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

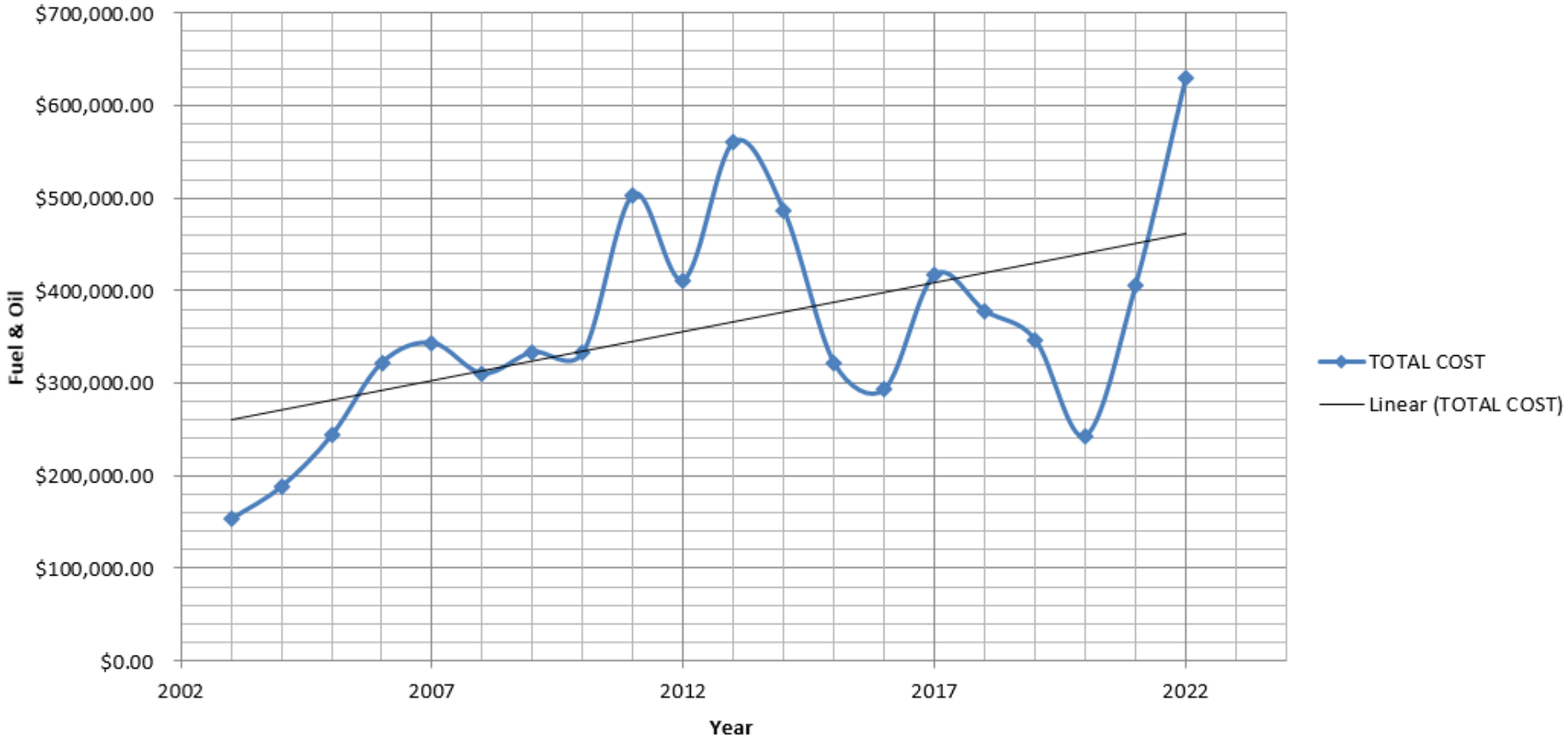
Dana Larsen, P.E.

Ward County Engineer

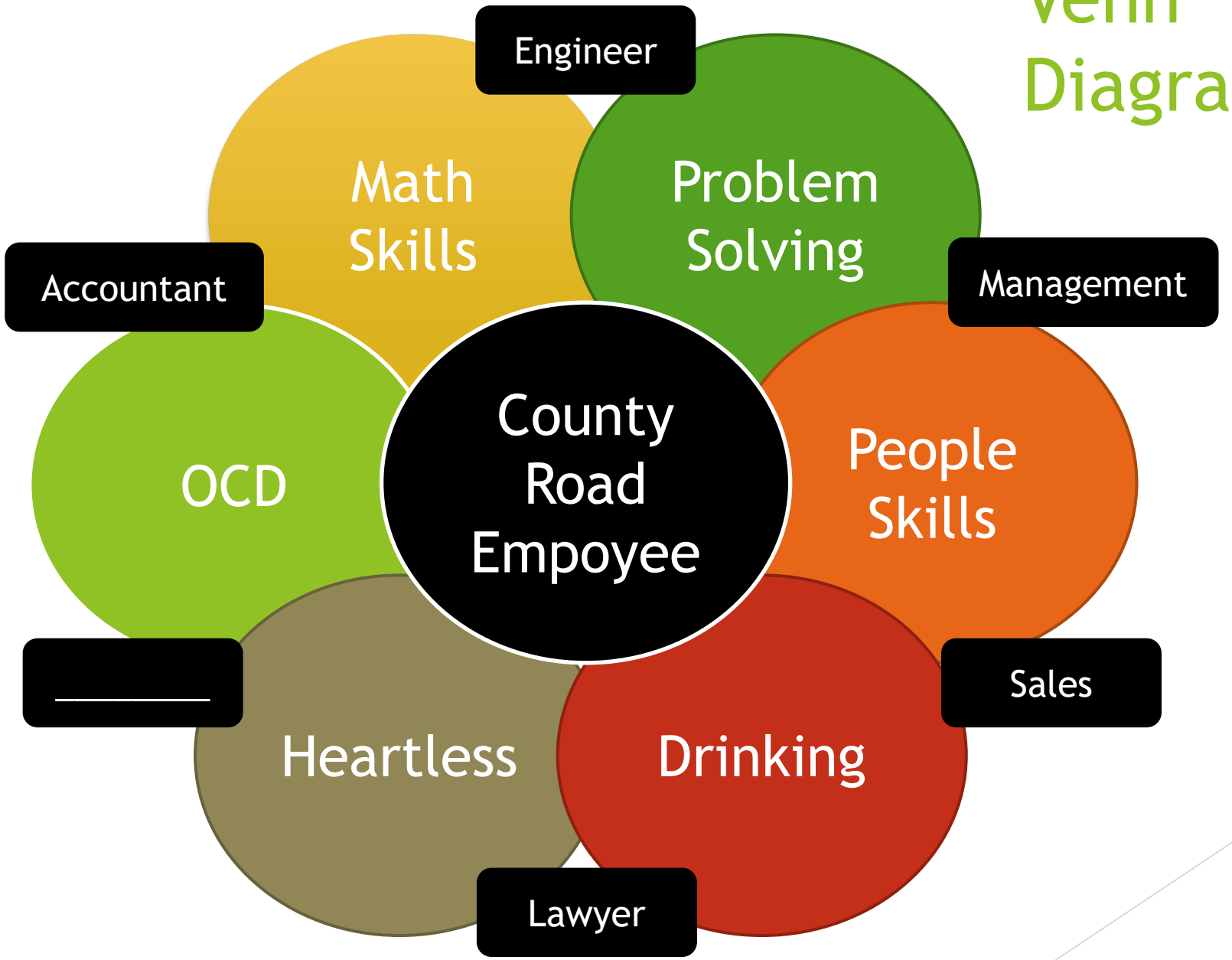
Ways to Store and Display Data

- 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)

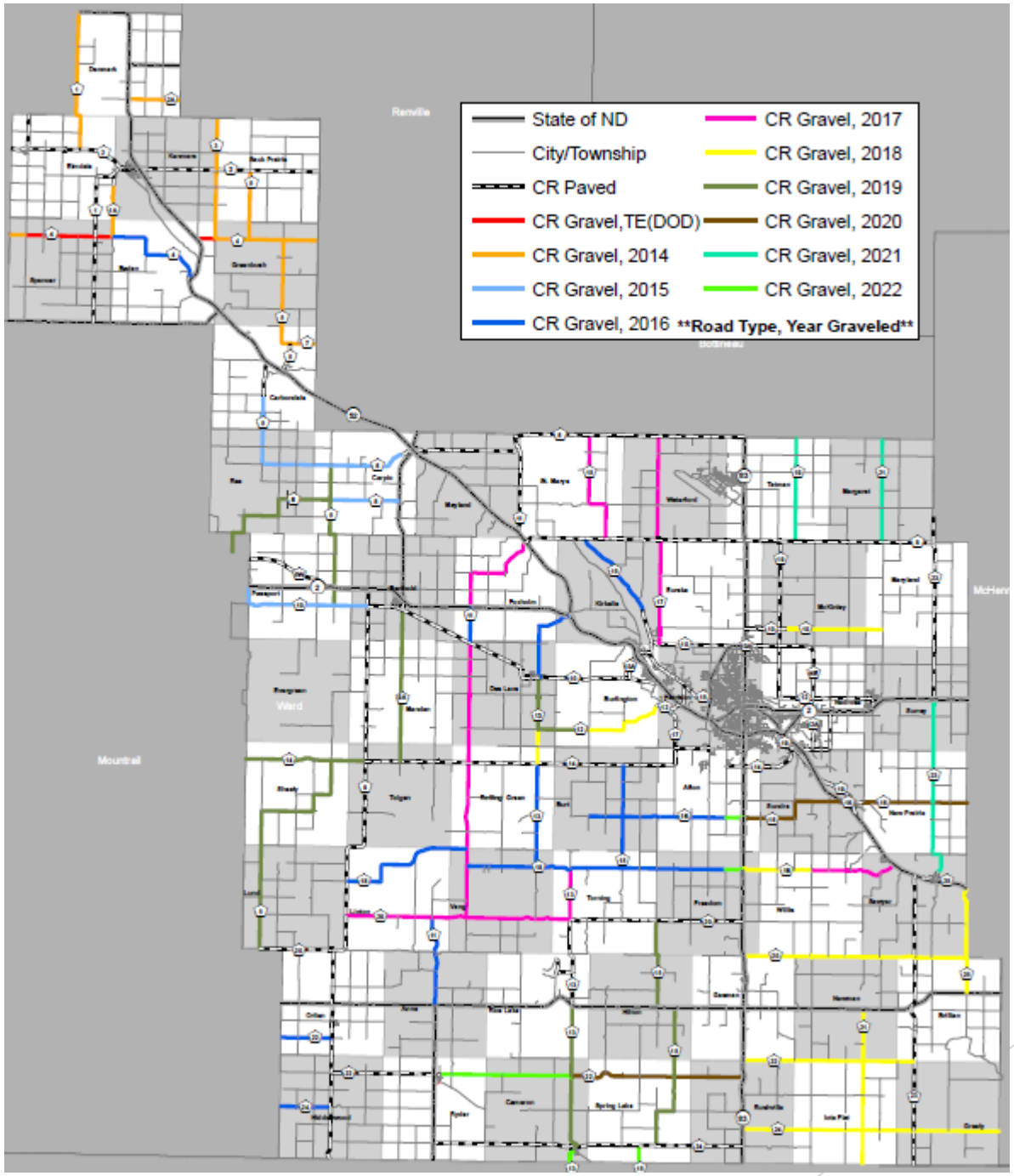
GIS Data

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

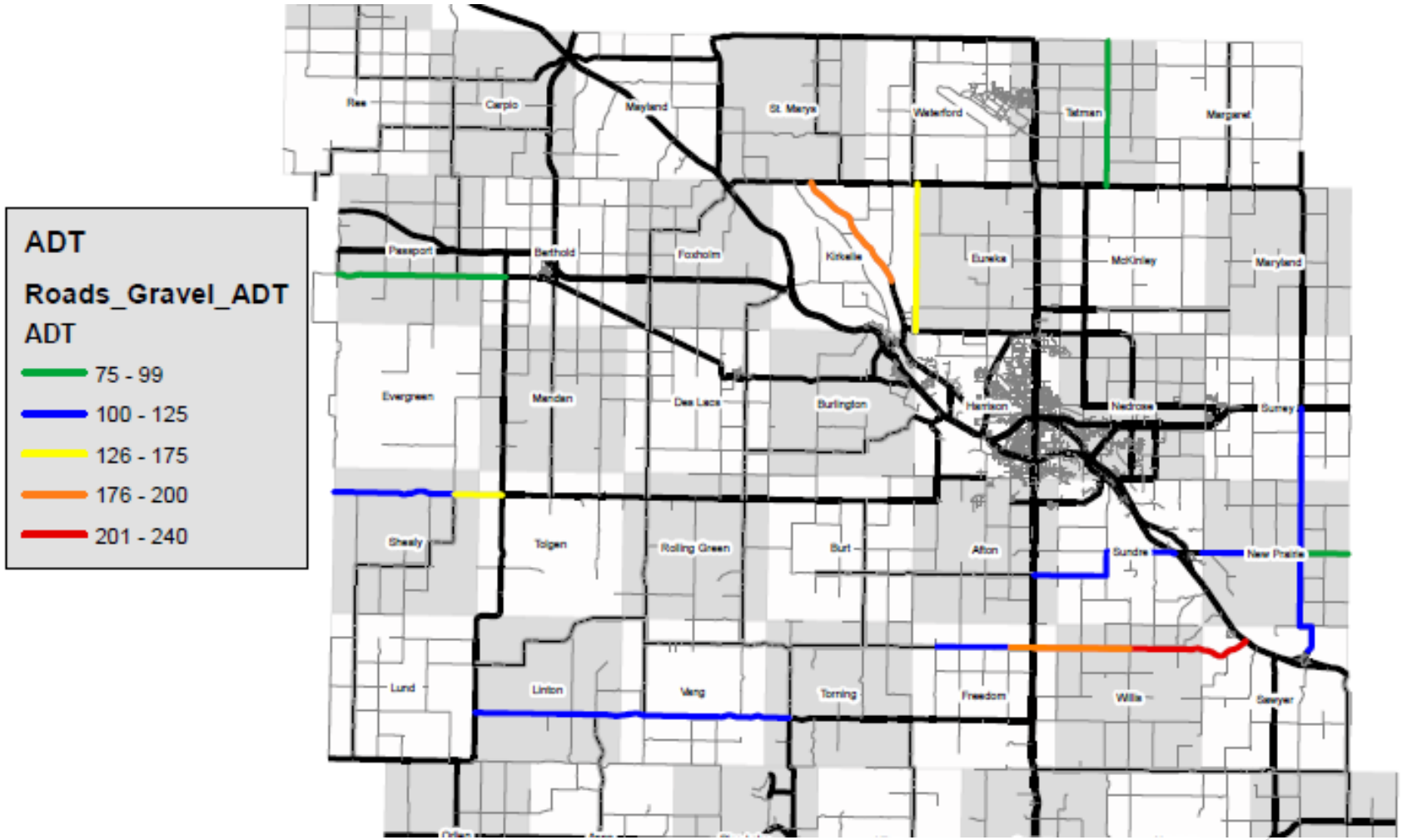
Road Centerline Data

- 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

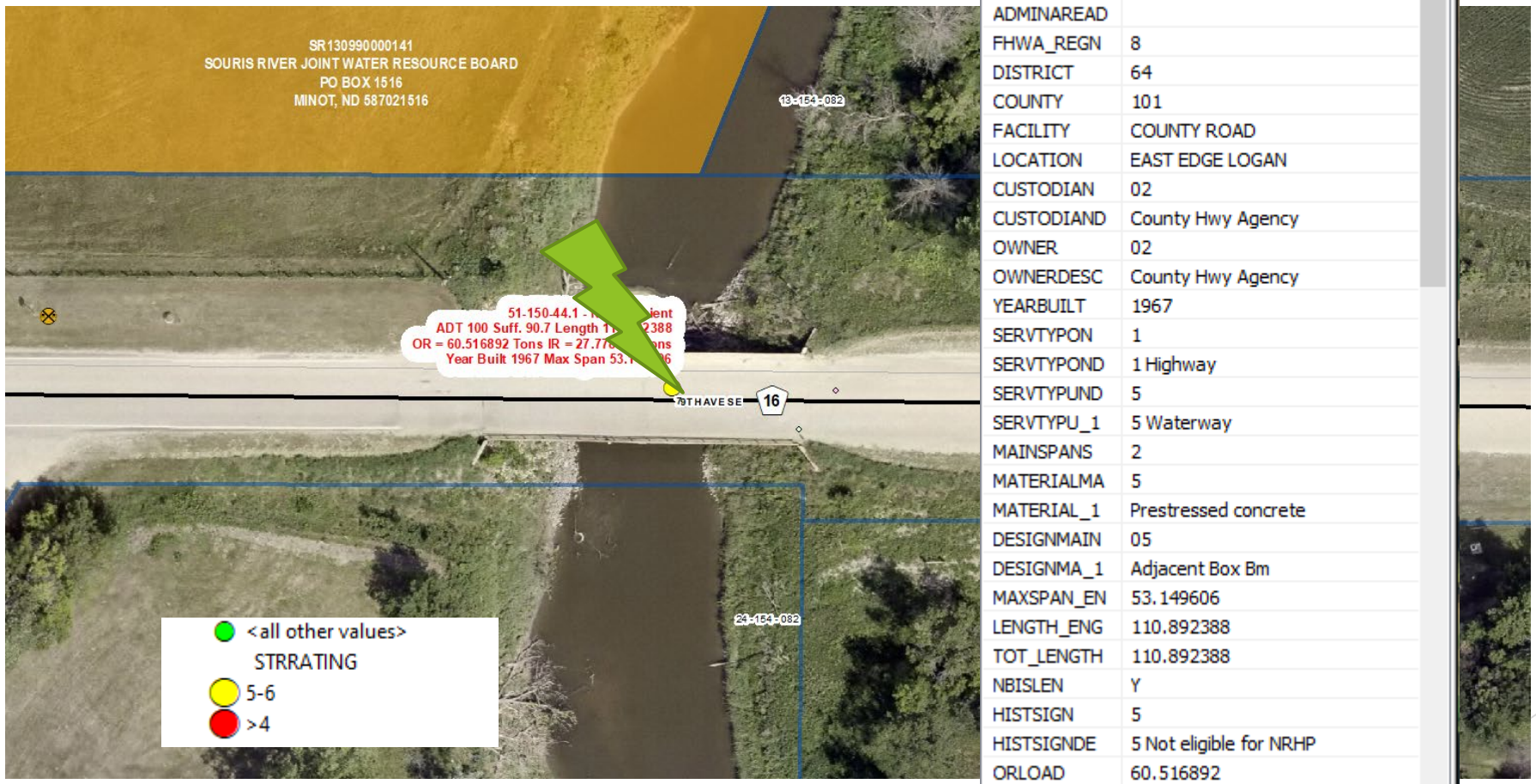
Last Year Graveled



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

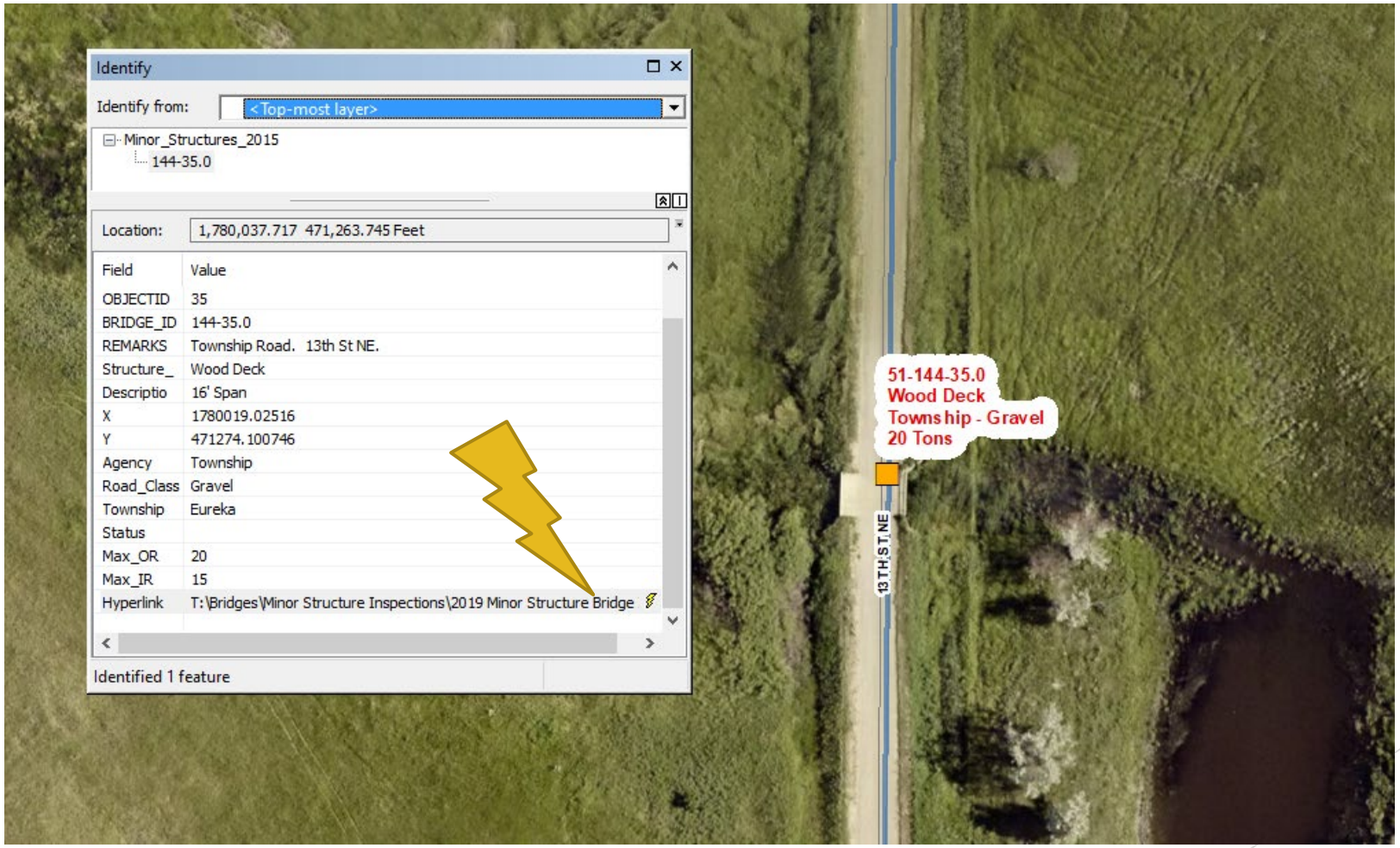
1 - State Name	North Dakota
8 - Structure Number	51-150-44.1
8A - FHWA Structure Number	000000051150441
5A - Record Type	1 - Route carried "ON" the structure
5B - Route Signing Prefix	4 - County highway
5C - Designated Level of Service	1 - Mainline
5D - Route Number	05146
5E - Directional Suffix	0 - 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

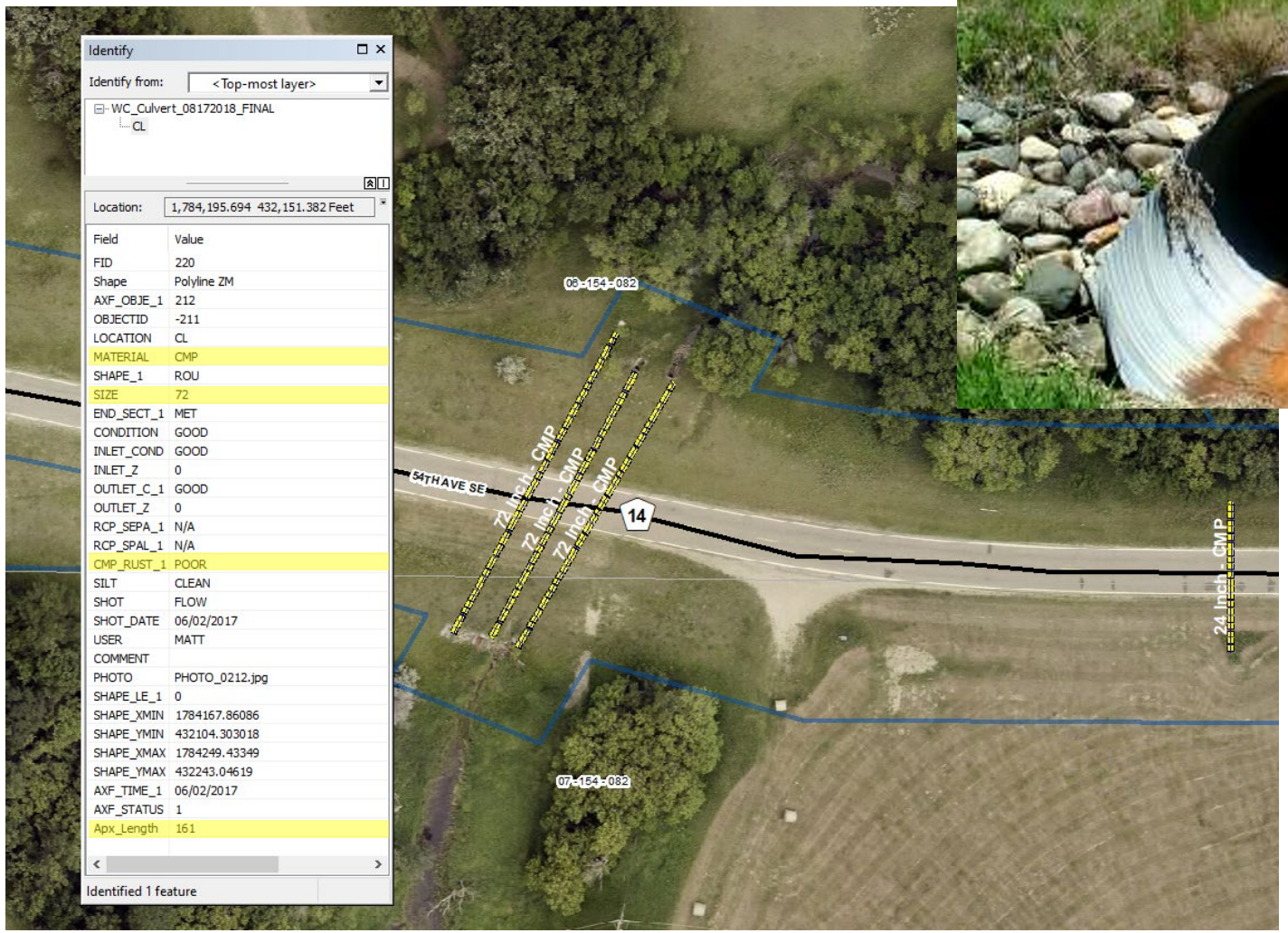
7

8

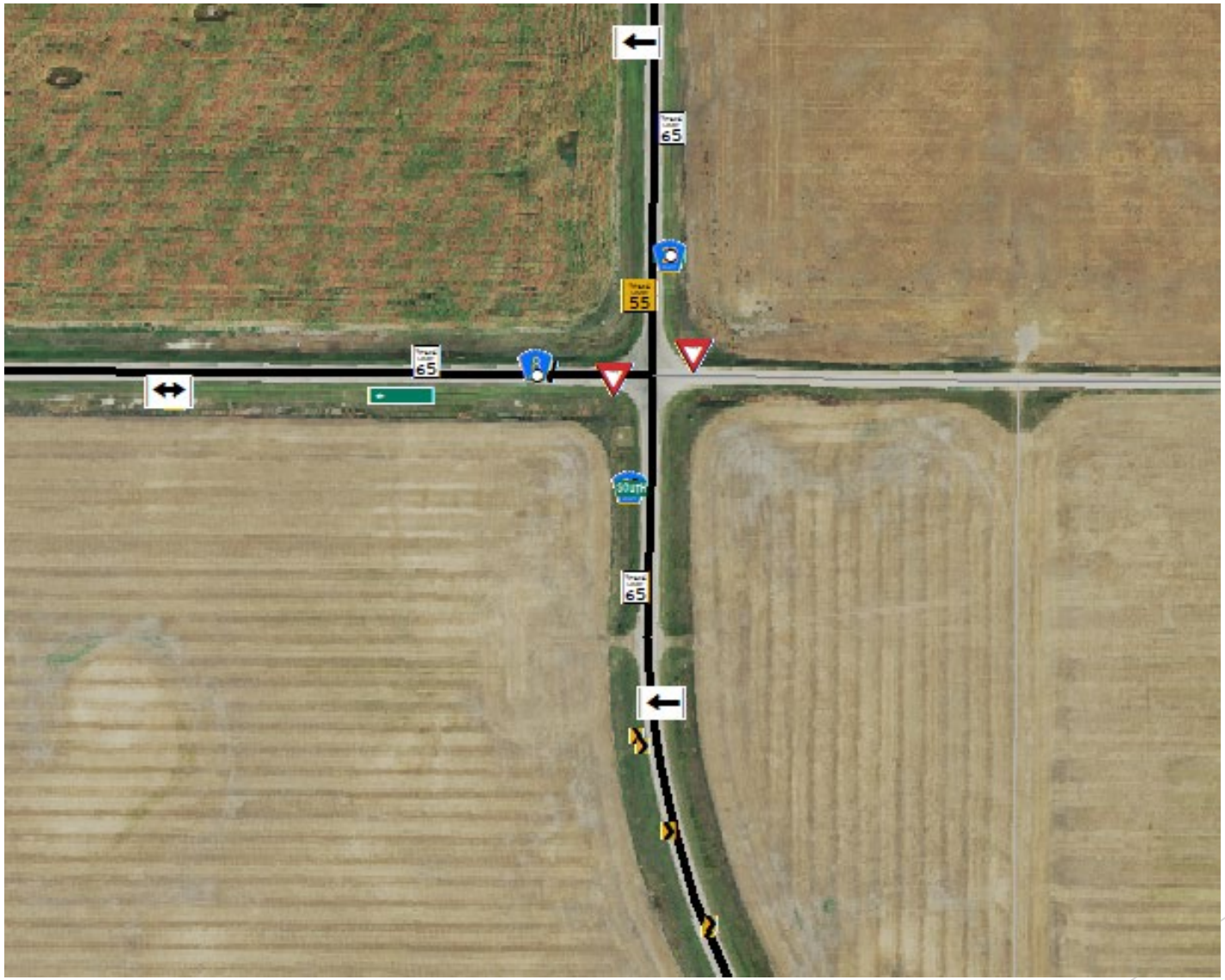
9

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

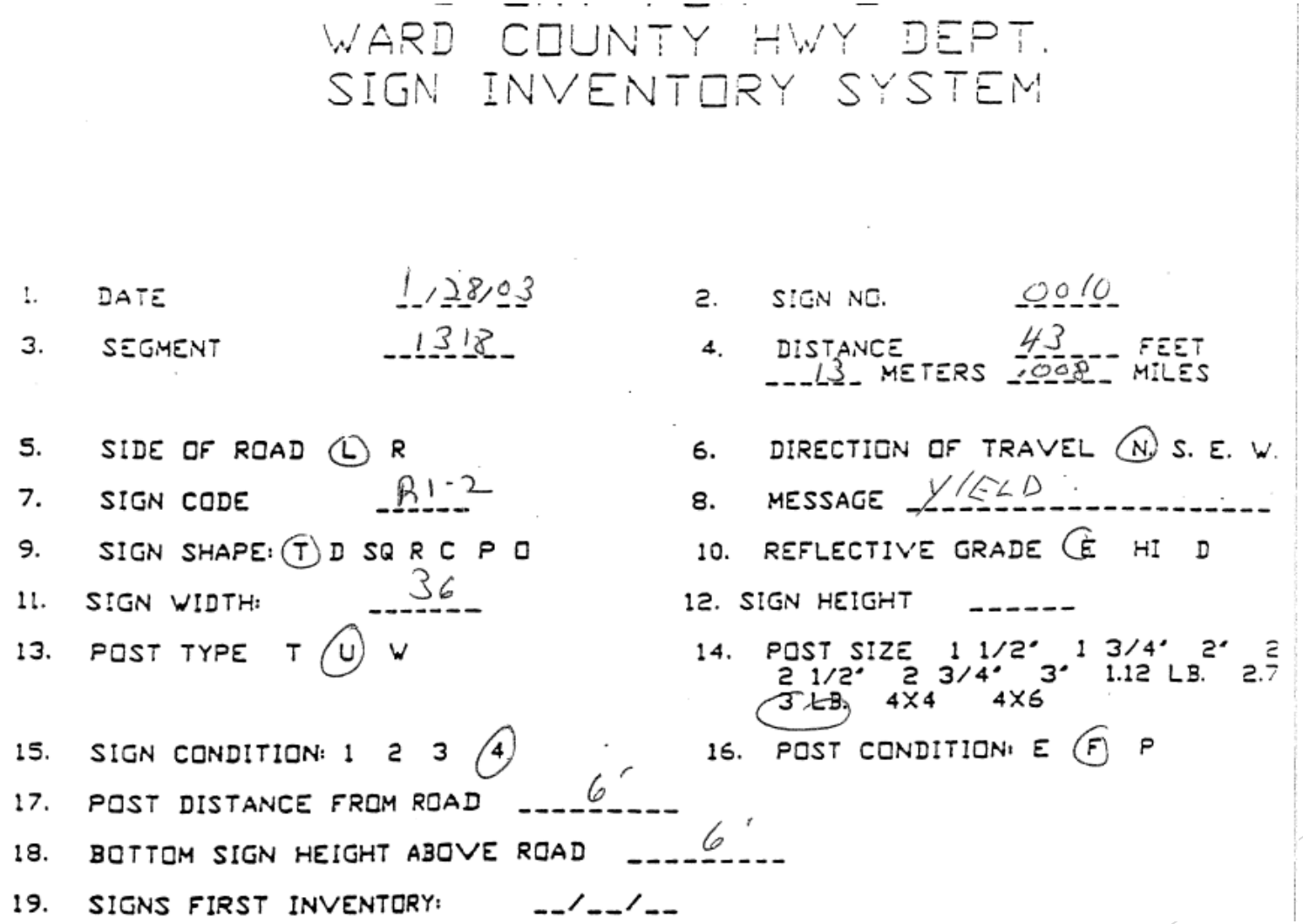
MUTCD - Manual on Uniform Traffic Control Devices

- **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

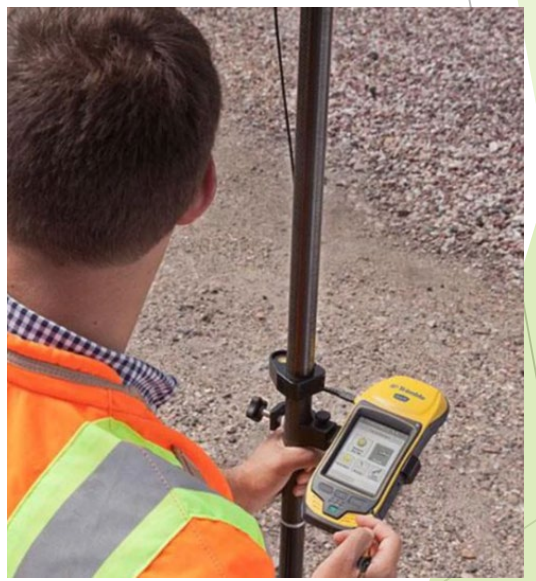
Culvert Database Planning - 2017

- 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	

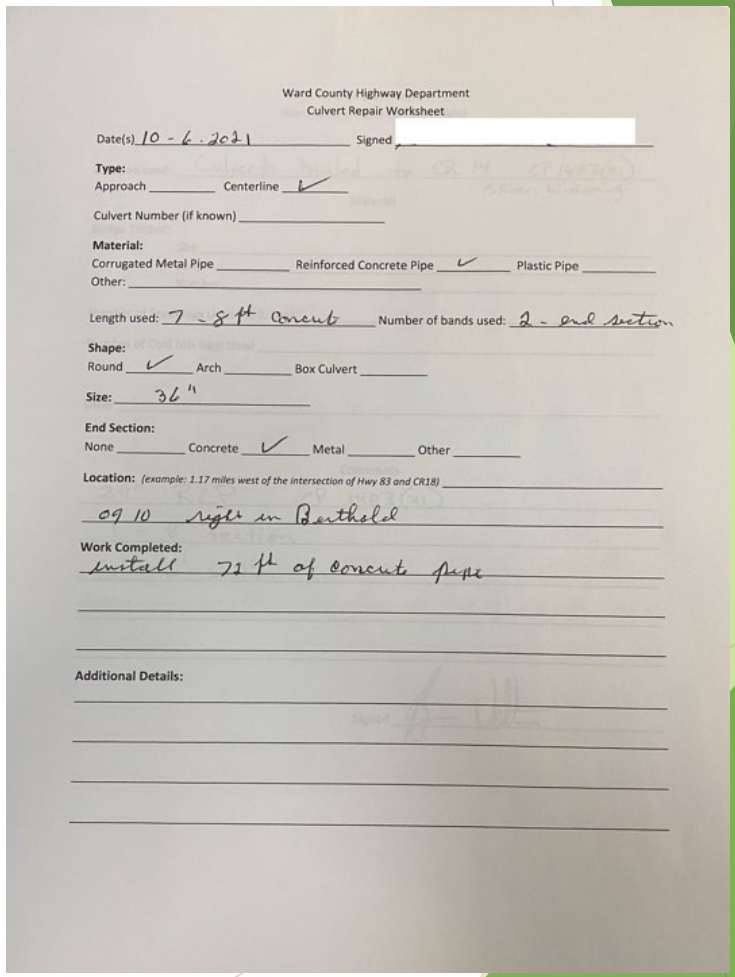
Culvert Database Collection

- 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 Sign Description - STOP Sign Location- Sheeting - HI PRISMATIC Blank- ALUMINUM Road Number- 0101 Latitude - 48.6726	Sign Type- R1-1-30	Sign Description - STOP	Road Number- 0101	Sheeting - HI PRISMATIC
SIGN 01010020	Sign Type- M1-6-1A Sign Description - WARD COUNTY 1A Sign Location- Sheeting - HI PRISMATIC Blank- ALUMINUM Road Number- 0101 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}

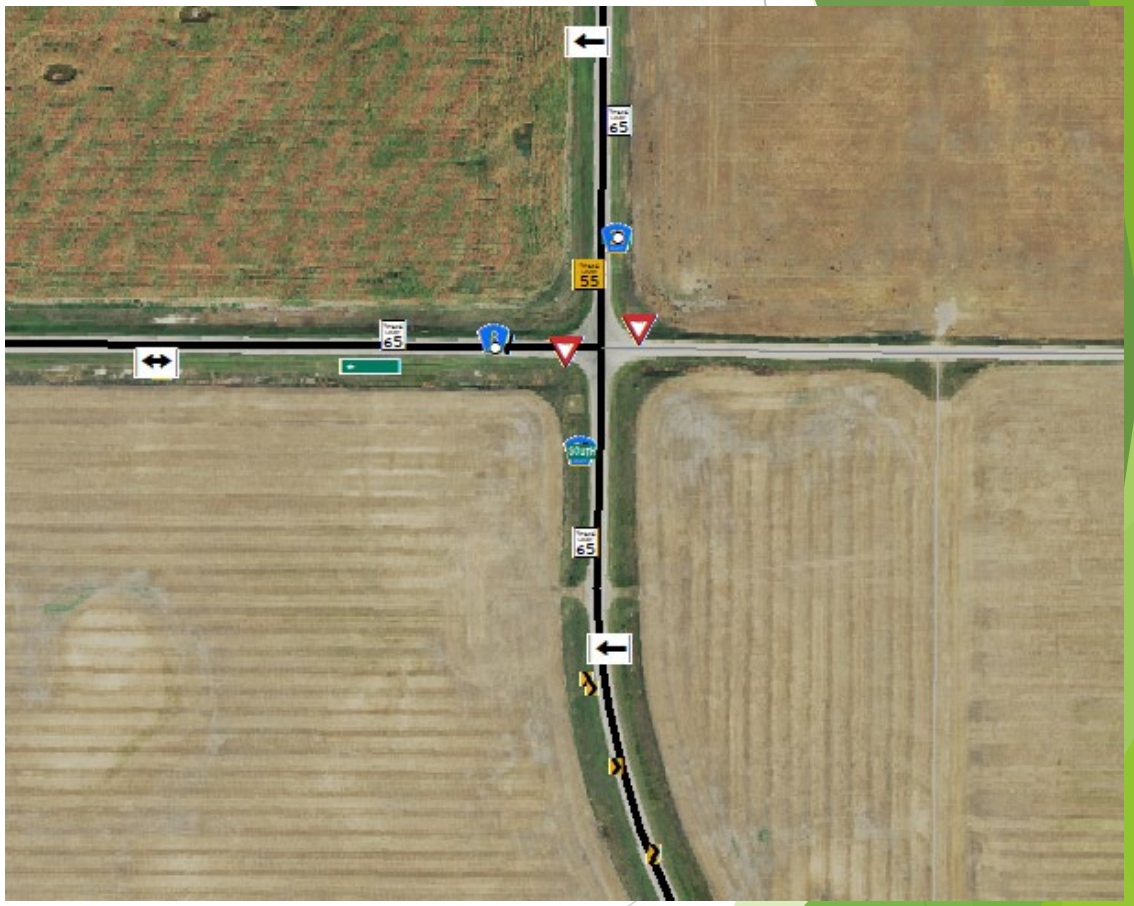
FROM DATE: 1/1/1997

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

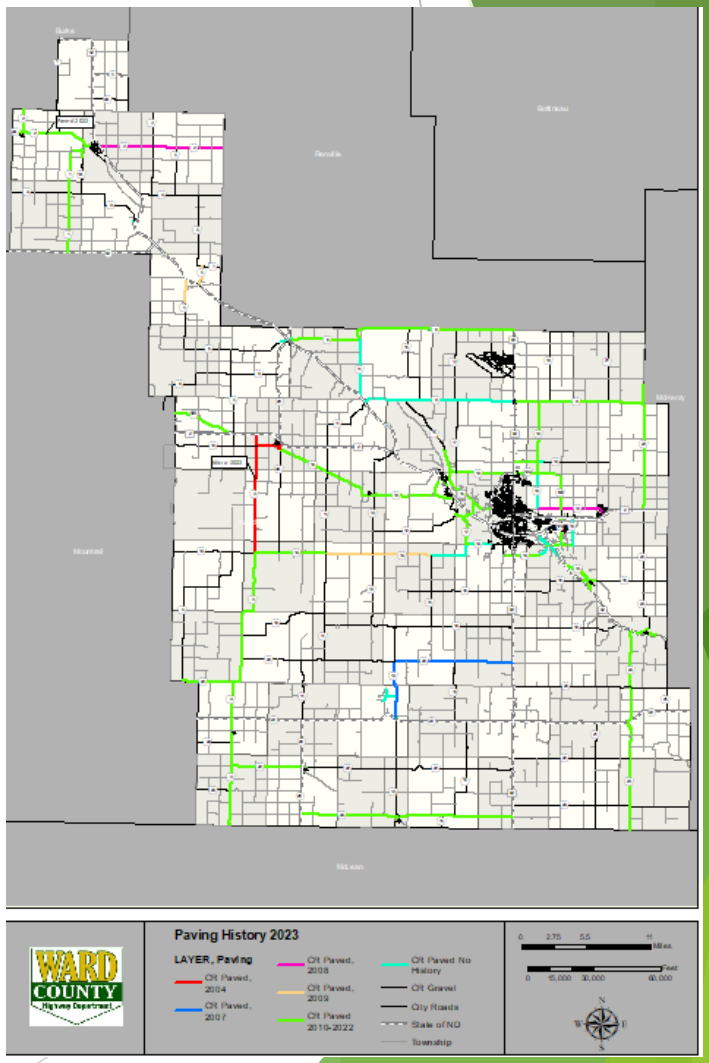
Symbolize Sign database

- 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