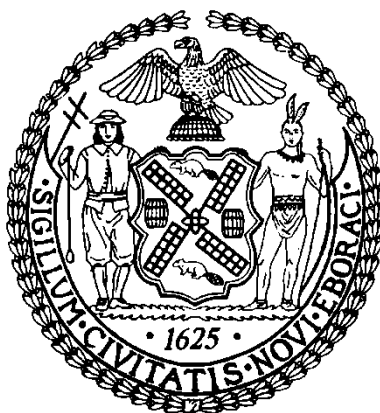


**CITY OF NEW YORK  
OFFICE OF THE COMPTROLLER**

**John C. Liu  
Comptroller**

**FINANCIAL AUDIT**

**Tina Kim  
Deputy Comptroller for Audit**



**Audit Report on the  
Fire Department of New York's  
Automatic Vehicle Location System**

*FM11-094A*

**November 9, 2011**



THE CITY OF NEW YORK  
OFFICE OF THE COMPTROLLER  
1 CENTRE STREET  
NEW YORK, N.Y. 10007-2341

John C. Liu  
COMPTROLLER

November 9, 2011

**To the Residents of the City of New York:**

My office has audited the New York City Fire Department's (FDNY) Automatic Vehicle Location (AVL) System to determine whether the AVL system functions as intended and whether the resources to maintain the system were appropriate. We audit entities such as the FDNY as a means of ensuring that they properly utilize the City's resources and operate in the best interest of the public.

On April 1, 2005, the Department of Information Technology and Telecommunications entered into an agreement with the Hewlett-Packard Company for the Emergency Communications Transformation Program (ECTP). The objective of ECTP is to centralize and integrate the call-taking and dispatch operations among the New York Police Department, FDNY, and Emergency Medical Services (EMS), which merged with FDNY in 1996, into two Public Safety Answering Centers. ECTP is divided into a number of sub-projects, one of which is the development and deployment of an AVL system for both fire emergency response vehicles and EMS vehicles.

The audit found that the AVL system has limited use for fire emergency vehicles, and questions whether the \$7.3 million expended on the fire emergency response vehicles was a good use of project funds, or if these funds could have been used more effectively elsewhere. The audit also found that the AVL system does not track or display the location of FDNY vehicles in "real time" and, in some instances, displays vehicles inaccurately or not at all. Additionally, FDNY's Radio Shop does not maintain accurate inventory records or a suitable inventory tracking system to account for all of its emergency response vehicles equipped with AVL or for its AVL ensembles. Finally, despite investing \$39 million in the AVL system, it appears that FDNY has not provided appropriate resources to maintain the system.

The audit makes six recommendations, including that FDNY assess whether additional resources should be spent on enhancements to the AVL system for fire emergency response vehicles and related equipment; perform periodic diagnostics to identify exceptions that occur within the AVL system; ensure that all AVL exceptions are tracked independently; and ensure that there are adequate resources to maintain the AVL system.

The results of the audit have been discussed with FDNY officials, and their comments have been considered in preparing this report. FDNY's complete written response is attached to this report. If you have any questions concerning this report, please e-mail my audit bureau at [audit@comptroller.nyc.gov](mailto:audit@comptroller.nyc.gov).

Sincerely,

  
John C. Liu

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*The City of New York*  
*Office of the Comptroller*  
*Financial Audit*

**Audit Report on the  
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**AUDIT REPORT IN BRIEF**

On April 1, 2005, the Department of Information Technology and Telecommunications (DoITT) entered into an agreement with the Hewlett-Packard Company (HP) for the Emergency Communications Transformation Program (ECTP). The objective of ECTP is to centralize and integrate the call-taking and dispatch operations among the New York Police Department (NYPD), Fire Department of New York (FDNY), and Emergency Medical Services (EMS), which merged with FDNY in 1996, into two Public Safety Answering Centers (PSACs). ECTP is divided into a number of sub-projects, one of which is the development and deployment of an Automatic Vehicle Location (AVL) system for both fire emergency response vehicles and EMS vehicles.

According to an April 19, 2006, joint press release, the Mayor and former Fire Commissioner stated that, "all New York City ambulances and Fire Department apparatus including engines, ladder trucks, rescue companies and battalion vehicles will be equipped with the Automatic Vehicle Location (AVL) system by the end of the summer. AVL utilizes Global Positioning Satellite (GPS) technology to track the real-time movements of any equipped vehicle, helping dispatchers more accurately deploy emergency resources." The press release further stated that, "AVL is invaluable in providing a real-time update of where resources are actually located. Combined with CAD, AVL is a powerful tool that creates a visual map of where emergency resources are located and their movements."

FDNY's two Computer Aided Dispatch (CAD) systems (one for fire emergency vehicles and the other for EMS) are designed to serve the demanding call-taking and dispatching needs of FDNY. CAD also provides a recommendation of which vehicle(s) should respond to an incident based on certain factors in the CAD systems, including a vehicle's actual location, which is supplied by AVL. The AVL system provides FDNY management and dispatchers with a visual tool that displays the location of the vehicles being dispatched. However, FDNY officials stated that AVL is fully integrated into the EMSCAD system, but not into the Starfire CAD (for fire emergency vehicles) system.

As of February 2011, the total cost of the AVL project for Fire and EMS was approximately \$39 million.

Our objectives were to determine whether the AVL system functions as intended and whether the resources to maintain the system were appropriate.

### **Audit Findings and Conclusions**

As the AVL system has limited use for fire emergency vehicles, we question whether the \$7.3 million expended on the fire emergency response vehicles was a good use of project funds or if these funds could have been used more effectively elsewhere. Additionally, the AVL system does not track or display the location of FDNY vehicles in “real time” and, in some instances, displays vehicles inaccurately or not at all. However, we do not believe the instances we observed of inaccurately displayed or missing vehicles pose a threat to public safety.

Additionally, FDNY’s Radio Shop does not maintain accurate inventory records or a suitable inventory tracking system to account for all of its emergency response vehicles equipped with AVL or for its AVL ensembles.

Finally, despite investing \$39 million in the AVL system, it appears that FDNY has not provided appropriate resources to maintain the system. According to FDNY officials, the resources within EMSCAD programming and FDNY’s Radio Shop may not be sufficient to maintain the system.

### **Audit Recommendations**

The audit recommends that FDNY should:

- Assess whether additional resources should be spent on enhancements to the AVL system for fire emergency response vehicles and related equipment.
- Prior to each EMS shift, have vehicle crews confirm with their dispatchers that their vehicles’ AVL units are functioning properly. Any exceptions should be documented and referred to the appropriate party.
- Perform periodic diagnostics to identify exceptions that occur within the AVL system. These exceptions should be documented and corrective action taken to ensure that the exceptions are corrected.
- Ensure that all AVL exceptions are tracked independently.
- Ensure that there are adequate resources to maintain the AVL system.
- Ensure that all AVL equipment is accurately engraved, bar-coded, and entered into the electronic inventory tracking system in a timely manner.

**Agency Response**

FDNY officials generally agreed with the report’s recommendations. In their response, FDNY officials stated, “...we agree with a large percentage of the recommendations in the report, noting that the Department had previously recognized some of these same issues. As a result, we have already begun to take steps to address these recommendations.”

# INTRODUCTION

## **Background**

FDNY protects the lives and property of New York City residents and visitors. As first responders to fires, public safety and medical emergencies, disasters, and terrorist acts, the timely delivery of these services enables FDNY to make significant contributions to the safety of New York City and homeland security efforts. FDNY encompasses two divisions, Fire operations and EMS. Although they are part of the same agency, both function as two separate operations.

On April 1, 2005, DoITT entered into an agreement with HP for the Emergency Communications Transformation Program. ECTP was initiated in 2004 to address the needs of the City's emergency public call-taking and dispatch operations and to overhaul the City's 911 operations due to shortcomings which contributed to the loss of some communications relating to the September 11, 2001, World Trade Center catastrophe and the 2003 East Coast Blackout. The objective of ECTP is to centralize and integrate the call-taking and dispatch operations among the NYPD, Fire, and EMS into two Public Safety Answering Centers (PSACs) equipped with state-of-the-art hardware and software communications systems.

ECTP is divided into a number of sub-projects, one of which is the development and deployment of an AVL system for FDNY. AVL has four phases: the Discovery Phase (Technology Identification), Initial Rollout Phase (Initial FDNY/Map Rollout), Full Rollout Phase (Full FDNY/Map Rollout), and Mobility Phase (Mobile Map Rollout).

FDNY implemented a GPS device to locate and track its emergency response vehicles as part of the AVL project, thus helping dispatchers more accurately deploy emergency resources and creating a visual map of where resources are located and their movements. The AVL system combines GPS technology and street-level mapping to pinpoint the longitude, latitude, and course direction of any AVL-equipped vehicle. Locations acquired through AVL provide FDNY management and dispatchers with a visual tool that displays the location of the vehicles being dispatched on a digital map.

CAD is designed to serve the demanding call-taking and dispatching needs of FDNY. CAD also provides a recommendation of which vehicle(s) should respond to an incident based on certain factors in the CAD systems, including a vehicle's actual location, which is supplied by AVL. Currently, FDNY uses two CAD systems, one for fire emergency vehicles (Starfire) and the other for EMS vehicles (EMSCAD).

According to FDNY officials, AVL is fully integrated into the EMSCAD system, but not into the Starfire CAD system.<sup>1</sup> However, FDNY intends on completing the integration of AVL into the Starfire CAD system as part of the "Mobile Mapping" phase of the AVL project.<sup>2</sup>

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<sup>1</sup> This was further reiterated by FDNY officials at a City Council hearing on September 27, 2011.

<sup>2</sup> Fire and EMS units will utilize mobile mapping to reduce their response time to an incident when vehicle operators are unfamiliar with an assigned area.

AVL began as a pilot program in September 2005 with EMS units on Staten Island and in southern Brooklyn. Along with FDNY, DoITT installed AVL devices in approximately 1,100 emergency vehicles. More than 600 devices were installed in EMS ambulances by July 2006, while nearly 500 Fire vehicles had devices installed by August 2006. As of February 2011, the total cost of the AVL project for FDNY was approximately \$39 million.<sup>3</sup>

## **Objectives**

The audit's objectives were to determine whether the:

- AVL system functions as intended, and
- Resources to maintain the system were appropriate.

## **Scope and Methodology Statement**

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives, except for our inability to obtain any "trouble logs" related to AVL from FDNY.<sup>4</sup> We, therefore, could not determine if there were any documented issues with the AVL system. This issue is more fully disclosed in the Detailed Scope and Methodology section. This audit was conducted in accordance with the audit responsibilities of the City Comptroller as set forth in Chapter 5, §93 of the New York City Charter.

The scope of this audit was April 1, 2005, to March 31, 2011. Please refer to the Detailed Scope and Methodology at the end of this report for the specific procedures and tests that were conducted.

## **Discussion of Audit Results**

The matters covered in this report were discussed with FDNY officials during and at the conclusion of this audit. A preliminary draft report was sent to these officials and discussed at an exit conference on September 8, 2011. On October 4, 2011, we submitted a draft report to FDNY officials with a request for comments. We received a written response from FDNY on October 19, 2011.

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<sup>3</sup> Of the \$39 million total project cost, \$36 million was from Department of Homeland Security federal grants.

<sup>4</sup> Trouble logs are usually filled out each time equipment trouble is detected. These logs detail what equipment is affected, the nature of the trouble, and the time of the failure.



FDNY officials agreed with five of the six report recommendations. They partially agreed with our recommendation that FDNY should, prior to each EMS shift, have vehicle crews confirm with their dispatchers that their vehicles' AVL units are functioning properly, stating that, "In order for EMS units to participate in the 9-1-1 system they are required to log into the EMS CAD system via GPS functioning Mobile Data Terminal (MDT) at the start of the tour."

The full text of the FDNY response is included as an addendum to this report.

## FINDINGS

As the AVL system has limited use for fire emergency vehicles, we question whether the \$7.3 million expended on the fire emergency response vehicles was a good use of project funds or if these funds could have been used more effectively elsewhere.<sup>5</sup> Additionally, the AVL system does not track or display the location of FDNY vehicles in “real time” and, in some instances, displays vehicles inaccurately or not at all. However, we do not believe the instances we observed of inaccurately displayed or missing vehicles pose a threat to public safety.

FDNY’s Radio Shop does not maintain accurate inventory records or a suitable inventory tracking system to account for all of its emergency response vehicles equipped with AVL or for its AVL ensembles.<sup>6</sup> Finally, despite investing \$39 million in the AVL system, FDNY has not provided sufficient resources to maintain the system. According to FDNY officials, there is a lack of resources within EMSCAD programming and FDNY’s Radio Shop.

These matters are discussed in further detail in the following sections of this report.

### **FDNY Spent Approximately \$7.3 Million Which Could Have Been Used for Other Purposes**

Because FDNY dispatchers rely on the Starfire CAD system for tracking the actual location of each fire vehicle, we believe that FDNY unnecessarily spent approximately \$7.3 million to install AVL on its fire emergency response vehicles (non-EMS), where identifying the location of these vehicles through AVL is not needed. The vehicles are usually dispatched from a firehouse to an incident (within their response neighborhoods) and then return to the firehouse. However, there is a greater operational need for EMS to use AVL because ambulances are assigned to certain areas of the City, constantly moving around the City waiting to be dispatched to an incident.

During our observations, we noted several cases of fire vehicles leaving their firehouses, being dispatched and responding to incidents, and then returning to the firehouses. However, in some cases, we observed that the AVL map did not indicate whether these units ever left the firehouse nor did its status change.<sup>7</sup> In addition, fire emergency response vehicles were observed on the AVL map as simply “bouncing” from various points along the route. Consequently, it became apparent that the AVL map for the fire emergency response vehicles experiences time delays and does not accurately reflect the location of fire emergency vehicles.

Based on the limited documentation received from FDNY, we have estimated that there are approximately 679 fire emergency response vehicles. Furthermore, we found that the cost of AVL equipment per fire vehicle is \$10,808 (“AVL Ensemble”) for an estimated total cost of \$7.3

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<sup>5</sup> The \$7.3 million is specific to the cost of the Motorola units only, which are primarily used in Fire vehicles, and excludes Grey Island units. These amounts are exclusive of the cost for graphic equipment, wiring, and labor associated with the PSAC location in Brooklyn and the communication offices in the Bronx and Queens.

<sup>6</sup> The “AVL Ensemble” consists of a Mobile Data Terminal and the automatic vehicle locator equipment.

<sup>7</sup> A status change, such as if the vehicle is available for a call, en route to a call, or at the scene of an emergency, is displayed on the AVL map and CAD systems by a particular color.

million. This amount is exclusive of the cost for graphic equipment, wiring, and labor associated with the PSAC location in Brooklyn and the communication offices in the Bronx and Queens. In addition, FDNY could not accurately determine the total number of vehicles equipped with AVL (discussed in further detail below).

Currently, the AVL project is not complete. According to the original plan, the initial EMS rollout was to be completed by June 2006, while the AVL Fire rollout was to begin at that point and be completed by March 2007. All units were expected to appear on the AVL maps by September 2008. However, at this point, AVL has yet to be fully integrated into the Starfire CAD system, and the Mobile Mapping portion of the AVL project is still in progress. The AVL expansion (as it is called today) is currently funded for an additional \$4.3 million. We question the wisdom of expending additional funds due to the limited use of AVL for fire vehicles.

***FDNY Response:*** “On the Fire Operations side (non-EMS), AVL is used as a management tool. Specifically, the Office of the Chief of Fire Operations utilizes AVL to monitor building inspection activity. With the ongoing rollout of the mobile mapping phase, AVL will be utilized by both Fire and EMS units to enhance their ability to get to emergency locations, especially in those times in which vehicle operators are not familiar with areas in which they may be assigned...”

***Auditor Comment:*** According to FDNY, AVL utilizes GPS technology to track the movements of any equipped vehicle, helping dispatchers more accurately deploy emergency resources. Instead, the fire side (non-EMS) is using AVL only as a “management tool,” a term which throughout the audit was never clearly defined to us, to monitor building inspection activity. This does not appear to be the intended purpose of the AVL system and reinforces the fact that FDNY may have unnecessarily spent millions of dollars.

Moreover, since fire vehicles primarily respond to emergencies within a designated response neighborhood and their locations are generally known, we question the necessity of implementing mobile mapping on the fire side. Instead, we believe that FDNY could be using these funds elsewhere, such as on improving its emergency communications.

### **Vehicles were Inaccurately Displayed or Missing on the AVL Map**

During our limited observations of the AVL map at the Fire and EMS call centers, we determined that 7.6 percent of the sample vehicles were either inaccurately displayed or missing from the AVL map. However, the vehicles’ actual locations were accurately reflected in the CAD systems, allowing dispatchers to know where the vehicles were located and not posing a threat to public safety. Each FDNY vehicle equipped with AVL also consists of a Mobile Data Terminal, or MDT, which contains a built-in GPS device that is supplemented by “dead reckoning” capabilities in order to monitor distance and direction traveled to supplement satellite positioning where the GPS fails.

On April 6, 7, and 8, 2011, we observed a total of 124 calls at fire emergency dispatch operations, of which 13 (10.5 percent) had discrepancies between the CAD system and the AVL map. Similarly, on May 5, 6, and 9, 2011, we observed a total of 153 calls at EMS emergency dispatch operations, of which eight (5 percent) had discrepancies between the CAD system and the AVL map. Tables I and II show the total number of calls observed (for both Fire and EMS) by borough during our observation period and the total number of issues that were documented (i.e., vehicles depicted as being in the water or vehicles not seen on the AVL map).

**Table I**  
Fire Side

Date	Borough	Number of Calls Observed	Vehicles in the Water	Vehicles not on Map
4/6/11	Bronx	19	0	0
4/7/11	Queens	36	0	4
4/8/11	Brooklyn	12	2 (a)	1
4/8/11	Manhattan/Citywide	51	2	4
4/8/11	Staten Island	6	0	0
	<b>Totals</b>	<b>124</b>	<b>4</b>	<b>9</b>
			<b>10.5 percent</b>	

- a. Includes a Bronx vehicle seen while observing Brooklyn, Staten Island, and Manhattan.

**Table II**  
EMS Side

Date	Borough	Number of Calls Observed	Vehicles in the Water	Vehicles not on Map
5/5/11	Brooklyn	38	0	2
5/5/11	Staten Island	3	0	0
5/6/11	Manhattan	37	1	2
5/9/11	Bronx	36	1 (b)	0
5/9/11	Queens	36	1 (b)	1
5/9/11	Citywide	3	0	0
	<b>Totals</b>	<b>153</b>	<b>3</b>	<b>5</b>
			<b>5 percent</b>	

- b. These are two Manhattan vehicles that were seen while observing Bronx, Queens, and Citywide operations.

Specifically, the AVL map displayed the locations of seven vehicles (four fire units and three EMS units) as being in various bodies of water around New York (see Appendix for pictures) and did not show 14 vehicles at all. For example, we observed one of the vehicles displayed on the AVL map as being in the water under the Verrazano Bridge, but according to a fire dispatcher using the CAD system, the actual location was at its assigned firehouse in

Downtown Brooklyn. Furthermore, the 14 other vehicles (nine fire units and five EMS units) were located in the CAD systems, but could not be located visually on the AVL map because, according to the assigned dispatchers, their GPS were inoperable, and the assigned dispatchers were unaware that the units were not being displayed on the AVL map until we informed them. Consequently, the dispatchers would be unable to locate the vehicles on the AVL map or assist in directing them to their correct locations, if necessary.

***FDNY Response:*** “The units reflected in the water had defective GPS equipment that were repaired and returned to service within 24 hours.” FDNY further stated, “AVL map discrepancies (e.g., possible malfunctioning GPS equipment) are acted upon by dispatchers and notification made to the appropriate parties responsible for correcting such....FDNY Communications maintains a formal policy for dispatchers/dispatch supervisors to follow when AVL map discrepancies arise.”

### **Lack of Resources to Maintain the AVL System**

In determining whether the resources to maintain the AVL system were appropriate, we spoke with several FDNY officials regarding maintenance of the AVL system. According to FDNY officials, there is a need for additional personnel. As of July 5, 2011, EMSCAD programming was down to only two employees, one of whom is the manager. Also, an FDNY official informed us that FDNY’s Radio Shop has a lack of radio mechanics who are heavily relied upon to ensure that FDNY has fit and available vehicles at all times of the day. Therefore, there may be an insufficient amount of resources in place to properly maintain the AVL system.

### **Other Issue**

#### **Inventory Controls over AVL-Equipped Vehicles and AVL Ensembles are Weak**

FDNY’s Radio Shop was unable to determine the total number of emergency response vehicles equipped with AVL or the total amount of AVL ensembles in its inventory because it does not maintain accurate inventory records to account for all of its emergency response vehicles equipped with AVL or its AVL ensembles.

According to section III (1) (c) of FDNY’s Federal, State, and City Grant Compliance Program and Operating Standards,

“For purposes of federally funded grants, equipment is defined as property having a useful life of more than one year and an acquisition cost of \$5,000 or more per unit. Based on this definition, any item that is part of an overall system, even if valued at under \$5,000, must be considered covered by the inventory control requirements, if the overall system value is in excess of \$5,000 (e.g., AVL equipment).”

Furthermore, Section 15 of the Department of Investigation's Standards for Inventory Control and Management states that, "A perpetual inventory system is established to maintain an up-to-date count of all items in the inventory."

We asked FDNY to provide a list of all vehicles equipped with AVL, and FDNY officials provided us with a list from the Radio Shop containing 1,042 vehicles. Because this list did not indicate whether the vehicles were for Fire or EMS, FDNY subsequently provided us with a second list from Fleet Services indicating a total of 1,678 emergency response vehicles—a difference of 636 vehicles. After reconciling the two lists, we identified several discrepancies, which were presented to FDNY officials on March 28, 2011. After three months, FDNY was able to resolve most of the discrepancies. However, in a June 29, 2011, email, FDNY indicated that there are approximately 200 vehicles (including ladders, pumpers, engines, and ambulances) that are ordinarily considered emergency response vehicles, not equipped with AVL.<sup>8</sup>

Additionally, when we asked FDNY to provide a list of all AVL equipment, FDNY's Radio Shop provided us with three lists for Motorola MDTs as well as a separate list for Grey Island Systems International Inc./Interfleet Inc. (Grey Island) Mobile Data Units.<sup>9</sup> However, we are concerned about the accuracy of these lists. The Grey Island list, for instance, had 711 items listed. However, representatives from Grey Island provided us with documentation indicating that a total of 730 pieces of equipment were shipped to FDNY. As FDNY was unable to provide us with all of the documentation related to AVL inventory purchases, we were unable to determine the total amount of AVL equipment that should be in FDNY's inventory.

***FDNY Response:*** "Only front line vehicles registered within STARFIRE or EMSCAD are equipped with AVL capabilities. Many of the vehicles without AVL are spares or are used only in training; others are special units that don't require AVL."

***Auditor Comment:*** Since some of the approximately 200 emergency response vehicles are spares and could be placed into service at any time, we believe that FDNY should consider equipping these vehicles with AVL. Although we were not able to determine the total amount of AVL equipment that should be in FDNY's inventory, we did observe a sufficient amount of AVL units at FDNY's Radio Shop to cover the vehicles as well as having a sufficient supply for replacement.

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<sup>8</sup>According to FDNY officials, emergency response vehicles that should be equipped with AVL include ambulances and fire apparatus (i.e., engines, ladder trucks, rescue companies, and battalion vehicles.)

<sup>9</sup>On June 23, 2005, FDNY issued a GPS Evaluation Report indicating that the Motorola and Grey Island devices can be used by FDNY for the AVL project.

## RECOMMENDATIONS

FDNY should:

1. Assess whether additional resources should be spent on enhancements to the AVL system for fire emergency response vehicles and related equipment.

**FDNY Response:** FDNY agreed, stating that “The assessment is ongoing. The AVL project team was asked to begin work on developing a solution to display the location of fire units on maps in October 2005. Currently, all fire apparatus locations are displayed on interactive maps installed in key locations. The continued migration of AVL on the Fire Operations side would allow for the following major activities (some are in progress, while others are in planning phase): mobile mapping, E911 mapping, oblique angle image map display, unit emergency mapping and stolen vehicle mapping.”

2. Prior to each EMS shift, have vehicle crews confirm with their dispatchers that their vehicles’ AVL units are functioning properly. Any exceptions should be documented and referred to the appropriate party.

**FDNY Response:** FDNY partially agreed, stating that “In order for EMS units to participate in the 9-1-1 system they are required to log into the EMS CAD system via GPS functioning Mobile Data Terminal (MDT) at the start of the tour. AVL map issues observed by EMS staff (i.e., resource coordinators, dispatchers, dispatch and station supervisors) are noted to ensure both effective dispatching and that AVL anomalies are addressed and corrected.

When an EMS front line vehicle requires repair to an MDT, the EMS Station Officer records the status and contacts the FDNY Radio Repair Shop for service.”

**Auditor Comment:** Although FDNY claims that the EMS units are required to log into the EMSCAD system via their GPS-functioning MDTs, there appears to be no provision for notifying the dispatchers when the GPS malfunctions after the tour has begun. As previously mentioned, the assigned dispatchers informed us that the reason why the 14 vehicles that were part of our limited observation were not displayed on the AVL map was because their GPS were inoperable. Furthermore, the MDTs in the vehicles are equipped with a red light to indicate when the GPS is not functioning. Had the EMS units informed the dispatchers that the GPS in their vehicle was not functioning, the dispatchers would have known that the units were not being displayed on the AVL map.

3. Perform periodic diagnostics to identify exceptions that occur within the AVL system. These exceptions should be documented and corrective action taken to ensure that the exceptions are corrected.

**FDNY Response:** FDNY agreed, stating that “Diagnostic tests are conducted prior to acceptance to verify that they meet requirements. Whenever a modification is made or a new

version is released testing is performed to validate that existing features and functions perform properly and that whatever corrections or enhancements were made are operating as expected. Diagnostics are performed twice daily on many components AVL is dependent upon. This process is called the ‘tour check’.”

4. Ensure that all AVL exceptions are tracked independently.

**FDNY Response:** FDNY agreed, stating that “EMSCAD Programming test exceptions are documented in an extensive electronic tracking file, which is maintained by the Bureau of Technology Development and Systems (BTDS). An FDNY Project Management team is actively working on the next phase of AVL, which is called mobile mapping. One of the components being reviewed for development during this phase is the establishment of an independent tracking system to document all future AVL related CAD programming exceptions.”

5. Ensure that there are adequate resources to maintain the AVL system.

**FDNY Response:** FDNY agreed, stating that, “The FDNY Radio Repair Shop maintains a variety of systems, equipment, and technology related to the safety and efficiency of our members and in support of the overall mission of the department. All equipment is adequately maintained and repairs prioritized. The FDNY routinely reviews staffing requirements and will adjust staff if necessary.”

6. Ensure that all AVL equipment is accurately engraved, bar-coded, and entered into the electronic inventory tracking system in a timely manner.

**FDNY Response:** FDNY agreed, stating that “To ensure proper tracking and the inventory of AVL equipment FDNY utilizes the City of New York's ‘Grant Tracking System’ (GTS). GTS is incorporated into the FDNY's inventory process allowing the Department to record and track and barcode assets.

All AVL Ensemble equipment, including related base station equipment, is recorded and tracked in GTS. In addition, a physical inventory of respective equipment continues to be conducted, as required.

FDNY remains compliant with grant-related equipment inventory requirements. Moreover, the Department is in the process of implementing an agency-wide asset management system which will consolidate the FDNY Radio Shop databases used to track assets not supported by grant sources.”



## **DETAILED SCOPE AND METHODOLOGY**

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives, except for our inability to obtain any “trouble logs” related to AVL from FDNY. We, therefore, could not determine the number of software and hardware issues that may have occurred within the AVL system. This issue is more fully disclosed in the subsequent paragraph. This audit was conducted in accordance with the audit responsibilities of the City Comptroller as set forth in Chapter 5, §93 of the New York City Charter.

FDNY could not provide us with the trouble logs related to AVL, which indicate instances when the AVL system is malfunctioning. According to FDNY officials, the data is in an extensive tracking file which contains significantly more information than AVL, and it would be difficult to extract information specific to AVL. Because the trouble logs do not independently track AVL-related issues, we could not determine how often the system malfunctions. Therefore, we were unable to determine the reliability of the system. However, FDNY officials agree that “tracking for mapping items should be tracked independently; therefore, [they] are actively developing a procedure to address this matter.”

The scope of this audit was April 1, 2005, to March 31, 2011. To achieve our audit objectives, we reviewed and abstracted the agreement and relevant task orders between DoITT and HP. To obtain an understanding of FDNY’s AVL system, we interviewed relevant key personnel from FDNY and EMS and documented our understanding through written narratives, memoranda, and flowcharts.

To determine the accuracy and reliability of the AVL system on the Fire side, we conducted observations and walk-throughs at the Bronx and Queens Communication offices and the Public Service Answering Center 1 (PSAC1) in Brooklyn. For EMS, we conducted observations at PSAC1, which covers all five boroughs.

For both Fire and EMS, we observed dispatchers assigned to each borough for six separate days. For each incident, we observed and noted the time an incident appeared on the CAD screen, the vehicle(s) assigned, and the location of the selected incident. We then located each assigned vehicle on the AVL map and observed its movement on the map from the time the vehicle was assigned to an incident until it arrived at the scene. We also observed the status changes for each vehicle. Both the AVL and CAD systems use colors to denote the status of the emergency response vehicles. For example, purple means that the vehicle has been assigned to an incident, yellow means that the vehicle is en route to an incident, and red means that the vehicle has arrived at the scene.

To determine the total amount of AVL equipment, we conducted a walk-through of FDNY’s Radio Shop and requested a list of all emergency response vehicles equipped with AVL from the Radio Shop and Fleet Services. We also requested a list of all Motorola and Grey

Island Mobile Data Units, and contacted Grey Island directly for independent verification of the total equipment shipped to FDNY. In addition, we reviewed purchase orders, confirmation e-mails, invoices, receiving reports, and Product Delivery and Acceptance reports for the equipment purchased.

Finally, we contacted FDNY officials to determine whether the resources to maintain the AVL system were appropriate.

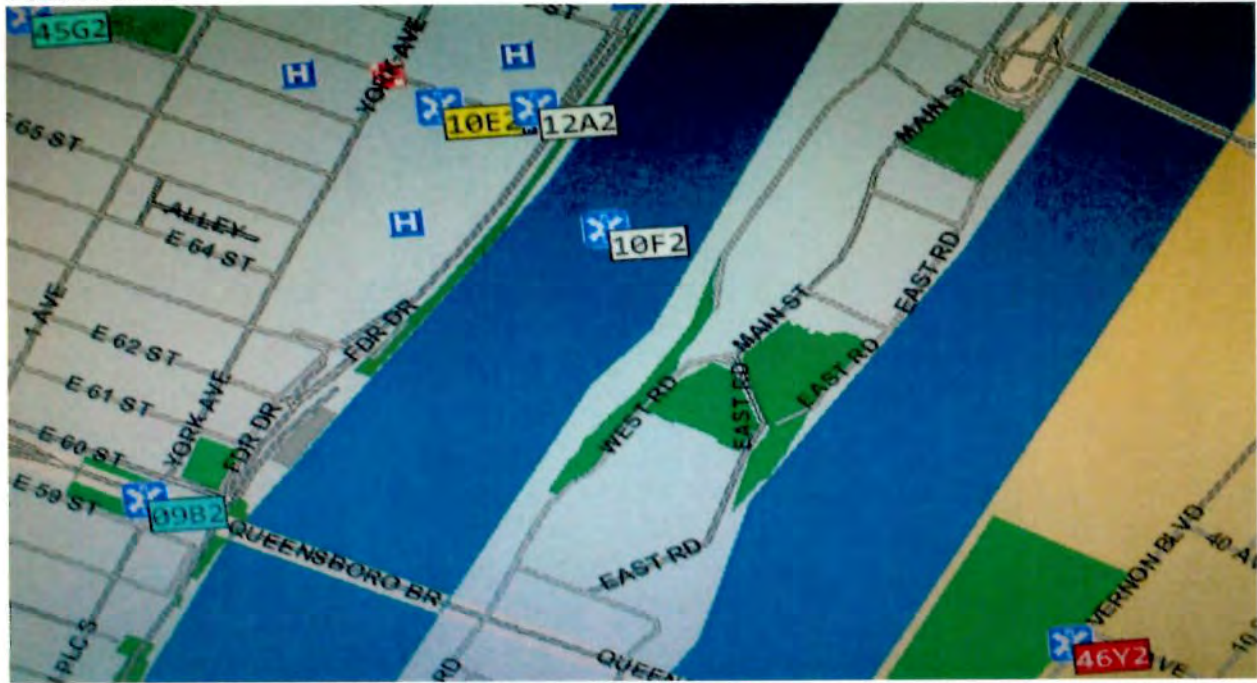
Pictures Showing Inaccuracies of Vehicle Locations

Vehicle 08C2



The AVL map showed Vehicle 08C2 in the middle of the Hudson River. However, the CAD system indicated that the vehicle was at West 41<sup>st</sup> Street and 10<sup>th</sup> Avenue in Manhattan.

Vehicle 10F2



The AVL map showed Vehicle 10F2 in the East River between the FDR Drive and Randall's Island. However, the CAD system indicated the actual location as being NYU Hospital.

Pictures Showing Inaccuracies of Vehicle Locations

Vehicle E092



The AVL map showed Vehicle E092 in the Long Island Sound, but according to the CAD system, the actual location was at its assigned firehouse in the Bronx.

Vehicle E235



The AVL map showed Vehicle E235 in the water under the Verrazano Bridge, but according to the CAD system, the actual location was at its assigned firehouse in Downtown Brooklyn.

Pictures Showing Inaccuracies of Vehicle Locations

Vehicle 01W2



The AVL map showed Vehicle 01W2 in the water near the Brooklyn Battery Tunnel, but according to the CAD system, the vehicle left Governor's Island and was on its way to a hospital in Manhattan.



## FIRE DEPARTMENT

9 METROTECH CENTER

BROOKLYN, N.Y. 11201-3857

SALVATORE J. CASSANO  
*Fire Commissioner*

Suite 8W-6

October 14, 2011

H. Tina Kim  
Deputy Comptroller  
Bureau of Audit  
The City of New York Office of the Comptroller  
1 Centre Street  
New York, NY 10007-2341

Re: **Audit Report on the Fire Department of New York's Automatic Vehicle Location System – FM11-094A**

Dear Deputy Comptroller Kim:

I write in response to the draft "Audit Report on the Fire Department of New York's Automatic Vehicle Location System", dated October 4, 2011. Please thank your staff for the time and diligence that they put into this audit. The Department appreciates their efforts and intends to utilize their recommendations.

I have attached copies of both the Fire Department's Response to Findings Summary, and the Agency Implementation Plan (AIP) which responds to the six recommendations made by the Office of the Comptroller in the audit referenced above.

As detailed in the AIP, we agree with a large percentage of the recommendations in the report, noting that the Department had previously recognized some of these same issues. As a result, we have already begun to take steps to address these recommendations.

If you have any questions about our response or AIP, please contact Domenick Loccisano, Executive Director of Compliance and Internal Audit, at (718) 999-5180.

Sincerely,

Salvatore J. Cassano  
Fire Commissioner

cc: Edward Kilduff, Chief of Department  
Robert Sweeney, Chief of Fire Operations  
Abdo Nahmod, Chief of EMS Operations  
Robert Boyce, Chief of Communications  
Michael Vecchi, Associate Commissioner of Management Initiatives  
Stephen Rush, Assistant Commissioner of Budget & Finance  
Donald Stanton, Assistant Commissioner of Technology Development & Systems  
George Davis III, Deputy Director, Mayor's Office of Operations

**FDNY Response to Findings Summary****Audit #:** FM11-094A**Audit Name:** Audit Report on the Fire Department of New York's Automatic Vehicle Location System**Finding:**

\*

The AVL system does not track or display the location of FDNY vehicles in "real time" and, in some instances, displays vehicles inaccurately or not at all.

**FDNY Response:**

FDNY/EMS utilizes AVL in real-time to determine the unit's location and status as part of the dispatch recommendation. This has reduced ambulance response times to life threatening emergencies. FDNY works diligently to correct any anomalies in data as they arise. As noted in the Comptroller's audit report (p.6), any anomalies appear only on the AVL map but do not factor into the dispatch process.

\*

FDNY unnecessarily spent as much as \$7.3 million to install AVL on its fire emergency vehicles (non-EMS).

**FDNY Response:**

On the Fire Operations side (non-EMS), AVL is used as a management tool. Specifically, the Office of the Chief of Fire Operations utilizes AVL to monitor building inspection activity. With the ongoing rollout of the mobile mapping phase, AVL will be utilized by both Fire and EMS units to enhance their ability to get to emergency locations, especially in those times in which vehicle operators are not familiar with areas in which they may be assigned. Additional attributes include, among other future capabilities: providing an optimal route to a hospital, enhancing EMS Field supervisor monitoring abilities, mapping caller locations (cell, fire box and solar cell box calls), which assists with locating callers in those areas with no addresses such as parks, train yards, cemeteries, etc., support the ability to display the status of a fire hydrant, and potentially send an alert to an appropriate resource when a hydrant is rendered out of service.



## FDNY Response to Findings Summary

**Audit #:** FM11-094A

- \* During limited observations by auditors, the AVL map displayed the locations of seven vehicles as being in various bodies of water around New York.

**FDNY Response:**

The units reflected in the water had defective GPS equipment that were repaired and returned to service within 24 hours. As noted in the Comptroller's audit report (p.6), any anomalies appear only on the AVL map but do not factor into the dispatch process.

- \* AVL map discrepancies (e.g., possible malfunctioning GPS equipment) are acted upon by dispatchers and notification made to the appropriate parties responsible for correcting such.

**FDNY Response:**

FDNY Communications maintains a formal policy for dispatchers / dispatch supervisors to follow when AVL map discrepancies arise.

- \* FDNY was unable to determine the total number of AVL equipment in its inventory because it does not maintain accurate inventory records.

**FDNY Response:**

FDNY is compliant with federal equipment inventory requirements; in addition, the Department is in the process of implementing an agency-wide asset management system. This system will mitigate inventory issues that currently exist at the FDNY Radio Shop due to disparate databases to help ensure tracking in accordance with FDNY standards.

- \* There are approximately 200 vehicles (including ladders, pumpers, engines and ambulances) ordinarily considered emergency response vehicles that may not be equipped with AVL.

**FDNY Response:**

Only front line vehicles registered within STARFIRE or EMSCAD are equipped with AVL capabilities. Many of the vehicles without AVL are spares or are used only in training; others are special units that don't require AVL.

**FDNY Agency Implementation Plan****Audit #:** FM11-094A**Audit Name:** Audit Report on the Fire Department of New York's Automatic Vehicle Location System**Rec. #:**

01

**Recommendation**

Assess whether additional resources should be spent on enhancements to the AVL system for Fire emergency response vehicles and related equipment.

**FDNY Response**

**AGREE.** The assessment is ongoing. The AVL project team was asked to begin work on developing a solution to display the location of fire units on maps in October 2005. Currently, all fire apparatus locations are displayed on interactive maps installed in key locations. The continued migration of AVL on the Fire Operations side would allow for the following major activities (some are in progress, while others are in planning phase): mobile mapping, E911 mapping, oblique angle image map display, unit emergency mapping and stolen vehicle mapping.

On the Fire Operations side (non-EMS), AVL continues to be used as a management tool. The Office of the Chief of Fire Operations utilizes AVL to monitor building inspection activity. With the ongoing rollout of the mobile mapping phase, AVL will be utilized by both Fire and EMS units to enhance their ability to get to emergency locations, especially in those times in which vehicle operators are not familiar with areas in which they may be assigned. Additional attributes include, among other future capabilities: providing an optimal route to a hospital, enhancing EMS Field supervisor monitoring abilities, mapping caller locations (cell, fire box and solar cell box calls), which assists with locating callers in those areas with no addresses such as parks, train yards, cemeteries, etc., support the ability to display the status of a fire hydrant, and potentially send an alert to an appropriate resource when a hydrant is rendered out of service.

02

**Recommendation**

Prior to each EMS shift, have vehicle crews confirm with their dispatchers that their vehicles' AVL units are functioning properly. Any exceptions should be documented and referred to the appropriate party.

## FDNY Agency Implementation Plan

Audit #: FM11-094A

Rec. #:  
02 cont.**FDNY Response:**

**PARTIALLY AGREE.** In order for EMS units to participate in the 9-1-1 system they are required to log into the EMS CAD system via GPS functioning Mobile Data Terminal (MDT) at the start of the tour. AVL map issues observed by EMS staff (i.e., resource coordinators, dispatchers, dispatch and station supervisors) are noted to ensure both effective dispatching and that AVL anomalies are addressed and corrected.

When an EMS front line vehicle requires repair to an MDT, the EMS Station Officer records the status and contacts the FDNY Radio Repair Shop for service.

03

**Recommendation**

Perform periodic diagnostics to identify exceptions that occur within the AVL system. These exceptions should be documented and corrective action taken to ensure that the exceptions are corrected.

**FDNY Response:**

**AGREE.** Diagnostic tests are conducted prior to acceptance to verify that they meet requirements. Whenever a modification is made or a new version is released testing is performed to validate that existing features and functions perform properly and that whatever corrections or enhancements were made are operating as expected. Diagnostics are performed twice daily on many components AVL is dependant upon. This process is called the "tour check".

04

**Recommendation**

Ensure that all AVL exceptions are tracked independently.

**FDNY Response:**

**AGREE.** EMSCAD Programming test exceptions are documented in an extensive electronic tracking file, which is maintained by the Bureau of Technology Development and Systems (BTDS). An FDNY Project Management team is actively working on the next phase of AVL, which is called mobile mapping. One of the components being reviewed for development during this phase is the establishment of an independent tracking system to document all future AVL related CAD programming exceptions.

FDNY Agency Implementation Plan

Audit #: FM11-094A

Rec. #:  
05

**Recommendation**

Ensure that there are adequate resources to maintain the AVL system.

**FDNY Response:**

**AGREE.** The FDNY Radio Repair Shop maintains a variety of systems, equipment, and technology related to the safety and efficiency of our members and in support of the overall mission of the department. All equipment is adequately maintained and repairs prioritized. The FDNY routinely reviews staffing requirements and will adjust staff if necessary.

06

**Recommendation**

Ensure that all AVL equipment is accurately engraved, bar-coded, and entered into the electronic inventory system in a timely manner.

**FDNY Response:**

**AGREE.** To ensure proper tracking and the inventory of AVL equipment FDNY utilizes the City of New York's "Grant Tracking System" (GTS). GTS is incorporated into the FDNY's inventory process allowing the Department to record and track and barcode assets.

All AVL Ensemble equipment, including related base station equipment, is recorded and tracked in GTS. In addition, a physical inventory of respective equipment continues to be conducted, as required.

FDNY remains compliant with grant-related equipment inventory requirements. Moreover, the Department is in the process of implementing an agency-wide asset management system which will consolidate the FDNY Radio Shop databases used to track assets not supported by grant sources.