

COUNTY AUDIT DEPARTMENT

REPORT # 360

An Audit of:

9-1-1 AGENCY - ADDRESS DATA

MARCH 15, 2019



Pat Frank INTEGRITY. TRANSPARENCY. ACCOUNTABILITY.

CLERK OF COURT & COMPTROLLER • HILLSBOROUGH COUNTY, FLORIDA



March 15, 2019

The Honorable Lesley “Les” Miller, Jr., Chairman
The Honorable Ken Hagan
The Honorable Pat Kemp
The Honorable Sandra L. Murman
The Honorable Kimberly Overman
The Honorable Mariella Smith
The Honorable Stacy R. White

Dear Chairman Miller and Commissioners:

The Audit Team performed an audit of the 9-1-1 Agency Address Data (Audit Report # 360, dated March 15, 2019). Responses to the Audit Team’s recommendations were received from the Deputy County Administrator and have been included in the Report after each audit comment and recommendation.

The purpose of this Report is to furnish management independent, objective analysis, recommendations, counsel, and information concerning the activities reviewed. It is not an appraisal or rating of management.

Although the Audit Team exercised due professional care in the performance of this audit, this should not be construed to mean that unreported noncompliance or irregularities do not exist. The deterrence of fraud and/or employee abuse is the responsibility of management. Audit procedures alone, even when carried out with professional care, do not guarantee that fraud or abuse will be detected.

The Audit Team appreciates the cooperation and professional courtesies extended to the auditors by the Manager and personnel of the 9-1-1 Agency along with the assistance from the Geospatial Services Division during this audit.

Sincerely,

Heidi Pinner, CIA, CISA, CFE, CRMA
Director of County Audit

CC: Mike Merrill, County Administrator
Greg Horwedel, Deputy County Administrator
Lucia Garsys, Chief Development & Infrastructure Administrator
John Lyons, Infrastructure Services Administrator
Erick Sumner, Director, Geospatial Services Division
Ira Pyles, Manager, 9-1-1 Agency
Kevin Brickey, Management & Budget Office
Dan Klein, Chief of Staff, Clerk of Court and Comptroller
Rick VanArsdall, Chief Deputy, Clerk to the Board

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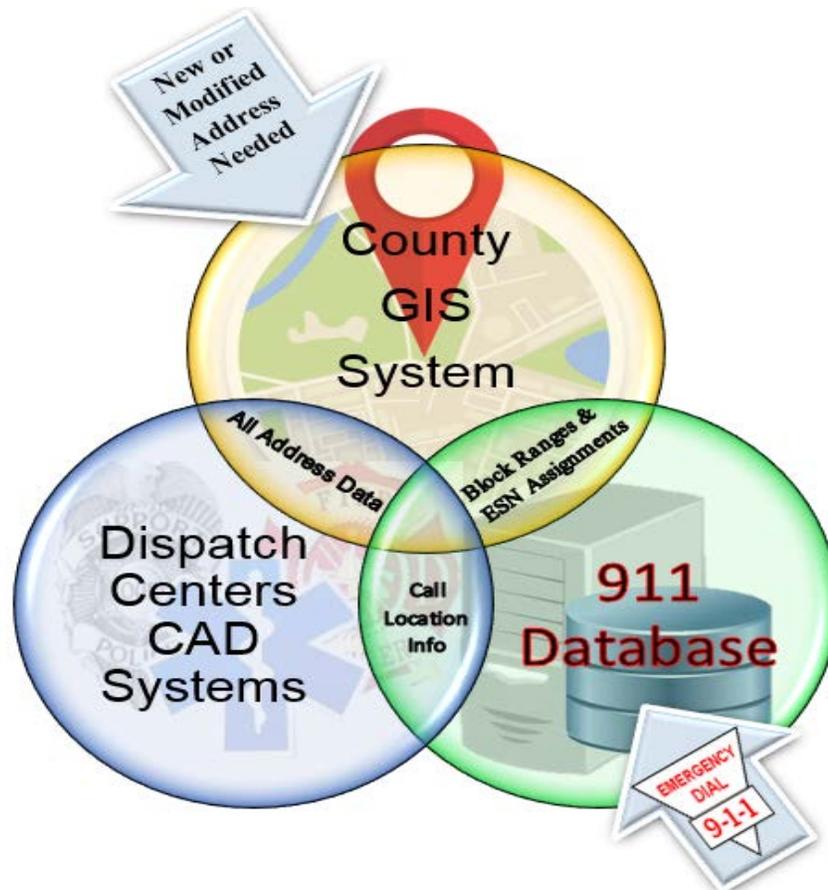
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EXECUTIVE SUMMARY

BACKGROUND INFORMATION

The 9-1-1 Agency and the Geospatial Services Division are responsible for adding and modifying block range addressing data for Hillsborough County. New block ranges are initiated when a permit is submitted to the Development Services Department to begin construction within the county. Block ranges must also be modified if there is a change in jurisdiction or if a road is renamed or modified due to construction. Geospatial Services updates block ranges in the County’s Geographic Information System (GIS). This data is made available to various 9-1-1 dispatch centers throughout the county, known as Public Safety Answering Points (PSAPs), who use the information to update their Computer Aided Dispatch (CAD) systems.

The 9-1-1 Agency also utilizes the updated information from Geospatial Services to make changes to the 9-1-1 database. The 9-1-1 database stores data about telephone service locations, including the 3-digit Emergency Service Number (ESN) that the phone system uses to route 9-1-1 calls. The 9-1-1 Agency makes changes to the 9-1-1 database based on additions or modifications to streets that have been submitted by cities within Hillsborough County. Residents are able to obtain phone service as long as their address falls within an established block range in the 9-1-1 database. Within the 9-1-1 database, the Master Street Address Guide (MSAG) includes all block ranges for the County and the Automatic Location Identification (ALI) data includes the individual addresses and phone numbers. The graphic below provides an overview of the relationship between each of the systems.



OBJECTIVE

The objective of the audit was to assess whether or not the 9-1-1 Agency and Geospatial Services have adequate internal controls in place to ensure that the address data in GIS and the 9-1-1 database is complete, accurate, and updated in a timely manner.

SCOPE

The audit was conducted in conformance with the *Generally Accepted Government Auditing Standards* and the *International Standards for the Professional Practice of Internal Auditing*. These Standards require that County Audit plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for the audit comments and conclusions based on the audit objectives. County Audit believes that the evidence obtained provides this reasonable basis.

The Audit Team obtained a data file of block ranges from the MSAG dated May 15, 2018, along with a data file listing all block ranges maintained in GIS as of May 14, 2018. The CAD systems and processes used by emergency dispatch centers throughout the county were not included in the scope of this review.

OVERALL EVALUATION

The 9-1-1 Agency and Geospatial Services were responsive to the Audit Team's inquiries and provided the information requested in a timely manner. The Audit Team encountered knowledgeable and dedicated employees during the course of the audit. The testing methodology and results are detailed in the audit comment beginning on page 3 of this Report.

OPINION

The control environment relative to the existing 9-1-1 database and address data is at the repeatable maturity level. This means that there are controls and/or processes in place with some formal structure. Some exceptions were identified when comparing the 9-1-1 database to the County's GIS data. Addressing the opportunities identified in this Report as management continues to modernize the GIS and emergency dispatch systems could further enhance the overall control structure and provide additional assurance.

Audit testing results were as of September 2018. The exit conference was held on November 28, 2018.

Other minor concerns not included in this Report have been communicated to management and/or corrected during fieldwork.

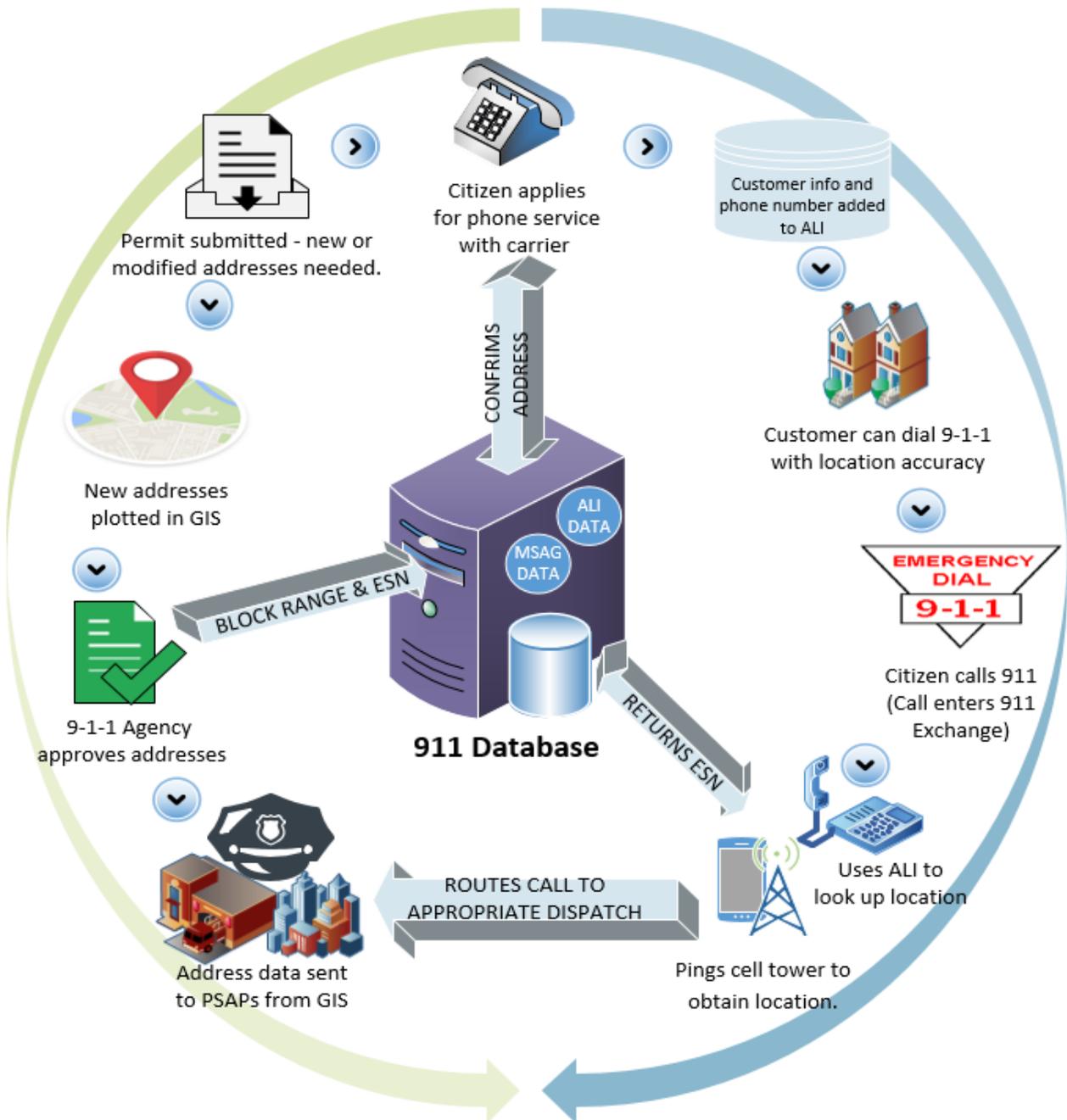
AUDITED BY

Heidi Pinner, CIA, CISA, CFE, CRMA, Director of County Audit
Ben Everett, CPA, CIA, CFE, Audit Manager
Matthew Demler, Internal Auditor II

AUDIT COMMENT & RECOMMENDATION

Opportunities exist to increase the accuracy of address data in the 9-1-1 database and GIS.

The objective of the audit testing was to determine the accuracy of address data in the 9-1-1 database by comparing the data in that system with the data that is updated and maintained in the GIS. Address data is maintained in these two systems, along with the corresponding ESN's, which are used for determining the appropriate jurisdictions for 9-1-1 call routing and dispatching emergency services. The following diagram provides some additional detail of the process flow for 9-1-1 address data.



Testing Methodology

The Audit Team selected a sample from a data set of all block ranges currently maintained in the 9-1-1 database system. When block ranges are entered in the 9-1-1 database, the streets are either entered as the full range of address numbers on a street (i.e.: 1-1000), or may be broken up into segments of block ranges (i.e.: 1-100, 101-300 etc.). From the data set, a random sample of one hundred (100) block ranges was selected. If a street was broken into several segments, the Audit Team included all associated block ranges for the street and tested them as part of the sample. The Audit Team compared the selected sample of address data against the data in GIS to verify that they reconciled.

During the review of the original sample of address data, a pattern of inconsistencies was observed. This pattern indicated that the GIS and 9-1-1 database systems were less likely to reconcile when block ranges are split because of different jurisdictions (assigned ESN's) being on different segments or sides of a street. Based on this observation, the Audit Team judgmentally selected an additional three (3) streets and corresponding block ranges which displayed this characteristic and included them in the sample. As a result, the final audit sample included 103 items.

Physical Map Testing

The Audit Team tested whether or not the block ranges in the 9-1-1 database and GIS physically exist within the County by utilizing maps and verifying the location's existence.

Results of Testing

The Audit Team was able to verify 102 of the 103 block ranges tested (99%). The one exception identified was for a road called Wishart in the City of Tampa. The MSAG and GIS have it listed two different times with different suffixes as WISHART BL and WISHART PL W. In the 9-1-1 database, both roads were identified as having physical addresses and associated phone numbers; however, when mapping it on the County's GIS system, only WISHART BL is listed as having physical structures.

Block Range Testing

Some roads are split into several separate block ranges because the road has dead ends, splits at an intersection, or has changes in jurisdiction. For the sample of block ranges selected, the Audit Team tested whether or not the block ranges maintained in the 9-1-1 database and GIS matched.

Results of Testing

Seventy one (71) of the 103 block ranges tested (69%) had matching data in the 9-1-1 database and GIS systems. The remaining 32 block ranges (31%), including all three of the additional sample items, had a mismatch for all or part of a block range. While some of the exceptions were for a small difference in the block range address numbers, others included more significant variances. An example of one of the larger data discrepancies (shown below) was for a road in the City of Tampa called West Frierson Avenue:

BLOCK RANGE IN 9-1-1 DATABASE	BLOCK RANGE IN GIS
101-3099 Frierson Av W	101-399 W Frierson Ave
	2500-3099 W Frierson Ave

An example of a smaller discrepancy is shown here:

BLOCK RANGE IN 9-1-1 DATABASE	BLOCK RANGE IN GIS
12100-13299 Tyler Run Av	12100-12399 Tyler Run Ave
	12500-13299 Tyler Run Ave

ESN Number Testing

An Emergency Service Number (ESN) is assigned to each block range in the 9-1-1 database and GIS systems. The ESN is the data element which identifies an address’s jurisdiction for emergency services and routes a call to the appropriate dispatch center. The Audit Team tested the 103 block ranges in the sample to determine whether or not it was assigned the same ESN within the 9-1-1 database and the County GIS.

Results of Testing

The ESN matched for 98 of 103 block ranges (95%). The remaining 5 block ranges, including all 3 of the additional sample items, had discrepancies identified. The Audit Team could not determine which system contained the accurate information.

Property Appraiser Jurisdiction Testing

A second test was performed by the Audit Team to determine whether or not the ESN jurisdiction associated with a block range was reliable by comparing the jurisdictions identified in the Hillsborough County Property Appraiser’s records to those recorded in the County GIS and in the 9-1-1 database.

Results of Testing

The jurisdictions matched for 101 of the 103 block ranges tested (98%). The 2 exceptions were both from the additional sample items and had data in GIS which did not align with the Hillsborough County Property Appraiser’s information.

Telephone Service Address Testing

The information in the 9-1-1 database includes a list of all telephone number customers at each address within a block range. The Audit Team compared this listing to the County GIS to see if there were any instances of telephone service at an address that fell outside the addresses recorded in GIS.

Results of Testing

The phone numbers assigned to 102 of the 103 block ranges tested (99%) had matching addresses in GIS. One service address in the 9-1-1 database had 16 phone numbers assigned to it but could not be found in GIS. Per management, this may have resulted from a re-configuration in the original street layout.

RECOMMENDATION

Based on the number and types of exceptions identified in the audit sample, it is reasonable to assume that similar inconsistencies are present throughout the population of data. This is especially true of the block ranges which are split because of different jurisdictions (assigned ESN's) being on different segments or sides of a street. The risk relative to these data inconsistencies can vary based on the underlying cause. At the time of audit testing, the root cause for each exception could not be confirmed. Therefore, to ensure that the address data utilized by the various systems and agencies throughout Hillsborough County remains consistent and reliable, management should:

1. Investigate the inconsistencies identified by the Audit Team and determine if any corrections to the data are needed in either the 9-1-1 database or GIS.
2. Determine the root cause of such inconsistencies and implement mitigating controls to address any underlying issues.
3. Implement holistic validation or monitoring controls to routinely compare data between the 9-1-1 database and the County GIS system.

CLIENT RESPONSE

The following collaborative responses were prepared by the 9-1-1 Agency and Geospatial Services Department.

1. *Concur*
2. *Concur*
3. *Concur*

CORRECTIVE ACTION PLAN

1. *As discrepancies were being identified through the audit process, the 9-1-1 Agency was researching the discrepancies to determine the root causes of inconsistencies and was taking corrective action as time and resources allowed. The 9-1-1 Agency continues to work towards corrective actions.*
2. *Quality control measures implemented in response to recommendation #1, above, will determine the steps necessary to prevent further occurrences. Mitigating controls to address*

any underlying issues causing these discrepancies will be implemented based on the findings of said investigation and research.

- 3. The 9-1-1 Agency will work with County GIS to further enhance current validation methods and perform additional data comparisons between the 9-1-1 database and the County GIS system. One such comparison currently employed by the 9-1-1 Agency is a complete data comparison between the Telephone Service Address data and the GIS Address Point data. Resources to complete these comparisons on a routine basis will require the appropriate allocation of staffing to perform the comparison as well as to take corrective actions on the discrepancies identified.*

Physical Map Testing

Efforts to improve overall consistency in data between the Master Street Address Guide (MSAG), GIS, and 9-1-1 database are ongoing and positive progress has been made. Quality control checks have been established and are routinely utilized. In this audit example, the block range in question is within the City of Tampa and not subject to the County's GIS scope of control. Continuing partnerships with the City of Tampa GIS staff and the City's Streets & Addresses team will ameliorate these discrepancies over time.

Block Range Testing

Block ranges serve a different purpose within these two databases and as such, are not expected to be absolutely synchronized. Block ranges within the 9-1-1 database are maintained as part of the MSAG utilized by telephone companies as a reference in their service order input process to validate addresses and assign an ESN to each telephone record. The block ranges within the GIS database are maintained to geospatially determine the approximate location of an address. As they serve different purposes, the maintenance of these two databases follow different practices.

The 9-1-1 database represents the entirety of block ranges with one entry which are possible along a street to represent the potential first address to the last potential address along the entire length of a street. Additional entries for a street in the 9-1-1 database will be maintained for streets that have major breaks (3 or more blocks) in the block range or changes in jurisdiction.

The GIS database represents the entirety of block ranges with multiple entries maintained at an intersection to intersection level to capture the potential first address to the last potential address between two intersections of a street. As such, the GIS database is better representative of addresses that are extant in the County.

The given example of West Frierson Avenue, within the City of Tampa, is a discrepancy within the 9-1-1 database as it has a major break and should have multiple entries.

However, Management is willing to accept this risk because we believe it to be de minimis. Currently, Fire Rescue Dispatch no longer dispatches for emergency response using block ranges.

A new computer-aided dispatch (CAD) system based upon parcel data was deployed in December 2018. The new CAD requires validation via a connected map for each individual address. The County's Geomatics Department produces and maintains the parcel database underlying the new CAD system.

In the new CAD system, if an address as reported by a 9-1-1 caller does not validate in the system then the nearest cross-street intersection is entered and the address given by the caller is entered into the comments. Response units are dispatched immediately toward the reported scene using the nearest cross-intersection; response crews also are advised en route of the caller's reported address. Once response crews are on scene, if the caller's address turned out to be correct, then Fire Rescue Dispatch forwards that information to Geomatics for resolution of the database.

If a wireless caller calls 9-1-1, then Fire Rescue Dispatch uses Phase 2 cellular phone technology to triangulate their location on the CAD map. Phase 2 technology broadcasts GPS coordinates from a caller's phone to show their location. Dispatch also asks callers to describe (if they are able to do so) the surrounding geography or visible landmarks. Other ways to home in on a caller's location include Rapid SOS; simultaneously contacting the caller's cellular provider, which is displayed as part of the CAD system's 9-1-1 caller ID function; or other database searches.

There are many reasons a 9-1-1 caller may not know an address – they are visitors to the area, they are disoriented due to a crash or other injury, etc. In every case, however, response crews are dispatched immediately to the reported incident scene. There is no delay caused by trying [to] reconcile an address to a block range. All dispatch activity is parcel-based in the newly-implemented CAD system. Staff is confident that these measures ensures as rapid response as possible to a scene.

ESN Number Testing

Efforts to improve overall consistency in data between the MSAG, GIS, and 9-1-1 database are ongoing and positive progress has been made. At the time of this audit, the 9-1-1 Agency was conducting quality control checks and taking corrective actions to eliminate these jurisdictional discrepancies. Ongoing quality control checks and corrective actions are being instituted for routine utilization to avoid these discrepancies going forward.

Property Appraiser Jurisdiction Testing

Efforts to improve overall consistency in data between the MSAG, GIS, and 9-1-1 database are ongoing and positive progress has been made. While utilized as a reference to gain consistency, attribution on the Hillsborough County Property Appraiser's parcel data is not designed specifically for this purpose. In instances where a parcel is logically bisected by a boundary of incorporation, the resultant attribution will be either "city" or "county". Ongoing quality control checks and corrective actions are being instituted for route utilization to avoid these discrepancies going forward.

Telephone Service Address Testing

In this audit example, the address in question is within the City of Tampa and not subject to the County's GIS scope of control. Continuing partnerships with the City of Tampa GIS staff and the City's Streets & Addresses team will ameliorate these discrepancies over time. As well, quality control checks have been established to identify these types of discrepancies and are planned to be routinely utilized.

TARGET COMPLETION DATES

1. *February 1, 2019*
2. *March 1, 2019*
3. *March 1, 2019*