

AUDIT REPORT NUMBER 2007-09
CITY OF RICHMOND
AUDIT OF DEPARTMENT OF PUBLIC WORKS
RADIO SHOP
March 2007

Executive Summary

March 16, 2007

The Honorable Members of City Council
Richmond City Audit Committee

The City's Auditor's Office has completed an audit of the Radio Shop Division. The audit objectives included operational efficiency and effectiveness of the Radio Shop and to verify oversight of the 800 MHz System and its related contracts.

Background

The 800 MHz System, referred to as a trunked simulcast radio system, consists of multiple channels and features which provides multiple users the ability to communicate simultaneously across the entire system. It is the primary means of wireless communications for public safety.

The City of Richmond is a partner of the Capital Region 800 MHz Trunked Radio System. There is a cooperative agreement amongst the City of Richmond, Henrico County, and Chesterfield County for regional radio communication and maintenance of the regional system. Each locality owns and operates its simulcast subzones covering the areas within its boundaries. The City's three subzone systems are connected through the "prime site" that is located in the Henrico County 911 Center.

The City's 800 MHz System is comprised of three radio towers and approximately 3,500 radio users.

Methodology

We conducted our audit in accordance with Government Auditing Standards issued by the Comptroller General of the United States. To accomplish the objectives, the auditor conducted interviews, performed field observations, and reviewed relevant records, policies and regulations. The auditor also conducted surveys of internal and external customers and benchmarked against other entities. The City Auditor's office believes that the audit provides a reasonable basis for conclusions regarding the internal control structure and recommendations.

The management of the City of Richmond, Virginia is responsible for maintaining the financial records of the City. It is also responsible for establishing and maintaining a system of internal accounting control. In fulfilling this responsibility, management is required to assess the expected benefits and related costs of control procedures.

Overall Conclusions

- The Radio Shop lacks fully documented disaster recovery plans, as well as clearly defined, documented and organized standard operating procedures.
- Based on a survey, 71% of their customers experienced bad receptions or dropped communications.
- Customers gave them high marks for their overall customer satisfaction.
- The Radio Shop developed productivity performance measures. However, a method to manage performance results has not been developed. Performance for five out of six goals were below standards.
- Fleet Management Services and the Radio Shop serve the same group of employees and other users. Co-locating the Radio Shop and Fleet Management Services could result in improvement in efficiency as the vehicles may not need to be transported to the Radio Shop.

Recommendations

The following recommendations are listed in the order they appear in the detailed report:

1. *Prepare a documented, comprehensive disaster recovery plan.*
2. *Establish and distribute to the staff a formal, written operating procedures manual.*
3. *Perform a focus coverage analysis to address concerns identified through the survey.*
4. *Establish proper segregation of duties. Require an individual who does not perform the functions of receiving and tracking inventory to perform the annual physical inventory count and verification.*
5. *Continue to monitor productivity and address performance issues identified.*
6. *Periodically refine performance measures to enhance productivity.*
7. *Consider co-locating Fleet management Services and the Radio Shop.*
8. *Benchmark other localities that have outsourced their radio shop operations and develop a short term plan (2-3 years) to reduce cost. Compare in-house operational costs with outsourcing costs.*

The City Auditor's Office appreciates the cooperation received from the Radio Shop's Operations Manager and his staff. These recommendations have been shared with management. Please feel free to contact the City's Auditor's Office for any questions related to this report.

Umesh V. Dalal, CPA
City Auditor

Introduction

The City Auditor's Office has completed an operational audit of the Radio Shop and the 800 MHz System in the Department of Public Works. The audit was conducted in accordance with Generally Accepted Auditing Standards applicable to governments. The results of the audit are summarized in this report.

Objectives and Methodology

The audit objectives included operational efficiency and effectiveness of the Radio Shop and to verify oversight of the 800 MHz System and its related contracts. To accomplish the objectives, the auditor conducted interviews, performed field observations and reviewed relevant records, policies and regulations. Auditors also conducted surveys of internal and external customers and benchmarked against other entities.

Background

800 MHz System

800 MHz System is the primary means of wireless communications for public safety

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The City's 800 MHz system is connected through the "prime site" that is located in the Henrico County 911 Center.

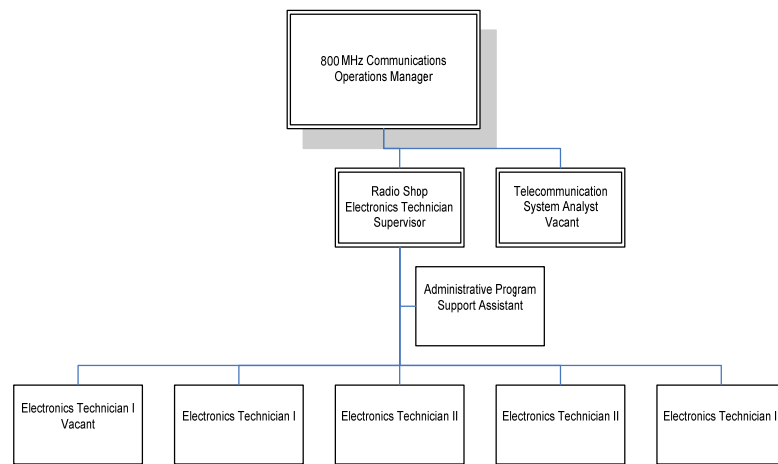
The City's 800 MHz System is comprised of three radio towers and has approximately 3,500 radio users. The location of the radio towers are as follows:

- City Hall
- 911 Center on Hopkins Road
- Fire Station 25

Radio Shop

The Radio Shop Division of the Department of Public Works is responsible for the operations of the shop and oversight of the 800 MHz System. The Division is responsible for two separate sections. One section is responsible managing the 800 MHz system through various contracts, which is performed by the Operations Manager. The other section is responsible for the installation, repairs, maintenance, and removal of radios.

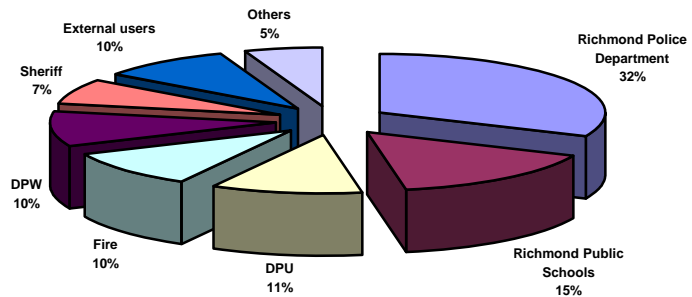
Radio Shop and 800 MHz System Organization Chart



Currently the City has approximately 3,500 authorized radios on the 800

MHz System from various departments and agencies. Numerous external organizations utilize the City's 800 MHz System, which include VCU Police, Capitol Police, and others.

800 MHz System users by Agency and Department



The chart bellows depicts the number of radio subscribers:

Radio Subscribers	
Department/Agency	Number of Radios
Richmond Police Department	1,125
Richmond Public Schools	542
DPU	386
Fire	366
DPW	340
Sheriff	250
External users	339
Others	192
Total users	3,540

The 800 MHz System management and monitoring is outsourced to Motorola with a subcontract with Radio Communications of Virginia. The maintenance agreement provides for dispatch service, infrastructure repair, network management, technical support and premier on site repair and response.

The Radio Shop is charged with the installation and maintenance of electronic equipment used by City agencies and departments. This includes installing and maintaining:

- mobile and portable radios
- mobile data computer system
- pagers
- dispatch consoles
- police and fire vehicle emergency lights and sirens
- public address systems; and,
- Other communications related equipment.

The financial results of operations for the Radio Shop Division are accounted for in an Internal Service Fund. Such funds are based on a cost reimbursement basis though charges to other departments for services provided. Radio Shop revenues are generated through various sources to include:

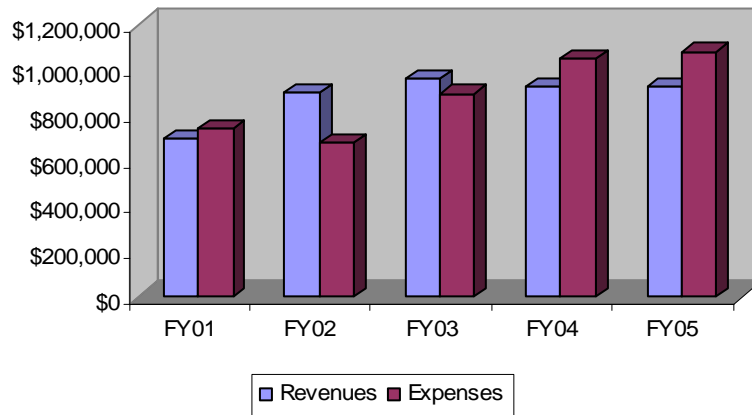
- labor for services
- monthly user charges for radios and pagers
- markups for parts sold

The Radio Shop labor charge rate is \$40 per hour. The rate was set in

***Labor rate of \$40
comparable to other
localities***

1997 and has not been changed since. However, according to the benchmarking results, \$40 per hour is comparable to the rates charged by other localities. Based on the billable hours and the payroll expenses, the actual hourly rate was \$49 (based on technicians and supervisor's wages, plus 24% fringe benefits overhead).

For more than five years, the Radio Shop's financial statements have shown a deficit in the accumulated fund balance. Expenses have been higher than revenues in three out of the last five years. The operating results from FY01 – FY05 are depicted below:



(Source: Adopted Biennial Fiscal Plan)

***Disaster Recovery
Plan***

The Radio Shop performs a critical function in the City. It provides important communication links to the public safety officers, without which the ability of the City to provide police and fire services can be adversely impacted. Specifically, during a natural disaster or other emergencies the importance of this service cannot be over emphasized. Therefore, assuring reliability of this service is crucial.

***A documented,
comprehensive
disaster recovery
plan was not
available***

Auditors observed that Radio Shop does not have documented long or short-term risk management strategies. Also a documented, comprehensive disaster recovery plan was not available. Without these resources long and short term mitigation of risks and management's ability to assess, sustain and map out improvement to operations may be impacted. Documented plans provide a gauge for evaluation of management's progress and success. Moreover, disaster recovery plans define vulnerabilities and allow putting mechanisms in place to continue functioning as normal (or as close to it) in the event of an unexpected emergency or tragedy. In addition, documentation would be essential for precise guidance to the staff during emergencies for carrying out the assigned tasks consistently and without errors. However, on the positive side, steps have been taken to mitigate some of the risks.

***According to
management, several
informal practices
used in emergencies
are in place***

According to the Operations Manager, in order to cope with a power failure, every site is equipped with an uninterruptible power system (UPS). The UPS is backed up with an on-site generator with at least seven days runtime of fuel at each site. At the Hopkins Road site, the generator supplying the radio equipment is backed up by a pair of redundant generators feeding the 911 Center. If the City loses the three sites, the Public Safety users on the system would roam to the Henrico and Chesterfield subzones. Furthermore, management could also

deploy the portable communications tower purchased by the region under a USAI grant.

Recommendation

1. Prepare a documented, comprehensive disaster recovery plan.

The Radio Shop Division lacks clearly defined, documented and organized policies and procedures. Auditors observed that the Division management has issued numerous memorandums addressing safety, on call procedures and other guidelines; however, they need to be formalized into standard operating procedures. Standard operating procedures assist management accomplish their goals and objectives in a more effective and efficient manner. Without specific guidance, employees may not know how to consistently handle situations as they arise while performing their work. Standard operating procedures:

Standard Operating Procedures

- provide a basis for employee accountability,
- serve as a tool for employees seeking guidance on the proper way to handle specific situations when questions arise while performing their job,
- provide assurance to management that operations will be conducted according to management directives, and
- help ensure consistency and continuity during employee turnover.

Recommendation

2. Establish and distribute to the staff a formal, written operating procedures manual.

Auditors surveyed City agencies and departments, as well as external

**Customer
Satisfaction Survey**

customers. Some of the departments surveyed included:

- Police Department
- Fire
- Sheriff
- DPU
- Community Development
- Social Services

Response to Audit Survey	Percentage
Experienced bad or no reception	71%
Communication dropped often	46%
Pages not coming through ¹	47%

As shown in the above table, 71% of the departments and agencies surveyed experienced bad or no reception. This raises safety concerns for Police Officers and other safety personnel. The most problematic reception/communication areas included:

- Some City buildings and around the City of Richmond
- Large buildings around the downtown area
- Far west- end in Henrico for DPU customers
- Detention Center has both bad reception and at times no reception (not on the 800 MHz System. They utilize the ht750 and the ht1000 radios)
- Basements, elevators, University of Richmond, Phillip Morris on Commerce Road
- Deep south side

¹ Pagers are outsourced through a contract. The Radio Shop is only responsible for managing the contract.

This situation appears to present some risks for Richmond citizens, businesses and City employees. Lack of communication in an emergency situation such as an active fire could present increased risk to firefighters' lives, citizens' lives and property. However, management is in the process of addressing these issues.

Recommendation

- 3. Perform a focus coverage analysis to address concerns identified through the survey.***

Inventory

Radio Shop keeps records of parts and radio inventory in its Asset and Management System. Inventory is manually entered into the system upon receipt. Agencies and departments are automatically charged for the applicable parts when a service or repair is performed. The tasks of ordering, receiving and tracking of inventory parts are performed solely by one individual. No one person should be in total control of the entire process. This situation could result in risk of misuse of City resources without being detected in a timely manner.

Recommendation

- 4. Establish proper segregation of duties (require an individual who does not perform the functions of receiving and tracking inventory to perform the annual physical inventory count and verification).***

Performance Measures

Introduction:

Defined standards and targets add value to the management decision making process. Performance measures serve as evaluation tools for

service effectiveness and output efficiency. This tool can be used to track labor productivity. Care should be exercised to assure adequacy of performance measures. Establishing performance measures based on industry practices and other benchmarking data would assure establishment of measures that not only can be used to measure performance. Goals and performance measures should be adequately tracked and include defined outcome results. Comparing an operation's performance with its own past performance merely indicates improvement or deterioration in performance over a period. However, such comparison will not be indicative of the level of performance a function optimally should have.

User Satisfaction:

The Radio Shop Division received high marks from their customers for their overall satisfaction. They received 100% customer satisfaction for the services provided by the staff.

User satisfaction for overall Radio Shop service was high

Response	Percentage
Repair satisfaction	86%
Satisfaction with repair turnaround time	82%
Satisfaction with overall services provided	100%

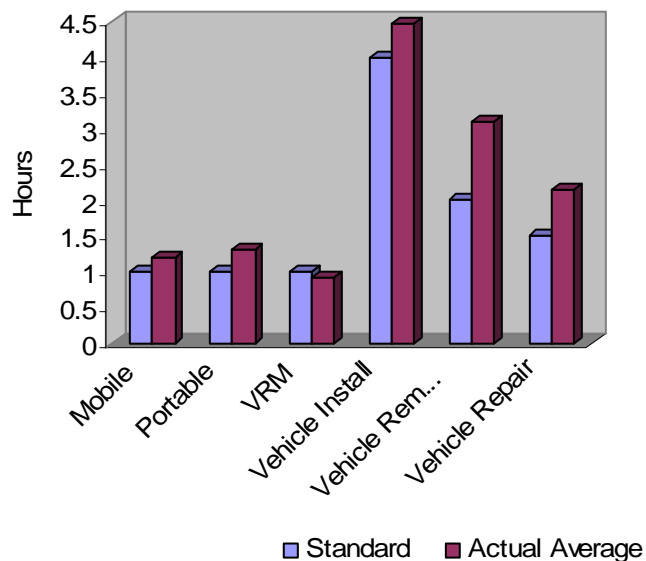
Performance measures:

Auditors observed that management has developed performance measures for FY07 (performance measures were not in place in FY06). The performance measures are now tracked through the new MCM Work Order/Asset Management System. The implementation of the new system now provides tools to monitor productivity. The

performance measures were based on experience and comparison with other localities. The Performance measures established were as follows:

Task	Performance Goal
Mobile	1 hour
Portable	1 hour
VRM	1 hour
Vehicle install	4 hours
Vehicle Removal	2 hours
Vehicle Repair	1.5 hours

The chart below depicts the technicians' performance measures and their actual average for the seven months ended January 2007; showing that staff's productivity was below management expectations in five out of six categories:



Co-locating Fleet and the Radio Shop

Recommendations

- 5. Continue to monitor productivity and address performance issues***

identified.

6. *Periodically refine performance measures to enhance productivity.*

The Radio Shop and the City's Fleet Management Services Division service and support the same group of employees and other users. During the seven month period ended January 31, 2007, the Radio Shop spent over 1,600 or approximately 40% of total hours in this function. Since some vehicles are driven to the Radio Shop in order to perform the needed task, co-locating the Radio Shop and Fleet Management Services could result in efficiency improvements because the vehicles may not be required to be transported to the Radio Shop. The Radio Shop installs mobile data computers (MDC) in the public safety vehicles and is responsible for installing, removing and repairing equipment in and from vehicles.

Furthermore, as already described in this report, the internal controls over the Radio Shop inventory needs to be improved. An audit currently underway at the Fleet Services will address the issues with their parts inventory. It may be possible to combine the two inventories in order to enhance controls over the Radio Shop inventory.

Recommendation

7. *Consider co-locating the Fleet Services and the Radio Shop.*

In order to reduce cost, other localities have found it more cost beneficial to outsource their radio shop operation. Based on conversation with management in Howard County, MD, they outsourced their radio shop operations at a cost of 1.35 million dollars. Even though Auditors did not perform a comprehensive study regarding outsourcing, many organizations are making the decision to

Outsourcing

outsource in order to lower cost of operations. Below are some localities that have outsourced their radio shop operation:

- City of Baltimore
- Howard County, MD
- Arlington County, MD

Recommendation

- 8. Benchmark other localities that have outsourced their radio shop operation and develop a short term plan (2-3 years) to reduce cost. Compare in-house operational costs with outsourcing costs.***

MANAGEMENT RESPONSE

Appendix A – Management Responses/Action Plan DPW – Radio Shop Audit		
<p>Recommendation #1: Prepare a documented, comprehensive disaster recovery plan. X Concur <input type="checkbox"/> Do not concur (Please explain)</p>		
Action steps	Responsible Employee	Target Date
Develop, document, and implement a comprehensive disaster recovery plan for the 800MHz radio system in the event of a network failure. This will include the role of Motorola, RCV, and the city Radio Shop personnel.	Operations Manager	September 2007
<p>Recommendation #2: Establish and distribute to the staff a formal, written operating procedures manual. X Concur <input type="checkbox"/> Do not concur (Please explain)</p>		
Action steps	Responsible Employee	Target Date
The Radio Shop currently has an established employee hand book for all policies, procedures, documents and some SOP's. The Radio Shop will review all documents and standardize them as Divisional SOP's. They will be organized and officially distributed to all staff members as standard operating procedures (SOP).	Operations Manager	December 2007
<p>Recommendation #3: Perform a focus coverage analysis to address concerns identified through the survey X Concur <input type="checkbox"/> Do not concur (Please explain)</p>		
Action steps	Responsible Employee	Target Date
The division has worked to address poor performing coverage areas since the new 800MHz system was installed in 2001. The	Operations Manager	Continual

<p>overwhelming areas of concern are in-building, primarily confined to basements and elevator shafts. Both VCU and the Convention Center have had in-building amplifiers installed to boost the radio signals to provide the level of coverage required by the Public Safety community. We have partnered with the State Capitol Police and are currently installing an in-building solution in the newly renovated capitol building. We have also completed an RF coverage study of the RPD headquarters building and plan to use the data to design and install a solution to aid in radio coverage of the basement and 1st floor of the building.</p> <p>Enhancing coverage in privately owned buildings presents challenges for the division. Some localities have addressed this by enacting new zoning requirements for public safety radio system performance and requiring the owner to install systems when buildings block the radio signals.</p> <p>Both Police and Fire have “talk around” channels to provide local coverage for on scene communications. Their SOP’s address the use of these channels and should always provide a means of communications for the radio user regardless of the system performance in a building.</p> <p>We plan to continue to identify poor performing coverage areas and work to address them with the most appropriate technically feasible solution.</p>		
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<p>Recommendation #4: Establish proper segregation of duties. Require an individual who does not perform the functions of receiving and tracking inventory to perform the annual physical inventory count and verification. X Concur <input type="checkbox"/> Do not concur (Please explain)</p>		
Action steps	Responsible Employee	Target Date
We have identified this as an area for improvement and enacted new divisional policies. The Radio Shop Supervisor will spot check any inventory performed by the clerical staff.	Supervisor	Implemented
<p>Recommendation #5: Continue to monitor productivity and address performance issues identified. X Concur <input type="checkbox"/> Do not concur (Please explain)</p>		
Action steps	Responsible Employee	Target Date
The new MCM work order\asset management system has allowed us to more closely track the performance of the Radio Shop. We developed a daily, monthly and annual reporting system. This allows us to track both the short term and long term goals.	Supervisor, Operations Manager	Implemented
<p>Recommendation #6: Periodically refine performance measures to enhance productivity. X Concur <input type="checkbox"/> Do not concur (Please explain)</p>		
Action steps	Responsible Employee	Target Date
We plan to continue our reporting process while looking to improve productivity of the Radio Shop along with our reporting methods.	Supervisor, Operations Manager	Continual



<p>Recommendation #7: Consider co-locating the Fleet Services and the Radio Shop. <input checked="" type="checkbox"/> Concur <input type="checkbox"/> Do not concur (Please explain)</p>		
<p>Action steps</p>	<p>Responsible Employee</p>	<p>Target Date</p>
<p>We agree that collocating both Fleet and Radio Shop operations under one roof has some advantages. Public Works in the process of designing a new centralized DPW operations center that will house both organizations in one location.</p>	<p>Deputy Director, Operations Manager Fleet</p>	<p>August 2008</p>
<p>Recommendation #8: Benchmark other localities that have outsourced their radio shop operation and develop a short term plan (2-3 years) to reduce cost. Compare in-house operational costs with outsourcing costs. <input checked="" type="checkbox"/> Concur <input type="checkbox"/> Do not concur (Please explain)</p>		
<p>Action steps</p>	<p>Responsible Employee</p>	<p>Target Date</p>
<p>We have already started the bench marking process and continue to identify efficiency improvements. We work closely with our regional partners along with other localities in the state. Collaboration with other localities provides us insight into processes that can improve our operations and we plan to continue that dialog.</p>	<p>Operations Manager</p>	<p>Continual</p>