Addressing and its Impacts on 911 Call Routing and Dispatching

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Overview

- 911/Next-Generation 911 (NG911) Background
- Computer-Aided Dispatch (CAD)
- Addressing Best Practices
- Addressing Common Issues
- Validation & QA/QC tools
- Other Considerations

NENA THE 9-1-1 ASSOCIATION

UCA UTAH COMMUNICATIONS AUTHORITY

NEXT GENERATION 9-1-1

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Current/Old 911 System (E911)

- Analog system reliant on data tables to route 911 calls to appropriate Public Safety Answering Point (PSAP)
  - Master Street Address Guide (MSAG) - streets
    - Maintained by PSAPs
  - Automatic Location Identification (ALI) - addresses
    - Maintained by telecom
- Landline/VOIP calls linked to static addresses with pre-determined PSAP
- Wireless calls routed based on cell tower sector, then lat/lon information (typical accuracy within ~30-500 m

MSAG Table

	A	B	C	D	E	F	G	H	I	J	K	L
1	DIR	STREET	LOW	HIGH	COMM	ST	O_E	ESN	DATE MODIFIED	EXCHANGE	ENTITY	MSAG
37	E	500 SOUTH	1	600	NEPHI	UT	B	430	4/29/1996		29	JUABUT
38	E	570 SOUTH	400	600	NEPHI	UT	B	430	4/29/1996		29	JUABUT
39	E	600 NORTH	1	900	NEPHI	UT	B	430	4/29/1996		29	JUABUT
40	E	600 SOUTH	1	300	NEPHI	UT	B	430	4/29/1996		29	JUABUT
41	E	635 SOUTH	498	498	NEPHI	UT	B	430	4/29/1996		29	JUABUT
42	E	700 NORTH	1	950	NEPHI	UT	B	430	4/29/1996		29	JUABUT

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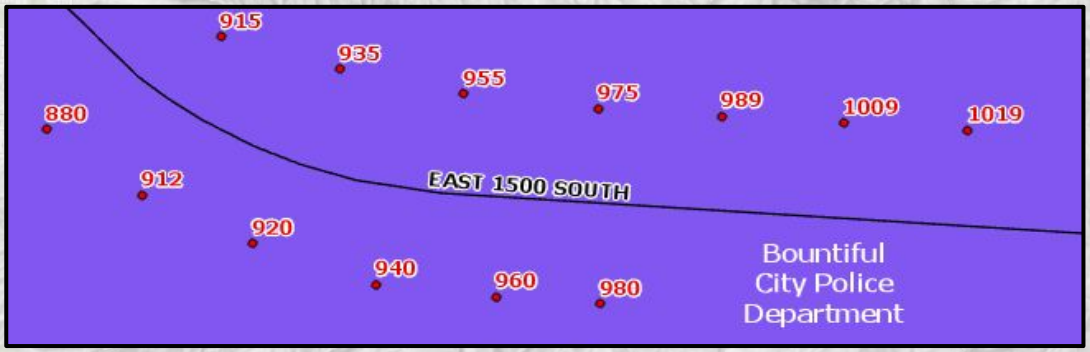
Next Generation 911 (NG911)

- Calls will be routed to PSAPs based on GIS data depending on caller location
  - PSAP boundaries
  - Road centerlines (RCL)
  - Address points (AP)
- Dynamic routing possible by changing PSAP boundaries during emergencies, downtime, or high call volume
- Internet Protocol (IP)-based communications system with upgraded call handling equipment
  - Enables additional data streams (text, photos, video, health sensors, IoT, etc.)

GIS-driven!



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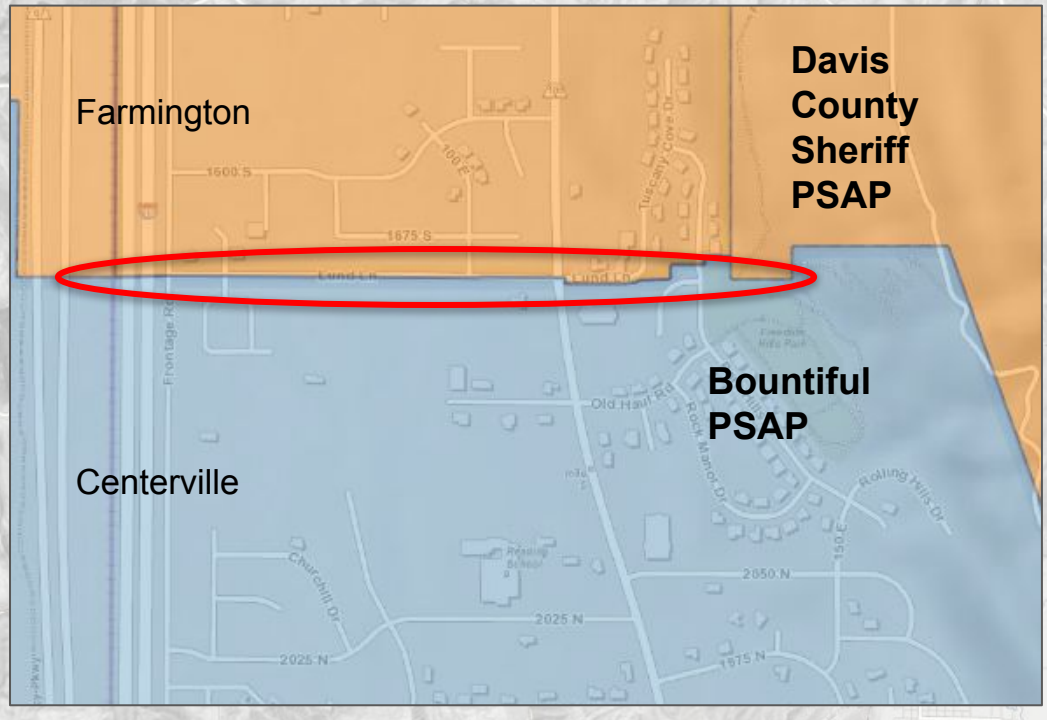
Utah NG911 Project

- Formalize official PSAP boundaries ✓
- Compile civic location data
  - Address Points (APs) ✓
  - Road Centerlines (RCLs) ✓
- Build emergency service boundaries
  - Law ✓
  - Emergency Medical Services (EMS) ✓
  - Fire (in-work)



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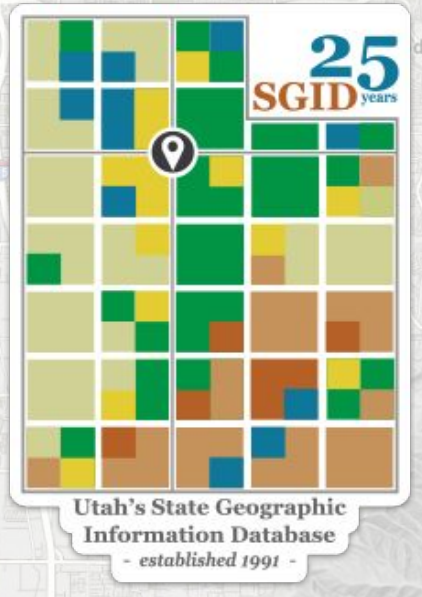
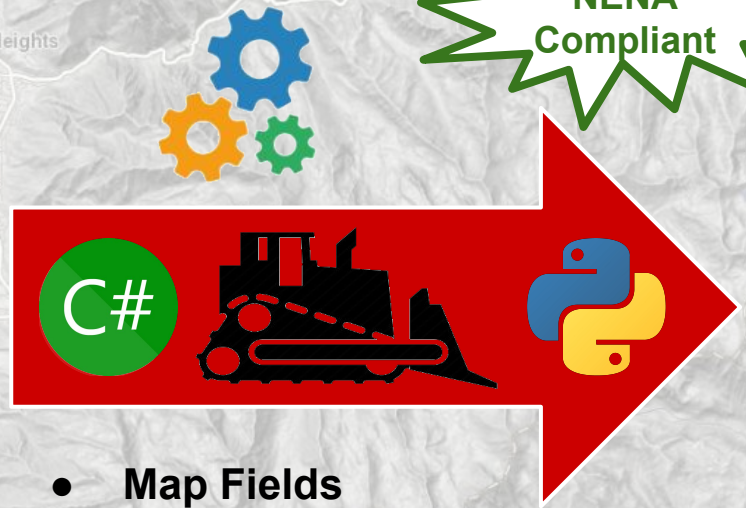
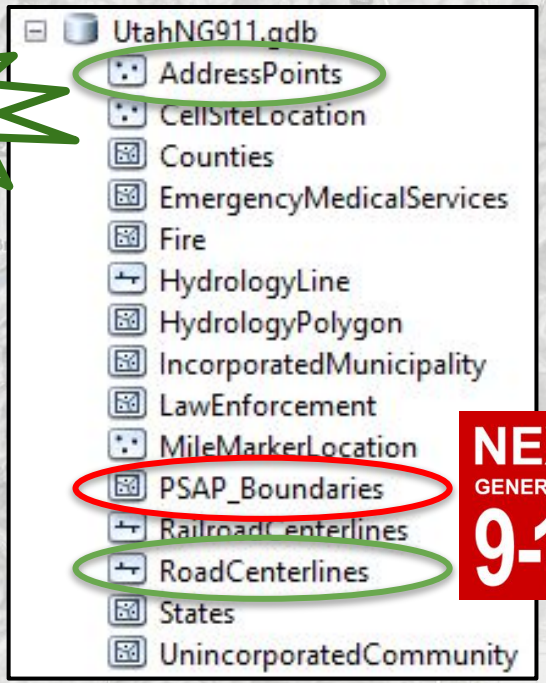
Data Aggregation and SGID → NG911

- Monthly process to Extract, Transform, Load (ETL) data from SGID into NG911 database





NENA Compliant



NEXT GENERATION 9-1-1

- Map Fields
- Data Type/Character Length
- FIPS code → county name
- ZIP5 → community name
- Project to WGS84

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Computer-Aided Dispatch (CAD)

- **Table-Based (Spillman Classic Geobase)**
  - Older dispatch version that relies on text/tables
  - Like MSAG, each street assigned left/right attributes/response zones
  - Tables built from GIS data, but doesn't explicitly use GIS in the CAD software
  - EVERYTHING needs an address that ***perfectly*** matches a RCL (name, addr range, city)
  - Can't utilize unit address points...only base addresses
  - St George Dispatch, Richfield CC, Uintah Basin CC, Beaver SO, Millard SO
- **GIS-Based (Spillman Geovalidation)**
  - Newer version that uses GIS! (ArcGIS Server required)
  - Spatial queries to determine which response zones a point falls within
  - Can better utilize address points, units, etc.
  - Not everything needs an address anymore - POIs (trailhead, peaks, natural features)
  - Weber Area 911, Central Utah 911, Layton, VECC on something similar (Versaterm)
- **Many agencies are in the queue to upgrade/migrate**
  - Takes time to migrate data, procure hardware, schedule with Spillman, etc.

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Addressing Best Practices

- All addresses must be unique within an address system
- All address points match a road centerline and use the primary street name (matches street sign - on top!)
- Use the USPS standard abbreviations (https://pe.usps.com/text/pub28/28apc_002.htm)
- Try to always use prefix directions (predir) in Utah
- RCL address range parity is consistent and explicit (odd/even separated)
  - odd side (left): 1-99 even side (right): 0-98 (some use 2-100)
- Direction of RCL and prefix direction point away from address grid origin
- Split RCLs at every intersection, admin/response boundary, etc.
  - Supports road network connectivity, cleanly assigning L/R attributes
- Avoid overly winding and U-shaped street segments

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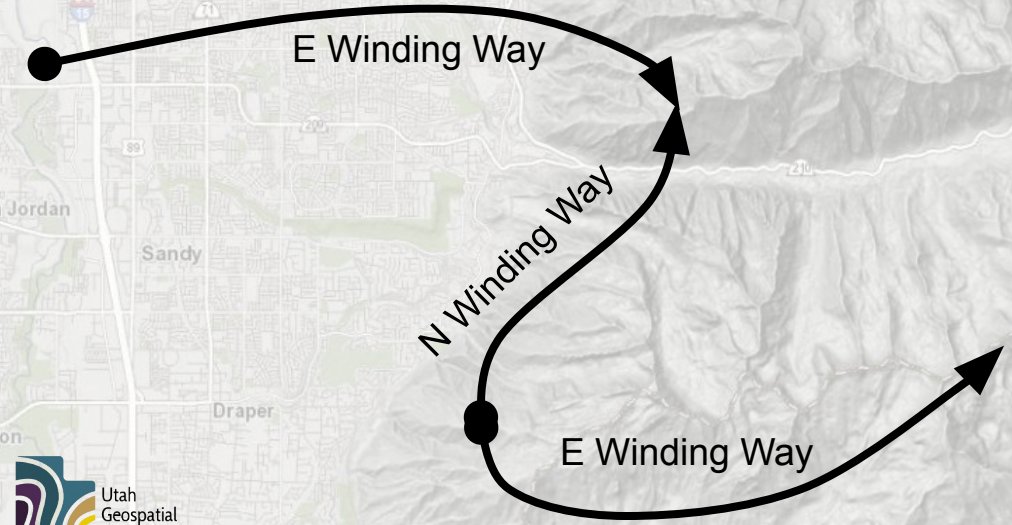
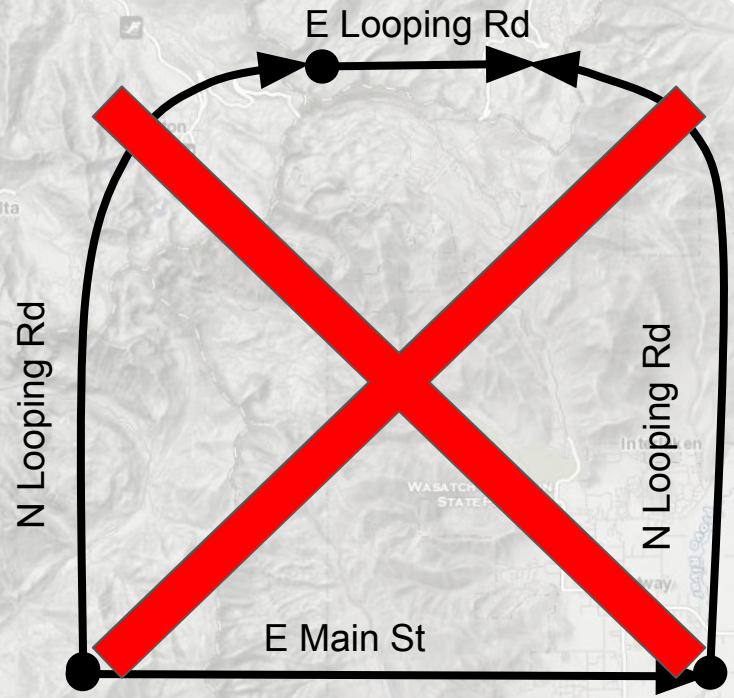
Addressing Best Practices

- **Avoid overly winding and U-shaped street segments**
  - **Break these up into segments w/ appropriate primary directions**
  - **Extend one predirection segment or rename a segment to avoid range overlaps**
  - **Occasionally use suffix directions - not ideal, but could solve the issue**





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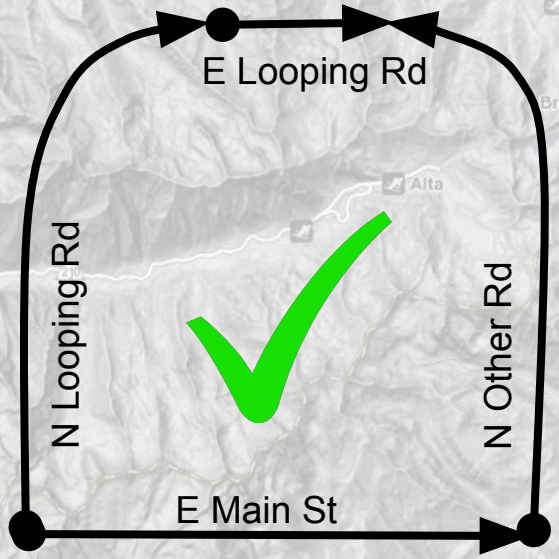

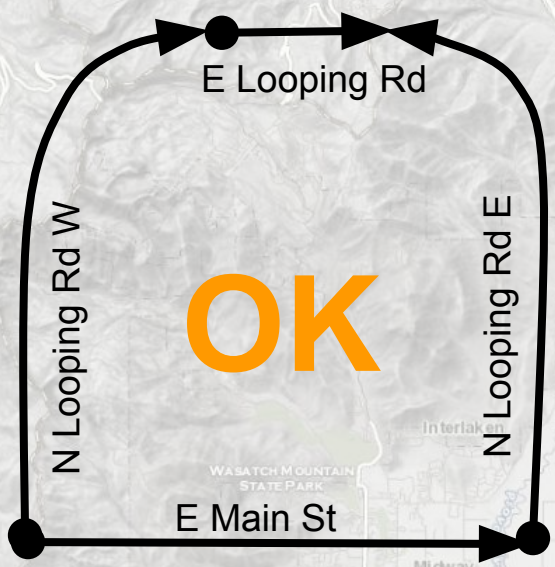

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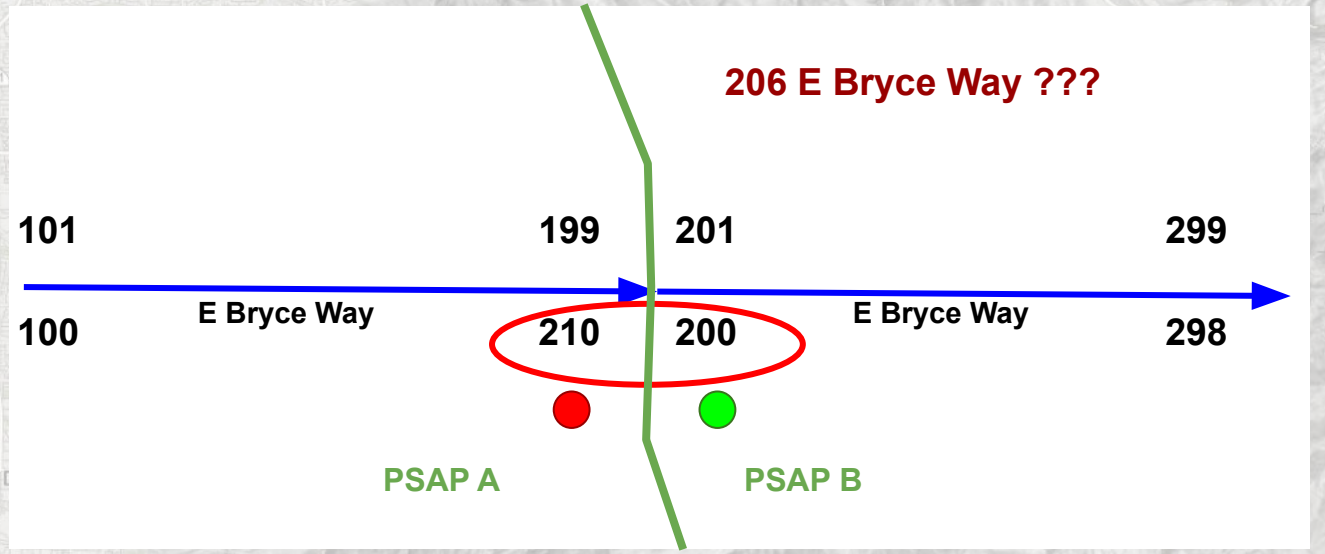
Addressing Common Issues

- AP & RCL attribute mismatch (primary vs. alias name, city, etc.)
- Transposing prefix direction and suffix direction
- Directions or Street Types in Street Name field
- Basic tpyos
- Compound words spelled differently on APs & RCLs
  - Fox Tail Way vs. Foxtail Way
- Inconsistent naming of highways
  - Highway 89, Hwy 89, US-89
- Address range issues (RCLs)
  - Range is missing (can't be used for addressing/geocoding)
  - Range typo
  - Range overlaps
  - Range High vs. low range issue (screws up geocoding)
  - Parity not assigned or incorrect (screws up geocoding)
    - Left/Right = odd, even, or both for possible house numbers

Addressing Common Issues (RCLs)

- Address range overlaps
  - Adjacent segments (or distant ones) overlap
    - Ambiguous address locations
    - Where does the call get routed?



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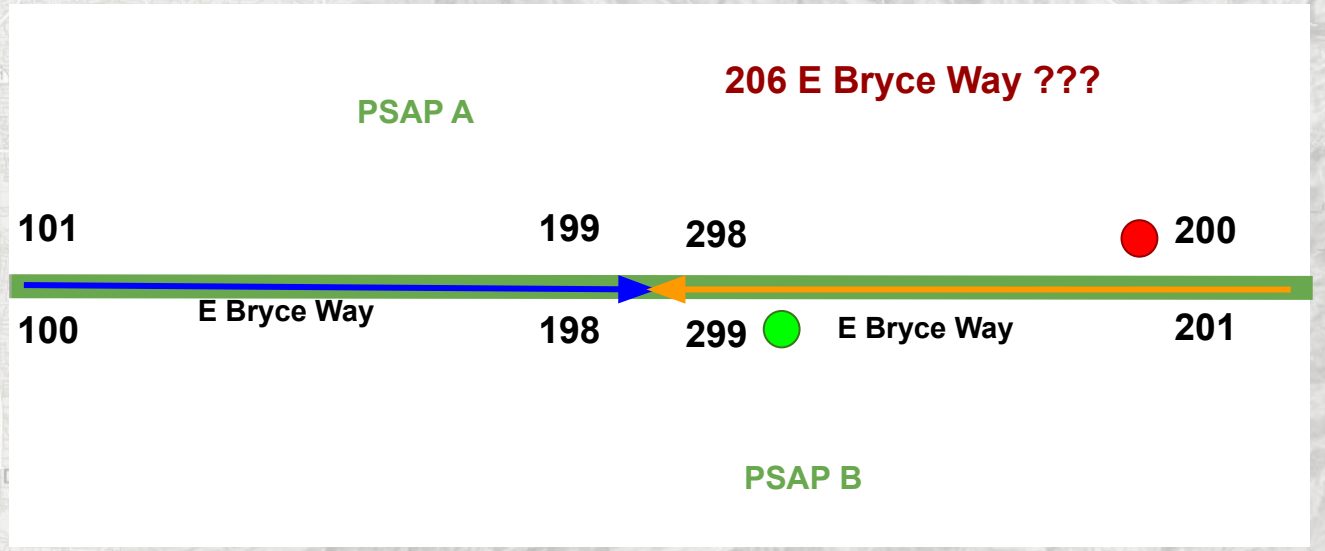
Addressing Common Issues (RCLs)

- Road pointing in wrong direction
  - Incorrect address locations (wrong side of street)
  - Call gets routed to wrong PSAP



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Addressing Common Issues (RCLs)

- "Circular" addressing
  - Requires address ranges to point in opposite directions on opposite sides of the street

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Addressing Common Issues (APs)

- Duplicate points (same attributes and geometry)
- Attribute duplicates (same attributes, different geometry)
  - Big problem for 911 response...where do the EMTs go?

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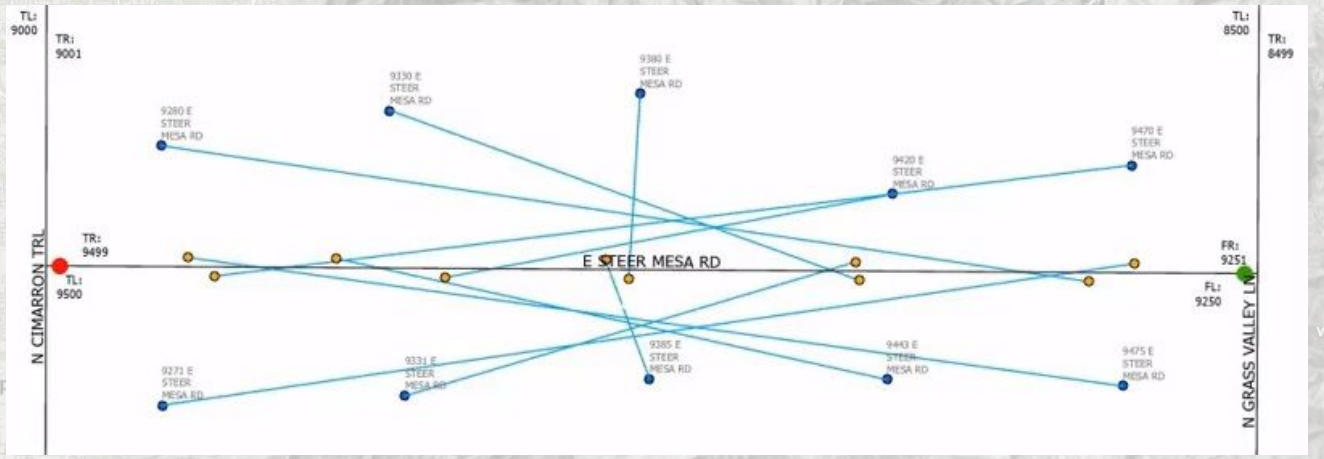
Addressing Common Issues

- **Mandatory NG911 fields that are missing data**
  - **Missing data is:** `[<Null>, None, 'none', 'null', '', ' ', '  ']`
  - **Mandatory RCL Fields**
    - FromAddr_L, FromAddr_R, ToAddr_L, ToAddr_R
    - Parity_L, Parity_R (99.94% of Utah RCLs don't include this!)
      - Left/Right = odd, even, or both for possible house numbers
    - Street_Name
    - Community_L, Community_R (city or MSAG, postal, address system)
    - State_L, State_R
    - County_L, County_R
  - **Mandatory Address Point Fields**
    - Add_Number
    - Street_Name (Predir, Suffdir, Street_Type if necessary)
    - Community_L, Community_R (city or MSAG, postal, address system)
    - State
    - County

*UGRC can populate State and County

Validation & QA/QC tools

- UGRC has "address cross-check" tools to compare AP to RCLs
  - Define search radius and number of RCL segments to check for each AP
- "Fishbone" Analysis
- ESRI Address Data Management
- Other 3rd party tools - often geared toward 911
  - DataMark, 911 DataMaster, 1Spatial, Geocomm, etc.



John Ehlen - https://johnehlen.com/agic2020-presentation/

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Other Considerations

- **Address points *can* act like a "Silver Bullet"**
  - Exactly locate an address
    - Not a geocoded estimate with distance offset like road centerline geocodes
    - Utilize building and unit info
  - Cover up for other mistakes, issues, bad practices
    - A street where some points use primary name, others use alias
    - Locate a point even if RCL address range doesn't capture the house number
    - Can use multiple points on same structure to represent primary, alias names
- **Address points can be critical for many government operations**
  - 911 call-routing (NG911) and responders finding the emergency (CAD)
  - Voting - validate registered address, right precinct, voting districts, etc.
  - Various planning/analysis projects
    - waste pickup
    - broadband service
    - etc.

Questions?

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