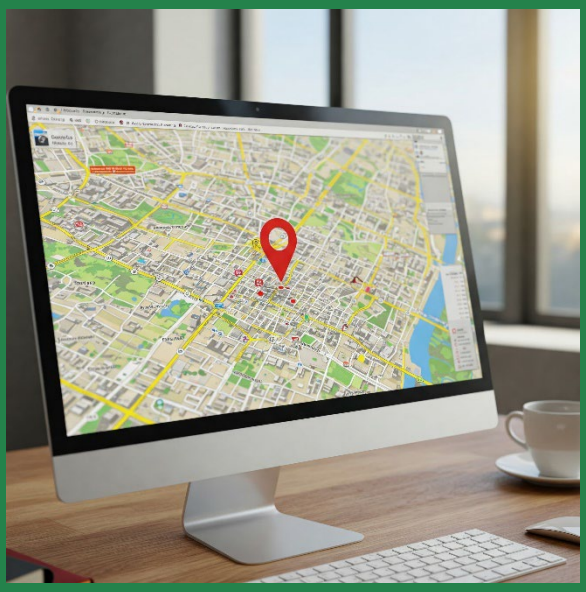
Automated Vehicle Locator (AVL) Devices



City of Charlotte
Internal Audit Department
600 E. Fourth St.
Charlotte, NC 28202

Staff

City Auditor
Tina Adams, CPA, CIA
Audit Supervisor
Will Pellisero, CPA, CIA, CISA
Senior Auditor
Daniel Nuccio, CPA, CFE

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October 16, 2025

CITY OF CHARLOTTE
INTERNAL AUDIT

AUTOMATED VEHICLE LOCATOR (AVL) DEVICES AUDIT REPORT SUMMARY

Objective

To evaluate whether adequate internal controls exist to track and monitor fleet vehicle usage.

Background

The City of Charlotte has approximately 5,075 road-based vehicles subject to their Automated Vehicle Locator policy, with ownership of those vehicles spread throughout the organization. The five departments with the most vehicles are CMPD (1,714), General Services (758), CATS (636), Charlotte Water (537), and Aviation (423).

Conclusion

Enhancing department proficiencies through training and utilization of AVL software will result in more effective monitoring of fleet vehicle usage.

1. **The City is not fully utilizing AVL capabilities to design and implement controls that deter and detect unauthorized use of fleet vehicles.**
    - City policy tasks the AVL Governance Committee with oversight of the AVL program
    - Six of 10 departments report performing AVL data review, however none are proactive and documented.
    - Departments cited data integration, driver identification, training, resources/support, and AVL accuracy as roadblocks to increasing utilization.
    - The AVL Governance Committee should:
        - Coordinate with I&T to provide training and support where possible.
        - Actively monitor departments' implementation of AVL controls.

Actions Planned

General Services has agreed to implement the recommendations in this report by December 31, 2026.

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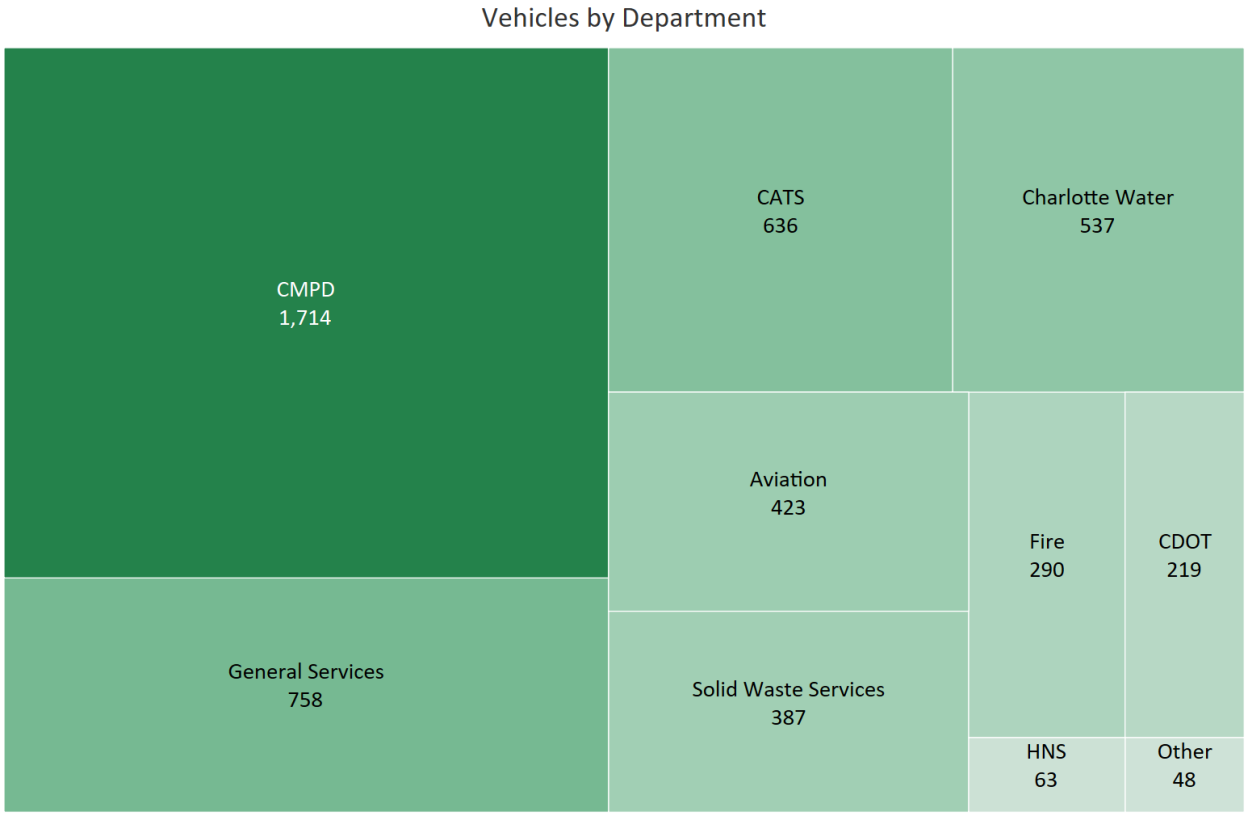
Objective

To evaluate whether adequate internal controls exist to track and monitor fleet vehicles activity to deter and detect unauthorized usage.

Background

Automated Vehicle Locator (AVL) devices utilize telematics to help organizations monitor and manage their vehicle fleets. These systems use GPS technology, onboard diagnostics, and wireless communications to provide real-time data on vehicle location, speed, idle time, and other operational metrics. These AVL devices are intended to help the City achieve critical fleet goals that include safety and risk mitigation; efficient, productive, and effective governance; and sustainability and resilience within its fleet.

The City of Charlotte is committed to responsible operation of its fleet through efficient and effective practices. The City has approximately 5,075 road-based vehicles subject to the Automated Vehicle Locator policy. Ownership and management of these vehicles varies by department as shown below:



Based on a survey of users, departments use seven different software programs to manage AVL devices: GeoTab, CAD, Via, TransitMaster, OnRoute, GeoFleet, and Coretex.

This audit examined the utilization of AVL data to detect and prevent unauthorized usage of City vehicles. We defined unauthorized usage as the use of a City vehicle for non-City business, including personal gain

or not performing work at all. This audit scope aligns with objectives 2 and 3 of the City AVL policy, specifically focusing on identifying vehicle time off-route and off-duty, as well as the anti-idling campaign. The Vision Zero audit report, published in FY 2025, aligned in-part with objective 1 of the City AVL policy. In collaboration with Internal Audit, CDOT recently published a white paper regarding AVL usage for improving driver behavior. The paper noted that there are varied policies across departments for addressing poor driver behavior and that features needed for more effective investigation and control have not been fully implemented, for example driver badge access readers. CDOT has proposed collaborating with General Services – Fleet Management for the ongoing support of the AVL Governance Committee.

Findings and Recommendations

1. *The City is not fully utilizing AVL capabilities to design and implement controls that deter and detect unauthorized use of fleet vehicles.*

In 2024, auditors received information about a City vehicle being used for unauthorized purposes. Auditors' investigations were limited by a lack of adequate AVL data and supporting documentation. This prevented the audit team from reaching a conclusion on the validity of the allegation.

To gain a better understanding of the citywide use of AVL equipment and data, auditors conducted a survey of City departments to identify the controls that exist to deter and detect unauthorized use of fleet vehicles. This survey of 14 employees representing 10 departments[1] found that only one department proactively reviews AVL data to prevent unauthorized vehicle use. However, this review is not documented. Additionally, five departments perform reactionary reviews, which are triggered by specific events such as complaints.

Departments gave feedback on challenges they face in managing AVL usage which has been consolidated below:

- Inability to automatically match work orders to vehicle locations.
- Difficulty determining the driver of specific vehicles.
- Supervisors have not received adequate training on software features, functions, and capabilities.
- There were not enough resources and technical support for in-depth monitoring and reviews.
- Data inaccuracies/imprecision contributed to limitations of reviews.

> "Data is only worth what you can get out of it. Fleet managers need to monitor all data points, take the time to examine the analytics, and come up with clear action plans."
>
> *A Beginner's Guide to Fleet Management, Routific*

These responses echo the challenges auditors encountered during the review of the allegation. Full utilization of AVL software would allow departments to establish trends and proactively monitor fleet vehicles to deter the use of City-owned vehicles for non-official duties. These trends can be used to help meet the objectives outlined in the City's policies, mainly identifying vehicle off-route and off-duty time as well as the anti-idling campaign.

In a hypothetical example, the combination of creating alerts for off-route vehicles and performing documented reviews could identify a department vehicle that regularly deviates from its assigned route. Further research would have to be performed at that point to determine if the vehicle is being used for unauthorized purposes or if there are inefficiencies in the dispatching process resulting in work orders not being recorded.

There were two policies relevant to this audit, one for fleet vehicles (MFS 16) and one for AVL (GS 5).

[1] We originally surveyed 12 departments (Aviation, CATS, CDOT, Charlotte Water, CMPD, Communication and Marketing, Fire Department, General Services/ Fleet Management, HNS, I&T, Solid Waste Services, and Storm Water Services), however two of the departments (Communication and I&T) did not have AVL devices installed in their vehicles. As a result, we have excluded their responses from this report finding.

MFS 16

MFS 16 was created to provide and maintain an effective, efficient and environmentally sustainable fleet of vehicles, motorized (non-plant) and trailed equipment, and manage the fleet and equipment in a manner that fulfills the City's mission and the user's operational requirements in a cost-effective way. MFS 16 includes a section covering the use of City and private vehicles for City business which states:

> "City-owned vehicles shall be assigned and used only in performance of official duties and not for personal use (except for commuting and incidental stops which do not add significant time to the trip or cost to the City)."

Related to the official use of vehicles, MFS 16 also stipulates:

> "Fleet Management shall report suspected instances of asset misuse/abuse to the respective Departmental Asset Coordinator. Each department is responsible for investigating allegations of misuse/abuse and taking appropriate action."

Additional sections of the policy used for this audit were Responsibilities and References #1 (Departmental Directors), #4 (Management & Financial Services Director), and #5 (Fleet Management Advisory Team, FMAT). Responsibilities relevant to this audit are identified below:

- Department Directors are responsible for ensuring that all Assets under their control are managed in accordance with the policy.
- Management & Financial Services Director (now the General Services Director) is responsible for supporting each director in the effective and efficient management of their assets and serving as (or appointing) an executive sponsor for the Fleet Management Advisory Team.
- FMAT is responsible for advising Fleet Management in the development and implementation of policies, processes and practices affecting citywide asset management with the goal of minimizing the fleet's environmental impact while maximizing the efficiency, effectiveness, and value of the City's fleet and equipment assets.

This policy assigns individual departments the first line of defense role, responsible for managing fleet vehicle usage risk. (See Appendix B for the "Three Lines of Defense" model). While it is not explicitly assigned, the AVL Governance Committee is the logical choice as the second line of defense role for support and monitoring of the first line of defense.

GS 5

The City AVL policy outlines three objectives:

1) Safety and Risk Mitigation:

   To encourage the safe operation of city vehicles by establishing minimum standards and guidelines for vehicle speed, seat belt usage, harsh cornering, hard breaking, rapid acceleration, and other parameters; it is critical to focus driver's training and coaching efforts in the areas where it is most needed.

2) Efficient, Productive, and Effective Governance:

   To improve city operations by identifying vehicle time off-route and off-duty, identifying vehicle congregation patterns, remotely evaluating engine and diagnostic codes, improving accurate recording of vehicle mileage meter information, recording the accurate number of engine operation hours, and supporting incident response efforts by informing dispatchers of vehicle locations and status.

3) Sustainability and Resiliency:

To develop a fleet wide data set of utilization information for analyzing data across the fleet including:

- Vehicle fleet right-sizing efforts,
- Alternative fueling suitability, including electric vehicles and charging infrastructure requirements, and
- Anti-idling campaigns and idle mitigation efforts

In addition, GS 5 includes other sections relevant to this audit:

- Driver Registration:
  - "Usage of a city vehicle and rolling stock assets will be directly tied to a driver. Vehicles assigned to a single driver can be associated with that driver."
- Telematics System:
  - "All city telematics data will be stored in a single database to ensure the availability of city-wide reporting and data analysis."
  - "The telematics system will be configured such that departments have access only to departmental vehicle data. I&T, Strategy and Budget, Fleet Management, and Risk Management will have access to city-wide datasets in order to perform fleet and risk analysis across departments."
  - "Supervisors and managers will be able to create and chose from a variety of reports to review interdepartmental and citywide data."
- AVL Governance Committee:
  - "Fleet Management, in coordination with other city departments, will form an AVL Governance Committee that will be charged with oversight of the AVL program."
  - "The main responsibilities of the Governance Committee will be to ensure consistency and standards across departments, AVL system management, and user access and security control."
  - "The Committee will have representatives from each AVL user department, as well as representatives from Fleet Management, Risk Management, and I&T."
  - "Fleet Management will be responsible for chartering the Committee and organizing the Committee meetings. The AVL Committee will be an interdepartmental team that will report to the City of Charlotte's General Services Director."

This policy also assigns individual departments the first line of defense role, responsible for managing AVL risk. The AVL Governance Committee, I&T, Strategy and Budget, Fleet Management, and Risk Management are assigned elements of responsibility for managing AVL activity/risk as part of the second line of defense. However, the AVL Governance Committee has not routinely convened since the Covid pandemic. General Services is listed as the responsible department for the citywide policy and the AVL Committee reports to the General Services Director.

Recommendation 1A: General Services should reconvene the AVL Governance Committee to enhance the existing citywide policy to:

- Require all departments to conduct and document regular reviews of AVL data to improve oversight and prevent unauthorized vehicle use, including establishing alerts, reviews, and reporting.
- Establish the AVL Governance Committee's authority and responsibility for actively monitoring that departments are performing these reviews.

Value Added: Risk Reduction; Effectiveness

General Services Response: Agree. General Services will engage the city's Risk Management Office (RMO), Human Resources (HR), I&T, and CDOT, to evaluate the current AVL policy and identify opportunities to strengthen oversight of vehicle usage. This will include assessing the feasibility of requiring departments to conduct and document regular AVL data reviews, exploring the use of alerts and standardized reporting to detect unauthorized use. Feedback from all Department stakeholders will be sought via the Committee or the Deputy Directors. Based on feedback, General Services would collaborate with key departmental stakeholders to develop practical updates to the policy, with a focus on enhancing accountability while aligning with existing resources and operational needs. The Committee's goal for implementation of this recommendation is March 31, 2026.

Recommendation 1B: General Services should ensure that the AVL Governance Committee submits an IT project request to coordinate with I&T and departments to work with AVL software vendors to improve data reliability issues, identify drivers, and explore opportunities to integrate AVL systems with work order tracking for better operational efficiency. In accordance with IT standards, the I&T project will include the identification of requirements and project risks, cost/benefit analysis of proposed technology solutions (including the use of AI), and coordination with technology vendors.

Value Added: Risk Reduction; Effectiveness

General Services Response: Agree. General Services will direct the AVL Governance Committee to coordinate the multiple AVL systems with I&T in assessing AVL system performance. This includes facilitating discussions with AVL software vendors to address data reliability issues, improve driver identification capabilities, and explore potential integration with work order tracking systems to enhance operational efficiency where applicable. The AVL Governance Committee will also assist in identifying needs for additional training or support to help departments effectively utilize their AVL systems, while working within existing resources. The Committee's goal for implementation of this recommendation is December 31, 2026.

Recommendation 1C: General Services should ensure the AVL Governance Committee actively monitors departments' implementation of AVL controls including annual reporting, by department, on:

- Policy adherence. Examples include percentage of vehicles with AVL devices installed and active and identification of vehicle drivers.
- Work order integration status
- AVL related disciplinary actions
- Sustainability. Examples include reduction in idling, and reduction in average vehicle operating hours

Value Added: Risk Reduction; Effectiveness; Sustainability

General Services Response: Agree. General Services will direct the AVL Governance Committee to check in annually with departments to remind and encourage their compliance with AVL data review processes and to support the AVL Governance Committee's efforts. The Committee will request relevant information on policy adherence, work order integration, and sustainability metrics. The Committee's goal for implementation of this recommendation is June 30, 2026.

Conclusion

Enhancing department proficiencies through training and utilization of AVL software will result in more effective monitoring of fleet vehicle usage.

Distribution of Report

This report is intended for the use of the City Manager's Office, City Council, and all City departments. Following issuance, audit reports are sent to City Council and subsequently posted to the Internal Audit website.

Scope, Methodology, and Compliance

Scope

Automated vehicle locator related software and devices that existed during FY 2024 and FY 2025.

Methodology

To achieve the audit objectives, auditors obtained a listing of assets owned by the City. Using that list, auditors determined which departments should have vehicles with AVL devices installed in them based on City policy. Individuals from those departments were then surveyed to determine the internal controls that existed for monitoring vehicle usage and detecting unauthorized use. Where applicable, follow-up questions were asked to specific respondents.

Compliance

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.

Government auditing standards require that we determine which internal controls are material to the audit objective(s) and obtain an understanding of those controls. To evaluate internal controls, the City Auditor's Office follows the Committee of Sponsoring Organizations of the Treadway Commission's Internal Control – Integrated Framework (COSO Framework) as included in Standards for Internal Control in the Federal Government (GAO Green Book).

In planning and performing the audit, auditors obtained an understanding of the internal controls associated with automated vehicle locator devices, assessed the internal control risks, and determined the following internal control components were significant:

- Control Environment – The set of standards, processes, and structures that provide the basis for carrying out internal control across the organization.
- Control Activities – The actions management establishes through policies and procedures to achieve objectives and respond to risks.

Internal control deficiencies that are significant within the context of this audit's objective(s) are stated in the Findings and Recommendations section of this report. For additional information regarding internal control components and the related principles of internal control, please see Appendix A.

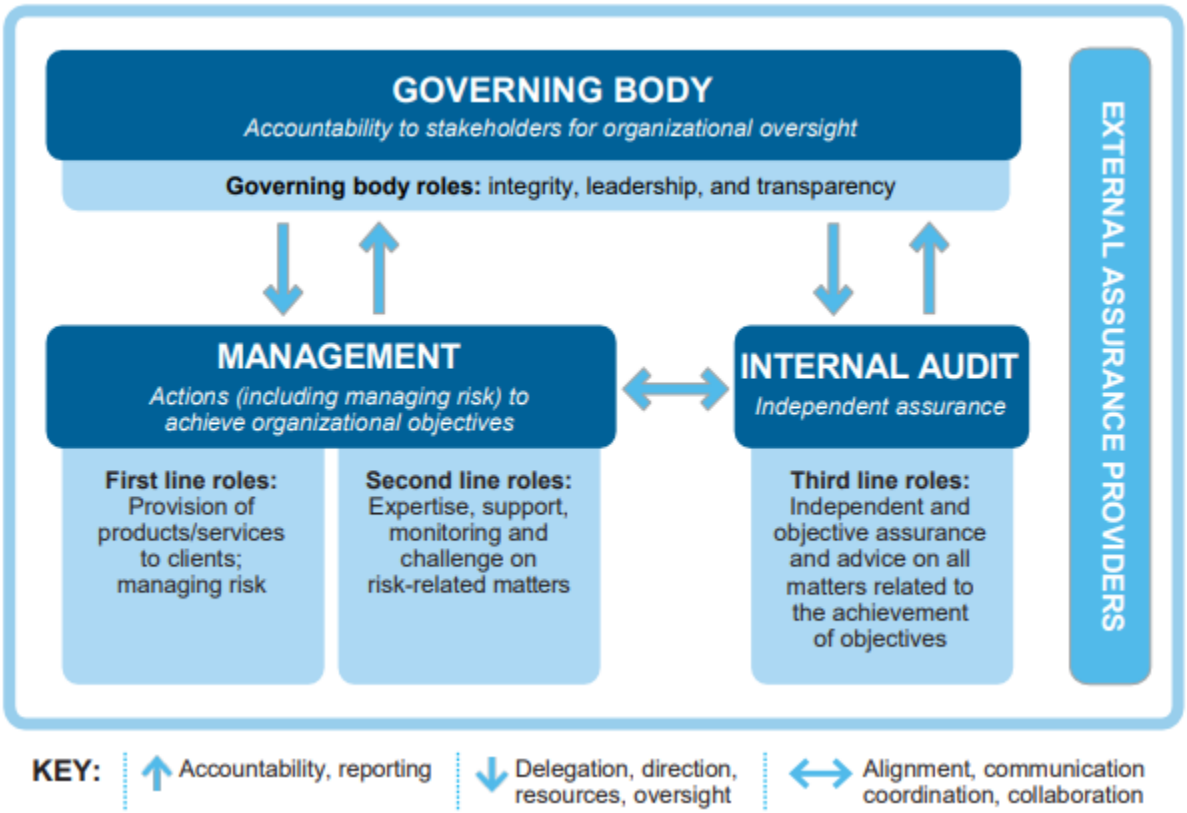
Appendix A

The Five Components and 17 Principles of Internal Control

Control Environment	1. The oversight body and management should demonstrate a commitment to integrity and ethical values. 2. The oversight body should oversee the entity's internal control system. 3. Management should establish an organizational structure, assign responsibility, and delegate authority to achieve the entity's objectives. 4. Management should demonstrate a commitment to recruit, develop, and retain competent individuals. 5. Management should evaluate performance and hold individuals accountable for their internal control responsibilities.
Risk Assessment	6. Management should define objectives clearly to enable the identification of risks and define risk tolerances. 7. Management should identify, analyze, and respond to risks related to achieving the defined objectives. 8. Management should consider the potential for fraud when identifying, analyzing, and responding to risks. 9. Management should identify, analyze, and respond to significant changes that could impact the internal control system.
Control Activities	10. Management should design control activities to achieve objectives and respond to risks. 11. Management should design the entity's information system and related control activities to achieve objectives and respond to risks. 12. Management should implement control activities through policies.
Information & Communication	13. Management should use quality information to achieve the entity's objectives. 14. Management should internally communicate the necessary quality information to achieve the entity's objectives. 15. Management should externally communicate the necessary quality information to achieve the entity's objectives.
Monitoring	16. Management should establish and operate a monitoring mechanism that monitors both internal and external activities that impact the control system and evaluate the results. 17. Management should remediate identified internal control deficiencies on a timely basis.

Appendix B

The Three Lines of Defense



Reference: Institute of Internal Auditors