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

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STATE OF ARIZONA
OFFICE OF THE
AUDITOR GENERAL

DEBRA K. DAVENPORT, CPA
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

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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, reinstituting 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.

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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.

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

Photo: Courtesy of the Arizona Department of Transportation.

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,

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

Phase	Description of Activity
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.

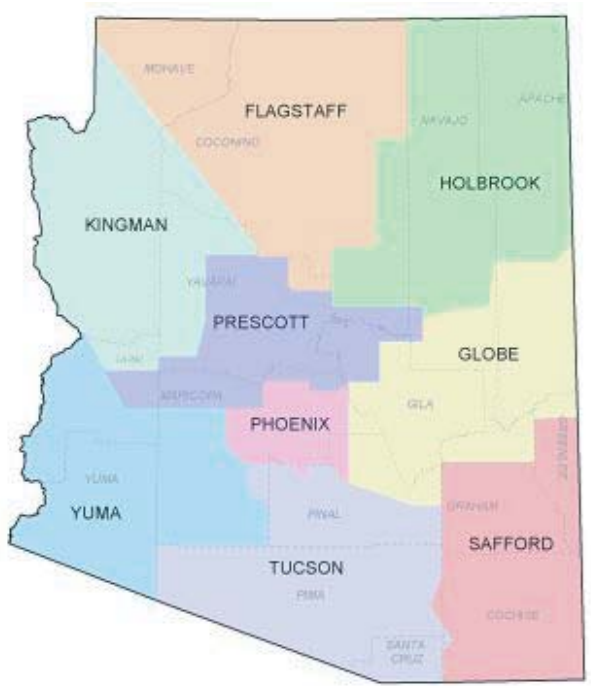
Consultants provide services such as project design, construction management, and various engineering services during the scoping, design, and construction phases of project development, while contractors perform construction. A national survey reported in 2003 that virtually all state departments of 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[1]:

Figure 1: ITD Engineering Districts
As of April 2006



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

- **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

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[1]
Fiscal Years 2004 through 2006
(Unaudited)

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

1 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.

2 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.

3 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.

4 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.

5 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*,[2] and an article on construction auditing from *The Internal Auditor*.[3]

- 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.

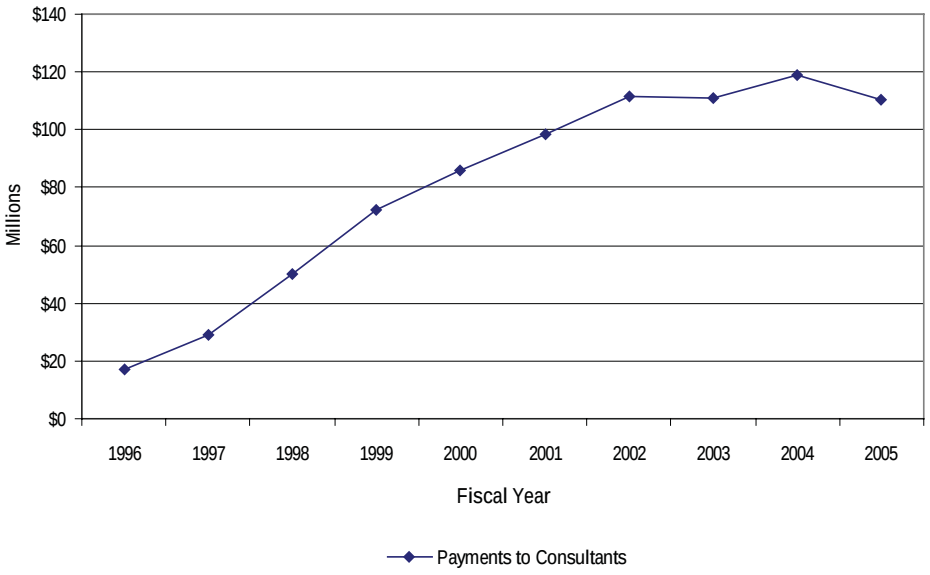
2003 national survey report, most state transportation agencies use consultants for some of the design and management of highway projects.[4] The report found agencies were increasingly using consultants to deliver services driven by growth in highway programs coupled with the same number of or fewer 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.[5]

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

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.[6] 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.[7] 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.

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.

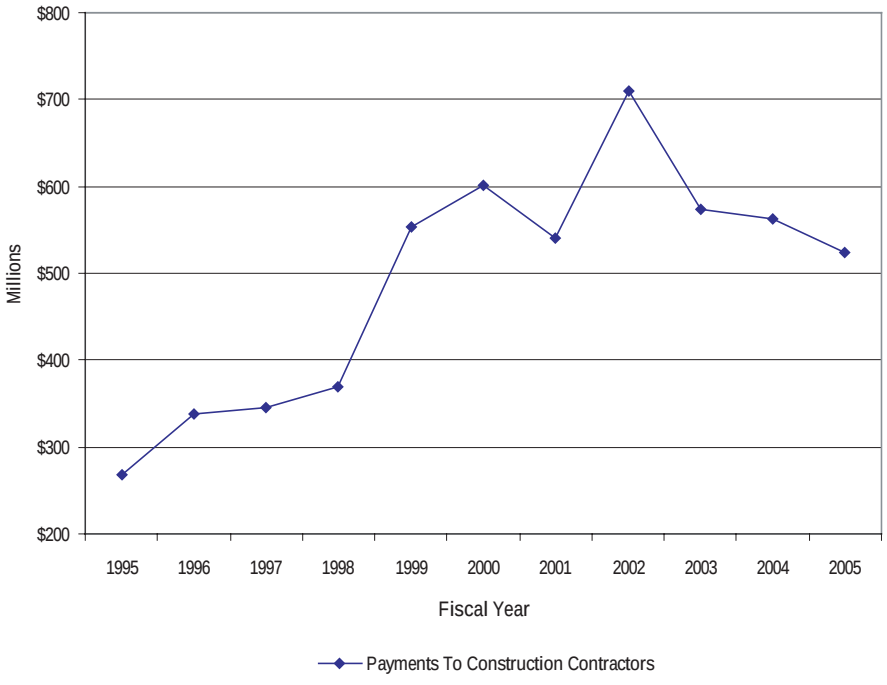
Consultant use has increased—ITD's dependence on consultants has substantially increased over the past 10 years. Although ITD paid consultants $17 million in fiscal year 1996, in fiscal year 2005 the consultant payments totaled $110 million. This is a 424 percent increase since 1996 after adjusting for 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.[8] 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
Fical 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.

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 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.

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	46	19
Subtotal (Firm employees with ADOT link)	110	45
Firm employees without ADOT link	137	55
Total firm employees	247	100

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.[9] 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.[10] Further, legislative audits in other states have raised questions about the accuracy of data used to perform cost comparisons.[11]

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.[12] 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.[13] 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.[14] 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.[15]

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

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.

ITD experience levels are declining.

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.[16] 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.[17] 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.[18]

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)

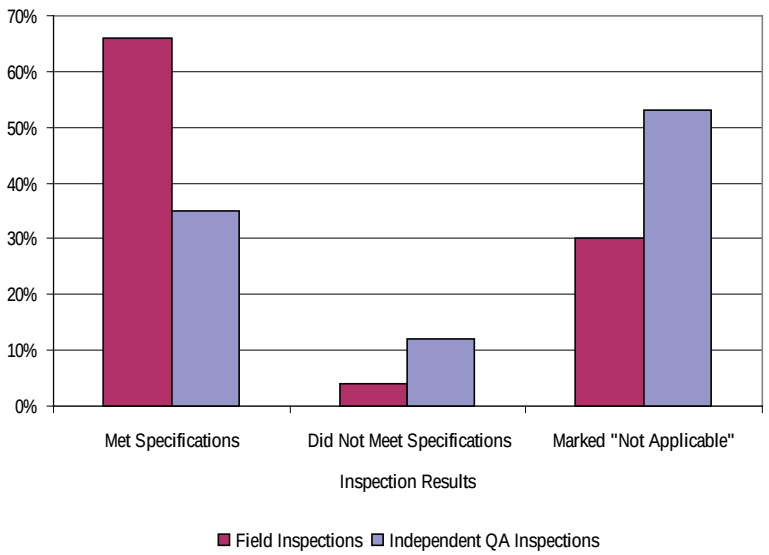
Source: ADOT *Guidelines for Weighting Attributes on Quantified Checklists* and checklist attributes.

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.

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.

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.[19] The Office could not provide verifiable data regarding the size of its pre-award backlog.

Estimated Audit Backlogs as of February 9, 2006:

Pre-award	500 [1]
Incurred cost	40
Construction cost	47
Administrative	17

[1] 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[1]	52	51	1
Incurred cost	1	0	1
Construction	25	7	18
Total	78	58	20

[1] 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 audits were issued 6 months to 2 years after the audit exit conference.

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.[20] 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.

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.

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	8	5	3
Total	16	9	7

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

- **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

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.

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

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.

The Office hopes to fill all of its vacancies by Jluy 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.

- 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 Wlashchin, 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

Victor M. Mendez
Director

David P. Jankofsky
Deputy Director

July 17, 2006

Debbie K. Davenport
Auditor General
2910 North 44th 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

Arizona Governor's Award for Quality
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 appropriates 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

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

Arizona Supreme Court—Administrative Office of the Courts—Information Technology and FARE Program