Minnesota NG9-1-1 GIS News

July, 2016 Issue #4

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Useful Links:

DPS-ECN

Minnesota Department of Public Safety Emergency Communication Networks GIS Information

MnGeo

Minnesota Geospatial Information Office

SECB

Statewide Emergency Communications Board

NENA

National Emergency Number Association

FirstNet

First Responder Network Authority

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NG9-1-1: National Collaboration

The Minnesota Department of Public Safety, Emergency Communication Networks division (DPS-ECN) is responsible for oversight of public safety communications including the 9-1-1 system in the state and the migration to a Next Generation 9-1-1 (NG9-1-1) system. Minnesota is not alone in this journey, many states are beginning to plan for or are actively engaged in the process of creating their NG9-1-1 systems (see status map). Numerous federal, state, professional and academic organizations are also working together to define the processes and standards that will help guide the development and integration of NG9-1-1 geospatial data and systems nationally. Initiatives such as the National Address Database (NAD) are indicative of this multi-agency cooperation.

A recent report prepared by the NG911 NOW Coalition – a working group established by the National Association of State 911 Administrators (NASNA), National Emergency Number Association (NENA), and the Industry Council for Emergency Response Technologies (iCERT), emphasizes the need for collaboration at all levels of government and industry to help realize their goal of the nationwide deployment of NG9-1-1 by 2020. A June 13, 2016 NOW press release announcing the report, highlighted the role states play:

"State governments play a vitally important role in facilitating the deployment of NG911. The state governance, regulatory, statutory, funding, technical and operational, and educational aspects of successful deployment must be addressed at the state level," said Evelyn Bailey, NASNA's executive director. "The states that have made the most progress are those that have addressed these matters. The combined efforts of the Coalition partners will help the remaining states to step up the pace."

Cooperation between state and local government entities will be critical to the success of implementing NG9-1-1 in Minnesota. Within the Twin Cities metropolitan area the Metropolitan Emergency Services Board (MESB) plays a key role in building out NG9-1-1 geospatial data. I would like to thank Jill Rohret, Executive Director of MESB, for contributing this issue's guest article. Their work with PSAP managers as well as county and city GIS managers will help ensure that local data can be integrated with the statewide NG9-1-1 system while meeting local needs as well. Thank you Jill!

Jackie Mines, Director, DPS-ECN

Metropolitan Emergency Services Board

By Jill Rohret, Executive Director

The Metropolitan Emergency Services Board (MESB) was established by a Joint Powers Agreement for the purposes of overseeing the metropolitan 9-1-1 system, the metropolitan portion of the Allied Radio Matrix for Emergency Response (ARMER) system, and Emergency Medical Services (EMS) in the Twin Cities metropolitan area.

Formed in June 2005 by the counties of Anoka, Carver, Chisago, Dakota, Hennepin, Isanti, Ramsey, Scott and Washington, as well as the City of Minneapolis, as a result of a merger of the former Metropolitan 9-1-1 Board and the former Metropolitan Radio Board, the MESB provides metropolitan 9-1-1 network oversight, establishes standards and guidelines for 9-1-1 services, and coordinates the 9-1-1 database to ensure accuracy and integrity of the 9-1-1 system. It also oversees and manages the metropolitan portion of the ARMER system, establishes standards and guidelines for radio system operation in the region, and encourages and facilitates participation among the region's first responder agencies. For EMS, the MESB coordinates regional EMS activities, serves as an information clearinghouse, and supports EMS providers with monetary and programmatic resources to enhance the metropolitan EMS system. The MESB provides an essential forum for problem-solving and discussion by facilitating and coordinating meetings and activities for ARMER users, Public Safety Answering Points (PSAPs), and EMS providers involved in providing public safety service and response. The MESB also represents and advocates for the needs of its member entities and the metropolitan 9-1-1, ARMER, and EMS systems.

MESB Role in 9-1-1

In 1982, seven metropolitan counties formed the Metropolitan 9-1-1 Board as a joint powers agency to govern the metropolitan 9-1-1 system and carry out the requirements of counties under Minnesota Statute Chapter 403 for the establishment, operation, and maintenance of a 9-1-1 telephone system for the metropolitan area. The Board was later expanded to include Chisago and Isanti counties, along with the City of Minneapolis. The member entities recognized economic and operational advantages to the members to jointly plan, coordinate, and administer a regional 9-1-1 system. The Board allowed for cost savings and efficiencies for the counties as each county did not have to have staff to coordinate and manage the 9-1-1 network and database. The MESB continues that role today. Minnesota Statute 403 specifies the MESB's role in 9-1-1 system governance and maintenance. MS 403.07 Subd. 2 requires the MESB to establish design standards for the metropolitan 9-1-1 system. These standards must be included in State of Minnesota 9-1-1 rules. The MESB works closely and regularly with DPS-ECN on all 9-1-1 matters, but particularly in maintaining the efficacy of the 9-1-1 network infrastructure. The MESB also assists the region's PSAPs by determining the correct routing of wireless cell sectors, a role which was added as the 9-1-1 system needs evolved. In addition, the MESB monitors metropolitan 9-1-1 system performance and coordinates extensively on behalf of its member entities with system vendors and telecommunications service providers on 9-1-1 service related matters.

9-1-1 Data

In relation to 9-1-1 data, the current metropolitan area Enhanced 9-1-1 (E9-1-1) system relies on three key datasets: the Master Street Address Guide (MSAG), Automatic Location Identification (ALI), and ESN (Emergency Service Number) data. The MSAG is a tabular database used in validating addresses and determining the correct routing of 9-1-1 calls to the appropriate PSAP. It is the official 9-1-1 record of valid street names and house number ranges within communities in the region. The MSAG associates street address ranges to the correct combination of police, fire and medical responders (designated in the 9-1-1 system as an Emergency Service Number or ESN). Telecommunications service providers submit their wireline telephone records daily to be processed against the MSAG. Once validated, the records are added to or updated in the ALI database that is used for 9-1-1 call routing and caller location display at PSAPs.

The MESB coordinated the initial creation of the MSAG for the metropolitan region prior to implementation of the current E9-1-1 system on December 2, 1982. Since that time, each metropolitan county, having statutory responsibility for operation and maintenance of their 9-1-1 system, has maintained their portion of the MSAG, which is then overseen at a regional level by the MESB. In most cases, counties have assigned day-to-day responsibility of MSAG maintenance to PSAP personnel familiar with Computer Aided Dispatch (CAD) data. Each PSAP has a designated MSAG Coordinator who then interfaces with the MESB on various 9-1-1 data related matters. In partnership with their cities and emergency agencies, counties/PSAPs keep the address, emergency response, and PSAP boundary information contained in their MSAG and ESNs current. The MESB provides standardized regional 9-1-1 data oversight and support, as well as coordinates with telecommunication service providers, database vendors, and the metro area 9-1-1 system integrator on various 9-1-1 database issues.

NG9-1-1 and GIS

Today's E9-1-1 system is based on a phone number that, when a 9-1-1 call is made, flows through the 9-1-1 network and is used by the PSAP call handling equipment to perform a query into the static ALI database to obtain location information pre-associated with the calling device's phone number. With NG9-1-1, however, the current location of the calling device becomes part of the initial call flow through the 9-1-1 network. The location of the calling device may be a civic street address or a latitude/longitude coordinate. In an NG9-1-1 environment, both location validation and call routing determination will be done using geospatial data deployed in new NG9-1-1 network elements rather than today's existing database models. The county's role of maintaining the data essential to operating its 9-1-1 system will continue as the system evolves, however, the role will be accomplished through the maintenance of geospatial datasets rather than tabular files, such as the MSAG.

Early in the planning for NG9-1-1, the MESB recognized the industry need to replace the legacy MSAG with geospatial datasets as the means for address validation and call routing determination. As a result, in 2004, the MESB hired a GIS Coordinator to begin working with county and regional agencies in the assessment and planning for how future 9-1-1 needs could be accommodated with GIS efforts contemplated or underway in the metropolitan area. The discussions focused on creation of publicly available, authoritative, centerline and address point datasets that were multi-use in nature, but would be capable of meeting the anticipated NG9-1-1 requirements under development by the NENA. Collaboration by GIS staff from the seven metropolitan counties, the MESB, the Metropolitan Council, and the State of Minnesota resulted in the Metropolitan Road Centerline Consortium (MRCC) project (see Issue #3 of this newsletter) that has become the vehicle for meeting the NG9-1-1 centerline requirements for the metropolitan region. Similar collaborative efforts are anticipated to meet NG9-1-1 address point data requirements for the metropolitan region.

Data Validation and Synchronization

The MESB also recognized that the transition to NG9-1-1 would require a significant effort to validate and synchronize legacy 9-1-1 data (MSAG, ESNs, and ALI telephone record data) with the geospatial data (centerline, address points, and emergency service response polygons). Although the State of Minnesota did not officially kickoff the Minnesota NG9-1-1 GIS project until 2015, the MESB began working with its member counties and PSAPs as early as 2010 to explore what would be involved in the NG9-1-1 data validation and synchronization effort. Anticipating statewide requirements, the MESB has helped its member counties identify key markers of NG9-1-1 data synchronization, organize and report on discrepant data, and coordinate with key parties on error resolution.
The MESB has identified essential phases of the 9-1-1/GIS data synchronization effort including validation of Emergency Service Zone (ESZ) and response agency boundaries with the MSAG and ESNs, validation of street names across the key datasets, geocoding of 9-1-1 addresses to centerline and address point data, geocoding of address point data to the centerline, centerline validations (e.g. parity checks), and ESN assignment comparison/validation. The metropolitan area counties and PSAPs are currently at various stages in their data synchronization, depending on

when they started, the state of their existing GIS data, timing with Computer Aided Dispatch (CAD) system upgrades, etc. Through diligence on their part, some MESB counties have even reached a current level of just .2% or less of 9-1-1 addresses that do not match either their county centerline or address points.

In working with its member entities, the MESB has also observed that, due to the data synchronization effort, metropolitan area PSAPs and county GIS departments have forged new partnerships surrounding GIS data, as well as strengthened their ties with address authorities, thereby ensuring that official addressing is consistently reflected throughout the datasets. The 9-1-1/GIS data synchronization effort in the metropolitan area is clearly benefiting existing centerline, address point, CAD, MSAG, and ALI data accuracy today. The synchronization effort is also positioning metropolitan area counties to be in a state of data readiness so that minimal adjustments will be needed to meet statewide NG9-1-1 GIS standards as they are finalized and approved.

Staff from the MESB, metro county GIS organizations, and PSAPs are working closely with Adam Iten, the State's NG9-1-1 GIS Project Manager, to share knowledge gained in the metro area over recent years and to offer input into the statewide project. The MESB is looking forward to more clarity from the DPS-ECN and MnGeo regarding NG9-1-1 system requirements as statewide planning and implementation evolves. As specifics of the State's NG9-1-1 system become clear, MESB will continue, as it has in the past, to support its member counties and PSAPs as they align their GIS data and processes to meet NG9-1-1 needs.

The Future of 9-1-1

In the future, 9-1-1 will remain a vital part of public safety. Though the future technical specifications are not entirely clear, the MESB is committed to evolving its role in the 9-1-1 system as it continues to evolve with technology and user needs. The MESB will continue to support and work with metropolitan agencies to optimize the 9-1-1 system and data, and will continue to advocate for system performance standards.

NG9-1-1 GIS Standards - Update

The Minnesota NG9-1-1 GIS Standards Workgroup continues to move forward with its efforts to establish GIS data standards for NG9-1-1. The workgroup consists of GIS managers and staff representing each of **DPS-ECN's seven regions**.

Whether you describe them as guidelines, specifications, models, benchmarks or axioms, standards are needed because NG9-1-1 GIS data will be harvested from and maintained by local authoritative sources whenever possible. Standards will help ensure that these data can be consumed efficiently and with confidence that they will meet Emergency Call Routing Function (ECRF) and Location Validation Function (LVF) requirements.

Road Centerlines Review:

Working closely with the GIS Standards Workgroup, in late March DPS-ECN and MnGeo published a first draft of the document, *Minnesota Next Generation 9-1-1 GIS Data Standards*. Although the draft document focused solely on standards for road centerlines, it also included an overview of the state's proposed NG9-1-1 GIS data model, roles and responsibilities for the state and its partners, map projection requirements, and data creation and collection standards.

PSAP and GIS managers from across the state were asked to review the document and comment on standards defined in the publication by the end of April. Nearly 50% of the state's PSAPs responded, submitting more than 250 comments or questions. Examples include:

> *"Are the field names, types, and widths required or will the state have a means to translate the data into the final statewide schema as long as some field is present in the dataset to cover each mandatory and conditional field?"*

"Are we conforming to State or Nena requirements? Assume this is saying conform to State standards which conforms to NENA standards?"

"Our current road centerline data closely aligns with requirements here. Missing fields should not require much effort to populate. That said, ZIP CODE boundaries have posed some difficulty locally. I could benefit from an authoritative zip code boundary source to populate the ZIP_L and ZIP_R fields."

"Our centerlines meet spatial requirements, some maintenance will be needed once schema is changed and new fields are introduced. Is there a plan or suggestions in place to assist in verification of 100% msag [MSAG] matching once msag [MSAG] entries are made into the road centerline dataset?"

"Can E991 [E9-1-1] funds be used to acquire outside help on the project, and will the state provide help to meet this extensive list of standards?"

Comments have been compiled and reviewed by DPS-ECN and MnGeo and in most cases, staff responded to questions asked by the reviewers. MnGeo staff worked closely with the GIS Standards Workgroup to include revisions recommended through the vetting process in the second draft of the document. The second draft will be distributed for review in late August/early September to PSAPs, GIS managers and for the first time, NG9-1-1 vendors, ECRF and LVF vendors, and other states. This is the second of at least three revisions expected before formal approval of the completed document by the MESB, NG9-1-1 GIS Subcommittee, NG9-1-1 Committee, SECB, and Minnesota Geospatial Advisory Council. Final approval will likely not occur until early 2017 (Figure 1).

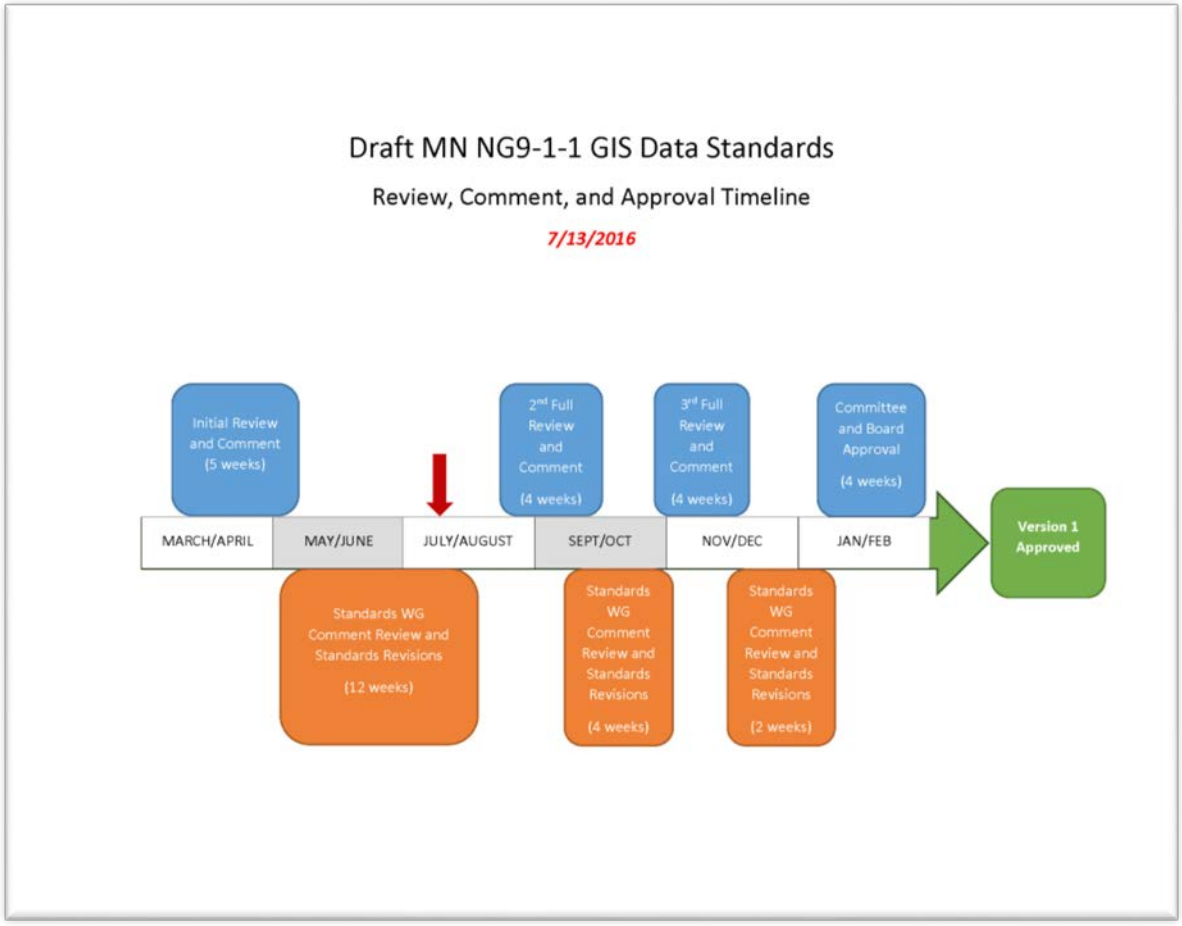


Figure 1: Data Standards Timeline

The second draft of *Minnesota Next Generation 9-1-1 GIS Data Standards* will also include preliminary specifications for address points and polygonal GIS data.

Address Points:

A growing number of PSAPs and GIS authorities across the country are building an "address point" layer for their service areas. Address points use a distinct geographic location such as USNG or latitude/longitude to describe the position of a residence, business, grocery store, police station, etc. (Figure 2).

Information associated with an address point such as its street address, accompanying phone number, business name and contents (such as hazardous chemicals storage) can potentially be displayed on a 9-1-1 dispatcher's screen. The ability to link address locations to photos, 3-D floor plans and much more make address points more useful than current-day MSAG and ALI data.

Figure 2: Address Points

DPS-ECN and MnGeo are recommending that PSAPs begin building their address point layer along with road centerlines and emergency service boundaries. As with road centerlines, to maximize the benefit of collecting and utilizing site/structure address points in NG9-1-1, data standards are needed. DPS-ECN and MnGeo have begun work to define those standards for Minnesota building upon draft standards prepared by NENA, MetroGIS and adjacent states. Staff from the MESB, MnGeo and DPS-ECN have methodically compared (Figure 3) each with the other - identifying commonalities and differences. Preliminary results from this analysis will be incorporated in the second draft of *Minnesota Next Generation 9-1-1 GIS Data Standards* after being vetted by the MetroGIS Address Workgroup, MESB and the GIS Standards Workgroup.

In addition to defining "structure" of the data, i.e. domains, attributes, field widths and types, etc., consideration must be given to how address points are placed. The document, *NENA Information Document for Development of Site/Structure Address Point GIS Data for 9-1-1*, provides helpful guidelines for address point data development including point placement considerations. Many of its recommendations will be incorporated in future revisions of *Minnesota Next Generation 9-1-1 GIS Data Standards*.

	MINNESOTA							NENA Site/Structure Address Points Data Model					MetroGIS				IOWA			
	Descriptive Name	Field Name	M/C	Ty	Field	Responsibility	Domain	Descriptive Name	Field Name	M/C/O	Type	Field Width	Field	M/C/O	Type	Field Width	Field	M/C/O	Type	Field Width
1	Source of Data	SOURCE	M	T	75	Local	Y	Source of Data	Source	M	A	75	ADIRSOURCE, AUTHORITY, EDI	O, M, O	A, A, A	40, 40, 40	SOURCE	M	A	75
2	Date Updated	EDITED_DT	M	D		Local	N	Date Updated	DateUpdate	M	D	20	UPDATEDATE	M	D	8	UPDATED	M	D	26
3	Effective Date	ACT_DATE	C	D		Local	N	Effective Date	Effective	O	D	20	n/a				EFF_DATE	M	D	26
4	Expiration Date	RET_DATE	C	D		Local	N	Expiration Date	Expire	O	D	20	n/a				EXP_DATE	O	D	26
5	Site Unique ID	UNIQUE_ID	M	T	100	Local	N	Site NENA Globally Unique ID	Site_NGUID	M	A	100	ADD_ID_NAT, ADD_ID_LOC	M, M	A	60, 50	SITE_UID	M	A	100
6	Country	COUNTRY	O	T	2	State	Y	Country	Country	M	A	2	n/a				COUNTRY	M	A	2
7	State	STATE	M	T	2	State	Y	State	State	M	A	2	STATE_CODE	M	A	2	STATE	M	A	2
8	County	COUNTY	M	T	40	Local	Y	County	County	M	A	40	CO_NAME	M	A	20	COUNTY	M	A	40
	n/a							Additional Code	AddCode	C	A	6	n/a				n/a			
9	Additional Data URI	ADDDATAURI	C	T	254	Local/State	N	Additional Data URI	AddDataURI	C	A	254	n/a				n/a			
10	Municipality	CITY	M	T	100	Local	Y	Incorporated Municipality	Inc_Muni	M	A	100	MUNI_NAME	M	A	30	INC_MUNI	M	A	100
	n/a							Unincorporated Community	Uninc_Comm	O	A	100	n/a				UN_COMM	C	A	100
	n/a							Neighborhood Community	Nbrhd_Comm	O	A	100	n/a				NGHBD_COMM	C	A	100
11	Address Number Prefix	ANUMBERPRE	C	T	15	Local	N	Address Number Prefix	AddNum_Pre	C	A	15	ANUMBERPRE	M	A	6	HNP	O	A	15

Figure 3: Address Points Standards Analysis

Polygonal GIS Data:

To the extent that time allows, the second draft of *Minnesota Next Generation 9-1-1 GIS Data Standards* will include preliminary standards for polygonal data such as PSAP, law, fire, first responder and ambulance service areas. Ultimately, standards for polygonal data will define the structure of the data as well as resolution, map projections, etc.

Once these standards are defined, vetted and approved, polygonal data submitted by local authorities will be carefully reviewed by DPS-ECN and MnGeo staff. They will work with PSAPs, GIS managers and emergency service providers to resolve issues like boundary overlaps or gaps that may occur between adjacent PSAPs (Figure 4). Polygonal data will be compared with road centerlines, address points and MSAG tabular data as well to ensure its completeness and accuracy.

Figure 4: Service Area Gaps

A complete set of standards for polygonal data will appear in the third revision of the data standards document.

Data Readiness Profiles – Update

As noted in Issue #3 of *Minnesota NG9-1-1 GIS News*, a major initiative currently underway at MnGeo is the assessment of existing geospatial data needed to support the NG9-1-1 operations. Data Readiness is one of many processes used by MnGeo to evaluate 9-1-1 and GIS data submitted by local authorities (PSAPs, GIS managers, etc.). It falls within the Data Assessment activity – the first of three major program activities. The other two are Data Preparation, and Ongoing Data Maintenance. Each activity consists of multiple processes and phases undertaken to prepare the geospatial data for on-going ECRF and LVF use.

NG9-1-1 data assessments began in late 2015 when DPS-ECN and MnGeo requested GIS and tabular 9-1-1 data: MSAG, ALI and English Language Translation (ELT), from each PSAP in the state. Beginning with the Northeast region, these data have undergone a rigorous inspection and evaluation. Results from nearly 100 data readiness checks are being captured in a Data Readiness Profile table for each PSAP. Key results will be highlighted in a comprehensive Data Readiness Report and shared with PSAP and GIS authorities to support them with the validation and ultimately correction of their data. Below are examples (Figure 5) of several pieces of a *draft* Data Readiness Report.

Once the Data Readiness Profiles are completed for a region, MnGeo will work with local PSAP and GIS managers to schedule and kick-off the next activity, Data Preparation. Like the previous activity, Data Preparation consists of multiple processes and phases used by state and local authorities to validate and correct street centerlines, address points, PSAP and ESN boundaries. Tabular information, including the MSAG, ALI, ELT data are also to be assessed for each ECN region in the state - beginning with the Northeast. The Data Preparation process involves six phases:

1. Community Name Validations
2. Street Name Validations
3. Address Validations
4. Road Centerline Validations
5. Emergency Service Zone Validations
6. Edge Matching

Summary tables and charts:

2. Observation of Data Supplied to MnGeo
   a. Comments
      i. There are blanks records in all of their GIS data.
   b. Aitkin County MSAG

Number of Entries	1855
Unique Street Names	1260
Unique Community Names	18

   c. Centerlines

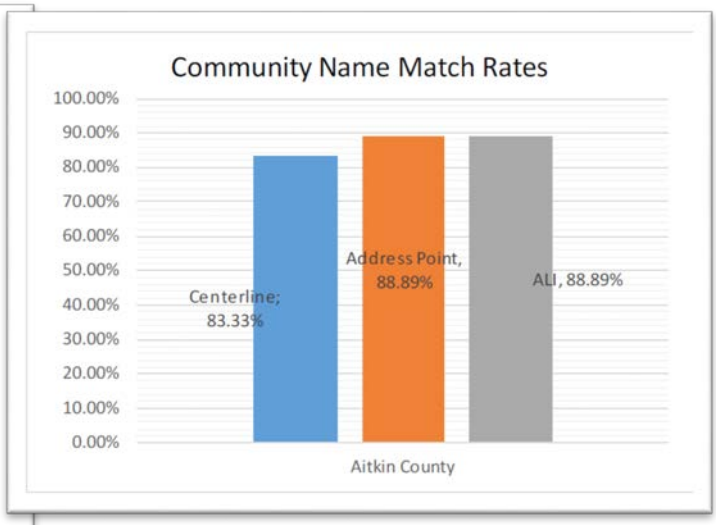
Number of Entries	4979
Unique Street Names	1247
Unique Community Names	15

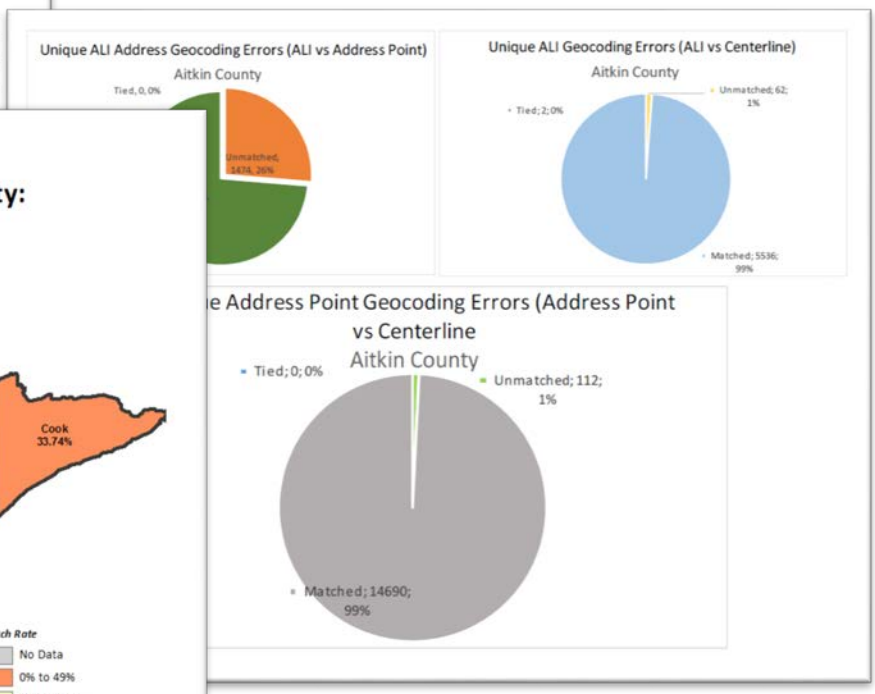
   d. Address Point

Number of Entries	14824
Unique Street Names	1056
Unique Addresses	14802
Unique Community Names	16

   e. ALI

Number of Entries	7391
Unique Street Names	0
Unique Addresses	5600
Unique Community Names	0





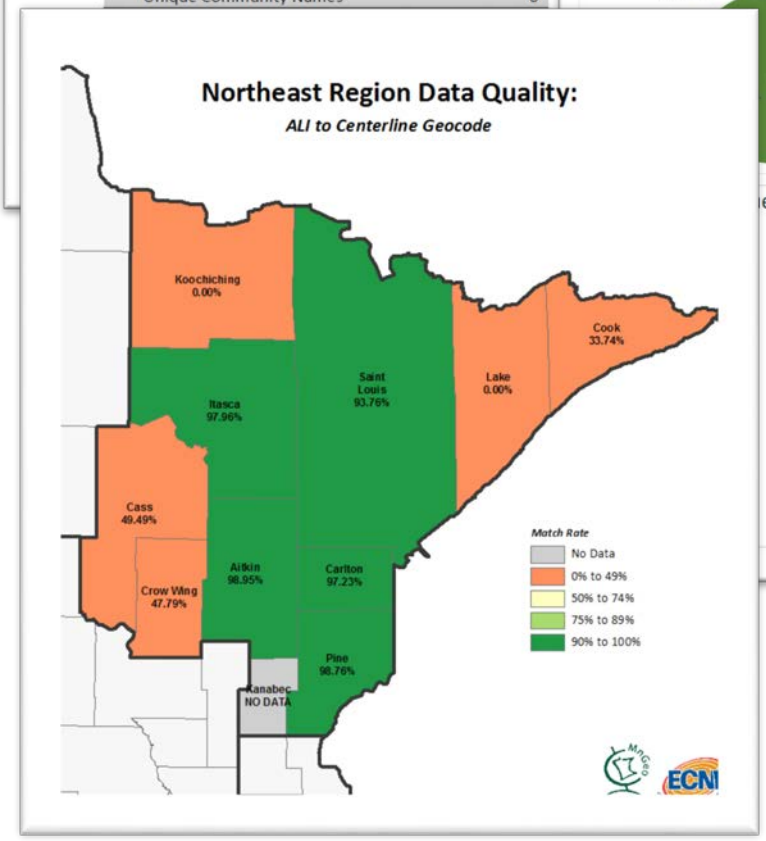


Figure 5: Data Readiness Profile Report

Community Names Validation report:

During the Community Names Validation phase the jurisdictional community name found in three input data files will be scrutinized for accuracy, continuity and adherence to state standards. The data sets to be evaluated for each PSAP are: Road Centerlines, Address Points, and the MSAG. This process has been designed to address the following questions:

1. Is every community name in the MSAG represented in both the Street Centerline and the Address Point geospatial data files?
2. Under what conditions should a change to a Community Name in any of those input data sets be required?
3. Who should determine when a change should be made?
4. What process should the affected stakeholders take to assure a change is permanently reflected in their source data?

Consistent and accurate community names are important because they are a critical component of geocoding, location validation, and call routing tasks. Below is a sample (Figure 6) comparison of Aitkin community names from five different sources. Pale red indicates a mismatch between these sources. For example, the community name "Deerwood" appears in the MSAG but not in the street centerline file provided by the PSAP or in the GNIS database.

PREFERRED NG911 Community Name	MSAG Community Name	Centerline Community Name	Address Point Community Name	GNIS Community Name	GNIS Feature ID
AITKIN	AITKIN	AITKIN	AITKIN	City of Aitkin	2393894
	AITKIN CO SO				
	DEERWOOD		DEERWOOD		
	FINLAYSON	FINLAYSON	FINLAYSON		
	FLOODWOOD	FLOODWOOD	FLOODWOOD		
HILL CITY	HILL CITY	HILL CITY	HILL CITY	City of Hill City	664474
	ISLE	ISLE	ISLE		
	JACOBSON	JACOBSON	JACOBSON		
MCGRATH	MCGRATH	MCGRATH	MCGRATH	City of McGrath	2395067
MCGREGOR	MCGREGOR	MCGREGOR	MCGREGOR	City of McGregor	2395068
PALISADE	PALISADE	PAL			
	SANDSTONE	SAN			
	STURGEON LAKE	STU			
	SWAN RIVER	SWA			
	SWATARA	SWA			
TAMARACK	TAMARACK	TAM			
	WRIGHT	WRI			

Aitkin County Street Name Validation
MSAG Compared to Centerline and Address Point Datasets

# of MSAG Community Names	18
# of Centerline Community Names	15
# of Address Point Community Names	16
# of Discrepancies between MSAG and Centerline	3
# of Discrepancies between MSAG and Address Point	2
# of Discrepancies between Address Point and Centerline	1

Figure 6: Community Names Analysis

In the coming weeks, DPS-ECN and MnGeo staff will be meeting with PSAP and GIS managers in the Northeast region to review and discuss their assessment of local data.

Upcoming Events

Notable upcoming DPS-ECN NG9-1-1 events:

- August 11: NG9-1-1 GIS Subcommittee Meeting
- August 24: NG9-1-1 Committee Meeting
- August 25: SECB Meeting
- September 8: NG9-1-1 GIS Subcommittee Meeting
- September 28: MN Geospatial Advisory Council Meeting
- October 26-28: MN GIS/LIS Annual Conference, Duluth, MN

Neighboring States

For more information about NG9-1-1 efforts in the states surrounding Minnesota, visit:

Iowa Enhanced 9-1-1
North Dakota ND911
South Dakota 9-1-1
Wisconsin: In planning phase. See NENA status map.

If you have a news item pertaining to NG9-1-1 that you would like to share in future issues of this newsletter, please contact:

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