



Road Centerlines and Site/Structure Address Points

Best Practices Document

August 2019

CONTENTS

1. Background	5
2. Purpose	5
3. GIS Data Layer Descriptions and Usage in NG911 Systems.....	6
3.1. Road Centerlines	6
3.2. Site/Structure Address Points	6
3.3. Usage in NG911 Systems	6
4. Schema.....	7
4.1. Spatial Reference	7
4.2. Data Layer Names	7
4.3. Data Layer Attributes	7
4.4. Road Centerlines	9
4.5. Site/Structure Address Points	10
5. Field Descriptions, Definitions and Domains	12
5.1. Road Centerlines	12
5.1.1. Additional Code Left	12
5.1.2. Additional Code Right	12
5.1.3. Complete Alias Street Name	12
5.1.4. Country Left	12
5.1.5. Country Right	13
5.1.6. County Left	13
5.1.7. County Right	13
5.1.8. Date Updated	13
5.1.9. Discrepancy Agency ID	13
5.1.10. Effective Date	14
5.1.11. ESN Left:	14
5.1.12. ESN Right:	14
5.1.13. Expiration Date	14
5.1.14. Incorporated Municipality Left	15
5.1.15. Incorporated Municipality Right	15
5.1.16. Left Address Number Prefix	15
5.1.17. Left FROM Address	15
5.1.18. Left TO Address	16
5.1.19. Legacy Street Name	16
5.1.20. Legacy Street Name Post Directional	16
5.1.21. Legacy Street Name Pre Directional	16
5.1.22. Legacy Street Name Type	16

5.1.23.	MSAG Community Name Left.....	16
5.1.24.	MSAG Community Name Right	16
5.1.25.	Neighborhood Community Left.....	16
5.1.26.	Neighborhood Community Right.....	17
5.1.27.	One-Way.....	17
5.1.28.	Parity Left	17
5.1.29.	Parity Right	18
5.1.30.	Postal Code Left.....	18
5.1.31.	Postal Code Right.....	18
5.1.32.	Postal Community Name Left.....	18
5.1.33.	Postal Community Name Right.....	18
5.1.34.	Right Address Number Prefix	18
5.1.35.	Right FROM Address.....	19
5.1.36.	Right TO Address	19
5.1.37.	Road Centerline NENA Globally Unique ID.....	19
5.1.38.	Road Class.....	20
5.1.39.	Speed Limit	20
5.1.40.	State Left	21
5.1.41.	State Right	21
5.1.42.	Street Name	21
5.1.43.	Street Name Post Directional	21
5.1.44.	Street Name Post Modifier	21
5.1.45.	Street Name Post Type.....	21
5.1.46.	Street Name Pre Directional.....	22
5.1.47.	Street Name Pre Modifier	22
5.1.48.	Street Name Pre Type	22
5.1.49.	Street Name Pre Type Separator.....	22
5.1.50.	Unincorporated Community Left	22
5.1.51.	Unincorporated Community Right	22
5.1.52.	Validation Left	23
5.1.53.	Validation Right	23
5.2.	Site/Structure Address Points.....	23
5.2.1.	Additional Code	23
5.2.2.	Additional Data URI	23
5.2.3.	Additional Location Information	23
5.2.4.	Address Number.....	24
5.2.5.	Address Number Prefix.....	24
5.2.6.	Address Number Suffix.....	24
5.2.7.	Building.....	24
5.2.8.	Complete Landmark Name	24
5.2.9.	Country.....	24
5.2.10.	County	25
5.2.11.	Date Updated	25
5.2.12.	Discrepancy Agency ID	25
5.2.13.	Effective Date	25

5.2.14.	Elevation	26
5.2.15.	ESN	26
5.2.16.	Expiration Date	26
5.2.17.	Floor	26
5.2.18.	Incorporated Municipality	26
5.2.19.	Latitude	27
5.2.20.	Legacy Street Name	27
5.2.21.	Legacy Street Name Post Directional	27
5.2.22.	Legacy Street Name Pre Directional	27
5.2.23.	Legacy Street Name Type	27
5.2.24.	Longitude	27
5.2.25.	Mile Marker/Milepost	27
5.2.26.	MSAG Community Name	28
5.2.27.	Neighborhood Community	28
5.2.28.	Parcel Identifier	28
5.2.29.	Place Type	28
5.2.30.	Placement Method	28
5.2.31.	Postal Code	28
5.2.32.	Postal Community Name	28
5.2.33.	Room	28
5.2.34.	Seat	29
5.2.35.	Site NENA Globally Unique ID	29
5.2.36.	State	29
5.2.37.	Street Name	29
5.2.38.	Street Name Post Directional	29
5.2.39.	Street Name Post Modifier	29
5.2.40.	Street Name Post Type	30
5.2.41.	Street Name Pre Directional	30
5.2.42.	Street Name Pre Modifier	30
5.2.43.	Street Name Pre Type	30
5.2.44.	Street Name Pre Type Separator	30
5.2.45.	Taxing Authority	31
5.2.46.	Unincorporated Community	31
5.2.47.	Unit	31
5.2.48.	ZIP Plus-4	31
6.	<i>Data Development and Availability</i>	<i>31</i>
7.	<i>Considerations for GIS Data Development & Maintenance</i>	<i>32</i>
7.1.	General Considerations	32
7.2.	Considerations for Road Centerlines	32
7.3.	Considerations for Site/Structure Address Points	32
8.	<i>Quality Control of Next Generation 911 GIS Data</i>	<i>33</i>
8.1.	Definitions of Commonly Used Quality Control Terms	34

8.1.1.	Street Name Elements.....	34
8.1.2.	Zone.....	34
8.1.3.	Address Elements	34
8.2.	General Quality Control.....	34
8.3.	Boundary Quality Control	35
8.4.	Site/Structure Address Points Quality Control	35
8.5.	Road Centerlines Quality Control.....	35
8.6.	Site/Structure Address Points to Road Centerlines Quality Control	36
8.7.	ALI to Road Centerlines Synchronization	36
8.8.	ALI to Site/Structure Address Points Synchronization	36
8.9.	MSAG (Low and High) to Road Centerlines.....	36
8.10.	Quality Control Exceptions	37
9.	<i>Parsing Street Names into the PEMA GIS Data Model.....</i>	37
10.	<i>Recommendations and Best Practices for GIS Data Development & Maintenance.....</i>	38
10.1.	Road Centerlines Best Practices	38
10.1.1.	General Best Practices	38
10.1.2.	Road Centerline Segmentation	38
10.1.3.	Naming and Addressing.....	41
10.1.4.	Overlapping Routes and Multiple Street Names	43
10.1.5.	Roundabouts and Traffic Circles/Squares	44
10.1.6.	Military Bases	49
10.1.7.	Populating Validation Right/Validation Left	49
10.2.	Site/Structure Address Points Best Practices	50
10.2.1.	General Best Practices.....	50
10.2.2.	Address Point Placement	50
10.2.3.	Address Point Placement for Special Cases.....	51
10.2.4.	Named Sites and Structures	54
10.2.5.	Military Bases	54
10.2.6.	Populating Address Number Suffix.....	54
10.2.7.	Populating Parcel Identifier	55
11.	<i>Phased Approach for NG911 GIS Data Development and Maintenance.....</i>	55
12.	<i>Items Pending Future Work.....</i>	56
13.	<i>Terminology</i>	56
14.	<i>References.....</i>	58

1. Background

In a Next Generation 911 (NG911) environment, the entirety of the 911 call process is spatially enabled. The marriage between GIS and NG911 will not just replace the antiquated static location methodology of historical 911 systems with the dynamic location services necessary to find today's transient 911 caller, GIS also will be used to route the call from the 911 caller to the proper Public Safety Answering Point (PSAP).

The National Emergency Number Association (NENA) specializes in setting standards for implementing and managing 911 systems, including the data used in public safety systems to support emergency response, particularly as it relates to NG911. The NENA Detailed Functional and Interface Standards for the NENA i3 Solution [1] defines the overall NG911 system architecture and standardizes the structure and design of the NG911 Functional Elements, including services, databases, network elements, and interfaces required for processing NG911 calls. The NENA Standard for NG911 GIS Data Model [2] provides the foundation for this Best Practices document.

In NG911, the static call routing and address validation tables are replaced by spatial referencing through the Emergency Call Routing Function (ECRF) to route calls to the proper PSAP and the Location Validation Function (LVF) to validate addresses within the NG911 system. The NENA Standard for NG911 GIS Data Model [2] states that the following GIS data layers are required for the ECRF and LVF to function, and are required for call taking and dispatch operations in an NG911 environment:

- Road Centerlines
- Site/Structure Address Points
- PSAP Boundaries
- Provisioning Boundaries
- Emergency Service Boundaries pertaining to fire/rescue, emergency medical services (EMS), and law enforcement response areas

The Pennsylvania Emergency Management Agency (PEMA) and local government partners are coordinating the development and maintenance of statewide Road Centerlines and Site/Structure Address Points GIS datasets to support PSAP operations. The goal is to integrate the local GIS datasets into a seamless georeferenced database that PSAPs across the Commonwealth can access. This document is intended to provide GIS data stewards with best practices and guidance for building and maintaining the Road Centerlines and Site/Structure Address Points GIS data layers that will be contained in this database.

Best practices and guidance for statewide PSAP Boundaries, Emergency Service Boundaries, and Provisioning Boundaries are available in PEMA's companion document, [*Public Safety Answering Point \(PSAP\), Emergency Service and Provisioning Boundaries Best Practice Document*](#).

2. Purpose

The purpose of this document is to provide a common data model for the required Road Centerlines and Site/Structure Address Points GIS data layers 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 Pennsylvania's statewide dataset. NG911 requires higher levels of GIS data standardization and attribute detail than GIS data used for existing E911 systems. This document provides GIS data stewards with recommendations and best practices for creating and maintaining Road Centerlines and Site/Structure Address Points GIS data layers that will meet Pennsylvania's NG911 GIS data requirements.

Significant effort must be made by each jurisdiction to ensure that their local GIS data layers are accurate, maintained on a regular basis, and conform to NG911 requirements. This document provides the common GIS processes that must be implemented statewide for successful aggregation of local GIS data into the statewide dataset.

This will require substantial coordination and cooperation between 911 GIS stakeholders within Pennsylvania and with their counterparts in adjacent states as they work to resolve data discrepancies along shared boundaries. Seamless alignment with adjacent jurisdictional areas is critical to effective and efficient coordination and delivery of emergency services in an NG911 environment. A common data model for the Road Centerlines and Site/Structure Address Points GIS data layers will assure that no data duplication, gaps, or overlaps exist, as they could cause detrimental deficiencies in the life-safety services provided by the 911 system. Therefore, adherence to the data model and cross jurisdictional cooperation are needed in the implementation, operation, and maintenance of the NG911 system in Pennsylvania.

3. GIS Data Layer Descriptions and Usage in NG911 Systems

3.1. 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.

3.2. 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 from 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.

3.3. Usage in NG911 Systems

In an NG911 system, the Road Centerlines and the Site/Structure Address Points GIS data layers are used by several NG911 Core Services (NGCS) functional elements. The Road Centerlines and the Site/Structure Address Points provide authoritative civic location address data that is used by the:

- Location Validation Function (LVF) to determine if a civic location is valid for call routing and dispatch before a 911 call is made;
- Emergency Call Routing Function (ECRF) to identify the location of a 911 call and then perform a geographic query to determine the appropriate PSAP to route the call to;
- Mapping Data Service (MDS) to display a map to the call taker showing the location of an out-of-area call;
- Geocode Service (GCS) to provide geocoding and reverse-geocoding services;
- MSAG Conversion Service (MCS) to create an MSAG record for backwards compatibility;
- CAD system for map display and to support the dispatch of responders to the right location.

4. Schema

The NENA Standard for NG911 GIS Data Model [2] defines the required data schema and associated fields for the Road Centerlines and Site/Structure Address Points GIS data layers. All fields listed in the NENA standard are included in this document as well as a few additional Pennsylvania-specific fields. All fields listed in this standard must be carried in the local data, even if data does not exist for a field or a field is classified as Optional. This allows easier aggregation of local data into the statewide data layers and avoids future data downtime that would have been required to add the Optional fields at a later date.

4.1. Spatial Reference

Local GIS data may be kept in any projection desired however, Pennsylvania's statewide Road Centerlines and Site/Structure Address Points GIS datasets will be maintained in the following spatial reference that is required for NG911 systems:

- Coordinate Reference System and Datum: World Geodetic System of 1984 (WGS84)
- WGS84 geodetic parameters are specified by the European Petroleum Survey Group (EPSG) as follows:
 - For 2-dimensional geometries the geodetic parameters are required to follow EPSG::4326
 - For 3-dimensional geometries the geodetic parameters are required to follow EPSG::4979

Note that WGS84 (GPS) elevation is measured as height above the ellipsoid, which varies significantly from height above the geoid (approximately Mean Sea Level).

Local data stored in other projections will be converted to WGS84 prior to integration in the statewide datasets.

4.2. Data Layer Names

All Road Centerlines and Site/Structure Address Points data layers intended for submission shall be named according to the following guidelines. Data layers with different names will not be included in quality assurance tests or aggregated into statewide datasets.

- Road Centerlines layer: RoadCenterlines
- Site/Structure Address Points layer: SiteStructureAddressPoints

4.3. Data Layer Attributes

Each data layer is described in this document with a table listing the attributes. Section 5 that follows provides detailed attribute descriptions, required data domains, and example field values. 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 NG911 system. Local GIS data and the Pennsylvania statewide data layers must conform to this standard naming schema.
- **M/C/SR/O:** This column is used to indicate whether populating the attribute is Mandatory, Conditional, Strongly Recommended, or Optional.
 - **Mandatory** – An attribute value must be populated in the data field for each record. Mandatory data fields must not be blank.
 - **Conditional** – 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.
 - **Strongly Recommended** – Not required to be populated in the local data at this time, however population of this field will be mandatory in the coming years. Currently it is a local decision on whether to populate the data field.
 - **Optional** – Not required to be populated in the local data. It is a local decision on whether to populate the data field.
- **Type:** The required attribute type, as defined in NENA standards.
 - **P** – Printable ASCII characters (decimal codes 32 to 126). All field values must be fully spelled out and utilize title case, except in legacy fields which require upper case as per NENA 02-010, NENA Standard for Data Formats for 911 Data Exchange & GIS Mapping and where otherwise noted (e.g. Text fields in Esri feature classes and shapefiles).
 - **E** – UTF-8 restricted to character sets designated by the 911 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** – 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. Depending on the provider of the relational database, this data type may vary.
 - **D** – 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 in the Commonwealth dataset.
 - **F** – Floating (numbers that have a decimal place). There is no defined field length of a floating number; it is system dependent. However, in ESRI geodatabase feature classes and shapefiles, these shall be double fields.
 - **N** – Non-negative Integer. This field consists of whole numbers only. (e.g. In Esri geodatabase feature classes and shapefiles, these shall be short-integer or long-integer fields.)
- **Field Width:** The maximum field width, in number of characters.

4.4. Road Centerlines

Descriptive Name	Field Name	M/C/SR/O	Type	Field Width
Discrepancy Agency ID	DiscrpAgID	M	P	75
Date Updated	DateUpdate	M	D	-
Effective Date	Effective	O	D	-
Expiration Date	Expire	O	D	-
Road Centerline NENA Globally Unique ID	RCL_NGUID	M	P	254
Left Address Number Prefix	AdNumPre_L	C	P	15
Right Address Number Prefix	AdNumPre_R	C	P	15
Left FROM Address	FromAddr_L	M	N	6
Left TO Address	ToAddr_L	M	N	6
Right FROM Address	FromAddr_R	M	N	6
Right TO Address	ToAddr_R	M	N	6
Parity Left	Parity_L	M	P	1
Parity Right	Parity_R	M	P	1
Street Name Pre Modifier	St_PreMod	C	E	15
Street Name Pre Directional	St_PreDir	C	P	9
Street Name Pre Type	St_PreTyp	C	E	50
Street Name Pre Type Separator	St_PreSep	C	E	20
Street Name	St_Name	M	E	60
Street Name Post Type	St_PosTyp	C	E	50
Street Name Post Directional	St_PosDir	C	P	9
Street Name Post Modifier	St_PosMod	C	E	25
Legacy Street Name Pre Directional*	LSt_PreDir	C	P	2
Legacy Street Name*	LSt_Name	C	P	75
Legacy Street Name Type*	LSt_Type	C	P	4
Legacy Street Name Post Directional*	LSt_PosDir	C	P	2
ESN Left*	ESN_L	C	P	5
ESN Right*	ESN_R	C	P	5
MSAG Community Name Left*	MSAGComm_L	C	P	30
MSAG Community Name Right*	MSAGComm_R	C	P	30
Country Left	Country_L	M	P	2
Country Right	Country_R	M	P	2
State Left	State_L	M	P	2
State Right	State_R	M	P	2
County Left	County_L	M	P	40
County Right	County_R	M	P	40

Descriptive Name	Field Name	M/C/SR/O	Type	Field Width
Additional Code Left	AddCode_L	C	P	6
Additional Code Right	AddCode_R	C	P	6
Incorporated Municipality Left	IncMuni_L	M	E	100
Incorporated Municipality Right	IncMuni_R	M	E	100
Unincorporated Community Left	UnincCom_L	O	E	100
Unincorporated Community Right	UnincCom_R	O	E	100
Neighborhood Community Left	NbrhdCom_L	O	E	100
Neighborhood Community Right	NbrhdCom_R	O	E	100
Postal Code Left	PostCode_L	O	P	7
Postal Code Right	PostCode_R	O	P	7
Postal Community Name Left	PostComm_L	O	P	40
Postal Community Name Right	PostComm_R	O	P	40
Road Class	RoadClass	O	P	15
One-Way	OneWay	SR	P	2
Speed Limit	SpeedLimit	O	N	3
Validation Left	Valid_L	O	P	1
Validation Right	Valid_R	O	P	1
Complete Alias Street Name	Alias	C	E	245

4.5. Site/Structure Address Points

Descriptive Name	Field Name	M/C/SR/O	Type	Field Width
Discrepancy Agency ID	DiscrpAgID	M	P	75
Date Updated	DateUpdate	M	D	-
Effective Date	Effective	O	D	-
Expiration Date	Expire	O	D	-
Site NENA Globally Unique ID	Site_NGUID	M	P	254
Country	Country	M	P	2
State	State	M	P	2
County	County	M	P	40
Additional Code	AddCode	C	P	6
Additional Data URI	AddDataURI	C	U	254
Incorporated Municipality	Inc_Muni	M	E	100
Unincorporated Community	Uninc_Comm	O	E	100
Neighborhood Community	Nbrhd_Comm	O	E	100

Descriptive Name	Field Name	M/C/SR/O	Type	Field Width
Address Number Prefix	AddNum_Pre	C	P	15
Address Number	Add_Number	C	N	6
Address Number Suffix	AddNum_Suf	C	P	15
Street Name Pre Modifier	St_PreMod	C	E	15
Street Name Pre Directional	St_PreDir	C	P	9
Street Name Pre Type	St_PreTyp	C	E	50
Street Name Pre Type Separator	St_PreSep	C	E	20
Street Name	St_Name	C	E	60
Street Name Post Type	St_PosTyp	C	E	50
Street Name Post Directional	St_PosDir	C	P	9
Street Name Post Modifier	St_PosMod	C	E	25
Legacy Street Name Pre Directional*	LSt_PreDir	C	P	2
Legacy Street Name*	LSt_Name	C	P	75
Legacy Street Name Type*	LSt_Type	C	P	4
Legacy Street Name Post Directional*	LSt_PosDir	C	P	2
ESN*	ESN	C	P	5
MSAG Community Name*	MSAGComm	C	P	30
Postal Community Name	Post_Comm	O	P	40
Postal Code	Post_Code	O	P	7
ZIP Plus 4	Post_Code4	O	P	4
Building	Building	SR	P	75
Floor	Floor	SR	P	75
Unit	Unit	SR	P	75
Room	Room	SR	P	75
Seat	Seat	O	P	75
Additional Location Information	Addtl_Loc	O	E	225
Complete Landmark Name	LandmkName	C	E	150
Mile Marker/Milepost	Milepost	C	P	150
Place Type	Place_Type	O	P	50
Placement Method	Placement	O	P	25
Longitude	Long	O	F	-
Latitude	Lat	O	F	-
Elevation	Elev	SR	N	6
Taxing Authority	TaxAuth	O	P	50
Parcel Identifier	UPI	O	P	50

5. Field Descriptions, Definitions and Domains

This section provides a detailed description, attribute data domain, and examples for each field in the Road Centerlines and Site/Structure Address Points GIS data layers. All field values must be fully spelled out and utilize title case unless noted otherwise. An attribute data domain defines the set of all valid values that are allowed in the attribute data field. If the domain defines no values, then any value that matches the data type and description may be used for the attribute data field. Those fields with given data domain values must use only one of those values for the attribute data field. All attribute Descriptive Names are grouped by data layer and listed alphabetically.

5.1. Road Centerlines

5.1.1. Additional Code Left

Description: The Additional Code as described in Section 5.2.1 on the Left side of the road segment relative to the FROM Node. Since this field is not applicable in the US, it will not be populated in PA GIS data layers.

Domain: Restricted to the values provided in Statistics Canada, Standard Geographical Classification 2011, Volume I, Statistical Area Classification by Province and Territory – Variant of SGC 2011 at <https://www.statcan.gc.ca/subjects-sujets/standard-norme/sgc-cgt/2011/index-indexe-eng.htm>

Example: 3318013; 55091

5.1.2. Additional Code Right

Description: The Additional Code as described in Section 5.2.1 on the Right side of the road segment relative to the FROM Node. Since this field is not applicable in the US, it will not be populated in PA GIS data layers.

Domain: Restricted to the values provided in Statistics Canada, Standard Geographical Classification 2011, Volume I, Statistical Area Classification by Province and Territory – Variant of SGC 2011 at <https://www.statcan.gc.ca/subjects-sujets/standard-norme/sgc-cgt/2011/index-indexe-eng.htm>

Example: 3318013; 55091

5.1.3. Complete Alias Street Name

Description: The primary complete alias street name (or “also known as” street name) associated with the road centerline segment.

Domain: None

Example: “Spring Road” as an alias for “Carlisle Springs Road”
“West Ward Line Alley” as an alias for “West Cedar Alley”
“T-0552” as an alias for “Snarrytown Road”

5.1.4. Country Left

Description: The two-letter abbreviation of the Country on the Left side of the road segment relative to the FROM Node, in capital letters.

Domain: Restricted to the two-letter designations provided in ISO 3166-1.

Example: "US" for the United States of America; "CA" for Canada

5.1.5. Country Right

Description: The two-letter abbreviation of the Country on the Right side of the road segment relative to the FROM Node, in capital letters.

Domain: Restricted to the two-letter designations provided in ISO 3166-1.

Example: "US" for the United States of America; "CA" for Canada

5.1.6. County Left

Description: The name of the County on the Left side of the road segment relative to the FROM Node.

Domain: See County

Example: Allegheny County; Centre County; Wyoming County

5.1.7. County Right

Description: The name of the County on the Right side of the road segment relative to the FROM Node.

Domain: See County

Example: Cambria County; Dauphin County; Elk County

5.1.8. Date Updated

Description: The date and time that the record was created or last modified. This value **MUST** be populated upon modifications to attributes, geometry, or both.

Domain: Date and Time 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 in the Commonwealth dataset.

Example: (of a W3C dateTime with optional precision of .1 second)

2018-12-21T17:58.03.1-05:00 (representing a record updated on December 21, 2018 at 5:58 and 3.1 seconds PM US Eastern Standard Time);

2018-07-11T08:31:15.2-04:00 (representing a record updated on July 11, 2018 at 8:31 and 15.2 seconds AM US Eastern Daylight Time)

5.1.9. Discrepancy Agency ID

Description: The Agency Identifier (a registered domain name) for the agency that is responsible for receiving a Discrepancy Report (DR) and sufficiently resolving the discrepancy, should a discrepancy be discovered in the GIS data layer. This shall be the agency responsible for provisioning the GIS data layer to the Spatial Interface (SI) or to the SI Provider and may be the same agency as the locally appointed 911 Authority. The Discrepancy Agency ID must be represented by the Agency Identifier (a registered domain name) in the format *countyname.state.pa.us*.

Domain: None

Example: somerset.state.pa.us; sullivan.state.pa.us

5.1.10. Effective Date

Description: The date and time that the record is scheduled to take effect (e.g. the date and time an annexation takes effect and the new boundary is recognized for use in the NG911 system).

Domain: Date and Time 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 in the Commonwealth dataset.

Example: (of a W3C dateTime with optional precision of .1 second)

2020-02-18T02:30:00.1-05:00 (representing a record that will become active on February 18, 2020 at 2:30 and 0.1 seconds AM US Eastern Standard Time);

2020-10-09T13:01:35.2-04:00 (representing a record that will become active on October 9, 2020 at 1:01 and 35.2 seconds PM US Eastern Daylight Time)

5.1.11. ESN Left:

Description: The Emergency Service Number (ESN) on the Left side of the road segment relative to the FROM Node.

Domain: Characters from 000 to 99999

Example: 005, 140

5.1.12. ESN Right:

Description: The Emergency Service Number (ESN) on the Right side of the road segment relative to the FROM Node.

Domain: Characters from 000 to 99999

Example: 003, 130

5.1.13. Expiration Date

Description: The date and time when the information in the record is no longer considered valid (e.g. the date and time an annexation takes effect and the former boundary is no longer recognized for use in the NG911 system).

Domain: Date and Time 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 in the Commonwealth dataset.

Example: (of a W3C dateTime with optional precision of .1 second)

2021-02-18T02:30:00.1-05:00 (representing a record that will expire and no longer be valid on February 18, 2021 at 2:30 and 0.1 seconds AM US Eastern Standard Time);

2021-10-09T13:01:35.2-04:00 (representing a record that will expire and no longer be valid on October 9, 2021 at 1:01 and 35.2 seconds PM US Eastern Daylight Time)

5.1.14. Incorporated Municipality Left

Description: The name of the Incorporated Municipality (e.g. city, borough, township, town) on the Left side of the road segment relative to the FROM Node. Incorporated Boroughs and Townships shall include “Borough” or “Township” as part of the incorporated municipality name. Cities and Towns shall only include the incorporated municipality name and not the incorporated municipality type.

Domain: None

Example: Indian Lake Borough; Philadelphia

5.1.15. Incorporated Municipality Right

Description: The name of the Incorporated Municipality (e.g. city, borough, township, town) on the Right side of the road segment relative to the FROM Node. Incorporated Boroughs and Townships shall include “Borough” or “Township” as part of the incorporated municipality name. Cities and Towns shall only include the incorporated municipality name and not the incorporated municipality type.

Domain: None

Example: Wilkes-Barre; Callimont Borough

5.1.16. Left Address Number Prefix

Description: An extension of the Left FROM Address or Left TO Address consisting of the alphanumeric characters, punctuation, and spaces that precedes it and further identifies a location on the Left side of the road segment relative to the FROM Node.

Domain: None

Example: "201-" in “201-445 Meadow Drive”; “N” in “N32774 Ferry Road”

5.1.17. Left FROM Address

Description: The beginning value of the address range on the Left side of the road segment at the FROM node (begin point). This value can be higher than the Left TO Address.

Domain: Whole numbers from 0 to 999999

Example: See Figure 5-1 below

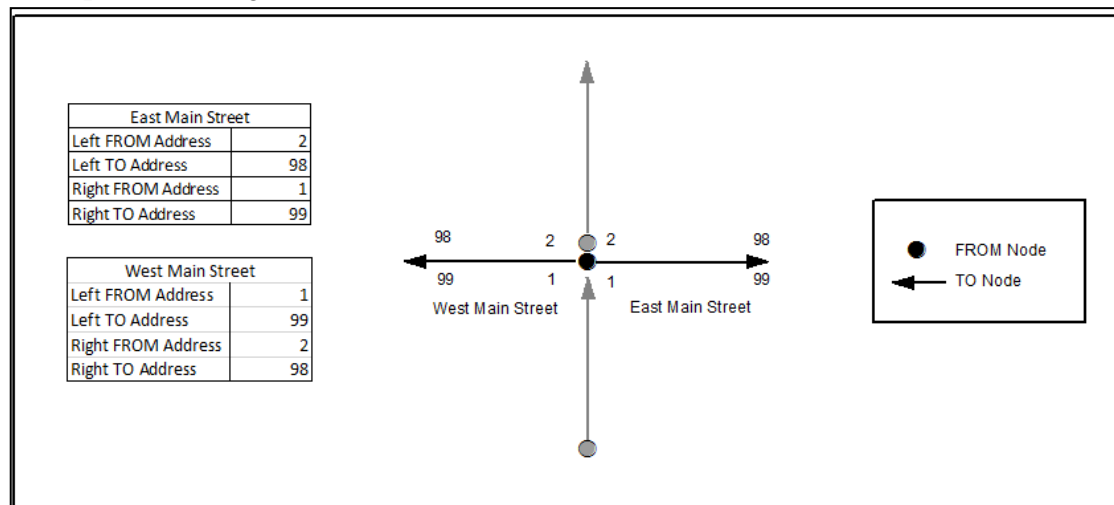


Figure 5-1 Example of Left FROM, Left TO, Right FROM, and Right TO Addresses

5.1.18. Left TO Address

Description: The ending value of the address range on the Left side of the road segment at the TO node (endpoint). This value can be lower than the Left FROM Address.

Domain: Whole numbers from 0 to 999999

Example: See Figure 5-1 above

5.1.19. Legacy Street Name

Description: The street name field as it appears in the MSAG, as assigned by the local addressing authority. Attribute values must be in uppercase.

Domain: None

Example: “MAIN” in “W MAIN ST”; “OLD LINCOLN” in “OLD LINCOLN HWY”

5.1.20. Legacy Street Name Post Directional

Description: The trailing street direction suffix as it appears in the MSAG, as assigned by the local addressing authority. Attribute values must be in uppercase.

Domain: N, S, E, W, NE, NW, SE, SW

Example: “W” in “MAIN ST W”; “S” in “MAPLE AVE S”

5.1.21. Legacy Street Name Pre Directional

Description: The leading street direction prefix as it appears in the MSAG, as assigned by the local addressing authority. Attribute values must be in uppercase.

Domain: N, S, E, W, NE, NW, SE, SW

Example: “N” in “N CENTER AVE”; “W” in “W UNION ST”

5.1.22. Legacy Street Name Type

Description: The valid street abbreviation as it appears in the MSAG, as assigned by the local addressing authority. Attribute values must be in uppercase.

Domain: Strongly recommend that only the values provided in USPS Publication 28, Appendix C1 [4], in the Postal Service Standard Suffix Abbreviation column be used. This field may be blank.

Example: “AVE” for “AVENUE”; “TRL” for “TRAIL”; “PKWY” for “PARKWAY”

5.1.23. MSAG Community Name Left

Description: The MSAG Community Name on the Left side of the road segment relative to the FROM Node, as it appears in the MSAG. Attribute values must be in uppercase.

Domain: None

Example: LISTIE; SAINT MICHAEL

5.1.24. MSAG Community Name Right

Description: The MSAG Community Name on the Right side of the road segment relative to the FROM Node. Attribute values must be in uppercase.

Domain: None

Example: BLOUGH; DUNLO

5.1.25. Neighborhood Community Left

Description: The name of an unincorporated neighborhood, subdivision or area within an incorporated municipality on the Left side of the road segment relative to the FROM Node.

Domain: None

Example: Shawleystown; Garden View

5.1.26. Neighborhood Community Right

Description: The name of an unincorporated neighborhood, subdivision or area within an incorporated municipality on the Right side of the road segment relative to the FROM Node.

Domain: None

Example: Snob's Knob; East End

5.1.27. One-Way

Description: The direction of traffic movement along a road in relation to the FROM node and TO node of the road segment

Domain: B, FT, TF

B – Travel in both directions allowed

FT – One-way traveling from FROM node to TO node

TF – One way traveling from TO node to FROM node

Example: See Figure 5-2 below

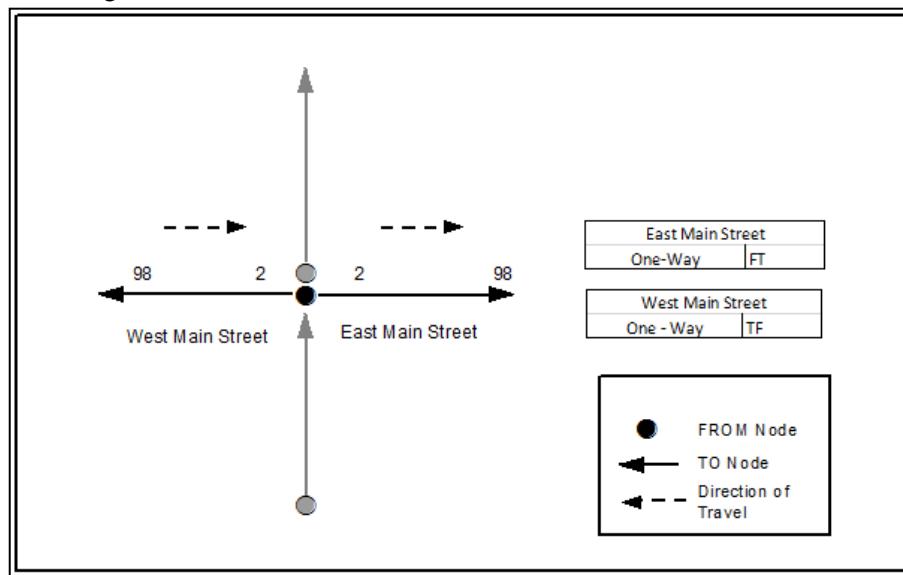


Figure 5-2 Example of One-Way

5.1.28. Parity Left

Description: The even or odd property of the address number range on the Left side of the road segment relative to the FROM Node.

Domain: O, E, B, Z

O – Odd

E – Even

B – Both

Z – Address Range 0-0

Example: O; E; B; Z

5.1.29. Parity Right

Description: The even or odd property of the address number range on the Right side of the road segment relative to the FROM Node.

Domain: O, E, B, Z

O – Odd

E – Even

B – Both

Z – Address Range 0-0

Example: O; E; B; Z

5.1.30. Postal Code Left

Description: The Postal Code on the Left side of the road segment relative to the FROM Node.

Domain: Restricted to the values provided in the USPS City State File Product.

Example: 15217; 17101; 19106

5.1.31. Postal Code Right

Description: The Postal Code on the Right side of the road segment relative to the FROM Node.

Domain: Restricted to the values provided in the USPS City State File Product.

Example: 17102; 18702; 19107

5.1.32. Postal Community Name Left

Description: A city name associated with the Postal (ZIP) Code of an address on the Left side of the road segment relative to the FROM Node.

Domain: Restricted to city names provided in the USPS City State File Product.

Example: Pittsburgh; Harrisburg; Philadelphia

5.1.33. Postal Community Name Right

Description: A city name associated with the Postal (ZIP) Code of an address on the Right side of the road segment relative to the FROM Node.

Domain: Restricted to city names provided in the USPS City State File Product.

Example: Harrisburg; Philadelphia; Wilkes Barre

5.1.34. Right Address Number Prefix

Description: An extension of the Right FROM Address or Right TO Address consisting of the alphanumeric characters, punctuation, and spaces that precedes it and further identifies a location on the Right side of the road segment relative to the FROM Node.

Domain: None

Example: “S” in “S877 Highway 88”; “N” in “N32774 Ferry Road

5.1.35. Right FROM Address

Description: The beginning value of the address range on the Right side of the road segment at the FROM node (begin point). This value can be higher than the Right TO Address.

Domain: Whole numbers from 0 to 999999

Example: See Figure 5-3 below

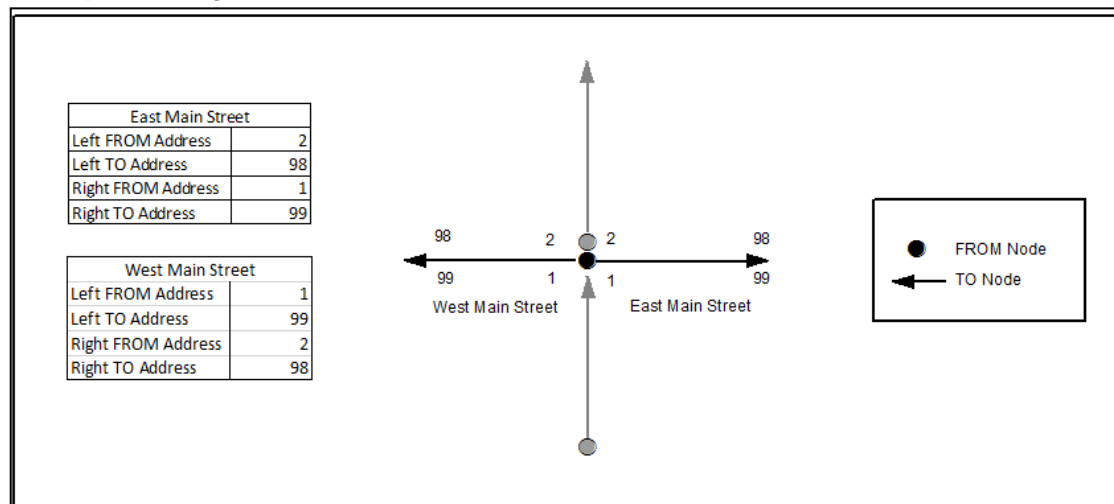


Figure 5-3 Example of Left FROM, Left TO, Right FROM, and Right TO Addresses

5.1.36. Right TO Address

Description: The ending value of the address range on the Right side of the road segment at the TO node (endpoint). This value can be lower than the Right FROM Address.

Domain: Whole numbers from 0 to 999999

Example: See Figure 5-3 above

5.1.37. Road Centerline NENA Globally Unique ID

Description: The NENA Globally Unique ID (NGUID) for each Road Centerline segment. Each record in the Road Centerlines layer must have a globally unique ID so that when coalescing data from other local 911 Authorities into the ECRF and LVF, this unique ID only occurs once. The Road Centerline NGUID is created by concatenating the NENA-standard prefix “RCL”, the locally assigned unique ID, the “@” symbol, and the Agency Identifier (a registered domain name).

Domain: None

Example: RCL1234@somerset.state.pa.us; RCL3339@lycoming.state.pa.us

5.1.38. Road Class

Description: The general description of the type of road.

Domain: Primary, Secondary, Local, Ramp, Service Drive, Vehicular Trail, Walkway, Stairway, Alley, Private, Parking Lot, Trail, Bridle Path, Other

These values are based on road classification definitions from the Census MAF/TIGER Feature Class Codes (MTFCC) at <https://www.census.gov/library/reference/code-lists/mt-feature-class-codes.html>.

This element may change in a future update of the NENA Standard for NG911 GIS Data Model [2].

- *Primary* roads are limited-access highways that connect to other roads only at interchanges and not at at-grade intersections. This classification includes interstate highways and other highways with limited access, some of which are toll roads.
- *Secondary* roads are main arteries that are not limited access, usually in the US Highway, State Highway, or County Highway system. These roads have one or more lanes of traffic in each direction, may or may not be divided, and usually have at grade intersections with many other roads and driveways.
- *Local* roads are generally a paved non-arterial street, road, or byway that usually has a single lane of traffic in each direction. This classification includes neighborhood, rural roads, city streets, and some unpaved roads.
- *Ramp* is a road that allows controlled access from adjacent roads onto a limited access highway, often in the form of a cloverleaf interchange.
- *Service Drive* is a road, usually paralleling a limited access highway, that provides access to structures and/or service facilities along the highway. These roads can be named and may intersect with other roads.
- *Vehicular Trail* (4WD, snowmobile) is an unpaved dirt trail where a four-wheel drive vehicle, snowmobile, or similar vehicle is required.
- *Walkway* (Pedestrian Trail, Boardwalk) is a path that is used for walking, being either too narrow for or legally restricted from vehicular traffic.
- *Stairway* is a pedestrian passageway from one level to another by a series of steps.
- *Alley* is a service road that does not generally have associated addressed structures and is usually unnamed. It is located at the rear of buildings and properties.
- *Private* (service vehicles, logging, oil fields, ranches, etc.) is a road within private property that is privately maintained for service, extractive, or other purposes. These roads are often unnamed.
- *Parking Lot* is the main travel route for vehicles through a paved parking area.
- *Trail* (Ski, Bike, Walking/Hiking Trail) is generally a path used by human powered modes of transportation.
- *Bridle Path* is a path that is used for horses, being either too narrow for or legally restricted from vehicular traffic.
- *Other* is any road or path type that does not fit into the above categories.

Example: Local; Ramp; Private

5.1.39. Speed Limit

Description: Posted speed limit in MPH

Domain: Whole numbers from 1 to 999

Example: 30; 45; 65

5.1.40. State Left

Description: The two-letter abbreviation of the state or state equivalent on the Left side of the road segment relative to the FROM Node, in capital letters.

Domain: See State

Example: PA, NY, WV

5.1.41. State Right

Description: The two-letter abbreviation of the state or state equivalent on the Right side of the road segment relative to the FROM Node, in capital letters.

Domain: See State

Example: PA; DE, NJ

5.1.42. Street Name

Description: The official name of the road as defined by the local addressing authority. It does not include any street directionals or modifiers.

Domain: None

Example: “Locust” in “Locust Street”; “219” in “Route 219”; “Southside” in “Southside Lane”

5.1.43. Street Name Post Directional

Description: A word following the Street Name element that indicates the direction taken by the road from an arbitrary starting point or line, or the sector where it is located.

Domain: North, South, East, West, Northeast, Northwest, Southeast, Southwest

Example: “West” in “Main Street West”; “South” in “Maple Avenue South”

5.1.44. Street Name Post Modifier

Description: A word or phrase that follows and modifies the Street Name element but is separated from it by a Street Name Post Type or a Street Name Post Directional or both.

Domain: None

Example: “Extended” in “Main Street Extended”
“Fire Road 12” in “Lakeview Road Fire Road 12”
“southbound” in “Interstate 81 southbound”

5.1.45. Street Name Post Type

Description: A word or phrase that follows the Street Name element and identifies the type of thoroughfare in a complete street name.

Domain: Restricted to the values found in the NENA Street Name Pre Types and Street Name Post Types Registry, or combinations thereof, at <http://technet.nena.org/nrs/registry/StreetNamePreTypesAndStreetNamePostTypes.xml>. It is strongly recommended that when two Street Name Post Types occur after the Street Name, the first occurrence be included in the Street Name field and the second be placed in the Street Name Post Type field.

Example: “Highway” in “Mason Dixon Highway”
“Path” in “Iroquois Path”
“Bypass” in “Route 219 Bypass”
“Extension” in “Main Street Extension”

5.1.46. Street Name Pre Directional

Description: A word preceding the Street Name element that indicates the direction taken by the road from an arbitrary starting point or line, or the sector where it is located.

Domain: North, South, East, West, Northeast, Northwest, Southeast, Southwest

Example: “North” in “North Center Avenue”; “East” in “East Bakersville-Edie Road”

5.1.47. Street Name Pre Modifier

Description: A word or phrase that precedes and modifies the Street Name element but is separated from it by a Street Name Pre Type or a Street Name Pre Directional or both.

Domain: None

Example: “Old” in “Old Route 40”; “West” in “West South 4th Street”

5.1.48. Street Name Pre Type

Description: A word or phrase that precedes the Street Name element and identifies the type of thoroughfare in a complete street name.

Domain: Restricted to the values found in the NENA Street Name Pre Types and Street Name Post Types Registry, or combinations thereof, at <http://technet.nena.org/nrs/registry/StreetNamePreTypesAndStreetNamePostTypes.xml>

Example: “Route” in “Old Route 40”
“Boulevard” in “Boulevard of the Allies”
“Avenue” in “Avenue A”

5.1.49. Street Name Pre Type Separator

Description: A preposition or prepositional phrase between the Street Name Pre Type and the Street Name elements.

Domain: Restricted to values found in the NENA Street Name Pre Type Separators Registry at <http://technet.nena.org/nrs/registry/StreetNamePreTypeSeparators.xml>

Example: “of the” in “Boulevard of the Allies”

5.1.50. Unincorporated Community Left

Description: The Unincorporated Community on the Left side of the road segment relative to the FROM Node.

Domain: None

Example: Pennsdale; Opp

5.1.51. Unincorporated Community Right

Description: The Unincorporated Community on the Right side of the road segment relative to the FROM Node.

Domain: None

Example: Pump Station; Maggio Estates

5.1.52. Validation Left

Description: Indicates if the address range on the Left side of the road segment should be used for civic location validation. A value of “Y” means the Road Centerlines layer can be used for address validation and therefore any Address Number within the address range on the Left side of the road segment should be considered by the LVF to be valid. A value of “N” means the Road Centerlines layer should not be used for validation and an Address Number within the address range on the Left side of the road segment should only be validated using the Site/Structure Address Points layer. If no values are populated, a value of “Y” is assumed.

Domain: Y, N

Example: Y; N

5.1.53. Validation Right

Description: Indicates if the address range on the Right side of the road segment should be used for civic location validation. A value of “Y” means the Road Centerlines layer can be used for address validation and therefore any Address Number within the address range on the Right side of the road segment should be considered by the LVF to be valid. A value of “N” means the Road Centerlines layer should not be used for validation and an Address Number within the address range on the Right side of the road segment should only be validated using the Site/Structure Address Points layer. If no values are populated, a value of “Y” is assumed.

Domain: Y, N

Example: Y; N

5.2. Site/Structure Address Points

5.2.1. Additional Code

Description: A Standard Geographical Classification code used in Canada that specifies a geographic area and is used to differentiate two municipalities with the same name in a province that does not have counties. Since this field is not applicable in the US, it will not be populated in PA GIS data layers.

Domain: Restricted to the values provided in Statistics Canada, Standard Geographical Classification 2011, Volume I, Statistical Area Classification by Province and Territory – Variant of SGC 2011 at <https://www.statcan.gc.ca/subjects-sujets/standard-norme/sgc-cgt/2011/index-indexe-eng.htm>

Example: 3318013; 55091

5.2.2. Additional Data URI

Description: A Uniform Resource Identifier (URI) that defines the Service URI for accessing additional data and information associated with the Site/Structure Address Point location, including building information (e.g. blueprints, contact info, floor plans).

Domain: None

Example: <https://add168603.example.com>

5.2.3. Additional Location Information

Description: A part of a subaddress that is not a Building, Floor, Unit, Room, or Seat.

Domain: None. It is strongly recommended that both a type (e.g. Concourse, Gate, Corridor) and identifier (e.g. B, B27, 5) be included.

Example: Cardiac Wing; Concourse C; Gate B27; Loading Dock 12

5.2.4.Address Number

Description: The numeric identifier of the structure or addressed site along a thoroughfare or within a defined community.

Domain: Whole numbers from 0 to 999999

Example: “10310” in “10310 Somerset Pike”; “100” in “100 East Union Street”

5.2.5.Address Number Prefix

Description: An extension of the Address Number consisting of the alphanumeric characters, punctuation, and spaces that precedes the Address Number and further identifies the location of the structure or addressed site.

Domain: None

Example: “S” in “S877 Highway 88”; “N” in “N32774 Ferry Road

5.2.6.Address Number Suffix

Description: An extension of the Address Number that follows it and further identifies the location of the structure or addressed site.

Domain: None

Example: “½” in “307 ½ Seventh Street”
 “Rear” in “408 Rear West Main Street”
 “B” in “8305B Algon Avenue”

5.2.7.Building

Description: One among a group of buildings that have the same address number and complete street name. Note that this element may change in a future update of the NENA Civic Location Data Exchange Format Standard.

Domain: None. It is strongly recommended that both a type (e.g. Building, Tower) and identifier (e.g. A, 4) be included.

Example: Building 8; East Tower

5.2.8.Complete Landmark Name

Description: The name by which a prominent site or structure is publicly known and which may or may not be associated with a civic address. Note that this element may change in a future update of the NENA Civic Location Data Exchange Format Standard.

Domain: None

Example: Eastern State Penitentiary; Fairmount Park; Independence Hall; Wannamaker Building; Quemahoning Dam; Somerset County Courthouse; US Flight 93 National Memorial

5.2.9.Country

Description: The two-letter abbreviation of the Country where the address point is located, in capital letters.

Domain: Restricted to the two-letter designations provided in ISO 3166-1.

Example: "US" for the United States of America; "CA" for Canada

5.2.10. County

Description: The name of the County where the address point is located.

Domain: Restricted to the exact listed values as published in ANSI INCITS 31:2009, including casing and use of abbreviations.

Example: Berks County; Lycoming County; Somerset County

5.2.11. Date Updated

Description: The date and time that the record was created or last modified. This value **MUST** be populated upon modifications to attributes, geometry, or both.

Domain: Date and Time 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 in the Commonwealth dataset.

Example: (of a W3C dateTime with optional precision of .1 second)

2018-12-21T17:58.03.1-05:00 (representing a record updated on December 21, 2018 at 5:58 and 3.1 seconds PM US Eastern Standard Time);

2018-07-11T08:31:15.2-04:00 (representing a record updated on July 11, 2018 at 8:31 and 15.2 seconds AM US Eastern Daylight Time)

5.2.12. Discrepancy Agency ID

Description: The Agency Identifier (a registered domain name) for the agency that is responsible for receiving a Discrepancy Report (DR) and sufficiently resolving the discrepancy, should a discrepancy be discovered in the GIS data layer. This shall be the agency responsible for provisioning the GIS data layer to the Spatial Interface (SI) or to the SI Provider and may be the same agency as the locally appointed 911 Authority. The Discrepancy Agency ID must be represented by the Agency Identifier (a registered domain name) in the format *countyname.state.pa.us*.

Domain: None

Example: somerset.state.pa.us; cambria.state.pa.us; warren.state.pa.us

5.2.13. Effective Date

Description: The date and time that the record is scheduled to take effect (e.g. the date and time an annexation takes effect and the new boundary is recognized for use in the NG911 system).

Domain: Date and Time 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 in the Commonwealth dataset.

Example: (of a W3C dateTime with optional precision of .1 second)

2020-02-18T02:30:00.1-05:00 (representing a record that will become active on February 18, 2020 at 2:30 and 0.1 seconds AM US Eastern Standard Time);

2020-10-09T13:01:35.2-04:00 (representing a record that will become active on October 9, 2020 at 1:01 and 35.2 seconds PM US Eastern Daylight Time)

5.2.14. Elevation

Description: The WGS84 (GPS) elevation, given in meters above the ellipsoid, associated with the site/structure address. Future population of this field will be required to meet FCC vertical accuracy requirements. Note that in 2022 the National Geodetic Survey will replace the North American Vertical Datum of 1988 (NAVD 88) with a new vertical datum. This 2022 datum change will impact the vertical elevation recorded in this field.

Domain: Whole numbers from 0 to 999999.

Example: 301; 506; 832

5.2.15. ESN

Description: A 3 to 5 character alphanumeric string that represents the Emergency Service Zone (ESZ) where the address point is located.

Domain: Characters from 000 to 99999

Example: 359; 181

5.2.16. Expiration Date

Description: The date and time when the information in the record is no longer considered valid (e.g. the date and time an annexation takes effect and the former boundary is no longer recognized for use in the NG911 system).

Domain: Date and Time 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 in the Commonwealth dataset.

Example: (of a W3C dateTime with optional precision of .1 second)

2021-02-18T02:30:00.1-05:00 (representing a record that will expire and no longer be valid on February 18, 2021 at 2:30 and 0.1 seconds AM US Eastern Standard Time);

2021-10-09T13:01:35.2-04:00 (representing a record that will expire and no longer be valid on October 9, 2021 at 1:01 and 35.2 seconds PM US Eastern Daylight Time)

5.2.17. Floor

Description: A floor, story, or level within a building.

Domain: None. It is strongly recommended that both a type (e.g. Floor, Level) and identifier (e.g. 5, Mezzanine) be included.

Example: Mezzanine; First Floor; Division 1

5.2.18. Incorporated Municipality

Description: The name of the Incorporated Municipality (e.g. city, borough, township, town) where the address point is located. Incorporated Boroughs and Townships shall include “Borough” or “Township” as part of the incorporated municipality name. Cities and Towns shall only include the incorporated municipality name and not the incorporated municipality type.

Domain: None

Example: Harrisburg; Somerset Township; Cassandra Borough

5.2.19. Latitude

Description: The angular distance of the address point location north or south of the equator as defined by the coordinate system, expressed in decimal degrees.

Domain: +90 degrees to -90 degrees

Example: 40.264385

5.2.20. Legacy Street Name

Description: The street name field as it appears in the MSAG, as assigned by the local addressing authority. Attribute values must be in uppercase.

Domain: None

Example: “GLADES” in “GLADES PK”; “BLVD OF THE ALLIES” in “BLVD OF THE ALLIES”

5.2.21. Legacy Street Name Post Directional

Description: The trailing street direction suffix as it appears in the MSAG, as assigned by the local addressing authority. Attribute values must be in uppercase.

Domain: N, S, E, W, NE, NW, SE, SW

Example: “W” in “MAIN ST W”; “S” in “MAPLE AVE S”

5.2.22. Legacy Street Name Pre Directional

Description: The leading street direction prefix as it appears in the MSAG, as assigned by the local addressing authority. Attribute values must be in uppercase.

Domain: N, S, E, W, NE, NW, SE, SW

Example: “N” in “N RED DR”; “E” in “E HIGH ST”

5.2.23. Legacy Street Name Type

Description: The valid street abbreviation as it appears in the MSAG, as assigned by the local addressing authority. Attribute values must be in uppercase.

Domain: Strongly recommend that only the values provided in USPS Publication 28, Appendix C1 [4], in the Postal Service Standard Suffix Abbreviation column be used. This field may be blank.

Example: “ST” for “STREET”; “ALY” for “ALLEY”; “PL” for “PLACE”

5.2.24. Longitude

Description: The angular distance of the address point location east or west of the prime meridian of the coordinate system, expressed in decimal degrees.

Domain: -180 degrees to +180 degrees

Example: -76.883829

5.2.25. Mile Marker/Milepost

Description: A measured distance travelled along a road, highway, trail, navigable waterway, or other unaddressed route, from a given point, that is posted with a milepost sign, a mile marker sign, or other marker. Milepost numbers may be used in place of, or in addition to, Address Numbers.

Domain: None

Example: “Milepost 101.3” on the Pennsylvania Turnpike
“Mile Marker 42” on US 219

5.2.26. MSAG Community Name

Description: The Community name where the address point is located, as it appears in the MSAG. This may or may not be the same as the Community Name assigned by the United States Postal Service (USPS). Attribute values must be in uppercase.

Domain: None

Example: PINE TOWNSHIP; JORDAN TOWNSHIP; NORTH HUNTINGDON TOWNSHIP

5.2.27. Neighborhood Community

Description: The name of an unincorporated neighborhood, subdivision, or area within an incorporated municipality where the address point is located. Neighborhood communities are only used when they are known and have a clearly defined boundary.

Domain: None

Example: Shadyside; Garden View

5.2.28. Parcel Identifier

Description: A finite, punctuated sequence of numbers which identifies each separate tract, lot, land parcel or other interest of real estate in a county.

Domain: None

Example: 43+,005.0-0314.00-000+; 88534302788642

5.2.29. Place Type

Description: The type of feature identified by the address.

Domain: Restricted to the values provided in RFC 4589 at <http://tools.ietf.org/rfc/rfc4589.txt>

Example: Airport; bank; hotel; office; residence; stadium; store

5.2.30. Placement Method

Description: The methodology used for placement of the address point.

Domain: Geocoding, Parcel, Property Access, Site, Structure, Unknown

Descriptions of these values are found in the NENA Site/Structure Address Point Placement Method Registry at <http://technet.nena.org/nrs/registry/SiteStructureAddressPointPlacementMethod.xml>

Example: Parcel; Structure

5.2.31. Postal Code

Description: A 5-digit code that identifies the individual USPS Post Office or metropolitan area delivery station associated with the address point. Also known as a ZIP Code.

Domain: Restricted to the values provided in the USPS City State File Product.

Example: 15207; 17120; 18705

5.2.32. Postal Community Name

Description: A city name associated with the Postal (ZIP) Code of the address point.

Domain: Restricted to city names provided in the USPS City State File Product.

Example: Pittsburgh; Harrisburg; Wilkes Barre

5.2.33. Room

Description: A single room within a building.

Domain: None. It is strongly recommended that both a type (e.g. Room) and identifier (e.g. 237, 12A, Cypress) be included.

Example: Cypress Room; Classroom 213

5.2.34. Seat

Description: A place where a person might sit within a building. Note that this element may change in a future update of the NENA Civic Location Data Exchange Format Standard.

Domain: None. It is strongly recommended that both a type (e.g. Cubicle, Desk) and identifier (e.g. 5A, 11) be included.

Example: Seat K21; Metro Desk

5.2.35. Site NENA Globally Unique ID

Description: The NENA Globally Unique ID (NGUID) for each Site/Structure Address Point. Each record in the Site/Structure Address Points layer must have a globally unique ID so that when coalescing data from other local 911 Authorities into the ECRF and LVF, this unique ID only occurs once. The Site NGUID is created by concatenating the NENA-standard prefix “SSAP”, the locally assigned unique ID, the “@” symbol, and the Agency Identifier (a registered domain name).

Domain: None

Example: SSAP652@somerset.state.pa.us; SSAP131044@lycoming.state.pa.us

5.2.36. State

Description: The two-letter abbreviation of the state or state equivalent, where the address point is located, in capital letters.

Domain: Restricted to the two-letter designations provided in ISO 3166-2. USPS Publication 28, Appendix B [4], includes the same abbreviations as ISO 3166-2 except PUB 28 is missing “UM”, the abbreviation representing the nine minor uninhabited islands owned by the US. These abbreviations are also available at <https://www.census.gov/library/reference/code-lists/ansi/ansi-codes-for-states.html>.

Example: PA, MD, OH

5.2.37. Street Name

Description: The official name of the road as defined by the local addressing authority. It does not include any street directionals or modifiers.

Domain: None

Example: “Market” in “Market Street”; “Spruce” in “Spruce Street”; “21st” in “21st Street”

5.2.38. Street Name Post Directional

Description: A word following the Street Name element that indicates the direction taken by the road from an arbitrary starting point or line, or the sector where it is located.

Domain: North, South, East, West, Northeast, Northwest, Southeast, Southwest

Example: “West” in “Main Street West”; “South” in “Maple Avenue South”

5.2.39. Street Name Post Modifier

Description: A word or phrase that follows and modifies the Street Name element, but is separated from it by a Street Name Post Type or a Street Name Post Directional or both.

Domain: None

Example: “Extension” in Main Street South Extension”
“Extended” in “Main Street Extended”
“southbound” in “Interstate 81 southbound”

5.2.40. Street Name Post Type

Description: A word or phrase that follows the Street Name element and identifies the type of thoroughfare in a complete street name.

Domain: Restricted to the values found in the NENA Street Name Pre Types and Street Name Post Types Registry, or combinations thereof, at <http://technet.nena.org/nrs/registry/StreetNamePreTypesAndStreetNamePostTypes.xml>. It is strongly recommended that when two Street Name Post Types occur after the Street Name, the first occurrence be included in the Street Name field and the second be placed in the Street Name Post Type field.

Example: “Boulevard” in “Roosevelt Boulevard”
“Parkway” in “Cobbs Creek Parkway”
“Road” in “Main Street Road”
“Extension” in “Main Street Extension”

5.2.41. Street Name Pre Directional

Description: A word preceding the Street Name element that indicates the direction taken by the road from an arbitrary starting point or line, or the sector where it is located.

Domain: North, South, East, West, Northeast, Northwest, Southeast, Southwest

Example: “North” in “North 2nd Street”; “West” in “West Thompson Street”

5.2.42. Street Name Pre Modifier

Description: A word or phrase that precedes and modifies the Street Name element but is separated from it by a Street Name Pre Type or a Street Name Pre Directional or both.

Domain: None

Example: “Old” in “Old Route 40”; “West” in “West South 4th Street”

5.2.43. Street Name Pre Type

Description: A word or phrase that precedes the Street Name element and identifies the type of thoroughfare in a complete street name.

Domain: Restricted to the values found in the NENA Street Name Pre Types and Street Name Post Types Registry, or combinations thereof, at <http://technet.nena.org/nrs/registry/StreetNamePreTypesAndStreetNamePostTypes.xml>

Example: “Route” in “Old Route 40”
“Boulevard” in “Boulevard of the Allies”
“Avenue” in “Avenue A”

5.2.44. Street Name Pre Type Separator

Description: A preposition or prepositional phrase between the Street Name Pre Type and the Street Name elements.

Domain: Restricted to values found in the NENA Street Name Pre Type Separators Registry at <http://technet.nena.org/nrs/registry/StreetNamePreTypeSeparators.xml>

Example: “of the” in “Avenue of the States”

5.2.45. Taxing Authority

Description: The primary local Incorporated Municipality to which property taxes are paid for the Site or Structure.

Domain: None

Example: Nanty Glo Borough; Milford Township

5.2.46. Unincorporated Community

Description: The name of an Unincorporated Community where the address point is located.

Domain: None

Example: Wills; Mine 40; Vim

5.2.47. Unit

Description: A group or suite of rooms within a building that are under common ownership or tenancy, typically having a common primary entrance. Note that this element may change in a future update of the NENA Civic Location Data Exchange Format Standard.

Domain: None. It is strongly recommended that both a type (e.g. Apartment, Suite, Unit) and identifier (e.g. C2, Penthouse, 710) be included.

Example: Apartment 201; Unit 13A; Suite 5100; Front; Rear

5.2.48. ZIP Plus-4

Description: A 4-digit code that when added to the Postal Code refines the mail delivery point down to a specific block or building and may prove useful to validate locations. ZIP Plus-4 codes change more often than US Postal codes because they are associated with delivery routes.

Domain: Restricted to the values provided in the USPS ZIP + 4[®] Product

Example: 0002; 1323; 2908

6. Data Development and Availability

PEMA and local government partners are coordinating the development and maintenance of statewide Road Centerlines and Site/Structure Address Points GIS datasets that meet Pennsylvania's NG911 GIS data requirements to support PSAP operations. Since all 67 counties have Road Centerlines and almost all have Site/Structure Address Points, most initial data development work will focus on migrating these datasets to Pennsylvania's NG911 GIS Data Model, correcting issues found during the gap analysis QA/QC checks, and updating the data. Only a few counties will need to invest extra effort creating their initial Site/Structure Address Points layer. Considerations, recommendations and best practices for Road Centerlines and Site/Structure Address Points GIS data development and maintenance are provided in the following sections of this document.

Local Road Centerlines and Site/Structure Address Points GIS datasets will be integrated into a seamless georeferenced statewide database that PSAPs across the Commonwealth can access. NG911 requirements for high quality, well-attributed, standardized GIS data allows these GIS datasets to have many uses beyond 911. Following a "build once, use many" philosophy, all levels of government across the Commonwealth and beyond will have access to these datasets, reducing replication and reproduction of GIS data. These statewide datasets will be in the public domain and be distributed through Pennsylvania's official public access geospatial data portal, Pennsylvania Spatial Data Access (PASDA), at <http://www.pasda.psu.edu>. It is important to note that no personally identifiable information will be contained in these statewide datasets.

7. Considerations for GIS Data Development & Maintenance

7.1. General Considerations

- *Metadata* – Metadata is information about the dataset that explains the *who, what, where, when, why, and how*. This information is important when sharing data with others so that the recipient clearly understands what the data contains and who to contact if there are additional questions. Basic metadata will be required with each dataset shared with PEMA for incorporation into the statewide Road Centerlines and statewide Site/Structure Address Points. The PEMA NG911 GIS Working Group is developing a list of the critical metadata elements that must be included with the submitted data as well as the metadata elements that will be published with the statewide datasets. This information will be included in an updated version of this document.
- *Use of orthoimagery versus GPS data collection devices* – The availability of current, high resolution orthoimagery can provide a cost-effective way to create spatially accurate address points, add new road centerlines, or compile changes in existing road centerlines. Road centerline compilation and address point placement done in the office is much more efficient than sending staff into the field with GPS units to collect geospatial coordinates for addressed locations and road alignments. Consider limiting GPS use to collect locations for:
 - Subaddresses
 - Sites, structures and new roads not yet present in the existing imagery
 - Sites, structures, and road centerlines that are not clearly discernible in the existing imagery

7.2. Considerations for Road Centerlines

- *Accuracy of boundary data (for alignment/segmentation at boundaries)* – Boundary data is essential to accurate NG911 data. Overlapping boundaries can create issues when segmenting data. This is especially important when aligning Road Centerlines with state boundaries. Pennsylvania is currently working with adjacent states to come up with an agreed upon boundary for correct alignment and segmentation of Road Centerlines at those boundaries. When aligning Road Centerlines with any boundary, the local jurisdiction should always check with the GIS data steward for the entity responsible for maintaining that boundary alignment to ensure the correct boundary is being used.
- *Limitations of CAD software (0-0 ranges; breaking at over/underpasses)* – Each CAD software has its own requirements when dealing with road centerline data. In some cases, CAD software may require 0-0 ranges, while others may not. Some CAD software may also allow for Z (height) values which will affect how road centerlines are split at over/underpasses. These best practices may not take into account each CAD software vendors solutions, and therefore the data developer should always refer to CAD software requirements whenever updating Road Centerlines. It is important to note that in some cases, the Road Centerlines dataset may need to undergo Extract, Transform and Load (ETL) processes to meet NG911 requirements.

7.3. Considerations for Site/Structure Address Points

Programs developing Site/Structure Address Points need to carefully consider the level of positional accuracy desired and the resources available not just for initial data development but long-term data maintenance. In general, address point placement methodologies that result in more spatially accurate points require more resources to create

and maintain them. Not all attribute fields are required for the ECRF and LVF to function. Having a strategy to populate these fields over time will help keep costs in check while making the best use of available resources.

A good data development and maintenance plan should be created at the earliest stages to ensure the best use of available resources and address data. Considerations when developing such a plan include but are not limited to:

- *Placement Method (e.g. Structure, Site, Property Access, Parcel, Geocoding)* – Some address point placement methodologies require minimal resources while others are very resource intensive. Consider starting with a less spatially accurate placement method and over time gradually improve the spatially accuracy of the address points as resources allow. For example, use available parcel data to generate address points from parcel centroids and then as resources permit, use orthoimagery to move the address points onto the sites and structures. This allows for quick creation of a Site/Structure Address Points layer that can be used immediately in 911 applications. Similarly, if using orthoimagery to place address points but field research is required for an address that cannot be clearly discerned on the imagery, create a temporary address point using the parcel centroid location if the parcel upon which it is located is known. Population of the Placement Method attribute is recommended in these situations to provide data users with information on the address point's positional accuracy.
- *Amount of subaddress detail needed* – Costs increase directly with the amount of subaddress detail that is collected. When determining the amount of subaddress detail needed, consider how 911 applications will use the data and how precise the address point location needs to be. At a minimum, enough subaddress detail should be provided to route 911 calls to the appropriate PSAP and get first responders to the correct location. Consider beginning with a low level of subaddress information and increase in granularity as time and resources permit. For example, collect subaddress information that will at least get responders to a specific building. Additional subaddress detail may be needed where a large site or building is split by an Emergency Service Boundary and subaddresses at that location are served by different responding agencies.
- *Limitations of CAD software* – It is important to understand the limitations and requirements of your CAD software as currently not all CAD software programs can natively ingest GIS data in NENA's NG911 GIS Data Model format (upon which the PEMA GIS Data Model is based). Some optional fields may not be recognized and therefore population of those fields could be postponed. Consider the CAD software's ability to use stacked points, subaddress data in a related table structure, or even recognize subaddresses as unique addresses. Also consider if the CAD software can differentiate between the Placement Methods or requires a specific Placement Method (e.g. Property Access versus Structure). For example, a structure located far from the road it is addressed off of may benefit from having two address points: one address point at the driveway entrance (Placement Method=Property Access) and a second address point on the structure (Placement Method=Structure). If the CAD software cannot differentiate between the points, it may be preferred to only show one point.

8. Quality Control of Next Generation 911 GIS Data

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 NG911 GIS Data is categorized into two categories: critical and non-critical. Critical issues will cause issues with NG911 call routing and location validation functions and will not be accepted into the NG911 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 NG911 Core Service provider but will not prevent the data from being provisioned into the system.

Prior to and during transition to a NG911 system, quality control between the 911 GIS data and the E911 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 E911 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. Ultimately, the goal for NG911 is 98% accuracy for both the GIS data and the ALI to Road Centerlines synchronization.

8.1. Definitions of Commonly Used Quality Control Terms

8.1.1.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

8.1.2.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

8.1.3.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.

8.2. General Quality Control

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 PEMA GIS Data Model.
- *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 PEMA GIS Data Model, is missing.
- *Field values outside of domain:* Check to identify where field values are outside of the acceptable domain values as defined by the PEMA GIS Data Model.

8.3. Boundary Quality Control

Includes 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 gap:* Check to identify where gaps exist between polygons in each boundary feature class.
- *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.

8.4. Site/Structure Address Points Quality Control

- *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.

8.5. Road Centerlines Quality Control

- *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 does not meet length requirements:* Check to identify where the length of a road segment is less than 10 feet.
- *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.
- *Road centerline segment has incorrect line directions:* Check to identify where road segments are drawn in the opposite direction of addressing.
- *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 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.
- *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.
- *Road centerline outside Provisioning Boundary (Critical):* Check to identify where road segments exist outside of the Provisioning Boundary.

8.6. Site/Structure Address Points to Road Centerlines Quality Control

- *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.

Synchronization of ALI and MSAG to GIS Data

8.7. 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.

8.8. 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.

8.9. 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.

8.10. Quality Control Exceptions

Exceptions are flags at the feature level that notify QC checks to omit the feature 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. While there is no single specific process of implementing exceptions and the use of exception codes, the typical process is to add an exceptions field to each GIS data layer and populate with a defined code for each needed exception at the feature level. At the time of publication, exception codes and descriptions have not been developed for the Commonwealth of Pennsylvania.

9. Parsing Street Names into the PEMA GIS Data Model

Parsing street names into their appropriate Street Name elements usually is straightforward. Most confusion arises when populating the new Pre Modifier, Pre Type, Pre Type Separator, and Post Modifier elements. The following table provides examples of how Street Names should be parsed. Please refer to Section 5 Field Descriptions, Definitions and Domains for more information about each element. The NENA Next Generation 911 (NG911) United States Civic Location Data Exchange Format (CLDXF) Standard [5] defines the detailed civic location data elements needed for address data exchange. Review of the document is strongly recommended as it provides an in-depth discussion of address parsing.

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
				Broadway			
				Mason Dixon	Highway		
				Cobbs Creek	Parkway		
	North			Center	Avenue		
				North	Avenue		
	North			Union	Street		
				North Union ¹	Street		
				South Carolina ¹	Avenue		
	South			West End ¹	Boulevard		
West ²	South			4th	Street		
		United States Highway		22			
		State Route		301			
Old		County Road		40			
		Route		219	Bypass		
		Avenue		A			
Alternate	North	Avenue		B			
		Boulevard	of the	Allies			
		Avenue	of the	States			
		Lake	of the	Pines	Boulevard	South	
		Rue ³	des ³	Etoiles			
				Villa at the Woods ⁴			
				Old Lane	Circle		
				Main Street ⁵	Road		
				Main Street ⁵	Extension		
				State	Street	East	
				Maple	Lane	South	Extension
				Main	Street		Extended ⁶
				Lakeview	Drive		Fire Road 3
		Interstate		81			southbound ⁷

NOTES:

¹ When the Street Name is a place name, the directional is included in the Street Name field and not parsed as a Street Name Pre Directional (requires local knowledge as to whether the directional is part of a place name).

² When two directional words occur together before the Street Name, the first occurrence is parsed as a Street Name Pre Modifier and the second is parsed as a Street Name Pre Directional.

³ Foreign language (e.g. French, Spanish, Italian) equivalents of Street Name Pre Types and Street Name Pre Type Separators are parsed into these fields and not in the Street Name field.

⁴ Since “Villa” is not a valid Street Name Pre Type and is not in USPS Publication 28, Appendix C1 [4], it is included in the Street Name field.

⁵ When two Street Name Post Types occur after the Street Name, the first occurrence is included in the Street Name field and the second is parsed as a Street Name Post Type.

⁶ Since “Extended” is not in USPS Publication 28, Appendix C1 [4], it is parsed as a Street Name Post Modifier.

⁷ Traveling direction on divided roads is parsed as a Street Name Post Modifier (in lowercase).

NENA maintains a Registry of known values for Street Name Pre Types and Street Name Post Types associated with a Street Name at <http://technet.nena.org/nrs/registry/StreetNamePreTypesAndStreetNamePostTypes.xml>. NENA also maintains a Registry of known values for Street Name Pre Type Separators associated with a Street Name at <http://technet.nena.org/nrs/registry/StreetNamePreTypeSeparators.xml>. When parsing addresses into these fields, confirm the parsed values already exist in the registries. Valid values that do not exist can be added to the NENA registries by request with appropriate supporting documentation. Contact the PEMA NG911 GIS Working Group who will coordinate all requests to add new valid values that exist in Pennsylvania to the NENA registries.

10. Recommendations and Best Practices for GIS Data Development & Maintenance

10.1. Road Centerlines Best Practices

10.1.1. General Best Practices

Road alignments should be compiled from current orthoimagery or a high-quality data collection device and attributed using source data with reliable attribution. The accuracy of the Road Centerlines dataset is only as good as the least accurate data source or data collection device that was used to create it.

In general, one should first reference Section 8, Quality Control of Next Generation 911 GIS Data, in this Best Practices document. The QC checks will provide valuable information into how the validation software looks at the Road Centerlines and the types of checks that should be performed to ensure consistent, valid data throughout the dataset. Ensuring that the data meets the requirements of the QC process and Synchronization of ALI and MSAG to the Road Centerlines will eliminate unnecessary rework and ensure the data meets the required specifications for NG911 call routing and location validation.

10.1.2. Road Centerline Segmentation

Road segmentation is an important part of the data development process for NG911 Road Centerlines data. There are different ways that segmentation may need to be done, and these may be based on the requirements of the local CAD vendor. In most cases, roads should not be split at driveways, unnamed roads, or parking lots. Roads should always be split in the following cases:

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

In some cases, a PSAP Boundary is different than a County Boundary due to the agreed upon response areas. Road centerlines must be split at the PSAP boundary and the County Boundary, regardless of how close they may be located to each other.

Roads Centerlines must also be split where changes occur for any other attributes carried on the Road Centerlines. Figure 10-2 below shows Baun Lane split at the County line, even though the Somerset County PSAP Boundary includes the entire road. Note that no gaps or overlaps exist in the address ranges.

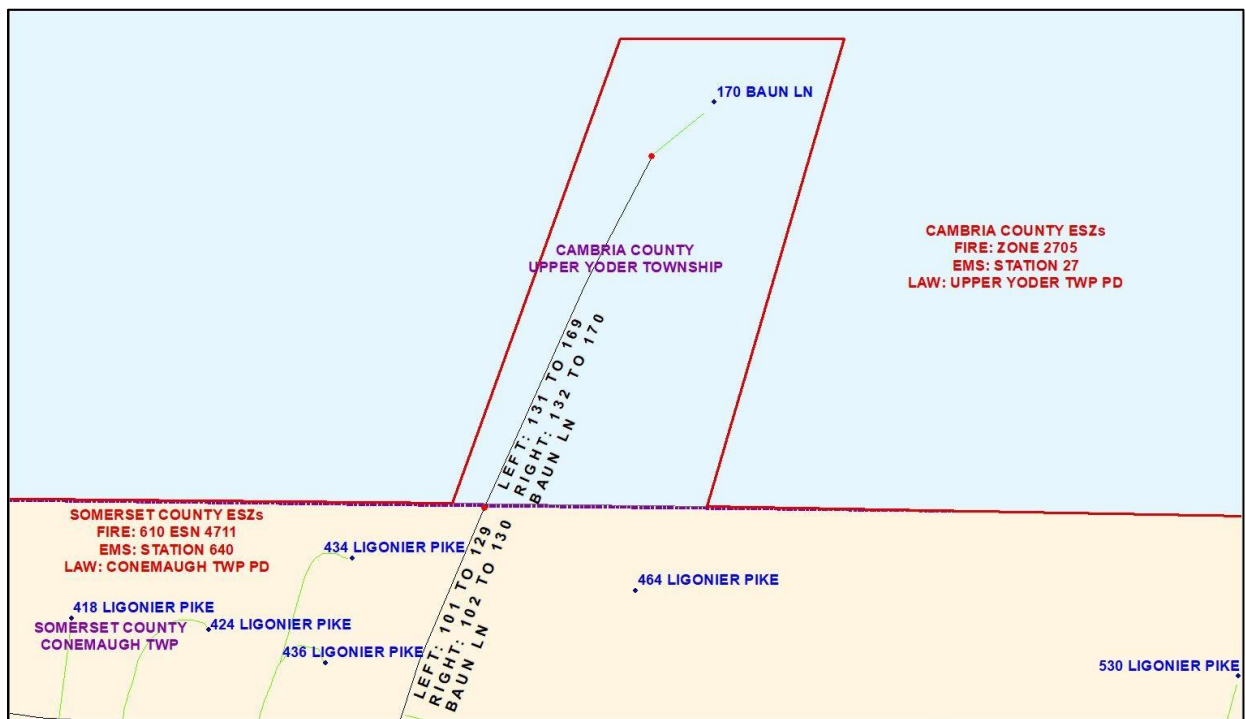


Figure 10-2 Example of Road Centerlines segmentation at county boundary where road is in one PSAP

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 incorporated municipality as they usually have responsibility for naming roads in their jurisdiction.

Road Centerlines topology should be checked against boundary datasets to ensure that Road Centerlines snap to the boundaries. Some Road Centerlines follow 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 Commonwealth of Pennsylvania should already be topologically correct for NG911, border states are likely to have a conflict with boundary delineation. Pennsylvania borders the following states:

- New York
- New Jersey
- Delaware
- Maryland
- West Virginia
- Ohio

Currently, New York and Pennsylvania have agreed on a contiguous boundary. There are other ongoing discussions being held with all other surrounding states with a goal to finalize the discussion by the end of 2019. 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. If there are no official State boundary layers on the PASDA website, PEMA should be contacted directly for guidance.

10.1.3. Naming and Addressing

Address Ranges

Currently, some jurisdictions utilize 0-0 address ranges or start with zero. In general, 0-0 address ranges should be avoided as NENA recommends that zero not be used to indicate there is no Address Number. Instead, it is recommended that potential ranges be developed on roads where no structures would be built.

There are several reasons a road may start at 0, or have a 0-0 range. They are (and may not be limited to):

- Local CAD software requires it
- A street segment has an address of “½” so the address range must start at 0

During ETL of the County dataset to the State NG911 dataset, 0-0 ranges will be changed to null.

Interstates/Highways

Interstates and highways should be named according to their jurisdiction. Traveling direction (e.g. northbound, southbound, eastbound, westbound) should be used and should be placed in the Post Modifier field in lowercase.

Example: I80 EB and I80 WB

Street Name Pre Type:	Interstate
Street Name:	80
Street Name Post Modifier:	eastbound

Street Name Pre Type:	Interstate
Street Name:	80
Street Name Post Modifier:	westbound

Local telecommunication providers (Telco) may have specific requirements for existing MSAG and ALI data. For example, they may require data be present in the Post Type field (no null or blank values) or require abbreviations be used for the Street Name Post Type. Local jurisdictions should check with their local Telco on requirements. PEMA will ETL any abbreviations used in the Street Name Post Type field into fully spelled values as long as the metadata provided with the local dataset indicated that the field included abbreviations.

Interchanges/Ramps

Ramp and interchange naming can be a particularly challenging. It is strongly recommended that as much information as possible is put into the ramp names, including the FROM road, TO road, traveling direction, and exit number as appropriate. Ramps should be single segments.

The following ramp naming convention is recommended, with everything placed in the Street Name field:

<Ramp/Exit #> <FROM Street> <travel direction> to <TO Street> <travel direction>

Where:

- Ramp/Exit #: The text “Ramp” or “Exit <#>”

Note: If there is no exit number for ramps between an undivided road and a divided road, then “On Ramp” and “Off Ramp” are preferred to the generic “Ramp” designation.

- FROM Street: Route/Street Name that the ramp is coming off of
- TO Street: Route/Street Name that the ramp goes to
- Travel direction: *northbound*, *southbound*, *eastbound*, *westbound* traveling direction, in lower case

Due to the 60 character field width limitation of the Street Name field, the following abbreviations should be used with the numbered routes for ramp names ONLY:

- I – Interstate
- US – United States Highway, United States Route
- PA – State Highway, State Route
- CR – County Highway, County Route, County Road
- TWP – Township Road

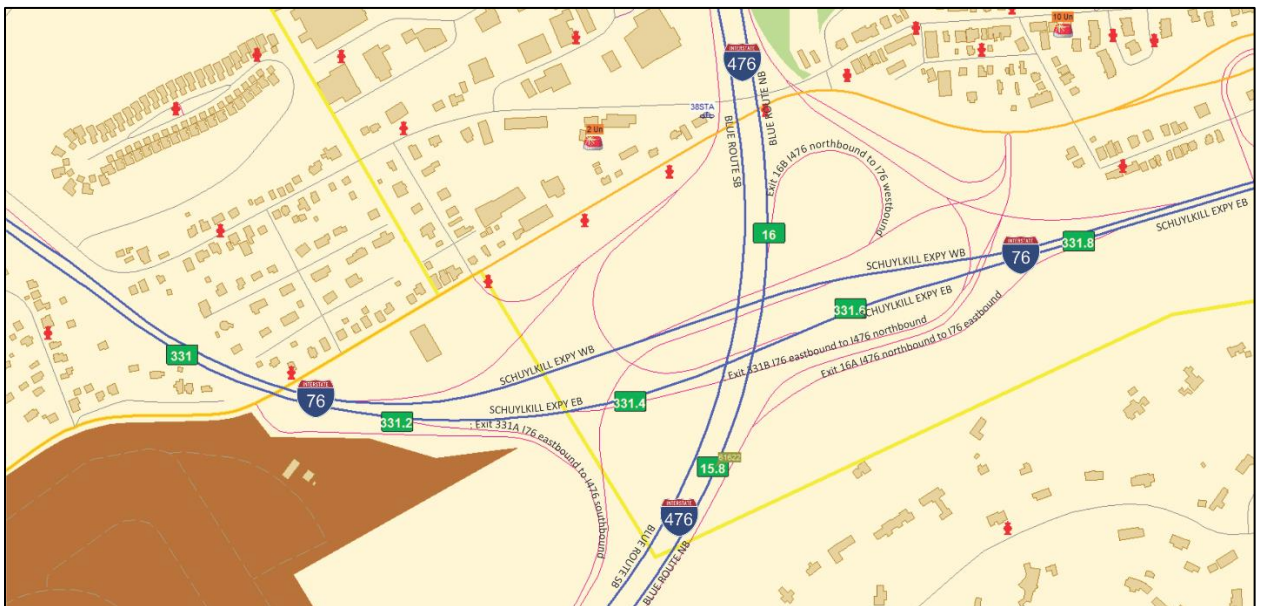


Figure 10-3 Example of ramp names in Montgomery County

Example ramp names as shown in Figure 10-3 in the recommended ramp naming convention:

- **Street Name:** Exit 16A I476 northbound to I76 eastbound
- **Street Name:** Exit 16B I476 northbound to I76 westbound
- **Street Name:** Exit 331A I76 eastbound to I476 southbound
- **Street Name:** Exit 331B I76 eastbound to I476 northbound

Rest Areas/Service Plazas

Rest areas and service plazas can be isolated (entry only from a limited access highway) or accessible via a local road. The main service roads in and out of an isolated service plaza should be treated as driveways. Local roads which provide access to a rest area/service plaza should be treated as any other local road.

Divided Highway Connector Roads

Divided highways frequently include connector roads intended for use by emergency vehicles and maintenance vehicles to quickly get to the other side of the road without having to go to an exit or interchange. For the purposes of consistency, these roads should be named “Crossover”.

10.1.4. Overlapping Routes and Multiple Street Names

Street names are an important part of any NG911 system. However, in many cases, roads can be known by several different names, especially by different agencies. Local jurisdictions may assign a local name for a road, while PennDOT may assign a specific state route number to that same road segment. To further complicate the street name issue, the road may also have a US route number, a second state route number, a county route number, or another name for that same road segment.

These multiple street names are all important in the NG911 system. However, they cannot currently all be captured in the PEMA Data Model. In the future, it is expected that an Alias Street Name table will be built which will allow an unlimited number of alias street names to be cross referenced from the road centerline geometry to a related table which will allow storage of all the different street names.

Within the current PEMA Data Model, the Complete Alias Street Name attribute field has been developed to allow for one additional alias street name. This is a conditional field that must be populated if an alias street name exists.

The official 911 street name for a road is always populated in the Street Name elements. Sometimes it may be a local name (e.g. Main Street) and sometimes it may be a route number (e.g. United States Route 11). In order to best effectively utilize the Street Name and Complete Alias Street Name fields, one should use the following hierarchy to determine how the fields should be populated:

- Local 911 Street Name (highest priority)
- Interstate Name
- Interstate Business Route name
- US Route name
- US Business, Alternate, or Truck Route name
- State Route name
- State Business, Alternate, or Truck Route name
- County Route Name
- Other local or memorial street name (lowest priority)

In cases of concurrent routes with no local street name:

The highest jurisdiction route would be put into the Street Name elements, and the lower jurisdiction route would go into the Complete Alias Street Name.

Example: US Route 6 and PA 660 in Wellsboro, PA overlap but there is no local street name.

Street Name Pre Type:	United States Route
Street Name:	6
Complete Alias Street Name:	State Route 660

When multiple routes with the same jurisdiction overlap but there is no local street name:

The lowest route number would go into the Street Name elements and the next higher route number would go into the Complete Alias Street Name. Any additional route numbers would not be represented in the data at this time. However, in the future all alias route numbers would be placed in the Complete Alias Street Name Table.

Example: PA 85, PA 210 & PA 954 in Beyer, PA all overlap but there is no local street name.

Street Name Pre Type:	State Route
Street Name:	85
Complete Alias Street Name:	State Route 210

If routes overlap a local name:

The local street name would go into the Street Name elements, and the route number with the highest jurisdiction would go into the Complete Alias Street Name.

Example: US Route 30 in Gettysburg, PA has a local jurisdiction street name of York Street but it is also known locally as Lincoln Highway.

Street Name:	York
Street Name Post Type:	Street
Complete Alias Street Name:	United States Route 30

10.1.5. Roundabouts and Traffic Circles/Squares

Naming of roundabouts, traffic circles, and traffic squares can be complicated, particularly when routes overlap the official 911 street names or when street names end or change at the circle. Many of the street naming concepts for overlapping routes, divided highway connector roads, and multiple street names that are discussed above in Section 10.1.4 Overlapping Routes and Multiple Street Names can be applied to roundabouts and traffic circles.

If two roads intersect at a roundabout or traffic circle:

Populate the Street Name elements with the official 911 street name on those segments in the circle that one would traverse to get to the other side of the circle. In situations where a segment in the circle would be traversed by both intersecting roads, populate the Street Name elements with the street name of the road with the higher jurisdiction, following the same hierarchy as established above in Section 10.1.4 Overlapping Routes and Multiple Street Names. Populate the Complete Alias Street name on segments in the circle traversed by both intersecting roads with the street name of the road with the lower jurisdiction.

The Complete Alias Street Name for segments in the circle traversed by only one intersecting road would be populated with the name of an overlapping route or other valid alias street name, following the same

hierarchy as established above in Section 10.1.4 Overlapping Routes and Multiple Street Names. However, if there is no overlapping route or alias street name, populate the Complete Alias Street Name with the Street Name of the intersecting road, adding “Connector” as a Post Modifier on the segments that the intersecting road does not traverse through to get to the other side of the circle.

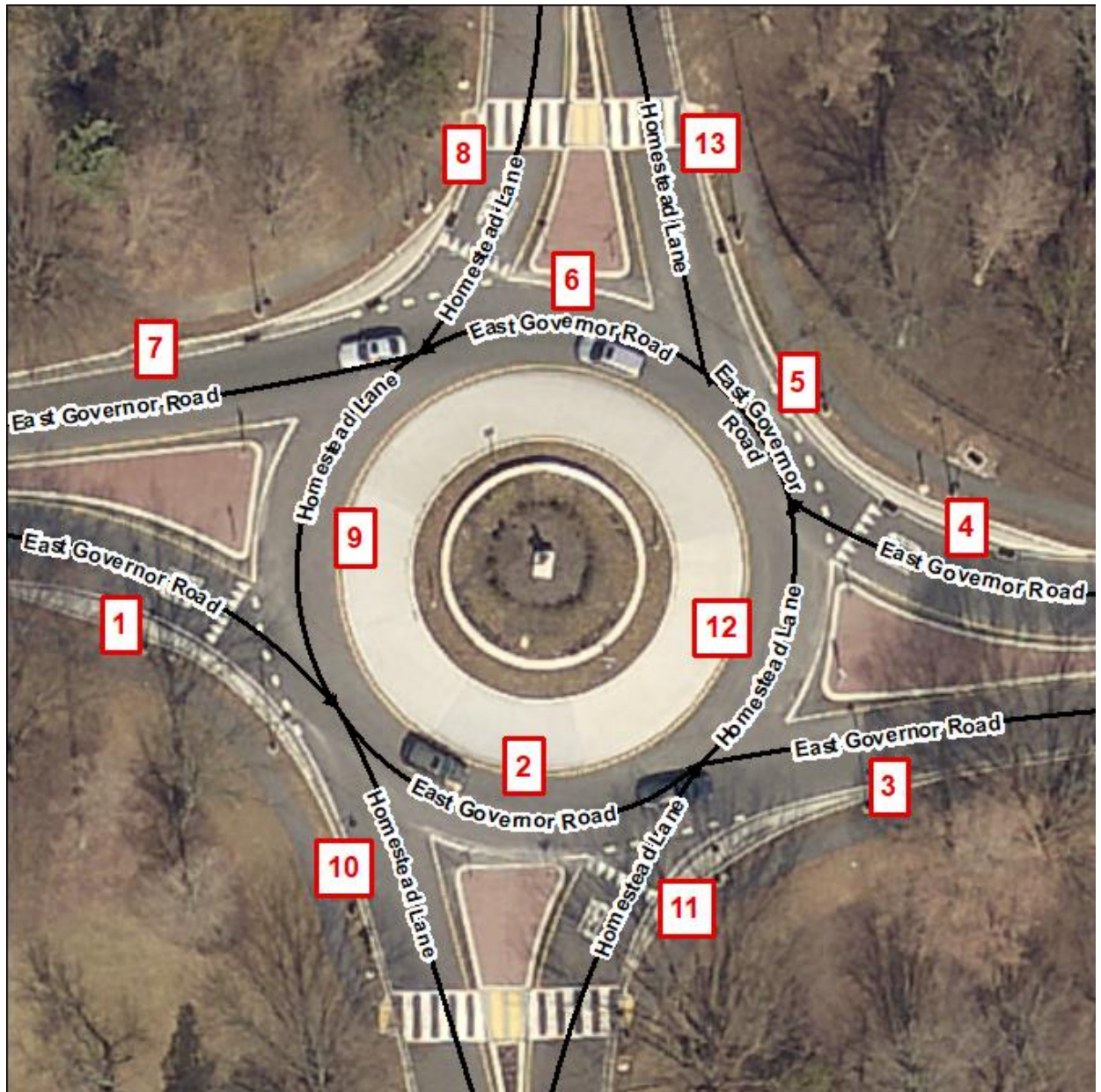


Figure 10-4 Example roundabout with two intersecting roads

For example, in Figure 10-4 above, East Governor Road runs east-west through the roundabout on segments 2, 5 and 6 and Homestead Lane runs north-south through the roundabout on segments 9, 12, and 5. Since Governor Road is a higher jurisdiction (US Route) than Homestead Lane (local), the Street Name elements for segment 5 would be populated with Governor Road and Homestead Lane would be the Complete Alias Street Name.

The Complete Alias Street Name for segments 2 and 6 would be populated with United States Route 322, which overlaps East Governor Road. Since Homestead Lane has no alias street name, the Complete Alias Street Name for segments 9 and 12 would be populated with East Governor Road Connector. Table 10-1 below provides the recommended population of the Street Name elements and the Complete Alias Street Name for all segments in Figure 10-4.

Segment #	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	Complete Alias Street Name
1		East			Governor	Road			United States Route 322
2		East			Governor	Road			United States Route 322
3		East			Governor	Road			United States Route 322
4		East			Governor	Road			United States Route 322
5		East			Governor	Road			Homestead Lane
6		East			Governor	Road			United States Route 322
7		East			Governor	Road			United States Route 322
8					Homestead	Lane			
9					Homestead	Lane			East Governor Road Connector
10					Homestead	Lane			
11					Homestead	Lane			
12					Homestead	Lane			East Governor Road Connector
13					Homestead	Lane			

Table 10-1 Population of Street Names in Figure 10-4

If a street name ends at a roundabout or traffic circle:

Do not populate the Street Name elements with the ending street name on any segments in the circle. Instead, populate the Street Name elements on all segments in the circle with the Street Name of the intersecting road, adding “Connector” as a Post Modifier on the segments that the intersecting road does not traverse through to get to the other side of the circle.

For routing purposes, populate the Complete Alias Street Name with the ending street name on those segments in the circle that one would traverse to get to the road on the other side of the circle. Do not populate the Complete Alias Street Name with the ending street name on any segments in the circle if there is no road on the other side of the circle.

For example, in Figure 10-5 below, Blue Mountain Parkway and Pennsylvania Avenue both end at the roundabout where they intersect with Linglestown Road. The Street Name elements for segments 2, 3, and 7 would be populated with Linglestown Road since it runs east-west through the circle and these are the primary segments one would traverse through the circle. The Street Name elements for segments 9 and 10 in the circle would be populated with Linglestown Road Connector.

For routing purposes, the Complete Alias Street Name for segment 9 would be populated with Blue Mountain Parkway and the Complete Alias Street Name for segments 3, 10, and 6 would be populated with Pennsylvania Avenue. Since Linglestown Road is also known as State Route 39, the Complete Alias Street Name for segments 2 and 7 would be populated with State Route 39. Table 10-2 below provides the recommended population of the Street Name elements and the Complete Alias Street Name for all segments in Figure 10-5.

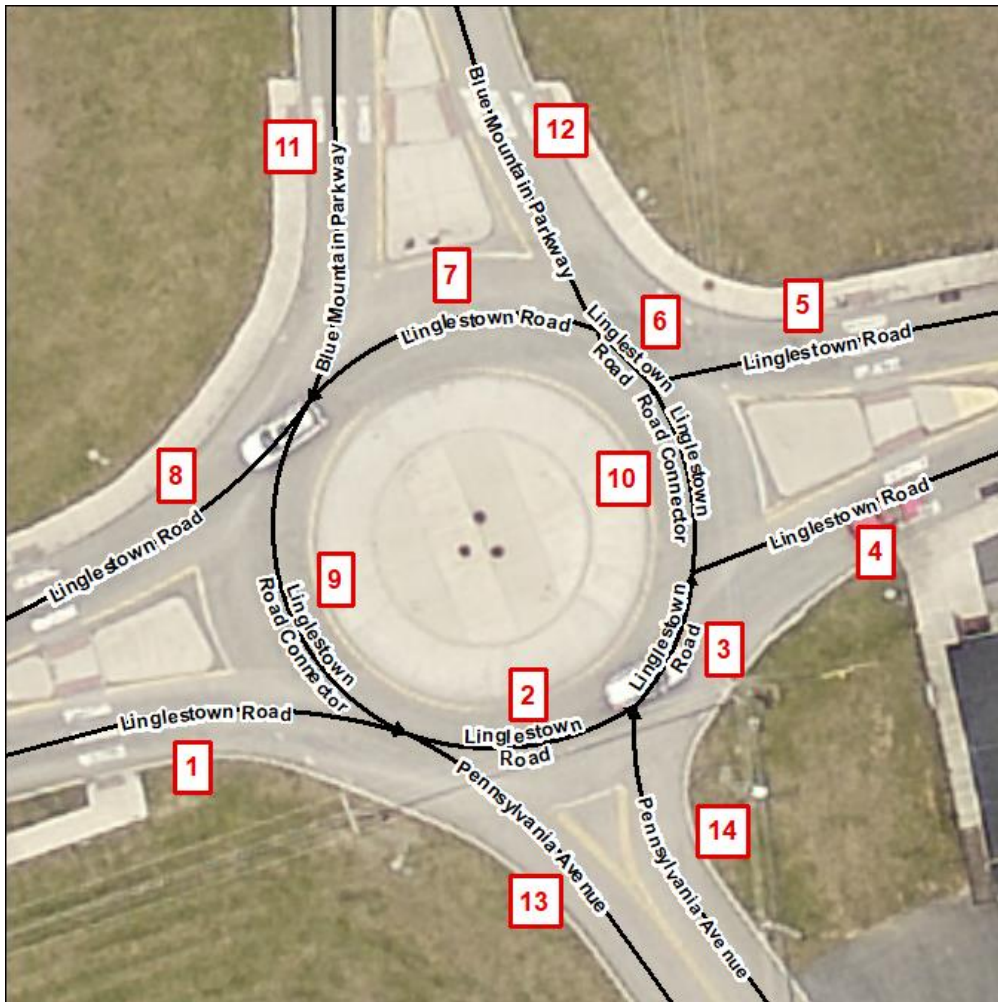


Figure 10-5 Example with street names ending at the roundabout

Segment #	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	Complete Alias Street Name
1					Linglestown	Road			State Route 39
2					Linglestown	Road			State Route 39
3					Linglestown	Road			Pennsylvania Avenue
4					Linglestown	Road			State Route 39
5					Linglestown	Road			State Route 39
6					Linglestown	Road			Pennsylvania Avenue
7					Linglestown	Road			State Route 39
8					Linglestown	Road			State Route 39
9					Linglestown	Road		Connector	Blue Mountain Parkway
10					Linglestown	Road		Connector	Pennsylvania Avenue
11					Blue Mountain	Parkway			
12					Blue Mountain	Parkway			
13					Pennsylvania	Avenue			
14					Pennsylvania	Avenue			

Table 10-2 Population of Street Names in Figure 10-5

If a traffic circle has its own 911 street name, different than the intersecting roads:

Populate the Street Name elements with the traffic circle's 911 street name on all segments in the circle. If the intersecting roads continue through the traffic circle, populate the Complete Alias Street name with the street name of the road with the higher jurisdiction, following the same hierarchy as established above in Section 10.1.4 Overlapping Routes and Multiple Street Names.

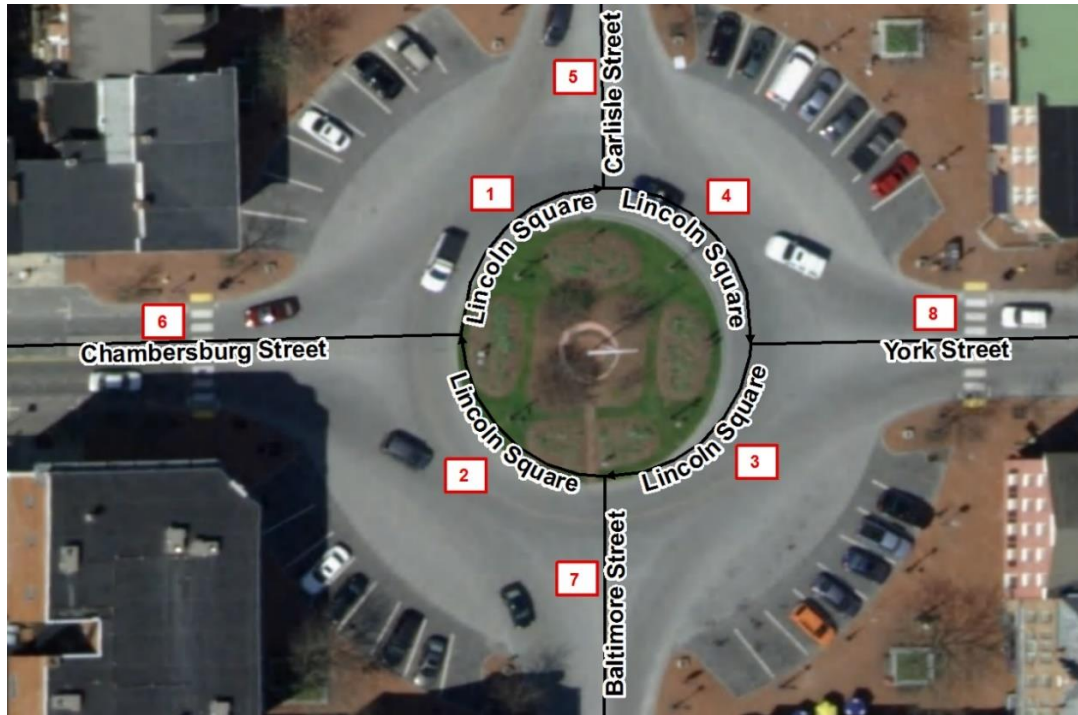


Figure 10-6 Example traffic circle with its own 911 street name

For example, in Figure 10-6 above, the traffic circle has an official 911 street name of Lincoln Square. Therefore, the Street Name elements for segments 1, 2, 3, and 4 would be populated with Lincoln Square. The street names of all intersecting roads end at the traffic circle, so none are populated as the Complete Alias Street Name.

Since United States Route 30 overlaps the east-west roads, the Complete Alias Street Name for segments 1, 2, 3, and 4 would be populated with United States Route 30. Table 10-3 below provides the recommended population of the Street Name elements and the Complete Alias Street Name for all segments in Figure 10-6.

Segment #	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	Complete Alias Street Name
1					Lincoln	Square			United States Route 30
2					Lincoln	Square			United States Route 30
3					Lincoln	Square			United States Route 30
4					Lincoln	Square			United States Route 30
5					Carlisle	Street			United States Route 15 Business
6					Chambersburg	Street			United States Route 30
7					Baltimore	Street			United States Route 15 Business
8					York	Street			United States Route 30

Table 10-3 Population of Street Names in Figure 10-6

10.1.6. Military Bases

Military bases may or may not have their own PSAP and responsibility for emergency services. In most cases, the military facility will share street name information but will not provide address specific information. It is recommended that the local 911 jurisdiction reach out to the military facility and work directly with them to obtain the most current information the facility is willing to provide.

10.1.7. Populating Validation Right/Validation Left

The intent of the Validation Right and Validation Left fields is to identify areas where only the Site/Structure Address Points should be used by the LVF for validation purposes and any address ranges on that side of the road segment should be ignored. Some locations have “grandfathered” addresses which are out of sequence with the Road Centerlines or may have parity issues (odd address on the even side of the road).

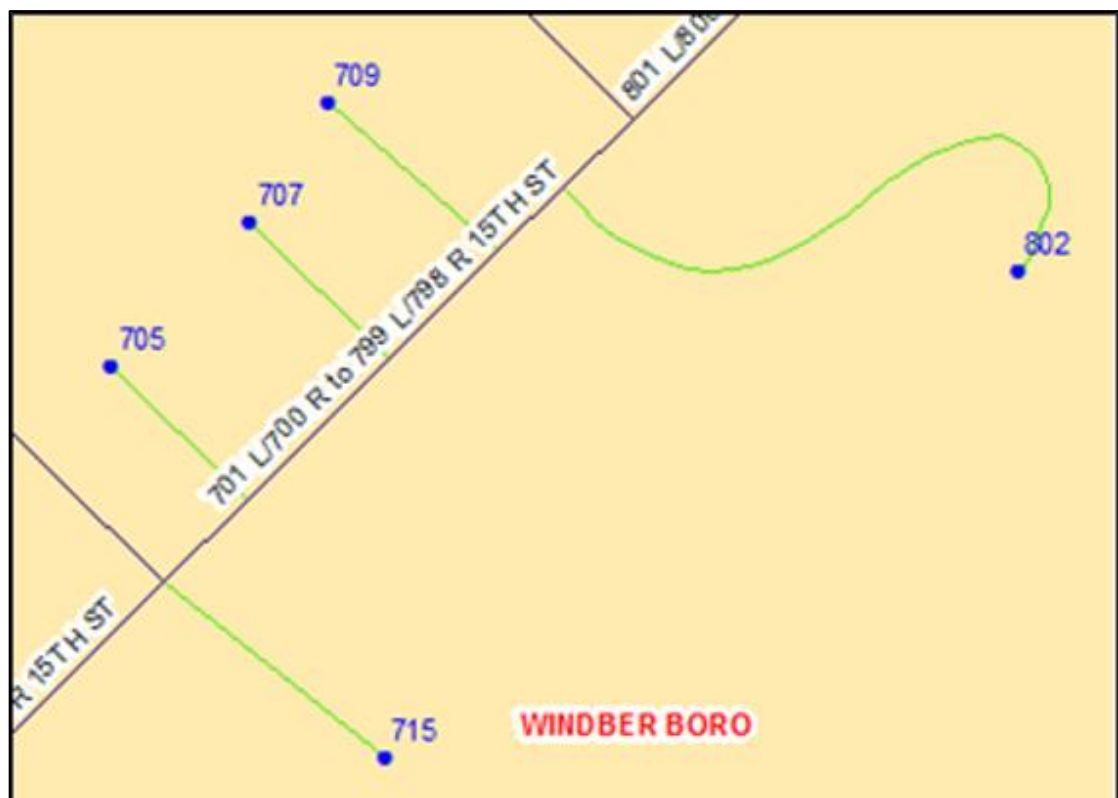


Figure 10-7 Example where populating Validation Left is recommended

In Figure 10-7, the odd address of 715 is on the right side of 15th Street which has an address range of 700-798, whereas odd addresses 705, 707, and 709 are on the left side of 15th Street which has an address range of 701-799. It is recommended that Validation Left on the segment associated with the odd addresses be populated with “N”, indicating that the road segment on that side NOT be used for LVF validation since it would validate 715, but 715 does not exist on that side of the segment. As long as no even addresses in the 700-798 range exist elsewhere, Validation Right could be populated with “Y”, indicating that side of the road segment CAN be used for LVF validation.

10.2. Site/Structure Address Points Best Practices

10.2.1. General Best Practices

Address point placement should be based on an authoritative list of addresses, current orthoimagery, and source data with reliable attribution. The accuracy of the Site/Structure Address Points dataset is only as good as the least accurate data source or data collection device that was used to create it.

In general, one should first reference Section 8, Quality Control of Next Generation 911 GIS Data, in this Best Practices document. The QC checks will provide valuable information into how the validation software looks at the Site/Structure Address Points and the types of checks that should be performed to ensure consistent, valid data throughout the dataset. Ensuring that the data meets the requirements of the QC process and the ALI to Site/Structure Address Points synchronization will eliminate unnecessary rework and ensure the data meets the required specifications for NG911 call routing and location validation.

10.2.2. Address Point Placement

The NENA Information Document for Development of Site/Structure Address Point Data for 911 [6] provides detailed guidelines on address point placement and subaddress data development. Review of the document is strongly recommended as it provides an in-depth discussion of five address point placement methodologies that meet NG911 call routing and location validation requirements. These include:

- Placement of an Address Point Based on Geocoding off of Road Centerlines
- Placement of an Address Point Based on a Parcel
- Placement of an Address Point Based on a Site
- Placement of an Address Point Based on a Structure(s)
- Placement of an Address Point Based on Property Access

The document also includes a section on Address Point Placement for Subaddresses (specific locations within structures, sites, or within a group of structures and/or sites). As such, NENA-INF-014 should be considered a companion document to this Best Practices document.

Address point placement is especially critical for NG911 call routing and dispatch. During NG911 call routing, an address point is spatially compared to the PSAP Boundary to determine which PSAP to send the call. It is also spatially compared to the Emergency Services Boundaries to provide the call taker with the recommended Law, Fire and EMS providers that should respond to the call. The address point must fall within the correct PSAP Boundary or valuable time will be lost for call transfer to the correct PSAP.

Address Point versus Access Point

Address points are typically placed on the addressed feature (e.g. structure, site). However, there are some situations where an access point may be preferred. An access point is the point of access to the addressed feature and may represent a driveway, gate, an entrance to a building containing multiple addresses, or other entrance. The access point can be useful for directing emergency responders to a structure that may be located far from the road it is addressed off of, an addressed location that has multiple entrances to the property, or a building with multiple entrances where each entrance serves multiple different addresses. In such cases, it may be useful to include an address point and an access point.

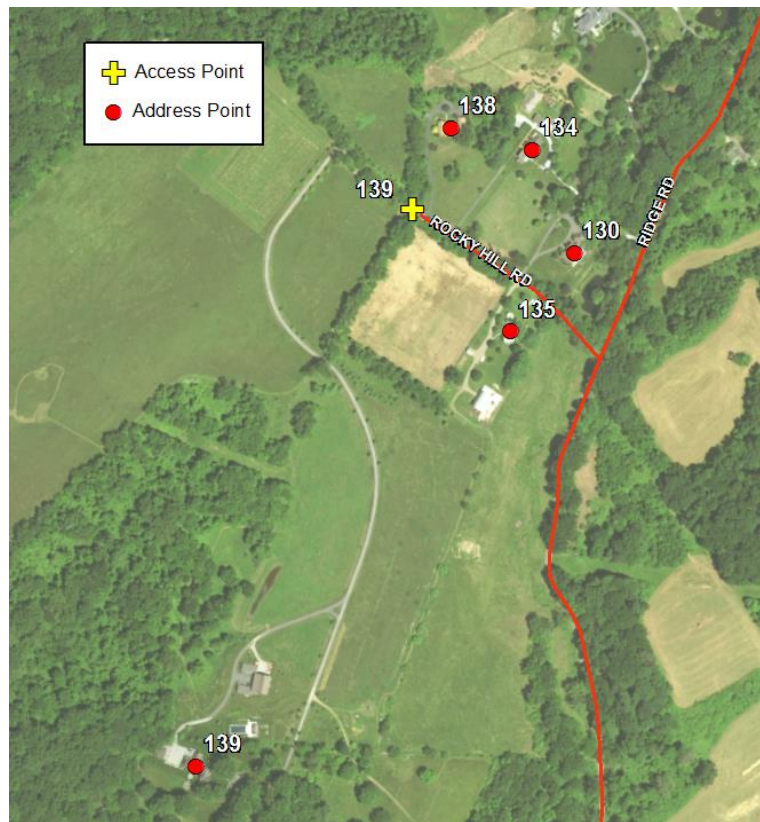


Figure 10-8 Example where including both an Access Point and Address Point is beneficial

If both an access point and address point are shown, population of the Placement Method attribute field is strongly recommended to clearly differentiate the two points. It also provides a means to easily remove one or the other if a 911 application is unable to differentiate between them. See NENA-INF-014, Section 3.4.5 Placement of an Address Point Based on Property Access, for more information.

10.2.3. Address Point Placement for Special Cases

In most cases, address point placement is straightforward with points placed on the center of a structure or site. Large structures or sites, particularly those with multiple entry points, may benefit by having the address point placed at the primary entrance to the structure or site. However, there are some situations that may require a little more research or even field visits to determine the correct placement location.

Multiple Addresses or Units within a Single Structure

Shopping centers, commercial buildings, condominiums, and duplexes contain multiple businesses or residences that are located within the same structure. In some cases, the individual units have been addressed with their own individual address number but in many situations, they share the same address number and are only differentiated by subaddress information (e.g. apartment, unit, suite, etc.). In both situations, address point placement is usually based on whether the units share an entrance to the building or have their own separate entrance.

Generally, address points should be placed at or near each addressed unit's building entrance. When addressed units share a common entrance, typical practice is to stack the address points at the shared building entrance. Address points should fall within the building footprint.



Figure 10-9 Example showing multiple addresses within a single structure, all with separate entrances

Large buildings may sometimes have multiple entrances with elevators located nearby that only serve specific floors. In these situations, it is important to make sure that address points are stacked at the building entrance associated with the elevator that serves their floor so that responders are directed to the correct entrance.

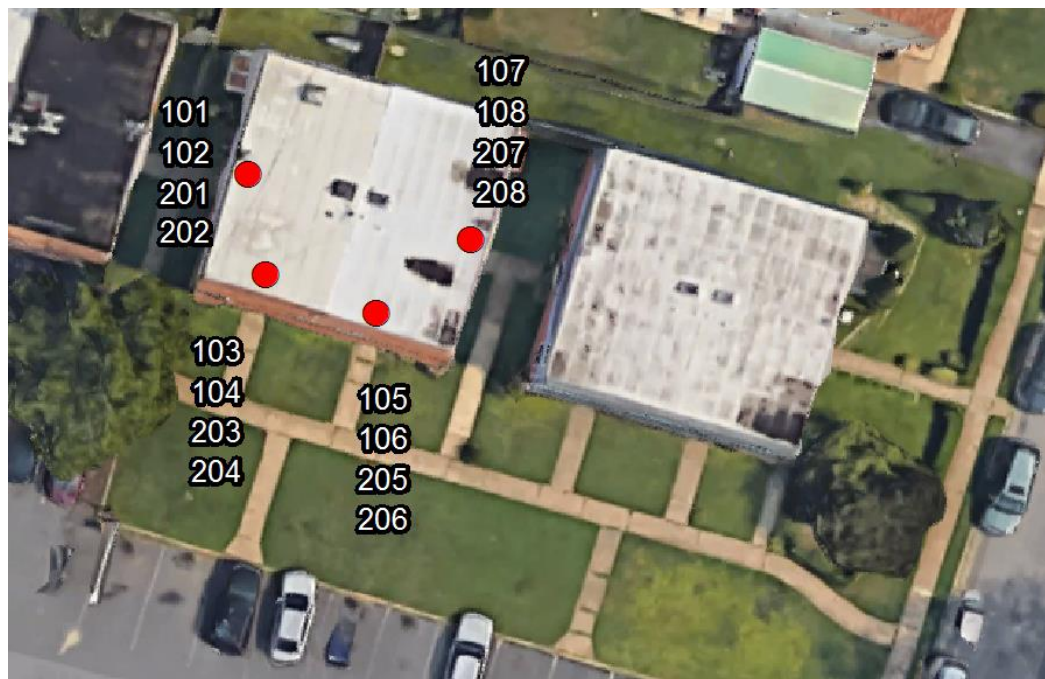


Figure 10-10 Example showing multiple addresses within a single structure, sharing a common entrance

Some 911 applications and CAD software have difficulty with subaddresses. To alleviate this issue, an address point that has only the structure address and no subaddress information can be created and placed at the structure's primary entrance. The address points with subaddress information can then be stacked on it. If subaddresses are not usable in an application, address points with populated subaddress fields can then be easily extracted from the file while still allowing other applications full use of the address points with subaddress information.

In rare situations, a structure may be split by a PSAP Boundary or Emergency Service Boundary. In these situations, it is critical that the address points are placed within the corresponding PSAP and Emergency Services Boundaries that services the address. This may not be at the structure entrance.

Multiple Structures and/or Sites that Share the Same Address

Some properties contain multiple structures and/or sites that share the same address and are only differentiated by a number, name, or other unique identifier (e.g. medical campus, mobile home park, correctional facility, campground).

At a minimum, each structure and/or site should have its own address point with subaddress fields populated so that responders can be sent to the correct location. This is especially critical when the property is split by a PSAP Boundary or Emergency Service Boundary. Points must be placed so that calls can be routed to the correct PSAP and the appropriate emergency service providers can be identified.



Figure 10-11 Example where structures share same address but are differentiated by building number

To assist responders, it is often helpful to create an address point that contains only the property address (no subaddress information) and place the address point at the primary access to the property, particularly if the property is very large. If subaddress information is known but one is not able to identify the specific structure and/or site it is associated with, the address points with subaddress information can be stacked on this access point.

Transient Structures

Mobile home parks, seasonal camps, and other addressed locations often have temporary structures that can be moved to a different location on the addressed property or be removed entirely from the property. For large properties where the temporary structure is moved frequently, the address point should be placed at the access to the property.

For small areas or areas where the temporary structure is usually located when it is on the property, the address point can be placed where the transient structure would normally be located. To minimize maintenance of the Placement Method attribute field for such situations, populate Placement Method as “Site” if the address contains subaddress information (e.g. Lot #, Unit #, etc.) and “Parcel” if there is only one address for the property. This avoids having to constantly update the record when the temporary structure is removed from the property.

10.2.4. Named Sites and Structures

Currently, named locations in some 911 systems are stored in a common places or landmarks layer rather than in an address points GIS dataset, even if the location is assigned an address. In NG911, these locations should all be represented as address points in the Site/Structure Address Points dataset with the Complete Landmark Name attribute field populated with the feature’s name

The Address Number and Street Name fields in the Site/Structure Address Points are conditional elements, meaning if an address number or street name exists for a location, it must be populated. That is why landmarks that do not have a civic address can still be represented as an address point in the Site/Structure Address Points dataset. They just need to have their Complete Landmark Name field populated.

10.2.5. Military Bases

Military bases may or may not have their own PSAP and responsibility for emergency services. In most cases, the military facility will share street name information with the local 911 jurisdiction but will not provide address specific information. It is recommended that the local 911 jurisdiction reach out to the military facility and work directly with them to obtain the most current information the facility is willing to provide. Some facilities may share their address information but restrict usage for 911 operations only, not allowing the data to be publicly shared. Local 911 entities having difficulties obtaining address information should reach out to PEMA for assistance.

10.2.6. Populating Address Number Suffix

When creating new addresses, use of the Address Number Suffix field should be avoided. Instead, it is recommended that the Unit field be populated with “Apartment #” or “Unit #” (for residences) and “Suite #” (for businesses). Existing addresses with a valid Address Number Suffix must still populate this field as described in Section 5.2.6 in this document.

10.2.7. Populating Parcel Identifier

This is a new, optional field that does not exist in the NENA Standard for NG911 GIS Data Model [2] but was added to the PEMA GIS Data Model to be able to link to local parcel databases for data analysis purposes. Population of Parcel Identifier is generally straightforward with the parcel ID, Uniform Parcel Identifier (UPI), or another unique parcel identifier assigned based on the parcel it is located within. In the future, the PEMA NG911 GIS Working Group will develop guidance for populating this attribute. Until then, users should note the following:

- Multiple address points on the same parcel will carry the same Parcel Identifier value. Counties that have a “point card” for each structure could concatenate the point card and parcel ID to generate a unique Parcel Identifier. However, subaddresses within the same structure would still carry the same Parcel Identifier.
- Addressed structures on leaseholds (e.g. privately-owned cabins on state land, wind turbines, etc.) can be populated with the parcel ID of the parcel they are located on. This could be useful for future damage assessment purposes.
- Some buildings may fall into two (or more) separate parcels. The PEMA NG911 GIS Working Group will provide guidance for this in a future version of this document.

11. Phased Approach for NG911 GIS Data Development and Maintenance

Creating and preparing Road Centerlines and Site/Structure Address Points for use in NG911 will take time and can initially seem overwhelming. It is recommended that these datasets be created and improved in an incremental, phased approach. Prioritizing the data improvement tasks will result in data that can be used immediately in existing 911 systems and over time in NG911 systems. The recommended steps are:

1. Migrate existing required NG911 GIS data into the PEMA NG911 Data Model (required to provision data into an NG911 system).
2. Resolve all identified critical errors found during Quality Control checks (records with critical errors will not be provisioned into an NG911 system).
3. Synchronize ALI and MSAG to the GIS data to achieve at least 98% accuracy.
4. For counties that do not yet have a Site/Structure Address Points dataset, create primary address points in the PEMA NG911 Data Model (subaddresses are not required for call routing to function properly), resolve critical errors, and perform the ALI to Site/Structure Address Points Synchronization.
5. Resolve errors found during General Quality Control checks related to Field Values being outside of the domain.
6. Spatially improve the alignment of Road Centerlines using current orthoimagery
7. Resolve errors found during Quality Control checks related to segments crossing a boundary layer.
8. Resolve errors found during Quality Control checks related to segments not snapped to adjacent segments.
9. Spatially improve the location of Address Points, moving geocoded or parcel-based address points onto existing structures using current orthoimagery.
10. Create address points for each individual structure in areas where multiple structures share the same address, populating the Building, Unit, or Additional Location Information elements to ensure each address point has a unique address.
11. Resolve errors found during Site/Structure Address Points to Road Centerlines Quality Control checks.

12. Resolve the remaining errors found during the Quality Control checks.
13. Begin populating the Strongly Required attribute fields, taking into consideration that some of these fields are marked as potentially changing in a future update of another NENA standard or may be impacted by the 2022 vertical datum change.
14. Begin populating the Optional attribute fields, taking into consideration that some of these fields are also marked as potentially changing in a future update of another NENA standard.

12. Items Pending Future Work

The PEMA NG911 GIS Working Group has identified the following items that require additional research and/or development work:

- List of QC exception codes and descriptions
- Minimum metadata required with local data submission
- Metadata elements for the Statewide GIS data layers
- NGUID prefix values for other Emergency Service Boundary layers
- Identify existing ETL scripts and facilitate additional development and sharing of scripts to transform local GIS data into the PEMA GIS Data Model
- Transformation from local reference systems to WGS84
- Impacts the 2022 datum change may have on the GIS data
- Guidance for populating the Parcel Identifier field
- Guidance for creating Address Points representing Mile Markers/Mileposts, in particular for navigable waterways and river miles
- Discuss aligning PennDOT roads with NG911 centerlines
- Additional PA specific fields (e.g. concatenated street name)
- Monitoring the NENA NG911 GIS Data Model changes

13. Terminology

The following terms are a subset of terms defined in the NENA Master Glossary of 911 Terminology [7] document NENA-ADM-000.22-2018

Term or Abbreviation	Definition / Description
ALI (Automatic Location Identification)	The automatic display at the PSAP of the caller's telephone number, the address/location of the telephone and supplementary emergency services information of the location from which a call originates.
CAD (Computer Aided Dispatch)	A computer based system, which aids PSAP Telecommunicators by automating selected dispatching and record keeping activities.
CLDXF (Civic Location Data Exchange Format)	A set of data elements that describe detailed street address information.

Term or Abbreviation	Definition / Description
ECRF (Emergency Call Routing Function)	A functional element in an ESInet which is a LoST protocol server where location information (either civic address or geo-coordinates) and a Service URN serve as input to a mapping function that returns a URI used to route an emergency call toward the appropriate PSAP for the caller's location or towards a responder agency.
GCS (Geocode Service)	An NG9-1-1 service providing geocoding and reverse-geocoding.
GIS Data Steward	Data stewards are GIS professionals who are vested in the creation and maintenance of spatial data in their respective Jurisdictions, and as such are the logical source for authoritative foundational data for NG911 from all jurisdictions in the Commonwealth.
LoST (Location-to-Service Translation) Protocol	A protocol that takes location information and a Service URN and returns a URI. Used generally for location-based call routing. In NG911, used as the protocol for the ECRF and LVF.
LVF (Location Validation Function)	A functional element in an NGCS that is a LoST protocol server where civic location information is validated against the authoritative GIS database information. A civic address is considered valid if it can be located within the database uniquely, is suitable to provide an accurate route for an emergency call and adequate and specific enough to direct responders to the right location.
MCS (MSAG Conversion Service)	A web service providing conversion between PIDF-LO and MSAG data.
MDS (Mapping Data Service)	Provides a PSAP call taker with information showing the location of an out-of-area caller.
MSAG (Master Street Address Guide)	A database of street names and house number ranges within their associated communities defining Emergency Service Zones (ESZs) and their associated Emergency Service Numbers (ESNs) to enable proper routing of 9-1-1 calls.
NENA (National Emergency Number Association)	The National Emergency Number Association is a not-for-profit corporation established in 1982 to further the goal of "One Nation-One Number." NENA is a networking source and promotes research, planning and training. NENA strives to educate, set standards and provide certification programs, legislative representation and technical assistance for implementing and managing 9-1-1 systems. www.nena.org
NENA i3	NENA i3 introduces the concept of an Emergency Services IP network (ESInet), which is designed as an IP-based inter-network (network of networks) shared by all agencies which may be involved in any emergency.
NGCS (Next Generation 911 (NG911) Core Services)	The base set of services needed to process a 911 call on an ESInet. Includes the ESRP, ECRF, LVF, BCF, Bridge, Policy Store, Logging Services and typical IP services such as DNS and DHCP. The term NG911 Core Services includes the services and not the network on which they operate. See Emergency Services IP Network.
Registry	A registry is a single place for keeping valid data values associated with a specific XML data element.

Term or Abbreviation	Definition / Description
SI (Spatial Interface)	A standardized data replication interface used to publish GIS data to the functional elements that consume GIS data, such as the ECRF, LVF, Map Database Services, etc.
URI (Uniform Resource Identifier)	A URI is an identifier consisting of a sequence of characters matching the syntax rule that is named <URI> in RFC 3986. It enables uniform identification of resources via a set of naming schemes. A URI can be further classified as a locator, a name, or both. The term "Uniform Resource Locator" (URL) refers to the subset of URIs that, in addition to identifying a resource, provides a means of locating the resource by describing its primary access mechanism (e.g., its network "location"). The term "Uniform Resource Name" (URN) has been used historically to refer to both URIs under the "urn" scheme [RFC2141], which are required to remain globally unique and persistent even when the resource ceases to exist or becomes unavailable, and to any other URI with the properties of a name. An example of a URI that is neither a URL nor a URN is sip:psap@example.com .
WGS 84 (World Geodetic System 1984)	The World Geodetic System reference coordinate system used by the Global Positioning Systems and in cartography and navigation.

14. References

1. NENA Detailed Functional and Interface Standards for the NENA i3 Solution (NENA-STA-010)
https://cdn.ymaws.com/www.nena.org/resource/resmgr/standards/NENA-STA-010.2_i3_Architectu.pdf
2. NENA Standard for NG911 GIS Data Model (NENA-STA-006)
https://dev.nena.org/higherlogic/ws/public/download/13408/NENA-STA-006%20NG911%20GIS%20Data%20Model_SF.N.pdf
3. XML Schema Part 2: Datatypes Second Edition
<https://www.w3.org/TR/xmlschema-2>
4. Publication 28 - Postal Addressing Standards
<https://pe.usps.com/cpim/ftp/pubs/pub28/pub28.pdf>
5. NENA Next Generation 911 (NG911) United States Civic Location Data Exchange Format (CLDXF) Standard (NENA-STA-004)
https://cdn.ymaws.com/www.nena.org/resource/resmgr/Standards/NENA-STA-004.1.1-2014_CLDXF.pdf
6. NENA Information Document for Development of Site/Structure Address Point GIS Data for 911 (NENA-STA-014)
https://cdn.ymaws.com/www.nena.org/resource/resmgr/Standards/NENA-INF-014.1-2015_SSAP_INF.pdf
7. NENA Master Glossary of 911 Terminology (ADM-000.22-2018)
https://cdn.ymaws.com/www.nena.org/resource/resmgr/standards/NENA-ADM-000.22-2018_FINAL_2.pdf
8. NENA Standards for the Provisioning and Maintenance of GIS data to ECRF and LVFs (NENA-STA-005)
https://cdn.ymaws.com/www.nena.org/resource/resmgr/standards/NENA-STA-005.1.1-2017_ECRF-L.pdf
9. NENA Information Document for Location Validation Function Consistency (NENA-INF-027)
https://cdn.ymaws.com/www.nena.org/resource/resmgr/standards/nena-inf-027.1-2018_lvfconsi.pdf

10. NENA Next Generation 911 Data Management Requirements (NENA-REQ-002)
https://cdn.ymaws.com/www.nena.org/resource/resmgr/Standards/NENA-REQ-002.1-2016_NGDataMg.pdf
11. NENA GIS Data Collection and Maintenance Standards (NENA 02-014)
https://cdn.ymaws.com/www.nena.org/resource/resmgr/Standards/NENA_02-014.1_GIS_Data_Colle.pdf
12. NENA Information Document for Synchronizing Geographic Information System Databases with MSAG & ALI (NENA 71-501)
https://cdn.ymaws.com/www.nena.org/resource/resmgr/Standards/NENA_71-501_GIS_MSAG_ALI_05-.pdf