavement and replacing it with asphalt. This adds about 10 years to pavement life. In fiscal year 2006, ADOT spent \$77.3 million preserving approximately 399 lane miles and has budgeted \$103.4 million for pavement preservation in fiscal year 2007.

Maricopa County voters approved another funding source by passing Proposition 400 in November 2004, extending the County's one-half cent transportation excise tax. A portion of this is allocated to regional highway maintenance. That allocation is worth about \$279 million between fiscal years 2006 and 2025. For each of fiscal years 2006 and 2007, \$5.7 million was allocated to ADOT and is used for landscape, litter control, and sweeping.

## Most Arizona pavement rated satisfactory

Well-maintained pavement provides various benefits, including increased safety, fewer auto repairs, improved quality of the overall road network, and higher user comfort, according to a Kentucky research report.<sup>1</sup>

Pavement quality is determined by measuring the roughness in inches over a mile, the extent of cracking, patching, and asphalt oil seepage, rut depth, and friction amount. Specialized crews survey all Arizona highways, collecting data by observation and special equipment.

Arizona's pavement smoothness compares favorably with other states. For 2005 (the most recent data available), Arizona's good ratings for interstate roads were higher than for all five contiguous states, while its good ratings for other roads were ranked third.

Arizona's ratings for smoothness and other quality factors were better in 2005 than in 1995.

### State Comparison of Pavement Smoothness Calendar Year 2005

Interstate Highways	Percentage with Good Rating <sup>1</sup>
Arizona	95.2%
New Mexico	92.8
Nevada	88.1
Utah	72.5
Colorado	50.8
California	50.2
<b>Other Roads</b>	
Nevada	96.4%
New Mexico	78.4
Arizona	70.5
Utah	59.1
California	53.0
Colorado	52.8

<sup>1</sup> A "good" rating is defined as roads receiving an International Roughness Index rating of less than 95, which measures the inches of bounce a vehicle will experience over one roadway mile.

<sup>1</sup> Kreis, Doug, Lenahan O'Connell, and Brian Howell. *Long-Term Maintenance Needs Planning*. Lexington, KY: Kentucky Transportation Center, College of Engineering, University of Kentucky, 2005.

# Improved approach needed to determine maintenance needs and allocate money

Although maintenance funding has increased, so have maintenance costs and demands. Highway maintenance expenditures increased 56.6 percent between 1997 and 2006. Pavement preservation spending fluctuated between \$66 million to \$115.5 million, except for increased federal funding in 1998 and 1999 that increased the total for those years to \$169.8 million and \$196.2 million, respectively.

**Increased material costs**—Highway maintenance material costs have been increasing and, as a result, the Division has been doing less preventive maintenance. As an example of the increases, the cost of asphalt has gone up 171 percent from 1997 to 2006. The overall construction price index has risen 58 percent during this same period.

Changes in Selected Construction Costs  
As of August 2006

	Asphalt	Cement	Steel	Overall
Past year	77%	11%	11%	14%
Past 5 years	*	33	59	41
Past 10 years	171	48	49	58

\* There is a gap in the data for asphalt that prevents a calculation of the price change over this time span.

**Increased demand**—Not only has the cost of maintenance increased, but the demand for maintenance has also increased. For example, between 1997 and 2006:

- Travel lane miles increased 8 percent in total.
- The proportion of urban lane miles increased, producing increased costs for landscaping, median barriers, lighting, etc.
- Traffic volume increased 59 percent.

Further, the time ADOT maintenance crews spent on emergency incidents increased 25 percent just between 2004 and 2006.

Other demands have also increased maintenance costs and workload. For example, ADOT officials state that public expectations now require ADOT to use deicing chemicals instead of less-expensive cinders to clear winter roads.

According to ADOT, there is a widening gap between current resources and maintenance needs, but it was unable to document the extent of the gap.

**Planning process lacking**—State-wide and district annual maintenance budgets are mainly based on past years' budgets and not on the annual work that needs to be done. There are no district or state-wide guidelines to help identify maintenance needs or how to prioritize them. The Division's allocation of most maintenance monies does not consider miles, traffic volume, population changes, and other factors that affect the workload. As a result, some districts may be able to do even the lowest-priority work, while others may struggle to accomplish higher-priority work. A comparison of district maintenance budgets shows significant differences in budget amounts per miles of highways and per vehicle miles traveled (VMT) in the districts.

Comparisons of District Budgets

	Budget per Mile	Budget per VMT <sup>1</sup>
Average district ratio per category	\$2,796	\$1.47
Lowest district ratio per category	1,627	0.53
Highest district ratio per category	4,745	3.39

<sup>1</sup> Traffic volume is measured by daily vehicle miles traveled (VMT). A "vehicle miles traveled" unit is one vehicle traveling the distance of one mile. Thus, total vehicle miles traveled is the total mileage traveled by all vehicles.

The Division should establish maintenance and inspection frequency schedules and guidelines to help identify and prioritize needed maintenance work.

The Division has taken some steps to better measure its maintenance needs, such as developing four computerized systems. Although the Division has high expectations for these systems, they are not yet fully developed or in use. Consequently, their effectiveness cannot yet be judged.

As it implements the computer systems, the Division should also implement a systematic planning approach that would

identify maintenance needs state-wide, provide a method to prioritize needs, and provide a systematic method for allocating resources.

## Recommendations

The Division should:

- Develop and implement guidelines to identify and prioritize needed annual maintenance work.
- Identify, quantify, and prioritize all annually needed maintenance work.
- Identify work that cannot be done with existing resources to quantify any maintenance funding gap.
- Develop and implement a methodology that ensures systematic allocation of resources based on state-wide needs and priorities, and districts' or regions' needs and responsibilities.

### TO OBTAIN MORE INFORMATION

A copy of the full report  
can be obtained by calling

**(602) 553-0333**



or by visiting  
our Web site at:  
[www.azauditor.gov](http://www.azauditor.gov)

Contact person for  
this report:  
Shan Hays

## Other pertinent information on litter control

The Division is responsible for managing litter control on state-maintained roads. ADOT uses paid contractors, the Adopt-a-Highway program, prison labor, and in-house maintenance crews to control litter.

ADOT schedules each roadway mile in the greater Phoenix area for weekly litter pickup, done mostly by private contractors. In fiscal year 2006, \$1.8 million in Maricopa County's Proposition 400 monies was designated to pay for contracted litter pickup. The Maricopa Association of Governments used another \$200,000 in Proposition 400 monies for litter prevention and education.

Adopt-a-Highway sponsors in Phoenix, Tucson, and Flagstaff contract with preapproved maintenance contractors for

litter control. This litter pickup occurs typically every other week, although in Flagstaff and Tucson, some sponsored litter pickup is done only 12 to 18 times per year.

Volunteer groups are also involved in the Adopt-a-Highway program. As of February 2006, ADOT had 2,235 volunteer groups assisting in litter control on 2,467 roadway miles.

ADOT also used about 86,000 hours of prison labor to perform litter pickup along some Arizona highways. The total cost of this work was almost \$62,000 in fiscal year 2006.

Finally, ADOT maintenance crews pick up litter in rural areas only in response to complaints or to address obvious safety hazards.



DEBRA K. DAVENPORT, CPA  
AUDITOR GENERAL

STATE OF ARIZONA  
OFFICE OF THE  
AUDITOR GENERAL

WILLIAM THOMSON  
DEPUTY AUDITOR GENERAL

June 5, 2007

Members of the Arizona Legislature

The Honorable Janet Napolitano, Governor

Victor Mendez, Director  
Arizona Department of Transportation

Transmitted herewith is a report of the Auditor General, A Performance Audit of the Arizona Department of Transportation—Highway Maintenance. This report is in response to a May 22, 2006, resolution of the Joint Legislative Audit Committee. The performance audit was conducted as part of the sunset review process prescribed in Arizona Revised Statutes §41-2951 et seq. I am also transmitting with this report a copy of the Report Highlights for this audit to provide a quick summary for your convenience.

As outlined in its response, the Arizona Department of Transportation agrees with all of the findings and plans to implement 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 June 6, 2007.

Sincerely,

Debbie Davenport  
Auditor General

Enclosure

# SUMMARY

---

The Office of the Auditor General has conducted a performance audit of the Arizona Department of Transportation (ADOT) pursuant to a May 22, 2006, resolution of the Joint Legislative Audit Committee. This is the second in a series of three reports and was conducted as part of the sunset review process prescribed in Arizona Revised Statutes (A.R.S.) §41-2951 et seq. This audit focuses on the Intermodal Transportation Division's (Division) highway maintenance activities including how maintenance monies are spent, the overall highway pavement conditions, and how needed maintenance work is identified and planned. The first audit focused on the use of consultants to design and manage construction projects, the process for inspecting projects under construction, and audits conducted on consultant and construction contracts. The final audit report will address the 12 statutory sunset factors.

ADOT was established in 1974 to plan, develop, design, construct, maintain, and operate the State's highway transportation infrastructure for moving people and goods by surface and air throughout Arizona. The State's transportation infrastructure value exceeded \$9 billion as of June 30, 2006, and the Division had 922 employee positions assigned to highway maintenance activities. ADOT has nine districts that provide highway maintenance services within their assigned geographic areas and four groups with state-wide maintenance duties. In addition, eight employees in the Materials Group measure pavement conditions and administer pavement preservation projects done by contractors. As of December 31, 2005, Arizona's highway system included 18,503 travel lane miles, which measure roadway capacity, or more than 27,000 maintenance lane miles including ramps, passing lanes, and shoulders. For fiscal year 2007, ADOT has a total of \$124.3 million in funding for highway maintenance, and plans to spend \$103.3 million for pavement preservation.

## Maintenance monies support numerous activities (see pages 11 through 17)

The Division provides various road-related and pavement maintenance. Legislative appropriations for maintenance—approximately \$118.6 million in fiscal year 2007—represent approximately 10 percent of ADOT's total highway monies, and almost 9

of 10 of these dollars are spent on nonpavement features and other costs such as employee leave, supervision, and utilities. Nonpavement features are extensive including roadside items such as highway shoulders, drainage structures, guardrails, and fences; traffic control features such as signs, signals, and pavement markings; landscaping and vegetation; and rest areas. Although the Division's maintenance crews perform most maintenance activities, division expenditures for contractor-provided maintenance have increased. Specifically, the Division spent \$17.5 million on contractor-provided maintenance in fiscal year 2006, compared to \$4.1 million in fiscal year 1997.

Expenditures for pavement preservation projects come primarily from federal and state monies made available through ADOT's *Five-Year Transportation Facilities Construction Program*. Contractors perform these projects, which usually involve replacing 1 to 3 inches of pavement or overlaying existing pavement with 1 to 3 inches of asphalt. These projects are intended to extend the life of pavement before more costly reconstruction is needed. In fiscal year 2006, ADOT estimates it spent \$77.3 million on 25 pavement preservation projects for an estimated 399 lane miles and plans to spend \$103.3 million for pavement preservation, which includes \$5.5 million for preventive maintenance, in fiscal year 2007.

ADOT also receives monies that are earmarked for highway maintenance in Maricopa County. In November 2004, Maricopa County voters approved Proposition 400, which extended the County's half-cent transportation excise tax, of which a portion is allocated to ADOT for regional landscape maintenance and litter pickup. The Division received \$5.7 million each year in fiscal years 2006 and 2007 and used these monies for landscape maintenance, litter control, and pavement sweeping.

## Most Arizona pavement rated satisfactory (see pages 19 through 24)

Most road pavement in Arizona's state highway system has received satisfactory ratings, and overall ratings were higher in 2005 than in 1995.<sup>1</sup> Well-maintained pavement provides several benefits, including increased safety, fewer auto repair expenses, improved quality of the overall road network, and higher user comfort.<sup>2</sup> The Division evaluates pavement quality using various measures including the International Roughness Index (IRI), a nationally accepted measure of road smoothness. Arizona's roads compared favorably with contiguous states', and ratings generally showed improvement in 2005 compared to 1995. Interstate roads, which often have the highest traffic volume, received better ratings than state routes and U.S. highway roads, which have a lower percentage of high traffic volume

<sup>1</sup> The Division's road condition measurement focuses on pavement condition and does not address nonpavement features such as guardrails, shoulders, and drainage systems.

<sup>2</sup> Kreis, Doug, Lenahan O'Connell, and Brian Howell. *Long-Term Maintenance Needs Planning*. Lexington, KY: Kentucky Transportation Center, College of Engineering, University of Kentucky, September 2005.

segments. Finally, a consumer satisfaction survey showed that Arizona residents are generally satisfied with highway maintenance efforts, but still want improvements in all maintenance areas.

## Division should improve method to determine maintenance needs and allocate maintenance dollars (see pages 25 through 35)

The Division should improve how it identifies annual maintenance needs and allocates maintenance monies to maximize the state highway system's life expectancy, operational efficiency, appearance, and safety. ADOT has received increased funding for maintenance, but because of increased associated costs and maintenance demands, the Division reported that it has reduced its ability to provide adequate highway system maintenance, such as pavement preventive maintenance activities. Highway maintenance expenditures increased 56.6 percent between fiscal years 1997 and 2006, averaging a 5.1 percent annual increase. At the same time, asphalt costs increased 171 percent, traffic volume increased by 59 percent, and travel lane miles increased by 8 percent. Division officials said the majority of the new miles were in urban areas and are therefore more costly to maintain because of heavy traffic volume and landscaping, median barriers, lighting, and other features. In addition, some maintenance crews are affected by an increased number of emergency incidents that reduce time and money available for planned maintenance because the crews must respond to the incidents and repair damaged features, such as guardrails and fences, in a timely manner.

The Division does not have integrated, systematic, state-wide processes to identify maintenance needs. The districts plan annual work based on their historical activity and current budget, not on an analysis and prioritization of everything that needs to be done. In addition, the Division has not established adequate criteria such as maintenance and inspection frequency guidelines to help districts plan needed maintenance. Further, lacking an adequate process for identifying and prioritizing state-wide needs, ADOT generally allocates maintenance funding on a historical basis rather than by documented needs. This could result in one district's inability to complete higher-priority work while another district completes lower-priority work. Further, this method does not consider roadway miles, traffic volume, population, and other factors that may affect district maintenance workload.

The Division is developing four computerized systems to help measure its maintenance needs, but these systems will not identify all needed maintenance. The Division should implement a more systematic approach for addressing maintenance needs by establishing frequency schedules, when applicable, for maintenance activities; identifying all needed maintenance state-wide; estimating monies and

resources required to perform the needed maintenance; providing a prioritization method to ensure that the most important and cost-effective maintenance is performed within resource constraints; and providing a systematic method for allocating resources to meet maintenance needs.

## Other pertinent information (see pages 37 through 39)

The Division uses a combination of paid contractors, the Adopt-a-Highway program, prison labor, and in-house maintenance crews to provide litter control along the state highway system. In the greater Phoenix area, where a Maricopa County excise tax provides monies for landscape maintenance and litter pickup, the Division plans litter pickup for each roadway once a week. Most of this work is done by private contractors paid with the excise tax monies, augmented by the Adopt-a-Highway sponsor program. The Tucson and Flagstaff districts also use the Adopt-a-Highway sponsor program, but on a much smaller scale than the Phoenix area. In other districts, ADOT's maintenance crews do only spot litter pickup on a public complaint basis or when they observe debris on roadways that may pose safety hazards. The Adopt-a-Highway volunteer program supplements maintenance crew litter pickup in the rural districts.

# TABLE OF CONTENTS



Introduction & Background	1
Finding 1: Maintenance monies support numerous activities	11
Maintenance receives about 10 percent of ADOT's highways funding	11
Maintenance appropriations pay for many services	12
Five-Year Program funds pavement preservation	16
Proposition 400 monies support landscape maintenance and litter pickup in Maricopa County	16
Finding 2: Most Arizona pavement rated satisfactory	19
Division uses several criteria and methods to rate pavement	19
Arizona pavement smoothness compares favorably with other states	21
Arizona pavement quality better in 2005 than in 1995	21
Arizona interstate roads rated better than other roads	23
Finding 3: Division should improve method to determine maintenance needs and allocate maintenance dollars	25
Funding, demands, and costs increasing	25
Division lacks adequate planning process	29
Division can further improve needs measurement	31
Recommendations	35

• continued



# TABLE OF CONTENTS

Other Pertinent Information	37
Agency Response	
Tables:	
1 Summary of Centerline Miles, Travel Lane Miles, and Maintenance Lane Miles December 31, 1996 through December 31, 2005	2
2 Intermodal Transportation Division—Highway Maintenance Activities Schedule of Revenues and Expenditures, in Thousands Fiscal Years 2005, 2006, and 2007 (Unaudited)	6
3 Maintenance Expenditures by Broad Category Fiscal Year 2006 (Unaudited)	13
4 Comparison of IRI for State Highway System Roadways between Arizona and Surrounding States Calendar Year 2005	21
5 Percentage of Arizona Interstate, State Route, and U.S. Highway Roads Receiving a Satisfactory Rating in Roughness, Rut Depth, Cracking, Patching, and Flushing Calendar Year 2005	23
6 Percentage Changes in Construction Costs As of August 2006	27

continued •

# TABLE OF CONTENTS



## Tables: (Concl'd)

7	Comparisons of District Budget and FTE Allocations to District Maintenance Lane Miles and Traffic Volume Fiscal Year 2006	30
8	Adopt-a-Highway Sponsor Program Statistics By District Fiscal Year 2006 (Unaudited)	38
9	Adopt-a-Highway Volunteer Program Statistics By District Fiscal Year 2006 (Unaudited)	39

## Figures:

1	Nine Maintenance Districts	4
2	Distribution of Special-Line-Item Appropriated Monies To State-wide, Regional, and District Functions Totaling \$118.6 Million Fiscal Year 2007 In Millions (Unaudited)	12
3	Comparison of the Percentage of Arizona Highway System Roads Receiving Good or Satisfactory or Poor or Objectionable Ratings in Roughness, Cracking, Rut Depth, Patching, and Flushing Calendar Years 1995 and 2005	22
4	Highway Maintenance Actual Expenditures and Pavement Preservation Bid Amounts Fiscal Years 1997 through 2006 and Estimated Expenditures Fiscal Years 2007 through 2011	26

• concluded

# INTRODUCTION & BACKGROUND

The Office of the Auditor General has conducted a performance audit of the Arizona Department of Transportation (ADOT) pursuant to a May 22, 2006, resolution of the Joint Legislative Audit Committee. This is the second in a series of three reports and was conducted as part of the sunset review process prescribed in Arizona Revised Statutes (A.R.S.) §41-2951 et seq. This audit focuses on ADOT highway maintenance activities, including how maintenance monies are spent, the overall condition of highway pavement, and how needed maintenance work is identified and planned. The first audit focused on using consultants to design and manage construction projects, the process for inspecting projects under construction, and audits conducted on consultant and construction contracts. The final audit report will address the 12 statutory sunset factors.

## ADOT responsible for maintaining transportation infrastructure

ADOT was established in 1974 and is responsible for planning, developing, designing, constructing, maintaining, and operating the State's highway transportation infrastructure for moving people and goods by surface and air throughout Arizona. The State's transportation infrastructure value exceeds \$9 billion as of June 30, 2006, and ADOT's Strategic Plan notes that protecting this substantial investment for Arizona's taxpayers is of paramount importance.

The Intermodal Transportation Division (Division), one of ADOT's six divisions, is responsible for ADOT's highways program. As such, the Division provides comprehensive highway management activities, including highway design, construction, and maintenance. The Division's maintenance mission is "to maximize the life expectancy, operational efficiency, safety and appearance of the state highway system." In addition to pavement maintenance, the Division maintains other roadway features such as guardrails, shoulders, and drainage systems (see textbox). The Division's maintenance activities also include snow and ice removal, weed and litter control, and responding to accidents and other emergencies. Finally, the Division operates a traffic

The State's transportation infrastructure value exceeds \$9 billion.

### Examples of roadway features ADOT maintains:

- Cattle guards
- Drainage systems
- Guardrails
- Landscaping
- Lighting
- Median barriers
- Rest areas
- Right-of-way fencing
- Shoulders
- Signage
- Striping
- Traffic signals

**Table 1:** Summary of Centerline Miles, Travel Lane Miles, and Maintenance Lane Miles  
December 31, 1996 through December 31, 2005

<u>December 31</u>	<u>Centerline Miles</u>	<u>Travel Lane Miles</u>	<u>Maintenance Lane Miles<sup>1</sup></u>
1996	6,596	17,130	Not reported
1997	6,605	17,160	Not reported
1998	6,608	17,363	Not reported
1999	6,608	17,381	Not reported
2000	6,611	17,407	24,958
2001	6,651	17,554	25,423
2002	6,785	18,067	25,851
2003	6,786	18,184	26,095
2004	6,816	18,449	27,000
2005	6,800	18,503	27,568
Net increase over period reported	204	1,373	2,610
Percentage increase over period reported	3.1%	8.0%	10.5%

<sup>1</sup> Includes unpaved roads, which totaled 180 lane miles as of December 31, 2005.

Source: Auditor General staff analysis of information in *FHWA Highway Statistics* reports, ADOT's Highway Performance Management System, and *Annual State Highway System Logs*. Maintenance lane miles were not reported until 2000.

operations center that is intended to help maintain public safety and reduce urban congestion by monitoring roadways, providing public information, and managing traffic-related incidents state-wide.

The Division maintains an expanding state-wide road system that includes interstate highways, which have uniform design standards and cross state lines; U.S. routes, which cross state lines and whose design standards are not uniform; and state routes, which are unique to Arizona. This system comprises nearly 7,000 centerline miles, a measure that disregards the number of lanes, or more than 18,000 travel lane miles, a measure of roadway capacity. When ramps, passing lanes, and shoulders are included, the Division is responsible for maintaining more than 27,000 maintenance lane miles. All three measures have increased in the past 10 years, as shown in Table 1. Most highway growth added capacity through more lanes, rather than new highways. Thus, travel lane miles increased more than centerline miles. Maintenance miles exceed travel lane miles because they include paved shoulders, ramps, and auxiliary and passing lane miles.

## Organization, staffing, and maintenance activities

The Division's maintenance responsibilities are divided among several organizational units. Altogether, 922 of the Division's 2,223 FTE positions are assigned to highway maintenance. These employees are assigned to 4 groups with state-wide responsibilities and 9 districts responsible for defined geographical areas. In addition, a section in the Materials Group with 8 employees not funded by maintenance has responsibilities that include administering pavement preservation projects. Specifically:

- The state-wide **Maintenance Group** (6 FTE funded by maintenance appropriation), headed by the State Maintenance Engineer, provides support services to groups and districts that do maintenance work. This group allocates maintenance appropriations to the other groups and districts that have maintenance-funded employees. The group also operates and maintains ADOT's maintenance management system (PeCoS) that ADOT uses to plan

and report completed maintenance work, as well as preparing and maintaining performance guidelines that describe highway roadway maintenance work activities. In addition, the group assists districts with contracts for roadway maintenance services and materials. Finally, the group administers outdoor advertising permits and encroachment permits on highway right-of-ways.

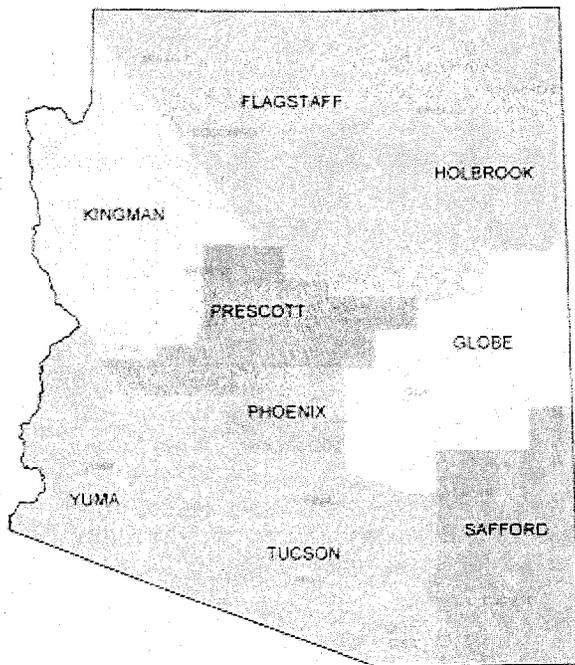
- The state-wide **Traffic Engineering Group's Traffic Operations Section** (48 FTE funded by maintenance appropriation) provides signing and striping, which involves painting traffic lines on pavement, for interstate highways and manufactures most of the highway signs. It also maintains highway lighting and traffic signals.
- The state-wide **Natural Resources Group** (33 FTE funded by maintenance appropriation) is responsible for managing land and vegetation along roadway corridors throughout the State for safety and maintenance, which includes providing weed and erosion control. This group has regional operations in Flagstaff, Phoenix, Prescott, and Tucson.
- The **Transportation Technology Group** (19 FTE funded by maintenance appropriation) houses the Traffic Operations Center in Phoenix that operates 24 hours every day and is part of the Freeway Management System (see textbox). Among other duties, the Center monitors freeway cameras and traffic volume sensors, and controls variable message signs and traffic interchange signals. It operates in part to help manage congestion caused by heavy traffic or accidents.
- **Nine Engineering Districts** (816 FTE funded by maintenance appropriation) have responsibility for highway maintenance work within their established geographic areas, as shown in Figure 1 (see page 4). Four of the nine districts—Flagstaff, Phoenix, Prescott, and Tucson—have regional responsibility for highway striping, signing, and traffic signals for all nine districts. The five other districts do not perform these duties. District duties also vary based upon climate and geographic differences. District maintenance responsibilities extend from the right-of-way fence on one side of the road to the right-of-way fence on the other side, and include:
  - Surface maintenance, such as filling potholes, sealing cracks, and leveling pavement;
  - Shoulder maintenance, such as repairing unpaved shoulders;

**Freeway Management System**—Transportation technology system used on 100 miles of freeway in the Phoenix area. System includes management of ramp meters, closed-circuit cameras, variable-message signs, and other communication systems used for monitoring and controlling traffic to reduce congestion, enhance safety, and save fuel.

**Traffic Operations Center**—24-hour facility intended to help maintain public safety and reduce urban congestion by monitoring real-time traffic conditions in the Phoenix area as well as state-wide weather and roadway conditions, providing timely public information on traffic conditions, and managing traffic-related incidents state-wide.

Districts are responsible for maintenance in their geographic areas.

Figure 1: Nine Maintenance Districts



Source: ADOT Web site map of construction and maintenance districts.

- Roadside maintenance, such as guardrail and fence repair;
- Drainage maintenance, such as cleaning out ditches to ensure water properly drains off pavement;
- Keeping roadways free from obstructions and debris; and
- Snow and ice removal.
- The Materials Group's state-wide **Pavement Management Section** (8 FTE, not funded by maintenance appropriation) administers pavement preservation projects done by contractors. The projects, which include removing and replacing the top few inches of pavement, prolong the time before a road requires more expensive reconstruction, according to ADOT officials. The section also surveys highway conditions and tests roads for cracking, roughness, and other characteristics used for planning pavement preservation projects.

In addition to in-house crews, the Division uses contractors to provide maintenance services. For example, contractors perform median cable barrier repair, rest area maintenance, pavement sweeping, landscape maintenance, and litter pickup, and provide services for all pavement preservation projects. According to division officials, ADOT uses contractors for any maintenance, reconstruction, or construction project valued at \$50,000 or more. Laws 2007, Chapter 77, §1 increases this contracting threshold to \$189,000 and beginning in fiscal year 2009 provides for annual inflation adjustments.

## Budget

ADOT's Highways Program had available monies of almost \$1.2 billion for fiscal year 2007, with \$118.6 million of this amount, or about 10 percent, provided for highway maintenance in a special line-item appropriation. Beginning in fiscal year 2006, the Legislature appropriated highway program revenues to maintenance using a special line item. Prior to that year, the maintenance amount was noted in a General Appropriations Act footnote, but it was not a special line-item appropriation. According to the appropriations report for fiscal year 2006, the special line item was created to highlight highway maintenance expenditures. Including \$5.7 million

provided from Proposition 400 transportation excise tax revenues, ADOT has a total of \$124.3 million for highway maintenance activities in fiscal year 2007.

The highway maintenance line item is funded mostly by revenue from the State Highway Fund with some monies coming from the Safety Enforcement and Transportation Infrastructure Fund. The Division's highway maintenance actual and estimated revenues and expenditures for fiscal years 2005 through 2007 are shown in Table 2 (see page 6). The highway maintenance appropriation is nonlapsing until 2 months after fiscal year-end, allowing the Division 14 months to expend maintenance monies. As Table 2 shows, the Division's total expenditures for highway maintenance were approximately \$106.7 million in fiscal year 2005 and \$113.5 million for fiscal year 2006, compared with \$127.9 estimated for fiscal year 2007. In fiscal years 2005 and 2006, the Division expended approximately 38 percent of its expenditures on employee salaries and benefits. The other operating expense category is large because it includes maintenance materials, equipment costs, contractor-provided maintenance, and costs for maintaining maintenance facilities throughout the State.

In addition to maintenance expenditures funded directly from its operating budget, the Division also expends significant amounts that come from two other sources, as follows:

- The State Transportation Board approves pavement preservation projects in ADOT's *Five-Year Transportation Facilities Construction Program* that are funded by state monies and federal highway trust monies. In fiscal years 2005 and 2006, the Division reported that it spent an estimated \$90 million and \$77.3 million, respectively, for such projects, and has projects with estimated costs totaling \$93.4 million planned for fiscal year 2007.
- The Maricopa Association of Governments (MAG) also allocates monies from the special half-cent transportation excise tax authorized by voters as Proposition 400 in November 2004 to the Division, which it uses for landscape maintenance, litter control, and sweeping for the Maricopa Regional Freeway system. The allocations for each of fiscal years 2006 and 2007 were \$5.9 million, of which the Division received \$5.7 million. Over the 20-year life of Proposition 400, MAG has earmarked \$279 million total for these maintenance activities administered by the Division.

A special tax provides monies for landscape maintenance, litter control, and sweeping for the Maricopa Regional Freeway system.

## Scope and methodology

This audit focused on how the Division spent special line-item monies for highway maintenance, highway conditions, and how the Division identified and planned needed maintenance activities. The audit includes the following findings and associated recommendations:

**Table 2: Intermodal Transportation Division—Highway Maintenance Activities Schedule of Revenues and Expenditures, in Thousands<sup>1</sup>**  
**Fiscal Years 2005, 2006, and 2007**  
**(Unaudited)**

	<b>2005 (Actual)</b>	<b>2006 (Actual)</b>	<b>2007 (Estimate)</b>
<b>Revenues:</b>			
Appropriations			
State Highway Fund <sup>2</sup>	\$106,112.0	\$110,818.7	\$118,087.1
Safety Enforcement and Transportation Infrastructure Fund <sup>3</sup>	558.7	558.7	558.7
Transportation excise taxes <sup>4</sup>	<u>          </u>	<u>5,700.0</u>	<u>5,700.0</u>
Total revenues	<u>106,670.7</u>	<u>117,077.4</u>	<u>124,345.8</u>
<b>Expenditures and operating transfers:</b>			
Personal services and related benefits	40,430.1	42,687.1	45,900.0
Professional and outside services	847.4	1,253.5	1,109.6
Travel	730.7	712.6	760.0
Other operating <sup>5</sup>	60,840.8	66,097.2	77,668.4
Equipment	<u>3,816.0</u>	<u>2,764.5</u>	<u>2,470.0</u>
Total expenditures	<u>106,665.0</u>	<u>113,514.9</u>	<u>127,908.0</u>
Excess (deficiency) of revenues over expenditures <sup>6</sup>	<u>\$ 5.7</u>	<u>\$ 3,562.5</u>	<u>\$ (3,562.2)</u>

<sup>1</sup> The table includes only the Arizona Department of Transportation's (ADOT) operating revenues and expenditures relating to the Intermodal Transportation Division's highway maintenance activities. Consequently, the table does not include pavement preservation capital expenditures used for pavement overlay projects included in ADOT's 5-year construction program paid with highway construction monies. In addition, the table is presented on a budgetary basis, in which expenditures are reported in the budget year incurred.

<sup>2</sup> Consists of the Division's portion of the Department's appropriation from State Highway Fund monies used to pay for its highway maintenance activities. The State Highway Fund receives monies from the Highway User Revenue Fund, and fuel and motor carrier taxes.

<sup>3</sup> Consists of the Division's portion of the Department's appropriation from Safety Enforcement and Transportation Infrastructure Fund monies used to pay for its highway maintenance activities. This Fund receives monies primarily from motor vehicle licenses and registration fees.

<sup>4</sup> Consists of monies from the special half-cent transportation excise tax authorized by voters as Proposition 400 in November 2004, which is allocated by MAG.

<sup>5</sup> Consists of various highway maintenance costs such as payments for utilities; landscaping; cable barrier and guardrail repair; rest area maintenance; traffic control; equipment, building, and land rental; general repair and maintenance; and materials.

<sup>6</sup> The estimated deficiency of revenues over expenditures for fiscal year 2007 will be funded with unexpended Proposition 400 monies carried forward from fiscal year 2006.

Source: Auditor General staff analysis of financial information provided by the Arizona Department of Transportation for fiscal years 2005, 2006, and 2007.

- Monies provided for highway maintenance activities represent about 10 percent of ADOT's highway program funding and support more than 250 different maintenance activities provided throughout the State.
- Arizona's state highway system as a whole has mostly smooth and good-quality pavement, and was in better condition in 2005 than in 1995. In addition, Arizona's state-maintained roads compare favorably with roads in contiguous states based upon data published by the Federal Highway Administration (FHWA).
- The Division could better measure and identify annual maintenance work needed to maximize the state highway system's life expectancy, operational efficiency, appearance, and safety. The Division has taken steps to better measure maintenance needs, but needs to do more, including identifying work that should be done but cannot be accomplished with existing resources, and establishing guidelines for maintenance and inspection frequencies and work priorities.

In addition, the report contains other pertinent information on the Division's litter control activities.

Auditors used a variety of methods to review and study the issues addressed in this audit. Audit methods included interviews with management and staff at ADOT, the Division, and the Federal Highway Administration. Auditors reviewed various policies and procedures, including performance guidelines for conducting maintenance work activities, to understand the type of work performed by the Division. Auditors also reviewed and analyzed budget requests for the state highway maintenance program. Further, auditors observed maintenance crews and made site visits to ten maintenance facilities.

Auditors also used the following methods in each finding area:

- To determine how highway maintenance monies were spent and to identify changing spending patterns and maintenance activities, auditors reviewed Joint Legislative Budget Committee (JLBC) appropriations reports for fiscal years 2006 and 2007, budget allocation reports prepared by the State Maintenance Engineer for the same periods, a state-wide activity spending report from PeCoS for fiscal year 2006, and ADOT's plan for highway construction, called the *Five-Year Transportation Facilities Construction Program*, for fiscal years 2007 through 2011, and previous plans back to fiscal year 1997. The Division uses PeCoS to report labor, equipment, materials, and other costs by more than 250 maintenance activity codes. Auditors consulted with the State Maintenance Engineer about how to categorize activity and program costs from PeCoS into fewer meaningful higher-level classifications to illustrate how maintenance monies were used. The PeCoS system provides the only source of information

on expenditures by maintenance type. Auditors compared total costs reported in PeCoS to total costs in Advantage, ADOT's financial and accounting software system, and concluded that PeCoS costs were reasonably complete for high-level category analysis. Finally, auditors obtained revenue and spending data on pavement preservation and maintenance activities funded by Proposition 400 from division officials for fiscal years 2006 and 2007 to document other highway maintenance spending.

- To evaluate changes in state-maintained highway pavement conditions, auditors obtained a spreadsheet with annual highway condition ratings at each milepost for calendar years 1995 to 2005. This data was from ADOT's Pavement Management System (PMS), which is the Division's system for tracking pavement quality. Auditors analyzed and summarized this data on six rating criteria to determine how roadway pavement conditions had changed from 1995 to 2005. Specifically, auditors used rating criteria the Division uses to evaluate pavement quality, including measures of pavement roughness; the percentage of pavement with cracking; the depth of ruts or height of ridges in the pavement; the percentage of pavement with patching; flushing, which measures the extent of asphalt oil seeping up from pavement; and friction, which measures a vehicle's ability to stop on pavement. Auditors sampled 50 ratings from the downloaded highway condition rating spreadsheet for the years 1995 and 2005 from each rating factor used in the analysis and compared them to source data in PMS and found without exception that spreadsheet data matched PMS data. To evaluate PMS data reliability, auditors interviewed division employees who gather roadway condition data, observed employees gathering data, reviewed equipment calibration logs, and verified internal controls over data recording, and concluded that internal controls were adequate. Auditors also compared state road condition data reported by the FHWA in its annual *Highway Statistics* publications from 1995 to 2004 to determine how Arizona roads compared to surrounding state roads. However, the FHWA does not collect data for the purpose of comparison, and cautions that not all states use the same collection and measurement methods. Auditors concluded that data for the surrounding states was reasonably comparable by consulting with an FHWA official, reviewing a FHWA document detailing each state's International Roughness Index (IRI) measurement and collection methods, and reviewing a California Department of Transportation study completed in July 2004, which compared the methodologies different states use to gather IRI data.
- To evaluate the Division's ability to identify, quantify, and estimate costs for maintenance activities needed to maximize the state highway system's life expectancy, operational efficiency, safety, and appearance, auditors interviewed maintenance supervisors at all levels within the Division to determine how they identified, measured, and documented highway maintenance needs. Auditors also evaluated division methods and processes for preparing highway

maintenance budget requests. To determine an appropriate inflationary index to use when comparing historical financial information, auditors interviewed an economist and department chair for the Western Bureau of Labor Statistics Information Office, an Arizona State University (ASU) professor with Realty Studies at the ASU Polytechnic College, and ADOT's Chief Economist. Auditors analyzed state-wide activity reports the State Maintenance Engineer provided from PeCoS data for fiscal years 1997 through 2006 and compared spending by maintenance activity between fiscal years 1997 and 2006 to identify significant differences or trends in work activities and spending levels, evaluated spending for pavement preservation during the same period, and compared annual maintenance expenditures to annual construction expenditures to identify significant trends or inequities. Finally, auditors reviewed literature on how preventive maintenance activities could reduce overall highway life-cycle costs if done at the right time.

- To gather information regarding division litter control activities, auditors interviewed maintenance managers and the ADOT Adopt-a-Highway coordinator, who provided highway miles and litter pickup frequencies for adopted highway segments. Auditors analyzed activity reports from PeCoS to compare district litter efforts and a Phoenix district log sheet for June 2006 showing daily litter pickup by route and milepost performed by contractors. Auditors reviewed provisions in a 5-year Inmate Work Contract executed in 2005 between ADOT and the Department of Corrections that included inmate litter pickup activities. Finally, auditors reviewed Proposition 400 provisions, MAG regional transportation plan updates, and MAG reports on Proposition 400's implementation to understand litter funding from that source.
- To complete the report's Introduction and Background section, auditors interviewed agency officials and compiled unaudited information from the ADOT Web site, *State Highway System Logs*, and other agency-prepared documents. To document historical changes in the number of centerline miles, lane miles, and maintenance lane miles, auditors reviewed annual FHWA *Highway Statistics* reports and *State Highway System Logs*, which contain detail on such things as the miles of state-maintained roadways by route and maintenance district, as well as detailed information on roadway characteristics, including surface and shoulder widths and pavement composition.

This audit was conducted in accordance with government auditing standards.

The Auditor General and staff express appreciation to the Director of the Arizona Department of Transportation, the State Engineer, the State Maintenance Engineer, and their staff for their cooperation and assistance throughout the audit.

# FINDING 1

## Maintenance monies support numerous activities

The Division uses maintenance monies to provide many different types of maintenance activities around the State. Legislative appropriations for maintenance represent about 10 percent of ADOT's total \$1.2 billion in highway monies. Nearly 9 of 10 maintenance dollars are spent on maintenance activities related to nonpavement features, such as highway shoulders, drainage, and guardrails. Expenditures for pavement preservation projects come primarily from federal and state monies made available through ADOT's *Five-Year Transportation Facilities Construction Program*. The Division also spends Proposition 400 monies that are earmarked for landscaping, litter control, and sweeping in Maricopa County.

## Maintenance receives about 10 percent of ADOT's highways funding

In fiscal year 2007, the Legislature appropriated approximately \$118.6 million for highway maintenance. This amount represents approximately 10 percent of the \$1.2 billion total for ADOT's highways program.

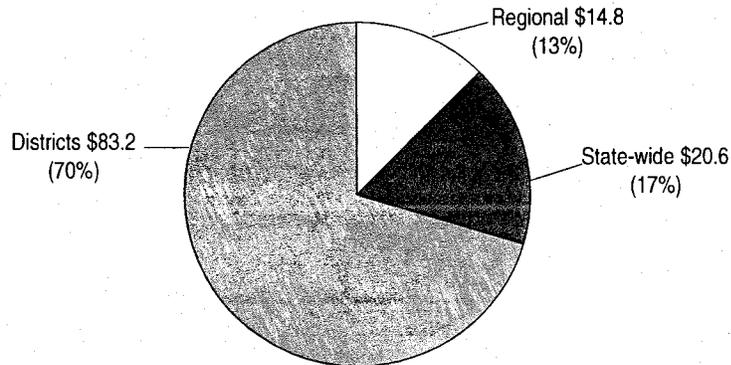
The Division allocates maintenance monies to be used at state-wide, district, and regional levels, as shown in the textbox and Figure 2 (see page 12). In fiscal year 2007, it allocated approximately 70 percent (\$83.2 million) of its total maintenance monies to its nine districts, another 13 percent (\$14.8 million) to regional activities provided by the Flagstaff, Phoenix, Prescott, and Tucson districts, and 17 percent (\$20.6 million) to its state-wide maintenance functions. The district regional activities include traffic engineering functions such as highway striping, signing, and traffic signals.

Division's allocation of fiscal year 2007 special line-item appropriation to district, state-wide, and regional functions (In millions)

<u>Districts:</u>		<u>State-wide:</u>	
Phoenix	\$21.5	Traffic Engineering	\$8.2
Tucson	10.7	Maintenance Group	7.5
Flagstaff	9.9	Natural Resources	3.4
Globe	8.9	Transportation Tech	1.5
Holbrook	8.1		
Prescott	6.7	<u>Regional:</u>	
Safford	6.7	Phoenix	\$5.7
Kingman	5.8	Prescott	3.2
Yuma	4.9	Tucson	3.1
		Flagstaff	2.8

Source: Auditor General staff analysis of ADOT's *Allocation Report for the FY 2007 Highway Maintenance Budget* and fiscal year 2007 budget data provided by the Division's Phoenix Maintenance District.

**Figure 2:** Distribution of Special-Line-Item Appropriated Monies To State-wide, Regional, and District Functions Totaling \$118.6 Million Fiscal Year 2007 In Millions (Unaudited)



Source: Auditor General staff analysis of ADOT's *Allocation Report for the FY 2007 Highway Maintenance Budget* and fiscal year 2007 budget data provided by the Division's Phoenix Maintenance District.

In addition to these appropriated operating budget monies, ADOT uses monies from the Transportation Facilities Construction Program for pavement preservation. Specifically, ADOT's pavement management section has planned projects totaling \$103.3 million for fiscal year 2007 for pavement preservation projects approved by the State Transportation Board in ADOT's *2007-2011 Five-Year Transportation Facilities Construction Program*. The Division also received \$5.7 million in fiscal year 2007 from Proposition 400 monies, which it will use for regional landscape maintenance, litter control, and sweeping on state highways in Maricopa County. (See page 16 for more details on these two funding sources.)

## Maintenance appropriations pay for many services

The Division provides a wide array of road-related maintenance in addition to pavement maintenance, which composes less than 10 percent of maintenance expenditures. The Division uses a Maintenance Management System called PeCoS and has defined more than 250 activities to which maintenance costs are assigned. For summary purposes, in consultation with the State Maintenance Engineer, auditors grouped these activities into 10 broad categories. As Table 3 illustrates (see page 13), 7 of the 10 categories are related specifically to the Division's direct maintenance activities. The other three categories comprise various activities and costs that could not be grouped with one of the seven maintenance categories.

The Maintenance Management System tracks maintenance costs for more than 250 activities.

**Table 3: Maintenance Expenditures by Broad Category**  
**Fiscal Year 2006**  
**(Unaudited)**

<b>Category</b>	<b>Labor</b>	<b>Equipment</b>	<b>Materials</b>	<b>Service Contracts</b>	<b>Other<sup>1</sup></b>	<b>Total</b>
<b>Direct Maintenance:</b>						
Roadside	\$ 7,797,747	\$ 2,986,481	\$ 2,538,651	\$ 5,715,587		\$ 19,038,466
Traffic	3,942,935	1,014,964	7,441,147	31,237		12,430,283
Other direct maintenance <sup>2</sup>	3,161,610	2,954,964	157,106	3,782,936		10,056,616
Paved surfaces <sup>3</sup>	2,216,706	1,116,023	3,207,443	3,094,595		9,634,767
Landscape and vegetation	2,630,043	672,775	1,330,487	2,938,347		7,571,652
Rest area	96,171	28,307	18,663	1,975,120	\$ 312,364	2,430,625
Winter	<u>894,403</u>	<u>417,361</u>	<u>1,056,807</u>			<u>2,368,571</u>
Subtotal	<u>20,739,615</u>	<u>9,190,875</u>	<u>15,750,304</u>	<u>17,537,822</u>	<u>312,364</u>	<u>63,530,980</u>
<b>Other Maintenance Costs:<sup>5</sup></b>						
Other operating expenditures	8,424,478	249,788	30,012		12,488,169	21,192,447
Unallocated equipment costs <sup>6</sup>		10,637,813			1,866,372	12,504,185
State-wide maintenance	<u>10,308,361</u>	<u>620,199</u>	<u>362,516</u>			<u>11,291,076</u>
Subtotal	<u>18,732,839</u>	<u>11,507,800</u>	<u>392,528</u>		<u>14,354,541</u>	<u>44,987,708</u>
Total	<u>\$39,472,454</u>	<u>\$20,698,675</u>	<u>\$16,142,832</u>	<u>\$17,537,822</u>	<u>\$14,666,905</u>	<u>\$108,518,688<sup>4</sup></u>

- <sup>1</sup> This includes expenditures such as utilities, travel, office supplies, and equipment direct billing, which according to ADOT officials, is fuel surcharges from ADOT Equipment Services. The rest area other expenditures are for utilities.
- <sup>2</sup> Includes miscellaneous maintenance-related activities such as contracted miscellaneous maintenance, materials handling, building and yard maintenance, encroachment permits, and staff and equipment loaned to other than the assigned crew.
- <sup>3</sup> Excludes pavement preservation expenditures for pavement overlay projects included in ADOT's 5-year construction program that are paid for with highway construction monies.
- <sup>4</sup> This amount includes \$106,273,126 reported in the PeCoS state-wide maintenance activity report and \$2,245,562 in additional equipment costs that were not included in the PeCoS report. ADOT's financial accounting system, ADVANTAGE, shows \$113,514,900 in maintenance expenditures for fiscal year 2006. ADOT officials stated the \$4,996,212 (4.4 percent) difference might be attributable to maintenance materials purchases, which are recorded as expenditures on ADVANTAGE, but not recorded as expenditures in the PeCoS system until used, and some costs that are not recorded in PeCoS. They also attributed differences to carry-over funds captured in different fiscal years in the two systems and to materials costs, which in PeCoS are average inventory costs while ADVANTAGE uses actual purchase costs.
- <sup>5</sup> Includes expenditures such as leave, supervision, training, and recordkeeping that cannot be matched to a specific daily maintenance activity, but are essential for operations.
- <sup>6</sup> Unallocated equipment costs represent equipment costs, including the cost of maintaining and repairing equipment, remaining after charging equipment usage to direct maintenance categories.

Source: Auditor General staff analysis of expenditure data from the Division's PeCoS maintenance management system and ADOT's financial accounting system for fiscal year 2006.

## Categories related directly to Division's maintenance programs—

Auditor-grouped categories for direct maintenance represent costs coded to specific PeCoS activity codes that directly impact the preservation, rehabilitation, and enhancement of highway pavement, shoulders, and other highway features. These categories composed 59 percent of expenditures for fiscal year 2006:

- **Roadside maintenance (\$19 million)**—These expenditures were for activities such as litter pickup and maintenance of roadside features, including shoulders, drainage structures, guardrails, and fences. These activities included \$5.7 million in contract services and \$13.3 million of in-house activities.
- **Traffic maintenance (\$12.4 million)**—These expenditures were for maintaining traffic control features such as signs, signals, and pavement markings. Thirty-one thousand dollars was spent on contract services; the remainder was for in-house activities.
- **Other direct maintenance (\$10.1 million)**—These expenditures were for various miscellaneous maintenance-related activities, including contracted miscellaneous maintenance (\$3.7 million), materials handling, encroachment permits and related activities, building and yard maintenance, and contracted prison labor. In fiscal year 2006, ADOT expended approximately \$3.8 million for contracted services in this category, and the remainder was for in-house activities.
- **Paved surfaces (\$9.6 million)**—These expenditures were for pavement maintenance activities such as crack filling, seal coats, flushing, and patching. These activities included \$3.1 million in contract services and \$6.5 million for in-house activities.
- **Landscape and vegetation maintenance (\$7.6 million)**—These expenditures were for activities such as landscape maintenance, mowing, and vegetation control. Three million dollars was spent on contracted services in this category, while \$4.6 million was expended on in-house activities.
- **Rest area maintenance (\$2.4 million)**—These expenditures were for interstate and noninterstate rest area maintenance. Almost \$2 million was spent for contract services, over \$300,000 for rest area utilities, and the remainder for other in-house activities.
- **Winter maintenance (\$2.4 million)**—These expenditures were for activities such as snow removal and de-icing. The fiscal year 2006 amount was approximately half the winter maintenance total expended in fiscal year 2005 and varies annually based upon the weather. All these expenditures were for in-house activities.

Categories not directly coded in PeCoS to specific maintenance programs or activities—These auditor-grouped categories include expenditures such as leave, supervision, training, and recordkeeping that cannot be matched to a specific daily maintenance activity, but are essential for operations. Division officials state they are planning future PeCoS changes that will allow them to better distribute some of these costs directly to maintenance activities. The following nonspecific cost categories composed 41 percent of fiscal year 2006 expenditures:

- **Other operating expenditures (\$21.2 million)**—These expenditures included activities such as leave (\$5.5 million), other operating expenditures (\$5.2 million), roadway utilities (\$3.5 million), training (\$1.9 million), nonhighway utilities (\$1.3 million), professional and outside services (\$1 million), recordkeeping (\$610,235), and to nine other expenditure classifications.
- **Unallocated equipment costs (\$12.5 million)**—These expenditures were related to costs associated with ADOT-owned and rented equipment not included in the direct maintenance categories. ADOT's maintenance crews reported the hours that equipment was used in each activity, and PeCoS converted that information into a dollar amount and charged the amount to the appropriate category, such as roadside maintenance. Unallocated costs represented equipment costs, including the cost of maintaining and repairing equipment, remaining after charging equipment usage to direct maintenance categories.
- **State-wide maintenance (\$11.3 million)**—These expenditures were not directly coded to maintenance categories or were for services benefiting state-wide programs. These included supervision (\$4.8 million), administrative support (\$2.8 million), other support activity (\$1.9 million), salaries for Traffic Operations Center employees (\$1 million), transport equipment (\$0.7 million), and the remainder for contract support services. All these expenditures were for in-house activities.

As shown by Table 3 (see page 13), the largest expenditure was for division staff labor, which totaled nearly \$39.5 million for fiscal year 2006. The remaining expenditure types in descending amount order were equipment, contractors, materials, and other operating expenses. In fiscal year 2006, the Division paid contractors more than \$17.5 million to provide highway maintenance services, which represented 15.9 percent of maintenance spending that year. By comparison, the Division spent \$4.1 million, or 5.9 percent of maintenance spending, for contractor services in fiscal year 1997. According to an ADOT official, contractor usage increased because the Division received maintenance appropriation increases in response to highway system growth and the Division

used the increased funding to hire contractors because its staffing levels did not increase during the period, but actually decreased. The Division had 951 maintenance employees in fiscal year 1997 and 922 (29 fewer) in fiscal year 2006.

## Five-Year Program funds pavement preservation

Another substantial funding source involves monies adopted by the State Transportation Board for pavement preservation projects in ADOT's *Five-Year Transportation Facilities Construction Program*. Contractors perform these projects, which usually involve removing and replacing 1 to 3 inches of pavement or overlaying existing pavement with 1 to 3 inches of asphalt. According to an ADOT official, the projects are generally designed to add about 10 years of additional life to pavement. In fiscal year 2006, ADOT spent \$77.3 million on 25 pavement preservation projects for an estimated 399 lane miles, and plans to spend \$103.3 million for pavement preservation in fiscal year 2007. Approximately 90 percent of these monies (\$93.4 million) are planned for pavement preservation projects, which include removing and replacing a layer of pavement, but additional monies will be used for preventive maintenance (\$5.5 million) and for spot pavement preservation projects (\$4.4 million), which remove and replace a layer of pavement in a small area.

Pavement preservation usually involves replacement or overlay of 1 to 3 inches of asphalt.

## Proposition 400 monies support landscape maintenance and litter pickup in Maricopa County

ADOT also receives monies for specific highway maintenance activities in Maricopa County. In November 2004, Maricopa County voters approved Proposition 400, which extended the County's one-half cent transportation excise tax, of which a portion is allocated for regional landscape maintenance and litter pickup. The MAG Transportation Policy Committee (Committee) determines the uses and allocations of Proposition 400 monies, while ADOT implements them. The Committee identified approximately \$279 million of Proposition 400 monies that will be provided in fiscal years 2006 through 2025 for litter pickup and landscape maintenance in the MAG region. In fiscal years 2006 and 2007, MAG approved \$5.9 million per year, of which ADOT uses \$5.7 million for landscape maintenance (\$3.5 million), litter control (\$1.8 million), and sweeping (\$0.4 million). According to ADOT management, \$200,000 from each year's allocation was to be spent on a litter prevention and education program under a MAG solicitation. (See Other Pertinent Information, pages 37 through 39, for information on ADOT's litter control activities.)

ADOT did not spend the full amount it received in the first year of the Proposition 400 program. Specifically, in fiscal year 2006, ADOT spent only about 37.3 percent of the \$5.7 million allocated to it from Proposition 400 monies. According to ADOT officials, monies were not spent because they became available in January 2006, halfway through the fiscal year. ADOT intends to supplement its fiscal year 2007 Proposition 400 allocation with the unspent portion of the fiscal year 2006 monies. Proposition 400 monies are intended to supplement and not supplant other monies; as such, ADOT officials indicate that ADOT segregates these monies from its appropriated maintenance monies and accounts for Proposition 400 maintenance activities separately from its other maintenance activities.

# FINDING 2

## Most Arizona pavement rated satisfactory

Road pavement in Arizona's state highway system has generally received satisfactory ratings, and overall ratings were higher in 2005 than in 1995. Well-maintained pavement provides several benefits, and the Division evaluates pavement quality using various measures. Arizona's roads compared favorably with contiguous states' and improved in measured criteria in the last 10 years. These measures indicate that Arizona's state highway system has mostly smooth and good-quality pavement. While all road types were improved in 2005 compared to 1995, interstate roads, which have the highest traffic volume, received better ratings than state routes and U.S. highway roads. Lastly, a 2005 consumer satisfaction survey showed that Arizona residents were generally satisfied with highway maintenance efforts, but still wanted improvements in all maintenance areas.

### Division uses several criteria and methods to rate pavement

Well-maintained pavement provides several benefits and the Division uses several criteria to evaluate pavement quality. A 2005 research report by the Kentucky Transportation Center at the University of Kentucky says that well-maintained pavement provides various benefits including increased safety, fewer auto repair expenses, improved quality of the overall road network, and higher user comfort.<sup>1</sup> The Division's foremost measure is the IRI, which measures roadway smoothness and is a nationally accepted pavement quality measure used by other states and the FHWA. The Division uses the IRI and other measures to evaluate pavement quality (see textbox on page 20). Division manuals and agency officials specify how these measures are applied to rate pavement as satisfactory, tolerable, or objectionable (see textbox on page 20).

Specialized division crews survey all Arizona highways and collect data to evaluate pavement conditions through observation or using special equipment. Crews annually measure pavement for roughness, cracking, rut depth, patching, and

The Division uses the nationally accepted IRI, among other measures, to assess quality.

<sup>1</sup> Kreis, Doug, Lenahan O'Connell, and Brian Howell. *Long-Term Maintenance Needs Planning*. Lexington, KY: Kentucky Transportation Center, College of Engineering, University of Kentucky, 2005.

**Division's rating criteria to evaluate pavement quality:**

Measure	Description of Measure	Satisfactory	Objectionable	Arizona Averages
Roughness (IRI)	Aggregate measure of vehicle bounce in inches as computed by infrared sensors over a 1-mile of roadway.	less than 94	greater than 143	78
Cracking	Percentage of linear feet of cracking measured over a 1,000 square foot area at each milepost.	less than 10%	greater than 30%	2.4%
Rut Depth	Depressions or ridges in roadway wheel path, in inches.	less than 0.25 in.	greater than 0.51 in.	0.12 in.
Patching	Percentage of surface treatment measured over a 1,000 square foot area at each milepost.	less than 10%	greater than 30%	1.8%
Flushing	Extent of asphalt oil seeping up from pavement decreasing friction or stopping ability, rated on a 5-point scale.	greater than or equal to 3	less than or equal to 2	4
Friction	The ability of the pavement to stop a vehicle, rated on a 100-point scale.	greater than or equal to 43	less than or equal to 34	61

Source: Auditor General staff summary of information in ADOT's *Preliminary Engineering and Design Manual* and information received in interviews with ADOT officials.

flushing. ADOT officials state that they intend to collect friction data biennially, but equipment difficulties and other work priorities make regular collection of this data inconsistent. The Division has standardized its data collection methods to ensure rating uniformity. For example, crews always measure pavement conditions in the increasing milepost direction for single-lane roads and in the right lane for each side of a divided highway. Crews regularly calibrate all equipment used for measuring IRI and friction to ensure consistent and accurate readings. The Division has separated data collection and data uploading duties, and an employee checks collected data against prior-year information to identify any significant inconsistencies. Division officials stated that collected condition data is used to perform analyses and generate reports for planning needed pavement preservation and rehabilitation projects.

The Division's road condition measurement focuses on pavement condition and does not address nonpavement features such as guardrails, shoulders, and drainage systems. However, the Division plans to evaluate these features using Level of Service (LOS) indicators in connection with the Maintenance Budgeting System, which is under development (see Finding 3, pages 31 through 32 for more information on the LOS indicators).

The Division has standardized data collection methods.

## Arizona pavement smoothness compares favorably with other states

According to state IRI data the FHWA publishes annually in its *Highway Statistics* reports, Arizona road smoothness compares favorably to roads in the five surrounding states.<sup>1,2</sup> The FHWA classifies the road surface as good if it has an IRI score of less than 95, similar to the Division's ranking of road smoothness as satisfactory if the IRI score is below 94. As shown in Table 4, in 2005—the most recent year for which data is available—Arizona's percentage of interstate roads with good ratings was higher than all five contiguous states, while two other states ranked higher in the percentage of other roads with good ratings. Arizona's ratings were different for urban than for rural roads. Most Arizona noninterstate roads are considered rural, and for those roads, nearly 79 percent had a good rating. For urban noninterstate roads, only 48 percent had a good rating. By comparison, the five contiguous states' percentage of urban noninterstate roads with good ratings ranged from approximately 25 percent in California to approximately 78 percent in Nevada.

## Arizona pavement quality better in 2005 than in 1995

Arizona road ratings for smoothness, cracking, rut depth, and flushing were better in 2005 than they were 10 years earlier in 1995. As shown in Figure 3 on page 22, a comparison of data from 2005—the most recent data available—and data from 1995 shows that the percentage of Arizona roads receiving good or satisfactory ratings for these measures has increased. Similarly, the percentage of roads receiving poor or objectionable ratings was as low in 2005 as in 1995 in every category. Some measures have not changed substantially in recent years. For example, over 97 percent of roads had satisfactory ratings for patching in 1995, and in 2005 the percentage of roads with satisfactory ratings was still between 97 and 98 percent.

**Table 4:** Comparison of IRI for State Highway System Roadways between Arizona and Surrounding States Calendar Year 2005

Interstate Highways	Percentage with Good Rating <sup>1</sup>	Lane Miles Reported
Arizona	95.2%	1,165
New Mexico	92.8	1,000
Nevada	88.1	561
Utah	72.5	939
Colorado	50.8	956
California	50.2	2,458
<b>Other Roads</b>		
Nevada	96.4%	1,573
New Mexico	78.4	1,935
Arizona	70.5	1,554
Utah	59.1	1,237
California	53.0	5,172
Colorado	52.8	2,614

<sup>1</sup> A "good" rating is defined as roads receiving an IRI rating of less than 95.

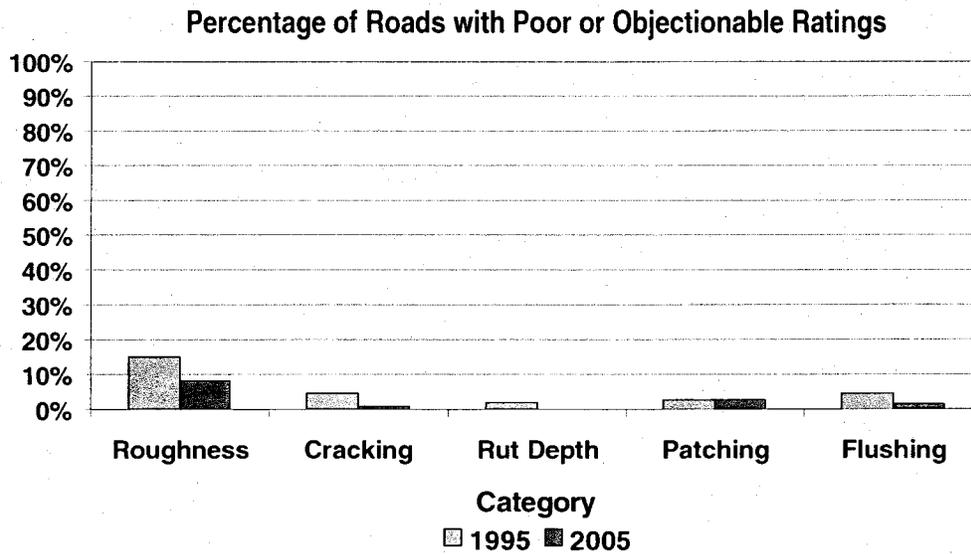
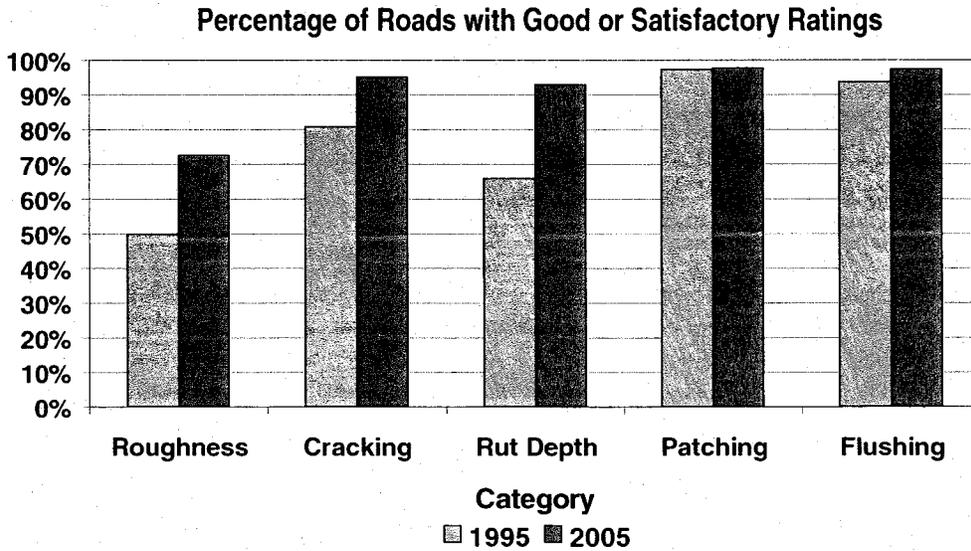
Source: Auditor General staff analysis of roadway condition data in *Highway Statistics 2005* published by FHWA.

The percentage of Arizona roads with good or satisfactory ratings has increased.

<sup>1</sup> An FHWA official stated that pavement condition data is supposed to be reported on a 2-year cycle, preferably with one-half of each state's highway system reported each year, but many states report a large portion of the data every year.

<sup>2</sup> U.S. Department of Transportation. Federal Highway Administration. Office of Highway Policy Information, *Highway Statistics 2005*.

**Figure 3:** Comparison of the Percentage of Arizona Highway System Roads Receiving Good or Satisfactory or Poor or Objectionable Ratings<sup>1</sup> in Roughness, Cracking, Rut Depth,<sup>2</sup> Patching, and Flushing Calendar Years 1995 and 2005



<sup>1</sup> Figures exclude percentage of roads rated between good or satisfactory and poor or objectionable.

<sup>2</sup> Rut depth data is for 2004 because, according to an ADOT official, ADOT does not have complete data for 2005 due to a transition in its data collection method during the year.

Source: Auditor General staff analysis of roadway condition data from ADOT's Pavement Management System.

Adequate maintenance and preservation is needed to maintain the favorable ratings. ADOT officials cautioned that the need for highway maintenance activities is not diminished by the current quantity of good or satisfactory pavement ratings because adequate maintenance is still required to maintain favorable ratings. Increased ratings after 1995 could in part be attributed to a substantial increase in the amount of pavement preservation completed in fiscal years 1998 and 1999. ADOT officials stated that not enough preventive maintenance and pavement preservation work has been completed in recent years, and this would eventually lead to declined ratings. During the audit, the officials were unable to quantify how much needed preventive maintenance and pavement preservation work was not being completed (see Finding 3, pages 25 to 35). However, after the end of audit fieldwork, ADOT's Materials Group provided unaudited data which estimated that anticipated pavement preservation project budgets for fiscal years 2008 through 2012, totaling \$590 million, were \$300 million less than needed to maintain Arizona highways at fiscal year 2007 condition ratings.

## Arizona interstate roads rated better than other roads

Pavement ratings differ by road system type, with Arizona's interstate roads receiving the best ratings despite having the highest traffic volume. As shown in Table 5,

**Table 5:** Percentage of Arizona Interstate, State Route, and U.S. Highway Roads Receiving a Satisfactory Rating in Roughness, Rut Depth, Cracking, Patching, and Flushing<sup>1</sup> Calendar Year 2005

	<b>Interstate</b>	<b>State Route</b>	<b>U.S. Highway</b>
<b>Road miles surveyed</b>	2,342	3,683	1,990
<b>Miles with high traffic volume<sup>2</sup></b>	91.8%	23.8%	13.6%
<b>Road condition ratings</b>			
Roughness	91.3%	65.3%	63.6%
Rut Depth <sup>3</sup>	94.0	92.8	92.0
Cracking	98.7	95.2	90.6
Patching	98.9	98.1	96.3
Flushing	99.4	96.8	96.6

<sup>1</sup> See textbox on page 20 for descriptions of ratings and rating criteria.

<sup>2</sup> Percentage of roads with average daily traffic volume of more than 10,000 vehicles in 2004.

<sup>3</sup> Rut depth data is for 2004 because, according to an ADOT official, ADOT does not have complete data for 2005 due to a transition in its data collection method during the year.

Source: Auditor General staff analysis of road condition data from ADOT's Pavement Management System.

interstate roads have superior smoothness and slightly better ratings in other measures when compared to state route and U.S. highway roads. Nearly all interstate roads—almost 92 percent—have daily traffic volume of more than 10,000 vehicles, while less than one-fourth of state routes and only about 14 percent of U.S. highways have traffic volumes that high.

## Arizona citizens generally satisfied with highway maintenance

Arizona citizens are mostly satisfied with highway maintenance, but want more.

According to a consultant survey, most Arizona citizens are generally satisfied with highway maintenance efforts, but want more maintenance. In 2005, an ADOT consultant conducted a state-wide telephone survey of 403 residents to obtain public perception of Arizona's highway maintenance program.<sup>1</sup> Consultants asked residents to rate current and desired maintenance levels for paved roadway surfaces, road shoulders, roadside, vegetation, landscaping, drainage, structures, traffic control and safety, rest areas, and snow and ice removal. The survey found that although 79 percent of polled residents were generally satisfied with current highway maintenance efforts in each category, they also wanted improved maintenance in all categories. The survey also found that urban residents rated maintenance more favorably than rural residents. Residents surveyed also indicated they were more satisfied with ADOT road maintenance when compared to local road maintenance.

<sup>1</sup> According to the December 2005 consultant report by the Dye Management Group, Inc., the telephone survey was statistically valid. The report does not identify the survey's margin of error.

# FINDING 3

---

## Division should improve method to determine maintenance needs and allocate maintenance dollars

The Division should improve its method of identifying annual maintenance needs and allocating maintenance monies to maximize the life expectancy, operational efficiency, appearance, and safety of the state highway system. Although funding has increased, materials and other costs have also risen along with maintenance demands. Although ADOT officials cite an increasing gap between needed maintenance and resources, the Division's approach for allocating monies relies mainly on modifying the previous year's allocations instead of on identified needs. The Division is taking steps to better identify maintenance needs through data system improvements, but it should establish a more systematic method that identifies all needed maintenance and allocates funding according to prioritized needs.

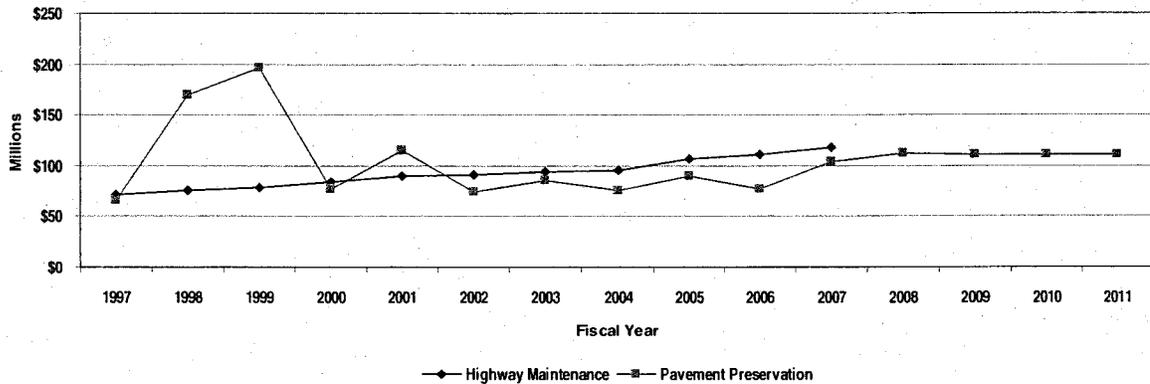
### Funding, demands, and costs increasing

ADOT has received increased funding for maintenance, but associated maintenance costs and demands have also increased. Highway maintenance funding has gradually increased and pavement preservation funding has fluctuated, but will increase in the future. However, division officials believe increased material costs reduce their ability to do some maintenance. They also cited increased maintenance demands caused by lane mile additions, rising traffic volume, public expectations, environmental laws, more sophisticated equipment, and other factors that reduce their ability to provide adequate highway system maintenance.

Added lane miles and rising traffic volume have increased maintenance demands.

**Funding increasing**—As shown in Figure 4 (see page 26), highway maintenance monies have gradually increased while pavement preservation spending has fluctuated but is planned to increase in fiscal year 2008.

**Figure 4:** Highway Maintenance Actual Expenditures and Pavement Preservation Bid Amounts<sup>1</sup>  
 Fiscal Years 1997 through 2006<sup>2</sup>  
 and Estimated Expenditures  
 Fiscal Years 2007 through 2011



- 1 The Materials Group was only able to provide bid amounts for pavement preservation projects for fiscal years 1997 through 2006. ADOT officials believe these amounts are a close approximation of actual expenditures for the projects.
- 2 Pavement preservation amounts for fiscal years 1997 to 2006 exclude "minor pavement preservation" projects that began in fiscal year 1998 and were budgeted between \$1 million and \$4 million per year, and "preventive maintenance" projects that began in fiscal year 2005 and were budgeted at \$5 million each year.

Source: Auditor General staff analysis of data obtained from ADOT's Maintenance Group, Materials Group, and the 2007-2011 Five-Year Transportation Facilities Construction Program.

Highway maintenance expenditures increased 56.6 percent between fiscal years 1997 and 2006, averaging a 5.1 percent annual increase. During that same time period, estimated pavement preservation expenditures fluctuated from \$66 million to \$115.5 million, except for fiscal years 1998 and 1999, which had \$169.8 million and \$196.2 million, respectively, because of increased federal funding. Although estimated pavement preservation expenditures declined between fiscal years 2001 and 2006, ADOT's *Five-Year Transportation Facilities Construction Program* shows increased funding for fiscal years 2007 through 2011.

**Materials costs escalating**—Highway maintenance materials costs are increasing and division officials believe they are doing less preventive maintenance as a result. ADOT's Arizona Transportation Research Center (Center) reported substantial construction price increases in the past 10 years as of August 2006, based upon the Producer Price Index.<sup>1</sup> For example, as shown in Table 6 (see page 27), the Center found that the price of asphalt had increased by 171 percent, while labor had risen by 33 percent. The price of lumber—the only measured commodity that did not have a substantial increase—had actually gone down by 1 percent, but lumber has little relevance to maintenance activities. In addition, the Associated General Contractors of America issued an alert in September 2006 stating that construction materials inflation had increased far faster than consumer goods inflation since 2004 and was expected to be between 6 and 8 percent

Asphalt prices increased 171 percent from 1997 to 2006.

<sup>1</sup> Semmens, John and Jeff Romine. *Price Trends for Major Roadway Inputs. Final Report 622*. Phoenix: Arizona Transportation Research Center and Maricopa Association of Governments, Dec. 2006.

**Table 6: Percentage Changes in Construction Costs  
As of August 2006**

	Asphalt	Diesel	Gasoline	Labor	Lumber	Portland Cement Concrete	Plastic	Steel
Past year	77%	1%	21%	3%	-6%	11%	20%	11%
Past 5 years	*	147	151	11	4	33	38	59
Past 10 years	171	205	216	33	-1	48	39	49

\*There is a gap in the data for asphalt that prevents a calculation of the price change over this time span.

Source: Arizona Transportation Research Center, Report 622, *Price Trends for Major Roadway Inputs*, December 2006.

annually.<sup>1</sup> After the end of our audit fieldwork, ADOT officials provided an inflation index they were developing specifically for their maintenance inputs including materials, vehicle fuels, and electricity. The index is designed to be weighted according to the mix of maintenance materials and is based upon changes in the Producer Price Index. ADOT officials reported they intend to continually update this index to document how price increases affect ADOT's maintenance budget.

The Division's fiscal year 2008 budget request stated that because of increased materials costs, districts have reduced pavement preventive maintenance such as fog sealing, seal coating, and crack sealing. According to ADOT officials, these activities significantly extend the useful life of pavement and have the highest return on investment (see textbox). A 2005 University of Kentucky study reported that routine maintenance must be carried out in a timely manner at specified intervals if serious damage to highways is to be prevented and maintenance costs are to be reduced.

#### Examples of Pavement Preventive Maintenance

**Fog sealing**—A light spray application of an asphalt mixture to restore or rejuvenate pavement surfaces. It may delay more costly overlays for 1 to 2 years.

**Seal coating**—An application of liquid asphalt and cover material to seal and restore surface life, flexibility, and skid resistance.

**Crack sealing**—Cleaning and then filling pavement cracks with asphalt materials to prevent passage of water through and into the road's base or sub-grade.

**Maintenance demands increasing**—Growing maintenance demands between 1997 and 2006 also affect the amount of maintenance activities required. Specifically:

- Travel lane miles increased 8 percent between fiscal years 1997 and 2006 and maintenance lane miles increased 10.5 percent between fiscal years 2001 and 2006. Division officials said the majority of these were urban lane miles, which are more costly to maintain because of heavy traffic volume, and landscaping, median barriers, lighting, and other features not present in rural lane miles.

<sup>1</sup> Associated General Contractors of America. *AGC's Construction Inflation Alert*. Arlington, VA: Associated General Contractors of America, Sept. 2006.

Traffic volume increased 59 percent between fiscal years 1997 and 2006.

- Traffic volume throughout the state highway system increased 59 percent between fiscal years 1997 and 2006. Increasing traffic loads cause higher pavement costs because more frequent roadway rehabilitation is needed.<sup>1</sup> In addition, increased traffic often dictates that maintenance work has to be done at off-peak driving times when labor costs are higher because crews must work at night and on the weekends.
- Increased emergency incidents reduce time and money available for planned maintenance because crews must respond to incidents and repair damaged features, such as guardrails and fences, in a timely manner. Division internal reports show that the time ADOT maintenance crews spent on emergency responses alone, excluding time spent repairing any highway features damaged by accidents, increased 25 percent between fiscal years 2004 and 2006. Although state-wide expenditures for emergency responses and six related activities for repairing damaged features represented less than 4 percent of maintenance spending in fiscal year 2006, emergency responses can affect some crews more than others. For example, between fiscal years 2004 and 2006, the Cordes Junction maintenance crew had an average of 346 emergency responses annually, consuming almost 9 percent of its total crew hours, while three nearby crews averaged less than 2 percent of total crew hours for emergency responses.
- Other demands also increase ADOT's maintenance costs and workload, according to an ADOT official. For example, the official stated that public expectations now require ADOT to use de-icing chemicals instead of less-expensive cinders to clear roads in winter. In addition, the official said that more time and activities are required to comply with more stringent federal and state environmental laws, and using more sophisticated equipment such as cameras to manage traffic increases the number of features that must be maintained.

Gap between resources and needs reported—According to ADOT officials there is a widening gap between current resources and maintenance needs. However, lacking an adequate planning process, the officials were unable to provide specific details regarding needed maintenance work that was not getting done. Division maintenance expenditures, excluding pavement preservation and Proposition 400 monies, represented \$6,339 per travel lane mile (adjusted for inflation) in fiscal year 2001 and were \$6,019, or approximately 5 percent, less per travel lane mile in fiscal year 2006, illustrating a potential resource decrease.<sup>2</sup>

Similar to the maintenance gap, ADOT officials reported a gap between resources and pavement preservation needs. After the end of audit fieldwork, ADOT's Materials Group provided unaudited data regarding the size of the gap.

1 Labi, Samuel and Kumares C. Sinha. *The Effectiveness of Maintenance and its Impact on Capital Expenditures*. Springfield, VA: National Technical Information Service, June 2003.

2 Auditors used the GDP price deflator index for state and local governments to adjust fiscal year 2001 expenditures.

Specifically, the Materials Group estimated that pavement preservation project budgets for fiscal years 2008 through 2012, which are anticipated to total \$590 million, would be \$300 million less than needed to maintain Arizona highways at fiscal year 2007 condition ratings. Although the Materials Group could not quantify the resource gap in previous years, one official stated that materials cost increases caused the Materials Group to reschedule past pavement preservation projects to later years, and that it would soon be about 2 years behind on its projects.

## Division lacks adequate planning process

The Division does not have an adequate and comprehensive planning process for state highway maintenance. The districts plan annual work based on their historical activity and current budget, not on an analysis and prioritization of everything that needs to be done. Lacking an adequate planning process, ADOT allocates maintenance funding mainly on a historical basis, rather than by documented needs. ADOT should establish frequency guidelines for conducting inspections and addressing problems found in the inspections as well as for performing scheduled maintenance where applicable, and should also establish work priorities to facilitate a more systematic needs-based allocation to help plan needed maintenance.

**Division does not identify all needed work**—State-wide and district maintenance planning is based on annual budgets and not upon annual work that needs to be done. Therefore, the Division is unable to demonstrate which activities are not getting done because of the perceived funding gap. Districts create their annual maintenance plans to fit their allotted budget using previous years' activity as a starting point. District subunits, called "orgs," identify each anticipated maintenance activity's amount and cost and enter them into PeCoS to create the district consolidated work plan. Submitted plans must conform to budgets provided to the org and district.

ADOT allocates maintenance funding mainly on a historical basis instead of according to needs.

**Allocations not based on documented needs**—Because the Division does not have a systematic approach to identify needed maintenance activities and priorities, it cannot allocate maintenance monies based upon state-wide needs and priorities. Instead, the Division allocates the total annual maintenance budgets to the regions, districts, and other maintenance groups based mainly on their historical budgets. This could prevent one district from performing higher-priority work, while another district does lower-priority work. Further, this method does not consider roadway miles, traffic volume, population, and other factors that may determine district or region maintenance workload. Division officials reported that they allocated a \$2.8 million budget increase in fiscal year 2007 for maintaining new features based on needs, inventory growth, recent cost increases, and other metrics. However, auditors could not verify this because ADOT lacked

documentation showing how allocations were calculated. As shown in Table 7, districts differ in budget and employee resources considering their maintenance lane miles (MLM) and traffic volume, measured in daily vehicle miles traveled (VMT).

Although Table 7 shows potential inequities among districts, one measure by itself is not sufficient to demonstrate inequity, and a combination of measures, including relative road quality, may provide better allocations. For example, it may be appropriate for a district with relatively high urban miles to receive more funding per mile than a district with high rural mileage that is less costly to maintain. In addition, a district with more unsatisfactory pavement ratings may need more resources than a district with relatively high overall pavement ratings. Districts may also differ in the number and type of nonpavement features that they must maintain. The Division's allocation method is not needs-based and does not address specific factors that dictate resources needed to provide adequate maintenance.

**Table 7: Comparisons of District Budget and FTE Allocations to District Maintenance Lane Miles and Traffic Volume<sup>1</sup> Fiscal Year 2006**

	<b>Budget per Mile</b>	<b>Budget per VMT</b>	<b>Miles per FTE</b>	<b>VMT per FTE</b>
Average district ratio per category	\$2,796	\$1.47	43	105,980
Lowest district ratio per category	1,627	0.53	28	30,860
Highest district ratio per category	4,745	3.39	68	253,025

<sup>1</sup> Traffic volume is measured by daily vehicle miles traveled (VMT). A "vehicle miles traveled" unit is one vehicle traveling the distance of one mile. Thus, total vehicle miles traveled is the total mileage traveled by all vehicles.

Source: Auditor General staff analysis of data from ADOT's *Allocation Report for the FY 2007 Highway Maintenance Budget*, the *2005 State Highway System Log*, and VMT data provided by the Transportation Planning Division.

Division should develop maintenance frequency schedules and establish work priorities—The Division has not developed adequate guidelines to aid districts in identifying maintenance needs. Although the Division has established written *Performance Guidelines* for 253 maintenance activities, few of these include the frequency at which specific activities should be provided. The Division should establish frequency guidelines for conducting inspections and addressing problems discovered during inspections. In addition, the Division should establish frequency guidelines for maintenance activities where appropriate. Because maintenance needs are affected by several variables

including accidents, weather, and traffic volume, the Division should consider these factors in developing the frequency guidelines. The Division also lacks specific state-wide guidelines on how to prioritize maintenance work to ensure that the most important work is completed first within available resources. Moreover, the Division does not have guidelines on how districts should report any needed work that cannot be done with available resources in order to enable the Division to allocate monies appropriately.

The Division could facilitate a more systematic needs-based allocation by establishing maintenance and inspection frequency schedules and work priorities. First, establishing these frequency schedules would help districts quantify annual maintenance needs, leading to a determination of state-wide needs. Second, establishing priorities for maintenance activities would help ensure that one district does not perform lower-priority work while another is unable to provide higher-priority maintenance work. The Division could then use all this data, combined with road mileage by highway type, pavement conditions, number of various nonpavement features, and other factors to develop an equitable resource allocation.

Similar approaches can identify needed maintenance work and allocate monies. For example, Texas uses a model not only to identify needs, but also to allocate monies based on those needs.<sup>1</sup> Under the Texas model, district allocations are based on combining several individual roadway feature and condition factor formulas. Formulas include many important variables such as state average costs, lane miles, traffic flow, rainfall, and mowing/litter acres.

Texas uses a needs-based approach to identify maintenance needs and allocate funding.

## Division can further improve needs measurement

The Division is taking steps to better measure maintenance needs through data system improvements, but could do more by considering a new approach to identify needs and allocate funding. The Division is developing four computerized systems to help measure maintenance needs and funding requirements. However, because the systems are still being developed and put into operation, auditors could not confirm that they will perform as anticipated, and implementing the systems by themselves will not identify all needed maintenance. In addition to the steps it is already taking, the Division should consider taking an integrative approach to systematically identify needed maintenance and to allocate monies.

**Some steps taken to improve**—The Division is developing several computerized systems to help it measure maintenance needs and funding requirements, but these systems by themselves will not identify all needed maintenance. Specifically:

<sup>1</sup> Graff, Joe S. "Texas Department of Transportation Maintenance Budget Allocation." Paper presented at the 1997 AASHTO/TRB Maintenance Management Conference, Saratoga Springs, NY.

ADOT is developing a new system to use letter grades to help identify overall maintenance needs and estimate funding required.

- **New system to determine overall funding needs**—The Maintenance Budgeting System (MBS) is intended to determine funding required for maintaining six groupings of road system features at specified condition levels. For example, one grouping is “paved surfaces,” which includes potholes, cracking, unpaved shoulders, and four other roadway features (see textbox). The MBS will use cost data from PeCoS and condition assessments expressed as letter grades from Level of Service (LOS) ratings to estimate funding needed to maintain the six broad highway features categories at specified condition levels (see textbox). An ADOT official explained that the letter grades will be determined based upon the percentage of system components that require maintenance. However, while the Division has raw LOS condition data, it has not yet developed official letter grades. According to an ADOT official, the MBS system will be finalized in July 2007 and used for the fiscal year 2009 budget. Although the MBS system may help estimate funding by feature groupings, it will not identify where and when specific maintenance is needed, nor funding for each feature type in the grouping.

### Maintenance Budgeting System

The Division is working with a consultant to develop an MBS to estimate operating budget needed to maintain components of the highway system at specific LOS letter grades. For example, if the Legislature wanted an A grade for one indicator and a B grade for another, the MBS would estimate funds needed to accomplish that level of service.

### Level of Service Indicators

Maintenance LOS ratings will be expressed as letter grades A, B, C, D, and F, with plus and minus grades used if finer gradations are desired. LOS grades will be assigned to these six broad roadway feature groupings:

- Paved surfaces (7 items, including potholes, cracking, and unpaved shoulders)
  - Roadside (9 items, including guardrail, litter, fences, unpaved ditches, and drainage)
  - Traffic (4 items, including signposts, delineators, striping, and pavement markings)
  - Vegetation (7 items, including trees and brush in clear zone, and sign marker visibility)
  - Landscape (12 items, including litter, irrigation, pruning and trimming)
  - Rest Areas (24 items, including parking lots, sidewalks, trash bins, and restrooms)
- 
- **Replacement system to track highway features**—The Division is implementing a new feature inventory system (FIS) that will use Global Positioning System (GPS) technology to record exact locations of all roadway features, such as guardrails, fences, and drainage pipes, and will record essential attributes of each feature. According to an ADOT official, no other state transportation department has successfully implemented a GPS-based FIS system. FIS is important to help identify which features need to be maintained. For example, it will help supervisors know the location of drainage pipes that need cleaning

or what materials are needed for various repairs without visiting repair sites. The new FIS was developed because the old system did not include new feature types added since the 1970s. Although a December 2005 report by the ADOT Information Technology Group stated that the new FIS was completed in March 2003, it has not yet been populated with data and the Division does not have a firm timetable of when the system will be fully functional. Although the FIS will help quantify features in the highway system, it does not include feature condition ratings, which could be useful in identifying the timing and location of needed nonpavement maintenance activities.

- **Redesigned maintenance management system**—Maintenance work crews use the PeCoS maintenance management system to plan and track maintenance activity costs and accomplishments. The Division expects to fully implement a major upgrade to PeCoS in August 2008. This upgrade is intended to be a new system rather than an enhancement because the original database structure has not significantly changed since the 1970s. The Division intends that the new PeCoS will provide an interface with other ADOT databases including LOS ratings and the FIS. In addition, ADOT expects the new system to reduce redundant data entry, increase data accuracy, reduce technical support costs, and enhance the user interface. However, the system will not prioritize nor identify specific maintenance work that needs to be done.
- **Replacement system to identify needed pavement maintenance**—The Highway Pavement Management Application (HPMA) replaces an older application and was designed to use pavement inventory, condition data, and decision trees for identifying the time, location, and type of pavement preservation and preventive maintenance treatments needed. The application also considers various pavement treatment costs and available funding to suggest an appropriate prioritized treatment plan. The Materials Group reports that as of January 2007, it began producing specific reports that identify pavement segments for pavement preservation projects at various funding levels, and they are still refining how the system will be used. Although district staff will have access to the system to view the HPMA-suggested prioritized treatment plan for pavement preservation, the HPMA has not been set up for planning the type of pavement maintenance activities provided by in-house maintenance crews. The Division does not have estimates of when the maintenance crew pavement activities will be implemented in the HPMA.

The Division considers these computerized systems to be the cutting edge of technology and expects them to greatly assist in planning maintenance needs. Because these systems are either not fully developed or not yet fully used, auditors could not confirm that the systems will accomplish their intended benefits. In addition, they will not be sufficient to identify all needed state-wide maintenance.

**More systematic approach needed**—As the Division continues to implement its computerized systems, it should further implement a new overall, integrative planning approach to identify needed maintenance throughout the state highway system and to more systematically allocate maintenance monies among districts and groups. A more systematic approach would:

- establish frequency schedules, as appropriate, for maintenance activities;
- identify all needed maintenance state-wide;
- estimate monies and resources required to perform the needed maintenance;
- provide a prioritization method to ensure that the most important and cost-effective maintenance is performed within resource constraints; and
- provide a systematic method for allocating resources to meet maintenance needs.

This approach could also identify maintenance that could not be provided with current resources and identify funding gaps.

## Recommendations:

1. To better ensure that the state highway system's life expectancy, operational efficiency, appearance, and safety are maximized, the Division should:
  - a. Develop and implement guidelines on how to identify annually needed maintenance work which would include frequency schedules, as appropriate, and periodic inspections to identify needed work;
  - b. Develop and implement guidelines on how to prioritize maintenance work to ensure that the most important state-wide maintenance needs are met first within available resources;
  - c. Identify, quantify, and prioritize maintenance that needs to be done annually; and
  - d. Identify work that cannot be done with existing resources to identify any maintenance funding gap.
2. To ensure that state-wide maintenance needs are addressed, the Division should develop and implement a methodology to allocate monies to districts and regions based on state-wide needs and priorities, and each district's and region's relative needs and roadway responsibilities (for example, lane miles and traffic flow).

# OTHER PERTINENT INFORMATION

During this audit, auditors collected other pertinent information regarding the various activities and methods used in litter pickup along state-maintained roadways.

## ADOT provides for litter pickup on state roads

The Division is responsible for managing litter control throughout the state highway system, but litter pickup activities vary state-wide. ADOT uses a combination of paid contractors, the Adopt-a-Highway program, prison labor, and in-house maintenance crews to provide litter control on roads in the state highway system.

Litter control practices vary across the State—Because of Proposition 400 funding beginning in fiscal year 2006, Maricopa County roads receive the most litter control attention of highways state-wide (see textbox). According to an ADOT Phoenix District official, the Division plans for each of the 276 greater Phoenix area roadway miles covered by the program to receive weekly litter pickup. Most of this work is done by private contractors paid for with Proposition 400 monies, augmented by the Adopt-a-Highway sponsor program (see page 38). The Tucson and Flagstaff districts also use the Adopt-a-Highway sponsor program, but on a much smaller scale than Phoenix. ADOT officials explained that highways in districts other than Phoenix, Tucson, and Flagstaff receive substantially less litter control attention because of less available money and limited interest in highway sponsorship through the Adopt-a-Highway program. In these districts, ADOT's maintenance crews do mostly spot litter pickup on a public complaint basis or when they observe debris on roadways that may pose safety hazards. The Adopt-a-Highway volunteer program also provides supplemental litter pickup in all nine districts throughout the State.

### Proposition 400

In November 2004, Maricopa County voters approved the extension of its half-cent transportation excise tax, which continues during the calendar years 2006 through 2025. Based on estimated revenues, a total of approximately \$279 million will be allocated to pay for litter pickup and landscape maintenance.

## Division uses multiple methods for litter pickup

The Division uses five methods for litter control on roads in the state highway system:

- Proposition 400 contractors**—According to an ADOT Phoenix district official, Proposition 400 monies (see textbox, page 37) fund litter control for 276 roadway miles in the Maricopa County Regional Freeway system. In fiscal year 2006, \$1.8 million was designated from Proposition 400 monies to pay for this litter control and \$200,000 was used for a litter prevention and education campaign. The official explained that the Division receives these monies and hires contractors to pick up litter on roadway shoulders, medians, and pavement. The Division has a full-time inspector who verifies contractor work quality to ensure adequate litter control.

**Table 8:** Adopt-a-Highway Sponsor Program Statistics By District  
Fiscal Year 2006  
(Unaudited)

District	Number of Sponsors	Sponsored Miles	District Centerline Miles <sup>1</sup>
Phoenix	113	352.6	545.7
Tucson	2	14.2	972.8
Flagstaff	4	4.0	833.0
<b>Total</b>	<b><u>119</u></b>	<b><u>370.8</u></b>	<b><u>2,351.5</u></b>

<sup>1</sup> The most recent centerline mile information is from December 31, 2005.

Source: Auditor General staff analysis of data provided by the program coordinator in ADOT's Communication and Community Partnerships Office and ADOT's 2005 State Highway System Log.

- Adopt-a-Highway sponsors**—The Adopt-a-Highway sponsor program allows businesses and other organizations that contract directly with one of several pre-approved maintenance providers to remove litter in the busier urban areas where more frequent litter removal is necessary. As shown in Table 8, the Division reports that as of January 2007, 119 groups sponsored more than 370 roadway miles in the Phoenix, Tucson, and Flagstaff districts. According to the program coordinator, most litter control paid by sponsors is done every other week. However, in Flagstaff and Tucson, some sponsored litter pickup is done only 12 to 18 times a year. In Maricopa County, the Division has a full-time inspector who ensures the quality of sponsored litter control done by contractors, according to a Phoenix district official. Division officials state that for Maricopa County, sponsored and Proposition 400 work are coordinated to ensure weekly litter pickup on each roadway segment.

- **Adopt-a-Highway volunteers**—Under the Adopt-a-Highway volunteer program, volunteer associations such as civic groups and schools pick up litter approximately twice a year on their adopted highway segment. As shown in Table 9, as of February 2006, ADOT had 2,235 volunteer groups enrolled in the program throughout the State caring for an estimated 2,467 roadway miles.

- **Prison labor**—ADOT maintenance districts use contracted prison labor to perform litter pickup along some Arizona highways. According to ADOT records, ADOT used nearly 86,000 hours of inmate labor in fiscal year 2006 at a total cost of almost \$62,000. Under its agreement with the Department of Corrections (DOC), ADOT coordinates with prison officials to set work hours, work locations, and job assignments subject to DOC agreement and the availability of inmate workers. DOC provides security supervision, and ADOT is responsible for inmate labor expenses at \$0.50 per hour, Correctional Officer supervision expenses at the DOC rate in accordance with its policy, transportation costs at the state rate per mile, and other related costs. Agency officials state that inmate labor is typically limited to areas within close proximity of the prison and more rural areas.

- **In-house maintenance crews**—ADOT officials stated that maintenance crews pick up litter in rural regions on a complaint basis or when crews observe items on the roadway that could pose safety hazards. According to ADOT officials, in-house maintenance crews assume limited responsibility for litter control because they emphasize roadway functionality and safety, with litter pickup being a lower priority. ADOT records show that in fiscal year 2006, approximately \$1 million was spent on litter pickup performed by in-house maintenance crews throughout the State. According to ADOT officials, in-house maintenance crews are also responsible for collecting litter bags filled by Adopt-a-Highway volunteers.

**Table 9:** Adopt-a-Highway Volunteer Program Statistics By District Fiscal Year 2006 (Unaudited)

District	Number of Volunteer Groups	Adopted Miles	District Centerline Miles <sup>2</sup>
Flagstaff	216	356.6	833.0
Globe	461	265.0	898.3
Holbrook	173	173.0	921.6
Kingman	131	250.8	577.8
Phoenix	102	119.7	545.7
Prescott	337	349.8	587.8
Safford	349	349.0	816.6
Tucson	371	449.7	972.8
Yuma	95	153.5	647.3
<b>Total</b>	<b>2,235</b>	<b>2,467.1<sup>1</sup></b>	<b>6,800.9</b>

<sup>1</sup> According to the program coordinator, the Safford and Holbrook districts did not have exact information regarding the number of miles cared for so a minimum estimation of 1 mile per group was used. It is likely that this value is higher since the program encourages groups to adopt 2-mile segments, and most districts have a mixture of groups that adopt 1-mile and those that adopt 2-mile segments.

<sup>2</sup> The most recent centerline mile information is from December 31, 2005.

Source: Auditor General staff analysis of data provided by the program coordinator in ADOT's Communication and Community Partnerships Office and the ADOT 2005 State Highway System Log.

# AGENCY RESPONSE



# Arizona Department of Transportation

## Office of the Director

206 South Seventeenth Avenue Phoenix, Arizona 85007-3213

Janet Napolitano  
Governor

Victor M. Mendez  
Director

Richard Travis  
Deputy Director

May 31, 2007

Debbie K. Davenport  
Auditor General  
2910 North 44<sup>th</sup> Street  
Phoenix, Arizona 85008

Dear Mrs. Davenport:

Our thanks to you and your staff for the open dialogue and professionalism displayed during the audit of the Arizona Department of Transportation (ADOT) Highway Maintenance Program.

**Finding 3: Division should improve method to determine maintenance needs and allocate maintenance dollars.**

**Recommendations:**

1. **To better ensure that the state highway system's life expectancy, operational efficiency, appearance, and safety are maximized, the Division should:**
  - a. Develop and implement guidelines on how to identify annually needed maintenance work which would include frequency schedules, as appropriate, and periodic inspections to identify needed work;
  - b. Develop and implement guidelines on how to prioritize maintenance work to ensure that the most important state-wide maintenance needs are met first within available resources;
  - c. Identify, quantify, and prioritize maintenance needs to be done annually; and
  - d. Identify work that cannot be done with existing resources to identify any maintenance funding gap.

**Agency Response:**

The finding of the Auditor General is agreed to and the audit recommendations will be implemented.

As described in the American Association of State Highway and Transportation Officials (AASHTO) Guidelines for Maintenance Management Systems (MMS), MMS have evolved from output-focused systems (work units, quantities, expenditures) of the 1970's to the integrated, performance-based, outcome-driven systems of today. The Level of Service (LOS) Maintenance Budgeting System program that ADOT has developed is a critical component of our MMS, it represents the state-of-the-art in

Debbie K. Davenport  
Page two  
May 31, 2007

performance-based maintenance budgeting and its structure is consistent with the AASHTO guidelines.

LOS is a performance-based system that does not quantify work to be done or maintenance needs at a detailed level, but rather identifies the performance level or target that is desired and the resources necessary to deliver that performance level. The LOS Maintenance Budgeting System is designed to prioritize maintenance work statewide by the process of setting target grades for each category. For example, setting a target of A for traffic vs. a target of a B+ for roadside is setting a statewide priority of traffic control features above roadside features.

There has been some level of frequency recommendation for many years in the maintenance activity guidelines. For example, the activity for Routine Signal/Lighting Maintenance and Inspection specifies bi-monthly frequency for ramp meters and signals and semi-annual frequency for highway lighting. The Pavement Management System (PMS) is capable of setting the recommended frequencies for pavement activities. The guidelines will be reviewed for appropriate frequency recommendations and changes made as necessary.

The upgraded PECOS application will allow districts to identify maintenance work to be done and will enable the district to set priorities in the planning module of the application. When planning work annually, each org supervisor has a variety of resources available, including PECOS reports, LOS data, PMS data, accident data, and more. When implemented, the new PECOS will provide a highly-integrated maintenance management system that will include interfaces with the LOS, Feature Inventory System, Sign Management System, Pavement Management System and the Equipment Services database. The integration will better position the agency to identify and quantify the gap in resources.

- 2. To ensure that state-wide maintenance needs are addressed, the Division should develop and implement a methodology to allocate monies to districts and regions based on state-wide needs and priorities, and each district's and region's relative needs and roadway responsibilities (for example, lane miles and traffic flow).**

**Agency Response:**

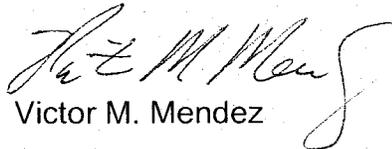
The finding of the Auditor General is agreed to and the audit recommendations will be implemented.

Debbie K. Davenport  
Page three  
May 31, 2007

The current allocation process has not resulted in any significant imbalance or differences in conditions among districts as supported by the data in the pavement management system, preliminary Level-of-Service (LOS) data, or any other currently available measure. We will review the current allocation process. The new LOS Maintenance Budgeting System will improve our ability to do state-wide prioritization and allocation of monies to the districts.

We will implement these recommendations, which we believe will improve our internal processes.

Sincerely,



Victor M. Mendez

## Performance Audit Division reports issued within the last 24 months

---

<b>05-02</b>	Department of Administration— Financial Services Division	<b>05-16</b>	Department of Revenue Sunset Factors
<b>05-03</b>	Government Information Technology Agency (GITA) & Information Technology Authorization Committee (ITAC)	<b>06-01</b>	Governor's Regulatory Review Council
<b>05-04</b>	Department of Economic Security—Information Security	<b>06-02</b>	Arizona Health Care Cost Containment System— Healthcare Group Program
<b>05-05</b>	Department of Economic Security—Service Integration Initiative	<b>06-03</b>	Pinal County Transportation Excise Tax
<b>05-06</b>	Department of Revenue—Audit Division	<b>06-04</b>	Arizona Department of Education—Accountability Programs
<b>05-07</b>	Department of Economic Security—Division of Developmental Disabilities	<b>06-05</b>	Arizona Department of Transportation—Aspects of Construction Management
<b>05-08</b>	Department of Economic Security—Sunset Factors	<b>06-06</b>	Arizona Department of Education—Administration and Allocation of Funds
<b>05-09</b>	Arizona State Retirement System	<b>06-07</b>	Arizona Department of Education—Information Management
<b>05-10</b>	Foster Care Review Board	<b>06-08</b>	Arizona Supreme Court, Administrative Office of the Courts—Information Technology and FARE Program
<b>05-11</b>	Department of Administration— Information Services Division and Telecommunications Program Office	<b>06-09</b>	Department of Health Services—Behavioral Health Services for Adults with Serious Mental Illness in Maricopa County
<b>05-12</b>	Department of Administration— Human Resources Division	<b>07-01</b>	Arizona Board of Fingerprinting
<b>05-13</b>	Department of Administration— Sunset Factors	<b>07-02</b>	Arizona Department of Racing and Arizona Racing Commission
<b>05-14</b>	Department of Revenue— Collections Division		
<b>05-15</b>	Department of Revenue— Business Reengineering/ Integrated Tax System		

## Future Performance Audit Division reports

---



A REPORT  
TO THE  
ARIZONA LEGISLATURE

Performance Audit Division

---

Sunset Review

# Arizona Department of Transportation— Sunset Factors

---

JULY • 2007  
REPORT NO. 07-04



**Debra K. Davenport**  
Auditor General

The Auditor General is appointed by the Joint Legislative Audit Committee, a bipartisan committee composed of five senators and five representatives. Her mission is to provide independent and impartial information and specific recommendations to improve the operations of state and local government entities. To this end, she provides financial audits and accounting services to the State and political subdivisions, investigates possible misuse of public monies, and conducts performance audits of school districts, state agencies, and the programs they administer.

## The Joint Legislative Audit Committee

---

Senator Robert Blendu, Chair

Representative John Nelson, Vice-Chair

Senator Carolyn Allen

Representative Tom Boone

Senator Pamela Gorman

Representative Jack Brown

Senator Richard Miranda

Representative Peter Rios

Senator Rebecca Rios

Representative Steve Yarbrough

Senator Tim Bee (ex-officio)

Representative Jim Weiers (ex-officio)

## Audit Staff

---

Melanie M. Chesney, Director

Shan Hays, Manager and Contact Person

Brent Nelson, Team Leader

Jay Rasband

Copies of the Auditor General's reports are free.  
You may request them by contacting us at:

**Office of the Auditor General**

2910 N. 44th Street, Suite 410 • Phoenix, AZ 85018 • (602) 553-0333

Additionally, many of our reports can be found in electronic format at:

**[www.azauditor.gov](http://www.azauditor.gov)**



DEBRA K. DAVENPORT, CPA  
AUDITOR GENERAL

STATE OF ARIZONA  
OFFICE OF THE  
AUDITOR GENERAL

WILLIAM THOMSON  
DEPUTY AUDITOR GENERAL

July 18, 2007

Members of the Arizona Legislature

The Honorable Janet Napolitano, Governor

Mr. Victor Mendez, Director  
Arizona Department of Transportation

Transmitted herewith is a report of the Auditor General, a Sunset Review of the Arizona Department of Transportation (ADOT). This report is in response to a May 22, 2006, resolution of the Joint Legislative Audit Committee and was conducted as part of the sunset review process prescribed in Arizona Revised Statutes §41-2951 et seq.

Included with this report is a written response from ADOT.

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

This report will be released to the public on July 19, 2007.

Sincerely,

Debbie Davenport  
Auditor General

Enclosure

# TABLE OF CONTENTS



Introduction & Background	1
Sunset Factors	7
Table	
1 Schedule of Operating Revenues and Expenditures, in Thousands Fiscal Years 2005, 2006, and 2007 (Unaudited)	4
Agency Response	

• concluded

# INTRODUCTION & BACKGROUND

---

The Office of the Auditor General has conducted a review of the Arizona Department of Transportation (ADOT) using the 12 criteria in Arizona's sunset law. The analysis of the 12 sunset factors was conducted pursuant to a May 22, 2006, resolution of the Joint Legislative Audit Committee and prepared as part of the sunset review set forth in Arizona Revised Statutes (A.R.S.) §41-2951 et seq.

This sunset review is the last in a series of three reports on ADOT. The other two reports were performance audits on aspects of construction management and the highway maintenance program. ADOT's Motor Vehicle Division (MVD) has its own sunset date and was separately reviewed through three other audits (see Auditor General Report Nos. 04-09, 04-10, and 04-11).

## Organization

By statute, ADOT is divided into six divisions. As of December 27, 2006, ADOT reported that it had 4,691 FTEs, of which 138 positions were vacant.

- **Intermodal Transportation (2,223 FTEs, 89 vacancies)**—This division is responsible for constructing, maintaining, and operating all state-owned highways, including interstates and U.S. routes.
- **Motor Vehicles (1,730 FTEs, 19 vacancies)**—MVD provides various services to the public, including issuing driver's licenses, vehicle registrations, and vehicle titles. MVD oversees private third-party providers of MVD services, including ServiceArizona, which provides MVD's customers a convenient way to complete a wide array of services, primarily through the Internet. In addition, MVD is responsible for motor carrier and tax services, including collecting gasoline and use fuel taxes, accounting for and distributing the Highway User Revenue Fund (HURF) and other related revenues, and registering interstate motor carriers. MVD is also responsible for enforcing transportation-related laws and regulations at port-of-entry checkpoints at Arizona's borders and at mobile checkpoints.

- **Administration (659 FTEs, 19 vacancies)**—This area consists of four groups that provide administrative support services for the other divisions. Specifically:
  - **Transportation Services Group (643 FTEs, 18 vacancies)**—This group includes units responsible for audit and analysis, civil rights, equipment services, financial management, human resources, organization and employee development, procurement, information technology, the *Arizona Highways* magazine, physical plant operations, and health and safety.
  - **Communication and Community Partnerships (13 FTEs, 1 vacancy)**—This group is responsible for government relations, building partnerships, the Adopt-a-Highway litter control program, and for providing various forms of media and public communication services.
  - **Office of the Inspector General (OIG) (1 FTE, 0 vacancies)**—This group was established in 2004 by Executive Order No. 2004-23. This Order requires the OIG to conduct case investigations and audits designed to prevent and deter fraud, abuse, and misconduct in ADOT programs; evaluate the effectiveness and adequacy of program safeguards and controls; make recommendations to ADOT's Director and the Governor's Office on ways to strengthen and improve program procedures and operations; and coordinate with law enforcement agencies and the Governor's Office of Homeland Security. According to ADOT officials, the current Inspector General will retire at the end of June 2007, and the position is under review to determine whether it will be retained or abolished.
  - **Policy and Government Affairs (2 FTEs, 0 vacancies)**—This group was recently formed, according to ADOT officials, and its exact duties are still being defined. At this time, its main duties will be to research and coordinate policy issues impacting the agency; manage local, state, federal, and international government relations; assist with inter-agency coordination; and serve as the primary liaison for the State Transportation Board and the 5-year planning process.
- **Transportation Planning (42 FTEs, 8 vacancies)**—This division is responsible for providing research, plans, and programs to help identify current significant transportation issues in Arizona as well as improve existing systems. According to ADOT, the division is also responsible for developing the 5-Year Transportation Facilities Construction Program.
- **Aeronautics (33 FTEs, 4 vacancies)**—This division administers state monies and accepts federal monies available for airport improvement projects, and produces an annual 5-Year Airport Development Program. The Division licenses aircraft dealers and registers nonairline aircraft within the State. The Division also oversees the administration and operation of the state-owned Grand Canyon National Park Airport and provides other services to encourage and advance the safe and orderly development of aviation in Arizona.

- **Public Transportation Division (4 FTEs, 1 vacancy)**—This division administers several Federal Transit Administration grant programs, provides technical assistance and expertise to local transit agencies and decision-makers, coordinates and funds state transit and rail planning efforts, and sets and monitors light rail system safety standards.

In addition, the State Transportation Board, which comprises seven governor appointees (see textbox), has significant responsibility for the State's transportation system and serves in an advisory capacity to the ADOT Director. The Board is required to develop and adopt a state-wide transportation policy and adopt a long-range plan. In addition, the Board is charged with adopting uniform transportation planning practices, transportation system performance measures, and data collection standards for data collected to report system performance measures. Further, the Board has authority to designate which state routes are included within the state highway system, award construction contracts for transportation facilities, monitor the status of construction projects, and establish policies to guide the development or modification of ADOT's 5-Year Transportation Facilities Construction Program. Finally, the Board has exclusive authority for issuing revenue bonds for financing transportation improvements throughout the State.

#### State Transportation Board:

- State divided into six transportation districts composed of one to four counties.
- One member appointed per district for a 6-year term, except districts with 2,200,000 or more population have two members appointed (currently only one district with two members).
- Appointees must have been a resident and taxpayer of the county from which they are appointed for at least 5 years prior to their appointment.
- Districts with more than one county will have the appointment rotated among counties.

Source: A.R.S. §§28-301 and 28-302.

## Operating budget

ADOT's operating budget, excluding MVD, is an estimated \$340 million for fiscal year 2007 and consists mostly of revenues from the State Highway Fund, as shown in Table 1 (see page 4). ADOT's largest category of operating budget expenditures is employee salaries and benefits, which are expected to total approximately \$181.5 million in fiscal year 2007. The second largest category is other operating expenses, which include various costs such as payments for utilities, traffic control, and maintenance of highways and other state transportation system components. In addition to monies from state and federal sources, ADOT received \$5.9 million in fiscal years 2006 and 2007 from the Maricopa County half-cent transportation excise tax to assist in providing landscape maintenance and litter pickup of the regional freeway system in Maricopa County.<sup>1</sup> ADOT's operating budget does not include monies available for debt service payments or capital expenditures, such as costs of highway construction projects, in the 5-Year Transportation Facilities Construction Program. In addition to its operating budget, for fiscal year 2007, ADOT had \$435.8 million in other nonappropriated monies and \$445.9 million in federal monies.

<sup>1</sup> The Maricopa Association of Governments (MAG) approved \$5.9 million per year, but according to ADOT management, \$200,000 from each year's allocation was returned to MAG for a litter prevention and education program. The remaining \$5.7 million was provided to the Intermodal Transportation Division for regional landscape maintenance, litter control, and sweeping on state highways in Maricopa County.

**Table 1: Schedule of Operating Revenues and Expenditures, in Thousands<sup>1</sup>  
Fiscal Years 2005, 2006, and 2007  
(Unaudited)**

	2005 (Actual)	2006 (Actual)	2007 (Estimate)
<b>Revenues:</b>			
Appropriations <sup>2</sup>			
State Highway Fund	\$261,938.5	\$277,690.6	\$292,277.5
Transportation Department Equipment Fund	34,004.7	35,845.5	38,526.8
State Aviation Fund	1,967.0	2,057.8	2,188.8
Safety Enforcement and Transportation Infrastructure Fund	558.7	558.7	558.7
State General Fund	71.7	76.4	82.9
Transportation excise taxes <sup>3</sup>		<u>5,900.0</u>	<u>5,900.0</u>
Total revenues	<u>298,540.6</u>	<u>322,129.0</u>	<u>339,534.7</u>
<b>Expenditures and operating transfers:</b>			
Personal services and related benefits	144,607.6	153,842.2	181,500.8
Professional and outside services	9,869.9	8,853.9	6,909.0
Travel	2,288.0	2,200.4	2,919.8
Other operating <sup>4</sup>	120,580.6	132,148.4	137,271.2
Equipment	<u>20,975.7</u>	<u>19,684.5</u>	<u>14,296.1</u>
Total expenditures	298,321.8	316,729.4	342,896.9
Operating transfers out <sup>5</sup>		<u>200.0</u>	<u>200.0</u>
Total expenditures and operating transfers out	<u>\$298,321.8</u>	<u>\$316,929.4</u>	<u>\$343,096.9</u>
Excess (deficiency) of revenues over expenditures and operating transfers out <sup>6</sup>	<u>\$ 218.8</u>	<u>\$ 5,199.6</u>	<u>\$ (3,562.2)</u>

<sup>1</sup> This table only includes ADOT's operating revenues and expenditures. Consequently, the table does not include debt service payments or capital expenditures such as costs of construction projects included in ADOT's 5-year construction program. It also does not include financial activity of the Motor Vehicle Division (MVD) because MVD was not within the scope of ADOT's sunset review. MVD has a separate sunset review date. In addition, it is presented on a budgetary basis in which expenditures are reported in the budget year incurred.

<sup>2</sup> Consists of that portion of ADOT's appropriations from each of the listed funds that are used to pay for its operations. These appropriations primarily consist of monies collected from motor vehicle and fuel taxes, charges for services, and licenses and permit fees.

<sup>3</sup> Consists of monies from the special half-cent transportation excise tax authorized by voters as Proposition 400 in November 2004, which is allocated by the Maricopa Association of Governments (MAG) for department operations.

<sup>4</sup> Consists of various costs such as insurance, motor vehicle fuel and parts, telecommunication costs, utilities, landscaping, cable barrier and guardrail repair, rest area maintenance, traffic control, building and land rental, general repair and maintenance, and materials.

<sup>5</sup> MAG approved \$5.9 million per year (see footnote 3), but according to ADOT management, \$200,000 from each year's allocation was returned to MAG for a litter prevention and education program. The remaining \$5.7 million was provided to the Intermodal Transportation Division for regional landscape maintenance, litter control, and sweeping on state highways in Maricopa County.

<sup>6</sup> The estimated deficiency of revenues over expenditures for fiscal year 2007 will be funded with unexpended proposition 400 monies carried forward from fiscal year 2006.

Source: Auditor General staff analysis of financial information provided by ADOT for fiscal years 2005, 2006, and 2007.

## Scope and methodology

ADOT's performance was analyzed in accordance with the 12 statutory sunset factors and excluded MVD, which received a sunset review in 2004. Audit work in the following areas provided a basis for response to the sunset factors:

- Aspects of Construction Management (Auditor General Report No. 06-05).
- Highway Maintenance (Auditor General Report No. 07-03).

This report also includes unaudited information obtained from ADOT officials, the Governor's Regulatory Review Council, the Secretary of State, the Office of the Attorney General, the Federal Highway Administration Highway Statistics reports, and ADOT's Web site. Auditors also reviewed applicable state and federal laws and regulations.

The audit was conducted in accordance with government auditing standards.

The Auditor General and staff express appreciation to ADOT's Director and staff for their cooperation and assistance throughout the audit.

# SUNSET FACTORS

---

In accordance with A.R.S. §41-2954, the Legislature should consider the following 12 factors in determining whether ADOT, excluding MVD, should be continued or terminated. The two performance audits identified areas where ADOT has operated effectively and efficiently, as well as opportunities for ADOT to improve operations.

## 1. The objective and purpose in establishing ADOT.

ADOT was organized in 1974 by combining the Arizona State Highway Department and the Arizona Department of Aeronautics.

ADOT's mission is:

"To provide products and services for a safe, efficient, cost-effective transportation system that links Arizona to the global economy, promotes economic prosperity and demonstrates respect for Arizona's environment and quality of life."

Statutes outline ADOT's main duties, excluding those related to MVD:

- Conduct state-wide transportation system planning, cooperate and coordinate planning with local governments, and establish an annually updated priority program of transportation systems improvements;
- Design and construct transportation facilities in accordance with a priority plan and maintain and operate state highways, state-owned airports, and state public transportation systems;
- Investigate new transportation systems and cooperate with and advise local governments in the development and operation of public transit systems; and
- Administer and implement transportation safety programs in accordance with law.

2. The effectiveness with which ADOT has met its objectives and purposes and the efficiency with which the agency has operated.

ADOT generally operates effectively and efficiently in performing its functions. As of 2005 (most recent available data), ADOT was responsible for 18,503 travel lane miles of roadway, according to the Federal Highway Administration's Highway Statistics report, which was an increase of approximately 8 percent in the number of travel lane miles since 1996. Most of the growth came from lanes added to increase existing road capacity. The state highway system includes interstate highways, U.S. routes, and state routes. ADOT's infrastructure assets, which include bridges as well as roads, were valued at more than \$9 billion in ADOT's 2006 *Comprehensive Annual Financial Report*. According to ADOT, it has accelerated its progress in developing the Maricopa County Regional Freeway system and in 2000 changed the urban freeway construction schedule from 14 to 7½ years, which is now mostly completed. ADOT uses contractors for building highways and employs field inspectors and independent quality assurance inspectors to verify construction quality and compliance with specifications. Finally, ADOT regularly measures pavement smoothness and road quality factors, and overall, these measures showed that Arizona's highway system was in good condition as of 2005 (most recent data available) and had improved since 1995.

Auditors found that ADOT can operate more effectively and efficiently in some areas. For example:

- ADOT Highway Maintenance (Auditor General Report No. 07-03)—To better ensure that the life expectancy, operational efficiency, appearance, and safety of the state highway system are maximized, the Division should develop and implement a more systematic approach for identifying and addressing maintenance needs. It should establish frequency schedules for various maintenance activities, identify all needed maintenance state-wide, and estimate monies and resources required to perform the needed state-wide maintenance. Further, it should provide a prioritization method to ensure that the most important and cost-effective maintenance is performed within resource constraints and provide a systematic method for allocating resources to meet maintenance needs.
- ADOT Aspects of Construction Management (Auditor General Report No. 06-05)—ADOT should optimize its internal resources to reduce consultant usage when appropriate during completion of project design, construction management, and other similar functions. Making greater use of internal resources would help to reduce costs and maintain employee core competency levels. In addition, to better ensure that contractors meet construction standards, ADOT should take steps to improve consistency, documentation, and followup on its inspections.

Finally, ADOT was not completing enough audits of highway design and construction contracts, and was not issuing reports in a timely manner. ADOT reported in January 2007 that it had implemented or was in process of implementing all recommendations made in this audit.

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

ADOT has operated within the public interest by planning, designing, constructing, and maintaining a state-wide transportation system. According to data from the Federal Highway Administration's Highway Statistics reports, travel lane miles in the highway system increased from 17,407 in 2000 to 18,503 in 2005. In addition, the percentage of roadway miles in good or satisfactory condition, based on measures collected by ADOT, was higher in 2005 than in 1995. ADOT operates a 24-hour Traffic Operations Center and Freeway Management System to help manage congestion on urban freeways and to inform motorists of highway conditions throughout the State.

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

ADOT has an extensive list of administrative codes in Title 17 of the Arizona Administrative Code, which contains rules and regulations for various divisions throughout the agency. In accordance with A.R.S. §41-1056, ADOT reviews its promulgated rules every 5 years to assess consistency with statute.

However, according to the staff of the Governor's Regulatory Review Council (GRRRC), ADOT has not promulgated all rules required by 12 statutes. According to ADOT, one of these statutes, A.R.S. §28-1802, is obsolete, and a bill will be introduced in the 2008 legislative session to repeal it. The statute requires the Vehicle Equipment Safety Commission to adopt rules. Another example of a statute where a rule is required but has not been promulgated is A.R.S. §28-367, which requires that the ADOT Director make rules for the application and expenditure of all public transit monies.

In addition, GRRRC staff identified nine statutes with discretionary language that allow ADOT to adopt rules as ADOT considers appropriate. ADOT reported that it has initiated the rule-making process for one of these statutes, A.R.S. §28-455(C)(14)(f), which pertains to disclosure of personal information.

**5. The extent to which ADOT 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.**

ADOT uses several avenues to keep the public informed of its actions. It follows statutory requirements for notifying the public, accepting written comments, and holding oral proceedings.

The State Transportation Board initiates numerous efforts to inform the public of its intentions, and to obtain input prior to final adoption of the 5-Year Transportation Facilities Construction Program, by holding:

- Public monthly State Transportation Board meetings at different locations throughout the State.
- Focus sessions with local government officials to discuss the 5-year program and the Long Range Transportation Plan and to obtain input on regional transportation issues.
- Formal public hearings each year in Tucson, Flagstaff, and Phoenix regarding the proposed 5-year program.

During the audit, ADOT took steps to improve compliance with the Open Meeting Law by providing proper notification to the Secretary of State about where public meeting notices are posted as required by A.R.S. §38-431.02(A)(1). Auditors initially found that three of seven public bodies associated with ADOT and within this audit scope had filed proper notices with the Secretary of State. Three public bodies, the State Transportation Board, the Transportation Enhancement Review Committee, and the Parkways Historic and Scenic Roads Advisory Committee, had filed notices with the Secretary of State, but their filings did not state the location where public notices would be posted. The remaining public body, the Citizen's Transportation Oversight Committee, had not filed a notice with the Secretary of State about where its public meeting notices would be posted. When auditors brought these noncompliance instances to ADOT's attention, ADOT prepared and filed the notices.

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

This factor does not apply because ADOT does not have statutory authority to investigate and resolve complaints except in MVD. Sunset factors for MVD were addressed in a separate report (see Auditor General Report No. 04-11). ADOT is responsible for licensing aircraft dealers, but has no statutory authority to investigate and resolve complaints regarding licensees. According to an Aeronautics Division official, ADOT received one complaint about a licensee between September 2004 and May 2007 and sought advice from the Attorney General's Office, which confirmed that ADOT had no authority to intercede between the complainant and the licensee.

However, ADOT reported that it has a process to handle inquiries and complaints from its customers. Specifically, ADOT reported that its Office of Communication and Community Partnerships' Constituent Services Officer (CSO) is responsible for receiving, routing, and resolving customer complaints

and inquiries. ADOT's CSO reported that he receives general questions, suggestions for improvement, and complaints regarding various issues including litter, debris, graffiti, and potholes. Complaints are received by phone call, e-mail, and written correspondence. The CSO reported that he handles phone calls on a case-by-case basis, resolving the issue, forwarding the call to a specific specialist or expert, or forwarding the call to a division. The CSO prepares weekly reports summarizing phone calls received, which show that during approximately 4 months ending December 14, 2006, his office received approximately 350 phone calls per month. Nearly 13 percent of these calls were complaints. The CSO stated that there are no reports summarizing e-mails and written correspondence, but he believes that these may be incorporated into a new tracking system.

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

The Attorney General has the authority to prosecute all actions pursuant to Title 28 (Transportation) under A.R.S. §28-333. The Attorney General's Transportation Section represents ADOT in routine legal matters such as eminent domain litigation, property damage claims, construction contracts, procurement contracts, vehicle license suspensions, driver's license revocations and appeals, and personnel matters. In addition, the Attorney General's Liability Management Section works with ADOT to handle tort claims and litigation when ADOT is sued by persons injured in highway accidents.

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

According to ADOT officials, ADOT develops a legislative program every year that identifies statutory changes needed to enable it to better fulfill its objectives and mission. For example, over the last 4 years, from 2003 to 2006, ADOT reported that it has supported the following changes to statute:

- **Laws 2003, Chapter 201 (SB 1063)**—Omnibus bill that allowed cities and towns to designate roads as primitive, authorized ADOT's Director to license the name of *Arizona Highways* magazine to a private entity for commercial purposes, and added Indian tribes to the list of entities ADOT can cooperate with to receive full benefits for the State. According to an Attorney General Opinion, this last provision was required to enable ADOT to continue receiving federal grant monies for providing accessible vehicles for the elderly and disabled. The bill also included provisions related to MVD, such as adding new types of specialized license plates.

**Design-build**—Contractor furnishes design services in addition to construction.

**Job-order contracting**—Contract is for indefinite quantities of construction, and construction to be performed is specified in job orders issued during the contract.

**Construction-manager-at-risk**—Construction contract is separate from design contract.

Source: A.R.S. §28-7361.

- **Laws 2004, Chapter 167 (HB 2626)**—Amended A.R.S. §§11-269.03 and 28-334 to allow counties to enter into agreements with ADOT to accelerate right-of-way acquisition, design or construct eligible projects, and advance monies to ADOT pursuant to those agreements. Also, any political subdivision may pledge excise taxes to the repayment on any borrowing to fund the advance. Amendments also allowed ADOT to exchange federal funds with local governments to receive local funds and to include additional federal funds in the exchange to offset matching costs required of local governments to receive full benefits available under federal law.
- **Laws 2005, Chapter 150 (HB 2123)**—Amended A.R.S. §28-7678 to extend the authority of the State Board of Transportation to sell Board Fund Obligations (BFOs), which are nonnegotiable loans, to the Arizona State Treasurer to provide money for the Highway Expansion and Extension Loan Program (HELP) fund, which constitutes the state infrastructure bank, until fiscal year 2020 in a principal amount not more than \$200 million in any one fiscal year and to mature no later than 4 calendar years after BFO date. Amendments also continued the HELP Advisory Committee until 2024. This committee develops for the State Board of Transportation a simplified application form for financial assistance and guidelines for loans and financial assistance. The committee also reviews and makes recommendations on requests for loans and financial assistance. In addition, the committee is required to submit an annual report on the HELP program to the Governor and the Legislature.
- **Laws 2005, Chapter 162 (HB 2579)**—Amended numerous statutes relating to the procurement of professional and construction services. The changes permitted ADOT to continue using design-build projects until December 31, 2025; limited contracts for job-order-contracting construction services to 5 years and a maximum dollar amount per individual job of \$1 million; eliminated the requirement for any state entity using construction-manager-at-risk, design-build, or job-order-contracting to submit an annual report to the Secretary of State; clarified the duties of the contractor selection committee; and provided requirements for preconstruction services and payment to contractors.
- **Laws 2006, Chapter 27 (SB 1024)**—Amended A.R.S. §28-410 to allow ADOT to share pertinent computer programs and Web-based applications with out-of-state agencies, political subdivisions, and tribal governments. For example, an ADOT official stated that in an effort to share best practices in 2006, the Nevada Department of Transportation requested that ADOT share the development of a safety database that assists in tracking workers' compensation. The official also stated that ADOT has often utilized the experience and expertise of other states' departments of transportation in obtaining information or resources regarding best practices.

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

The Legislature has already taken action to address the only area auditors identified during these audits where a statutory change appeared to be needed. Specifically, Laws 2007, Chapter 77, Section 1, increased the limit for projects that can be carried out by in-house crews. A.R.S. §28-6923 required ADOT to obtain outside contractor bids for all construction or reconstruction projects involving an expenditure of \$50,000 or more. A similar statute, A.R.S. §34-201, requires counties, cities, towns, and certain other entities to obtain outside contractor bids for street, road, and bridge work, but set the limit at \$150,000 in fiscal year 1995 with subsequent year limits adjusted according to changes in the GDP price deflator. The 2007 law raised ADOT's limit to \$189,000 with annual increases for inflation starting in fiscal year 2009.

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

Termination of ADOT could harm the public welfare. Federal law requires state transportation departments to adequately maintain transportation improvements funded by federal monies. In addition, if ADOT were terminated, alternatives would be needed for other duties including planning, constructing, maintaining, and operating the State's transportation infrastructure including highways and airports.

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

ADOT has only limited regulatory authority other than in MVD. Sunset factors for MVD were addressed in a separate report (see Auditor General Report No. 04-11).

ADOT's Aeronautics Division licenses aircraft dealers and registers nonairline aircraft. ADOT reported that it exercises an appropriate level of regulation in the areas in which it has been given regulatory authority. ADOT also reported that regulatory activities are continually monitored, and whenever discrepancies are discovered, appropriate corrective actions are taken.

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

ADOT, more than any other state department, extensively uses private consultants and contractors to accomplish its duties. ADOT consultants and contractors provide many types of services, including project design, project management, roadway construction, project inspection, highway maintenance,

and performing duties of vacant employee positions. The audit did not identify any additional opportunities for ADOT to use private contractors. The Governor's Efficiency Review Team reported in June 2005 that ADOT spent more on consultant contracts and used more consulting services than all other state agencies combined. ADOT reported that consultants provide approximately 80 percent of its highway design efforts. According to ADOT, in fiscal year 2006 it paid design consultants \$115 million to assist in project assessments, location studies, administration of projects, and preparation of reports. The total value of active contracts held with design consultants was \$611 million for fiscal year 2006. ADOT also reported that in fiscal year 2006, it made payments totaling \$590.5 million to private contractors in performing highway construction. In addition, the Intermodal Transportation Division paid contractors more than \$17.5 million in fiscal year 2006 to provide highway maintenance services such as median cable barrier repair, rest area maintenance, pavement sweeping, landscape maintenance, and litter pickup.

# AGENCY RESPONSE



# Arizona Department of Transportation

## Office of the Director

206 South Seventeenth Avenue Phoenix, Arizona 85007-3213

Janet Napolitano  
Governor

June 12, 2007

Richard Travis  
Deputy Director

Victor M. Mendez  
Director

Debbie K. Davenport  
Auditor General  
2910 North 44<sup>th</sup> Street  
Phoenix, Arizona 85008

Dear Ms. Davenport:

The Arizona Department of Transportation (ADOT) extends its thanks to you and your staff for the professionalism displayed during the Sunset Review of ADOT.

ADOT agrees with all aspects of the Sunset Review, and offers the following amplifications and comments.

**Factor 2. The effectiveness with which ADOT has met its objectives and purposes and the efficiency with which the agency has operated.**

ADOT is in the process of implementing all of the recommendations from the Highway Maintenance and Aspects of Construction Management audits.

Regarding the use of consultants, ADOT uses a management level process to determine consultant needs based on project schedule, availability of in-house staff and expertise requirements on the project. ADOT uses this process to evaluate the need for consultants on any given project.

Also, ADOT would like to draw a clear distinction between the contractors that are utilized for highway construction versus the consultants that are utilized in the design, development, project management, inspection and testing processes. The Arizona Revised Statutes require ADOT to utilize private contractors to construct the highways.

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

ADOT has formed a committee to review the areas identified by the Auditor General, and will develop such rules as necessary.

We thank you for your extensive efforts on this review.

Sincerely,

Victor M. Mendez

cc: Richard Travis, Deputy Director  
John A. Bogert, Chief of Staff  
Brian McInnis, Chief Auditor  
Division Directors

## Performance Audit Division reports issued within the last 24 months

---

<b>05-05</b>	Department of Economic Security—Service Integration Initiative	<b>06-03</b>	Pinal County Transportation Excise Tax
<b>05-06</b>	Department of Revenue—Audit Division	<b>06-04</b>	Arizona Department of Education—Accountability Programs
<b>05-07</b>	Department of Economic Security—Division of Developmental Disabilities	<b>06-05</b>	Arizona Department of Transportation—Aspects of Construction Management
<b>05-08</b>	Department of Economic Security—Sunset Factors	<b>06-06</b>	Arizona Department of Education—Administration and Allocation of Funds
<b>05-09</b>	Arizona State Retirement System	<b>06-07</b>	Arizona Department of Education—Information Management
<b>05-10</b>	Foster Care Review Board	<b>06-08</b>	Arizona Supreme Court, Administrative Office of the Courts—Information Technology and FARE Program
<b>05-11</b>	Department of Administration—Information Services Division and Telecommunications Program Office	<b>06-09</b>	Department of Health Services—Behavioral Health Services for Adults with Serious Mental Illness in Maricopa County
<b>05-12</b>	Department of Administration—Human Resources Division	<b>07-01</b>	Arizona Board of Fingerprinting
<b>05-13</b>	Department of Administration—Sunset Factors	<b>07-02</b>	Arizona Department of Racing and Arizona Racing Commission
<b>05-14</b>	Department of Revenue—Collections Division	<b>07-03</b>	Arizona Department of Transportation—Highway Maintenance
<b>05-15</b>	Department of Revenue—Business Reengineering/Integrated Tax System		
<b>05-16</b>	Department of Revenue Sunset Factors		
<b>06-01</b>	Governor's Regulatory Review Council		
<b>06-02</b>	Arizona Health Care Cost Containment System—Healthcare Group Program		

## Future Performance Audit Division reports

---

Arizona School Facilities Board

Structural Pest Control Commission