# NDACo's Initial Involvement in GIS

- 911 GIS Dataset development began in 2013 – Part of the NG9-1-1 initiative
- 49 of 53 counties have been completed
  - Roads
    - Addressing Information
    - Functional Classification (according to NDDOT)
    - Speed Limits
  - Address Points
    - Addressing Information
- Data continually maintained by 911 coordinators or their designee

# What we found

- Used Google and Microsoft street views to assign the proper street names.
- Worn out street signs in many counties.
- Important for Emergency Response
- Important for Other Services
- Many using Google, Garmin, etc. instead
  - Problems with that
- Real World Scenario

# What can be done?

- 911 Funds can be used for signs
  - Authorized by the Emergency Services Communications Coordinating Committee
  - Should be equitably distributed
    - County, Township, Incorporated/Unincorporated
- 7.6M in 911 funds carried over from 2021-2022
- 8.6 M in 911 funds carried over from 2019-2020
- 7.5 M in 911 funds carried over from 2017-2018
- Is it enough?  Probably not but it's a start.

# What ELSE is NDACo doing?

- Seeking additional funding sources if needed
  - First use what we have
- GIS Services (NEW)

# GIS and Traffic Sign Database

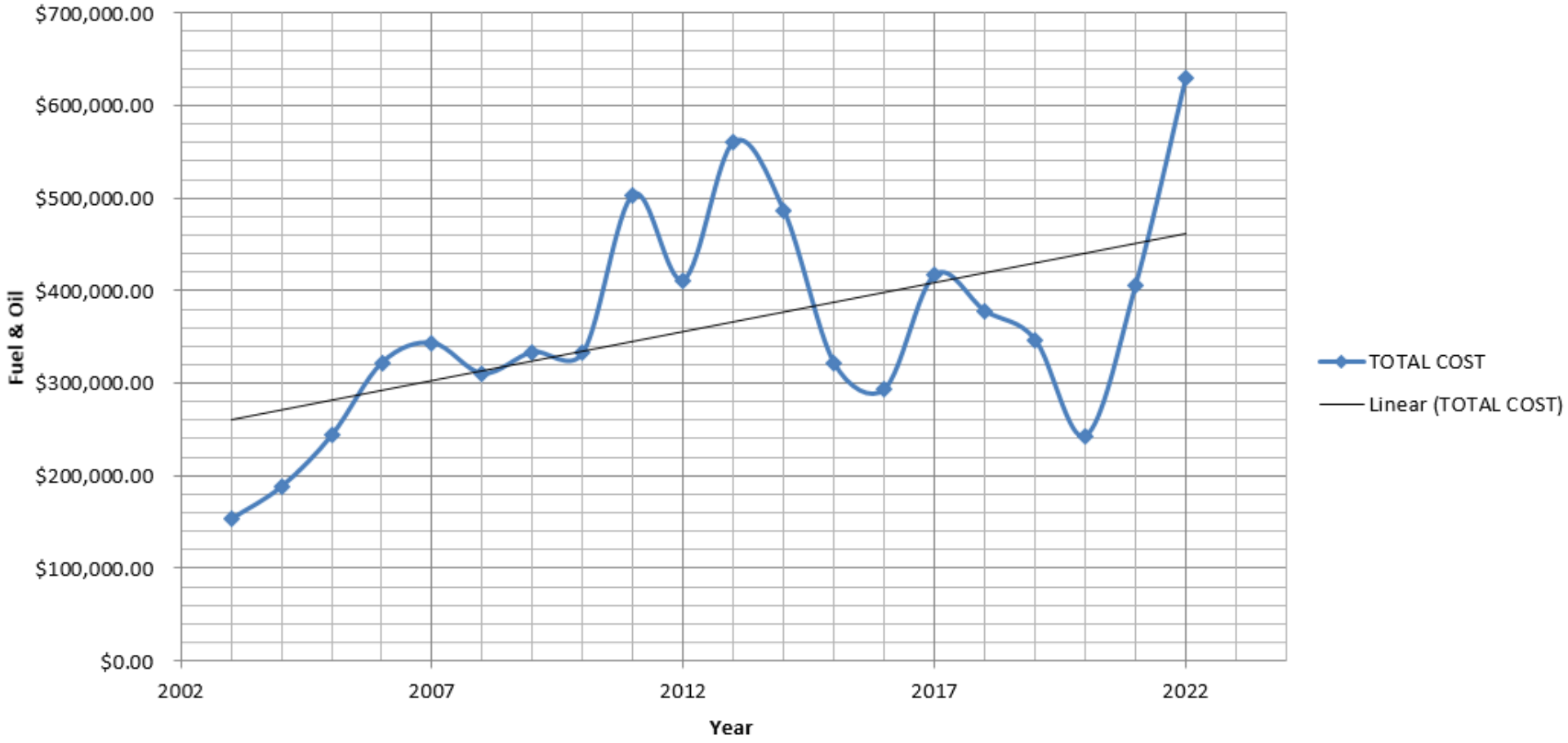
Dana Larsen, P.E.

Ward County Engineer

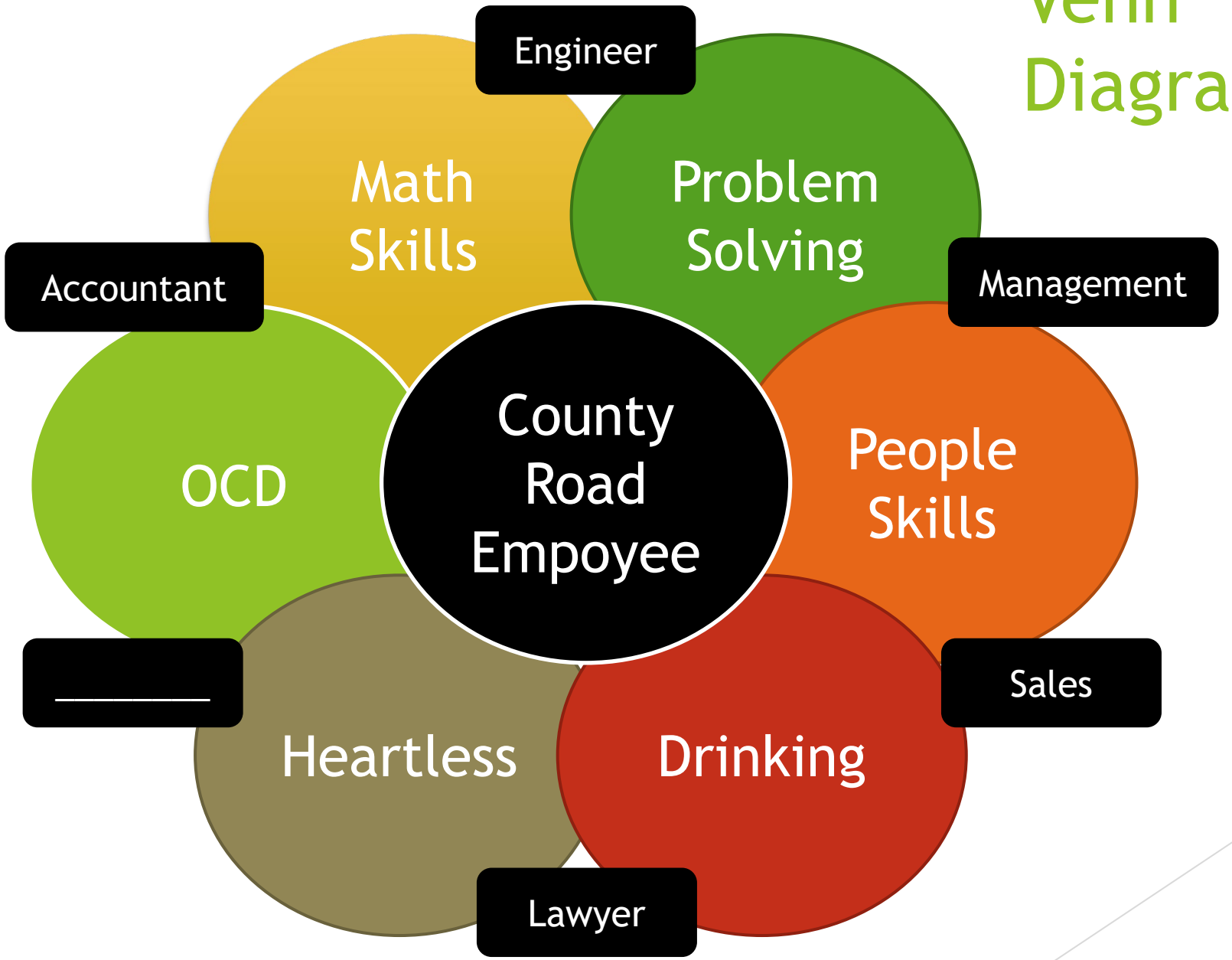
# Ways to Store and Display Data

- Database
- Spreadsheet
- Line Chart
- Bar Charts
- Pie Charts
- Pivot Tables
- Bubble Charts
- Venn Diagrams
- GIS (Geographic Information Systems) Mapping

# Ward County Fuel and Oil Costs by Year



# Venn Diagram



# GIS - Geographic Information Systems

# GIS Data I Use Routinely

- **Road Data**
  - Reconstructed
  - Graveled
  - Paved
  - Chip Sealed
  - Crack Sealed
  - Micro Surface
- **Bridge Structures**
- **Minor Structures**
- **Culvert data**
- **Sign Data**
- Parcel Information
- Imagery
- Lidar Data
- ADT Traffic Counts
- Floodplain/FIRM
- TE Routes and Missile Sites
- Control Points and Section Corners
- Gravel Pit Locations & Gravel Quantities
- Railroad and Railroad Crossing Info
- City Limits & Zoning Jurisdictions

# GIS Data - Free

- North Dakota GIS Hub
  - https://www.gis.nd.gov/
- ND Department of Water Resources
  - https://www.dwr.nd.gov/info_edu/map_data_resources/mapservices.html
- Other GIS Servers
  - ND DOT –North Dakota Department of Transportation
  - USFWS – United States Fish and Wildlife Service
  - USGS - United States Geological Survey
  - ESRI - Environmental Systems Research Institute

# Imagery

- **County Imagery**
  - 2010 – 1ft
  - 2015 – 9 inch
  - 2020 – 3 inch
- **State Data**
  - 1938
  - 1946
  - 1961
  - 1974
  - 1999
  - 2003-2020 NAIP
- 2021 – 6-inch State Wide (with shaded relief)

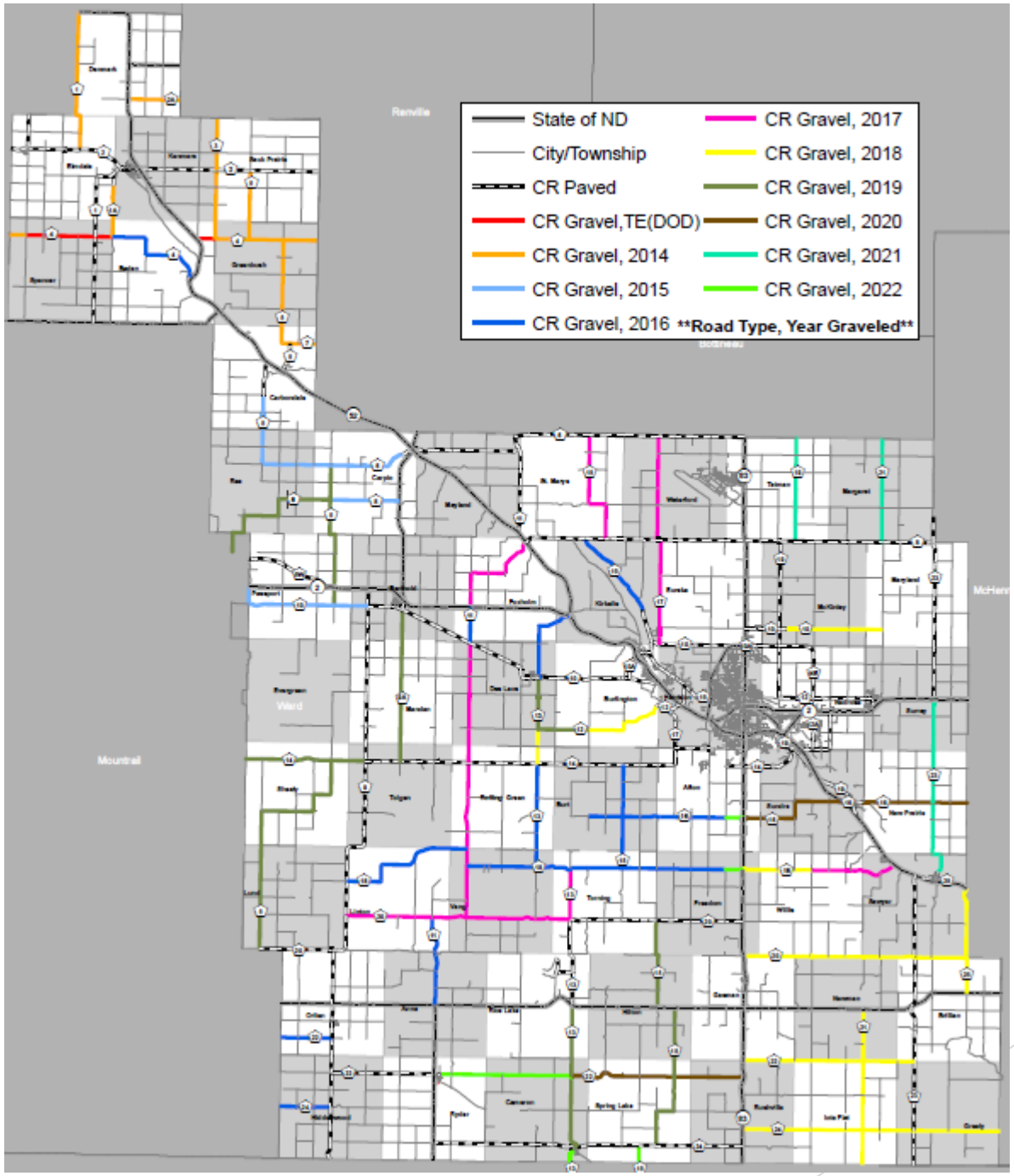
# GIS Data

- Road Data
- Bridge Structures
- Minor Structures
- Culvert data
- Sign Data

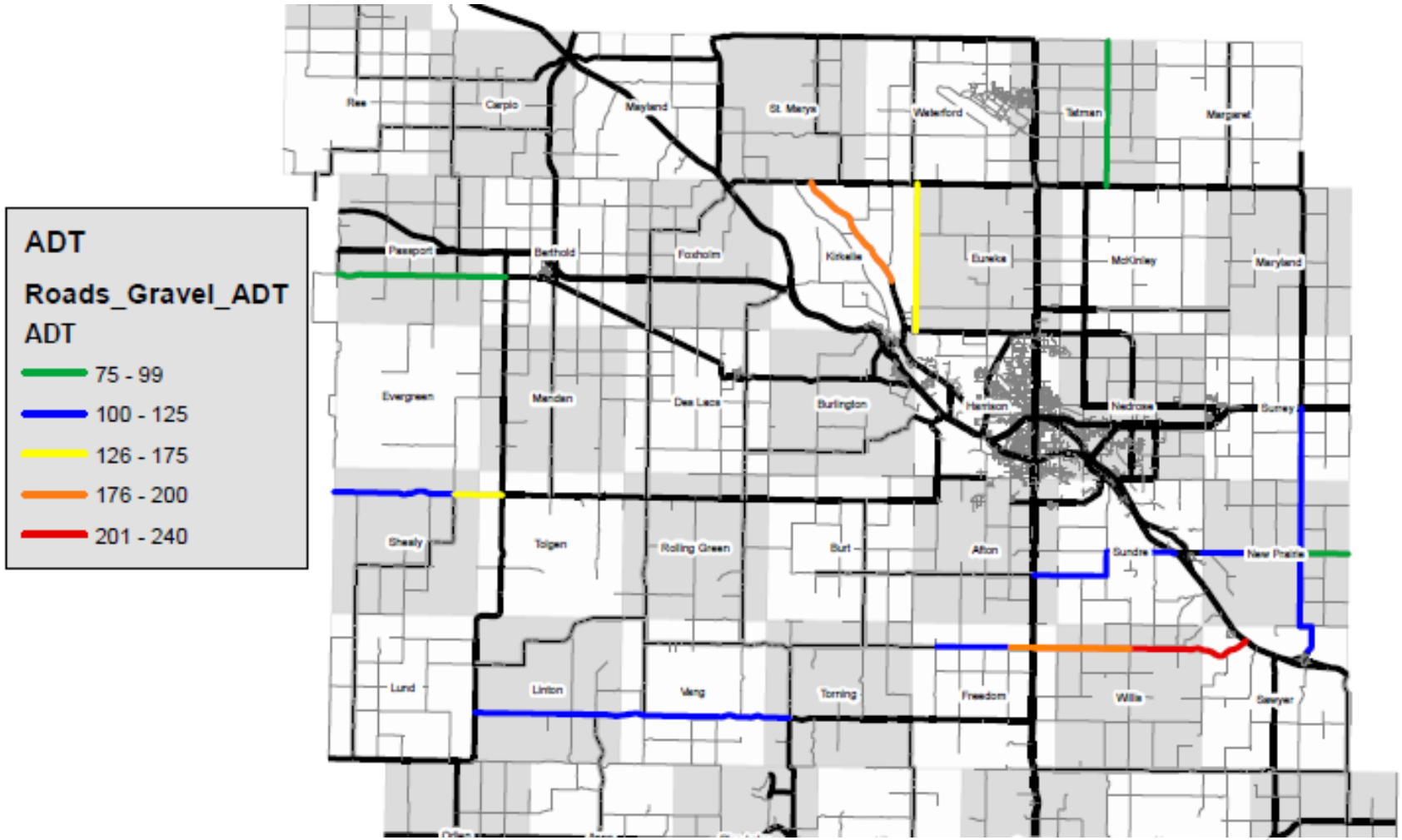
# Road Centerline Data

- County Road Number
- Segment Number
- Street/Avenue
- Federal Aid Number
- Road Surface Type
- Road Class
- Year Constructed
- Last Year Paved
- Last Year Chip Sealed or Micro Surfaced
- Last year Crack Sealed
- Last year Graveled
- Epoxy Striping Year

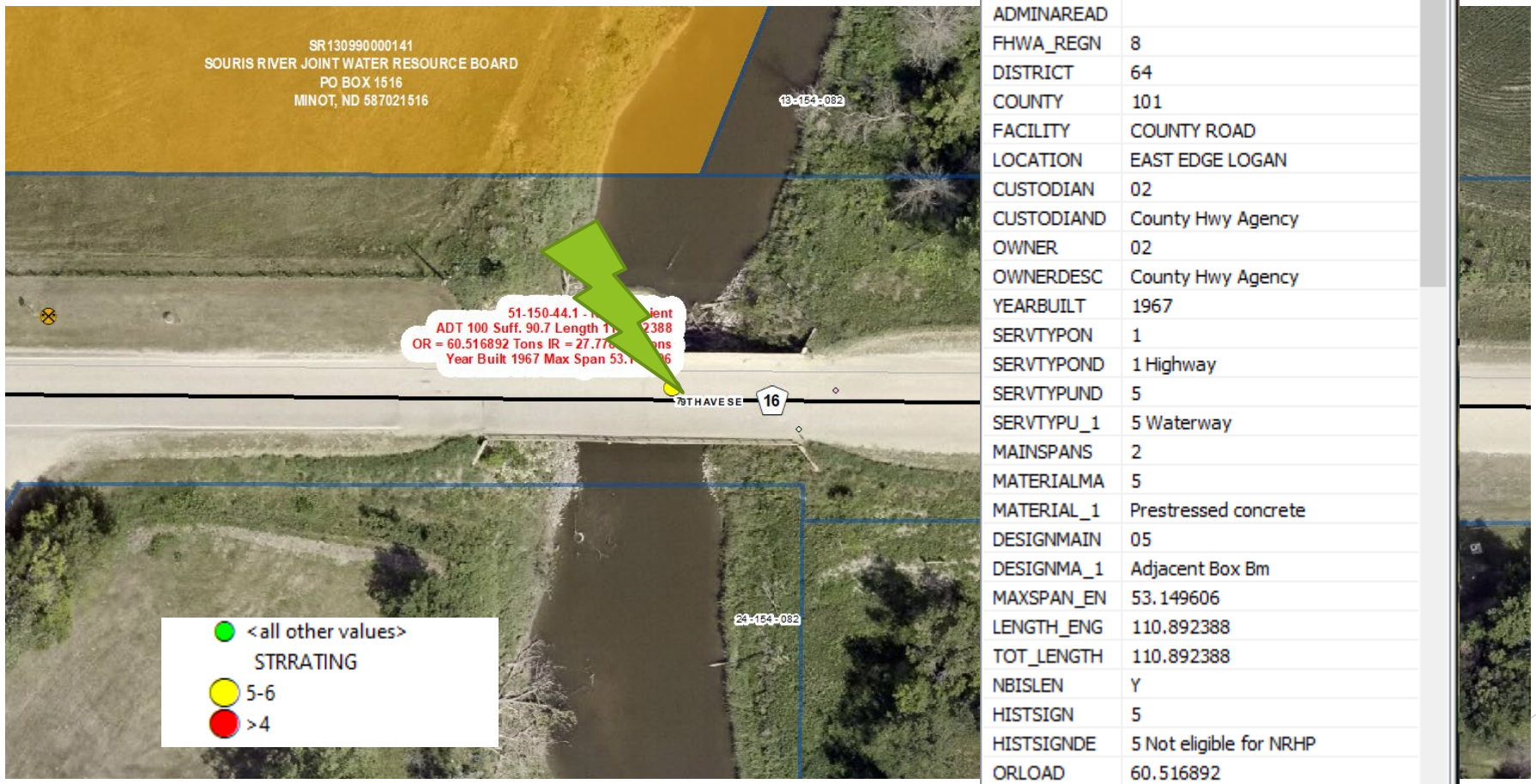
# Last Year Graveled



# ADT on Gravel Roads



# Bridge Structure




Location: 1,809,800.708 421,286.087 Feet

| Field | Value |
|---|---|
| BRIDGE_ID | 51-150-44.1 |
| ADMINAREA | 2 |
| ADMINAREAD | |
| FHWA_REGN | 8 |
| DISTRICT | 64 |
| COUNTY | 101 |
| FACILITY | COUNTY ROAD |
| LOCATION | EAST EDGE LOGAN |
| CUSTODIAN | 02 |
| CUSTODIAND | County Hwy Agency |
| OWNER | 02 |
| OWNERDESC | County Hwy Agency |
| YEARBUILT | 1967 |
| SERVTYPON | 1 |
| SERVTYPOND | 1 Highway |
| SERVTYPUND | 5 |
| SERVTYPU_1 | 5 Waterway |
| MAINSPANS | 2 |
| MATERIALMA | 5 |
| MATERIAL_1 | Prestressed concrete |
| DESIGNMAIN | 05 |
| DESIGNMA_1 | Adjacent Box Bm |
| MAXSPAN_EN | 53.149606 |
| LENGTH_ENG | 110.892388 |
| TOT_LENGTH | 110.892388 |
| NBISLEN | Y |
| HISTSIGN | 5 |
| HISTSIGNDE | 5 Not eligible for NRHP |
| ORLOAD | 60.516892 |
| IRLOAD | 27.778246 |

# InspectX

inspectX

Jump to structure | Inventory | Schedule | Inspection | Maintenance

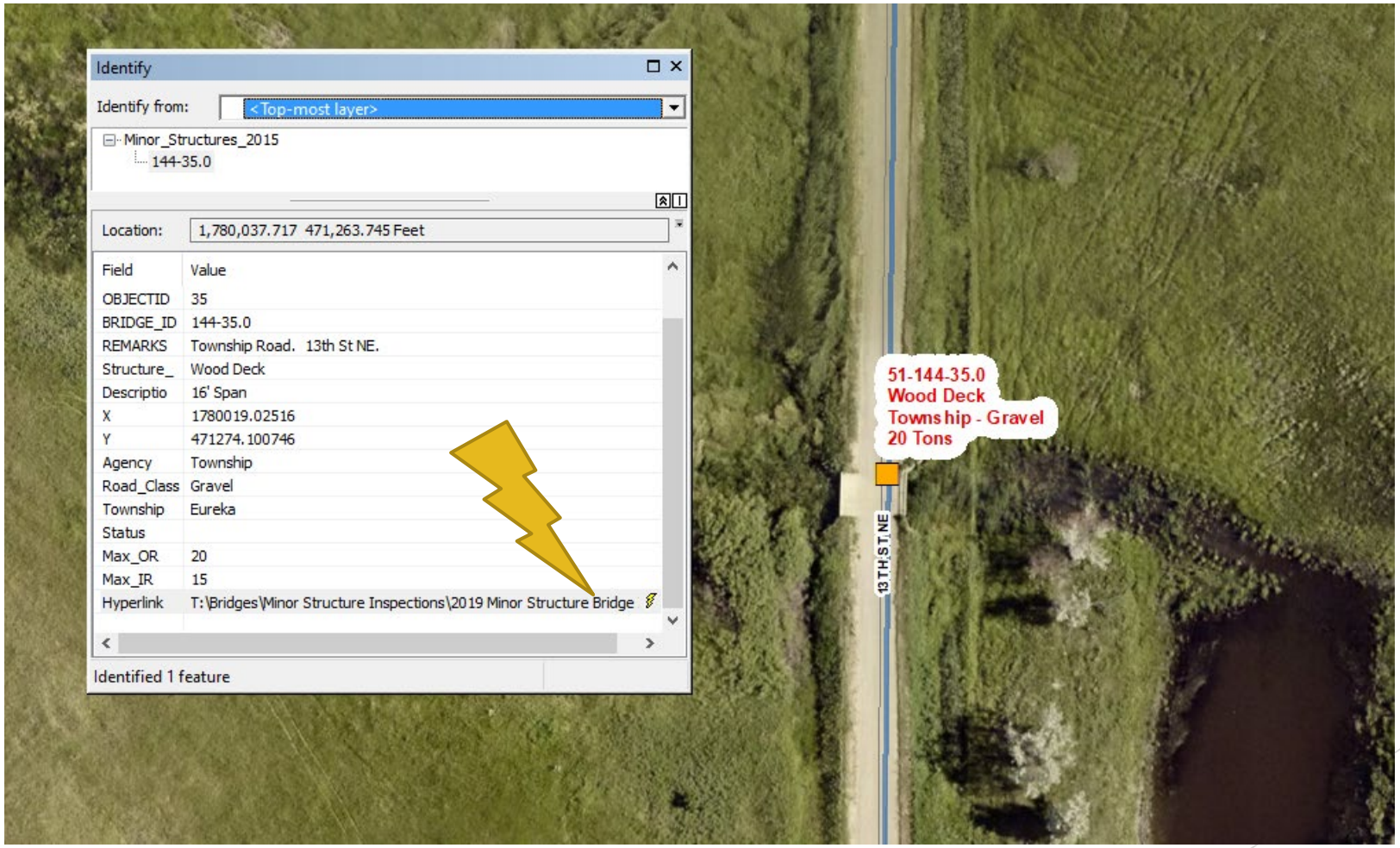
| | |
|---|---|
| 1 - State Name | North Dakota |
| 8 - Structure Number | 51-150-44.1 |
| 8A - FHWA Structure Number | 000000051150441 |
| 5A - Record Type | 1 - Route carried "ON" the structure |
| 5B - Route Signing Prefix | 4 - County highway |
| 5C - Designated Level of Service | 1 - Mainline |
| 5D - Route Number | 05146 |
| 5E - Directional Suffix | 0 - N/A |
| 2 - Highway Agency District | 64 - District 64 |
| 3 - County (Parish) Code | 101 - Ward |
| 4 - Place Code | SUNDRE TOWNSHIP |
| 6A - Features Intersected | SOURIS RIVER |
| 6B - Critical Facility Indicator | – |
| 7 - Facility Carried By Structure | COUNTY ROAD |
| 9 - Location | EAST EDGE LOGAN |
| 10 - Inventory Rte, Min Vert Clearance | 99.99 |
| 11 - Milepoint | 6.798 |
| 12 - Base Highway Network | 0 - Inventory route is not on the Base Network |
| 13A - LRS Inventory Route | |
| 13B - Subroute Number | |
| 16A - Latitude | 48.1532222222222 |
| 17A - Longitude | -101.150236111111 |
| 19 - Bypass/Detour Length | 2 |
| 20 - Toll | 3 - On free road. The structure is toll-free and carries a toll-free highway. |
| 21 - Maintenance Responsibility | 2 - County Highway Agency |
| 22 - Owner | 2 - County Highway Agency |
| 26 - Functional Class Of Inventory Rte. | 7 - Rural Major Collector |
| 27 - Year Built | 1967 |
| 28A - Lanes On Structure | 2 |

# Bridge Structure linked to InspectX

https://nddot.inspectx.co/#/bridge-summary/4339

| | |
|---|---|
| 109A - Average Daily Truck Traffic | 10 |
| Cat29 - Deck Area | 3419.91 |
| 27A - Bridge Age | 1967 |
| ExtraC - StatusWithout10Yr | |
| 0 - Bridge Id | 4339 |
| IX_FK1 - State Id | 34 |
| ExtraD - Recall Number | 51-150-44.1 |
| Cat10 - Bridge Condition | 1 - undefined |

# Minor Structures



# Minor Structure PDF File

1

2

3

4

5

6

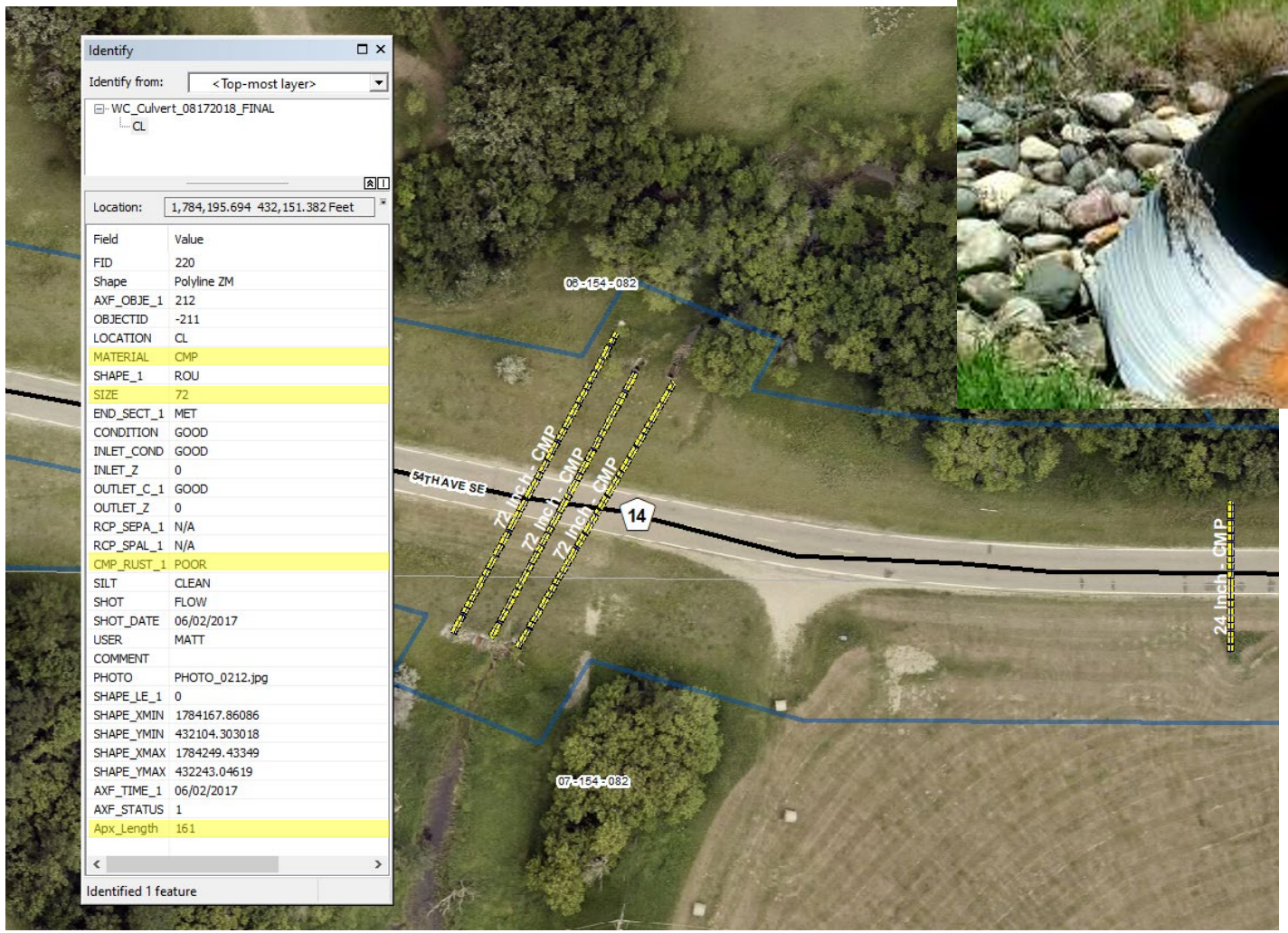
7

8

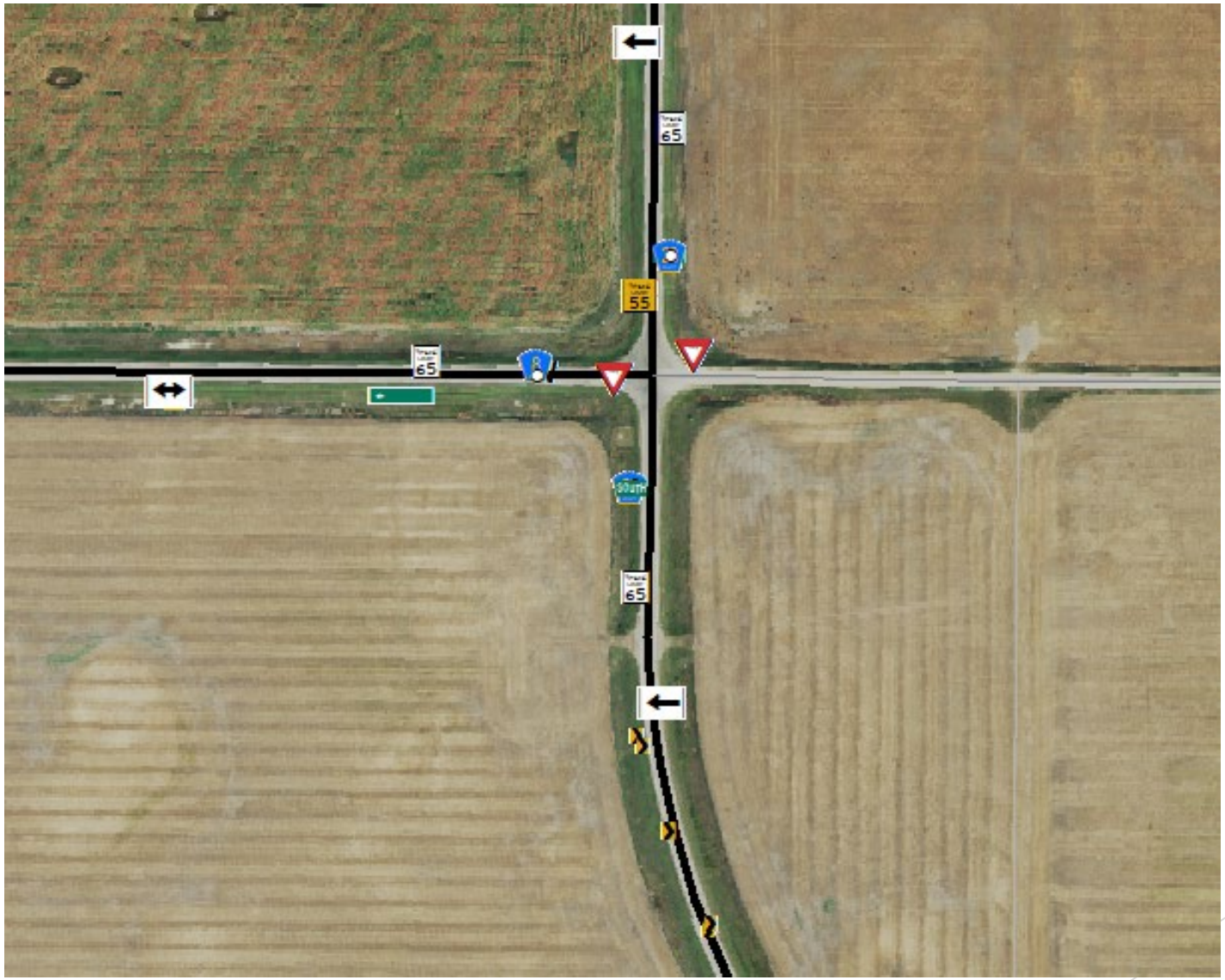

9

10

# Culvert Layer



# Sign Layer



# 2009 MUTCD
## Manual on Uniform Traffic Control Devices

- Compliance Dates
  - January 2012
    - By this date, all agencies will have to establish a sign maintenance program addressing the minimum sign retroreflectivity requirements
    - This date was extended to June 2014
  - January 2015
    - By this date, all agencies must comply with the new retroreflective requirements for regulatory signs, including Stop Signs, Yield Signs, Speed Limit Signs, Warning Signs
    - This date was extended

# MUTCD - Manual on Uniform Traffic Control Devices

- Public agencies or officials having jurisdiction shall use an assessment or management method that is designed to maintain sign retroreflectivity at or above the minimum levels in Table 2A-3.
- Compliance with the Standard in Paragraph 2 is achieved by having a method in place and using the method to maintain the minimum levels established in Table 2A-3. Provided that an assessment or management method is being used, an agency or official having jurisdiction would be in compliance with the Standard in Paragraph 2 even if there are some individual signs that do not meet the minimum retroreflectivity levels at a particular point in time

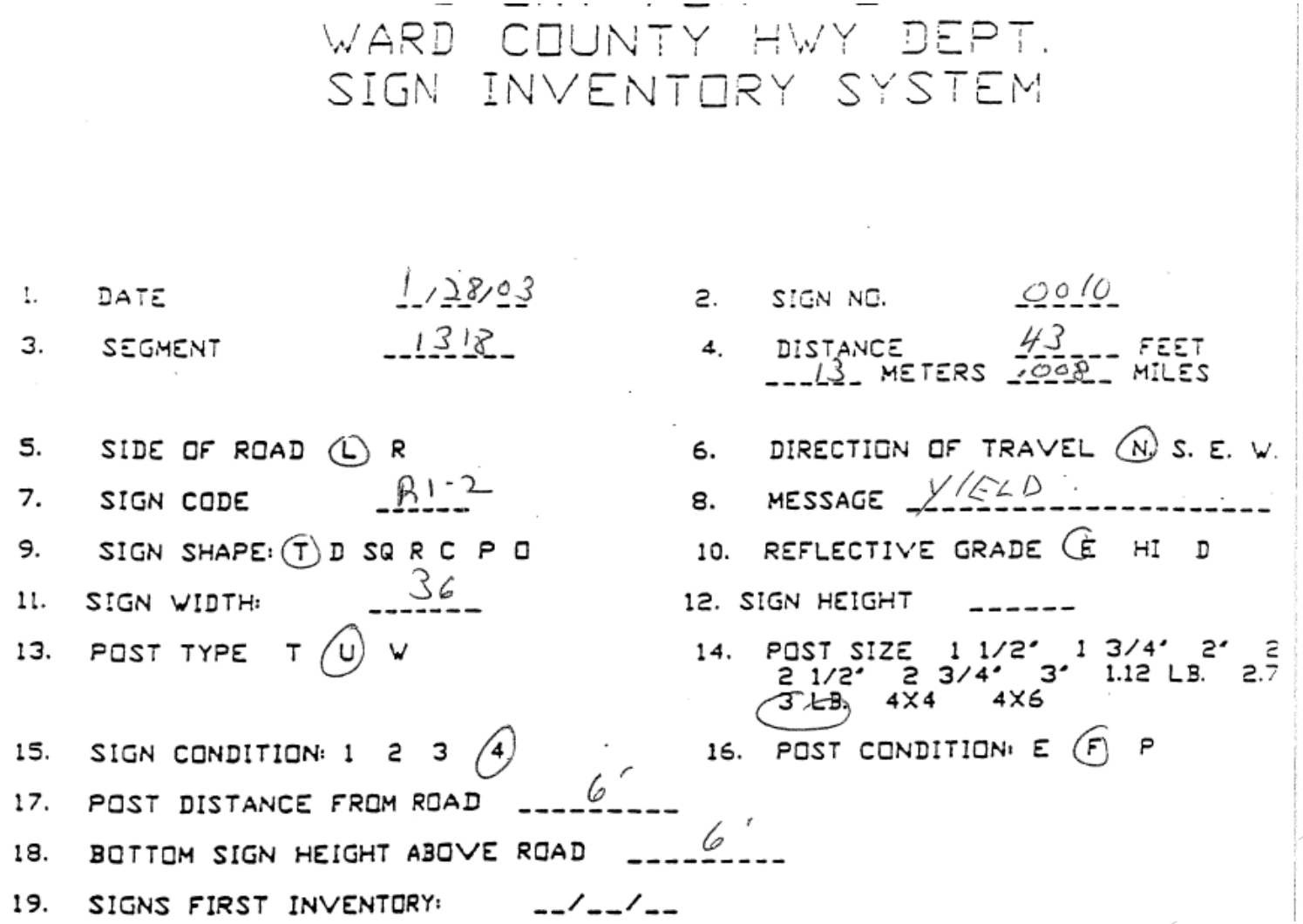
# MUTCD - Manual on Uniform Traffic Control Devices

- **Visual Nighttime Inspection** - assessed by a trained sign inspector conducting a visual inspection from a moving vehicle during nighttime conditions.
- **Measured Sign Retroreflectivity—Sign** retroreflectivity is measured using a retroreflectometer.
- **Expected Sign Life**—When signs are installed, the installation date is labeled or recorded so that the age of a sign is known. The age of the sign is compared to the expected sign life.
- **Blanket Replacement**—All signs in an area/corridor, or of a given type, should be replaced at specified intervals.
- **Control Signs**—Replacement of signs in the field is based on the performance of a sample of control signs.

# Sign Maintenance Program

- Sign Number
- Sign Type
- Description
- Sign Location
  - GPS Location
  - Distance from starting point
  - Distance from road
- Installation Date
- Last Inspection Data
- Sign Condition
- Sheeting Type
- Retroreflectivity Readings
- Post Type
- Sign Height
- Road Type
- Breakaway Type
- Side of the Road
- Direction Sign Faces
- Travel Direction

# Sign Inventory



WARD COUNTY HWY DEPT.
SIGN INVENTORY SYSTEM

1. DATE 1/28/03
2. SIGN NO. 0010
3. SEGMENT 1318
4. DISTANCE 43 FEET 13 METERS .008 MILES
5. SIDE OF ROAD (L) R
6. DIRECTION OF TRAVEL (N) S. E. W.
7. SIGN CODE R1-2
8. MESSAGE YIELD
9. SIGN SHAPE: (T) D SQ R C P O
10. REFLECTIVE GRADE (E) HI D
11. SIGN WIDTH: 36
12. SIGN HEIGHT ------
13. POST TYPE T (U) W
14. POST SIZE 1 1/2" 1 3/4" 2" 2 1/2" 2 3/4" 3" 1.12 LB. 2.7 3 LB. 4X4 4X6
15. SIGN CONDITION: 1 2 3 (4)
16. POST CONDITION: E (F) P
17. POST DISTANCE FROM ROAD 6'
18. BOTTOM SIGN HEIGHT ABOVE ROAD 6'
19. SIGNS FIRST INVENTORY: __/__/__

# Sign Repair Form

COUNTY ROAD SIGN REPAIR FORM

July 2007

| DATE | SIGN # | SEGMENT | SIGN COND | REASON FOR REPAIR | ACTION & MATERIALS |
|---|---|---|---|---|---|
| 6/6 | 0120 | 1009 | 4 | shot up | sign (HI) |
| 6/8 | 0210 | 1052 | 4 | shot up | Sign (HI) |
| 6/14 | 0130 | 1005 | 4 | Shot up | replace sign (HI) |
| 7/24 | 0210 | 0201 | 4 | missing | |
| X 7/26 | 0030 31+32 | 1516 | 4 | ranover | anchor 12' T-Post |
| 7/26 | 0010 | 1318 | 4 | ranover | 10' T-Post |
| 7/26 | 0071 | 0923 | 4 | Missing | (HI) |

# Sign Data


**WARD COUNTY HIGHWAY DEPT.**

08/12/2015

1 of 1

**REFLECTOMETRY BY SIGN NUMBER/PASS-FAIL**

FROM DATE: 8/12/2015

TO DATE: 8/12/2015

| SIGN NUMBER | DATE | TIME | SIGN TYPE | ROAD NUMBER |
|---|---|---|---|---|
| 13180010 | 08/12/2015 | 05:46:42 | R1-2-36 | 1318 |

**PASS**

PASS PASS

| READINGS | |
|---|---|
| .2 LEGEND | .2 BACKGND |
| 443 | 74.4 |

| | |
|---|---|
| LEGEND COLOR | WHITE |
| LEGEND MIN | 35 |
| BACKGND COLOR | RED |
| BACKGND MIN | 7 |
| CONTRAST RATIO | 3/1 |

| SIGN NUM | SIGN TYPE | SIGN DESCRIPTION | ROAD NUM | ROAD LOCATION |
|---|---|---|---|---|
| 13180010 | R1-2-36 | YIELD | 1318 | |

| INSTALLED | LATITUDE | LONGITUDE | REFR. DIST. | SIDE OF RD. | FACES | TRAVEL DIR. |
|---|---|---|---|---|---|---|
| 04/03/2007 | 48.181985N | 101.555345W | 43 | LEFT | SOUTH | NORTH |

| ROAD TYPE | SIGN BLANK | SHEETING | SIGN HEIGHT | POST TYPE | BRKAWY | SIGHT DIST. |
|---|---|---|---|---|---|---|
| COUNTY, GRAVEL | ALUMINUM | HI PRISMATIC | 6 | Telespar® | YES | |

# GIS CAN GET YOU ANYWHERE

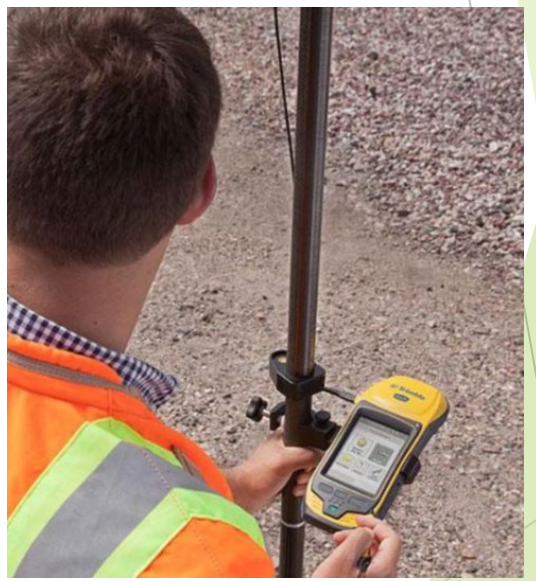
# Culvert Database Planning - 2017

- Previously done in 2008 as points
- File type
- Fields to Consider
- Drop Downs with set parameters
- Data storage
- Collection methods
- Unique number

| Field | Value |
|---|---|
| FID | 22 |
| Shape | Polyline ZM |
| LOCATION | CL |
| MATERIAL | CMP |
| SHAPE_1 | ROU |
| SIZE | 18 |
| END_SECT_1 | NONE |
| CONDITION | GOOD |
| INLET_COND | GOOD |
| OUTLET_C_1 | GOOD |
| RCP_SEPA_1 | N/A |
| RCP_SPAL_1 | N/A |
| CMP_RUST_1 | GOOD |
| SILT | CLEAN |
| SHOT | FLOW |
| SHOT_DATE | 5/26/2017 |
| USER | Cole |
| COMMENT | |
| PHOTO | PHOTO_0042.jpg |
| Updated | 0 |
| WrkComplte | |

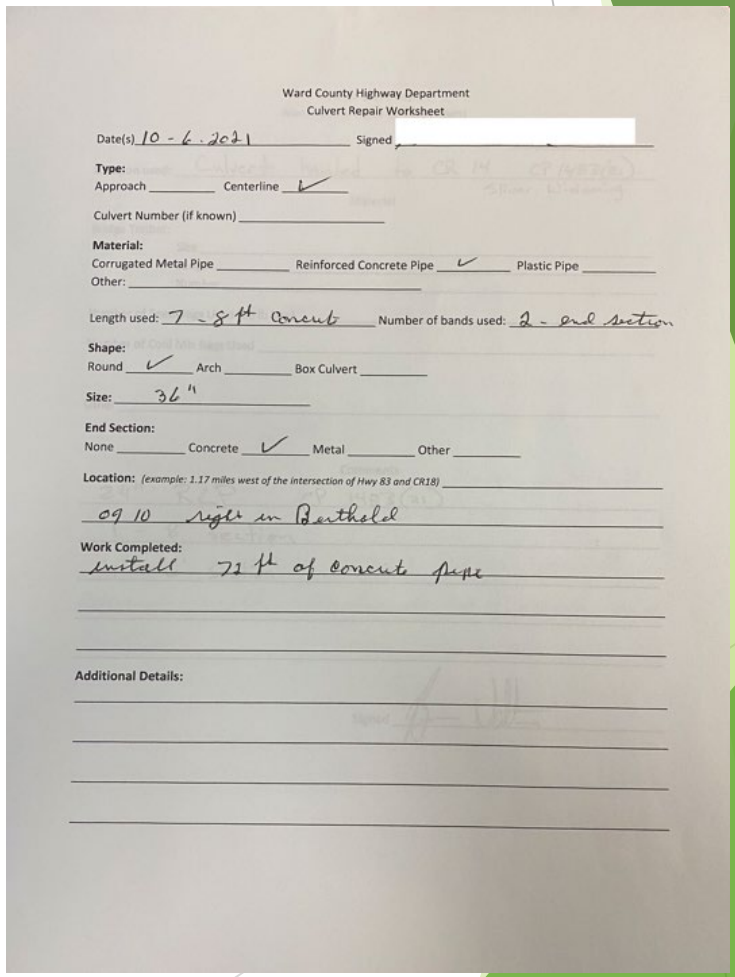
# Culvert Database Collection

- Used VRS (Virtual Base Station) via internet
- ArcPad
- Geo7x
- External antenna on GPS rod
- Camera built into collector
- Database created with drop downs
- Newer practices
  - IPad, external bluetooth antenna, field maps application.



# Culvert collection use/maintenance

- Maintain internally for repairs/replacements/new
- Using ArcGIS for implementation of updates in database
- Forms for staff to complete in field and hand in
- Field Maps application for field collection to continue to have the most up to date database



Ward County Highway Department
Culvert Repair Worksheet

Date(s) 10 - 6 - 2021 Signed

**Type:**
Approach _____ Centerline ✓

Culvert Number (if known) _____

**Material:**
Corrugated Metal Pipe _____ Reinforced Concrete Pipe ✓ Plastic Pipe _____
Other: _____

Length used: 7 - 8 ft Concrete Number of bands used: 2 - end section

**Shape:**
Round ✓ Arch _____ Box Culvert _____

**Size:** 36"

**End Section:**
None _____ Concrete ✓ Metal _____ Other _____

**Location:** *(example: 1.17 miles west of the intersection of Hwy 83 and CR18)*
09 10 right in Berthold

**Work Completed:**
install 72 ft of concrete pipe

**Additional Details:**

# Sign Database

- Data out of Reflectometer from Sign Technician
- AS400 layout from database
- Code inside excel to remove characters and make usable information
- Made them their own unique fields
- Joined into ArcGIS shapefile from KMZ file
- Used unique sign number created by Tech for join

| OID_ | Name | SymbolID | AltMo | Base | PopupInfo | HasLa | LabelID |
|---|---|---|---|---|---|---|---|
| 0 | SIGN 01010010 | 0 | -1 | 0.00000000000 | <table width="300"><tr><td> Sign Type - R1-1-30 Sign Description - STOP Sign Location - Sheeting - HI PRISMATIC Blank - ALUMINUM Road Number - 0101 Latitude - 48.6726 | -1 | 0 |
| 0 | SIGN 01010020 | 0 | -1 | 0.00000000000 | <table width="300"><tr><td> Sign Type - M1-6-1A Sign Description - WARD COUNTY 1A Sign Location - Sheeting - HI PRISMATIC Blank - ALUMINUM Road Number - 0101 Latitude | -1 | 0 |
| 0 | SIGN 01010021 | 0 | -1 | 0.00000000000 | <table width="300"><tr><td> Sign Type - M6-1A-21 Sign Description - HORIZONTAL SINGLE ARROW Sign Location - Sheeting - HI PRISMATIC Blank - ALUMINUM Road Number - 0101 Latitu | -1 | 0 |

| Name | PopupInfo | Sign Type | Sign Description | Road Number | Sheet type |
|---|---|---|---|---|---|
| SIGN 01010010 | Sign Type- R1-1-30<br>Sign Description - STOP<br>Sign Location-<br>Sheeting - HI PRISMATIC<br>Blank- ALUMINUM<br>Road Number- 0101<br>Latitude - 48.6726 | Sign Type- R1-1-30 | Sign Description - STOP | Road Number- 0101 | Sheeting - HI PRISMATIC |
| SIGN 01010020 | Sign Type- M1-6-1A<br>Sign Description - WARD COUNTY 1A<br>Sign Location-<br>Sheeting - HI PRISMATIC<br>Blank- ALUMINUM<br>Road Number- 0101<br>Latitude | Sign Type- M1-6-1A | Sign Description - WARD COUNTY 1A | Road Number- 0101 | Sheeting - HI PRISMATIC |

| Name | Sign Type | Sign Description | Road Number | Sheet type | Sheet type |
|---|---|---|---|---|---|
| SIGN 01010010 | Sign Type- R1-1-30 | Sign Description - STOP | Road Number- 0101 | Sheeting - HI PRISMATIC | Sheeting - HI PRISMATIC |
| SIGN 01010020 | Sign Type- M1-6-1A | Sign Description - WARD COUNTY 1A | Road Number- 0101 | Sheeting - HI PRISMATIC | Sheeting - HI PRISMATIC |
| SIGN 01010021 | Sign Type- M6-1A-21 | Sign Description - HORIZONTAL SINGLE ARROW | Road Number- 0101 | Sheeting - HI PRISMATIC | Sheeting - HI PRISMATIC |

# Sign Database

- Sign technician database from vendor
- Grouped based off of road segments
- Sign history per individual sign
- Sign numbers
  - First four = Road Segment
  - Last four = first sign on segment number
    - Last four numbers have a 10 number gap for future added signs in between

**WARD COUNTY HIGHWAY DEPT.**

01/04/2023

1 of 4

**SIGN DATA BY SEGMENTS {1252}**

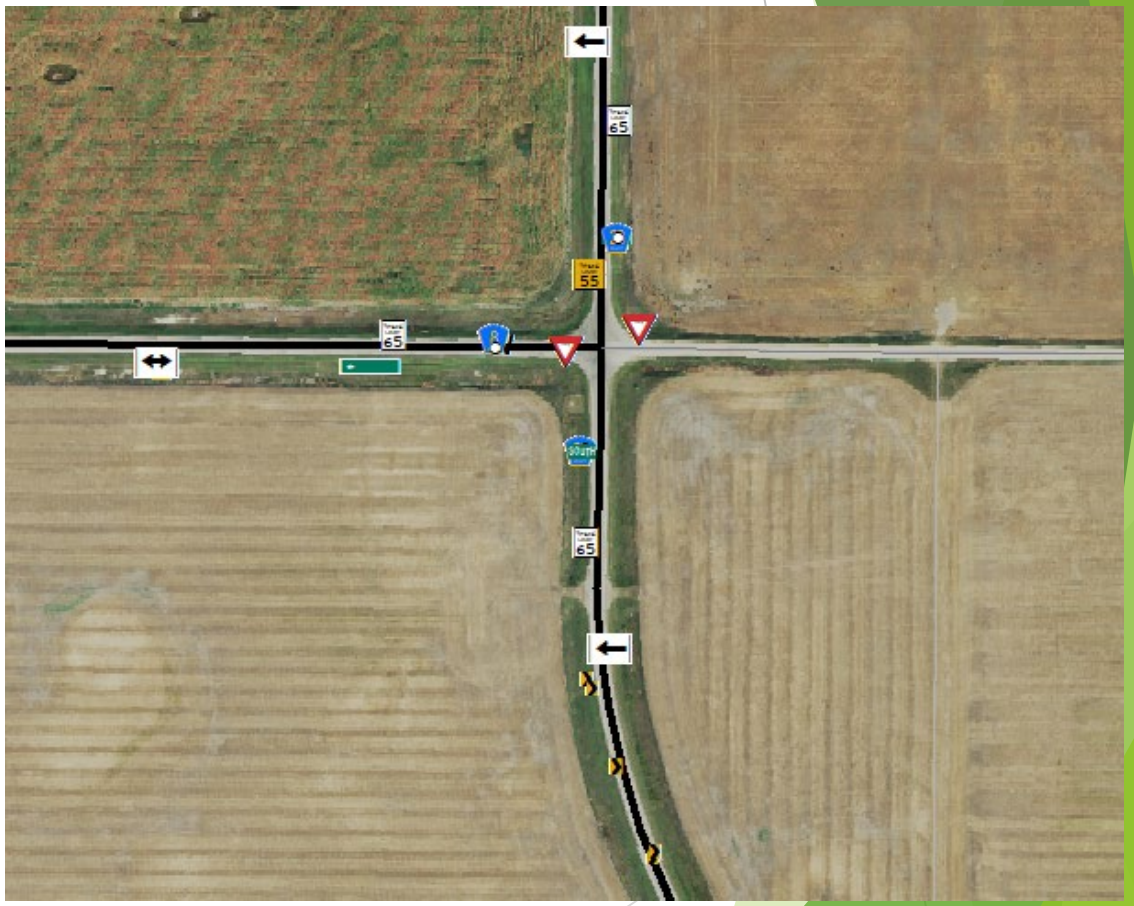
FROM DATE: 1/1/1997

TO DATE: 12/30/2022

| SIGN NUM | SIGN TYPE | DESCRIPTION | DISTANCE | DIR. TRAVEL | DATE INST. |
|---|---|---|---|---|---|
| 12520010 | R1-2-36 | YIELD | (15) | EAST | 07/29/2014 |
| 12520020 | R1-2-36 | YIELD | 45 | WEST | 02/10/2005 |
| 12520030 | M1-6-12 | WARD COUNTY 12 | 123 | EAST | 05/20/2019 |
| 12520040 | M2-1A-21 | JCT | 638 | WEST | 07/18/2022 |
| 12520041 | M1-6-13 | WARD COUNTY 13 | 638 | WEST | 07/18/2022 |
| 12520042 | M6-4A-21 | HORIZONTAL DOUBLE ARROW | 638 | WEST | 07/18/2022 |
| 12520050 | R1-2-36 | YIELD | 5287 | SOUTH | 06/17/2014 |
| 12520060 | R1-2-36 | YIELD | 5329 | NORTH | 06/17/2014 |
| 12520064 | OM3-R | TYPE THREE OBJECT MARKER RIGHT | 14274 | EAST | 08/01/2019 |
| 12520065 | OM3-L | TYPE THREE OBJECT MARKER LEFT | 14274 | WEST | 08/01/2019 |
| 12520066 | OM3-L | TYPE THREE OBJECT MARKER LEFT | 14288 | EAST | 08/01/2019 |
| 12520067 | OM3-R | TYPE THREE OBJECT MARKER RIGHT | 14288 | WEST | 08/01/2019 |
| 12520070 | R1-2-36 | YIELD | 15771 | SOUTH | 02/10/2011 |
| 12520080 | R1-1-30 | STOP | 15835 | NORTH | 02/10/2010 |
| 12520090 | W1-1L-30 | LEFT TURN SYMBOL | 25585 | EAST | 02/08/2012 |
| 12520091 | W13-1-20-18 | ADVISORY PLATE 20MPH | 25585 | EAST | 10/11/2018 |
| 12520100 | W1-6-48 | LARGE SINGLE ARROW | 26438 | EAST | 08/05/2020 |
| 12520110 | W1-1R-30 | RIGHT TURN SYMBOL | 27218 | SOUTH | 11/19/2021 |
| 12520111 | W13-1-20-18 | ADVISORY PLATE 20MPH | 27218 | SOUTH | 07/23/2020 |
| 12520120 | W1-1R-30 | RIGHT TURN SYMBOL | 28263 | NORTH | 04/03/2017 |
| 12520121 | W13-1-20-18 | ADVISORY PLATE 20MPH | 28263 | NORTH | 10/11/2018 |
| 12520130 | R1-2-36 | YIELD | 29074 | SOUTH | 05/22/2022 |
| 12520140 | W1-1L-30 | LEFT TURN SYMBOL | 29913 | WEST | 07/23/2020 |
| 12520141 | W13-1-20-18 | ADVISORY PLATE 20MPH | 29913 | WEST | 05/09/2019 |
| 12520150 | W1-4L-30 | LEFT REVERSE CURVE SYMBOL | 31108 | EAST | 07/23/2020 |
| 12520160 | W1-4L-30 | LEFT REVERSE CURVE SYMBOL | 35521 | WEST | 10/11/2018 |

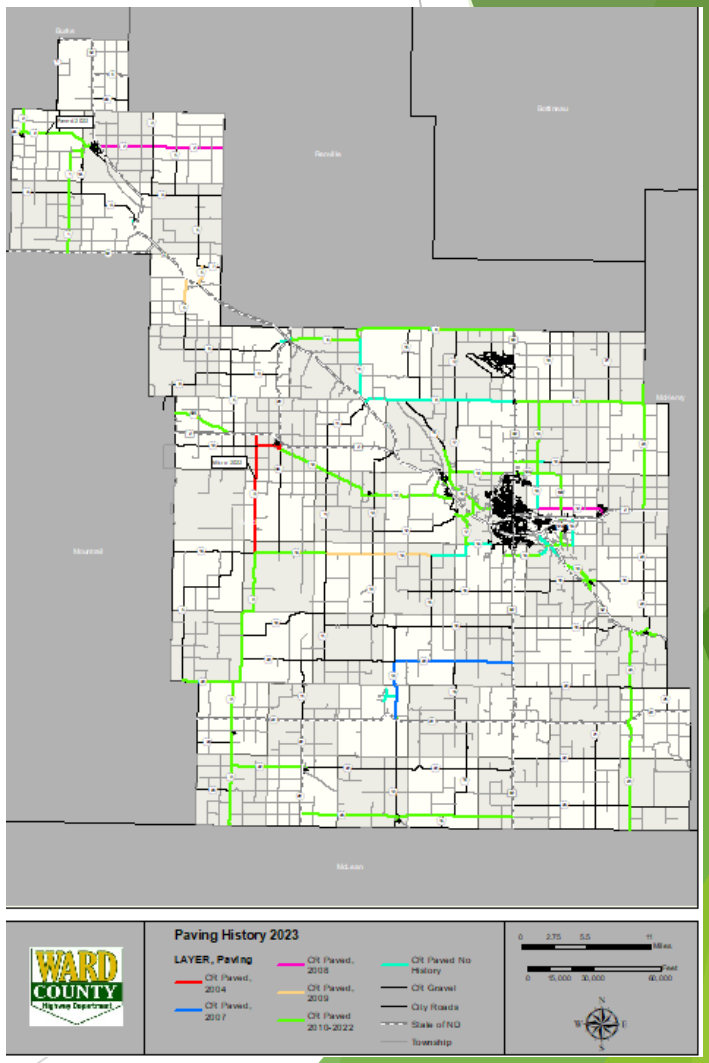
# Symbolize Sign database

- Create a symbology group layer for sign numbers from the Manual on Uniform Traffic Control Devices (MUTCD)
- Implement into a GIS layer and share to a hosted service for out internal basemap
- Collection done using Road Vista 922 reflectometer
  - < 3 meter position fix



# Roadway Database

- GRIT
  - Keep updated yearly for construction and maintenance projects – Upper Great Plains
    - https://dotsc.ugpti.ndsu.nodak.edu/GRIT/
- Internal database inside of ArcGIS
  - Updated yearly for constructions and maintenance projects
- Use for planning internally for years to come for budgets
- Make sure roads don't slip through cracks for maintenance



# Ward County hosted GIS

- Public viewers
- ArcGIS online hosted
- Hosted imagery service
- External sources utilized from state/federal agencies
  - Federal USFWS layers
  - ND Voting Layers
  - NDSWC and ND Hub Imagery

- Ward County GIS Homepage