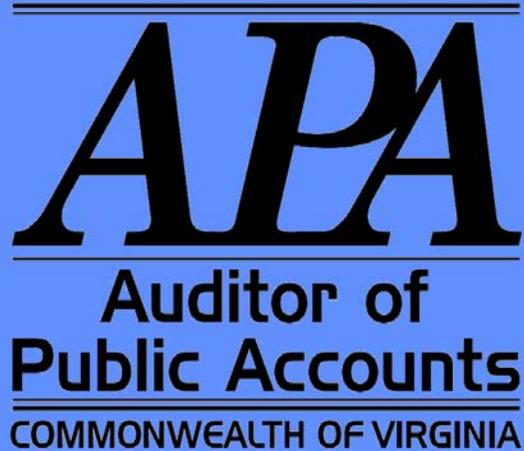


**INTERIM REVIEW OF STARS PROJECT**

**JANUARY 2008**



## **AUDIT SUMMARY**

We completed an interim review of the State Police Project Management Team's oversight and administration of the Statewide Agencies Radio System (STARS) Project. The STARS project includes a six-year, \$338 million agreement with Motorola to design and install a new state of the art telecommunications and radio system for the Virginia State Police and twenty other agencies of the Commonwealth. Our office monitors the status of major Commonwealth projects such as the Statewide Agency Radio System to help identify and prevent failures related to project management in order to minimize loss to the Commonwealth.

Our review found that the STARS Project Management Team has provided accurate but not complete information to support an accurate determination that the project is on-time and on-budget. The Project Management Team does not follow a number of best practices in project scheduling, budgeting and risk management. The Project Management Team has not revised its plan to ensure complete and timely communication to reflect current needs. The Project Management Team has not established complete policies and procedures to enable it to effectively manage the contract with Motorola.

We recommend throughout the report that the STARS Project Management Team incorporate the following.

- Revise the project communication plan to ensure current processes are included and all necessary written communiqué is documented and agreed-upon by all stakeholders.
- Develop a long-range assignment schedule of internal resources to more effectively plan for inspection of deliverables.
- Develop an estimated cost to complete the project in order to improve the effectiveness of budget management.
- Develop and adopt realistic assumptions for project scheduling and budgeting in order to reduce delays that are unexpected by key stakeholders.
- Continue to follow best practices in the execution, control, and close-out of the project in order to ensure the quality of the final system.

It is important for the Project Management Team to balance the three project constraints of cost, time, and scope, to ensure that the project delivery is on-time, on-budget, and complete with stakeholder's expectations. As the Project Management Team moves forward under the assumptions adopted and considers future changes in order to bring this project to a close on-time and on-budget, it is essential that the quality and intended scope of the project be considered in all decisions. Failure to do so could create greater long term costs to the Commonwealth resulting from future maintenance, upgrades, or training.

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## STARS PROJECT

### Background

The Virginia State Police began installation of the existing statewide land mobile radio system in 1977, and many of the radios still in use today date from that installation. Since 1977, the State Police estimate that they have installed the original radios in approximately six generations of patrol vehicles. This network supports only a single conventional voice channel in any given area. Therefore, the system has routine severe radio congestion and existing channels cannot support interoperability with local public safety radio systems without further increasing the wait time for users. In addition, the existing technology will not support advanced law enforcement needs for mobile data transmission.

Recognizing the inadequacies of the existing radio system, the State Police developed the Statewide Agencies Radio System (STARS) concept, which is based on the recognized need for a shared statewide public safety grade radio system that facilitates law enforcement mobile data transmission and interoperability with the localities. STARS will upgrade the current State Police land mobile radio (LMR) network with a digital radio system under the APCO Project 25 equipment standard. This equipment standard specifically addresses multiple user digital radio standards for public safety agencies throughout the country and the world. In addition, STARS will increase the capacity of the public safety service network and allow additional disaster recovery alternate paths.

STARS should allow for essential public safety grade communications to operate seamlessly throughout the Commonwealth for the twenty state agencies charged with emergency response duties and facilitate interoperability with local governments and federal agencies. The interoperability solutions within STARS allow each locality, at the county and city level, to communicate with users independent of their technology or radio frequency band. The locality can employ direct interoperability by using compatible radios that communicate on the STARS network or the federal radio network, depending upon the situation.

### Project Inception

On July 1, 2000, the Commonwealth, through the Department of General Services, awarded a consulting contract to Hayes, Seay, Mattern & Mattern, Inc. and its communications subsidiary, CTA Communications. CTA Communications provided technical consulting for the design of a modern communications network for the Commonwealth, which served as the basis for a Request for Proposal for a new communication system issued on August 1, 2001.

Twenty agencies were committed to participating in the STARS project since it was determined that these agencies would directly benefit from sharing and using the technology and network developed under STARS. The Governor designated the State Police as the lead agency for this project. Table 1 lists the twenty original agencies of the STARS project.

Table 1

Department of Alcoholic Beverage Control	Department of Health
Department of Aviation	Department of Information Technology
Division of Capitol Police	Department of Juvenile Justice
Department of Conservation and Recreation	Department of Military Affairs
Department of Corrections	Department of Mines, Minerals, and Energy
Department of Emergency Management	Department of Motor Vehicles
Department of Environmental Quality	Department of Professional and Occupational Regulation
Department of Fire Programs	Department of State Police
Department of Forestry	Department of Transportation
Department of Game and Inland Fisheries	Virginia Marine Resources Commission

On November 1, 2005 the Governor changed the composition of the participating agencies. The Departments of Aviation and Professional and Occupational Regulation withdrew and were replaced by the Chesapeake Bay Bridge Tunnel Police, the Department of Charitable Gaming, and the Virginia Port Authority. The name of the Department of Information Technology was corrected to read the Virginia Information Technologies Agency (VITA).

In response to the Request for Proposal, the State Police received a proposal only from Motorola. State Police's STARS Project Management Team evaluated the response and then began negotiations with Motorola. The State Police, the Attorney General's Office, and CTA Communications constituted the negotiation team, who reviewed Motorola's original offer of \$370,751,598 for the total system. The negotiation team analyzed the offer and prepared a counter offer. Final negotiations resulted in a total system cost of \$329,895,699 and on June 23, 2004, the Commonwealth signed the contract.

The reduction in the price represents changes in Motorola's costs and the Commonwealth assuming responsibility for the following construction and procurement activities no longer included in the Motorola proposal. The Commonwealth agreed to assume responsibility for:

- renovating a warehouse at State Police Headquarters to serve as the Network Operations Center;
- constructing a new building at the Division Six Headquarters at Salem to serve as a master site for the western portion of the state; and
- purchasing all of the software for the laptop computers through the VITA contract with Microsoft, where applicable.

### Project Scope

The STARS contract includes a number of components to enable statewide communication for emergency services. Major deliverables include: an integrated voice and data land-mobile-radio network; a mobile data communication network; a separate future 700MHz mobile data network; a microwave telecommunication network; upgrades to current State Police communication centers; construction of a zone control center and a network operations center; new hardware for the entire State Police fleet; and service migration from the current system to STARS.

Motorola will develop the transmitter sites, which will include upgrading or erecting new towers, shelters, grounding systems, and power systems. Motorola will also develop the Zone 1 Master Site in Chesterfield and upgrade or develop the seven State Police Division Headquarters (including the Zone 2 Master Site located in the Roanoke Valley).

Motorola will bring together the component sub-systems of land-mobile-radio, microwave, and data communications technology into a single system and ensure that the sub-systems function together. Motorola will perform the necessary work to design, manufacture, install, and integrate STARS with all participating agencies. Motorola will also provide documentation and training to support the operation of STARS during the implementation period.

### Project Financing - Capital

Funding for the capital portion of the STARS project uses revenue bonds authorized by the General Assembly. Chapter 522, Virginia Acts of the Assembly – 2004 Session, authorized the Virginia Public Building Authority to issue the initial \$159,300,000 in revenue bonds for Phase I of the project. Repayment of these bonds would come from an increase in the tax on rental vehicles within the Commonwealth.

Chapter 245, Virginia Acts of the Assembly – 2006 Session, authorized an additional bond issue in the amount of \$201,900,000 for Phase II of the project. To date, the Commonwealth has issued revenue bonds amounting to \$245,900,000.

Expenditures against the major contract with Motorola total \$184.3 million through September 30, 2007. This represents 53.8 percent of the current contractual amount. In addition to the contract with Motorola and the internal project management costs of State Police, the STARS project has issued contracts or purchase orders with a number of other vendors for facility construction, frequency licensing and computers and computer software. Capital payments to other vendors related to the STARS project total \$9.6 million through September 30, 2007.

The second largest capital contract is that with W M Schlosser, Inc. W M Schlosser, Inc. is the primary construction contractor for the renovation and construction of the State Police Headquarters Network Operations Center. W M Schlosser, Inc. completed the renovation at a total cost of \$3 million.

Through June 30, 2007, the Project Management Team has expended 53.7 percent of the total capital bonding authority and still has five out of seven Divisions of the State Police to complete. For a schedule of capital sources and uses see Appendix A.

Project Financing - Operating

The State Police will pay for consulting, management, testing, inspection, and other operating costs with General Funds specifically designated for administration of the STARS project. The following is the General Fund appropriation by year for this project.

<u>Fiscal Years and Funded Agency</u>	
2003-2004 – State Police	\$ 3,000,000
2005 – State Police	2,510,000
2006 – State Police	2,510,000
2005 - Department of Forestry	123,599
2006 - Department of Forestry	244,359
2007 - State Police	2,510,000
2008 - State Police	<u>2,510,000</u>
 Total General Fund Appropriations	 <u>\$ 13,407,958</u>

Since the first appropriation for STARS operating expenses in fiscal year 2003, the project has spent \$11.3 million through the first quarter of fiscal year 2008. Total General Funds spent on project management activities through September 30, 2007 is \$17.6 million, \$10.5 million of which are payments to Hayes, Seay, Mattern & Mattern, Inc. for technical consulting and \$3.9 million covers Project Management Team salaries. The \$6.3 million spent prior to fiscal year 2003 reduced the normal General Fund operating budget of the State Police in fiscal years 2001 and 2002.

Hayes, Seay, Mattern & Mattern, Inc. through its subsidiary CTA Communications is the technical consultant to the State Police and continues to provide the technical communications expertise and monitoring to ensure the system will meet the current and future needs of the Commonwealth. The State Police have issued and approved seven change orders with CTA Communications bringing the estimated final cost of the consulting engineering services to \$19,970,706. For a schedule of operating sources and uses see Appendix B.

## Project Management - Organization

The Governor authorized creation of the STARS Management Group, the STARS Project Management Team, and the STARS User Agency Requirements Committee for various degrees of involvement in the STARS Project.

The STARS Management Group includes the Secretaries of Public Safety, Technology, Natural Resources, Commerce and Trade, Health and Human Resources, Administration, Agriculture and Forestry, and Finance; with the Secretary of Public Safety serving as the Chairman. The duties of the Management Group are to:

- Provide direction and governance for the STARS project, including communications privacy and security;
- Review all procurements and contracts relating to the STARS project;
- Coordinate and assign radio frequency licenses granted by the federal government to agencies of the Commonwealth; and
- Promote interagency cooperation and coordination in the use of communication resources.

The STARS User Agency Requirements Committee (UARC) consists of designees of the agency heads of each of the participating agencies as listed earlier in Table 1. The duties of the UARC are to:

- Advise of the needs of member agencies for the planning, design, establishment, and operation of STARS;
- Provide advice on proposals for other federal, state, or local agencies to join STARS and on any proposals for third party use of STARS infrastructure; and
- Assist the Management Team with the development of a comprehensive management plan and procedures for the use and operation of STARS.

The STARS Project Management Team is under the command of the State Police Bureau of Administrative and Support Services Lieutenant Colonel. The Captain of the Property and Logistics Division of State Police leads the Project Management Team with his staff. The Captain of the Communications Division leads the inspection and testing of hardware deliverables and is assisted by a Project Manager and a number of telecommunication engineers.

The organization of the Project Management Team is slightly unconventional. Normally, there is a single Project Manager, who management holds accountable for the entire project's success or failure. In this case, the Property and Logistics Division Commander and Communications Division Commander share the roles and responsibilities of Project Manager while the individual with the designation "Project Manager" works under the direction of the Communications Division Commander. This organization of the Project Team makes it difficult to determine who has responsibility for various aspects of the Project.

## Project Management – Communication

Based on interviews with the STARS Management Team and our observations from project meetings, the separation of project management responsibilities has resulted in the untimely communication of delivery and inspection issues between State Police Divisions.

This project management structure depends heavily upon meetings for internal communication. However, we observed the cancellation of eight out of forty scheduled meetings in September 2007, and ten out of fifty-five scheduled meetings in October, all without rescheduling. As these meetings are the primary means of internal communication for the Project Team, and while meeting with no purpose is unproductive, cancelling this amount of meetings could leave stakeholders uninformed about the project's current progress.

The Communications Division supplies the work force that inspects the adequacy of deliverables by Motorola. Personnel must inspect and test every component delivered by Motorola within the STARS system before acceptance and payment. Motorola agrees to provide the Project Management Team ninety-day, sixty-day, thirty-day, and one week delivery notice when a component is ready for inspection to provide adequate time for the Communications Division to schedule their resources. The Communications Division has expressed concern during meetings that Motorola is not making these notifications timely and the State Police has difficulty in scheduling resources due to short notice.

Ineffective communication between the Project Management Team and Motorola has led to an instance of non-compliance with Commonwealth environmental laws and policies. The Department of Environmental Quality issued a notice of non-compliance to the Project Management Team when Motorola started work on a site in King George County before the Commonwealth completed the necessary environmental impact analysis. In reaction to this incident, the Project Management Team now sends a letter to Motorola prior to beginning construction on any future sites to establish the sequence of approvals for each construction phase.

Further, at least one change order (described in further detail below) was the result of the Project Management Team not informing Motorola that they had not finalized the lease for the Fork Mountain construction site by the date Motorola started site work. Future communication gaps between the Project Management Team and Motorola could have a material effect on the project schedule and cost.

Both Commonwealth Standards for Project Management as established by the Project Management Division of VITA and generally followed best practices (Project Management Institute) require that projects have a documented Communication Plan in order to avoid the type of events described above. Although the STARS Project Management Team has a communication plan included in its Project Management Plan. The Team created that plan in April, 2005 and there have been no revisions since. The change in communication process referenced above is evidence that the original communication plan is insufficient and should be updated.

### ***Recommendation 1***

The Project Management Team should revise its Project Communication Plan to ensure all project stakeholders are aware of ongoing project activities. Although meetings are valuable in project management, the processes and requirements for written communication should also be included in the Communication Plan to ensure consistency and completeness of communication.

## Project Management – Resource Planning

As we stated earlier, the Communications Division of State Police must incur the costs of inspecting and testing all of the deliverables of Motorola before any payment. The Communication Division, during monthly scheduled meetings, has expressed concern over the need for additional resources in order to complete inspection and testing of scheduled deliverables.

A project schedule including Motorola resources is maintained by Motorola and shared with the Project Management Team; however, Motorola does not maintain the needs and scheduling of State Police Communication Division resources for the inspection of deliverables in this schedule. The Project Management Team maintains an assignment schedule to track its resources on a short-term basis. The Project Management Team updates the assignment schedule on a weekly basis as Motorola communicates completion of deliverables. However, this schedule extends no more than one week in advance.

The Contract between Motorola and the Commonwealth provides for timely testing and/or inspection of all deliverables by State Police prior to acceptance, however if testing or inspection causes a delay in the project schedule, the Commonwealth would be liable for any actual costs incurred by Motorola for such delay. Such charges may include, but are not limited to, rescheduling charges, transportation, and travel expenses.

### ***Recommendation 2***

The Project Management Team should develop a long range assignment schedule for its internal resources in order to plan for the inspection and testing of deliverables by Motorola. Although the exact timing of deliverables may be uncertain, a long-range schedule of resources compared to deliverables will allow the Project Management Team to determine its needs well enough in advance to mitigate potential delays on behalf of the Commonwealth.

## Project Scheduling and Budgeting

Motorola maintains the only project schedule of activities for the STARS project. Motorola, during project scheduling meetings, obtains input and guidance from the STARS Project Management Team on scheduling assumptions and current status. However, the Project Management Team relies on Motorola to update and maintain the project schedule and has no means of independently tracking overall project status.

According to Motorola as of October 29, 2007, First Division is 100 percent complete, Fifth Division is 93 percent complete, Second Division is 80 percent complete, Third Division is 56 percent complete, Seventh Division is 54 percent complete, Sixth Division is 30 percent complete, and Fourth Division is 14 percent complete. Motorola also provides that subscriber migration is 71 percent complete, training of State Police on new equipment is 34 percent complete, and mobile DATA integration is 24 percent complete.

The Project Management Team tracks payments to Motorola against the major contract using the payment schedule from the contract. The Project Management Team also tracks capital and general fund expenses against total available funding; however, there is no project budget based upon a reasonable estimate to complete.

The Project Management Institute defines a project's estimate to complete (ETC) as "the expected additional cost needed to complete an activity, a group of activities, or the project. Most techniques for forecasting ETC include some adjustment to the original estimate, based on project performance to date." Further the Project Management Body of Knowledge considers the "Estimate to Complete" a necessary tool in managing a project's budget.

### ***Recommendation 3***

The Project Management Team should continually monitor budget against actual costs incurred and estimated. Project budget management should also make a reasonable estimate to complete, total project costs to date, and the available funding to complete the project. Without the development of a realistic estimated cost to complete the project, the Project Management Team can not determine if the current funding allotment will be sufficient or in excess of the actual need to complete the project.

### Project Delays

The ability to complete the project on-time and on-budget is a concern. Several factors have added to the time requirements to complete the project. During the project meetings, one of the major issues and concerns with the STARS project has been the amount of time that it takes to conclude the acquisition of a site for a communications tower.

Acquiring a communications tower includes conducting the site survey, obtaining a site lease or memorandum of understanding for sites owned by another agency, and obtaining the necessary regulatory permits for the site. This process is currently taking seven to nine months per site. Originally planned to take no more than 30 months, the project team now projects that the site infrastructure portion of the network will have an overall duration of 54 months.

To mitigate this delay, the project team has separated the civil site construction for each Division from the delivery and installation of equipment. Tower sites are being built as the permitting process is being completed instead of waiting on the completion of an entire Division prior to moving forward.

Additionally, the relocation of the Division 7 Headquarters in Northern Virginia to the multi-government center at Camp 30 is expected to add an undeterminable amount of delay to the project schedule as the construction of this site has not begun. Multiple change orders (see Appendix C) which increase the scope of the project also have an impact on the overall project schedule.

### Scheduling Assumptions

Motorola and the Project Management Team recognized a delay of 165 days from the original project completion date. In response to this delay, Motorola developed a number of assumptions in order to adjust the schedule and bring the end delivery date closer to the originally scheduled date. Motorola's current project schedule uses these assumptions which the Project Management Team has accepted.

The Project Management Team has directed Motorola to "crash the schedule" in order to reduce the overall timeline for completing the project. Crashing the Schedule involves adding additional resources and/or increasing the work hours of Motorola staff to deliver in a shorter time period. The Project Management Team in taking this approach does not appear to have considered and documented its impact on quality or cost to the project.

One project schedule assumption is the Commonwealth has secured the locations for all tower sites and they will not change. However, the Commonwealth has not yet obtained right of way or permitting for at least seven sites.

The current schedule includes an assumption that no extreme weather conditions will exist for the remainder of the project schedule, while the current critical path for the project includes a number of deliverables in the winter of 2008 and 2009 in the Southwest region of the state. Also, the current contract schedule assumes that the Communications Division has adequate staffing to cover inspection and testing for all functional areas, while we expressed above that the Communication Division has not determined the level of staffing necessary to meet this schedule since it lacks sufficient resources to prepare a planning schedule to determine the adequacy of staffing.

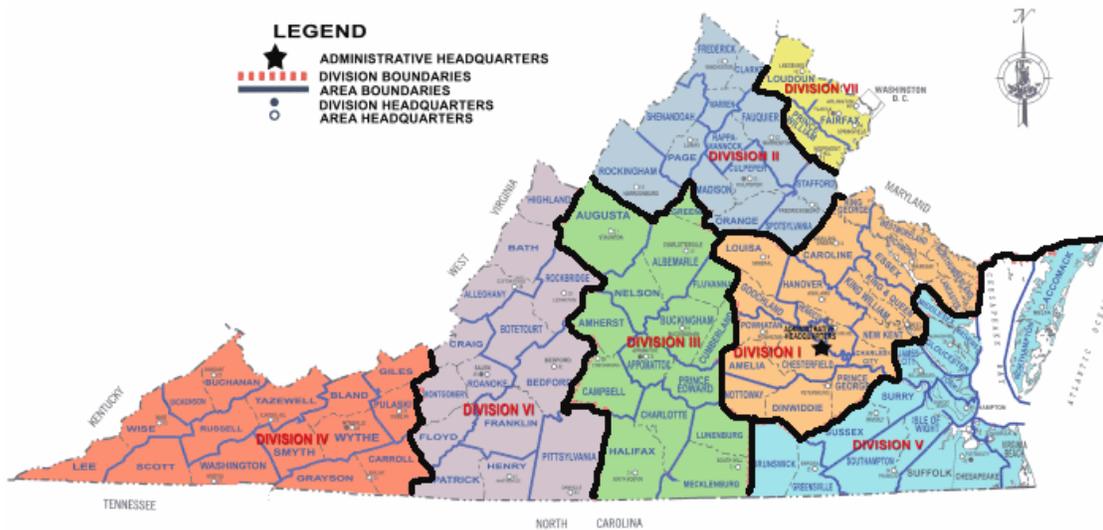
The assumptions adopted in the project schedule combine to further distance Motorola from any liability for project delays. An assumption that inspections and acceptances for all hardware systems will occur within 30 days of delivery by Motorola limits the amount of time the Communications Division has to inspect and accept the system delivery in each division. The assumption of ideal weather conditions and that the Project Management Team will have adequate staffing also increases the probability that the project will experience unexpected delays.

Multiple change orders as a result of unplanned deliverables (see Appendix C) have already created an additional \$8.4 million in project expense to the original contractual obligation. Additional change orders are also likely due to the assumptions made by management in the project schedule.

**Recommendation 4**

The Project Management Team should use reasonable, conservative assumptions in the project schedule to produce a realistic estimate for the completion and final delivery of the STARS project rather than attempting to “crash the schedule.” Although it is important to deliver the project on-time and on-budget, the use of unrealistic assumptions in the project schedule will only disguise the true length of the project as long as the assumptions hold true.

The following is the implementation schedule for the various divisions under both the original schedule and the accepted assumptions.



<u>Division</u>	<u>Original Planned Completion Date</u>	<u>Current Planned Completion Date</u>
Div 1 – Richmond	June 2006	March 2007 (Actual)
Div 5 – Tidewater	May 2008	November 2007
Div 2 - Culpepper	July 2008	October 2008
Div 7 - Northern Virginia	October 2008	May 2009
Div 6 - Salem	April 2009	September 2009
Div 3 - Appomattox	May 2009	June 2009
Div 4 - Wytheville	September 2009	August 2009

Estimated Cost of Delays

Based upon the current schedule the Project Management Team accepts that project delay is inevitable. Before the acceptance of the assumptions mentioned above, among others, the Project Management Team expected a 165 day delay in final project delivery. By “crashing the schedule” the Project Management Team now expects a 55 day delay in final project delivery. The estimated cost for retaining Motorola’s administrative services beyond the original schedule for Commonwealth caused delays is about \$16,835 per day. This cost is a baseline and does not include labor cost for completing particular jobs.

Using the information available, we developed a cost estimate of what a delay could add to the cost of the project. Based upon the scheduling assumptions accepted by the Project Management Team in the attempt to “crash the schedule,” with an anticipated project delay of 55 days at a minimum estimated cost of \$16,835 per day, the minimum estimated project delay cost is about \$926 thousand.

The delay cost per day is a calculation based upon the quarterly project office allocation payments to Motorola per the contract and does not include any additional resources that may or may not be needed by Motorola to complete tasks during the day-for-day delay period as the auditor cannot estimate these costs. The total Bonding Authority of \$361.2 million reduced by these estimated costs alone leave an estimated remaining capital funding after project completion of \$11.9 million under the assumption that no further change-orders will occur.

Total Bonding Authority	\$ 361,200,000
Less: Total current Motorola commitment	(338,637,453)
Total capital payments to other Vendors (through September 2007)	(9,644,216)
Minimum Day-for-day Estimated Delay Costs (based on 55 day delay)	<u>(925,925)</u>
Remaining capital funding assuming no further change-orders	<u>\$ 11,992,406</u>

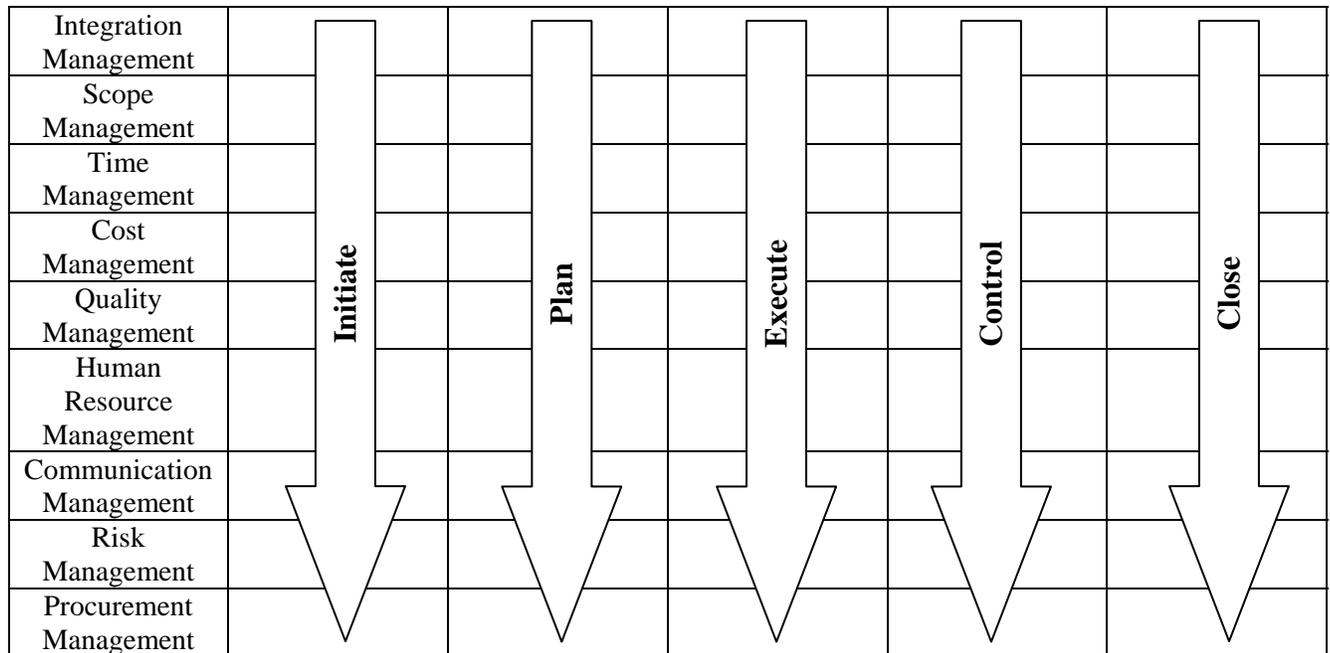
Under the assumption that there will be no future change orders to the contract with Motorola and no future capital expenses incurred by State Police outside of the scope of the Motorola contract the project has sufficient funding. However, if change orders to the Motorola contract and additional capital expenses above and beyond that committed to Motorola continue to increase at the rate that they have over the past three years, the Project Management Team could exhaust its capital funding before the project is complete. Since the project management team has not developed a reasonable estimated cost to complete the project, it is impossible to determine whether there is sufficient funding for the project’s current scope.

Best Practices in Project Management

The Project Management Institute (PMI) publishes the Project Management Body of Knowledge Guide (PMBOK), which is an internationally recognized standard that provides the fundamentals of project management as they apply to a wide range of projects. The Project Management Division of VITA has also adopted PMBOK practices in its Information Technology Resource Management (COV ITRM CPM 110) Project Management Guideline.

The PMBOK’s organization uses five process groups and nine knowledge areas which intersect one-another. The process groups include initiating, planning, executing, controlling, and closing the project. Through each of these processes, project managers should consider best practices in integration, scope, time, cost, quality, human resource, communication, risk, and procurement management. Figure 1 below is a visual representation of how the knowledge areas and process groups intersect.

Figure 1: PMBOK Knowledge Areas and Process Groups



The key to this principle is that all aspects of project management are ongoing throughout the life of the project and that a Project Management Plan, once created, is a dynamic document, not static. Project managers are guided by PMBOK to focus on the nine knowledge areas described above throughout each stage of the project.

Part of our review involved the comparison of these generally accepted best practices as they relate to project integration, scope, time, cost, quality, communication, and risk management to those practices followed by the STARS Project Management Team. The chart in Appendix D summarizes the results of our comparison.

Generally, the Project Management Team has adopted those best practices in project initiation and planning since VITA PMD requires them for adoption of the project. However, the STARS Project Management Team has not changed or updated the initial Project Management Plan since its original creation in April, 2005. There have been a number of changes during project execution to communication processes, resources, and even organization structure which the Project Management Plan should reflect.

The application of best practices within the knowledge areas described above should not end after the initial project plan is developed. These practices have significant importance and value during the execution and control of the project as well.

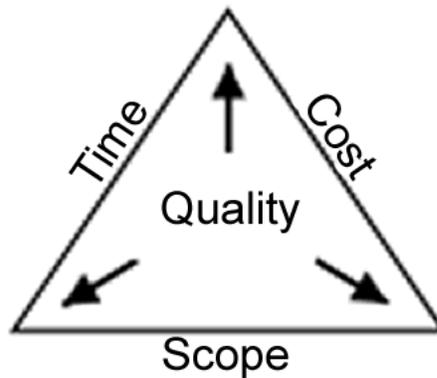
### ***Recommendation 5***

The STARS Project Management Team should continue to follow best practices in the execution, control, and close-out of the STARS Project. The Project Management Plan or the procedures for the management of the project should reflect changes in the project management approach as they occur. The requirement for completing a Project Management Plan is not a one-time formality but facilitates the use of best practices throughout the life of the project.

### Triple Constraint

The Triple Constraint of Project Management includes the balanced management of project scope, project time, and project cost. All three of these constraints have a direct impact on the quality of the deliverable. The Project Management Triangle (Figure 2) is a visual depiction of this concept where each side represents a constraint. One side of the triangle may not change without impacting the others.

Figure 2: The Project Management Triangle (Triple Constraint)



The time constraint refers to the amount of time available to complete the project. The cost constraint refers to the budgeted amount of funds available for the project. The scope constraint refers to what the project must complete in order to produce the final deliverable. These constraints are often competing constraints. For example, increased scope will typically create a need for increased time and increased cost. If the time constraint is tightened, costs could increase while the scope is reduced.

It is important for the STARS project to balance these three constraints to ensure that the project delivery is on-time, on-budget, and complete with stakeholder's expectations. As the Project Management Team moves forward under the assumptions adopted and considers future changes in order to bring this project in on-time and on-budget, it is essential that the quality and intended scope of the project be considered in all decisions. Failure to do so could create greater long term costs to the Commonwealth resulting from future maintenance, upgrades, or training.



# Commonwealth of Virginia

Auditor of Public Accounts  
P.O. Box 1295  
Richmond, Virginia 23218

Walter J. Kucharski, Auditor

December 20, 2007

The Honorable Timothy M. Kaine  
Governor of Virginia  
State Capital  
Richmond, Virginia

The Honorable Thomas J. Norment  
Chairman, Joint Legislative Audit  
and Review Commission  
General Assembly Building  
Richmond, Virginia

We have completed an interim review of the **Virginia State Police (State Police) management of the Statewide Agency Radio System** project, and submit our report entitled, "Interim Review of STARS." We conducted our review in accordance with the standards for performance audits set forth in Government Auditing Standards, issued by the Comptroller General of the United States.

The STARS implementation is a six-year, \$338 million agreement with Motorola to design and install a new state of the art telecommunications and radio system for the Virginia State Police and twenty other agencies of the Commonwealth. Our office monitors the status of major Commonwealth contractual commitments such as the Statewide Agency Radio System to help identify and prevent failures related to contract management in order to minimize loss to the Commonwealth.

## Objectives

Our objectives for the review of the STARS project were to determine whether:

- Project stakeholders are provided accurate and complete information to allow an accurate determination that the project is on-time and on-budget;
- The STARS Project Management Team manages the project schedule and financing using generally accepted best practices;
- The STARS Project Management Team has established a plan to ensure complete and timely communication both internally and externally to prevent project delays; and
- The STARS Project Management Team has established adequate policies and procedures to enable it to effectively manage the Contract between the Commonwealth and Motorola.

### Scope and Methodology

Our review examined the management of the STARS project, including the contractual agreement between State Police and Motorola. Our review focused on project oversight activities to date with an emphasis on project schedule management, project budget management, project communication, project funding, and contract change controls.

Our work consisted of management inquiries, examination of contractual agreements, project budget, project schedule, review of current procedures, and attendance at STARS Progress and Schedule Review meetings to track implementation progress.

### Conclusion

Overall, we found that the State Police STARS Project Management Team has provided accurate but not complete information to support an accurate determination that the project is on-time and on-budget. The Project Management Team does not follow best practices in project scheduling and budgeting. The Project Management Team has not revised its plan to ensure complete and timely communication to reflect current needs. The Project Management Team has not established complete policies and procedures to enable it to effectively manage the contract with Motorola.

### Exit Conference and Report Distribution

We discussed this report with Virginia State Police's management at an exit conference on January 11, 2008. Management's response has been included at the end of this report.

This report is intended for the information and use of the Governor and General Assembly, management, and the citizens of the Commonwealth of Virginia and is a public record.

AUDITOR OF PUBLIC ACCOUNTS



# COMMONWEALTH OF VIRGINIA

Colonel W. S. (Steve) Flaherty  
Superintendent

(804) 674-2000

## DEPARTMENT OF STATE POLICE

P.O. Box 27472 Richmond, Va. 23261-7472

January 23, 2008

Lt. Colonel Robert B. Northern  
Deputy Superintendent

Mr. Walter J. Kucharski  
Auditor of Public Accounts  
P. O. Box 1295  
Richmond, Virginia 23218

Dear Mr. Kucharski:

Auditors from your office completed an interim review of the State Police Project Management Team's oversight and administration of the Statewide Agencies Radio System (STARS) Project. The STARS project includes a six-year, \$338 million agreement with Motorola to design and install a new state-of-the-art telecommunications and radio system for the Virginia State Police and 20 other agencies of the Commonwealth.

The results of the review were discussed with the management of Virginia State Police at an exit conference on January 11, 2008. Their response is included as an attachment to this letter.

The auditors that conducted the review were competent and helpful. I am confident that working together the management of the STARS project can be improved. The recommendations made during the review will provide the guidance needed to make the improvements. Any questions may be directed to Lieutenant Colonel Robert G. Kemmler at (804) 674-4606.

Sincerely,

A handwritten signature in black ink, appearing to read "W. S. Flaherty".

Superintendent

WSF/MEB

Attachment

## *Virginia State Police's Audit Summary Response*

### ***Recommendation 1***

*The Project Management Team should revise its Project Communication Plan to ensure all project stakeholders are aware of ongoing project activities. Although meetings are valuable in project management, the processes and requirements for written communication should also be included in the Communication Plan to ensure consistency and completeness of communication.*

The audit report contained a statement that the "Project Management Team is slightly unconventional." This statement was referring to the team consisting of two captains and an engineer who was designated as the "Project Manager" and that this configuration makes it difficult to determine who is responsible for various aspects of the project. There is concurrence with this finding. There needs to be a designated Project Manager (PM) who will adhere to the requirements of the Project Management Body of Knowledge, known as PMBOK. It is the intention of the Department to hire a dedicated PM who will have the sole responsibility of meeting the applicable requirements found in the PMBOK. The STARS contract requires the Department to maintain a Program Director, who is the Property and Logistics Captain. This person is responsible for the project contract, schedule, and budget. The Communications Division Captain supervises the Department's telecommunications engineers and technicians. Therefore this person is responsible for the inspection and acceptance of the STARS infrastructure. While the establishment of two captains within the project may appear unconventional, it works well with the division of tasks and with the level of cooperation established between the captains.

The audit report mentioned meetings being cancelled and that meetings are the primary means of communication for the project team. The meeting record merely showed a scheduled meeting was cancelled with no further comment. Through conversations with the audit team a suggestion was made to note any reasons for meeting cancellations on the meeting record. This will be done to provide a level of detail that is useful when the meeting records are reviewed.

Many meetings are planned to keep all involved parties informed and there is daily contact and communications made when required. Any necessary communications are sent via email as applicable. Minutes/Action Registers are maintained and distributed to all parties on an ongoing basis within each specific project category.

There was a comment that the Communications Division personnel were concerned that they were not being given adequate notice to conduct inspections of deliverables. This comment was expressed during internal meetings. The concern has been addressed by the contract officer. Motorola provides at least a one week notice for inspections and either a person from the Communications Division or CTA Communications is scheduled to conduct the inspection or the inspection is rescheduled.

Following is the STARS Project management plan that addresses communications.

## **STARS Program Oversight and Workgroups**

The STARS Management Group is a Board established by Executive Order 28 (2002) and composed of the Secretaries of Administration, Agriculture and Forestry, Commerce and Trade, Finance, Health and Human Resources, Natural Resources, Public Safety, Technology, and Transportation. The Secretary of Public Safety will serve as the Chairman. The STARS Management Group will provide direction and overall governance for the development, implementation, and ongoing operation of STARS. In addition, they will review all procurements and contracts, coordinate radio frequency licenses granted by the federal government to agencies of the Commonwealth, and promote interagency cooperation and coordination in the use of communications resources.

The User Agencies Requirements Committee (UARC) consists of two representatives (primary and alternate) from each member agency and institution. The Chairman of the UARC is selected by the STARS Management Group. The current Chairman is Mr. Jackie T. Davis with the Department of Mines, Minerals and Energy. The UARC meets as necessary, but at least quarterly. Minutes are distributed to all participating agencies after each meeting. The specific duties of UARC are to advise on the needs of member agencies for the planning, design, establishment, and operation of STARS, provide advice on proposals for other federal, state, or local agencies to join STARS and on any proposals for third party use of any STARS infrastructure or component, and assist the STARS Management Team with the development of a comprehensive management plan and procedures for the operation of STARS.

The UARC will form various interoperability working groups to advise the STARS Program Management Team how to configure/program the networks. They will plan talkgroups to communicate during various intra-agency events and potential emergency situations. Interagency planning is part of the Systems Integrator contract.

The Virginia Information Technologies Agency (VITA) will be consulted by the Secretary of Public Safety, or his designee, prior to implementing any significant data transport related network upgrade or modification. STARS continues to provide monthly updates on the VITA ProSight IT Investment Portfolio Tool.

The STARS Internal Group meets every other Monday and is chaired by the STARS Program Director. The group is comprised of State Police Administrative and Support Divisions, the STARS Program Management Team, and representatives as needed from other agencies based upon their involvement as forecasted by the project schedule. Accomplishments and tasks that need to be started and completed are discussed. These meetings are canceled when a majority of the personnel are in the field working or out of town at other important meetings concerning sites, etc.

The STARS Internal Managers Group meets every other Monday and is chaired by the STARS Program Director. The group is comprised of State Police Administrative and Support Divisions (Capt. Michael E. Bolton, Ronnie Rice, and Pat Trent) and the Communications Division (Capt. John E. Furlough, John Agee, Tom Struzzieri, and Ray Evans) managers. During these meetings, any issues, concerns, or hot topics are discussed to keep the group informed. A STARS / Motorola Responsibility Assignment List has also been created to identify the appropriate primary and alternate individuals that are responsible for certain major functions of the project. These meetings are canceled when a majority of the personnel are in the field working or out of town at other important meetings concerning sites, etc.

The STARS/Motorola/CTA Project Workgroup (Progress Meeting) is comprised of the STARS Program Management Team, the Systems Integrator, and the engineering consultant. The managers meet on a monthly basis in accordance with the contract and topic oriented work groups as needed (typically multiple groups weekly). The meetings have an agenda and minutes are recorded and distributed. The purpose of the meetings is to review the schedule, identify problems, provide solutions to problems, establish action items, and schedule any needed teleconferences. Advisors from the various agencies will be included when their input is required. Representatives from VITA and APA are invited to attend these meetings.

Memorandums providing information and directions concerning the STARS Project are sent out to the VSP divisions on an as needed basis.

In addition, Trooper David Lewis has been assigned to the Communications Division to act as a liaison between the sworn employees assigned to the Bureau of Field Operations and the Bureau of Criminal Investigation. Trooper Lewis is active in problem resolution and field testing of potential solutions. A newsletter is under development to further communication with STARS users. The newsletter will highlight problems, solutions, and features of the radio equipment.

When there is an emergency need, all involved groups attend a "called meeting" when applicable. Any meetings of this nature will be added to the meeting record with an explanation as to why the meeting was called.

The original Project Management Plan submitted to VITA is currently being updated to incorporate changes made since April 2005. The plan will be kept up to date in the future by the PM.

## ***Recommendation 2***

*The Project Management Team should develop a long range assignment schedule for its internal resources in order to plan for the inspection and testing of deliverables by Motorola. Although the exact timing of deliverables may be uncertain, a long-range schedule of resources compared to deliverables will allow the Project Management Team to determine its needs well enough in advance to mitigate potential delays on behalf of the Commonwealth.*

There is constant, daily communication between the STARS Contracting Officer, Communications Division Engineers, and the STARS Program Director with the Motorola staff. Through this communication Motorola receives oversight and direction. When Motorola completes work and is ready for an inspection, the contracting officer makes arrangements for the inspection with either the Communications Division staff or CTA Communications staff. Normal site inspection assignments by CTA are included in their general fund budget contract. The architecture and engineer functions they perform are included in the Bond funds for the 6<sup>th</sup> Division Master Site. There has been a less effective method of Project Management, this function has been divided between two persons. Recognizing this weakness, the Virginia Information Technologies Agency (VITA) Staff Augmentation Services Contract is being reviewed to provide a full-time dedicated Project Manager (PM) to better handle oversight and the inspection schedule among other traditional PM duties.

Motorola and/or their subcontractor construction manager notify the STARS Contracting Officer five-seven days in advance when an inspection is needed. The STARS Contracting Officer adds their request to the Inspection Assignment Schedule and sends it to the Communications Supervisor for him to assign an individual. It is also sent to CTA (for standby alert) and the STARS Program Administrator. If he does not have anyone available, the STARS Contracting Officer will contact our Consultant for an assignment. When names are assigned, the list is sent out to Motorola, CTA, and all involved VSP personnel for notification of the upcoming assignments and inspections. Cell numbers are listed for all parties involved. An ongoing 90, 60, 30-day notice of upcoming resource requirements has been requested from Motorola to assist the Commonwealth in scheduling resources.

### ***Recommendation 3***

*The Project Management Team should continually monitor budget against actual costs incurred and estimated. Project budget management should also make a reasonable estimate to complete, total project costs to date, and the available funding to complete the project. Without the development of a realistic estimated cost to complete the project, the Project Management Team can not determine if the current funding allotment will be sufficient or in excess of the actual need to complete the project.*

The actual expenditures for the bond and general funds are tracked for accuracy. The previous APA auditor compared the expenditures tracked by the STARS Contracting Officer against the CARS report and found there was agreement in the figures. Of the \$314,000,000 expended, there was about a \$200 difference. The figure was so low; he did not pursue reconciling the difference. The cost to complete can be projected at any time by using the remaining items on the milestone payment schedule. This is a projection, as actual cost may vary. The STARS Contracting Officer keeps a running total of all bond expenditures and the VSP Finance Assistant Controller communicates with the STARS Contracting Officer at the end of each month of her totals for a comparison of CARS. The VSP Budget Analyst submits a monthly report to the STARS

Administrator for verification at the end of each month for the STARS general funds. The STARS funds are tracked very carefully with each spend by utilizing an Expenditure Bond Worksheet, the STARS actual budget, and CARS.

The Project Management Team maintains the status of STARS through VITA's Pro-Sight web tool. Actual site information is averaged with Motorola's project schedule percentages for a more realistic status.

The audit report mentioned there is no project budget based upon a reasonable estimate to complete the project. This point is valid and the Program Director and Contract Officer will work with the contractor to establish an accurate as possible cost to complete the project. The major costs that are subject to change are the tower sites for the western portion of the Commonwealth. There have been known cost increases in materials such as steel and concrete that has an impact on the cost of towers. The largest unknown variable comes from the site location. This determines the height and type of tower that is required along with the cost of construction based on road accessibility and if the tower pillars are being established in an area with significant rock or in soil. A significant task that has a high priority is to lock down the remaining sites; this will allow a cost to complete projection and a more accurate project schedule.

The PM will begin to independently track the project schedule and use audit tools to ensure the schedule is realistic so the overall project status will be known and remain current.

#### ***Recommendation 4***

*The Project Management Team should use reasonable, conservative assumptions in the project schedule to produce a realistic estimate for the completion and final delivery of the STARS project rather than attempting to "crash the schedule." Although it is important to deliver the project on-time and on-budget, the use of unrealistic assumptions in the project schedule will only disguise the true length of the project as long as the assumptions hold true.*

The project schedule had been extended by 165 days without a detailed explanation. The STARS staff and Motorola agreed to rebase line the schedule and make an effort to close the timeline closer to the contractual completion date. The assumptions were reviewed by the STARS staff, to include the engineering staff to ensure the assumptions were accurate and reasonable. Upon agreement of the assumptions, the proposed schedule with a 55-day extension was submitted for a ten day review; upon review approval the schedule will be submitted to the agency head, Colonel W. Steven Flaherty for approval and submission to VITA. This process has been monitored by a representative from VITA assigned to oversee STARS.

In order to produce a project schedule, assumptions must be made agreeing they should be reasonable and conservative. The notation of "ideal weather conditions" was terminology from Motorola. The Commonwealth countered with "no extreme weather conditions or other uncontrollable delays" as noted in Contract Section 1.6.

The amount of time required to acquire a tower site and to go through the permitting process is the most critical path on the project schedule. This is known and that is why locking down the remaining sites is a high priority. Once the remaining sites are locked down, the schedule will become more stable.

The phrase “crash the schedule” is included in the audit report. This is an unfortunate choice of words that were used in scheduling meetings. The intention was to revisit and rebaseline the project schedule using lessons learned concerning the amount of time that is required to construct tower sites. The costs were not to be increased to meet the time line, nor was overtime costs considered to meet the time line. The schedule review was based on assumptions negotiated and agreed to by the Commonwealth STARS team and the Contractor. The PM will monitor the schedule closely in the future.

### ***Recommendation 5***

*The STARS Project Management Team should continue to follow best practices in the execution, control, and close-out of the STARS Project. The Project Management Plan or the procedures for the management of the project reflect changes in the project management approach as they occur. The requirement for completing a Project Management Plan is not a one-time formality but facilitates the use of best practices throughout the life of the project.*

The Property and Logistics Division Commander and Communications Division Commander share the responsibilities of project oversight. Individuals' responsibilities with this Project have been changed. It is the intention of the Department to hire a dedicated PM who will have the sole responsibility of meeting the applicable requirements found in the PMBOK for the execution, control, and close-out of the STARS Project.

The original Project Management Plan submitted to VITA is currently being updated to incorporate changes made since April 2005. The plan will be kept up to date in the future by the PM and STARS Administrator.

AGENCY OFFICIALS

Colonel W. Steven Flaherty  
Superintendent

Lt. Col Robert G. Kemmler  
Director, Bureau of Administration  
And Support Services

Capt. Michael E. Bolton  
STARS Program Manager

OFFICIALS

John W. Marshall  
Secretary of Public Safety

Aneesh P. Chopra,  
Secretary of Technology

STARS Capital Funding Summary  
From July 1, 2005 to September 30, 2007

Appendix A

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Capital sources:	
Revenue bonds issued	\$ 245,900,000
Unissued bonding authority	<u>115,300,000</u>
Total sources	<u>361,200,000</u>
Capital sources:	
Motorola contract	184,315,027
W M Schlosser, Inc.	3,051,554
G&H Contracting	1,425,510
Hayes, Seay, Mattern, & Mattern, Inc.	1,440,383
Redi Call Communications	1,355,000
Federal Communication Commission	878,405
Other Miscellaneous Vendors*	<u>1,493,363</u>
Total uses	<u>193,959,244</u>
Net remaining funding at September 30, 2007	<u><u>\$ 167,240,756</u></u>

\* Other miscellaneous capital vendors includes various contractors used in the renovation and construction for both the central Command Center and the Southwest Command Center as well as computer hardware purchases outside of the scope of the Motorola contract.

Source: Commonwealth Accounting and Reporting System

Schedule of Sources and Uses - STARS Operations  
 From July 1, 2000 through September 30, 2007

	Total	2008*	2007	2006
Operating sources:				
State Police Operating Appropriation	\$ 9,524,714	\$ -	\$ -	\$ 1,417,139
General Fund STARS Appropriation	13,407,958	2,510,000	2,510,000	2,754,359
<b>Total sources</b>	<b>22,932,672</b>	<b>2,510,000</b>	<b>2,510,000</b>	<b>4,171,498</b>
Capital uses:				
Hayes, Seay, Matter, & Mattern	10,507,188	110,597	956,120	1,155,138
State Police payroll and internal services	3,929,001	254,794	841,564	1,068,681
Motorola services	781,820	-	-	781,820
Other Miscellaneous Vendors**	2,388,666	77,179	348,867	1,165,857
<b>Total uses</b>	<b>17,606,676</b>	<b>442,570</b>	<b>2,146,551</b>	<b>4,171,498</b>
<b>Net of sources over uses</b>	<b>\$ 5,325,996</b>	<b>\$ 2,067,430</b>	<b>\$ 363,449</b>	<b>\$ -</b>

\* Fiscal year 2008 uses are only through September 30, 2007.

\*\* Other miscellaneous operating vendors includes travel reimbursements for inspection and project management teams as well as miscellaneous supplies and services to support the operation of the Project Management Team.

Source: Commonwealth Accounting and Reporting System

Appendix B

2005	2004	2003	2002	2001
\$ -	\$ -	\$ 1,842,886	\$ 2,716,610	\$ 3,548,079
2,633,599	3,000,000	-	-	-
2,633,599	3,000,000	1,842,886	2,716,610	3,548,079
705,100	512,762	1,257,872	2,405,128	3,404,471
718,714	483,634	343,446	179,378	38,790
-	-	-	-	-
175,481	142,792	241,568	132,104	104,818
1,599,295	1,139,188	1,842,886	2,716,610	3,548,079
\$ 1,034,304	\$ 1,860,812	\$ -	\$ -	\$ -

SUMMARY OF SIGNIFICANT CHANGE ORDERS

To date, the STARS Project Management Team has issued and approved seventeen change orders to the contract, cancelled three change orders, and has four pending change orders whose costs are undeterminable at the time of our report. These change orders net to an additional \$8,481,474 in un-anticipated project costs. This increases the baseline of the Motorola contract to \$338,637,453. The following are some of the larger changes to the contract with Motorola:

MotoBridge IP – June 29, 2005

At a cost of \$1.4 million, Motorola will implement a technology using multiple frequencies patching in Division 1 rather than the single frequency patching design originally planned for all Divisions.

Final Design Adjustments – December 29, 2005

At a net cost reduction of \$3.2 million, the following three changes were made to the Contract: 1) Seven Microwave/Radio sites within Division 1 originally planned prior to Motorola being able to perform “Site-walks” were determined to be non-essential and removed from the project design saving the Commonwealth \$3.6 million; 2) Final design changes to 24 of the remaining radio sites were made to further reduce costs by nearly \$800,000; 3) Final design changes for tower materials, shelter materials, labor for tower installation and labor for civil work and buildings in 20 Microwave/Radio Sites result in an increased cost to the Commonwealth of \$1.2 million.

Upgrade Communications for Sites – September 28, 2006

At a cost of \$706,429, the Project Management Team authorized changing both the Division 1 Burgess site and the Division 5 Eastville site to 4-channel, Microwave/Radio Sites rather than the originally planned Microwave-only sites. This was necessary to obtain sufficient radio coverage for Divisions 1 and 5.

Coverage for Tunnels – June 26, 2006

At a cost of \$588,931, the project added radio sites not considered during preliminary design in the Monitor Merrimac Memorial Bridge Tunnel, Elizabeth River Midtown Tunnel, Hampton Roads Tunnel, and Elizabeth River Downtown Tunnel in order to provide signal coverage within the tunnel structures.

Decreased Laptop Costs – September 28, 2006

At a cost reduction of \$595,782, Motorola obtained the required laptop computers at a lower cost than originally anticipated. The Commonwealth received the savings of \$374 per laptop on 1,593 laptops.

Additional Subscribers – September 28, 2006

At a total cost of \$7,542,212, the Commonwealth added and deleted the following subscribers from the original STARS project group with associated costs or cost reductions to the Commonwealth:

Department of Forestry (DOF)	\$4,471,900
Virginia Port Authority (VPA)	1,530,460
Chesapeake Bay Bridge Tunnel (CBB)	708,505
Department of Environmental Quality (DEQ)	671,167
Department of Game and Inland Fisheries (DGIF) Scope Addition	367,650
Department of Charitable Gaming (DCG)	188,903
Virginia Marine Resources Commission (MRC)	48,790
Remove Department of Aviation (DOAV) and Department of Professional and Occupational Regulation (DPOR)	<u>(445,163)</u>
	<u>\$7,542,212</u>

With the exception of the Department of Forestry who will contribute \$368,000 per Appropriations Act Chapter 951, bond proceeds will pay the remaining additional subscriber costs.

Coverage for Chesapeake Bay Bridge Tunnel – March 13, 2007

At a cost of \$1,026,866, the change order added radio sites not considered during acceptance of the Chesapeake Bay Bridge Tunnel as a subscriber in a prior change order (described above), to provide signal coverage within the tunnel structure.

Equipment Removal and Changes to Fork Mountain Tower Site - Pending

At a cost of \$296,755, the Project Management Team will have radio equipment removed from 2,771 existing police cruisers at a cost of \$96.75 per cruiser and have radio equipment relocated from 297 old cruisers to new cruisers at a cost of \$96.50 per cruiser. The change order also includes \$185,525 in additional costs due to delays in the Project Management Team obtaining the lease agreement for the Fork Mountain tower site as well as design changes due to unexpected site conditions.

## Best Practices as established in the Project Management Body of Knowledge (PMBOK)

<b>PMBOK</b>	<b>Best Practice</b>	<b>Yes</b>	<b>Partially</b>	<b>No</b>
1.6.4	Is there an organizational unit which centralizes and coordinates the project management function and processes?	✓		
2.1	Is there recognized project life cycle phasing, complete with deliverables, phase-end acceptance, and formal authorization to start the next phase?	✓		
2.2	Does the project manager and the project management team try, early in the project, to identify a wide range of stakeholders and their requirements, including negative stakeholders ("those who see negative outcomes from the project's success")?	✓		
2.2	Is there clearly one person responsible for managing the project?		✓	
2.2 & 9	Is there a clearly identified project sponsor - "a person or group that provides the financial resources for the project"?	✓		
4.1	Is there a document (project charter) which authorizes the start of a project, and authorizes the project manager to expend resources on the project?	✓		
4.1	Does the charter include a purpose or justification?	✓		
4.1	Does the charter include the business needs?	✓		
4.1	Does the charter include a summary schedule and budget?	✓		
4.1	Does the charter include the expectations of stakeholders?	✓		
4.1	Does the charter include project assumptions and constraints (time-money-scope)?	✓		
4.3	Does the organization have a documented Project Management Plan, describing how the project will be executed, monitored, and controlled?	✓		
4.6	Is there a system in place to handle, document, and approve proposed or required changes to the cost, schedule, or scope?		✓	
4.6	Is there a process in place to communicate changes to the project cost, schedule, or scope?		✓	
4.7.3	Are lessons learned from the project formally recorded and distributed for future benefit?			✓
4.7.3	Are scope changes, actual costs, and actual schedule recorded?	✓		
5.2	Does project planning produce documents (e.g. scope statement) including:			
	project objectives?	✓		
	product description?	✓		
	what is in and out of scope?	✓		
	acceptance criteria?	✓		
	constraints and assumptions?	✓		
	organization structure?	✓		
	schedule milestones?	✓		
	approval requirements?	✓		
	cost estimate?	✓		

<b>PMBOK</b>	<b>Best Practice</b>	<b>Yes</b>	<b>Partially</b>	<b>No</b>
5.3	Is a work breakdown structure created providing the structure for the budget and schedule?	✓		
5.4	Is there a process to obtain stakeholders' formal acceptance of the completed project scope?	✓		
6.5	Are schedules produced for substantially all work on the project, and distributed to team members?	✓		
6.5	Are "critical" tasks identified in the project schedule?	✓		
6.5	Does scheduling consider the internal people resources required, and is the schedule reconciled against resources available?		✓	
6.6	Are the schedules updated regularly to show actual and forecast, and published with a comparison to schedule baseline?		✓	
6.7	Is appropriate corrective action taken if the project is falling behind schedule?		✓	
7	Is a cost estimate produced for substantially all work on the project?		✓	
7.3	Is the cost estimate (budget) updated regularly to show actual costs to date?	✓		
7.3	Is the cost estimate (budget) updated regularly to show estimates to complete?			✓
7.3	Is the cost estimate (budget) published with a comparison to the approved budget?			✓
7.3	Is the "earned value" technique used?			✓
7.3	Is corrective action taken at the appropriate time if the project is trending over budget?			✓
7	Do project decisions include consideration of the cost of using or owning the product (Life-cycle costing or total cost of ownership)?			✓
8.1	Does the organization use project management process improvement tools:			
	benchmarking?			✓
	independent audits/reviews?			✓
	other quality planning tools?			✓
8.2	Does the organization take action on non-conformance within the project to discover the "root-cause" and initiate preventative and corrective action?		✓	
9	Do cross-functional team members join the project early and participate in project planning and decision making?		✓	
9.1.2.1	Do all team members have a clear understanding of their roles and responsibilities?	✓		
9.1.3.1	Does team member authority reasonably match responsibility?		✓	
9.1.3.1	Does assignment of team members take into account their competencies, cost, and responsibilities?	✓		
9.3.1	Once project execution is started, is each team member's duration on the project planned and therefore reasonably predictable?		✓	
9.4	Does the core project management team reasonably observe team behaviour, manage conflict, and resolve issues?	✓		
9.4	Does the project manager or team reasonably evaluate team and team member performance and provide feedback for improvement?		✓	

<b>PMBOK</b>	<b>Best Practice</b>	<b>Yes</b>	<b>Partially</b>	<b>No</b>
10.1	In project planning has the team determined the information and communication needs of the stakeholders as follows:			
	Who are the stakeholders?	✓		
	Who needs what information?		✓	
	When is the information needed?		✓	
	How will it be provided?		✓	
	Who will provide the information?		✓	
10	Do stakeholders (including team members) feel that communications processes are reasonably sufficient?		✓	
10.3	Is there regular status reporting (work achieved versus work scheduled, percentages complete, future forecast progress, issues and problems, recommended corrective action) to appropriate stakeholders?		✓	
10.4.3	Are issues logs used to document concerns and their resolutions?			✓
11.1.3.1	Does the project team have a defined methodology for risk management?		✓	
	Does the risk management methodology include roles and responsibilities?		✓	
	Does the risk management methodology include a means for categorizing and prioritizing risks?		✓	
11.2	Does the team identify and document risk events (e.g. brainstorming sessions, interviewing subject matter experts)?		✓	
11.2.3	Is a document maintained logging all identified risks, their priorities or categories, and an "owner" for each risk?		✓	
11.3	Are the probability and impact of each risk estimated?		✓	
11.5	After identifying risks does the team develop and document appropriate responses?		✓	
11.5.2	In planning, does the team identify and document "opportunities" (uncertainties with potential positive effects on the project)?		✓	
11.6	During project execution, does the team monitor identified risks and ensure or revise risk responses with the risk owner or appropriate stakeholder?		✓	
11.6	During project execution, does the team continue to identify, document, analyze, and respond to new risks?		✓	
11.6.2.5	Does the project use contingency reserves in the budget and schedule?			✓
11.6.2.5	Does the project consciously manage contingencies during the execution of the project?			✓