Missouri NG911 GIS Consulting Services Project

Final Report Recommendations

submitted to the

Missouri 911 Services Board

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Executive Overview

In a Next Generation 9-1-1 (NG9-1-1) environment Geographic Information System (GIS) data is mission critical and is utilized to spatially route 9-1-1 calls to the appropriate Public Safety Answering Point (PSAP).

Prior to transitioning to an NG9-1-1 system, local entities, regions, and states must begin the preparation and remediation of the 9-1-1 GIS data to support NG9-1-1. This includes developing GIS standards, determining and performing quality control to ensure all critical errors are resolved, and education of all 9-1-1 GIS data providers and PSAPs at all levels of government.

In preparation for the implementation of an NG9-1-1 system, the Missouri 911 Services Board (MO 911 SB) contracted with GeoComm to:

- Assist MO 911 SB in establishing the Missouri NG9-1-1 GIS Standard and Best Practices Document based on the National Emergency Number Association (NENA) NG9-1-1 Data Model;
- Develop and host virtual and one recorded educational session based on the Missouri NG9-1-1 GIS Standard and Best Practices;
- Perform an assessment of each local jurisdiction's 9-1-1 GIS data to determine the level of current compliance with the Missouri NG9-1-1 GIS Standard; and
- Prepare a final report to include the details of the project.

Based on the GIS Gap Analysis completed as a part of the project, the current statewide GIS accuracy is **83.12%** for all errors identified and **86.98%** for only critical errors requiring resolution to enable NG9-1-1 call routing and location validation. The goal for each PSAP is critical error free GIS data.

Transition to and implementation of NG9-1-1 relies heavily on GIS and as such, during the project, numerous NG9-1-1 GIS related topics were identified that require further investigation. The most important next steps and recommendations are:

- **Continual Coordination between 9-1-1 and GIS Personnel** | Continue to provide education and outreach to the 9-1-1 Authorities, Addressing Authorities, and the GIS Data Providers throughout Missouri to ensure coordination continues between all entities to improve the NG9-1-1 GIS data sets.
- **NG9-1-1 GIS Legislation, Governance and Procedures** | Present GIS as a part of NG9-1-1 Legislation to include establishment of data standards, maintenance, and data reporting requirements, consider creating a NG9-1-1 GIS Governance Policy, continue working with local 9-1-1 Authorities, GIS Data Providers, Addressing Authorities and Street Naming Authorities on the importance of NG9-1-1 GIS standard operating procedures for each jurisdiction along with ordinance and resolutions where required.
- **Procure NG9-1-1 GIS Data Management Services** | Acquire NG9-1-1 GIS data management services to support MO 911 SB with the transition to, implementation and continued support of the Missouri NG9-1-1 system.
- **Standardization of Non-Standard USPS Post Types & Street Names in the Legacy Databases** | Coordinate with the NGCS, Counties and the legacy ALI provider to update all non-standard USPS abbreviations and road names.
- **Distribute URNs/URIs** | Distribute the Service URN and Service URI values to the GIS Data Providers and 9-1-1 Authority as soon as they are available.
- **Implementation of a GIS Derived MSAG** | Transition each PSAP from a legacy MSAG to a GIS derived MSAG in partnership with the PSAP, GIS Data Providers, NGCS Provider and GIS Management partner, if chosen.

- **Determine Quality Control Exceptions** | Once the NGCS Provider has been selected, a list of exception codes should be distributed to the GIS Data Providers and 9-1-1 Authorities for use within the GIS data sets.
- **Extract – Transform – Load Process: Next Generation Unique ID Creation** | Provide direction to the local GIS Data Providers to add and maintain only the locally assigned ID until the format of the NENA globally unique IDs are decided by NENA.
- **Extract – Transform – Load Process: Auto Population of Field Values** | During the selection of the GIS data management provider, identify if the provider can auto populate any or all the fields listed in the section.
- **Extract – Transform – Load Process: Identification of Existing Scripts and Tools for Schema Transformation** | Investigate the possibility of purchasing or creating scripts and tools for local GIS Data Providers to support the 9-1-1 centers in providing GIS data for NG9-1-1 and CAD. If selected, a GIS data management provider can provide assistance.

Additional details for each item listed above can be found under the Next Steps and Recommendations section.

Missouri NG9-1-1 GIS Standards

Purpose

The NG911 GIS Consulting Services Project included the creation of an NG9-1-1 GIS Data Standard specifically for Missouri and Best Practices surrounding each of the NG9-1-1 required GIS data layers.

The purpose of the document is to provide a common GIS data model and to set minimum accuracy benchmarks for Master Street Address Guide (MSAG), Automatic Location Information (ALI), and GIS data synchronization that must be attained before local data can be integrated into Missouri's statewide dataset. NG9-1-1 requires higher levels of GIS data standardization and attribution detail than GIS data used for existing E9-1-1 systems. This document also provides GIS data stewards with recommendations and best practices for creating and maintaining the required GIS data layers that will meet Missouri's NG9-1-1 GIS data requirements.

Definition of Required Data Layers

Road Centerlines

Road Centerlines represent the approximate centerline of a real-world roadway. The Road Centerlines GIS data layer utilizes arc-node topology with each road segment having attribute data associated with it that provides the segment's street name, civic address ranges and jurisdictional place names on each side of the segment, and other attribute information.

Site/Structure Address Points

Site/Structure Address Points represent the approximate location of a site or structure, or in some cases the location of access to a site or structure. Site/Structure Address Points can also represent landmarks. Each address point in the Site/Structure Address Points GIS data layer has attribute data associated with it that provides its street name, address number, jurisdictional place names, associated landmark name, and other attribute information.

Site/Structure Address Points generally provide more precise locations of addresses than can be found geocoding to Road Centerlines, particularly in areas with unusual addressing (e.g. flag lots, odd addresses on the even numbered side of a Road Centerline, even addresses on the odd numbered side

of a Road Centerline), large properties with subaddresses (e.g. academic campuses, government complexes, mobile home parks), remote locations where a structure may be located far from the road that it is addressed off of, and landmarks (some of which may not be addressed at all) that are well known features with names that might be the most or only identifiable information about the location.

The location attributes (e.g., Address Number, Street Name, place names) in the Site/Structure Address Points GIS data layer should be consistent with the location attributes (FROM/TO Address range, Street Name, place names) on the left or right side of the road segment in the Road Centerlines GIS data layer where the Address Point is located. However, this may not always be possible, especially in areas of unusual addressing.

Missouri NG9-1-1 GIS Data Model

The NG9-1-1 GIS Data Model for Missouri was designed from the NENA NG9-1-1 GIS Data Model to support both NENA and Missouri specific requirements. The NG9-1-1 GIS Data Model was developed by the MO 911 SB's GIS Subcommittee and includes the following GIS Data Layers:

Required:

- Road Centerlines
- Site/Structure Address Points
- PSAP Boundary
- Emergency Service Boundary (EMS, Fire, Law)
- Provisioning Boundary

A template of the NENA NG9-1-1 GIS Data Model can be downloaded from NENA's website at: https://www.nena.org/resource/resmgr/standards/NG911_GIS_TEMPLATE_FILES_201.zip

GIS Data Layer Table Descriptions

Each data layer is described in this document with a table listing the attributes. Detailed attribute descriptions, required data domains, and example field values can be found in the published Missouri standard here. The GIS data layer tables are formatted with the following information:

- **Descriptive Name:** Basic description of the data field name that clarifies the intent of the abbreviated name contained in the "Field Name" column.
- **Field Name:** The standardized data field name for GIS data used in an NG9-1-1 system. Local GIS data and the Missouri statewide data layers must conform to this standard naming schema.
- **Inclusion:** This column refers to the requirement for a field to be populated in a dataset to comply with the standard.
    - **Mandatory** (M) – An attribute value must be populated in the data field for each record. Mandatory data fields must not be blank.
    - **Conditional** (C) – If an attribute value exists for a record, it must be populated in the data field. If no attribute value exists for a record, the data field is left blank.
    - **Optional** (O) – Not required to be populated in the local data. It is a local decision on whether to populate the data field.
- **Field Type**: The required attribute type, as defined in NENA standards.
    - **T** [Text]: Includes the following attribute types from NENA
        - **P** [Text] – Printable ASCII characters (decimal codes 32 to 126).
        - **E** [Text] – UTF-8 restricted to character sets designated by the 9-1-1 Authority, but not including pictographic characters. This allows for foreign names that

require Latin letters not in the ASCII character set (e.g., Latin letters with tilde or grave accents).
        - **U** [Text] – A Uniform Resource Identifier (URI) as described in Section 13, Terminology, and defined in RFC 3986, and also conforming to any rules specific to the scheme (e.g. sip:, https:, etc.) of the chosen URI. Consult with the NG9-1-1 Core Services Provider for requirements.
    - **D** [Date] – Date and time. Information for a record represented as local time with offset from Coordinated Universal Time (UTC) as defined by the W3C "dateTime" datatype described in XML Schema Part 2: Datatypes Second Edition [3]. Since many GIS applications cannot currently utilize this format, local data may store the date and time in the local database date/time format but time must include seconds and may be recorded to 0.1 seconds. Local data stored in a local database date/time format will be converted to the NENA-required format prior to use in NG9-1-1.
    - **L** [Long]: Includes the following attribute types from NENA
        - **N** [Short, Long] – Non-negative Integer, consisting of whole numbers only.
    - **S** [Short]: Includes the following attribute types from NENA
        - **N** [Short, Long] – Non-negative Integer, consisting of whole numbers only.
    - **F** [Float] – Floating (numbers that have a decimal place). There is no defined field length of a floating number; it is system dependent. These shall be double-precision fields.
- **Field Width**: The maximum field width, in number of characters.
- **Domains** [Yes, No]: This column indicates if a set of valid values are to be used as attributes.

Road Centerline Schema

Descriptive Name	Field Name	Inclusion	Type	Field Width	Domain
Road Centerline NENA Globally Unique ID	RCL_NGUID	M	T	254	No
Left Address Number Prefix	AdNumPre_L	C	T	15	No
Left FROM Address	FromAddr_L	M	L	6	Yes
Left TO Address	ToAddr_L	M	L	6	Yes
Right Address Number Prefix	AdNumPre_R	C	T	15	No
Right FROM Address	FromAddr_R	M	L	6	Yes
Right TO Address	ToAddr_R	M	L	6	Yes
Street Name Pre Modifier	St_PreMod	C	T	15	No
Street Name Pre Directional	St_PreDir	C	T	9	Yes
Street Name Pre Type	St_PreTyp	C	T	50	Yes
Street Name Pre Type Separator	St_PreSep	C	T	20	Yes
Street Name	St_Name	M	T	60	No
Street Name Post Type	St_PosTyp	C	T	50	Yes
Street Name Post Directional	St_PosDir	C	T	9	Yes
Street Name Post Modifier	St_PosMod	C	T	25	No
Full Street Name*	FullStNm	M	T	245	No
Legacy Full Street Name*	LgFullStNm	O	T	175	No
Legacy Street Name Pre Directional	LSt_PreDir	C	T	2	Yes
Legacy Street Name	LSt_Name	C	T	75	No
Legacy Street Name Type	LSt_Type	C	T	4	Yes
Legacy Street Name Post Directional	LSt_PosDir	C	T	2	Yes
Postal Code Left	PostCode_L	O	T	7	Yes
Postal Code Right	PostCode_R	O	T	7	Yes
Postal Community Name Left	PostComm_L	O	T	40	Yes
Postal Community Name Right	PostComm_R	O	T	40	Yes
Country Left	Country_L	M	T	2	Yes
Country Right	Country_R	M	T	2	Yes
State Left	State_L	M	T	2	Yes

Descriptive Name	Field Name	Inclusion	Type	Field Width	Domain
State Right	State_R	M	T	2	Yes
County Left	County_L	M	T	40	Yes
County Right	County_R	M	T	40	Yes
Incorporated Municipality Left	IncMuni_L	M	T	100	Yes
Incorporated Municipality Right	IncMuni_R	M	T	100	Yes
Unincorporated Community Left	UnincCom_L	O	T	100	No
Unincorporated Community Right	UnincCom_R	O	T	100	No
Neighborhood Community Left	NbrhdCom_L	O	T	100	No
Neighborhood Community Right	NbrhdCom_R	O	T	100	No
Additional Code Left	AddCode_L	C	T	6	No
Additional Code Right	AddCode_R	C	T	6	No
One-Way	OneWay	O	T	2	Yes
Speed Limit	SpeedLimit	O	S	3	Yes
Road Class	RoadClass	O	T	15	No
Date Updated	DateUpdate	M	D	-	No
Effective Date	Effective	O	D	-	No
Expiration Date	Expire	O	D	-	No
Discrepancy Agency ID	DiscrpAgID	M	T	75	No
Parity Left	Parity_L	M	T	1	Yes
Parity Right	Parity_R	M	T	1	Yes
ESN Left	ESN_L	C	T	5	Yes
ESN Right	ESN_R	C	T	5	Yes
MSAG Community Name Left	MSAGComm_L	C	T	30	No
MSAG Community Name Right	MSAGComm_R	C	T	30	No
Validation Left	Valid_L	O	T	1	Yes
Validation Right	Valid_R	O	T	1	Yes

*Missouri specific addition to the NG9-1-1 GIS Data Standard

Site/Structure Address Points Schema

Descriptive Name	Field Name	Inclusion	Type	Field Width	Domain
Site NENA Globally Unique ID	Site_NGUID	M	T	254	No
Road Centerline NENA Globally Unique ID	RCL_NGUID	M	T	254	No
Address Number Prefix	AddNum_Pre	C	T	15	No
Address Number	Add_Number	C	L	6	Yes
Address Number Suffix	AddNum_Suf	C	T	15	No
Complete Landmark Name	LandmkName	C	T	150	No
Mile Post	Milepost	C	T	150	No
Building	Building	O	T	75	No
Floor	Floor	O	T	75	No
Unit	Unit	O	T	75	No
Room	Room	O	T	75	No
Seat	Seat	O	T	75	No
Additional Location Information	Addtl_Loc	O	T	225	No
Street Name Pre Modifier	St_PreMod	C	T	15	No
Street Name Pre Directional	St_PreDir	C	T	9	Yes
Street Name Pre Type	St_PreTyp	C	T	50	Yes
Street Name Pre Type Separator	St_PreSep	C	T	20	Yes
Street Name	St_Name	C	T	60	No
Street Name Post Type	St_PosTyp	C	T	50	Yes
Street Name Post Directional	St_PosDir	C	T	9	Yes
Street Name Post Modifier	St_PosMod	C	T	25	No
Full Street Name*	FullStNm	M+	T	245	No
Legacy Full Street Name*	LgFullStNm	O	T	175	No
Legacy Street Name Pre Directional	LSt_PreDir	C	T	2	Yes
Legacy Street Name	LSt_Name	C	T	75	No
Legacy Street Name Type	LSt_Type	C	T	4	Yes
Legacy Street Name Post Directional	LSt_PosDir	C	T	2	Yes
Postal Code	Post_Code	O	T	7	Yes
ZIP Plus 4	Post_Code4	O	T	4	Yes
Postal Community Name	Post_Comm	O	T	40	Yes
Country	Country	M	T	2	Yes
State	State	M	T	2	Yes
County	County	M	T	40	Yes
Incorporated Municipality	Inc_Muni	M	T	100	Yes
Unincorporated Community	Uninc_Comm	O	T	100	No
Neighborhood Community	Nbrhd_Comm	O	T	100	No
Additional Code	AddCode	C	T	6	No
Placement Method	Placement	O	T	25	Yes
Place Type	Place_Type	O	T	50	No
Additional Data URI	AddDataURI	C	T	254	No
Date Updated	DateUpdate	M	D	-	No
Effective Date	Effective	O	D	-	No
Expiration Date	Expire	O	D	-	No
Discrepancy Agency ID	DiscrpAgID	M	T	75	No
ESN	ESN	C	T	5	No
MSAG Community Name	MSAGComm	C	T	30	No
Longitude	Long	O	F	-	No
Latitude	Lat	O	F	-	No
Elevation	Elev	O	L	6	No

*Missouri specific addition to the NG9-1-1 GIS Data Standard

+The inclusion for this field will need to be updated to Conditional (C) in the next version as the Street Name element itself is Conditional.

PSAP Boundary Schema

Descriptive Name	Field Name	Inclusion	Type	Field Width	Domain
Emergency Service Boundary NENA Globally Unique ID	ES_NGUID	M	T	254	No
State	State	M	T	2	Yes
Agency ID	Agency_ID	M	T	100	Yes
Service URI	ServiceURI	M	T	254	Yes
Service URN	ServiceURN	M	T	50	No
Service Number	ServiceNum	O	T	15	No
Agency vCard URI	AVcard_URI	M	T	254	Yes
Display Name	DsplayName	M	T	60	No
Date Updated	DateUpdate	M	D	-	No
Effective Date	Effective	O	D	-	No
Expiration Date	Expire	O	D	-	No
Discrepancy Agency ID	DiscrpAgID	M	T	75	No

Emergency Service Boundary Schema

Descriptive Name	Field Name	Inclusion	Type	Field Width	Domain
Emergency Service Boundary NENA Globally Unique ID	ES_NGUID	M	T	254	No
State	State	M	T	2	Yes
Agency ID	Agency_ID	M	T	100	Yes
Service URI	ServiceURI	M	T	254	Yes
Service URN	ServiceURN	M	T	50	No
Service Number	ServiceNum	O	T	15	No
Agency vCard URI	AVcard_URI	M	T	254	Yes
Display Name	DsplayName	M	T	60	No
Date Updated	DateUpdate	M	D	-	No
Effective Date	Effective	O	D	-	No
Expiration Date	Expire	O	D	-	No
Discrepancy Agency ID	DiscrpAgID	M	T	75	No

Provisioning Boundary Schema

Descriptive Name	Field Name	Inclusion	Type	Field Width	Domain
Provisioning Boundary NENA Globally Unique ID	PB_NGUID	M	T	254	No
Date Updated	DateUpdate	M	D	-	No
Effective Date	Effective	O	D	-	No
Expiration Date	Expire	O	D	-	No
Discrepancy Agency ID	DiscrpAgID	M	T	75	No

Quality Control, GIS Synchronization and Accuracy Benchmarks

The most important part of preparation and maintenance of NG9-1-1 GIS data is synchronization and quality control.

Quality Control is an all-encompassing management approach that combines technical, qualitative and human resources to evaluate the quality of GIS data to meet the requirements of a system. Each GIS data layer, individually and in relation to each other, is analyzed to determine where integrity issues exist.

Integrity issues for NG9-1-1 GIS Data is categorized into two categories: critical and non-critical. Critical issues will cause issues with NG9-1-1 call routing and location validation functions and will not be accepted into the NG9-1-1 Core Service components. Non-critical issues have the potential to cause

issues with both of these functions, however additional features within the system will ensure the calls are correctly routed. Non-critical errors may be identified by the NG9-1-1 Core Service Provider but will not prevent the data from being provisioned into the system.

Prior to and during transition to a NG9-1-1 system, the 9-1-1 GIS data and the E9-1-1 routing databases, ALI and MSAG, must continue to be quality controlled through data synchronization. It is important to utilize the legacy street name elements within the Road Centerlines and Site/Structure Address Points datasets for synchronization with the legacy E9-1-1 databases. Integrity issues identified during the data synchronization process may need to be resolved through updates to the ALI and/or MSAG and the GIS data.

The process for quality control can be dependent on a variety of factors, however the major factors are the software utilized to perform the analysis and the format of the GIS data. Resolution of all errors identified as ***Critical*** errors, is of utmost importance. For NG9-1-1, 98% is often cited as a benchmark for resolution of GIS data errors and ALI to Road Centerlines errors, with a goal to continually improve the GIS data and achieve 100% resolution of all errors. Accuracy requirements should be discussed with Missouri's NextGen Core Service (NGCS) Provider.

Definitions of Commonly Used Quality Control Terms

Many terms are used for quality control that represent a group of fields within the GIS data. These groups of terms are listed below.

Street Name Elements:

Description: All the CLDXF (fully spelled out) street name fields and/or all the legacy (abbreviated) street name fields in both the Road Centerlines and Site/Structure Address Points feature classes.

CLDXF: Street Name Pre Modifier, Street Name Pre Directional, Street Name Pre Type, Street Name Pre Type Separator, Street Name, Street Name Post Type, Street Name Post Directional, Street Name Post Modifier

Legacy: Legacy Street Name Pre Directional, Legacy Street Name, Legacy Street Name Type, Legacy Street Name Post Directional

Zone:

Description: Any field or combination of fields used to ensure location uniqueness.

CLDXF: May include Country, State, County, Incorporated Municipality

Legacy: May include MSAG Community Name and ESN

Address Elements:

Description: All the address and subaddress elements including Address Number Prefix, Address Number, Address Number Suffix, Building, Floor, Unit, Room, Seat, Additional Location Information.

General Quality Control Checks for NG9-1-1

The following checks should be performed during quality control on all GIS data layers.

- Field format validation (Critical): Check to identify where fields are not formatted to meet the MO NG9-1-1 GIS Data Standard.
- Unique Identifier (Critical): Check to identify duplicate unique identifiers within individual or all source feature classes.

- Missing mandatory field values (Critical): Check to identify where mandatory field attribution, as defined in the MO NG9-1-1 GIS Data Standard, is missing.
- Field values outside of domain: Check to identify where field values are outside of the acceptable domain values as defined by the MO NG9-1-1 GIS Data Standard. This check may be *Critical* for certain fields defined by the Core Service Provider.

Boundary Quality Control Checks for NG9-1-1

The following checks should be performed during quality control on all boundary layers including Provisioning Boundary, PSAP Boundary and Emergency Service Boundaries; may also include County Boundary, Incorporated Municipality Boundary, Unincorporated Community Boundary and Neighborhood Community Boundary where available. Overlap errors are critical only for the Provisioning Boundary, PSAP Boundary and Emergency Service Boundaries.

- Boundary has overlaps (Critical): Check to identify where overlaps exist between polygons in each boundary feature class.
- Boundary does not cover the Provisioning Boundary (Critical): Check to identify where Emergency Service Boundaries do not cover the Provisioning Boundary in its entirety.
- Boundary has gap: Check to identify where gaps exists between polygons in each boundary feature class.

Site/Structure Address Point Quality Control Checks for NG9-1-1

The following checks should be performed during quality control on the site/structure address point data layer.

- Address found multiple times (Critical): Check to identify where site/structure addresses occur multiple times in a single Site/Structure Address Points dataset. This check analyzes all the street name elements, address elements and zone(s) to determine duplication of address points.
- Site/Structure Address Points outside Provisioning Boundary (Critical): Check to identify where site/structure address points exist outside of the Provisioning Boundary.
- Site/Structure Address Point full address does not match parsed values: Check to identify where the individual parsed address fields of an address do not match the full address field.

Road Centerline Quality Control Checks for NG9-1-1

The following checks should be performed during quality control on the road centerline data layer.

- Road centerline segments have overlapping address range values (Critical): Check to identify where road segments have overlapping address ranges in a given zone. The zone must be defined by the governing entity.
- Road centerline outside Provisioning Boundary (Critical): Check to identify where road segments exist outside of the Provisioning Boundary.
- Road centerline segment crosses a boundary layer: Check to identify where road segments cross a boundary and a split should occur. All boundaries where attribute values change should be included in the quality control. Includes, but may not be limited to, Incorporated Municipality Boundary, County Boundary, Provisioning Boundary, Emergency Service Boundaries.
- Road centerline segment FROM value is higher than the TO value: Check to identify where road segment address ranges have a higher FROM value than TO value. *May be critical in some NG9-1-1 systems.*

- Road centerline segment has incorrect line directions: Check to identify where road segments are drawn in the opposite direction of addressing.
- Road centerline has incorrect one-way value: Check to identify where roads are spatially continuous but one-way values are inconsistent or incorrect.
- Road centerline has range gaps: Check to identify where theoretically/potentially ranged road centerlines have address range gaps; zero ranged roads are ignored. *Only for counties with potential ranging, if applicable.*
- Road centerline segment parity issue: Check to identify where a road segment has a mixture of even and odd address ranges on the same side of the segment and conflicts with the Parity Left and Parity Right field values. *May be critical in some NG9-1-1 systems.*
- Road centerline segment not snapped to adjacent segments: Check to identify where road segments are not snapped to an adjacent segment.
- Road centerline segment has zero in address range value: Check to identify where road segment address ranges have a zero in one address range value and the other has a nonzero value. *May be critical in some NG9-1-1 systems.*

Site/Structure Address Point to Road Centerline Synchronization Checks for NG9-1-1

The following synchronization should be performed during quality control on the site/structure address point data layer to the road centerline data layer.

- Fail on full street name: Check to identify where the site/structure address point's street name elements and road segment's street name elements are not identical.
- Fail on zone: Check to identify where the site/structure address point's address number and street name elements match the road segment but are not found in the same zone.
- Fail on address range: Check to identify where the site/structure address point's street name elements and zone match the road segment, but the address number falls outside of the road segment's address ranges.
- Fail on block: Check to identify where the site/structure address point's street name elements, zone and address number match the road segment, but the site/structure address point does not fall on the correct block.
- Fail on parity: Check to identify where the site/structure address point's street name elements, zone and address number match the road segment, but the site/structure address point falls on the wrong side of the road segment.

ALI and MSAG Synchronization Checks for Transition to NG9-1-1

A continued synchronization of the ALI and MSAG databases used in legacy 9-1-1 is important throughout the transition to a NG9-1-1 system. Telephone providers will continue to use a version of the legacy databases to validate to for an extended period of time. The following synchronizations between the legacy databases and GIS data will ensure that the two databases remain in sync. The goal for synchronization per the NENA standards is 98% between the ALI database and the Road Centerline data layer.

ALI to Road Centerlines Synchronization

- Fail on full street name: Check to identify where the ALI street name elements and road segment's street name elements are not identical.

- Fail on zone: Check to identify where the ALI address number and street name elements match the road segment but are not found in the same zone.
- Fail on address range: Check to identify where the ALI street name elements and zone match the road segment, but the address number falls outside of the road segment's address ranges.

ALI to Site/Structure Address Points Synchronization

- Fail on full street name: Check to identify where the ALI street name elements and site/structure address point's street name elements are not identical.
- Fail on zone: Check to identify where the ALI address number and street name elements match the site/structure address point but are not found in the same zone.
- Fail on address range: Check to identify where the ALI street name elements and zone match the site/structure address point, but no exact address number match can be made.
- Fail on address number suffix: Check to identify where the ALI address number, street name elements and zone match the site/structure address point, but no exact address number suffix match can be made.

MSAG (Low and High) to Road Centerlines

- Fail on full street name: Check to identify where the MSAG street name elements and the road segment's street name elements are not identical.
- Fail on zone: Check to identify where an MSAG address range (high or low) and street name elements match the road segment but are not found in the same zone.
- Fail on address range: Check to identify where the MSAG street name elements and zone match the road segment, but no exact address range value match can be made.

Missouri NG9-1-1 GIS Educational Sessions

Following the development of the Missouri NG9-1-1 GIS Standard and Best Practices document, GeoComm along with the MO 911 SB designed educational sessions that were conducted in five (5) virtual sessions. At the conclusion of the virtual educational sessions, a recording was developed for those who were not able to attend, those who are new to 9-1-1 and GIS and those wanting a refresher.

Audience/Location	Date	Number of Attendees
Virtual Session 1	March 23rd, 2021	28
Virtual Session 2	March 25th, 2021	22
Virtual Session 3	March 31st, 2021	12
Virtual Session 4	April 7th, 2021	17
Virtual Session 5	April 8th, 2021	7

Educational Session Topics

The recorded educational session can be found at https://youtu.be/k6N-VRTwSDw and the PowerPoint slide deck can be found at https://www.missouri911.org/s/MO-911-Service-Board-Education-Seminar-2021-compressed.pdf.

Educational Sessions Topics:

- Missouri NG9-1-1 GIS Project Information
- GIS Data Use in NG9-1-1
  - What is Next Generation 9-1-1 (NG9-1-1)
  - Where is GIS Data Used in NG9-1-1

    - Why Do We Need Standardized Data
    - NENA NG9-1-1 GIS Data Model
    - GIS Data Layers in NG9-1-1 | Required, Strongly Recommended, Other
    - How Long will Transition to NG9-1-1 Take?
- Missouri NG9-1-1 GIS Data Standards Document
- Parsing Addresses into NENA Compliant Fields
- Quality Control Checks
- Best Practices
    - General Considerations
    - Road Centerlines
    - Site/Structure Address Points
    - Pending Future Work
- Questions and Discussion

Local GIS Data Assessment Results

GeoComm performed an extensive quality control on jurisdictions in Missouri. The following counties were individually processed:

- Adair
- Andrew
- Atchison
- Audrain
- Barry
- Bates
- Benton
- Boone
- Buchanan
- Butler
- Caldwell
- Callaway
- Camden
- Cape Girardeau
- Carroll
- Carter
- Cass
- Chariton
- Christian
- Clark
- Clay
- Clinton
- Cole
- Crawford
- Dade
- Dallas
- Daviess
- Dekalb
- Dent
- Douglas
- Dunklin
- Franklin
- Gasconade
- Gentry
- Greene
- Harrison
- Henry
- Hickory
- Holt
- Howell
- Iron
- Jackson
- Jasper
- Jefferson
- Johnson
- Knox
- Laclede
- Lafayette
- Lawrence
- Lewis
- Lincoln
- Linn
- Livingston
- Macon
- Maries
- Marion
- McDonald
- Mercer
- Moniteau
- Montgomery
- New Madrid
- Newton
- Nodaway
- Osage
- Ozark
- Pemiscot
- Perry
- Phelps
- Pike
- Platte
- Polk
- Pulaski
- Ralls
- Randolph
- Ray
- Reynolds
- Ripley
- Saline
- Schuyler
- Scotland
- Shelby
- St Charles
- St Clair
- St Francois
- St Louis
- Ste Genevieve
- Stoddard
- Stone
- Taney
- Texas
- Warren
- Wayne
- Webster
- Worth
- Wright

The following counties did not participate due to lack of GIS data, current GIS data projects or other local situations:

- Barton
- Bollinger
- Cedar
- Cooper
- Grundy
- Howard
- Madison
- Miller
- Mississippi
- Monroe
- Morgan
- Oregon
- Pettis
- Putnam
- Scott
- Shannon
- Sullivan
- Vernon
- Washington

Quality Control Process Utilized

The following process was utilized by MO 911 SB and GeoComm for quality control in Missouri.

1. GeoComm along with the MO 911 SB GIS Subcommittee established the quality control checks that would be utilized as a part of the project.
2. The MO 911 SB GIS Subcommittee identified three (3) pilot jurisdictions – Boone, Dallas and Knox/Macon Counties – to process through quality control and review the results to ensure all checks were applicable.
3. GeoComm individually requested each jurisdiction upload a copy of their GIS data, ALI and MSAG to GeoComm for review.
4. GeoComm reviewed all resources provided and documented them in a crosswalk; if questions arose while reviewing the data, GeoComm reached out to the jurisdiction for further information.
5. GeoComm processed quality control on each jurisdiction.
6. Upon completion and GeoComm review of quality control results, two (2) recommendation reports in Excel and PDF were developed in preparation of a jurisdiction conference call to review the results.
7. GeoComm notified each jurisdiction that their assessment was complete and provided a matrix of available times. After receiving time availability for all participants, GeoComm scheduled the jurisdiction call.
8. GeoComm completed each jurisdiction call to brief out on the results and reports.
9. Upon completion of conference calls, GeoComm distributed the results and reports to each jurisdiction via email and ShareFile.

Quality Control Checks Utilized

Quality control checks to be utilized were discussed and chosen by the MO NG9-1-1 GIS Task Force.

General Quality Control Checks		
QC Check	Description	Layer to Check
Critical Fields are Missing Value(s)	Check identifies where mandatory fields are missing values. This check can be run on Road Centerlines, SSAPs, Polygons, or ALI	Road Centerline
		Site/Structure Address Points
		Provisioning Boundary
		County Boundary
		EMS Boundary
		Fire Boundary
		Law Boundary
		PSAP Boundary
		Incorporated Municipality Boundary
MultiPart Geometry	Check identifies multipart features	Road Centerline
		Site/Structure Address Points

Critical Values Outside Domain	Check identifies values outside the acceptable list of value (Country, State, County, Parity, Legacy Pre & Post Direction, Legacy Type, CLDXF Pre & Post Direction, CLDXF Pre & Post Type, CLDXF Pre Modifer, PSAP URI)	Provisioning Boundary
		County Boundary
		EMS Boundary
		Fire Boundary
		Law Boundary
		PSAP Boundary
		Road Centerline
MultiPart Geometry	Check identifies multipart features	Site/Structure Address Points
		Provisioning Boundary
		County Boundary
		EMS Boundary
		Fire Boundary
		Law Boundary
		PSAP Boundary
		Incorporated Municipality Boundary

Ingestion Validation Quality Control Checks		
QC Check	Description	Layer to Check
Field Format Validation	Check identifies where fields are not properly formatted.	All
Project, Tolerance and Resolution Check	Check identifies where datasets provided by the user have inconsistent projections.	All
Field Mapping Validation	Check verifies that the source data is consistent with existing field mapping information provided by the user.	All
UniqueID	If a unique ID field is provided, this check identifies where a source unique ID provided by the client is not actually unique. Applicable for every layer.	All

Boundary Quality Control Checks		
QC Check	Description	Layer to Check
Polygons Have Gaps - Esri Topology Tools	Using Esri topology tools, this check identifies where gaps exist in a polygon boundary layer using Esri Topology Tools. This check can be run on any municipal or service area boundary.	EMS Boundary
		Fire Boundary
		Law Boundary
		PSAP Boundary
Polygons Have Overlaps - Esri Topology Tools	Using Esri topology tools, this check identifies where overlaps exist in a polygon boundary layer. This check can be run on any municipal or service area boundary.	EMS Boundary
		Fire Boundary
		Law Boundary
		PSAP Boundary
		EMS Boundary

Does Not Cover Authoritative Boundary - Esri Topology Tools	Using Esri topology tools, this check identifies where a Fire, Law, Medical, PSAP or County boundary does not cover the Authoritative Boundary using Esri Topology Tools.	Fire Boundary
		Law Boundary
		PSAP Boundary
		County Boundary
Does Not Cover SSAP or RCL	Check identifies where the Authoritative Boundary does not cover RCLs or SSAP.	Road Centerline
		Site/Structure Address Points

Road Centerline Quality Control Checks		
QC Check	Description	Layer to Check
Cross a Boundary Layer	Check identifies where roads cross a boundary layer.	EMS Boundary
		Fire Boundary
		Law Boundary
		PSAP Boundary
		County Boundary
		Incorporated Municipality Boundary
From Value Higher Than To	Check identifies where road ranges have a higher 'from' value than 'to' value.	
Full Address Does Not Match Concatenation of Parsed Out Values	Check identifies where the individual parsed fields of an address do not match a provided full street field. To be ran parsed and combined street fields must be provided.	
Has Incorrect Direction	Check identifies where roads are not drawn in the direction of increasing address.	
Overlapping Address Range Values	Check identifies where roads have overlapping address ranges in a given community or zone.	
Parity Issue	Check identifies where roads have a mixture of even and odd ranges on one side of the street.	
Has Stacked Segments	Check identifies where road centerlines are on top of one another or 'stacked'.	
Not Snapped to Adjacent Segments	Check identifies where roads are not snapped to adjacent segments.	
Has Zero In Range Value	Check identifies where road ranges have a zero From Value and nonzero To Value, or a zero To Value and a nonzero From Value.	
Zone Attribution Against Intersecting Polygon Attribution	Check identifies discrepancies between a centerline's zone attribution and the associated boundary it intersects within a buffer distance around the road centerline. Zone used: Incorporated Municipality	

Site/Structure Address Points Quality Control Checks	
QC Check	Description
Address Found Multiple Times	Check identifies where an SSAP address occurs multiple times in the dataset.
Full Address Does Not Match Concatenation of Parsed Out Values	Check identifies where the individual parsed fields of an address do not match the full address field. To run this check, both parsed fields and a combined full address field must be provided. By default building, floor, unit are utilized but can be configured to not be utilized.
SSAP Attribution Comparison Against Polygon Attribution (Zone Check)	Check identifies where the attribution for a zone value on a site structure address point (SSAP) is not consistent with the attribution the address point falls within.
Synchronization issues between SSAP and Road Centerlines	This check compares SSAPs to Road Centerlines. It identifies addresses that do not have a matching street name or range in the road centerline layer or are spatially located on the wrong side of the road based on road centerline address ranging.
Sub checks include:	
Fail on Full Street Name	No house number No matching street name found
Fail on Zone	Address found only in a different ESN Address found only in a different community and ESN Address found only in a different community
Found Multiple Times	Address matches multiple road segments
Fail on Address Range	Address falls in a gap in the compatible ranges Address could not be found in compatible ranges Address is higher than compatible ranges Address is lower than compatible ranges
Fail on Block	Address falls along the wrong range block
Fail on Parity	Address falls on the wrong side (odd on even; even on odd)

ALI to Road Centerline and Site/Structure Address Point Synchronization Checks	
QC Check	Description
Critical Fields are Missing Value(s)	Check identifies where mandatory fields are missing values. Checks for Address Number, Street Name, ESN & MSAG Community
ALI to Site/Structure Address Points	
Fail on Full Street Name	No matching street name found
Fail on Zone	Address found only in a different ESN Address found only in a different community and ESN Address found only in a different community
Found multiple times	Address matches multiple road segments
Fail on Address Number	Address lies between existing house numbers Address is lower than compatible ranges Address is higher than compatible ranges
Fail on Address Number Suffix	Address found with different house number suffix
Fail on Unit Designation	Address found with a different unit designation
ALI to Road Centerlines	
Fail on Full Street Name	No matching street name found
Fail on Zone	Address found only in a different ESN Address found only in a different community and ESN Address found only in a different community

Found multiple times	Address matches multiple road segments
Fail on Address Range	Address falls in a gap in compatible ranges Address is higher than compatible ranges Address is lower than compatible ranges

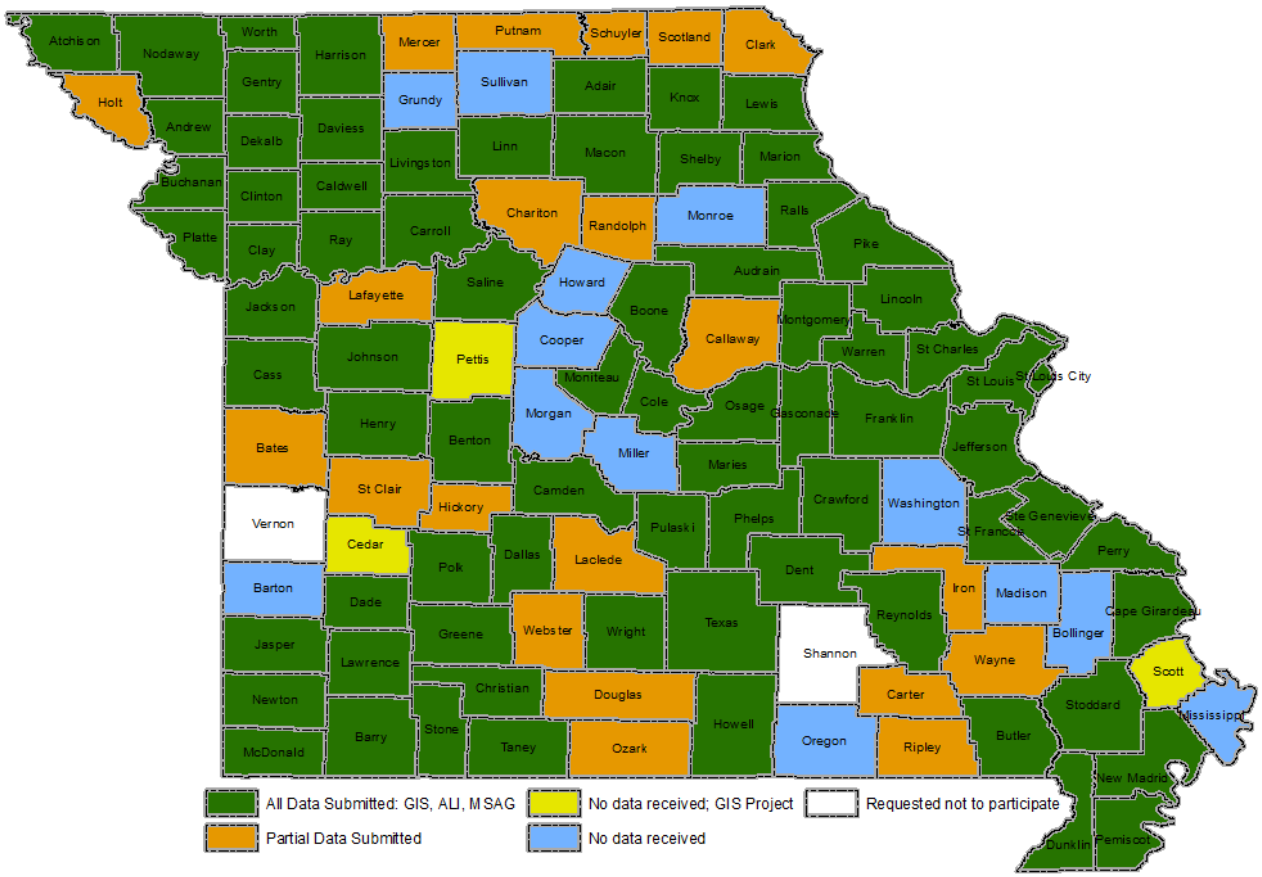
ALI to Road Centerline and Site/Structure Address Point Synchronization Checks	
QC Check	Description
Critical Fields are Missing Value(s)	Check identifies where mandatory fields are missing values. Checks for High/Low Range, Street Name, ESN & MSAG Community
MSAG to Road Centerline (High and Low Ranges Processed Separately)	
No matching street name found	The street name in the MSAG was not found in the roads file.
No house number	High or low range not populated in MSAG record
Address is higher than compatible ranges	The street name exists in the road centerline layer, but the low or high range number of the MSAG record cannot be found in the road centerline ranges.
Address is lower than compatible ranges	The street name exists in the road centerline layer, but the low or high range number of the MSAG record cannot be found in the road centerline ranges.
Address falls in a gap in the compatible ranges	The street name exists in the road centerline layer, but the low or high range number of the MSAG record cannot be found in the road centerline ranges.
Address could not be found in compatible ranges	The street name exists in the road centerline layer, but the low or high range number of the MSAG record cannot be found in the road centerline ranges.
Address found only in a different ESN	The street name exists in the roads file, but the MSAG ESN is different than the road centerline.
Address found only in a different community and ESN	The street name exists in the roads file, but the MSAG Community and ESN is different than the road centerline.
Address found only in a different community	The street name exists in the roads file, but the MSAG Community is different than the road centerline.

Resources Received for Quality Control

Each jurisdiction that participated only submitted the GIS data, ALI and MSAG available in their current 9-1-1 environment. Every PSAP did not submitted all the required resources for the assessment; 19 jurisdictions did not participate. The chart below contains an overview of the number of GIS data layers, ALIs and MSAGs submitted by the PSAPs/counties; a total of 95 PSAPs/counties participated.

Resources	Counties Submitting	Counties NOT Submitting
Provisioning Boundary	87	8
PSAP Boundary	87	8
Emergency Service Boundaries – EMS	83	12
Emergency Service Boundaries – Fire	90	5
Emergency Service Boundaries – Law	79	16
Road Centerlines	95	0
Site Structure Address Points	92	3
Incorporated Municipalities*	81	14
County*	89	6
ALI	75	20
MSAG	80	15

*Layer is strongly recommended and not mandatory.



Current GIS Accuracy for NG9-1-1

GIS data accuracy is a gauge to determine the amount of effort required for each jurisdiction to be prepared for the implementation of an NG9-1-1 system that utilizes the GIS data for NG9-1-1 call routing and location validation. Each participating PSAP in Missouri was assessed and the individual results for GIS error counts and features were aggregated and totaled to calculate a statewide accuracy for NG9-1-1. The goal to enable NG9-1-1 call routing is for each jurisdiction to be critical error free (0) for all mandatory GIS data layers in order to achieve an overall accuracy of 100%. More information on critical errors can be found in the Quality Control, GIS Synchronization and Accuracy Benchmarks and Remediation Recommendations for Jurisdictions sections.

The current statewide GIS accuracy is **83.12%** for all errors identified and **86.98%** for only the critical errors requiring resolution for NG9-1-1 call routing and location validation.

Resources	Current Accuracy	Current Accuracy
	All Errors	*Critical Errors*
Provisioning Boundary	69.25%	69.25%
PSAP Boundary	0.00%	0.00%
Emergency Service Boundaries – EMS	0.00%	0.00%
Emergency Service Boundaries – Fire	0.00%	0.00%
Emergency Service Boundaries – Law	0.00%	0.00%
Road Centerlines	87.79%	97.51%
Site Structure Address Points	81.56%	98.87%
Incorporated Municipalities*	81.56%	81.56%
County Boundary*	0.00%	0.00%

*Layer is strongly recommended and not mandatory.

Information about the remediation and estimated accuracy post-remediation can be found below under Remediation Recommendations for Jurisdictions.

Accuracy of 0.00% indicates that the number of errors exceeds the number of features. Each layer undergoes multiple quality control checks. Many checks such as the boundary gap and overlap checks can identify hundreds of errors.

Current ALI & MSAG to GIS Data Accuracy for Transition to NG9-1-1

The primary benchmark utilized by NGCS providers is the ALI to Road Centerline at or above 98%. While the traditional legacy ALI and MSAG will be converted to GIS-based resources within the NG9-1-1 environment, most systems will utilize a version of legacy databases during transition. Below is a chart containing the current accuracy of the ALI and MSAG synchronization in Missouri.

Resources	Current Accuracy
ALI to Road Centerline	75.19%
ALI to Site/Structure Address Points	67.63%
MSAG to Road Centerline	57.18%

ALI and MSAG synchronization in this initial assessment was completed on the resources as submitted. GeoComm did not remove any non-mappable records (wireless, FX, etc.) nor were duplicates removed. The process utilized by local jurisdictions may be different.

Remediation Recommendations for Jurisdictions

Each jurisdiction was provided extensive documentation on the quality control errors and remediation steps to update the existing GIS data to meet the NG9-1-1 GIS data benchmarks. The information below provides both an overarching step in the process and the number of total errors across all jurisdictions. Errors are categorized into **Critical**, those that are not acceptable in the NG9-1-1 environment, and **Non-Critical**, those that should be corrected for sound GIS data but will be acceptable within the NG9-1-1 environment.

Critical Error Remediation Recommendations

Remediation Recommendation	Number of Errors
Add and populate the mandatory fields	3,288,028
Correction of extra spaces in mandatory fields	*Included above*
Globally unique IDs	*Not analyzed*
Duplicate unique IDs	182
Correct values outside of domain	625,222
Correct features outside or not fully covered by provisioning boundary	110,662
Boundary | Gaps and overlaps	58,440
Boundary | Multipart geometry	697
Road Centerline | Correct range overlaps	57,287
Road Centerline | Range FROM higher than TO	14,879
Road Centerline | Range parity	6,040
Road Centerline | Segment Multipart/Complex Geometry	89,313
Correct ALI to Road Centerline errors	242,126
Migration of legacy street name elements to CLDXF street name elements	*Not analyzed*
Site/Structure Address Point | Duplicates	331,855

Non-Critical Error Remediation Recommendations

Remediation Recommendation	Number of Errors
Site/Structure Address Points to Road Centerline Synchronization Errors	836,366
Road Centerline | Segment Topology Snapping	83,353
Road Centerline | Stacked Segments	9,212
ALI to Site/Structure Address Point Synchronization Errors	313,436

Predictive Accuracy Post Remediation

An overall estimate of accuracy based on correction of all critical errors for the statewide GIS data is approximately 95.37%. The best practice benchmark utilized by most states is 98% for overall GIS accuracy. Individual county predicted accuracy can be found in Appendix C.

Maintenance Recommendations

Maintenance begins when remediation of NG9-1-1 GIS data is critical error free and the ALI to road centerline synchronization is at or above 98%. The process of quality control and synchronization is a vital process within maintenance and must be continued. The following items should be considered in maintenance and after reaching the transition goal.

Road Centerline Maintenance Recommendations

- Split Centerlines at all other road intersections and boundaries – Fire, Law, EMS
- Add Elevation for under / overpasses, where applicable

- Align centerlines with bordering cities, counties and state; ensuring segments are “snapped” to the neighboring jurisdictions borders
- Convert 0-0 ranges to NULL-NULL, where possible
- Request centerlines from military installations, where applicable
- Populate Validation Left / Right fields

Site/Structure Address Points Maintenance Recommendations

- Correct duplicate address points through subaddressing elements
- Create access point, where applicable
- Align address points to structures
- Create points for subaddress, where not already available

General Maintenance Recommendations

- Create basic metadata

Next Steps and Recommendations

Continual Coordination between 9-1-1 and GIS Personnel

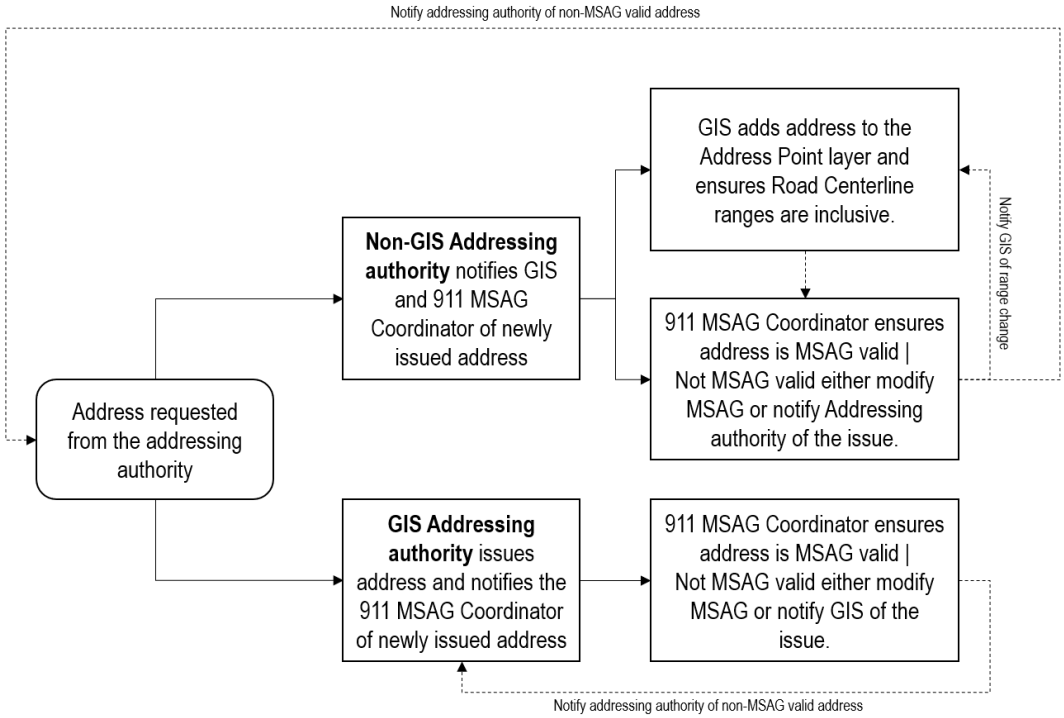
A key success component of NG9-1-1 is the coordination between 9-1-1 and GIS personnel. Neither organization can maintain the data and information required for NG9-1-1 systems alone; there must be collaboration and coordination. In particular, the MSAG Coordinators within 9-1-1 and the GIS personnel must build and maintain a strong communication plan to ensure the MSAG (Master Street Address Guide) and road centerlines are kept in alignment. When the MSAG Coordinator makes changes in the MSAG for new addresses that come through the provider’s service order requests, the MSAG Coordinator must notify GIS so that the changes are also made to the Road Centerline.

As transition occurs, it is likely that the NGCS provider will implement a GIS derived MSAG, an MSAG built from the Road Centerline data of each jurisdiction. As the GIS derived MSAG becomes reality, the ALI, or TN listing, will be validated by the GIS derived MSAG and not through the legacy MSAG currently maintained by the MSAG Coordinator. Once complete transition to NG9-1-1 has taken place, the locations will be validated, and the calls will be routed using GIS data and the ALI will transition to a Location Database.

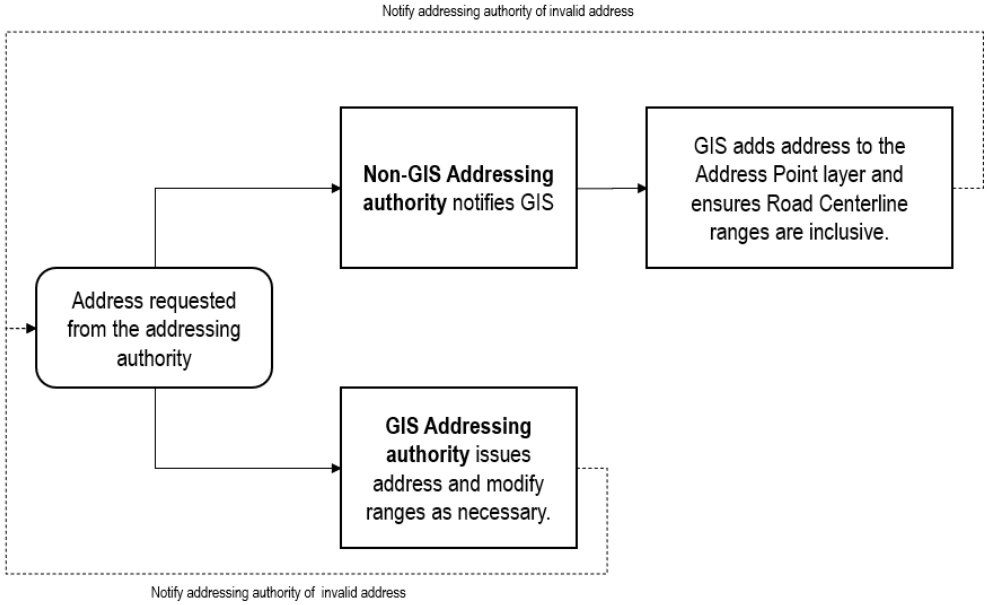
The flowcharts below depict an example of the communication between 9-1-1 and GIS for pre and post transition to NG9-1-1 for maintenance of the E9-1-1 MSAG, the transitional GIS derived MSAG, and NG9-1-1 GIS data.

Along with the MSAG and address validation, it is important for 9-1-1 and GIS to work together in the maintenance of response boundaries including but not limited to the PSAP, EMS, Fire and Law boundaries. If either entity is notified of a change in the boundary, they must notify the other to ensure all data resources are kept in sync.

Coordination before and during transition to NG9-1-1



Coordination after transition to NG9-1-1



RECOMMENDATION: Continue to provide education and outreach to the 9-1-1 Authorities, Addressing Authorities, and the GIS Data Providers throughout Missouri to ensure coordination continues between all entities to improve the NG9-1-1 GIS data sets.

NG9-1-1 GIS Legislation, Governance and Procedures

MO 911 SB should consider presenting legislation specific to NG9-1-1 GIS to ensure the mission critical nature of GIS is acknowledged and can be enforced. Few states have initiated legislation for GIS in NG9-1-1, with Kansas being an example in House Bill No. 2084. This example includes adding authorization to the Kansas 911 coordinating council to establish data standards, maintenance polices and data reporting requirements for GIS data. The bill also includes penalties should the GIS data not be maintained accurately.

Along with legislation, Kansas has a NG911 GIS Governance Policy that further defines governance, organization, strategic planning, standards and guidelines, communication, training and compliance. The Kansas examples are now being used as reference for a number of other states.

Maintenance of the NG9-1-1 GIS data is vital and coordination between all partners is one of the most important components of highly accurate GIS data. It is recommended that each 9-1-1 Authority, their GIS Data Provider and all Addressing and Street Naming Authorities within the PSAP area establish standard operating procedures. The standard operation procedures should include workflows for each component from Street Naming to addressing to NG9-1-1 GIS data updates and submission to the NGCS. If not already established, ordinances and resolutions at a local level may be required for enforcement.

RECOMMENDATION:

- Present GIS as a part of NG911 Legislation to include establishment of data standards, maintenance, and data reporting requirements.
- Consider creating a NG911 GIS Governance Policy.
- Continue working with local 9-1-1 Authorities, GIS Data Providers, Addressing Authorities and Street Naming Authorities on the importance of NG9-1-1 GIS standard operating procedures for each jurisdiction along with ordinance and resolutions where required.

Procure NG9-1-1 GIS Data Management Services

The process of preparing GIS data to support NG9-1-1 is complex and time demanding. Procuring NG9-1-1 GIS data management services is a valuable asset for states where agencies leading the NG9-1-1 effort do not have a team of dedicated GIS personnel to support the transition to, implementation and continual support of NG9-1-1. The State of Missouri should strongly consider acquiring NG9-1-1 GIS data management services to assist in providing ongoing project management support, tools for quality control and extract, transform and load (ETL) processes, development of NG9-1-1 related GIS data layers, auto population of attributes, updates to Missouri specific NG9-1-1 GIS documentation and other related NG9-1-1 GIS tasks. The State should also consider the impact an additional contract will have on existing staff and determine if additional personnel is needed or if a partnership with an existing state agency would be beneficial to assist in the management of the NG9-1-1 GIS Data Management Services.

RECOMMENDATION:

- Acquire NG9-1-1 GIS data management services to support MO 911 SB with the transition to, implementation and continued support of the Missouri NG9-1-1 system.
- Assess the impact an additional contract at MO 911 SB will have on existing staff and determine if additional staff or a partnership with another agency with GIS staff would be required to assist in the management of the NG9-1-1 GIS Data Management Services.

Development of Stitch Points for Road Centerlines Meeting at Boundaries

One of the most important aspects of NG9-1-1 is a seamless, nationwide road centerline dataset. Each state must lead the effort to ensure that the road centerline is seamless statewide. This process can only be accomplished with guidance and support from the State of Missouri.

GIS data is maintained by numerous entities (counties, cities, regions) in disparate systems. The exact geographic location where road centerline segment endpoints meet at borders between the GIS data managing entities is impossible to match without a reference layer to indicate the exact location to both entities. Stitch points or border points can be created to assist in the effort of creating a topologically accurate, seamless, statewide dataset.

The boundaries to align to are:

- State Boundary
- County Boundary
- PSAP Boundary
- Incorporated Municipality Boundary

If a street name and ranging is carried across PSAP boundaries, a discussion between the PSAPs is needed to ensure the address ranges have no gaps or overlaps at the PSAP boundary and the ranges each PSAP is responsible for are located on the road segments within their PSAP boundary. Street names should be assigned by the appropriate local authority starting with the incorporated municipality then by the county, state and federal government, as appropriate. The local Street Naming Authorities should work closely with the Addressing Authorities, GIS Data Providers, and 9-1-1 Authorities to ensure duplicate street names are not being utilized in multiple locations in the same jurisdiction.

Road Centerlines topology should be checked against boundary datasets to ensure that Road Centerlines are snapped to the boundaries. Some Road Centerlines follow incorporated municipal boundaries (e.g., County Line Road). Segmentation of these roads must match node for node with the corresponding boundary alignment. While County and PSAP boundaries within the State of Missouri should already be topologically correct for NG9-1-1, border states are likely to have a conflict with boundary delineation. Missouri borders the following states:

- Arkansas
- Illinois
- Iowa
- Kansas
- Kentucky
- Nebraska
- Oklahoma
- Tennessee

When aligning road centerline data with these other states, care should be used to ensure that there are no overlaps or gaps in data. Working directly with the bordering jurisdictions will greatly reduce issues with the data.

RECOMMENDATIONS:

- Develop guidance and workflows to reduce duplicate street names in each authoritative street naming/addressing area to eliminate adverse effects on 9-1-1.
- Coordinate with the surrounding state's 9-1-1 and GIS offices to share state provisioning boundaries so counties along the borders can align well before NG9-1-1 is implemented.
- Develop and share guidance with counties and incorporated municipalities on how to align boundaries and create stitch point for Road Centerline segments. Most NGCS providers allow a seven (7) to eight (8) square feet tolerance for boundary gaps and overlaps.

Implement the use of Missouri Specific Fields

In the development of the MO NG9-1-1 Data Model a few non-NENA NG9-1-1 GIS Data Model fields were added to support Missouri's needs. Additional information and guidance must be provided to the local jurisdictions by MO 911 SB to ensure accurate attribute population.

These include:

- Full Street Name (Road Centerlines and Site/Structure Address Points)
  - The Street Name with all Pre/Post Modifiers, Pre/Post Directionals, Pre Type Separator, and Pre/Post Types concatenated
- Abbreviated Full Street Name (Road Centerlines and Site/Structure Address Points)
  - The Full Street Name with abbreviations (where appropriate) used for the Pre/Post Modifiers, Pre/Post Types, and Pre/Post Directionals.
- Road Centerline NENA Globally Unique ID (Site/Structure Address Points)
  - The NENA Globally Unique ID (NGUID) for the Road Centerline segment that the Address Point record is associated with.

In conjunction with these Missouri specific fields, a modified version of the NENA NG9-1-1 GIS Data Model template will need to be created to support local GIS. The modified version must include the Missouri specific fields listed above and the domains as listed in the *Creation and Maintenance of Missouri Specific Domains to Support Local GIS* Section.

RECOMMENDATIONS:

- Add the fields listed to the MO NG9-1-1 GIS Data Model for interoperability with the legacy databases.
- Determine a method to include the population of these fields with the Extract, Transform and Load (ETL) process established by Missouri.

Creation and Maintenance of Missouri Specific Domains to Support Local GIS

The MO 911 SB GIS Subcommittee identified fields that contain domains. These domains are lists of acceptable values. It is recommended that the MO 911 SB and other state agencies, responsible for collecting local GIS data, work together to identify the organization(s) who will be responsible for the maintenance of the identified domains.

The following domains are part of the MO NG9-1-1 GIS Data Model:

- Direction Domain (DirectionDomain) | Street Name Pre Directional and Street Name Post Directional (*Layers: Road Centerlines and Site/Structure Address Points*)
- Abbreviation Direction Domain (abvDirectionDomain) | Legacy Street Name Pre Directional and Legacy Street Name Post Directional (*Layers: Road Centerlines and Site/Structure Address Points*)

The following domains are maintained by NENA:

- Street Name Pre Types and Street Name Post Types Registry | Street Name Pre Type and Street Name Post Type (*Layers: Road Centerlines and Site/Structure Address Points*)
- Street name Pre Type Separators Registry | Street Name Pre Type Separator (*Layers: Road Centerlines and Site/Structure Address Points*)
- Parity | Parity Left and Parity Right (*Layer: Road Centerlines)*
- Site/Structure Address Point Placement Method Registry | Placement Method (*Layer: Site/Structure Address Point)*
- NENA urn:nena:service:sos Registry | Service URN (*Layer: PSAP Boundary and Emergency Service Boundary)*

The following domains are maintained by the US Postal Service (USPS):

- Legacy Street Name Type (USPS Publication 28, Appendix C1) | Legacy Street Name Type (*Layers: Road Centerlines and Site/Structure Address Points*)
- Postal Code (USPS City State File Production) | Postal Code Left, Postal Code Right and Postal Code (*Layers: Road Centerlines and Site/Structure Address Points*)
- ZIP Plus 4 (USPS City State File Production) | ZIP Plus 4 (*Layer: Site/Structure Address Points*)
- Postal Community Name (USPS City State File Production) | Postal Community Name Left, Postal Community Name Right and Postal Community Name (*Layers: Road Centerlines and Site/Structure Address Points*)

The following domains were identified as a part MO NG9-1-1 GIS Data Model and a maintenance entity must be identified:

- County Domain (NG911CountyDomain) | County Left, County Right, County (*Layers: Road Centerlines and Site/Structure Address Points*)

RECOMMENDATIONS:

- Determine what organization will be responsible for maintaining the County Domain.
- Ensure surrounding states' border county names are added to the County Domain and that the domain includes the word "County" with the county name.
- Determine a state-level review process of proposed changes to the domain values in the NENA Registries; a single entity on behalf of the State of Missouri and the counties will submit any additions.
- Investigate creating Missouri specific domains for Postal Codes and Postal Community Names in partnership with the USPS. These domains should be maintained at a state level to reduce duplication of cost and maintenance effort.

Provide Assistance in Populating the MSAG Community Attributes

The most significant gap within the legacy data attributes of the local GIS datasets is the absence of the MSAG Community values in the Road Centerline and Site/Structure Address Points. These fields and values are necessary for interoperability between the existing legacy system and the NG9-1-1 system. In all NG9-1-1 implementations, the legacy system will continue to be utilized to route 9-1-1 calls with spatial routing failures and are required for the implementation of GIS derived MSAGs.

Due to the complex nature of identifying the vintage and original source of the MSAG Community in many cases it is not a simple GIS process to populate. This process is often time consuming and manual therefore the MO 911 SB should provide assistance where available.

RECOMMENDATION: Provide assistance to populate the MSAG Community values where not currently populated.

Information and Assistance Needed from the Selected NG9-1-1 Core Service Provider

Standardization of Non-Standard USPS Post Types & Street Names in the Legacy Databases

During the GIS Assessment GeoComm identified several counties where the MSAG and ALI contain non-US Postal Service standard abbreviations such as AV, instead of AVE, and LA, instead of LN. It is recommended that the NGCS along with MO 911 SB and the impacted PSAPs work with legacy MSAG and ALI providers to update these abbreviations and road names.

RECOMMENDATION: Coordinate with the NGCS, PSAPs and legacy ALI/MSAG providers to update all non-standard USPS abbreviations and road names.

Counties identified that have non-USPS standard abbreviations or missing street name post ordinals include:

- Audrain
- Barry
- Buchanan
- Cape Girardeau
- Christian
- Cole
- Crawford
- Dunklin
- Howell
- Jasper
- Lawrence
- Linn
- Montgomery
- New Madrid
- Newton
- Pemiscot
- Pike
- Polk
- Pulaski
- Ralls
- Randolph
- St Francois
- St Louis
- Ste Genevieve
- Stoddard
- Taney
- Texas
- Warren
- Wright

Counties where non-USPS standard abbreviations or missing street name post ordinals may be missing include:

- Bates
- Callaway
- Carter
- Chariton
- Clark
- Douglas
- Hickory
- Mercer
- Ozark
- Ripley
- Saline
- Schuyler
- Scotland
- St Clair
- Wayne

Distribute URNs/URIs

Due to the dependence on the NGCS Provider for the Service URN and Service URI the local GIS Data Providers were instructed to wait for these values before populating these fields. It is recommended that as soon as these values are available from the NGCS Provider, MO 911 SB should distribute them to the GIS Data Providers and 9-1-1 Authority for population.

RECOMMENDATION: Distribute the Service URN and Service URI values to the GIS Data Providers and 9-1-1 Authority as soon as they are available.

Implementation of a GIS Derived MSAG

A GIS derived MSAG is a tabular database of GIS data, typically the Road Centerline dataset. This tabular data is utilized to initially replace and then continually update the MSAG stored by the legacy data provider. A GIS derived MSAG reduces duplication of work by transitioning the MSAG maintenance of adding and updating street names and ranges to the GIS Data Provider while keeping the ALI correction requests to the existing MSAG Coordinator. This process will ultimately reduce the number of ALI correction requests submitted by the telephone providers through the use of a comprehensive and accurate GIS derived MSAG. To implement a GIS derived MSAG, the NGCS Provider may need to implement additional steps and software.

RECOMMENDATION: Transition each PSAP from a legacy MSAG to a GIS derived MSAG in partnership with the PSAP, GIS Data Providers, NGCS Provider and GIS Management partner, if chosen.

Determine Quality Control Exceptions

Throughout the project many local jurisdictions requested the use of exception codes to mark GIS features as exceptions. Exception codes are utilized, at the feature level, to allow real world situations, identified as errors through the quality control process to be omitted or removed from a specific check.

Features may have multiple exceptions. The use of exceptions should only be used to accommodate real-world situations that are identified as errors in the quality control process. Caution should be used when setting exceptions for features within a GIS dataset and should only be used when there is a viable exception that will cause an error to be identified. The MO 911 SB, in conjunction with the NGCS Provider and GIS Management partner (if applicable) should provide additional guidance on the use of these. Exception codes are also dependent on the NGCS Provider and should not be determined until a provider is selected.

RECOMMENDATION: Once the NGCS Provider has been selected, a list of exception codes should be distributed to the GIS Data Providers and 9-1-1 Authorities for use within the GIS data sets.

Provide Guidance on Creation of Metadata for NG9-1-1 GIS Data

Metadata is information about data and every 9-1-1 data layer maintained by a local jurisdiction needs to have metadata. The minimum requirements and elements will need to be determined by the State of Missouri in conjunction with the NGCS Provider, GIS Management partner, and 9-1-1 GIS stakeholders. The Federal Geographic Data Committee has defined mandatory fields and will serve as a starting point.

RECOMMENDATION: Work with the NGCS Provider, GIS Management partner (if applicable), and 9-1-1 GIS stakeholders to determine mandatory metadata elements for NG9-1-1.

Implement an Effective and Efficient State Extract – Transform – Load Process

Next Generation Unique ID Creation

NENA Globally Unique IDs are a combination of three (3) items – a layer identifier, a locally assigned ID and the Agency Identifier. At the time of this report there is discussion in the NENA NG9-1-1 GIS Data Model version 2 workgroup on a proposed change to the elements used to create the globally unique ID. The two elements with proposed changes are the layer identifier and the Agency Identifier. The basic concept behind the change is to transition these unique ID to an i3 format. E.g., urn:emergency:uid:gis:RCL:123:co.jackson.mo.us

Due to this potential change in the GIS Data Model next year, it is recommended that the State of Missouri hold this topic until further information is provided through the update. If this is not acceptable by the stakeholders, the State could implement a temporary solution by establishing suggested layer prefixes (e.g., RCL, SSAP, PSAP, etc.) and direct the GIS Data Providers to utilize a current local DNS for the Agency Identifier (e.g., co.jackson.mo.us).

RECOMMENDATION: Provide direction to the local GIS Data Providers to add and maintain only the locally assigned ID until the format of the NENA globally unique IDs are decided by NENA.

Auto Population of Field Values

There are numerous fields within the NG9-1-1 GIS Data Model that could be auto populated if the tools implemented by the State of Missouri allow. The following fields have the possibility of auto populating:

- Country
- State: some cases like Road Centerlines along the state boundary cannot be auto populated and must be populated at the local level.
- County: some cases like Road Centerlines cannot be auto populated due to bordering roads and if a local GIS Data Provider submits for more than one county the values must be populated at the local level.
- Discrepancy Agency ID
- Agency ID

- Service URI
- Service URN

RECOMMENDATION: If selecting a 9-1-1 GIS data management provider, identify if the provider can auto populate any or all the fields listed above. If a tool is built by the state or MO 911 SB, the auto population of fields through it should be considered and implemented where possible.

Identification of Existing Scripts and Tools for Schema Transformation

Throughout the project several jurisdictions identified the need for the development of ETL (exact, transform, load) scripts and tools to assist the individual jurisdictions with migrating their individual, local schema to the MO NG9-1-1 GIS Data Model and the variety of CAD systems utilized at the local level. It is recommended that MO 911 SB work with the GIS professionals at the local and state level to identify available scripts and tools or build these for use by local GIS Data Providers. Some GIS data management providers can provide these ETL processes during the QC and merging process.

RECOMMENDATION: Investigate the possibility of purchasing or creating scripts and tools for local GIS Data Providers to support the 9-1-1 centers in providing GIS data for NG9-1-1 and CAD. If selected, a GIS data management provider can provide assistance.

Develop Additional Guidance for Address Point Placement

During the development of the standards and best practices document there was no clear guidance from NENA, other federal organizations, or the State of Missouri on how to place address points for multi-story sites and subaddresses. Additional guidance may be provided in the future with the development and work of the NENA 3D data workgroup. The State of Missouri should keep appraised of the situation and closely monitor NENA for additional guidance. It is also recommended that the State of Missouri survey the 9-1-1 centers and request input on how or if their CAD system can handle stacked points or if they should be staggered.

RECOMMENDATIONS:

- Keep appraised of the work being undertaken at NENA for additional guidance on Site/Structure Address Point placement relating to stacked or staggered recommendations.
- Conduct a survey of the 9-1-1 centers to determine if locally used CAD systems can handle stacked points.

Develop Additional Guidance for a Road Name Alias Table

During the development of the standards and best practices document, discussion was held on the viability of implementing an Alias Street Name Table. At the time of publication there was no NGCS Provider that could implement and utilize an Alias Street Name Table and there was no further guidance available from NENA. Most CAD systems utilized by local 9-1-1 centers can and do use Alias Street Name Tables. It is recommended that MO 911 SB survey local 9-1-1 centers on the utilization of Alias Street Name Tables and gather the schema utilized in each CAD used across the state. Once the information is acquired, MO 911 SB along with the NG9-1-1 GIS Task Force should review the information and add the table and its requirements to the MO NG9-1-1 GIS Data Standard.

RECOMMENDATION: Gather information from the local 9-1-1 centers on the use and schema of the Alias Street Name Table. Using the information gathered review and add the appropriate details to the MO NG9-1-1 GIS Data Standard.

Other Recommendations

- Develop a strategy for populating optional data fields within the MO NG9-1-1 GIS Data Model.
- Provide guidance for mile marker / mileposts for navigable water ways and river miles.

- Provide guidance on consistent name/addressing for:
  - Crossover/connector roads on control-access highways
  - Rest areas, service plazas and buildings on controlled-access highways
  - On and off ramps
- Provide guidance on road naming on roundabouts and traffic circles
- Investigate data sharing practices and rules in Missouri and add information on GIS data sharing to the best practices
- Update the MO NG9-1-1 GIS Data Model to change the Full Street Name field in the Site/Structure Address Points from mandatory to optional as Street Name is conditional and not required for Site/Structure Address Points.
- Discuss Missouri specific additions to the MO NG9-1-1 GIS Data Model and monitor the NENA NG9-1-1 GIS Data Model for updates.
- Keep appraised of the ever-changing NENA documents and standards specifically the i3 standard, NG9-1-1 GIS Data Model standard, the Civic Location Data Exchange Format (CLDXF) standard, the GIS Data Stewardship working group, the GIS Data Transition working group and the 3D working group.

Appendix A | USPS Publication 28 Street Suffixes and Directionals

GIS data attributes should follow these NENA USPS street suffixes publication standards.

Street Suffixes

GIS data attributes should follow these USPS street suffixes publication standards.

ALY	CLB	CVS	FRG	HLS	LGT	NCK	PSGE	SHR	TRL	WAYS
ANX	CLF	CYN	FRGS	HOLW	LGTS	OPAS	PT	SHRS	TRLR	WL
ARC	CLFS	DL	FRK	HTS	LK	ORCH	PTS	SKWY	TRWY	WLS
AVE	CMN	DM	FRKS	HVN	LKS	OVAL	RADL	SMT	TUNL	XING
BCH	CMNS	DR	FRST	HWY	LN	PARK	RAMP	SPG	UN	XRD
BG	COR	DRS	FRY	INLT	LNDG	PARK	RD	SPGS	UNS	XRDS
BGS	CORS	DV	FT	IS	LOOP	PASS	RDG	SPUR	UPAS	
BLF	CP	EST	FWY	ISLE	MALL	PATH	RDGS	SPUR	VIA	
BLFS	CPE	ESTS	GDN	ISS	MDW	PIKE	RDS	SQ	VIS	
BLVD	CRES	EXPY	GDNS	JCT	MDWS	PKWY	RIV	SQS	VL	
BND	CRK	EXT	GLN	JCTS	MEWS	PKWY	RNCH	ST	VLG	
BR	CRSE	EXTS	GLNS	KNL	ML	PL	ROW	STA	VLGS	
BRG	CRST	FALL	GRN	KNLS	MLS	PLN	RPD	STRA	VLY	
BRK	CSWY	FLD	GRNS	KY	MNR	PLNS	RPDS	STRM	VLYS	
BRKS	CT	FLDS	GRV	KYS	MNRS	PLZ	RST	STS	VW	
BTM	CTR	FLS	GRVS	LAND	MSN	PNE	RTE	TER	VWS	
BYP	CTRS	FLT	GTWY	LCK	MT	PNES	RUE	TPKE	WALK	
BYU	CTS	FLTS	HBR	LCKS	MTN	PR	RUN	TRAK	WALK	
CIR	CURV	FRD	HBRS	LDG	MTNS	PRT	SHL	TRCE	WALL	
CIRS	CV	FRDS	HL	LF	MTWY	PRTS	SHLS	TRFY	WAY	

Street Directionals

N	NE
E	SE
S	NW
W	SW

Appendix B | NENA Resources for CLDXF Standard Field Attributes

Pre and Post Directional Values

North
South
East
West
Northeast
Northwest
Southeast
Southwest

Street Name Pre and Post Types

NENA Registry System | Street Name Pre Types and Street name Post Types

http://technet.nena.org/nrs/registry/StreetNamePreTypesAndStreetNamePostTypes.xml

Street Name Pre Type Separators

NENA Registry System | Street Name Pre Type Separators

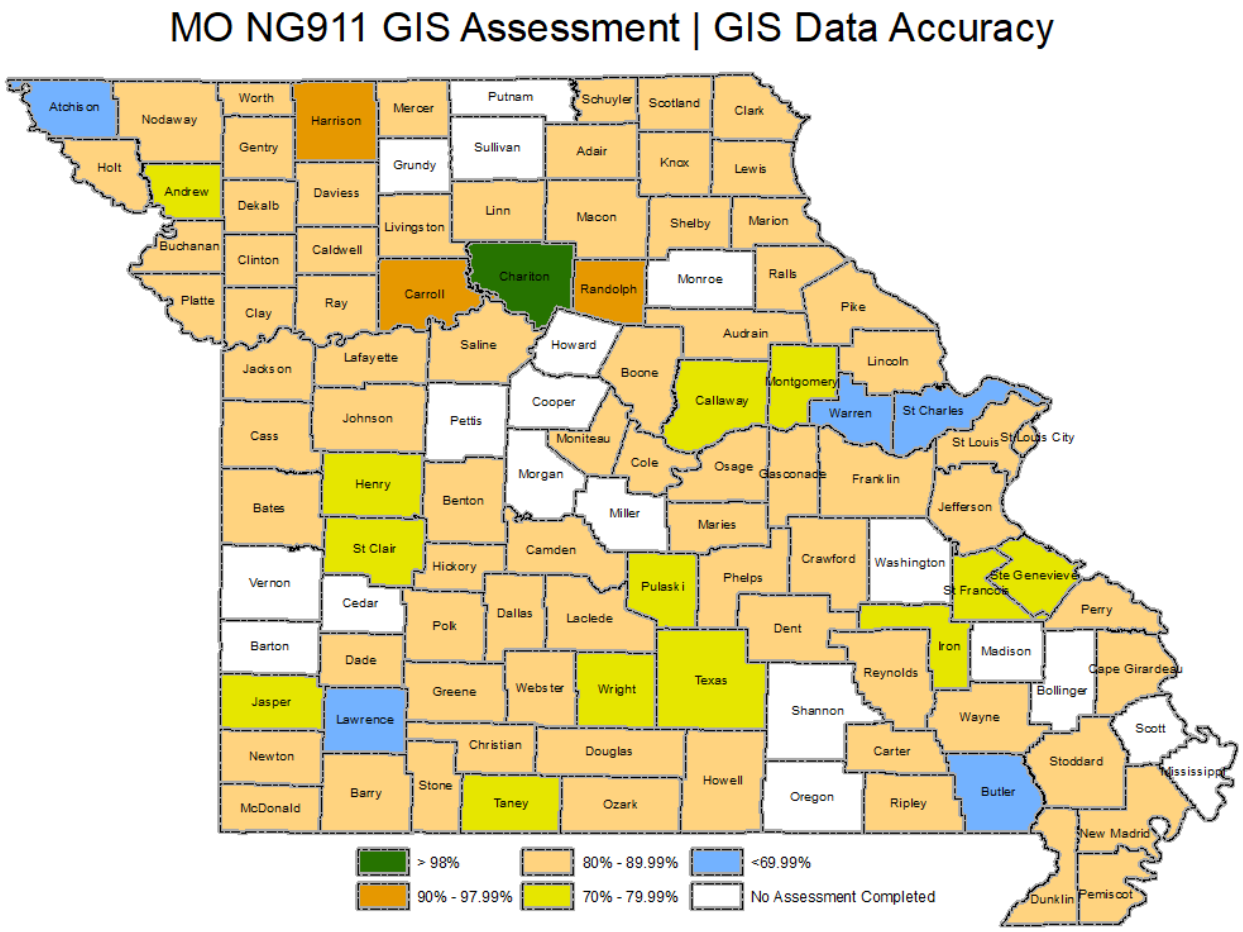
http://technet.nena.org/nrs/registry/StreetNamePreTypeSeparators.xml

Appendix C | County Current and Predicted Accuracy

Current GIS Accuracy for NG9-1-1 by County

The map and charts below show each county's GIS accuracy by layer and overall identified errors based on the Quality Control performed within the project.

Note: A N/A under the accuracy column indicates that a layer was not received for the assessment. A 0.00% indicates there are more errors present than the number of features in the layer. This is common during initial assessments until errors can be resolved for NG9-1-1.



*The Incorporated Municipality and County Boundaries are strongly recommended and not mandatory.

Adair	Accuracy
Provisioning Boundary	83.33%
PSAP Boundary	87.50%
Emergency Service Boundaries – EMS	75.00%
Emergency Service Boundaries – Fire	87.50%
Emergency Service Boundaries – Law	68.75%
Road Centerlines	86.89%
Site Structure Address Points	76.20%
Incorporated Municipalities*	83.33%
County Boundary*	0.00%
GIS Accuracy	**83.21%**

Andrew	Accuracy
Provisioning Boundary	83.33%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	43.27%
Emergency Service Boundaries – Fire	43.27%
Emergency Service Boundaries – Law	43.27%
Road Centerlines	92.87%
Site Structure Address Points	69.61%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**79.60%**

Atchison	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	90.02%
Site Structure Address Points	77.09%
Incorporated Municipalities*	N/A
County Boundary*	83.33%
GIS Accuracy	**85.90%**

Audrain	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	91.46%
Site Structure Address Points	77.42%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**85.78%**

Barry	Accuracy
Provisioning Boundary	85.71%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	3.41%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	91.40%
Site Structure Address Points	83.77%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**84.85%**

Bates	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	N/A
Emergency Service Boundaries – Law	0.00%
Road Centerlines	87.64%
Site Structure Address Points	N/A
Incorporated Municipalities*	83.33%
County Boundary*	0.00%
GIS Accuracy	**82.29%**

*The Incorporated Municipality and County Boundaries are strongly recommended and not mandatory.

Benton	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	92.86%
Site Structure Address Points	77.14%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**84.97%**

Boone	Accuracy
Provisioning Boundary	85.71%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	68.75%
Emergency Service Boundaries – Fire	11.06%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	85.28%
Site Structure Address Points	86.79%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**86.04%**

Buchanan	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	83.33%
Emergency Service Boundaries – Fire	71.50%
Emergency Service Boundaries – Law	75.00%
Road Centerlines	91.23%
Site Structure Address Points	84.74%
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**86.69%**

Butler	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	12.50%
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	N/A
Emergency Service Boundaries – Law	N/A
Road Centerlines	91.70%
Site Structure Address Points	N/A
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**91.69%**

Caldwell	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	78.41%
Emergency Service Boundaries – Fire	78.41%
Emergency Service Boundaries – Law	78.41%
Road Centerlines	93.46%
Site Structure Address Points	73.62%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**88.81%**

Callaway	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	86.81%
Emergency Service Boundaries – Fire	86.11%
Emergency Service Boundaries – Law	86.81%
Road Centerlines	88.45%
Site Structure Address Points	75.50%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**78.89%**

*The Incorporated Municipality and County Boundaries are strongly recommended and not mandatory.

Camden	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	2.84%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	90.71%
Site Structure Address Points	83.96%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**84.77%**

Cape Girardeau	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	87.50%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	90.57%
Site Structure Address Points	83.37%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**80.36%**

Carroll	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	39.84%
Emergency Service Boundaries – Fire	39.84%
Emergency Service Boundaries – Law	39.84%
Road Centerlines	92.98%
Site Structure Address Points	87.20%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**91.16%**

Carter	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	27.27%
Emergency Service Boundaries – EMS	18.75%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	60.00%
Road Centerlines	90.82%
Site Structure Address Points	86.09%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**87.79%**

Cass	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	77.14%
Emergency Service Boundaries – Fire	77.14%
Emergency Service Boundaries – Law	77.14%
Road Centerlines	92.57%
Site Structure Address Points	86.73%
Incorporated Municipalities*	66.67%
County Boundary*	66.67%
GIS Accuracy	**89.45%**

Chariton	Accuracy
Provisioning Boundary	83.33%
PSAP Boundary	87.50%
Emergency Service Boundaries – EMS	99.40%
Emergency Service Boundaries – Fire	98.40%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	99.68%
Site Structure Address Points	98.76%
Incorporated Municipalities*	100.00%
County Boundary*	83.33%
GIS Accuracy	**99.16%**

*The Incorporated Municipality and County Boundaries are strongly recommended and not mandatory.

Christian	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	75.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	91.19%
Site Structure Address Points	86.92%
Incorporated Municipalities*	N/A
County Boundary*	66.67%
GIS Accuracy	**87.59%**

Clark	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	N/A
Emergency Service Boundaries – Law	N/A
Road Centerlines	77.41%
Site Structure Address Points	85.59%
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**82.26%**

Clay	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	85.00%
Emergency Service Boundaries – Fire	85.00%
Emergency Service Boundaries – Law	85.00%
Road Centerlines	92.84%
Site Structure Address Points	67.97%
Incorporated Municipalities*	66.67%
County Boundary*	50.00%
GIS Accuracy	**79.63%**

Clinton	Accuracy
Provisioning Boundary	83.33%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	66.85%
Emergency Service Boundaries – Fire	66.85%
Emergency Service Boundaries – Law	66.85%
Road Centerlines	92.00%
Site Structure Address Points	75.13%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**85.26%**

Cole	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	62.50%
Emergency Service Boundaries – Fire	62.50%
Emergency Service Boundaries – Law	62.50%
Road Centerlines	88.77%
Site Structure Address Points	82.38%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**83.65%**

Crawford	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	91.55%
Site Structure Address Points	76.49%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**80.93%**

*The Incorporated Municipality and County Boundaries are strongly recommended and not mandatory.

Dade	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	87.50%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	56.94%
Emergency Service Boundaries – Law	51.79%
Road Centerlines	92.22%
Site Structure Address Points	86.42%
Incorporated Municipalities*	N/A
County Boundary*	66.67%
GIS Accuracy	**88.78%**

Dallas	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	80.12%
Site Structure Address Points	88.15%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**85.57%**

Daviess	Accuracy
Provisioning Boundary	83.33%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	37.50%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	86.68%
Site Structure Address Points	76.59%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**83.24%**

Dekalb	Accuracy
Provisioning Boundary	83.33%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	69.08%
Emergency Service Boundaries – Fire	69.74%
Emergency Service Boundaries – Law	69.74%
Road Centerlines	93.12%
Site Structure Address Points	65.67%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**87.56%**

Dent	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	75.00%
Emergency Service Boundaries – Fire	85.94%
Emergency Service Boundaries – Law	75.00%
Road Centerlines	91.82%
Site Structure Address Points	87.37%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**88.64%**

Douglas	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	N/A
Emergency Service Boundaries – Law	N/A
Road Centerlines	93.02%
Site Structure Address Points	77.12%
Incorporated Municipalities*	N/A
County Boundary*	83.33%
GIS Accuracy	**86.42%**

*The Incorporated Municipality and County Boundaries are strongly recommended and not mandatory.

Dunklin	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	79.17%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	91.58%
Site Structure Address Points	79.01%
Incorporated Municipalities*	N/A
County Boundary*	66.67%
GIS Accuracy	**82.94%**

Franklin	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	12.50%
Emergency Service Boundaries – EMS	48.21%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	N/A
Road Centerlines	91.86%
Site Structure Address Points	85.80%
Incorporated Municipalities*	83.33%
County Boundary*	0.00%
GIS Accuracy	**87.66%**

Gasconade	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	88.75%
Site Structure Address Points	81.09%
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**82.16%**

Gentry	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	25.00%
Emergency Service Boundaries – Fire	25.00%
Emergency Service Boundaries – Law	25.00%
Road Centerlines	92.55%
Site Structure Address Points	73.32%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**88.60%**

Greene	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	86.11%
Emergency Service Boundaries – Fire	86.82%
Emergency Service Boundaries – Law	84.83%
Road Centerlines	77.12%
Site Structure Address Points	88.17%
Incorporated Municipalities*	83.33%
County Boundary*	68.75%
GIS Accuracy	**85.43%**

Harrison	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	84.52%
Emergency Service Boundaries – Fire	84.52%
Emergency Service Boundaries – Law	84.52%
Road Centerlines	93.18%
Site Structure Address Points	86.50%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**90.49%**

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Henry	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	86.11%
Emergency Service Boundaries – Fire	86.11%
Emergency Service Boundaries – Law	86.11%
Road Centerlines	80.26%
Site Structure Address Points	75.55%
Incorporated Municipalities*	N/A
County Boundary*	66.67%
GIS Accuracy	**77.31%**

Hickory	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	23.44%
Emergency Service Boundaries – Law	N/A
Road Centerlines	87.63%
Site Structure Address Points	84.96%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**85.58%**

Holt	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	45.83%
Emergency Service Boundaries – Fire	45.83%
Emergency Service Boundaries – Law	45.83%
Road Centerlines	90.96%
Site Structure Address Points	86.42%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**88.40%**

Howell	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	37.50%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	50.00%
Road Centerlines	87.03%
Site Structure Address Points	80.45%
Incorporated Municipalities*	83.33%
County Boundary*	33.33%
GIS Accuracy	**82.62%**

Iron	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	85.71%
Road Centerlines	78.09%
Site Structure Address Points	74.84%
Incorporated Municipalities*	83.33%
County Boundary*	50.00%
GIS Accuracy	**75.44%**

Jackson	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	59.91%
Emergency Service Boundaries – Fire	59.91%
Emergency Service Boundaries – Law	59.91%
Road Centerlines	79.66%
Site Structure Address Points	86.16%
Incorporated Municipalities*	66.67%
County Boundary*	50.00%
GIS Accuracy	**84.79%**

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Jasper	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	10.64%
Road Centerlines	77.12%
Site Structure Address Points	74.38%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**75.16%**

Jefferson	Accuracy
Provisioning Boundary	85.71%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	72.77%
Emergency Service Boundaries – Law	28.75%
Road Centerlines	93.60%
Site Structure Address Points	87.15%
Incorporated Municipalities*	100.00%
County Boundary*	100.00%
GIS Accuracy	**88.58%**

Johnson	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	88.73%
Site Structure Address Points	87.16%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**87.15%**

Knox	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	89.90%
Site Structure Address Points	82.96%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**86.25%**

Laclede	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	N/A
Road Centerlines	91.19%
Site Structure Address Points	77.66%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**83.58%**

Lafayette	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	87.98%
Site Structure Address Points	79.57%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**82.44%**

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Lawrence	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	90.08%
Site Structure Address Points	33.69%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**61.98%**

Lewis	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	58.33%
Road Centerlines	92.43%
Site Structure Address Points	75.10%
Incorporated Municipalities*	66.67%
County Boundary*	66.67%
GIS Accuracy	**83.68%**

Lincoln	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	86.68%
Site Structure Address Points	82.61%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**83.20%**

Linn	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	67.76%
Road Centerlines	82.99%
Site Structure Address Points	82.12%
Incorporated Municipalities*	N/A
County Boundary*	66.67%
GIS Accuracy	**82.44%**

Livingston	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	91.63%
Site Structure Address Points	87.71%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**88.87%**

Macon	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	89.90%
Site Structure Address Points	82.96%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**86.25%**

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Maries	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	N/A
Emergency Service Boundaries – Law	N/A
Road Centerlines	91.11%
Site Structure Address Points	77.67%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**87.14%**

Marion	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	32.50%
Road Centerlines	90.45%
Site Structure Address Points	87.69%
Incorporated Municipalities*	66.67%
County Boundary*	66.67%
GIS Accuracy	**88.31%**

McDonald	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	N/A
Road Centerlines	91.88%
Site Structure Address Points	86.11%
Incorporated Municipalities*	66.67%
County Boundary*	66.67%
GIS Accuracy	**87.72%**

Mercer	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	62.50%
Emergency Service Boundaries – Law	N/A
Road Centerlines	89.54%
Site Structure Address Points	80.18%
Incorporated Municipalities*	83.33%
County Boundary*	N/A
GIS Accuracy	**84.32%**

Moniteau	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	91.85%
Site Structure Address Points	76.78%
Incorporatied Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**81.77%**

Montgomery	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	81.88%
Site Structure Address Points	83.17%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**77.11%**

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New Madrid	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	50.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	52.27%
Emergency Service Boundaries – Law	57.69%
Road Centerlines	92.49%
Site Structure Address Points	83.77%
Incorporated Municipalities*	N/A
County Boundary*	83.33%
GIS Accuracy	**86.95%**

Newton	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	70.00%
Emergency Service Boundaries – EMS	70.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	79.86%
Site Structure Address Points	86.35%
Incorporated Municipalities*	N/A
County Boundary*	0.00%
GIS Accuracy	**81.93%**

Nodaway	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	2.73%
Emergency Service Boundaries – Fire	2.73%
Emergency Service Boundaries – Law	2.73%
Road Centerlines	91.90%
Site Structure Address Points	81.35%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**85.42%**

Osage	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	91.62%
Site Structure Address Points	80.55%
Incorporated Municipalities*	100.00%
County Boundary*	66.67%
GIS Accuracy	**83.27%**

Ozark	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	100.00%
Emergency Service Boundaries – Law	N/A
Road Centerlines	85.10%
Site Structure Address Points	81.68%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**83.42%**

Pemiscot	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	75.00%
Emergency Service Boundaries – Fire	35.71%
Emergency Service Boundaries – Law	83.33%
Road Centerlines	90.65%
Site Structure Address Points	84.06%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**86.15%**

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Perry	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	75.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	75.00%
Road Centerlines	85.23%
Site Structure Address Points	87.26%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**86.08%**

Phelps	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	30.00%
Emergency Service Boundaries – Fire	30.00%
Emergency Service Boundaries – Law	30.00%
Road Centerlines	87.50%
Site Structure Address Points	85.60%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**85.95%**

Pike	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	90.75%
Site Structure Address Points	85.21%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**84.16%**

Platte	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	81.55%
Emergency Service Boundaries – Fire	81.55%
Emergency Service Boundaries – Law	81.55%
Road Centerlines	91.85%
Site Structure Address Points	85.88%
Incorporated Municipalities*	66.67%
County Boundary*	66.67%
GIS Accuracy	**87.63%**

Polk	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	50.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	52.72%
Road Centerlines	92.07%
Site Structure Address Points	86.46%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**88.19%**

Pulaski	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	85.23%
Emergency Service Boundaries – Law	85.00%
Road Centerlines	80.92%
Site Structure Address Points	61.40%
Incorporated Municipalities*	83.33%
County Boundary*	N/A
GIS Accuracy	**72.57%**

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Ralls	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	10.87%
Emergency Service Boundaries – Law	79.69%
Road Centerlines	89.77%
Site Structure Address Points	76.81%
Incorporated Municipalities*	66.67%
County Boundary*	66.67%
GIS Accuracy	**81.53%**

Randolph	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	75.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	N/A
Road Centerlines	91.60%
Site Structure Address Points	N/A
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**91.28%**

Ray	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	43.75%
Emergency Service Boundaries – EMS	85.58%
Emergency Service Boundaries – Fire	85.58%
Emergency Service Boundaries – Law	85.58%
Road Centerlines	93.28%
Site Structure Address Points	86.29%
Incorporated Municipalities*	66.67%
County Boundary*	66.67%
GIS Accuracy	**88.88%**

Reynolds	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	83.33%
Road Centerlines	91.10%
Site Structure Address Points	86.73%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**87.98%**

Ripley	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	11.36%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	21.25%
Emergency Service Boundaries – Law	18.75%
Road Centerlines	92.23%
Site Structure Address Points	87.71%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**89.03%**

Saline	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	0.00%
Emergency Service Boundaries – EMS	51.68%
Emergency Service Boundaries – Fire	51.68%
Emergency Service Boundaries – Law	51.68%
Road Centerlines	85.61%
Site Structure Address Points	82.52%
Incorporated Municipalities*	83.33%
County Boundary*	0.00%
GIS Accuracy	**81.96%**

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Schuyler	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	87.50%
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	N/A
Road Centerlines	89.53%
Site Structure Address Points	74.26%
Incorporated Municipalities*	66.67%
County Boundary*	66.67%
GIS Accuracy	**80.49%**

Scotland	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	N/A
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	N/A
Emergency Service Boundaries – Law	N/A
Road Centerlines	88.08%
Site Structure Address Points	82.72%
Incorporated Municipalities*	N/A
County Boundary*	N/A
GIS Accuracy	**84.86%**

Shelby	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	79.17%
Road Centerlines	92.12%
Site Structure Address Points	77.50%
Incorporated Municipalities*	66.67%
County Boundary*	66.67%
GIS Accuracy	**85.69%**

St Charles	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	48.75%
Road Centerlines	79.42%
Site Structure Address Points	65.17%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**68.16%**

St Clair	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	81.94%
Emergency Service Boundaries – Law	N/A
Road Centerlines	79.93%
Site Structure Address Points	76.08%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**78.02%**

St Francois	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	N/A
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	N/A
Road Centerlines	87.16%
Site Structure Address Points	76.16%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**78.07%**

*The Incorporated Municipality and County Boundaries are strongly recommended and not mandatory.

St Louis	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	62.50%
Emergency Service Boundaries – EMS	81.94%
Emergency Service Boundaries – Fire	66.29%
Emergency Service Boundaries – Law	83.33%
Road Centerlines	92.74%
Site Structure Address Points	84.21%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**85.70%**

Ste Genevieve	Accuracy
Provisioning Boundary	N/A
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	86.46%
Emergency Service Boundaries – Law	75.00%
Road Centerlines	73.75%
Site Structure Address Points	70.34%
Incorporated Municipalities*	83.33%
County Boundary*	100.00%
GIS Accuracy	**70.84%**

Stoddard	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	75.00%
Road Centerlines	91.44%
Site Structure Address Points	85.57%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**87.37%**

Stone	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	41.09%
Road Centerlines	90.50%
Site Structure Address Points	84.67%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**86.54%**

Taney	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	90.50%
Site Structure Address Points	74.16%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**76.92%**

Texas	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	88.50%
Emergency Service Boundaries – Fire	85.29%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	79.25%
Site Structure Address Points	67.01%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**70.86%**

*The Incorporated Municipality and County Boundaries are strongly recommended and not mandatory.

Warren	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	75.00%
Road Centerlines	73.90%
Site Structure Address Points	54.80%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**57.67%**

Wayne	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	32.95%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	92.41%
Site Structure Address Points	87.41%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**88.56%**

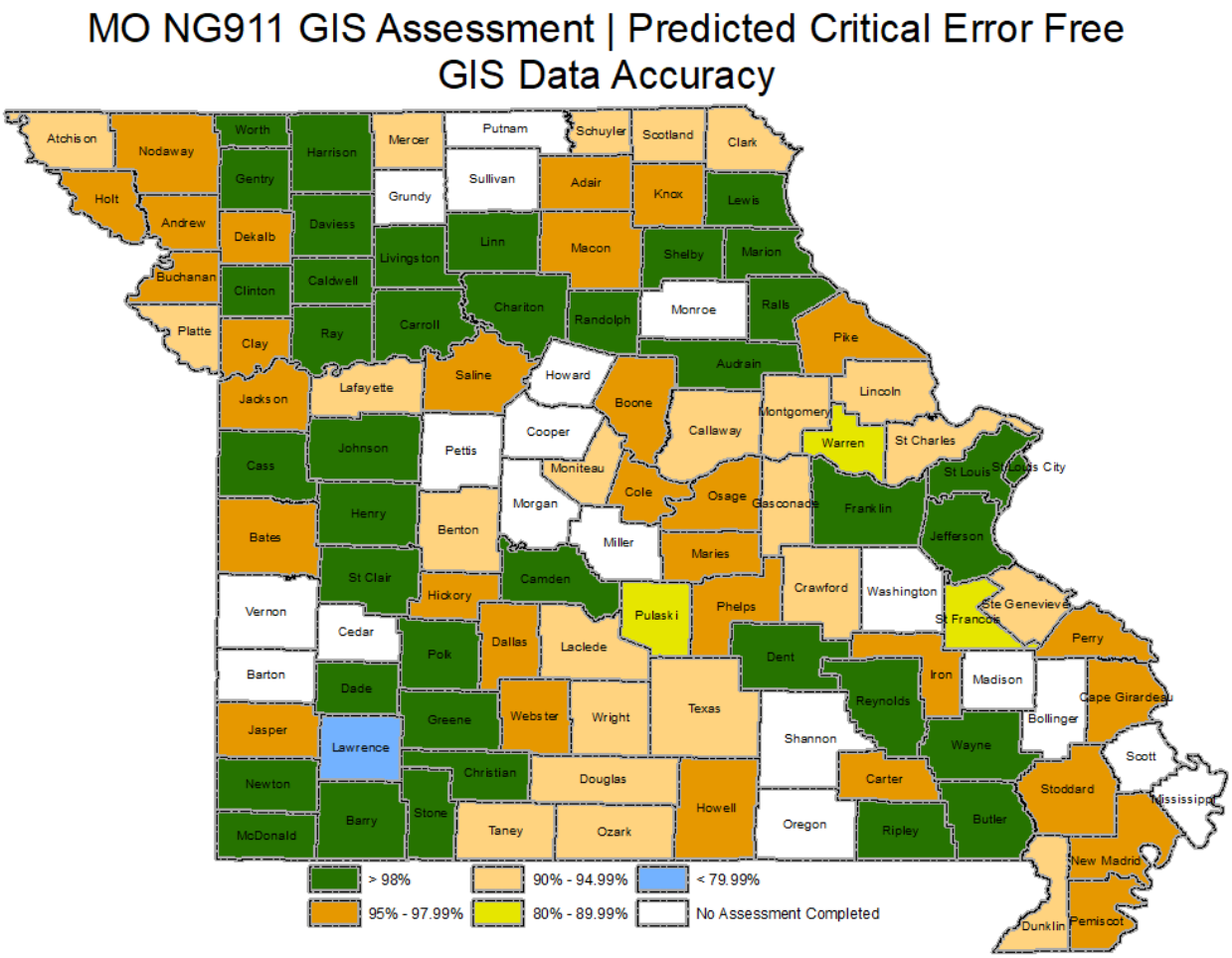
Webster	Accuracy
Provisioning Boundary	71.43%
PSAP Boundary	62.50%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	87.92%
Site Structure Address Points	84.44%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**84.26%**

Worth	Accuracy
Provisioning Boundary	66.67%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	0.00%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	0.00%
Road Centerlines	92.10%
Site Structure Address Points	75.47%
Incorporated Municipalities*	83.33%
County Boundary*	66.67%
GIS Accuracy	**86.81%**

Wright	Accuracy
Provisioning Boundary	85.71%
PSAP Boundary	75.00%
Emergency Service Boundaries – EMS	33.33%
Emergency Service Boundaries – Fire	0.00%
Emergency Service Boundaries – Law	71.88%
Road Centerlines	88.54%
Site Structure Address Points	73.94%
Incorporated Municipalities*	83.33%
County Boundary*	83.33%
GIS Accuracy	**78.59%**

Predicted | GIS Data Accuracy for Resolution of All Critical Errors

This chart depicts the solely the accuracy of the GIS data once it is critical error free. The GIS assessments also included several non-critical error checks which impacts the overall accuracy, however error correction for the non-critical errors is not required to transition to NG9-1-1.



County	Predicted Accuracy
Adair	95.69%
Andrew	95.30%
Atchison	94.34%
Audrain	98.37%
Barry	98.17%
Bates	96.15%
Benton	94.06%
Boone	96.36%
Buchanan	97.19%
Butler	98.14%
Caldwell	98.98%
Callaway	93.58%
Camden	98.09%
Cape Girardeau	97.97%
Carroll	99.12%
Carter	97.78%
Cass	98.67%
Chariton	99.37%
Christian	98.79%
Clark	94.23%
Clay	95.09%
Clinton	98.12%
Cole	97.75%
Crawford	92.04%
Dade	98.64%
Dallas	97.35%
Daviess	98.85%
Dekalb	97.97%
Dent	98.69%
Douglas	94.80%
Dunklin	93.50%
Franklin	98.13%

County	Predicted Accuracy
Gasconade	94.31%
Gentry	98.47%
Greene	99.24%
Harrison	98.98%
Henry	98.94%
Hickory	95.77%
Holt	97.65%
Howell	97.23%
Iron	97.66%
Jackson	95.21%
Jasper	97.57%
Jefferson	99.17%
Johnson	98.77%
Knox	96.11%
Laclede	93.94%
Lafayette	94.28%
Lawrence	72.32%
Lewis	99.16%
Lincoln	93.97%
Linn	99.40%
Livingston	98.82%
Macon	96.11%
Maries	96.28%
Marion	98.87%
McDonald	98.04%
Mercer	93.51%
Moniteau	92.41%
Montgomery	93.78%
New Madrid	96.99%
Newton	99.14%
Nodaway	96.04%
Osage	96.13%

County	Predicted Accuracy
Ozark	94.23%
Pemiscot	97.25%
Perry	96.36%
Phelps	97.14%
Pike	97.10%
Platte	94.53%
Polk	98.41%
Pulaski	84.46%
Ralls	98.14%
Randolph	98.17%
Ray	98.35%
Reynolds	98.09%
Ripley	99.01%
Saline	95.66%
Schuyler	90.06%
Scotland	94.23%
Shelby	99.15%
St Charles	90.43%
St Clair	98.72%
St Francois	88.59%
St Louis	98.14%
Ste Genevieve	92.54%
Stoddard	97.70%
Stone	98.17%
Taney	90.59%
Texas	93.48%
Warren	80.03%
Wayne	98.74%
Webster	96.14%
Worth	98.40%
Wright	91.99%

Predicted | Overall Data Accuracy for Resolution of All Critical Errors

Overall accuracy includes the current ALI and RCL synchronization rates. A N/A indicates that no ALI was submitted for QC.

County	Predicted Accuracy
Adair	90.60%
Andrew	95.21%
Atchison	89.64%
Audrain	96.91%
Barry	95.16%
Bates	N/A
Benton	91.79%
Boone	96.23%
Buchanan	93.16%
Butler	96.07%
Caldwell	90.57%
Callaway	N/A
Camden	97.48%
Cape Girardeau	91.23%
Carroll	97.16%
Carter	N/A
Cass	97.97%
Chariton	N/A
Christian	97.31%
Clark	N/A
Clay	93.08%
Clinton	97.53%
Cole	96.32%
Crawford	90.92%
Dade	96.63%
Dallas	97.20%
Daviess	98.10%
Dekalb	97.41%
Dent	96.93%
Douglas	N/A
Dunklin	91.97%
Franklin	96.92%

County	Predicted Accuracy
Gasconade	92.86%
Gentry	96.37%
Greene	98.18%
Harrison	97.86%
Henry	98.07%
Hickory	N/A
Holt	N/A
Howell	95.81%
Iron	95.27%
Jackson	89.82%
Jasper	95.85%
Jefferson	98.19%
Johnson	97.35%
Knox	95.50%
Laclede	N/A
Lafayette	N/A
Lawrence	72.48%
Lewis	96.17%
Lincoln	92.94%
Linn	98.83%
Livingston	98.03%
Macon	93.52%
Maries	92.52%
Marion	96.88%
McDonald	97.12%
Mercer	N/A
Moniteau	89.73%
Montgomery	91.03%
New Madrid	95.24%
Newton	95.27%
Nodaway	94.55%
Osage	95.58%

County	Predicted Accuracy
Ozark	N/A
Pemiscot	95.59%
Perry	92.80%
Phelps	95.66%
Pike	96.19%
Platte	90.72%
Polk	96.67%
Pulaski	82.70%
Ralls	96.31%
Randolph	95.71%
Ray	98.04%
Reynolds	96.05%
Ripley	N/A
Saline	94.58%
Schuyler	N/A
Scotland	N/A
Shelby	97.32%
St Charles	89.92%
St Clair	N/A
St Francois	85.45%
St Louis	97.66%
Ste Genevieve	90.59%
Stoddard	96.60%
Stone	97.50%
Taney	N/A
Texas	90.40%
Warren	78.48%
Wayne	N/A
Webster	95.92%
Worth	97.23%
Wright	88.45%