#### INTERNAL AUDITOR'S REPORT

## SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

COLUMBIA, SOUTH CAROLINA

FOLLOW-UP TO THE OFFICE OF CHIEF INTERNAL AUDITOR'S AUDIT OF THE BID ANALYSIS MANAGEMENT SYSTEM/DECISION SUPPORT SYSTEM (BAMS/DSS)

**REPORT DATE: JANUARY 17, 2017** 

### **CONTENTS**

		<u>PAGE</u>
I.	FOREWORD	1
II.	INTERNAL AUDITOR'S REPORT	2
III.	EXECUTIVE SUMMARY	3
	BACKGROUND	3
	OBJECTIVES	3
	SCOPE	3
	METHODOLOGY	3
	CONCLUSION	3
V.	OCIA PRIOR RECOMMENDATIONS, MANAGEMENT'S RESPONSES, AND CURRENT STATUS	4

### **FOREWORD**

In 2007, Act 114 of the South Carolina General Assembly created the Office of the Chief Internal Auditor (OCIA) as a function of the South Carolina Department of Transportation Commission to establish, implement, and maintain the exclusive internal audit function of all departmental activities. The General Assembly transferred the function, beginning July 1, 2016, pursuant to Act 275, to the South Carolina Office of the State Auditor. We established the division of Internal Audit Services as an independent, objective assurance and consulting function designed to add value and improve the operations of the South Carolina Department of Transportation (SCDOT). This report covers one of a number of engagements that we carried forward from the January 2016 audit plan developed by the OCIA with input from SCDOT management.



George L. Kennedy, III, CPA State Auditor

#### INTERNAL AUDITOR'S REPORT

January 17, 2017

Ms. Christy A. Hall, Secretary of Transportation and Members of the Commission South Carolina Department of Transportation Columbia, South Carolina

We have completed a follow-up to the Office of the Chief Internal Auditor's (OCIA) audit of the Bid Analysis Management System/Decision Support System (BAMS/DSS). The objective of this follow-up was to determine the status of the recommendations detailed in the BAMS/DSS report dated July 16, 2014.

We planned and performed our follow-up with due professional care in order to obtain sufficient, appropriate evidence to provide a reasonable basis for our observations and conclusions. For purposes of this report, observations are defined as insufficient actions by management to effectively respond to the OCIA's prior audit findings. We noted no observations as a result of our follow-up procedures.

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### **EXECUTIVE SUMMARY**

### **BACKGROUND**

The Office of Chief Internal Auditor (OCIA) conducted an audit of the Bid Analysis Management System/Decision Support System (BAMS/DSS) and issued its report on July 16, 2014. The objective of that audit was to determine the effectiveness and efficiency of the system in providing decision support in the areas of bid monitoring and evaluation, vendor and market analysis, item price estimation, and to determine the adequacy of internal controls to award bids and detect collusion. That audit included the following objectives:

- Analyze the need, accuracy, and adequacy of BAMS outputs and reports.
- Determine if SCDOT is utilizing all applications and reports within BAMS to make decisions.
- Determine the accuracy of the data entered into and analyzed by BAMS, to include the engineer's estimate.
- Determine if SCDOT's use of the BAMS system is effective in detecting collusion.
- Analyze the business application controls within the system.

### **OBJECTIVES**

The objective of this follow-up was to determine the status of the recommendations detailed in the BAMS/DSS report dated July 16, 2014.

#### **SCOPE**

The follow-up audit was limited to a review of Management's Response to the findings and recommendations detailed in the original report. The audit scope covered the current BAMS/DSS processes in place during the fiscal year ending June 30, 2017.

#### **METHODOLOGY**

To accomplish our audit objective, we reviewed policies and procedures related to BAMS/DSS, obtained and reviewed support documentation, and conducted interviews with management and staff of the SCDOT Construction Office. We reviewed BAMS/DSS processes, policies, procedures, reports and queries. We performed relevant test work on documentation supporting management's actions addressing the OCIA recommendations.

#### CONCLUSION

We determined that 16 of the 16 OCIA recommendations have been fully implemented. Details of our follow-up are described in the OCIA PRIOR RECOMMENDATIONS, MANAGEMENT'S RESPONSES, AND CURRENT STATUS section of the report.

#### Recommendation 1

OCIA recommended that the Construction Data Support staff consult with Info Tech, Inc. to assist with improving the operating performance and efficiency of BAMS/DSS.

### Response

Management agreed that the vendor provides appropriate user support under its current contract. Management also highlighted additional key areas in which the vendor provided services outside of the contract. Management cited key areas such as providing onsite focused training for system installation, conducting a Collusion Detection Workshop, implementing system enhancements, and providing ad hoc technical support. Management as well noted its future plans to continue utilizing the vendor to derive value from the system.

### **Status: Implemented**

Management has consulted with the vendor to engage and implement activities to enhance performance and utilization of BAMS/DSS.

#### **Recommendation 2**

OCIA recommended that the Bid Review Summary contains all items listed in the Bid Review Policies and Procedures. This would allow the BRC to gauge overall competition, evaluate project interest, and determine if a project should be re-advertised or re-let to encourage more competitive results.

#### **Response**

To conduct the Bid Review and Letting Review meetings, Management asserted that a Bid Review Summary, Bid Tabulations, maps, Interactive Line Item Profiles and Interested Bidder's List are utilized.

The Bid Review Summary is created by the Construction Data Support (CDS) office, using data from Web Transport, BAMS/DSS, and other sources. The Bid Summary includes details of the project and the apparent low bid and shows the comparison to the engineering estimate. Another element of the Bid Summary is the evaluation of the low bid in accordance with the FHWA guidelines for award. The result of this evaluation (Award, Reject) is included in this report as well as subsequent comments and recommendations from the BRC and LRC meetings. The report also includes any action items and follow-up items tasked during these meetings.

The Bid Tabulation sheets show item by item details of the estimate and the top three bids. The Tabulations are prepared and made available for review by Program Managers and other SCDOT staff to make a side by side comparison of the apparent low bid to the competitor's bids as well as the Engineer's Estimate on individual bid items in addition to overall totals and percentages.

Management also informed us that static maps were previously produced and referenced. However, maps are now generated from P2S and Google Earth. In addition, Management continues to view interactive line item profiles remotely.

Interactive Line Item Profiles are a feature of the BAMS/DSS application, and provide graphical and tabular details of the estimate to bid comparisons. These were previously available by a static set of tables and charts. This feature is now interactive and dynamic, and allows drill-downs to items where the bid history can be presented as context. The differences are presented as a percentage of the estimate, and provide a useful tool to highlight item bids that may be unbalanced or reflecting cost impacts that were not considered by the estimator.

In regards to the Bidder's List preparation, Management has implemented an alternative process to address the objectives of the Bidder's List. The objective of the Bidder's List is to identify potential bidders by location and contract work type. Management asserted that such a list would formally document this information. Management has also advocated that a Bidder's List would assist DBE (Disadvantaged Business Enterprise) subcontractors to identify prime contractors. In addition, Management has confirmed that the Office of DBE and Special Programs stated that the list as proposed would not meet their needs. As an alternative to the formal Bidder's List, Management has developed a Director of Construction's Extranet Page with a section for contractors and subcontractors to solicit and submit quotes.

### **Response (Continued)**

To identify prime contractors that have a historical interest in bidding specific work, management relies upon the experience of the Bid Review and Letting Review Committee to provide this information. Management has also reserved the right to use a Bidder's List based upon future feasibility.

#### **Status: Implemented**

We obtained and reviewed documents which management utilizes in in conducting the Bid Review and Letting Review meetings. We also found that the documents are listed in the Bid Review Policies and Procedures.

We reviewed management's alternative process in its response to the Interested Bidder's List and found that the alternative process met the original objectives of the Bidder's List.

#### **Recommendation 3**

OCIA recommended that a second person verify the unit prices entered into PES prior to creating the official estimate. Also, we recommend that SCDOT Contract Support Office consult with Info Tech, Inc. to convert data (from the estimating spreadsheet) to the Transport product format.

#### Response

Management in its response asserted that the Specifications and Estimates Unit has a process in place to review the estimates once they are entered into Transport and again before the Letting Date. The first review is for completeness and reasonability, which includes comparing the final quantity in the original spreadsheet to the final quantity in Transport. The purpose is to help prevent errors potentially caused by "typos." A final review is conducted to update any prices that may have changed due to cost of fuel or other factors during the period from the original estimate and to the letting. The estimates are also sent to an authorized RPG staff for review after they are entered into Transport.

### **Status: Implemented**

We conducted follow-up procedures with management to determine if any variations or changes have been made since its original response to the BAMS/DSS Audit. We determined that the current procedural steps are consistent with its response and procedures as documented in SCDOT's "Preparation of the Engineer's Estimate."

#### **Recommendation 4**

OCIA recommended that the department perform cost-based estimating for items that do not have prior history. The department could also periodically check the current prices of items to determine the reasonableness of the historical data.

#### Response

Management stated that the Estimators conduct research to determine a reasonable estimate for volatile items and items with limited bid history. The research includes discussions with the Designer specifying the product, internet search on the product, comparing the item to similar items with bid history, and internet searches of other DOT's bid histories. Historical bid prices are also adjusted when market volatility, material shortages or surpluses, or other cost trends are identified.

#### **Status: Implemented**

Management has a process in place for conducting research for items with limited or volatile price history that includes contacting Departments of Transportations in other states, conducting online historical searches of government agencies, requesting information from manufacturers and comparing prices of similar items from bid history.

#### **Recommendation 5**

OCIA recommended greater consistency with the method of developing unit bid prices in preparation of the engineer's estimate. In accordance with <u>Practical Guide to Cost Estimating</u> (prepared by AASHTO), dropping outlying data from the set and then using weighted averages, regression analysis, etc. is the most accurate method in estimating costs. Using only the lowest unit bid prices may result in an estimate that under-predicts project costs.

#### **Response**

Management stated that the Specification and Estimates Unit captures the bid history for the three lowest bidders on all projects. The Estimator begins analysis of the bid history with the low bidders only, and removes all outlying data. This data is analyzed using weighted averages, linear regressions, and quantity versus cost trend line analysis. The second and third bid history is only used if additional data is needed to make a reasonable estimate. All methods used are outlined in AASHTO's <a href="Practical Guide to Cost Estimating">Practical Guide to Cost Estimating</a>. The Unit has adopted the manual as the official source for developing estimates, and in the future all Estimators will be trained to follow the procedure set forth in the manual.

### **Status: Implemented**

Management has a process in place to capture the lowest bidders' prices. The information is provided in a standard report from AASHTO Web Transport. Management also asserted that the second and third bid will be reviewed if enough data is not available from the low bidders. If the data is not sufficient after the second and third tier of data, management will consider other options to determine price.

#### **Recommendation 6**

OCIA recommended revisions to the SCDOT Bid Review Policy and Procedures Manual to reflect exactly which projects would require FHWA approval on the justification memo.

### Response

Management stated that changes in the FHWA/SCDOT Stewardship Agreement have redefined which projects will require FHWA Concurrence on Award Justification Memoranda. Bid Review Policies and Procedures will be updated to reflect that only Projects of Division Interest (PODI) will require FHWA Concurrence.

### **Status: Implemented**

We found that Management has defined which projects require FHWA Concurrence on Award Justification Memoranda. Stewardship and Oversight Plans for Projects of Division Interest also reflect which projects require FHWA concurrence.

#### **Recommendation 7**

OCIA recommended conducting an analysis including projected costs of proceeding forward with the project including the difference between the actual bid and engineer's estimate as the largest expenditure. Other costs to include would be the guess as to what bids may be if the decision is to rebid the project. In the case of safety projects, other items to include would be accident data and the number/cost of potential accidents that may occur during the delay.

#### **Response**

Management in its response asserted that during the course of the audit its practices evolved and were in compliance with the intent of the recommendation. Management also cited several examples in which Award Justification Memoranda included appropriate statements and analysis to support moving forward versus re-bidding of proposals. Management cited examples including Analysis of Individual Bid Items, Safety Issues, Schedule Limitations, and Necessity of Work.

### **Status: Implemented**

We reviewed documentation which revealed that management discloses award justification for bids which are over the engineering estimate and the guidelines of the award.

#### **Recommendation 8**

OCIA recommended that SCDOT should review alternative methods in areas of the state where competition is limited to increase competitive bidding.

#### Response

Management responded that competition was a supply and demand business decision for the contractors based on the amount of work available in certain areas of the state. SCDOT projects are the primary users of asphalt in this state. The areas in question (portions of Districts 2 and 7) do not have a high concentration of asphalt plants due to the low demand from SCDOT in these rural areas. Over the years, several plants have shut down for economic reasons due to the lack of demand and production. If SCDOT demand could be managed to be more consistent, the economics could foster improved competition. Also, contractors have often stated that new plants are difficult to open due to environmental obstacles. Since 2012, SCDOT has placed an emphasis on the packaging of projects in order to make the work more attractive to a larger bidding group. SCDOT also continually evaluates alternative methods such as Micro surfacing, Warm Mix Asphalt and Ultra-Thin lift pavements to support improved competition.

### Status: Implemented

We found that Management is emphasizing the use of packaging projects and segregating the projects by work types to increase competitive bidding. SCDOT Contract Data Support Engineer cited examples of longer road segments as opposed to scattered road segment projects to increase completion and bid better unit prices. The Engineer also cited the use of work type segregation with vendors who have a material advantage as another example. Our follow-up procedures with management identified alternative methods management is pursuing to increase competitive bidding.

#### **Recommendation 9**

OCIA recommended the use of the BIDEVL report be produced as part of the Bid Review process to allow the review of excessive item bid prices in comparison to the engineer's estimate.

OCIA also recommended that the CDBOOK, CVARYE, and LOCMAP be produced as part of collusion detection to assist with the review for abnormal bid patterns such as: the number of contract awards to a specific firm; rotation of firms as lowest bidder; consistent percentage differential between the various firms' bids; specific percentage of the available work in a geographic area to one firm or several over a period of time; location of the low bidder's plant versus location of the second and third low bidders' plants; and variations in unit bid prices submitted by a bidder on different projects in the same letting.

### Response

The Director of Construction office concurred with the recommendations to utilize additional BAMS/DSS resources in support of letting review and collusion detection. However, additional resource analysis is needed regarding collusion detection functions.

#### Status: Implemented

Management has investigated the BIDEVL model and determined that useful information exists which could be included in the bid review. Management cited that the BIDEVL model provides a percentile ranking of each bid unit price which yields a wider context for the unit bid price. Management stated that utilization of the model will be considered based upon workloads and staffing.

Management has determined that the CDBOOK Model produces 6 reports which disclose general useful information. Management is currently using analysis tools which run similar measures and produce more focused results.

CVARY and CVARYE Models compare completed value of work to be awarded for each item in the contract. The measures have value after the work is complete or when evaluating the impacts of suspected collusion. The measures do not have value at the time of the letting review.

Management deems the LOCMAP model to be more useful for the collusion detection function than the Bid Review function. The LOCMAP Model also shows vendor activity over a set period of time, however due to staffing constraints the model is currently not being utilized. The current Bid Review process consists of the use of a combination of maps from P2S and Google Earth to understand the location of roads in contracts and the proximity to potential bidders.

We have concluded Management has considered the use of additional BAMS/DSS resources in support of letting review and collusion detection. Management is not using the additional resources due to various reasons such as workload and staffing constraints, the offering of generic information, time value of the information and utilization of alternative methods.

#### **Recommendation 10**

OCIA recommended that when errors exist on the Import Summary, a record be maintained noting what was done to resolve the error and/or an explanation of the error.

### Response

The Director of Construction (DOC) office stated that its practice would be modified to retain a copy of the import error logs and will document the correction and/or explanation of the errors. The DOC office also asserted that depending on the level of effort involved and the benefit derived from this practice, it reserved the right to re-evaluate this recommendation in the future.

### **Status: Implemented**

We inspected documentation to substantiate management's retention of an import error log which explains corrective action.

#### **Recommendation 11**

OCIA recommended that staff consult with Info Tech, Inc. concerning data conversion, setting system parameters, and agency customization to prevent errors during the import of external data.

#### Response

The DOC office concurred with the recommendation to the extent that errors were resulting from configuration issues with the installations of AASHTOWare applications (Preconstruction, SiteManager, and BAMS/DSS). In the case of incomplete or incorrect data provided by users and/or systems interfacing with AASHTOWare, the DOC office asserted that a combination of staff training, configuration and coordination of systems, and consultation with Info Tech, Inc. have and will continue to be employed to address the issues.

#### **Status: Implemented**

We were able to obtain and review documentation to support management's continuous efforts to consult with the vendor to resolve application errors.

### **Recommendation 12**

OCIA recommended that the BAMS/DSS application owner be added to SCOOT, IT SERVICES Terminated E-mail List. The e-mail provides a *Terminated Employee Report* to application owners.

#### Response

The DOC office will request to be added to the IT Services Terminated E-mail list and will use the list as a notice to validate BAMS/DSS users. Reporting on this validation will be produced quarterly.

### **Status: Implemented**

We were able to obtain support documentation from management to identify the designated termination list recipient for BAMS/DSS.

#### **Recommendation 13**

OCIA recommended ensuring all user IDs are unique. Also, OCIA recommended that all generic and default user profiles are deleted from the system. OCIA recommended enhancing password requirements that force users to change passwords every 30-90 days. OCIA recommended that passwords be unique and meet four of the six below minimum requirements:

- Eight or more characters
- Use Pass-Phrases (e.g., "!love MCDLDS," "My1964.5mustang," "Auditorsarebest")
- Upper case alpha
- Lower case alpha
- Numeric
- Special

OCIA noted in its recommendation that BAMS/DSS is an AASHTO product and some changes are not possible by the application owner, therefore OCIA recommended that the application owner suggest the recommendation in the Transport Users Group conference. The intent of the recommendation was to ensure user authentication and to ensure that outsiders cannot gain unauthorized access to the system or data. In addition, to ensure that authorized users have only the access needed to perform their duties.

### Response

Management stated that the BAMS/DSS system was developed on an older platform and had limitations in User IDs and Password configurations. Management further asserted that the AASHTOWare Project applications, including BAMS/DSS were scheduled for major upgrades in the coming years. These upgrades were to provide more flexibility and security in the BAMS/DSS login. In the meantime, Management asserted that it would contact the limited group of users on a quarterly basis to update their passwords and use the suggested password configuration to strengthen their passwords (to the extent possible). Management also noted all revised IT user authentication changes would complement the IT security enhancements as part the statewide initiative on data security.

#### **Status: Implemented**

BAMS/DSS resides on the client server and not on the network (i.e., the BAMS/DSS application is saved on the desktop). To access BAMS/DSS requires initial NTS credentials login which includes username and password. The passwords must adhere to the following construction:

- Passwords should be at least 8 characters
- Passwords should be comprised of a mix of letters and numbers
- Passwords should be comprised of upper and lower case characters
- Passwords should not be comprised of an obvious keyboard sequence (i.e., gwerty)
- Passwords should not include "guessable" data such as personal information like names, birthdays, addresses, phone numbers, locations, etc.

### **Status: Implemented (Continued)**

In accordance with the SCDOT network security policy, to maintain good security at a minimum users must change passwords every 90 days. The organization may use software that enforces this policy by expiring users' passwords after this time period.

Once the user has signed-on to NTS additional sign-on authentication credentials (i.e., User ID and Password) are required to access BAMS/DSS.

We were able to determine Management has a security process in place to authenticate the user access to BAMS/DSS. The logon access requires unique passwords criteria and a minimum 90 day password change.

#### **Recommendation 14**

OCIA recommended that any software not in direct relation to the BAMS/DSS application be removed in order to decrease the risk of a potential virus attack and to decrease the use of the machine by staff members not directly involved in the Bid Review Process.

#### Response

The DOC office agreed with the recommendation. The DOC office was considering options to physically secure the machine and limit access to staff members involved in the bid review process. The DOC office noted that all IT security enhancements would complement the statewide initiative on data security.

#### **Status: Implemented**

We obtained a complete listing of the program applications which are saved to the hard drive of the desktop on which the BAMS/DSS application is saved. The applications saved to the hard drive do not pose compatibility issues which would prevent BAMS/DSS processing capability or impair functionality.

The AASHTO Project BAMS/DSS requires the Microsoft Windows operating system to run. The additional Microsoft applications such as MS-Excel are used as a data import file for BAMS/DSS application.

We determined that the BAMS/DSS administrative owner approves user access to BAMS/DSS to individuals to perform duties related to the bidding process. Three individuals within the Director of Construction office are identified as users with access to the BAMS/DSS application. All of the individuals require direct access to BAMS/DSS to discharge their duties as relating to the bidding process.

We also found that the desktop on which the BAMS/DSS application is saved is located in the office of the BAMS/DSS administrative owner. In addition, to access the BAMS/DSS application, users are required to use their NTS security credentials.

Overall we were able to determine that incompatible software does not exist on the BAMS/DSS desktop. We also determined that only authorized users are granted access to BAMS/DSS.

#### **Recommendation 15**

OCIA recommended that the desktop on which BAMS/DSS is saved should become part of SCDOT Information Technology Services (IT Services) equipment life cycle process.

### Response

The DOC office agreed with the recommendation. The DOC office also noted its intention to contact IT Services to request the desktop to be included in IT Services' equipment life Cycle Process.

#### **Status: Implemented**

The typical IT equipment life cycle begins from the time equipment is requested through the end of its useful life or when it is disposed. The equipment life cycle usually consists of three phases: acquisition, use, and disposal.

We were able to obtain information that the BAMS/DSS desktop will become part of the 4 year retention cycle for information technology equipment.

#### **Recommendation 16**

Even though BAMS/DSS is part of SCDOT's disaster recovery plan, OCIA recommended that two office staff be responsible for this process to add greater assurance that the backup process is performed on a timely basis.

#### Response

The DOC office agreed with the recommendation. The DOC office further asserted that a brief policy would be prepared setting the frequency for the function, and establishing requirements for two persons to be responsible for completing and verifying that backups are performed. The policy was to allow some flexibility in the timing due to the variable timing of contract executions and activations in our systems. A log will be prepared and maintained for this function.

#### Status: Implemented

We requested documentation to support the establishment of a policy for BAMS/DSS backup procedures. The Support Engineer affirmed that the BAMS/DSS database will be backed up periodically by copying the data to network servers which are backed up to offsite storage. The Support Engineer also forwarded a policy statement which identified staff members with BAMS/DSS access, location of the log, date of backup, reason for backup, and person verifying the backup.

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