



# STATE OF NORTH CAROLINA

**PERFORMANCE AUDIT**

**NORTH CAROLINA DEPARTMENT OF  
TRANSPORTATION**

**HEAVY EQUIPMENT FLEET MANAGEMENT**

**SEPTEMBER 2010**

**OFFICE OF THE STATE AUDITOR**

**BETH A. WOOD, CPA**

**STATE AUDITOR**

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Beth A. Wood, CPA  
State Auditor

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September 20, 2010

The Honorable Beverly Perdue, Governor  
Members of the North Carolina General Assembly  
Eugene A. Conti, Jr., Secretary, North Carolina Department of Transportation

Ladies and Gentlemen:

We are pleased to submit this performance audit titled *North Carolina Department of Transportation Heavy Equipment Fleet Management*. The audit objective was to determine whether Department of Transportation policies and procedures provide reasonable assurance that underused or idle heavy equipment will be detected and corrective action taken. Eugene A. Conti, Jr. reviewed a draft copy of this report. His written comments are included in the appendix.

The Office of the State Auditor initiated this audit to identify improvement opportunities in heavy equipment fleet management.

We wish to express our appreciation to the staff of the Department of Transportation for the courtesy, cooperation, and assistance provided us during the audit.

Respectfully submitted,

A handwritten signature in cursive script that reads "Beth A. Wood".

Beth A. Wood, CPA  
State Auditor

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**SUMMARY**

**PURPOSE**

This audit report evaluates whether Department of Transportation (Department or DOT) policies and procedures provide reasonable assurance that underutilized or idle heavy equipment will be detected and corrective action taken. The report also makes recommendations so Department management can take appropriate corrective action.

**RESULTS**

Department of Transportation's policies and procedures do not provide reasonable assurance that underutilized or idle heavy equipment will be detected and corrective action taken. An analysis of DOT reports for approximately 2,300 pieces of heavy equipment,<sup>1</sup> costing around \$153 million, shows that more than half of those items were used less than 30% of the available time<sup>2</sup> between October 1, 2006, and September 30, 2009. Approximately one third of these pieces, costing \$56 million, were used less than 15% of the time during each year of the three-year period.

DOT could generate significant cash and reduce the amount of direct and overhead costs if it identified and disposed of underused equipment. Based on the average selling price over the past seven years, DOT could realize around \$3.5 million by selling half of the equipment (about 390 pieces) that was used less than 15% of the time during the year ending September 30, 2009.

Idle and seldom used equipment exist in part because the Department has not established a goal or expectation for heavy equipment usage rates. Furthermore, DOT lacks specific written policies and procedures that direct managers to identify and report underutilized equipment or instruct managers on what corrective action to take.

**RECOMMENDATIONS**

DOT management should establish performance measures or expectations for heavy equipment usage rates that would justify the cost associated with continued ownership. The Department should periodically review and adjust performance measures to increase efficiency and achieve departmental goals.

DOT management should develop written policies and procedures that clearly assign responsibility for identifying and reporting underused equipment. The Department should

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<sup>1</sup> The audit focused on six classes of heavy equipment used for road maintenance: excavators, tractors, backhoes, motor graders, loaders and dump trucks. These classes were chosen after consulting with DOT equipment managers because those classes were the most commonly used high-dollar-value classes of heavy equipment.

<sup>2</sup> Available time is considered to be 40 hour a week or 2,080 hours a year. Utilization rates were calculated by dividing the annual hours of actual use by available time (2,080 hours a year). Equipment use during emergency conditions (nights and weekends) is included in the actual use but does not increase the total available time.

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also develop written procedures to instruct managers on what corrective action to take when underused equipment is detected.

The Department should identify and dispose of underused equipment. Classes of equipment that are used less than defined minimum-use standards should be analyzed, by location, to identify the number of pieces that should be sold or transferred to other locations that need that type of equipment. Similarly, individual pieces of equipment that are routinely identified as idle or underutilized should be sold or transferred. Reasons for keeping underused equipment should be documented and approved by central managers.

The Department should provide training to all equipment managers in order to expand their knowledge in efficient fleet management practices. The Department should continue its efforts to obtain the Association of Equipment Manager Professionals fleet manager certification for all equipment superintendents.

### **AGENCY'S RESPONSE**

The Agency's response is included in the appendix.

## **INTRODUCTION**

### **BACKGROUND**

*North Carolina General Statute §136-18* assigns responsibility for maintaining the State's 80,000-mile highway system to the North Carolina Department of Transportation (Department or DOT). To meet its statutory responsibility, DOT owns, maintains, and manages a fleet of heavy equipment. The Department supplements its fleet on an as needed basis by renting heavy equipment from commercial rental businesses. The Fleet and Material Management Unit, a centralized unit within DOT's Highway Division, is charged with primary oversight of DOT's fleet of heavy road maintenance equipment.

After purchase, equipment is assigned to local DOT facilities within the 14 geographically clustered divisions in order to meet central and divisional road maintenance goals and objectives. Divisions, each headed by a Division Engineer and a Division Equipment Superintendent, are responsible for storing, scheduling, and maintaining their assigned fleet of heavy equipment. Each division performs an annual equipment needs and replacement assessment, at which time recommendations are made for disposals and new equipment purchases. Disposed equipment items are sold at auction or via surplus property, transferred to other facilities, or scrapped for used parts. All disposals and purchases require state level approval from the Fleet and Material Management Unit.

As of June 30, 2009, the Department held over 25,000 pieces of heavy equipment with an acquisition cost of approximately \$633 million.

### **OBJECTIVE, SCOPE, AND METHODOLOGY**

The audit objective was to determine whether Department of Transportation policies and procedures provide reasonable assurance that underused or idle heavy equipment will be detected and corrective action taken.

The Office of the State Auditor initiated this audit to identify improvement opportunities in heavy equipment fleet management.

The audit scope included a review of current fleet management practices and the use of equipment within six classes of DOT owned heavy equipment<sup>3</sup> between October 1, 2006, and September 30, 2009. We conducted the fieldwork from October 2009 to July 2010.

To determine current DOT fleet management procedures, we conducted interviews with Fleet and Material Management Unit personnel and division equipment managers and reviewed policies and procedures as they related to equipment use and fleet management. We also reviewed DOT management meeting minutes and Board of Transportation meeting minutes.

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<sup>3</sup>The audit focused on six classes of road maintenance heavy equipment: excavators, tractors, backhoes, motor graders, loaders and dump trucks.

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To determine current fleet management procedures in other states, we conducted internet research and interviewed DOT fleet managers in Virginia, Missouri and Texas.

To determine potentially underused or idle equipment, we analyzed DOT equipment utilization reports for six classes of DOT-owned heavy equipment for the three years ending September 30, 2009. These six classes (excavators, crawler tractors, backhoes, motor graders, loaders and dump trucks) were chosen after consulting with DOT equipment managers because those classes were the most commonly used high-dollar-value classes of heavy equipment.

The equipment utilization data we analyzed was available to Department management and equipment managers during the audited period. We did not verify or validate this data. Therefore, we do not conclude as to the exact amount of idle and underused equipment. However, we conclude that the Department had information available to it that indicated that some equipment was idle or used less than 15% of the time, and the Department did not take corrective action.

To determine the cost of the heavy equipment, we relied on cost information in DOT's fleet management records after reconciling the total to the Department's accounting and financial reporting system. To estimate the current value of the heavy equipment, we used DOT's average sale proceeds for excavators, tractors, backhoes, motor graders, loaders and dump trucks over the last seven years.

Because the sample of items analyzed is not intended to be statistically representative<sup>4</sup>, the results of our analysis cannot be projected to the entire (approximately 25,000 piece) heavy equipment fleet. The results of any analysis performed under this audit are restricted to the specific pieces of equipment selected for testing.

This report contains the results of the audit including findings and recommendations. Because of the test nature and other inherent limitations of an audit, together with limitations of any system of internal and management controls, this audit would not necessarily disclose all performance weaknesses or lack of compliance.

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

We conducted this audit under the authority vested in the State Auditor of North Carolina by *North Carolina General Statute 147.64*.

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<sup>4</sup> We judgmentally selected the six classes of heavy equipment after consulting with DOT equipment managers because those classes were the most commonly used high-dollar-value classes of heavy equipment.

## FINDINGS AND RECOMMENDATIONS

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### **DOT PROCEDURES DO NOT DETECT UNDERUSED AND IDLE HEAVY EQUIPMENT**

Department of Transportation's (DOT or Department) policies and procedures do not provide reasonable assurance that underutilized or idle heavy equipment will be detected and corrective action taken. An analysis of three years of DOT reports shows that more than half of items analyzed were used less than 30% of the available time<sup>5</sup> and some equipment was not used at all. The Department did not identify underused and idle equipment because DOT has not established a goal or expectation for heavy equipment usage rates that would justify the cost associated with continued ownership. Furthermore, DOT does not have specific written policies and procedures that direct managers to identify and report underutilized equipment or instruct managers on what corrective action to take.

### **DOT Reports Indicate Underused and Idle Equipment**

DOT has approximately 25,000 pieces of heavy equipment costing approximately \$633 million. Though DOT has not set minimal use rates or expectations, central equipment managers agreed during the audit that it would be reasonable to further investigate maintenance equipment utilization rates of less than 30%.

An analysis of DOT reports for approximately 2300 pieces of heavy equipment,<sup>6</sup> costing around \$153 million, shows that more than half of those items were used less than 30% of the available time between October 1, 2006, and September 30, 2009. Approximately one third of these pieces, costing \$56 million, were used less than 15% of the time during each year of the three-year period.

DOT reports indicate that some pieces of heavy equipment were not used at all. During the 12 months ending September 30, 2007, there were 274 pieces of heavy equipment (12% of items analyzed), with a cost of \$20.7 million, which were never used. There were 15 pieces of equipment, costing \$1.1 million, which sat idle during the entire three year period from October 1, 2006 to September 30, 2009.

Examining individual classes of equipment provides more insight into apparent underused and idle equipment. For example, of the 330 loaders analyzed, over 235 (71%) sat idle more than 70% of the time for the entire three-year period. During the year ending September 30, 2009, there were 270 loaders that sat idle 82% of the time. During the two years ending September 30, 2008, there were 54 loaders on DOT equipment yards that were never used.

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<sup>5</sup> Available time is considered to be 40 hour a week or 2,080 hours a year. Utilization rates were calculated by dividing the annual hours of actual use by available time (2,080 hours a year). Equipment use during emergency conditions (nights and weekends) is included in the actual use but does not increase the total available time.

<sup>6</sup> The audit focused on six classes of heavy equipment used for road maintenance: excavators, tractors, backhoes, motor graders, loaders and dump trucks. These classes were chosen after consulting with DOT equipment managers because those classes were the most commonly used high-dollar-value classes of heavy equipment.

## FINDINGS AND RECOMMENDATIONS

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In addition to the initial purchase price and ongoing depreciation expense, there are other costs to owning any piece of heavy equipment. DOT must pay for regular maintenance and other overhead costs in order to own any piece of machinery. Incurring these costs for seldom or never used items is not cost effective.

It would be impractical for DOT to dispose of all pieces of the equipment that have low utilization rates. In addition to scheduled maintenance projects, the Department stages back-up equipment throughout the state for emergency situations such as debris and snow removal after significant storms and to respond to unexpected road failures due to accidents or natural disasters.

Nevertheless, DOT could generate significant cash and reduce the amount of direct and overhead costs if it were to identify and sell underused equipment. Based on the average selling price of equipment within the six classes over the past seven years, DOT could realize around \$3.5 million in cash by selling just half of the equipment (about 390 pieces) identified as being used less than 15% of the time during the year ending September 30, 2009.

### **No Usage Goals or Expectations**

Idle and seldom used equipment exist because DOT has not established performance measures that define an efficient and productive level of equipment use. Though the data is available, no analysis has been conducted that looks at historical average use rates for classes of DOT owned maintenance equipment. Conducting such a trend analysis and comparing the results to average equipment use rates from DOT agencies in other states would provide management a baseline for establishing minimum use rates.

Managers are supposed to set performance goals and expectations and communicate the measures to the agency, activity, and individual level. The U.S. Government Accountability Office recommends the setting of performance measures and indicators so that management can compare actual performance to expected or planned goals, identify and investigate unexpected results, and take corrective action.

The Association of Equipment Management Professionals teaches Certified Fleet Managers that setting and comparing actual results to performance measures is an effective way to achieve greater efficiency<sup>7</sup>. Several other state DOT agencies adopted this valuable management control and have established or redefined equipment use goals and expectations. Within the past five years DOT agencies in Virginia, Missouri and Texas established minimum performance measures for heavy equipment use.

According to DOT management, the Department identified equipment utilization as an area in need of improvement in 2006, and began formulating a plan to increase

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<sup>7</sup> From The Career Equipment Fleet Manager manual published by the Association of Equipment Manager Professionals. The Certified Fleet Manager is a designation that DOT seeks for its managers of heavy equipment.

## FINDINGS AND RECOMMENDATIONS

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equipment utilization awareness and efficiency. In July 2009, DOT contracted with East Carolina University to analyze heavy equipment use and determine the point at which items in an asset class begin to cost more to retain than their projected market value. The Department states that one of the outcomes of the study will be a recommendation for minimum use standards for each equipment class. DOT managers also stated that this analysis was not conducted previously due to the lack of reliable historical equipment use data within its computerized fleet management system.

### **No Written Policies and Procedures**

Another reason idle and seldom used equipment exists is because the Department does not have written policies and procedures that direct managers to identify and report underutilized equipment or instruct managers on what corrective action to take if they suspect or detect underutilized equipment.

Central equipment managers stated that responsibility for monitoring and acting on low use rates lies at the division level. However, the responsibility for monitoring and acting on low use rates is not documented in written policy. Furthermore, DOT has not provided written guidance to assist division managers in defining inefficient use levels or specific steps to take if underused equipment is identified.

Government agencies should clearly assign authority and delegate responsibility to the proper personnel to manage organizational goals, objectives, and ensure general government accountability. The U.S. Government Accountability Office states that responsibility for decision-making should be clearly linked to the assignment of authority and that individuals should be held accountable.

Without clearly defined authority and responsibility to identify, report, and act upon underused or idle equipment, the Department likely retains underused or unneeded equipment in its heavy equipment fleet. Keeping underused and idle equipment in the fleet is inefficient, causing unnecessary expenses associated with storing and maintaining that equipment and preventing the Department from converting the asset to cash and using it for other priorities.

### ***Recommendation:***

DOT management should establish performance measures or expectations for heavy equipment usage rates that would justify the cost associated with continued ownership. The Department should periodically review and adjust performance measures to increase efficiency and achieve departmental goals.

DOT management should develop written policies and procedures that clearly assign responsibility for identifying and reporting underused equipment. The Department should also develop written procedures to instruct managers on what corrective action to take when underused equipment is detected.

## **FINDINGS AND RECOMMENDATIONS**

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The Department should identify and dispose of underused equipment. Classes of equipment that are used less than defined minimum use standards should be analyzed, by location, to identify the number of pieces that should be sold or transferred to other locations that need that type of equipment. Similarly, individual pieces of equipment that are routinely identified as idle or underutilized should be sold or transferred. Reasons for keeping underused equipment should be documented and approved by central managers.

The Department should provide training to all equipment managers in order to expand their knowledge in efficient fleet management practices. The Department should continue its efforts to obtain the Association of Equipment Manager Professionals fleet manager certification for all equipment superintendents.

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## Auditor's Response

It is the intent of the Office of the State Auditor that the Governor, the General Assembly, and the citizens of North Carolina receive only complete and accurate information from the reports issued by this office. Therefore, we are required to provide additional explanation when an agency's response could potentially cloud an issue, mislead the reader, or inappropriately minimize the importance of our findings.

Additionally, Generally Accepted Government Auditing Standards state,

When the audited entity's comments are inconsistent or in conflict with the findings, conclusions, or recommendations in the draft report, or when planned corrective actions do not adequately address the auditor's recommendations, the auditors should evaluate the validity of the audited entity's comments. If the auditors disagree with the comments, they should explain in the report their reasons for disagreement.

To ensure the availability of complete and accurate information and in accordance with Generally Accepted Government Auditing Standards, we offer the following clarification.

In response to audit recommendation #3, Department of Transportation (Department) management notes, "The department disposed of approximately 3,900 pieces of equipment which sold for approximately \$15.5 million during the years represented by the audit."

It is important for readers of this report to understand that the 3,900 pieces of equipment the Department reports as sold were from the total heavy equipment fleet of almost 300 categories, not just the six categories (2,300 pieces) analyzed in this report. The Department's response to our recommendation does not make this distinction. Readers of this report should not assume that the disposal of 3,900 pieces of equipment was solely from the six classes of equipment referenced in the audit report.

The Governor, Legislators, and the citizens of North Carolina should consider the clarification provided above when using this report to evaluate the Department of Transportation's heavy equipment fleet management and holding government managers accountable for their programs.

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STATE OF NORTH CAROLINA  
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE  
GOVERNOR

1501 MAIL SERVICE CENTER, RALEIGH, N.C. 27699-1501

EUGENE A. CONTI, JR.  
SECRETARY

September 7, 2010

The Honorable Beth A. Wood  
State Auditor  
Office of State Auditor  
20601 Mail Service Center  
Raleigh, North Carolina 27699-0601

Dear Ms. Wood:

Thank you for sharing the results of your recent audit regarding the North Carolina Department of Transportation (NCDOT) Heavy Equipment Fleet Management. Per your request please find below our response to your audit recommendations.

**AUDIT RECOMMENDATION #1:** DOT management should establish performance measures or expectations for heavy equipment usage rates that would justify the cost associated with continued ownership. The Department should periodically review and adjust performance measures to increase efficiency and achieve departmental goals.

**NCDOT RESPONSE:** NCDOT agrees with your recommendation to establish measures or expectations for heavy equipment. Currently, NCDOT has general measures and expectations for equipment useful life and replacement.

NCDOT contracted with East Carolina University in July 2009 to perform research to develop data driven equipment management measures. The scope of the project is to deliver optimal utilization targets and disposal points for 6 major categories of equipment, covered by the audit, as well as an algorithm that can be applied to the remaining 296 equipment types with the department's fleet. The results of this research will also allow NCDOT to periodically review and refine our targets and metrics for managers responsible for equipment decisions. Until this study is completed, I have directed we establish a 50 percent utilization goal for all of our managers annual performance objectives. Once the study is complete we will revise our performance objectives as indicated by the study results. We anticipate the study to be completed by October 1, 2010.

**AUDIT RECOMMENDATION #2:** DOT management should develop written policies and procedures that clearly assign responsibility for identifying and reporting underused equipment. The Department should also develop written procedures to instruct managers on what corrective action to take when underused equipment is detected.

**NCDOT RESPONSE:** NCDOT agrees policy and procedures are necessary to ensure proper management. We currently have general policy and procedures outlined in our Fleet and Material Management Manual. The results of the research mentioned above will enable NCDOT to enhance our policy and procedures specifically related to equipment utilization to ensure the most efficient and economical equipment management.

**AUDIT RECOMMENDATION #3:** The Department should identify and dispose of underused equipment. Classes of equipment that are used less than defined minimum use standards should be analyzed, by location, to identify the number of pieces that should be sold or transferred to other locations that need that type of equipment. Similarly, individual pieces of equipment that are routinely identified as idle or underutilized should be sold or transferred. Reasons for keeping underused equipment should be documented and approved by central managers.

**NCDOT RESPONSE:** NCDOT agrees that underused equipment needs to be assessed and disposed of when appropriate. Consideration for disposal is underuse, as well as emergency response needs related to snow, ice, and hurricanes. The process of review and disposal is not new to NCDOT. The department disposed of approximately 3900 pieces of equipment which sold for approximately \$15.5 million during the years represented by the audit. However, we have begun the process of reviewing each individual piece of equipment contained in the audit to determine if any piece should be disposed of or transferred. Additionally, I have directed an immediate review by the State Highway Administrator of any piece of equipment not utilized in the last year to determine if the equipment needs to be sold or reassigned. Any equipment not utilized and kept will have to be certified by the State Highway Administrator to remain in the NCDOT equipment fleet for safety or operational measures. From this point forward monthly reporting of utilization will be provided to division engineers, maintenance engineers, and equipment managers. Annual reporting will also be distributed to these engineers and any piece of equipment with less than 15 percent utilization will have to be certified by the State Highway Administrator to remain in the fleet. The process and targets for disposal and transferring of equipment will be adjusted as appropriate upon completion of the research results mentioned in items 1 and 2 above.

**AUDIT RECOMMENDATION #4:** The Department should provide training to all equipment managers in order to expand their knowledge in efficient fleet management practices. The Department should continue its efforts to obtain the Association of Equipment Manager Professionals (AEMP) fleet manager certification for all equipment superintendents.

**NCDOT RESPONSE:** NCDOT agrees training is necessary to ensure proper equipment management. Previous training has focused on equipment expense and equipment useful life. Future training will be provided to educate the field division staff on the cost of ownership and on "right sizing" the fleet. Each major piece of equipment will be expected to reach the target utilization level. If justification cannot be provided for not meeting those targets, then a decision will be made to transfer or sell the equipment. NCDOT will continue its effort to contract for training in the area of Fleet Management. The plan includes partnering with a community college and the AEMP to provide course work leading to an associate's degree in fleet

The Honorable Beth A. Wood  
September 7, 2010  
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management as well as the AEMP Fleet Manager Certification. Meetings will be held within the month to complete this process. Training will begin with the January 2011 semester.

The Department of Transportation appreciates your efforts to help us improve. We will use your audit results along with our previous and current efforts to improve equipment management at NCDOT. If you have any questions or would like to discuss this further, please let me know.

Sincerely,

A handwritten signature in black ink that reads "Eugene A. Conti, Jr." in a cursive script.

Eugene A. Conti, Jr.

EAC/LL/lj

cc: Jim Trogdon, P.E., Chief Operating Officer  
Bruce Dillard, Inspector General  
Terry Gibson, P.E., State Highway Administrator  
Jon Nance, P.E., Chief Engineer of Operations  
Lacy Love, P.E., Director of Asset Management  
Drew Harbinson, Director of Fleet and Material Management

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