



STATE OF NORTH CAROLINA

PERFORMANCE AUDIT

DEPARTMENT OF TRANSPORTATION

HIGHWAY PROJECT SCHEDULES AND COSTS

FEBRUARY 2008

OFFICE OF THE STATE AUDITOR

LESLIE W. MERRITT, JR., CPA, CFP

STATE AUDITOR

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February 7, 2008

The Honorable Michael F. Easley, Governor
Members of the North Carolina General Assembly
Mr. Lyndo Tippett, Secretary of the Department of Transportation

Ladies and Gentlemen:

We are pleased to submit this performance audit entitled *Department of Transportation - Highway Project Schedules and Costs*. The objective of the audit was to determine the extent to which Transportation Improvement Program highway projects are having schedule delays and cost increases and the major categories contributing to these problems. Mr. Tippett has reviewed a draft copy of this report. His written comments are included in Appendix H of the report. The attachments referenced in his written comments can be obtained on the Office of the State Auditor public web page.

This audit was initiated by the Office of the State Auditor in response to ongoing legislative, media, and public concerns regarding perceived highway construction schedule and cost overages.

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 black ink that reads "Leslie W. Merritt, Jr." in a cursive script.

Leslie W. Merritt, Jr., CPA, CFP
State Auditor

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PERFORMANCE AUDIT

SUMMARY

PURPOSE

This audit report determines the extent to which Transportation Improvement Program highway projects are having schedule delays and cost increases and the major categories contributing to these problems. The report identifies weaknesses and makes recommendations for management to improve performance.

RESULTS

The Department of Transportation (DOT or Department) is not successfully meeting planned start of construction schedules. Overall, 73% of the 390 highway projects audited missed the targeted construction start year, with 40% of projects missing the mark by more than a year. The majority of these delays were due to the permitting process, environmental reviews, and design changes. Had DOT awarded delayed projects according to the planned schedules, the Department could have saved inflation related construction costs of \$152.4 million. The impact of inflation on highway construction is also evident in the \$85.9 million projected savings associated with 23 accelerated projects.

The DOT is not meeting construction schedules and costs. Of the 390 highway projects audited, the construction work extended 21% beyond the original schedules, and payments to contractors were 7% above the original contracts. Of 100 projects sampled, the largest classifications of schedule overages were design revisions and pro rata days. The largest classifications of cost overruns were construction materials requirements that exceeded contract specifications (pay items) and design revisions.

DOT preconstruction and construction sections manage projects separately and without comprehensive project management oversight. The Department does not assess combined preconstruction and construction delivery performance at project completion. The preconstruction and construction schedules of 62% of the 390 highway projects audited were delayed more than 12 months. Actual costs exceeded the inflation adjusted Transportation Improvement Program (TIP) estimated amounts by 59%.

The structure of the Department's data retention systems does not facilitate timely gathering and analysis of performance indicators. Collecting the data for this audit was cumbersome in some areas, and impractical in others. In the end, planned comparisons of right of way estimates to actual costs were not performed because the needed data was missing, and comparisons of planned costs to actual costs for segmented projects were not performed because some direct costs were not allocated.

The Department is deficient in key performance management control activities and is not meeting fundamental management accountability requirements. DOT management does not have meaningful and reliable highway performance objectives and measures.

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RECOMMENDATION

The Department of Transportation should develop meaningful and reliable highway performance indicators and measures for preconstruction, construction, and overall project delivery. Management should gather relevant and reliable information. Systems and controls should provide performance results in a timely manner. Management should regularly analyze results of performance data for variances, trends, root causes, and relationships. Managers should apply results from their analyses in budgetary, decision making, and improvement processes.

We recognize that in 2001, DOT, in conjunction with federal and State regulatory agencies, implemented streamlined environmental and permitting processes to improve preconstruction schedule performance. Permitting and environmental activities for most of the highway projects in our audit occurred prior to 2001. Consequently, we are unable to determine if the permitting and environmental streamlining initiative is having a positive effect on preconstruction schedule performance. DOT anticipates reporting results of this process improvement effort beginning in April 2008.

AGENCY'S RESPONSE

The Agency's response is included in Appendix H. Attachments referenced in the written comments can be obtained on the Office of the State Auditor public web page.

INTRODUCTION

BACKGROUND

This audit report determines the extent to which Transportation Improvement Program (TIP) highway projects are having schedule delays and cost increases and the major categories contributing to these problems. The report identifies weaknesses and makes recommendations for management to improve performance in highway design and construction.

The North Carolina Board of Transportation (Board) biennially approves North Carolina's TIP. The TIP contains funding and schedule estimates for project right of way acquisition and start of construction in consideration of expected funding availability. DOT managers monitor the Board approved TIP schedule to coordinate and request funding for preconstruction activities (e.g. environmental impact studies and design activities) in order to meet the projects' scheduled start of construction.

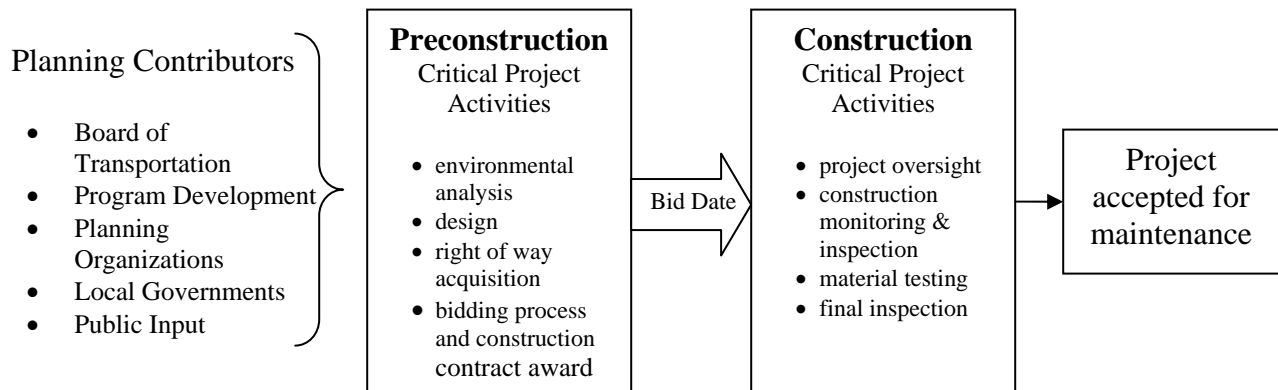
As preconstruction activities near the actual start of construction, DOT sets the construction contract time table, prepares the official engineer's estimate for the contract, and develops the contract bid package. DOT evaluates bids and awards the contract to the Board approved lowest bidder. Over the last five years, DOT awarded an average of \$981 million in construction contracts per year.

After DOT awards the highway construction contract, construction management activities begin. The DOT engineers and inspectors oversee construction activities performed by the contractor. Payments are made to the contractor as work is completed and verified by DOT inspectors.

Construction and contractor issues are primarily addressed during the construction phase. DOT and the contractor often execute agreed upon change orders that may adjust the original contract period, work to be performed, and payments to contractors. Once highway construction is successfully completed, a final inspection is made, and the project is accepted for State maintenance.

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The diagram below displays a snapshot of the highway project process.



OBJECTIVE, SCOPE, AND METHODOLOGY

The objective of the audit was to determine the extent to which Transportation Improvement Program (TIP) highway projects are having schedule delays and cost increases and the major categories contributing to these problems.

This audit was initiated by the Office of the State Auditor in response to ongoing legislative, media, and public concerns regarding perceived highway construction schedule and cost overages.

The scope of this audit includes all 390 TIP highway projects contractually completed between April 1, 2004 and March 31, 2007. This number also includes projects contractually scheduled to be completed during that timeframe, which were not fully completed by March 31, 2007.

To accomplish our objective, we collected project specific data from various DOT databases and documents, tested the reliability of the electronic data collected, and compared planned schedule and cost estimates to actual results. We selected a random sample of 100 of the 390 TIP highway projects to determine the underlying categories of the variances between planned and actual results. Due to the relatively small sample size, we were unable to make a statistical projection to the 390 projects in our scope. During our audit, we also interviewed DOT personnel, DOT Board members, legislators and Federal Highway Administration personnel.

In order to identify the appropriate preconstruction schedules and costs, it was necessary to define the project start date. In our discussions with DOT management, we came to consensus that the Board authorized preliminary engineering funding date is the start of preconstruction. We used this date to identify the applicable published TIP and to capture the planned schedules and costs for each project. We captured construction schedules and costs from the awarded construction contracts.

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

This report contains the results of the audit including conclusions and recommendations. Specific recommendations related to our audit objective are reported. Because of the test nature and other inherent limitations of an audit, together with the limitations of any system of internal and management controls, this audit would not necessarily disclose all weaknesses in the systems or lack of compliance.

We conducted the fieldwork from April 2007 to October 2007. We conducted this audit under the authority vested in the State Auditor of North Carolina by Section 147-64.6 of *North Carolina General Statutes*.

FINDINGS AND RECOMMENDATIONS

1. DOT IS NOT SUCCESSFULLY MEETING PLANNED PRECONSTRUCTION SCHEDULES

The Department of Transportation (DOT or Department) is not successfully meeting the planned start of construction schedules. Overall, 73% of the 390 highway projects audited missed the targeted start of construction year, with 40% of these projects missing the mark by more than one year. The majority of these delays were due to permitting, environmental reviews, and design changes. Had DOT awarded delayed projects according to the planned schedules, the Department could have saved inflation related construction costs of \$152.4 million.

Delays in the preconstruction schedule lead to the postponement of construction start, which ultimately affects the opening of the highway to traffic. Schedule delays lead to a variety of issues such as traffic congestion, increased pollution, safety issues, and increased project costs resulting from inflation.

Overall Preconstruction Analysis

DOT could have saved inflation related construction costs of \$152.4 million had it awarded the 286 delayed projects according to the planned schedules. The impact of inflation on highway construction is also evident in the \$85.9 million projected savings associated with 23 accelerated projects.

We analyzed the variance between the planned and actual start of construction for 390 highway projects completed or contractually scheduled to be completed between April 1, 2004 and March 31, 2007. For this analysis, we used the planned start of construction year in the Transportation Improvement Program (TIP) at the time funding for preconstruction was authorized to determine the planned preconstruction schedule.

On average, preconstruction activities took 66 months to complete. While some schedule delays are expected, 40% of the 390 highway projects had schedule delays greater than 12 months. The average delay of these projects was 18 months or 27% of the average preconstruction duration. To quantify the cost of schedule delays, we computed inflation costs or savings from the planned start of construction to the actual start of construction for each of the 390 projects.

We examined the schedule delays by project type and found that delays of more than 12 months were most common in bridge and rural projects. Preconstruction schedules for rural and bridge replacement projects were delayed more than 12 months approximately 44% of the time. Interstate and urban projects were delayed more than 12 months approximately 28% of the time (see Appendix A).

Reasons for Schedule Delays During Preconstruction

The Department does not focus efforts on categorizing the nature of delays and does not accumulate and analyze reasons for schedule delays in order to make process improvements.

FINDINGS AND RECOMMENDATIONS

We measured and analyzed the schedule variances for a random sample of 100 projects from the 390 highway projects. By accumulating and examining documents for the 417 DOT schedule changes, we identified 17 categories of schedule delays representing 1,747 months of schedule delays.

Overall, 60% of the 417 schedule changes and 54% of the 1,747 months of delay noted in the 100 sampled projects are related to the permitting process, environmental reviews, and design changes. On average, each environmental review delay translated to a five-month delay in schedule. Each permitting process and design change delayed the project an average of three months. Five delays representing a total of 60 months were undocumented¹ (see Appendix B).

In 2001, DOT, in conjunction with federal and State regulatory agencies, implemented streamlined environmental and permitting processes to improve preconstruction schedule performance. Permitting and environmental activities for most of the highway projects in our audit occurred prior to 2001. Consequently, we are unable to determine if the permitting and environmental streamlining initiative is having a positive effect on preconstruction schedule performance. However, our report does provide DOT with historical performance results in the permitting processes and environmental reviews categories that the Department can compare streamlined results against. DOT anticipates reporting quarterly results of this process improvement effort beginning in April 2008.

Recommendation: The Department of Transportation should classify and accumulate details related to schedule delays experienced during preconstruction. Managers should periodically review results, identifying categories with the greatest frequency and amount of schedule delay for further analysis. Efforts should be made to understand root causes of delays so that preventative or corrective action plans can be formulated and put in place. Results of historical performance, including relationships between performance and project characteristics should be understood and used to more accurately predict future preconstruction schedules.

2. DOT IS NOT SUCCESSFULLY MEETING PLANNED CONSTRUCTION SCHEDULES AND COSTS

The Department of Transportation (DOT or Department) is not meeting construction schedules and costs. Of the 390 highway projects audited, the construction work extended 21% beyond the original schedules, and payments to contractors were 7% above the original contracts. Of 100 projects sampled, the largest classifications of schedule overages were design revisions and pro rata days. The largest defined classifications of cost overruns were construction material requirements beyond the contract specifications (pay items) and design revisions.

¹ DOT could not provide recorded schedule change information for these projects.

FINDINGS AND RECOMMENDATIONS

Overall Construction Analysis

The schedule overages between the original contracts and actual workdays totaled 1,573 months, a 21% increase above the original schedules. The difference between the original contract price and payments to contractors totaled \$221 million, a 7% increase above the original budgets. Our analysis revealed that 65% of the 390 highway projects did not meet the original contract schedule, and 61% came in above original contract cost.

We analyzed the schedule and cost variances for 390 highway projects completed or contractually scheduled to be completed between April 1, 2004 and March 31, 2007. During our analysis, we also noted that interstate projects have the largest schedule and cost overages, and projects located in urban divisions have greater schedule and cost overages than rural divisions (see Appendix C).

Reasons for Schedule and Cost Overages During Construction

We examined supporting documentation for a random sample of 100 projects from the 390 highway projects audited. During our analysis, we identified 10 additional variance categories outside established DOT classifications. We assigned noted variances to a single category.

Of the 556 months of total schedule overage, 62% of overages noted within in our sample of 100 projects are categorized as pending², design revisions, or extra days required installing additional construction materials (pro rata days) (see Appendix D). The categories with the largest average schedule overages are project close-outs (1.7 months), DOT administrative issues (1 month), and design revisions (0.5 month).

Of the \$100 million of cost overruns noted within our sample of 100 projects, 61% are due to a difference in quantity or quality of materials required to build the highway project (pay items), design revisions, and revised project scope (see Appendix D). The categories with the largest average cost overruns are revised project scope (\$106,000 per instance) and design revisions (\$77,000 per instance).

Recommendation: The Department of Transportation should classify and accumulate details related to schedule and cost overages. Managers should periodically review results, identifying categories with the greatest frequency and amount of schedule and cost overages for further analysis. Efforts should be made to understand root causes of variances so that preventative or corrective action plans can be formulated and put in place. Results of historical performance, including relationships between performance and project characteristics, should be understood and used to more accurately predict future contract schedules and costs.

² This category represents calendar days beyond the original contract date that have not yet been included in a DOT approved change order or final settlement agreement. These days will be included in a future change order, final settlement agreement, or determined to be contractor performance related.

FINDINGS AND RECOMMENDATIONS

3. DOT DOES NOT MANAGE PRECONSTRUCTION AND CONSTRUCTION ACTIVITIES JOINTLY

The Department of Transportation (DOT or Department) preconstruction and construction sections manage projects separately and without comprehensive project management oversight. Furthermore, the Department does not assess the combined preconstruction and construction delivery performance at project completion. Without quantified results, management can not assess or report overall schedule and cost performance.

Schedule Analysis

DOT approaches highway delivery in two distinct phases - preconstruction and construction. To accurately assess schedule performance of highway project delivery, it is necessary to perform a combined analysis. This will allow management and stakeholders to see highway delivery performance in its entirety.

Preconstruction delays of greater than 12 months occurred in 40% of the 390 Transportation Improvement Program (TIP) highway projects completed between April 2004 and March 2007. Delays of greater than 12 months during the *construction* phase occurred in 26% of those same projects.

However, in analyzing the 390 projects from the beginning of preconstruction through the end of construction, 62% of highway projects were delayed more than 12 months, including 13 projects that were delayed more than 72 months. On average, project schedules were delayed 23 months during the combined preconstruction and construction periods. The average schedule delays and extensions represent 26% of the actual time needed to design and build the 390 highway projects (see Appendix E).

Cost Analysis

To accurately assess total cost performance of highway project delivery, it is necessary to perform a combined cost analysis of preconstruction and construction. Payments to contractors for the 390 highway projects exceeded contract prices by 7%. However payments to contractors are only one part of the total cost for TIP highway delivery. Costs for TIP highway projects also include preliminary engineering costs, right of way costs, and construction costs outside of payments to contractors. For the 292 projects analyzed for total cost performance, actual results exceeded inflation adjusted planned costs by 59% (see Appendix E).

DOT often divides larger projects into smaller segments for actual construction. In total, 98 of the 390 highway projects audited were segmented projects. Captured cost data for these projects were determined to be unusable for performance analysis purposes. We compared the TIP planning amounts in effect at the start of preconstruction activities to actual costs for the remaining 292 projects. For the 292 projects, actual costs exceeded

FINDINGS AND RECOMMENDATIONS

the inflation adjusted TIP estimated amounts³ by \$478.5 million or 59%. The greatest variance in planned versus actual costs occurred in right of way, with actual costs exceeding inflation adjusted planned amounts by 77%. These overages would be even greater if actual costs were adjusted for inflation⁴.

Recommendation: The Department of Transportation should develop and implement an appropriate project management program and facilitate comprehensive oversight from conception to completion. Assigning responsibility for overall highway delivery performance to units and individuals should reduce delays and cost overruns. Individual delays and overruns that do occur should be categorized for further analysis. Department managers should perform post-project analyses in order to measure individual and collective project schedule and cost performance against established targets and historical performance. Results should be used to update schedule and cost forecasting models. Having accurate estimates is essential as decision makers try to balance highway needs and resources.

4. DATA RETENTION SYSTEMS DO NOT FACILITATE MANAGEMENT ANALYSIS

The Department of Transportation (DOT or Department) data retention systems do not facilitate timely gathering and analysis of performance data. Collecting the data for this audit was cumbersome in some areas, and impractical in others. In the end, planned comparisons of right of way estimates to actual costs were not performed because the needed data was missing, and comparisons of planned costs to actual costs for segmented projects were not performed because the actual cost data was determined to be unreliable.

Management Responsibilities

A lack of relevant and complete data is a significant weakness in management's ability to plan and control operations. Management is responsible for establishing and maintaining a control system that allows management, as well as employees, to detect and correct impairments to the effectiveness and efficiency of operations while performing their assigned duties. Management's responsibility also includes implementing controls that provide assurance that financial and operational information used for reporting and decision making is available and reliable.

Data Gathering and Analysis

Operations and performance data were not readily available. Accumulating data for these analyses was time consuming and required frequent verification of data. Early in the

³ The TIP does not specify the preliminary engineering costs by project. For TIP planning, DOT uses 10% of right of way and construction estimates for preliminary engineering funding. We applied the same 10% estimate to determine planned preliminary engineering costs. TIP estimated costs were brought forward to 2006 base year dollars using the Consumer Price Index (CPI).

⁴ Actual total project costs were not brought forward to 2006 base year dollars due to the complexities in making that calculation. The point that actual costs significantly exceed planned costs is made without making those time consuming calculations.

FINDINGS AND RECOMMENDATIONS

audit, we met with DOT managers to describe our objective, agree upon the appropriate measurement points, determine which computer or file system held the data, and how it could best be retrieved. We also sought to identify which hard documents were available to support dates, estimates and costs as well as what documentation existed to explain any noted variances. DOT managers acknowledged that retrieving the needed data would be challenging because each functional area is responsible for its own operations and generally maintains the supporting project information within that area. While most of the data was retrievable, it came in a wide variety of formats with much of it only available in printouts.

Right of Way Estimates Were Not Available

We were unable to perform comparison and analysis of right of way estimates. We planned to compare final right of way estimates to actual costs in order to determine the accuracy of the estimates. We planned to analyze the results further in order to determine if a relationship existed between the size of noted variances and a particular project characteristic (e.g. type, geographic area). While right of way estimates are required for most highway projects, the estimates and supporting documents could only be produced for a handful of selected projects.

Some Total Costs Are Not Complete

Making planned to actual costs comparisons for segmented projects was impractical. Larger highways can take years, even decades, to plan and build. As these projects move through the planning and designing phases, DOT often breaks the project down into smaller segments for actual construction. These segments are then identified by DOT as individual highway projects in the Transportation Improvement Program.

Costs incurred prior to the decision to break a larger project into smaller segments (mostly planning, design, and right of way costs) are not assigned to the smaller projects in DOT's accounting system. We also noted an instance where paving costs for two segmented projects were captured in the accounting system in a single segmented project. Consequently, identifying and properly reallocating costs associated with a particular segment would require significant assumptions and research, thus this comparison was not pursued for 98 of the 390 highway projects audited.

Because relevant and complete performance data is not readily available, the Department can not perform these types of analyses on an on-going basis. Consequently, the DOT is missing the opportunity to identify areas where improvements can have the greatest impact for delivering quality highway products on time and on budget.

Recommendation: Management should establish a process to gather relevant and reliable information needed for performance analysis and reporting. Systems and controls should provide performance related data and information in a timely way that allows managers to regularly gauge performance and analyze results. Managers should ensure that needed performance data is available and reliable.

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Because the data needed for meaningful performance measurement and analysis comes from many functional areas and systems, DOT should task a dedicated workgroup to identify the appropriate underlying sources of performance data and develop a computerized method for extracting and reporting the results to DOT managers and the general public. The Office of Information Technology Services owns licenses of software designed to accomplish this task. DOT managers should explore that option as they determine the best course of action for resolving this finding.

5. DOT LACKS HIGHWAY DELIVERY PERFORMANCE OBJECTIVES AND MEASURES

The Department of Transportation (DOT or Department) is deficient in key performance management control activities and is not meeting fundamental management accountability requirements. DOT management does not have meaningful and reliable highway performance objectives and measures.

Management Responsibilities

A lack of performance measures and indicators limits management's ability to identify poor performance and make improvements. Establishing and maintaining performance indicators and measures allows managers at the agency and activity levels to regularly review and compare actual performance against pertinent mission oriented objectives, historical performance, and benchmarks. Deviations from performance targets, unusual trends, and the relationships between different data elements can be analyzed in order to fully understand root causes and to assist in the development of corrective actions where necessary.

Department and functional managers have a responsibility for establishing and maintaining effective controls that ensure appropriate goals and objectives are met and that resources are used efficiently, economically, and effectively. Management is also responsible for providing timely and appropriate performance reports to those who oversee work activities as well as the public.

DOT Environment

The Department lacks meaningful schedule and cost performance indicators, measures, and analyses. The Department does not produce performance measurement reports that capture the nature, magnitude or concentration of schedule and cost variance categories. In addition to not meeting its management responsibilities, the Department is missing opportunities to focus improvement efforts where they can be most effective and minimize schedule delays and cost overruns.

If DOT had an established management control system with performance indicators and analyses, it would have detected that 286 of the 390 highway projects completed between April 2004 and March 2007 missed the targeted year of construction, costing the Department \$152.4 million in inflationary costs. DOT analysis of Transportation Improvement Program (TIP) planned costs to actual costs would have detected that actual costs were 59% higher than inflation adjusted planned costs. Understanding the results of

FINDINGS AND RECOMMENDATIONS

these and other key performance measures should trigger management action to identify root causes, develop improvement processes, and develop more accurate schedule and cost estimates for managers and decision makers.

In recent years, the Department has considered some performance measures. For example, the Construction Division has worked to develop meaningful performance goals and measures for scheduling and cost. These measures and targets are still in draft status and have not been formally adopted.

The few schedule and costs measures available for management decision making have limited value, as they are focused on isolated areas. For example, the Department annually compares the number of preconstruction projects scheduled to be bid on in the prior year to those projects that were actually released for bidding. Schedule delays experienced earlier in the preconstruction process are not captured in this analysis. Even then, the average success rate of bids awarded in the revised start of construction year over the last five years is 61%, and was only 41% in 2006. Another DOT measurement is the amount of contract dollars awarded compared to the DOT estimated award amount. While this measurement provides insight into cash management results, it does not provide information on highway project schedule or cost performance.

The lack of performance management practices has been pointed out to DOT before. In 1998, an external performance review found that the department lacked a standard set of highway performance measures. A similar finding was documented in 2004 during the Dye Management Group's assessment of the Department. In 2007, a legislative initiated follow-up to the 2004 study found only limited progress had been made in implementing performance management recommendations. In addition, the internally initiated 2007 McKinsey & Company report identified the need for performance targets and indicators designed to improve accountability and efficiency for TIP projects (see Appendix F).

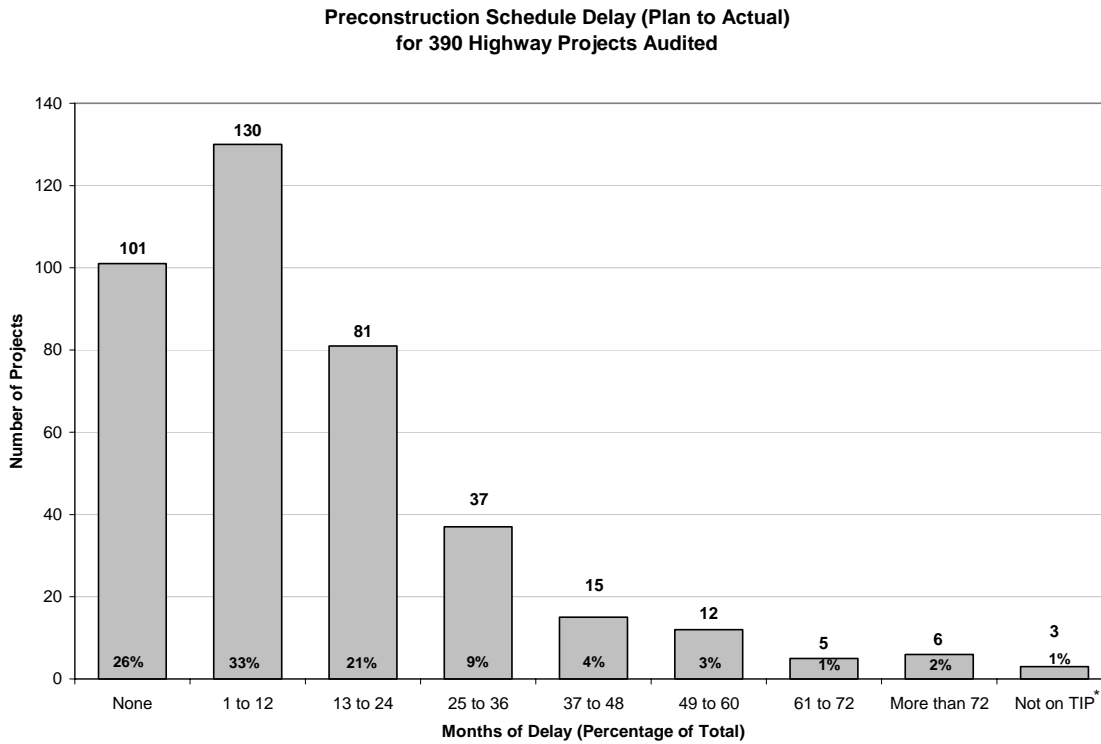
Other state departments of transportation measure and report performance results. Washington, Florida, South Carolina, and Virginia have performance measures for schedules and costs of highway projects and routinely report these results. The Virginia Department of Transportation (VDOT) in particular has an easy to understand performance reporting system. Reports available on the VDOT website indicate steady schedule and cost performance improvements since implementation of its performance management program.

Recommendation: The Department of Transportation should develop meaningful and reliable highway performance objectives, measures and indicators for preconstruction and construction schedules and costs. Results should be compared to established goals, as well as the results of prior periods, and should be reported internally and externally. Management should analyze results for variances, trends, and relationships and use them in budgetary, decision making, and improvement processes.

APPENDIX A

Preconstruction Analysis

This graph represents the schedule delays in preconstruction activities from the planned to actual start of construction dates for the 390 projects.



*A preliminary engineering authorized funding date could not be determined for these projects.

APPENDIX A

This table represents the schedule delays in preconstruction activities from the planned to actual start of construction date for the 390 projects by project type.

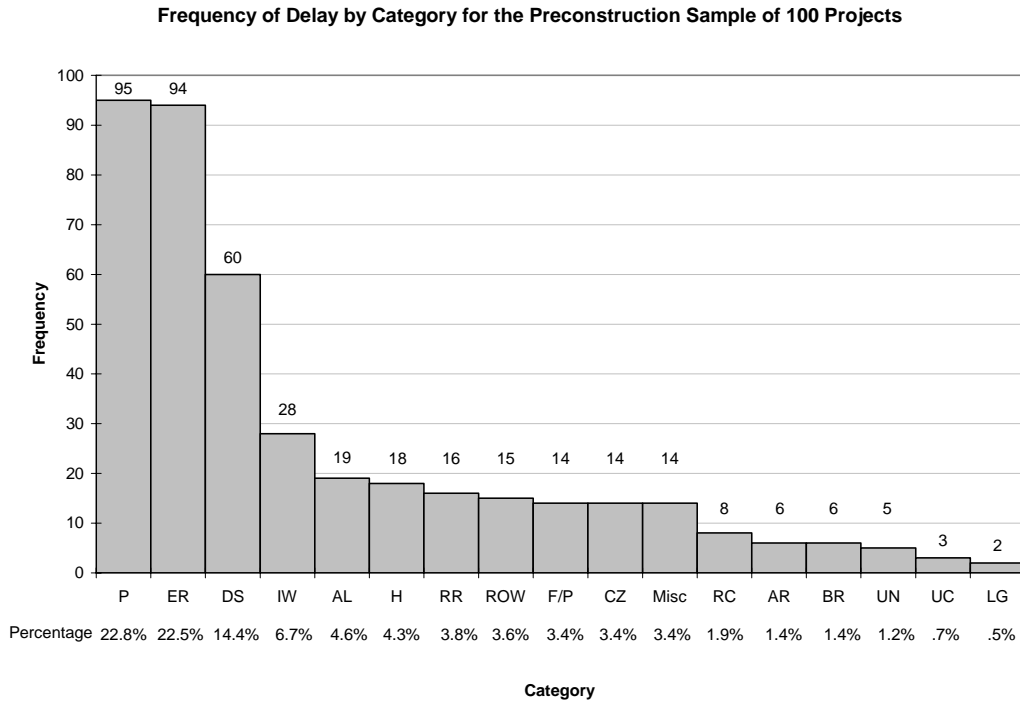
Preconstruction Schedule Delays (Plan to Actual) by Project Type				
Project Type	Months of Schedule Delays	Count	Percent	Percent of Projects with Greater than 12 Months of Delay
Bridge Replacement (B)	None	39	18%	} 43%
	1 to 12	87	39%	
	13 to 24	53	24%	
	25 to 36	25	11%	
	37 to 48	11	5%	
	49 to 60	3	1%	
	61 to 72	3	1%	
	More than 72	2	1%	
	Total	223	100%	
Interstate (I)	None	15	42%	} 30%
	1 to 12	7	20%	
	13 to 24	3	9%	
	25 to 36	3	9%	
	37 to 48	1	3%	
	49 to 60	2	6%	
	61 to 72	0	0%	
	More than 72	1	3%	
	Not listed in TIP*	3	8%	
Total	35	100%		
Rural (R)	None	29	36%	} 45%
	1 to 12	15	19%	
	13 to 24	20	25%	
	25 to 36	6	8%	
	37 to 48	2	3%	
	49 to 60	4	5%	
	61 to 72	1	1%	
	More than 72	2	3%	
Total	79	100%		
Urban (U)	None	16	31%	} 28%
	1 to 12	21	41%	
	13 to 24	5	10%	
	25 to 36	3	6%	
	37 to 48	1	2%	
	49 to 60	3	6%	
	61 to 72	1	2%	
	More than 72	1	2%	
Total	51	100%		
Special (X)	None	2	100%	
Total Projects		390	100%	

*A preliminary engineering authorized funding date could not be determined for these projects.

APPENDIX B

Preconstruction Categorical Analysis

The chart below displays the frequency (number of occurrences) for each category for the sample of 100 projects. The percentages listed at the bottom represent the percentage of total frequency.



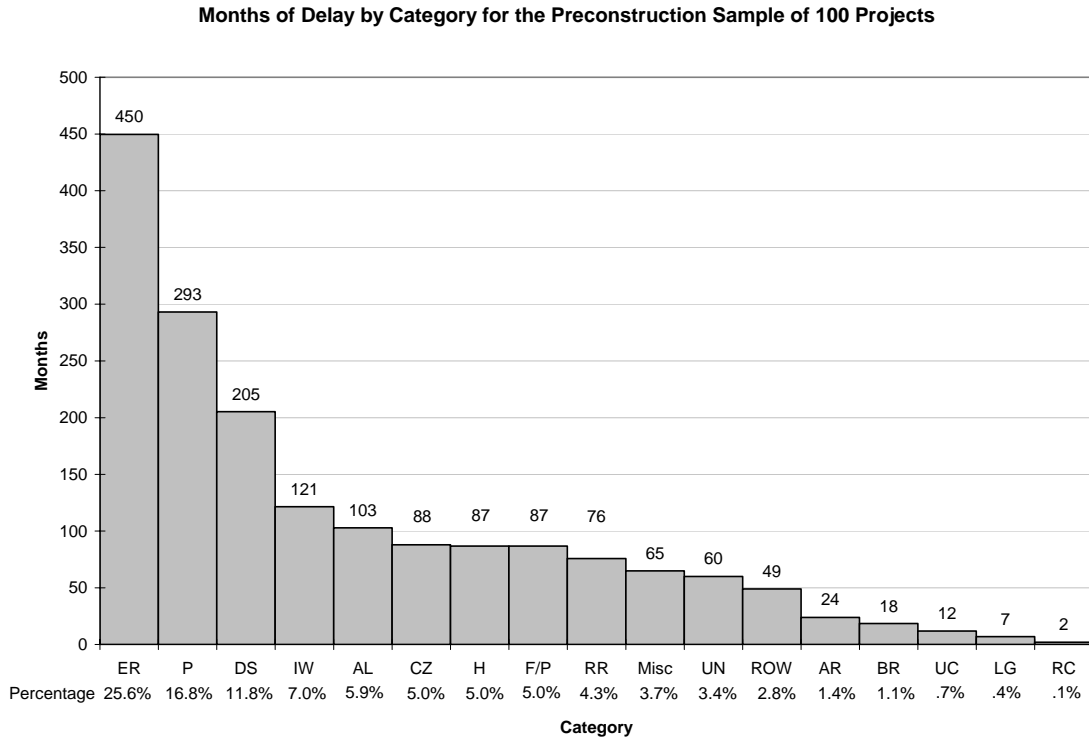
Categories - defined in Appendix G

- (P) Permitting
- (ER) Environmental Review
- (DS) Design
- (IW) Insufficient Workforce
- (AL) Number of Alternates
- (H) Historic Site
- (RR) Railroad Coordination
- (ROW) Right of Way
- (F/P) Funding / Prioritization
- (CZ) Citizen Involvement
- (Misc) Miscellaneous
- (RC) Revised Design Concept
- (AR) Archeological
- (BR) Bid Rejected
- (UN) Undocumented*
- (UC) Utility Conflicts
- (LG) Local Government Involvement

*DOT could not provide recorded schedule change information for these projects.

APPENDIX B

The chart below identifies the schedule delays in months for each category and percentages of each for the sample of 100 projects. The percentages listed at the bottom represent the percentage of total months.



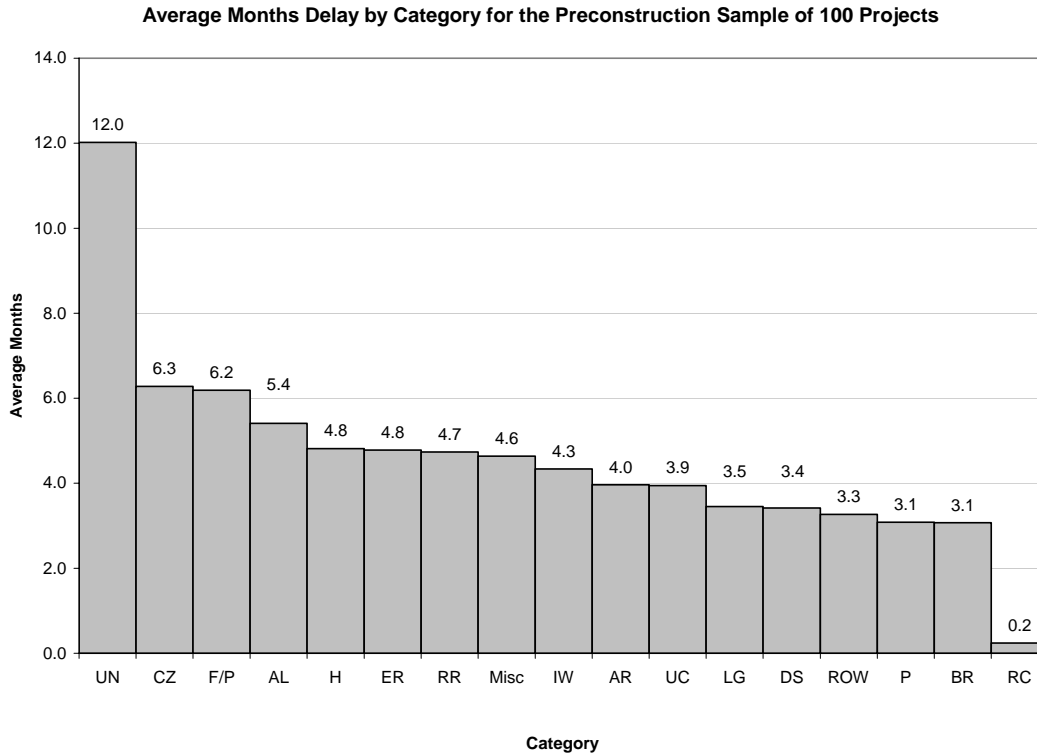
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- (UC) Utility Conflicts
- (LG) Local Government Involvement
- (RC) Revised Design Concept

*DOT could not provide recorded schedule change information for these projects.

APPENDIX B

The chart below displays the average schedule delay per category in months for the sample of 100 projects. Average delay equals the number of months per category divided by frequency of schedule delay.



Categories - defined in Appendix G

- (UN) Undocumented*
- (CZ) Citizen Involvement
- (F/P) Funding / Prioritization
- (AL) Number of Alternates
- (H) Historic Site
- (ER) Environmental Review
- (RR) Railroad Coordination
- (Misc) Miscellaneous
- (IW) Insufficient Workforce
- (AR) Archeological
- (UC) Utility Conflicts
- (LG) Local Government Involvement
- (DS) Design
- (ROW) Right of Way
- (P) Permitting
- (BR) Bid Rejected
- (RC) Revised Design Concept

*DOT could not provide recorded schedule change information for these projects.

APPENDIX C

Construction Analysis

The following table shows the average schedule and cost overages for construction contracts, by project type, as defined in the Transportation Improvement Program.

Variations by Project Type

Project Type	Number of Projects	Average Schedule Overages	Average Cost Overruns
Bridge	223	4%	2%
Interstate	35	52%	13%
Rural	79	23%	4%
Urban	51	41%	9%
Special	2	17%	1%
Total	390	21%	7%

The next table shows construction contract schedule and cost overages by location. Divisions 5 (Raleigh), 7 (Greensboro) and 10 (Charlotte) were considered metropolitan areas with the remainder of 14 divisions considered non-metropolitan areas.

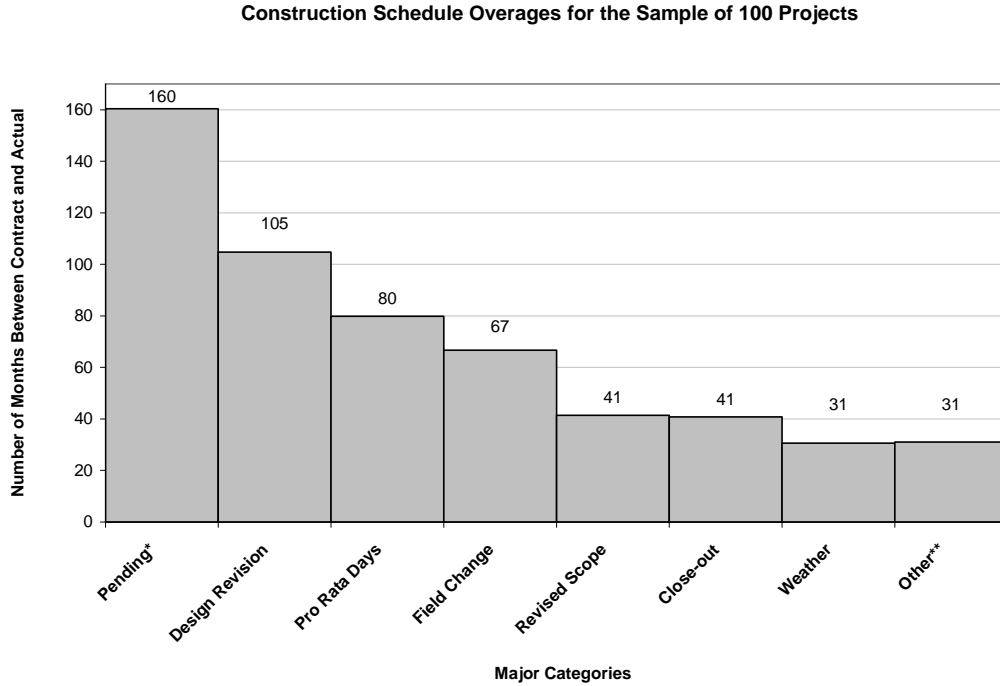
Variations by Location

Location	Number of Projects	Average Schedule Overages	Average Cost Overruns
Non-metro	264	15%	3%
Metro	126	33%	11%
Total	390	21%	7%

APPENDIX D

Construction Categorical Analysis

The following chart shows schedule variances by category between planned days as stated within the original contract and actual days based on date of acceptance or the DOT estimated completion date.



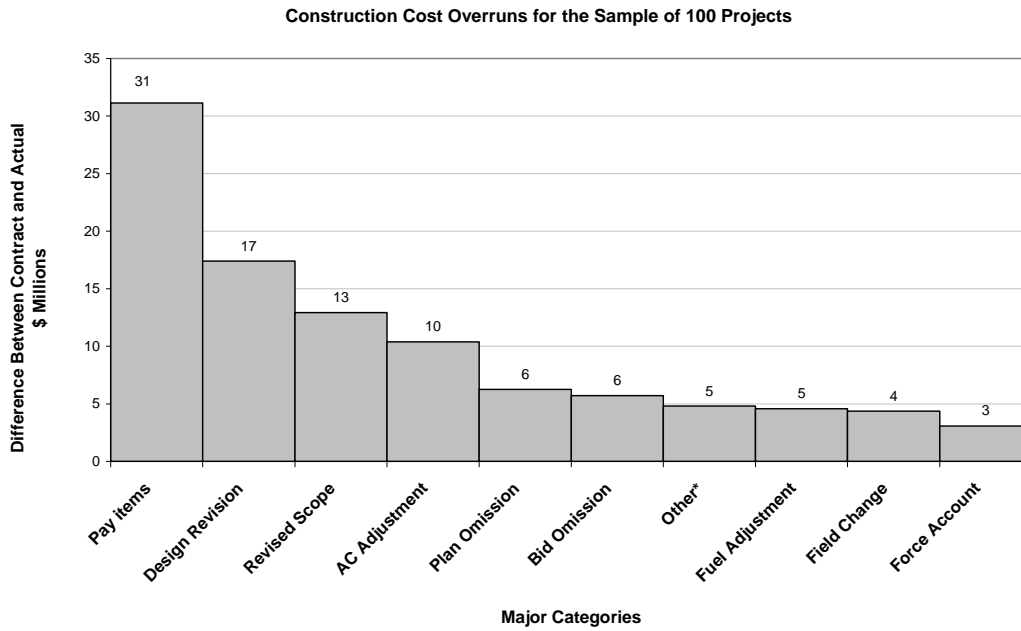
*This category represents calendar days beyond the original contract date that have not yet been included in a DOT approved change order or final settlement agreement. These days will be included in a future change order, final settlement agreement, or determined to be contractor performance related.

**This category combines schedule overages related to administrative, plan omissions, materials, inspector omissions, and contractor performance.

Categories - defined in Appendix G

APPENDIX D

The next chart shows cost overages between planned price per the original contract and the actual cost based on payments to contractor.



*This category represents close-outs, administrative, left over materials, contractor performance, inspector omissions, and materials.

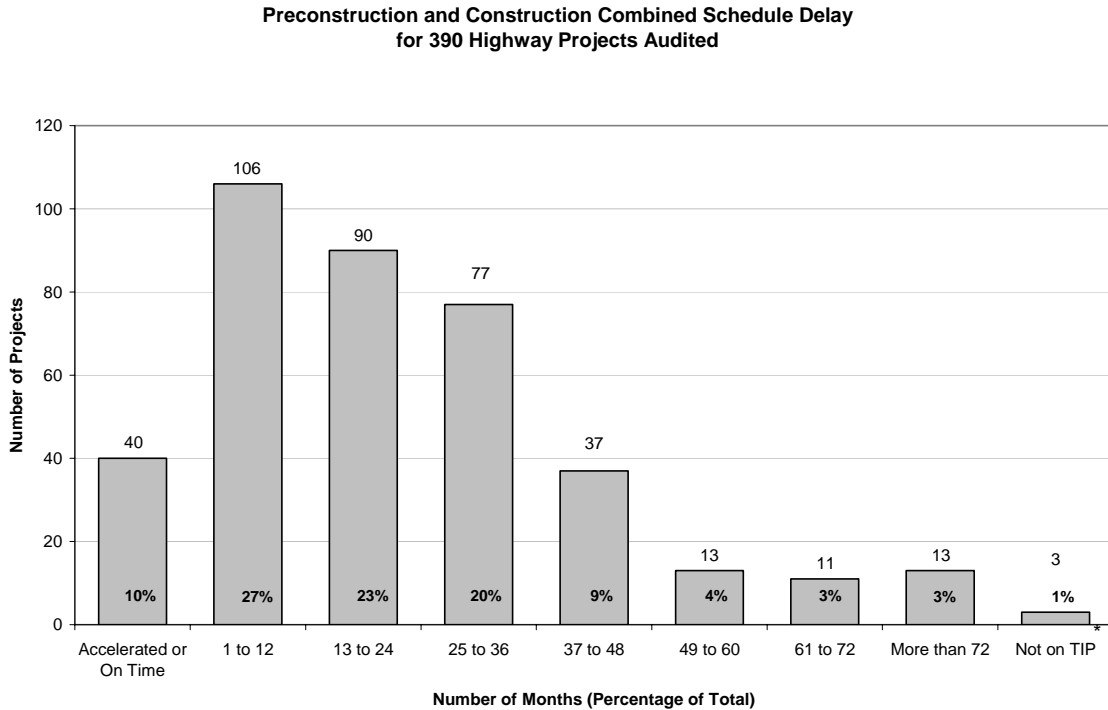
Categories - defined in Appendix G

APPENDIX E

Overall Project Analysis

Schedule Analysis

This graph displays the combined schedule overage for preconstruction and construction for 390 highway projects.



*A preliminary engineering authorized funding date could not be determined for these projects.

Cost Analysis

This table displays the estimated and actual total project costs and overruns for 292 projects.

	TIP Estimated Total Project Costs**	Actual Total Project Costs	Overruns	% Overruns
Preliminary Engineering Costs*	\$73,412,072	\$117,127,976	\$43,715,904	59.5%
Right of Way Costs	\$83,816,588	\$148,672,005	\$64,855,417	77.4%
Construction Costs	\$650,304,135	\$1,020,280,215	\$369,976,080	56.9%
Total Project Costs	\$807,532,794	\$1,286,080,196	\$478,547,402	59.3%

*We calculated the TIP estimated preliminary engineering costs as 10% of right of way and construction TIP estimates.

**TIP estimated total project costs were brought forward to 2006 base year dollars using the Consumer Price Index (CPI). Actual total project costs were not brought forward to 2006 base year dollars due to the complexities in making that calculation. The point that actual costs significantly exceed planned costs is made without making those time consuming calculations.

APPENDIX F

Prior DOT Performance Management Recommendations

Since 1998, external reviews reported multiple findings and recommendations related to performance management deficiencies.

Finding	Recommendation
<i>May 1998 - DOT Performance Review - KPMG Peat Marwick</i>	
The goals set forth in the Statewide Transportation Program are not formally and consistently measured.	Develop performance indicators for addressing how well DOT meets goals and objectives of the Statewide Transportation Program.
The Department lacks a standard set of construction program performance measures.	Strengthen construction program performance measures (analyze regularly to identify trends & systemic items of concern).
<i>July 2004 - NCDOT Project Delivery Study – Dye Management Group</i>	
Poor communications and public accountability for delivery performance. Little communication of delivery status and changes in status.	Provide proactive and standardized delivery reports at the program and project level to policymakers, customers & business partners.
There are no measurable performance objectives or work standards for the environmental process.	Establish performance targets at the project and organizational level for environmental activities.
Current business objectives and performance measures are expenditure based - value of contracts awarded.	Establish measurable department-wide strategic objectives for program delivery, an annual business for improvements, and management accountabilities for accomplishing them.
There is no management information or metrics for measuring, managing, and monitoring project delivery performance.	Design and implement a reporting system for program and project management control and management level reporting.
<i>July 2007 - NCDOT Project Delivery Study – PBS&J</i>	
Limited progress in implementing recommendations noted in the 2004 Dye Management Group Report	Establish project management philosophy by implementing Dye Management recommendations.
<i>October 2007 – Laying the Foundation for a Successful Transformation - McKinsey & Company</i>	
DOT lacks performance targets and indicators for TIP project schedule and costs.	Establish project management accountability including performance targets and indicators for TIP project schedule and cost.

APPENDIX G

Glossary of Terms

Preconstruction Categories - 17 categories were established for capturing the reasons for schedule delay in preconstruction. These categories are listed below.

Alternatives (AL)	A condition where DOT revises the project award schedule due to the need to prepare preliminary engineering design of additional highway location alternatives evaluated during environmental documentation.
Archeological (AR)	A condition where DOT revises the project award schedule due to delays specifically associated with resolving archeological issues during environmental documentation.
Bids Rejected (BR)	A condition where Department rejects all bids submitted by construction contractors at a letting, and the project is rescheduled for award at a later date.
Citizen Involvement (CZ)	A condition where DOT revises the project award schedule due to delays in receiving required citizen response during the public involvement process of environmental documentation.
Design (DS)	A condition where DOT revises the project award schedule due to the need for additional preliminary design in support of environmental documentation and/or the need for additional time to complete the final design and highway construction plans.
Environmental Review (ER)	A condition where DOT revises the project award schedule due to delays in the preparation and/or review of environmental documents that must be approved before final design of the recommended alternative can begin and/or construction permits can be issued.
Funding/Prioritization (F/P)	A condition where DOT revises the project award schedule due to funding and/or TIP prioritization adjustments by the Board of Transportation.
Historical (H)	A condition where DOT revises the project award schedule due to delays specifically associated with resolving historical issues during environmental documentation.
Insufficient Workforce (IW)	A condition where DOT revises the project award schedule due to insufficient and/or non-responsive workforce (within the Department, resource agencies, and/or private engineering firms) that fails to perform work assignments satisfactorily and meet project schedules.
Local Government Involvement (LG)	A condition where DOT revises the project award schedule due to delays in receiving required local government response during the public involvement process of environmental documentation.
Miscellaneous (Misc)	This category captures reasons for award schedule variances that do not clearly fall under one of the other variance categories.
Permitting (P)	A condition where DOT revises the project award schedule due to delays in preparation and submittal of environmental permit applications and/or receipt of permits. Construction cannot begin without these permits.
Railroad Coordination (RR)	A condition where DOT revises the project award schedule due to delays in resolving project involvement with railroad companies. Construction cannot begin without the required railroad agreements.
Revised Design Concept (RC)	A condition where DOT revises the project award schedule due to a change in the design concept (scope) of the project. A change in design concept requires additional environmental documentation and/or a revision in design and contract plans.

APPENDIX G

Right of Way (ROW)	A condition where DOT revises the project award schedule due to right of way issues (appraisals and relocation studies, right of way staking, negotiations, impact mitigation, acquisition time, etc.) that must be resolved before the project can be awarded.
Undocumented (UN)	A condition where DOT revises the project award schedule, but there is nothing documenting the revision.
Utility Conflicts (UC)	A condition where DOT revises the project award schedule due to the need for additional time to resolve a utility conflict with proposed construction that must be cleared before the project is advertised and awarded.

Construction Categories - The following categories were used for capturing the reasons for schedule and cost overages in construction.

AC Adjustment	Adjustments made to the payments due the contractor when the selling price of asphalt binder has fluctuated from the Base Price Index for asphalt binder included in contract.
Administrative	Items such as DOT initiated delays (i.e. awards, contract execution, environmental permits, unbalanced bids, regulatory changes) or litigation.
Bid Omissions	A designation for line items which are included in a contract by reference but which are not bid items. Examples are supplemental surveying and final surface testing.
Close-outs	This category captures reasons for cost and schedule variances included in the project closeout conference.
Contractor Performance	A condition when the contractor fails to perform satisfactorily in the execution of work necessary to complete the project in accordance with plans and contract specifications.
Design Revisions	A justifiable revision made in the original design which changes the contractor's intended construction operation and/or adds work to be accomplished by the contractor.
Field Changes	Physical conditions encountered in the field resulting in extra work, plan alterations or modifications to complete the work as contemplated.
Force Account	Issued whenever the engineer and the contractor cannot agree to the prices to be paid for the affected work.
Fuel Adjustment	Payments due the contractor for items specified in the contract when the average terminal price has fluctuated from the Base Index Price contained in the contract.
Inspector Omissions	A condition when it becomes necessary to amend the contractor's intended construction operation due to an omission or error on the part of the Department in performance of construction engineering and inspection and project stakeout responsibilities.

APPENDIX G

Left Over Materials	Payments made to contractor for contract-related materials which were to have been permanently incorporated into the work or were to remain the property of the Department, but due to revisions or elimination of items of work by the engineer, discrepancies in the contract, or termination of the contract, the material is not used in the work.
Materials	A condition when it becomes necessary to amend the contractor's construction operation due to a delay in delivery of material(s) that is beyond the contractor's control.
Pay Items	Construction material requirements beyond the contract specifications. Costs for these items are defined in the contract.
Pending	Calendar days beyond the original contract date that have not yet been included in a DOT approved change order or final settlement agreement. These days will be included in a future change order, final settlement agreement, or determined to be contractor performance related.
Plan Omissions	A condition when the resident engineer discovers an "omission" or "error" in contract plans that requires a supplemental agreement to correctly complete the project as contemplated.
Pro Rata Days	Additional days awarded (excluding previously awarded supplemental days) resulting when the total dollar value of adjusted final quantities (pay items) changes.
Revised Project Scope	A condition when the Department or outside entity such as a municipality revises the original project scope that changes the intended construction operation and/or adds work not in the original plans and contract.
Weather Days	Days granted to contractor related to authorized extensions that push completion dates into a specified "winter weather" period.

Additional Glossary Terms

Acceptance Date	That date at which essentially all work set forth in the contract and work modified by the engineer is satisfactorily completed.
Actual Days	The difference in calendar days between the availability date and date highway is available for traffic. Typically the acceptance date or revised completion date.
Availability Date	Date the contractor is available to begin controlling operations.
Change Order	Any change to original contract price or schedule.
Completion/Revised Completion Date	The date in the contract (or as revised by authorized extensions) when work set forth in the contract is satisfactorily completed.
Construction Cost Index (CCI)	An internal composite index used by the Department. It is composed of 46 roadway items and 15 structural items. Roadway and structure indices are combined to form the composite index.
Cost Overruns	Amounts over the original contract price including supplementals, claims, pay items, AC adjustments, other, fuel adjustments, force accounts, claims, left over materials, and final settlements..

APPENDIX G

Estimated Completion Date	The date provided by the resident engineer by which the work required by the contract will be completed.
Plan Days	Difference in calendar days between the contractor availability date and original contract completion date.
Schedule Overage	Difference between actual days and plan days for construction activities.



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

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

LYNDO TIPPETT
SECRETARY

January 30, 2008

Mr. Leslie W. Merritt, Jr., CPA, CFP
State Auditor
2 South Salisbury Street
20601 Mail Service Center
Raleigh, North Carolina 27609-0601

Dear Auditor Merritt:

This is in response to the Performance Audit and Exit Conference regarding North Carolina Department of Transportation Highway Project Schedules and Costs. I have reviewed the report and offer the following responses regarding each finding and recommendation.

1. DOT is not successfully meeting planned preconstruction schedules

Finding:

“Overall, 73% of the 390 highway projects audited missed the targeted start of construction year, with 40% of these projects missing the mark by more than one year.”

Response:

The Department continuously strives to improve this rate by reviewing and putting into place process initiatives. Within the audit’s overall preconstruction analysis, the planned start of construction year in the TIP at the time funding for preconstruction was authorized was used to determine the planned preconstruction schedule. Therefore, the planned letting fiscal year was noted at the beginning of the project planning study. This is at a point in the process where the project impacts are unknown, the project recommended alternative is unknown, and the Department is just beginning the project public involvement and coordination with our environmental Agency partners. Based on the unknowns at this time of the project planning study and

the extensive planning and design work necessary to comply with the National Environmental Policy Act (NEPA), it is very difficult to accurately predict the letting date for the project.

In addition, NCDOT has very little control over all the steps involved in the project development process. The high level steps of the project development process are shown in a flow chart on Attachment 1*. This flow chart shows the parts of the process that the Department controls completely, partially controls, and the areas where the Department does not have any control. Therefore the Department must establish a good coordination and involvement plan with the stakeholders in the project development process in order to advance the project from planning to award of the project.

To help address this situation, the Dye Management Report recommended restructuring the TIP to include both a development and delivery component. Based on this recommendation, the Department revised its current Draft TIP format to denote separate developmental and deliverable portions to better demonstrate the certainty of each project schedule. See Attachment 2* for an example of this format. Projects within the deliverable TIP have more certain schedules than those listed within the developmental portion of the TIP.

Our ability to more fully comply with the Dye Report recommendations is constrained by state laws governing the structure of the STIP.

Finding within Reasons for Schedule Delays during Preconstruction:

“The Department does not focus efforts on categorizing the nature of delays and does not accumulate and analyze reasons for schedule delays in order to make process improvements.”

Response:

This statement does not recognize the reports prepared by the Department’s Program Development Branch, which document the quarterly success of projects that are scheduled for right-of-way acquisition and construction within the current Fiscal Year and provide a reason for each project delay. Please refer to Attachment 3* for a sample of this report for FY 2006.

In addition, due to the Department’s recognition of issues that were causing delays on projects, major process improvement initiatives were launched in 2001. These improvement initiatives resulted in implementation of the Merger 01 Process, a collaborative project development process that combined the NEPA and 404 Permitting

*The attachment referenced above can be obtained on the Office of the State Auditor public web page.

processes. The Department has provided training on the Merger 01 Process to its staff, as well as agency partners.

The 2001 improvement initiatives also resulted in the creation of the Ecosystem Enhancement Program (EEP) that successfully separated mitigation from the permitting process. This program has won national awards and the Department has not had to delay a single project due to lack of mitigation since its implementation.

As stated previously, the Department recognizes that close coordination and collaboration with our stakeholders is integral to advancing a project, as well as minimizing impacts to the natural and human environment. To further strengthen our relationships and communication with our agency partners, the Department joined with these agencies to form an Interagency Leadership Team (ILT) in 2004. The goals of the ILT also help to streamline the project delivery process. Please refer to Attachment 4* for a brochure that describes the team and its mission and goals.

Finding within Reasons for Schedule Delays during Preconstruction:

“Permitting and environmental activities for most of the highway projects in our audit occurred prior to 2001. Consequently, we are unable to determine if the permitting and environmental streamlining initiative is having a positive effect on preconstruction schedule performance.”

Response:

The Department has recognized the need to determine how well the Merger 01 Process is working and whether it is helping streamline the project delivery process. Therefore, in conjunction with our agency partners, we have developed Merger Performance Measures to track the performance of the Merger 01 Process. Please refer to Attachment 5* for this information. We have also worked with our agency partners to establish Merger 01 Roles and Responsibilities. This information, included in Attachment 5*, was developed to ensure that individual Merger meetings, as well as the entire Merger 01 Process, are successful. We are currently scheduled to provide the first results regarding the Merger Performance Measures to the ILT in April.

Recommendation:

“The Department of Transportation should classify and accumulate details related to schedule delays experienced during preconstruction. Managers should periodically review results, identifying categories with the greatest frequency and amount of schedule delay for further analysis. Efforts should be made to understand root causes

*The attachment referenced above can be obtained on the Office of the State Auditor public web page.

of delays so that preventative or corrective action plans can be formulated and put in place. Results of historical performance, including relationships between performance and project characteristics should be understood and used to more accurately predict future preconstruction schedules.”

Response:

The Department agrees with this recommendation and believes its previous work to implement process improvement initiatives demonstrates that we have recognized some of the major causes for project delays and taken steps to improve the project development process.

In addition, the Department has developed an interdepartmental scheduling tool now known as the Scheduling Tracking and Reporting System (STaRS). This tool provides standard templates for activities and timeframes for various project types, as well as the ability to determine the status of the project and a prediction of the preconstruction schedule.

2. DOT is not successfully meeting planned construction schedules and costs

Recommendation:

“The Department of Transportation should classify and accumulate details related to schedule and cost overages. Managers should periodically review results, identifying categories with the greatest frequency and amount of schedule and cost overages for further analysis. Efforts should be made to understand root causes of variances so that preventative or corrective action plans can be formulated and put in place. Results of historical performance, including relationships between performance and project characteristics, should be understood and used to more accurately predict future contract schedules and costs.”

Response:

The Department has placed a high priority on project scope, cost, schedule and budget over the last several years by emphasizing attention to detail, providing high quality construction, examining and applying warranties for construction work, making sound engineering decisions as construction progresses, and ensuring that long term maintenance goals and project serviceability are achieved.

Highway construction has administrative oversight not only from the central construction unit but also from field engineers. The centrally staffed engineers (who are assigned by region) ensure proper and consistent administration of contracts, perform monthly project site reviews to identify and discuss construction project issues, and review significant project overruns and construction project schedules. Administration of each individual contract is accomplished by onsite field engineers who oversee day-to-day operations on the projects. This tiered structure allows for timely, accurate resolution of issues that may arise and provides a level of oversight to ensure impacts to cost and time are identified and handled appropriately.

The entire administration process has been enhanced by the development of the Highway Construction and Materials System (HiCAMS) in the early 2000s. The HiCAMS system houses all project-related data, including materials, contract payments, contract time, and contract adjustments, and serves as a tool for all construction engineers to use in managing the administration of contract construction projects. Through HiCAMS, the field engineers and central engineers review cost and schedule variances monthly.

The Department's construction contract administration structure also ensures proper time extensions are granted and the financial scope of a project does not override engineering decisions regarding safety and quality. The continuous monitoring of cost and schedule variances on our projects is used to improve our processes and make effective and efficient adjustments.

Finding within Overall Construction Analysis:

"The schedule overages between the original contracts and actual workdays totaled 1,573 months, a 21% increase above the original schedules."

Response:

The audit findings relative to time schedule variances appear to focus on the original contract time and do not address time extensions to the contract completion date. The Department allows time extensions to the contract completion date for delays to operations beyond the contractor's control as well as changes in the scope of work. Approval of any contract time extension goes through administrative reviews as previously discussed.

The procedure of allowing contract time extensions for delays beyond the control of a contractor is a common national practice for highway construction that prevents inflated bid prices that may otherwise exist for projects that do not allow time extensions.

The Department charges contractors monetary damages for projects that exceed the contract completion date without a contract time extension, and restricts contractors who have experienced excessive schedule variances within their control from bidding on additional work.

In general, this section of the audit report also appears to draw conclusions from data that has been averaged. The Department finds average data helpful to initiate further individual project analysis, but not to form conclusions. While projects may have similarities, each project is unique with individual circumstances that may not be comparable on a project by project basis.

Finding within Overall Construction Analysis:

"The difference between the original contract price and payments to contractors totaled \$221 million, a 7% increase above the original budgets."

Response:

During the time period reviewed, an unprecedented rise in the cost of asphalt cement and fuel resulted in a significant increase in overall project cost. Asphalt cement and fuel items are not part of the “as bid” contract price, but are included in the total construction cost. The Department utilizes asphalt cement and fuel price adjustment to prevent inflated bid prices and ensure that actual costs are paid due to the volatile nature of petroleum (oil) pricing.

Historically, cost overruns on highway construction projects have averaged approximately 4 percent per year. Please see Attachment 6* for an example of the 2005 overrun report. In accordance with nationally accepted practice, the Department budgets for this fiscal overrun for each project.

3. DOT does not manage preconstruction and construction activities jointly

Finding:

“The Department of Transportation preconstruction and construction sections manage projects separately and without comprehensive project management oversight.”

Response:

The Department’s preconstruction and construction sections coordinate closely and both are involved with all phases of the project development process. For instance, our Division Engineer or an assigned Division representative is invited to and usually attends project development Merger meetings as well as any other major project-related meetings. As preconstruction plans progress within the design phase, the Preconstruction staff and Division construction staff meet with other Department representatives to review the project’s proposed design. Recommendations are made for design changes that will aid in right-of-way acquisition, construction and long-term maintenance.

Finding under Cost Analysis:

“DOT often divides larger projects into smaller segments for actual construction. In total, 98 of the 390 highway projects audited were segmented projects. Captured cost data for these projects were determined to be unusable for performance analysis purposes.”

Response:

The Department does generally divide long projects (typically 10 miles or greater) into segments for construction purposes, as it is frequently difficult to fund the entire project

* The attachment referenced above can be obtained on the Office of the State Auditor public web page.

length within one construction contract. However, the NEPA process requires that an environmental document address a project that has logical termini, which is usually interpreted as having beginning and ending points at major intersecting roadways where large amounts of traffic are entering and exiting the project. Since the NEPA document must address the entire project length, cost estimates provided within the planning phase relate to the entire project length.

It should also be noted that right of way and construction cost estimates are provided within the planning document for all alternatives that are being considered. In most cases, the various project segments are established for construction after an alternative has been selected.

Recommendation:

“The Department of Transportation should develop and implement an appropriate project management program and facilitate comprehensive oversight from conception to completion. Assigning responsibility for overall highway delivery performance to units and individuals should reduce delays and cost overruns. Individual delays and overruns that do occur should be categorized for further analysis. Department managers should perform post-project analyses in order to measure individual and collective project schedule and cost performance against established targets and historical performance. Results should be used to update schedule and cost forecasting models. Having accurate estimates is essential as decision makers try to balance highway needs and resources.”

Response:

The Department agrees with the findings and has current ongoing work efforts in this regard. As part of our current organizational review, we will begin piloting three different project management concepts for a selected group of TIP projects this year.

One of the three concepts involves establishing a Tri-Technical team consisting of a project planning engineer, Roadway Design Project Engineer and Division Construction Engineer. This team will work closely to manage the project scope, cost, schedule and budget from the planning stages through the completion of the construction. The Department will also review the use of a DOT project executive on a select number of TIP projects. The DOT executive will also manage the project scope, cost, schedule and budget. The third concept will pair a DOT executive with a Project Team made up of technical staff responsible for delivering the technical information needed for project development.

4. Data retention systems do not facilitate management analysis

Finding:

“Right of Way Estimates were not Available.”

Response:

The Department has recently initiated a new right-of-way computer program that documents right-of-way estimates. These estimates will be available at our central Right of Way Branch office.

Finding:

“Some Total Costs Are Not Complete.”

Response:

Within the planning stage for a project, right-of-way cost estimates and construction cost estimates are provided for each detailed study alternative that is described in the environmental document. These estimates are provided for the entire project. An alternative is selected after considering such things as construction and right of way cost comparisons, impacts to the human and natural environment, and public comments.

After an alternative is selected, the project construction segments are generally identified based on funding availability and logical termini points or usable segments for the project breaks. To go back in the process and determine the right of way costs for each project segment at this point would add an extra step and work within the process. Instead, a right of way cost estimate for each section is provided when right-of-way acquisition is about to begin.

The Department has developed a TIP Cost Estimates Milestone flow chart as shown in Attachment Number 7* that depicts the stages within the process where construction and right-of-way cost estimates will be updated.

Recommendation:

“Management should establish a process to gather relevant and reliable information needed for performance analysis and reporting. Systems and controls should provide performance related data and information in a timely way that allows managers to regularly gauge performance and analyze results. Managers should ensure that needed performance data is available and reliable.

“Because the data needed for meaningful performance measurement and analysis comes from many functional areas and systems, DOT should task a dedicated workgroup to identify the appropriate underlying sources of performance data and develop a computerized method for extracting and reporting the results to DOT managers and the general public. The Office of Information Technology Services owns licenses of software designed to accomplish this task. DOT managers should explore that option as they determine the best course of action for resolving this finding.”

* The attachment referenced above can be obtained on the Office of the State Auditor public web page.

Response: We agree with the recommendation and have established a team to examine how to better utilize our Information Technology.

5. DOT lacks highway delivery performance objectives and measures

Finding under DOT Environment:

“The Department does not produce performance measurement reports that capture the nature, magnitude or concentration of schedule and cost variance categories. In addition to not meeting its management responsibilities, the Department is missing opportunities to focus improvement efforts where they can be most effective and minimize schedule delays and cost overruns.”

Response:

As previously mentioned and attached, the Program Development Branch provides quarterly success rates for both right-of-way acquisition and letting dates. Through analysis of this information, the Department launched major improvement initiatives in 2001 (Merger 01 and EEP), and we have continued to refine and improve these processes. Also, the establishment of the TIP Estimates flow chart as previously discussed is an effort to ensure cost estimates are obtained and updated at appropriate times during the project development process.

Finding under DOT Environment:

“If DOT had an established management control system with performance indicators and analyses, it would have detected that 286 of the 390 highway projects completed between April 2004 and March 2007 missed the targeted year of construction, costing the Department \$ 152.4 million in inflationary costs.”

Response:

Attachment 8* includes information that shows TIP Construction Dollar Awards in years 2000-2007. Please note from this information that during the years 2003 and 2004, the Department let more than \$1 billion in projects to contract. If DOT had been able to achieve 100 percent project delivery, there would have been insufficient funding to award all the projects. The Department also had to reduce its dollar volume of lettings in the years 2005-2007 due to lack of cash on hand as seen in Attachment 8*.

Finding under DOT Environment:

“The average success rate of bids awarded in the revised start of construction year over the last five years is 61%, and was only 41% in 2006.”

* The attachment referenced above can be obtained on the Office of the State Auditor public web page.

Response:

In Fiscal Year 2006, DOT had to reduce the lettings to sustain its cash balances. The 41 percent delivery rate did not take into consideration that several projects were delayed due to lack of funding. If the projects that were delayed in 2006 due to funding were removed from the calculation, the Department's delivery rate was 65 percent as noted within Attachment 3*. Including the higher rate of 65 percent for Fiscal Year 2006, the Department attained an average delivery rate of 67 percent. As an update, the Department achieved 70 percent of the lettings scheduled for FY 2007. A success rate of 89 percent was achieved on TIP projects that were completed in the Department's Preconstruction area, as indicated in the second report provided with Attachment 3*.

Finding under DOT Environment:

"The lack of performance measures has been pointed out to DOT before. In 1998, an external performance review found that the Department lacked a standard set of highway performance measures. A similar finding was documented in 2004 during the Dye Management Group's assessment of the Department."

Response:

In 2004, the DOT's Division of Highways began developing a business plan. A copy is included as Attachment 9*.

Recommendation:

"The Department of Transportation should develop meaningful and reliable highway performance objectives, measures and indicators for preconstruction and construction schedules and costs. Results should be compared to established goals, as well as the results of prior periods, and should be reported internally and externally. Management should analyze results for variances, trends, and relationships and use them in budgetary, decision making, and improvement processes."

Response:

The Department agrees with the recommendations. The Department is expanding and strengthening the work that began in 2004 towards this effort and is in the process of developing meaningful and reliable performance objectives and measures through the establishment of a new performance management system for our employees. These measures are linked to the Department's mission and goals and will become a part of the individual performance rating system, known as the Performance Dashboard & Appraisal. This system will establish performance targets and measures for employees that will be used to rate employee performance. The performance dashboard will also track overall performance against published performance targets.

* The attachment referenced above can be obtained on the Office of the State Auditor public web page.

The Department is also working on the development of external and internal performance reporting dashboards. Individual work units will routinely use this information to develop action plans to help meet or exceed their metrics. In conclusion, I hope you will note from my responses that the Department has been working diligently to improve our project and program delivery. I would be remiss in my response if I did not provide additional information regarding the extensive work that is being conducted by our Transformation Management Team (TMT), an effort launched this past spring.

Please refer to Attachment 10* that provides a summary of the work of the TMT. (It should be noted that some of the dates might have changed slightly since this information was compiled in October 2007). The ongoing work of the TMT and the various workstreams that have been created by our organizational review directly address many of your findings and recommendations. For more information regarding the McKinsey Study and our organizational review, please refer to our Department's website.

I appreciate the opportunity to provide comments regarding the audit and thank you and your staff for your recommendations. I am confident that the improvement processes we have already implemented and the work that is currently ongoing will continue to improve our delivery of transportation products, programs and services to the taxpayers of North Carolina.

Sincerely,



Lyndo Tippett

LT/db

Attachments

cc: Dan DeVane, Chief Deputy Secretary
Bill Rosser, PE, State Highway Administrator
Mark Foster, CPA, Chief Financial Officer
Roberto Canales, PE, Deputy Secretary
Steve Varnedoe, PE, Chief Engineer of Operations
Debbie Barbour, PE, Director of Preconstruction

* The attachment referenced above can be obtained on the Office of the State Auditor public web page

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