

# 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)

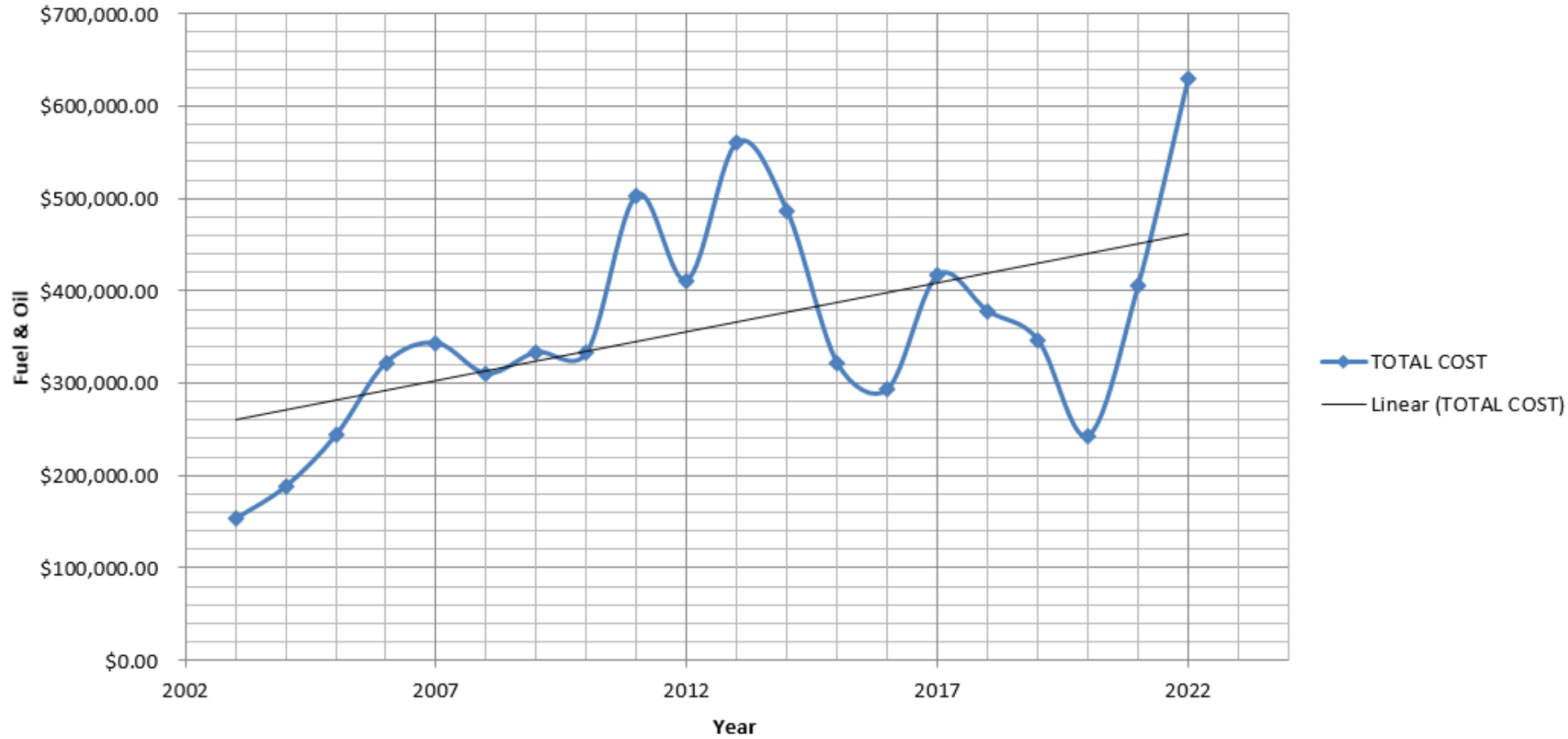
# GIS and Traffic Sign Database

Dana Larsen, P.E.  
Ward County Engineer

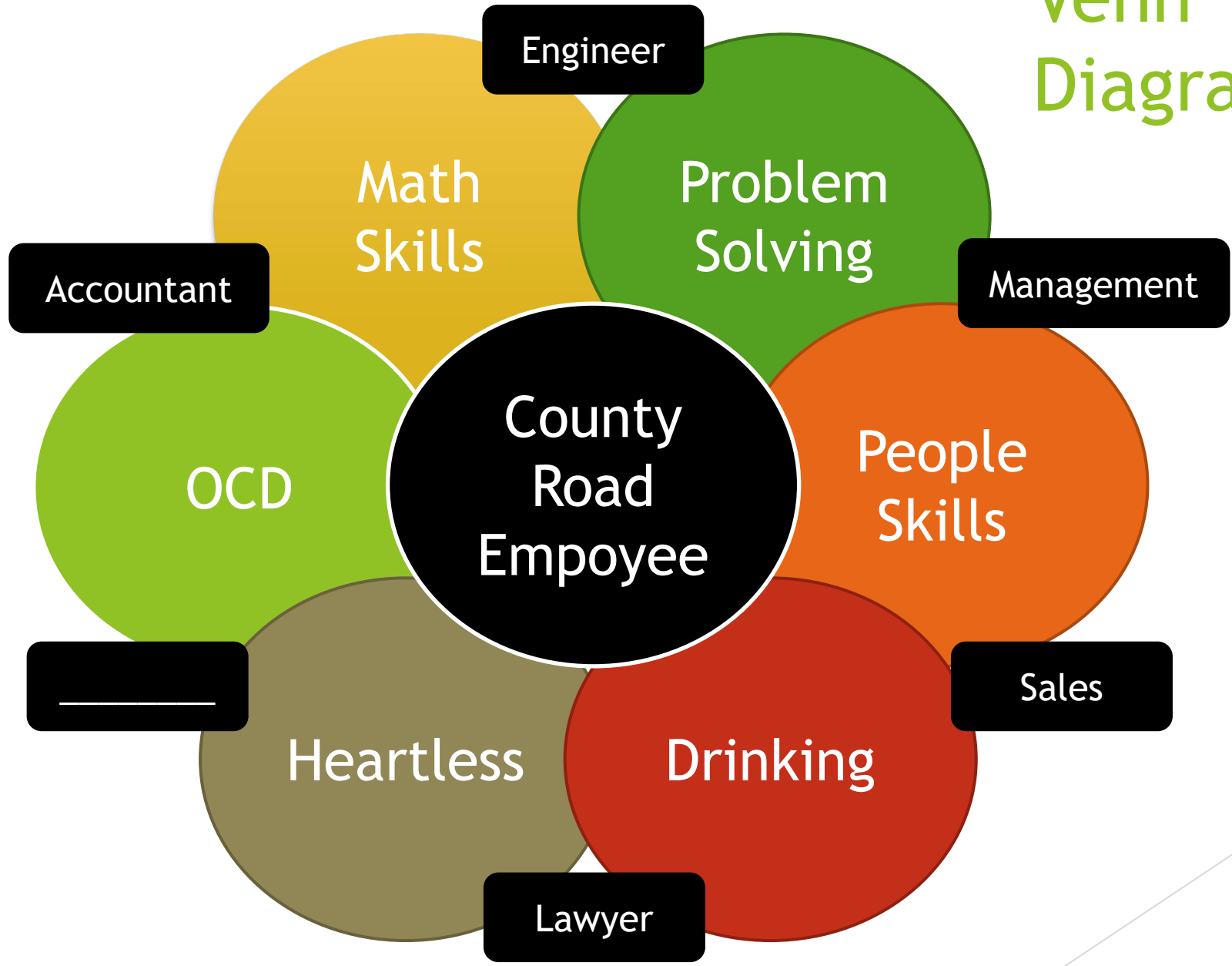
# Ways to Store and Display Data

- ▶ 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](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

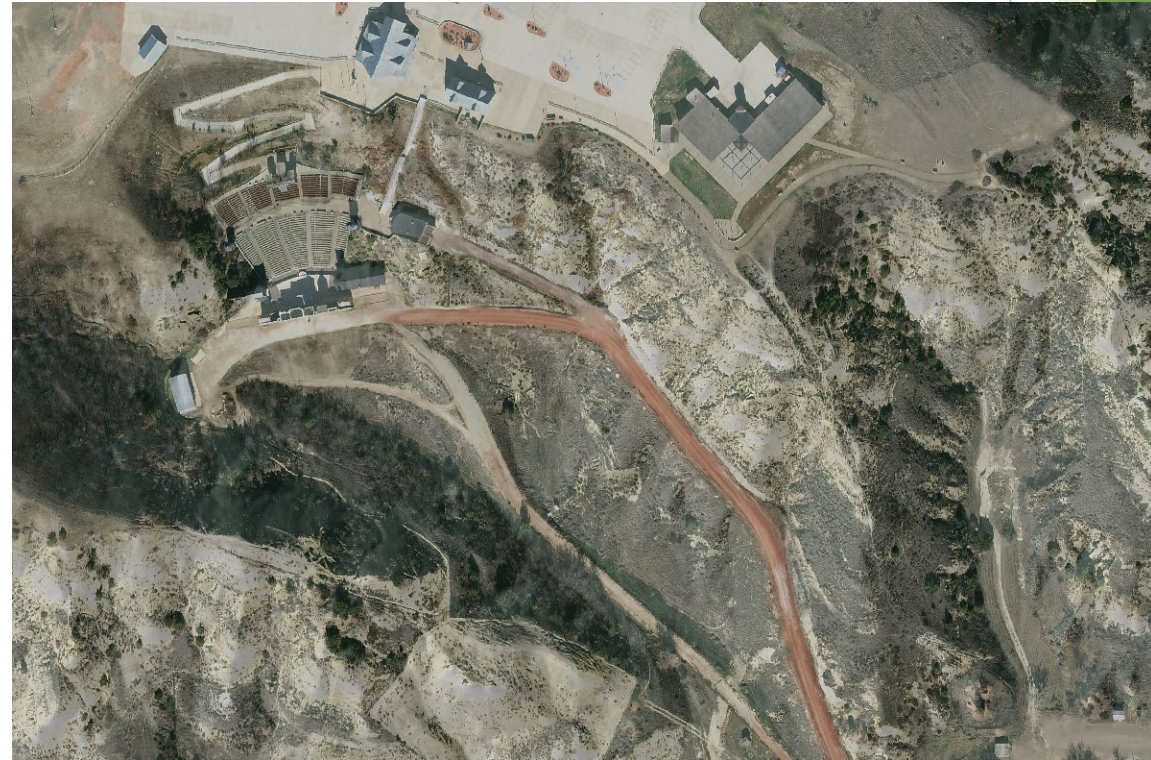
- ▶ **County Imagery**

- ▶ 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)



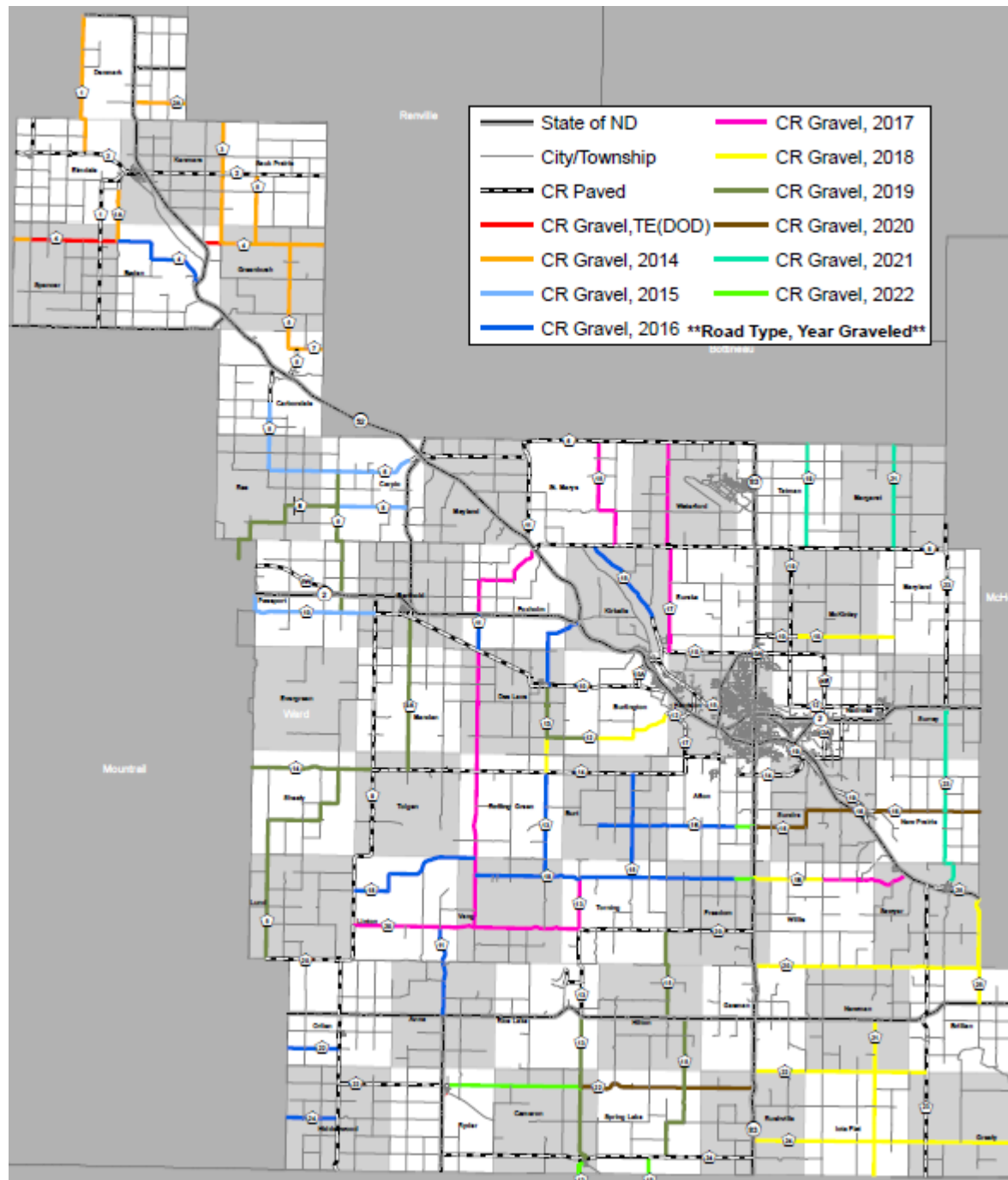
# GIS Data

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

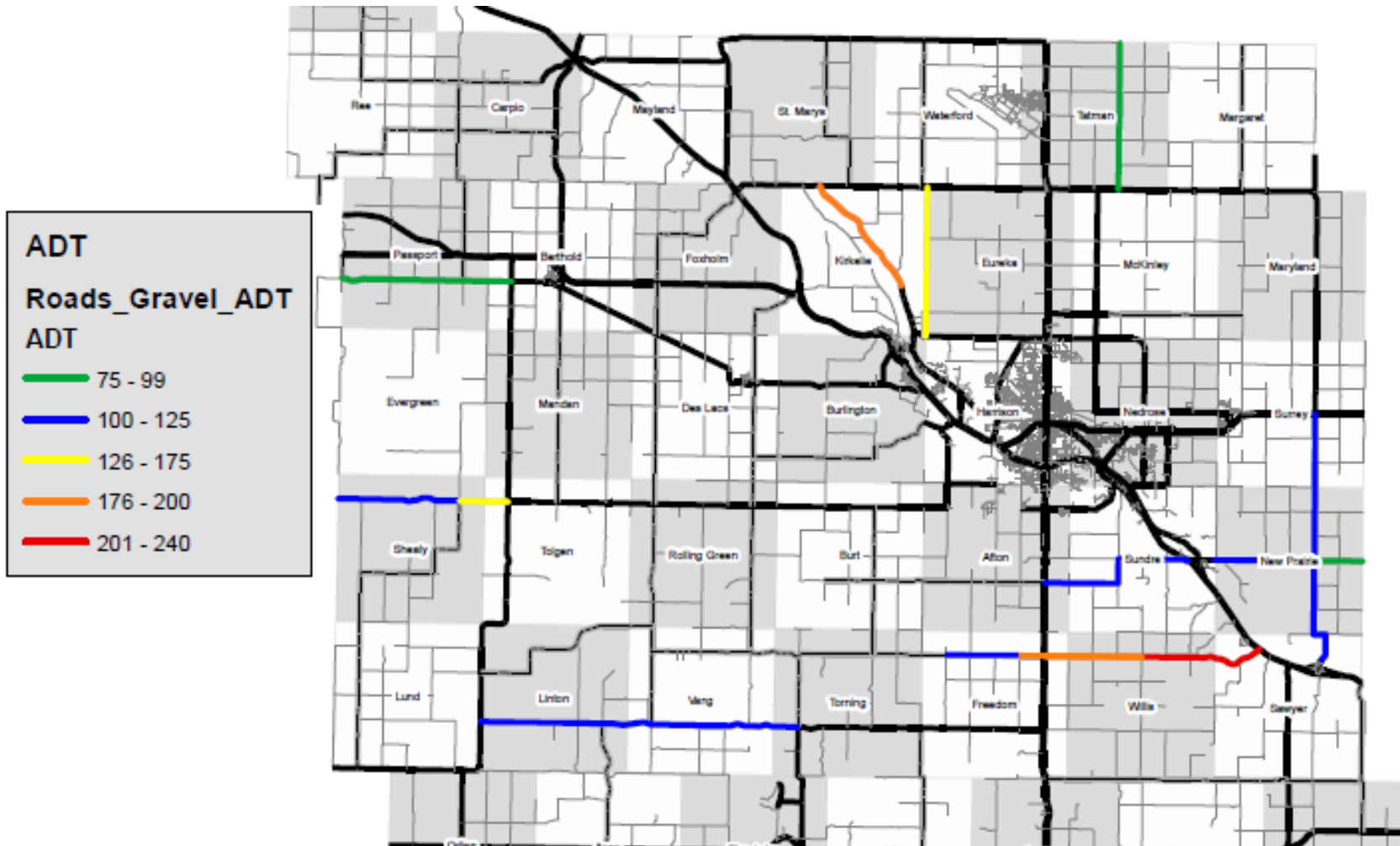
# Road Centerline Data

- ▶ 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

SR 130990000141  
SOURIS RIVER JOINT WATER RESOURCE BOARD  
PO BOX 1516  
MINOT, ND 587021516

13-154-082

51-150-44.1 - Adjacent  
ADT 100 Suff. 90.7 Length 110.892388  
OR = 60.516892 Tons IR = 27.778246  
Year Built 1967 Max Span 53.149606

16

24-154-082

< all other values >  
STRRATING  
5-6  
>4

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
SERVTYPEPOND	1 Highway
SERVTYPEPUND	5
SERVTYPEPU_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	00000051150441
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

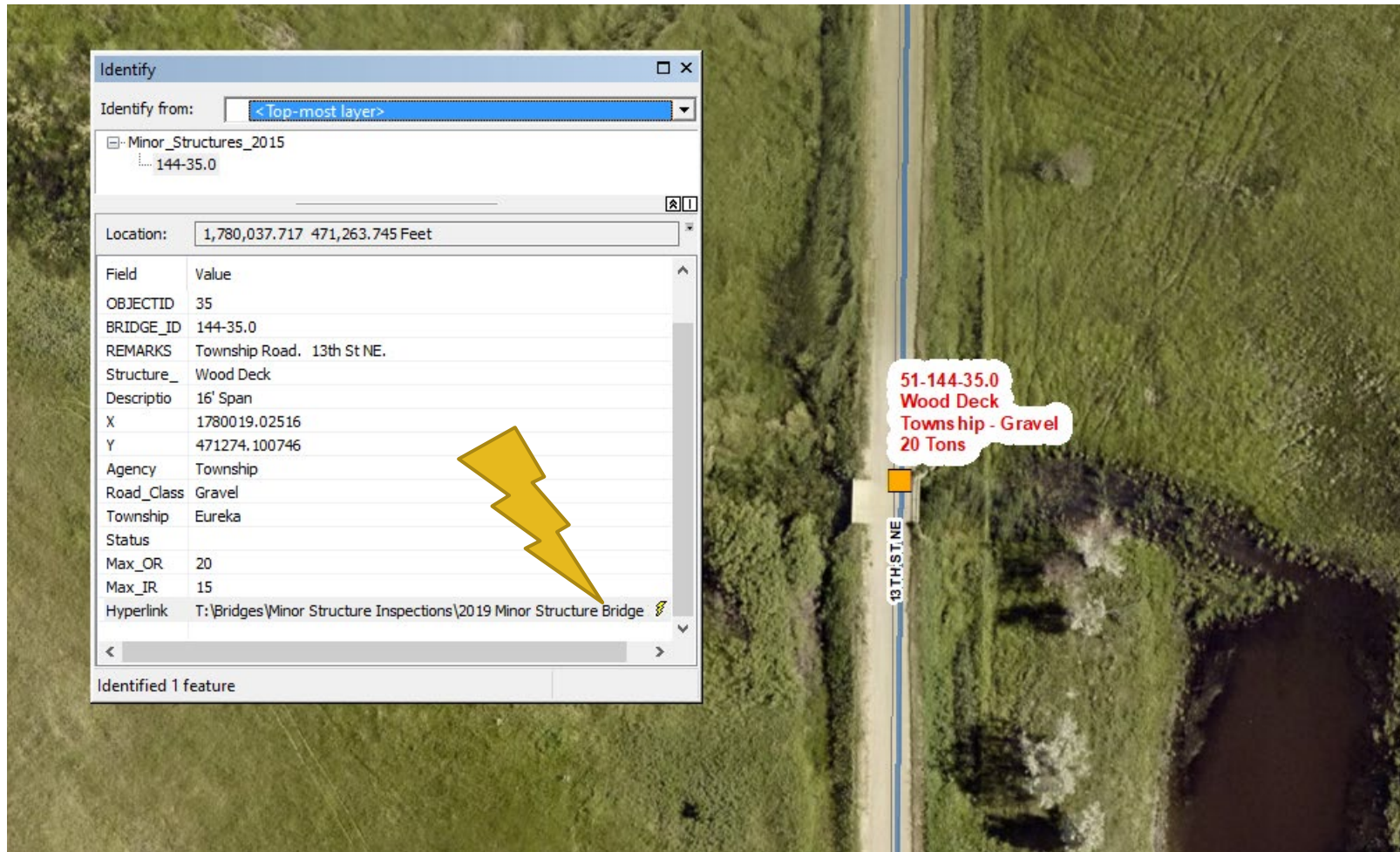


# Bridge Structure linked to InspectX

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

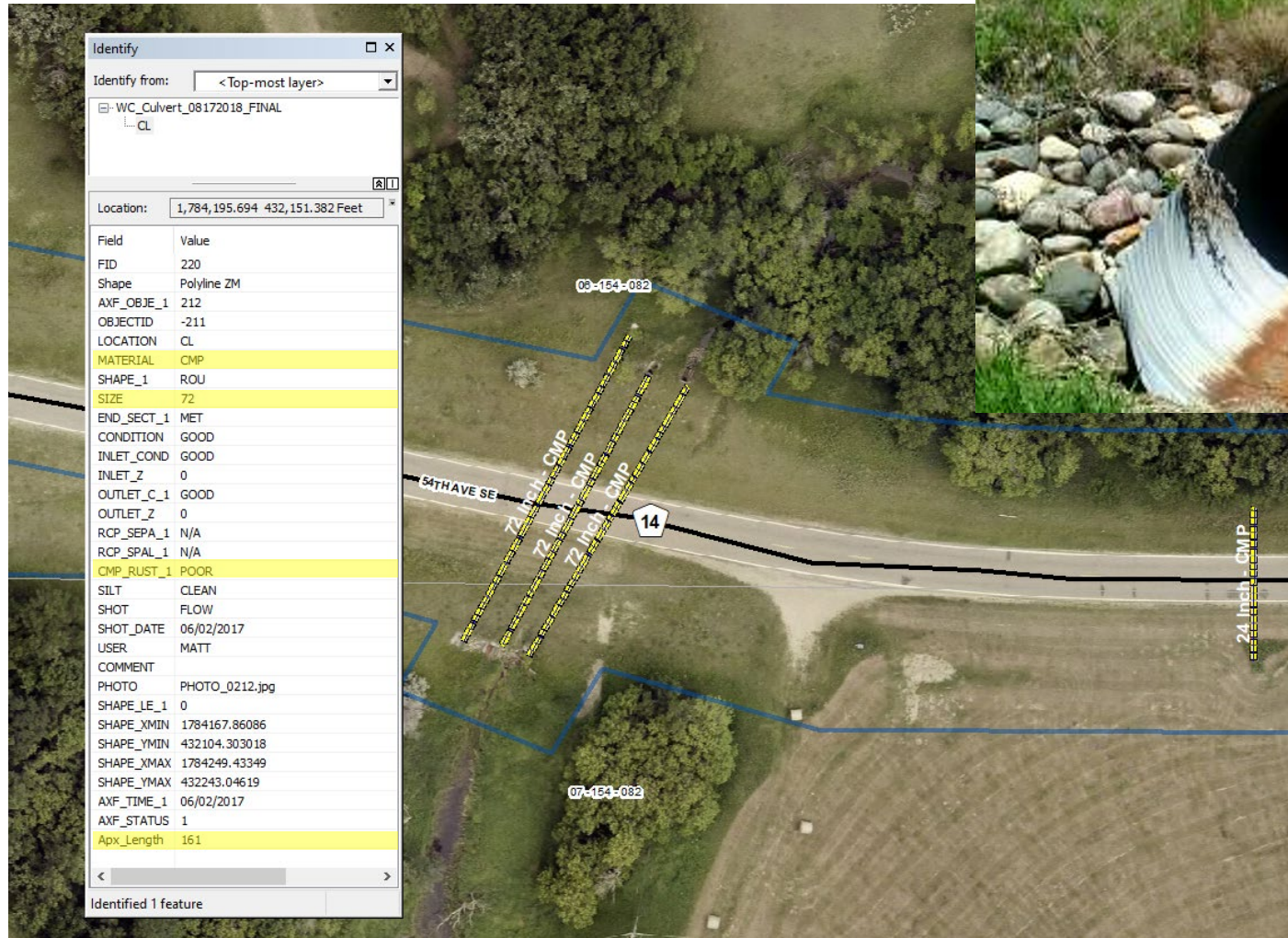
109A - Average Daily Truck Traffic	10
Cat29 - Deck Area	3419.91
27A - Bridge Age	1967
ExtraC - StatusWithout10Yr	
0 - Bridge Id	4339
IX_FK1 - State Id	34
ExtraD - Recall Number	51-150-44.1
Cat10 - Bridge Condition	1 - undefined

# Minor Structures

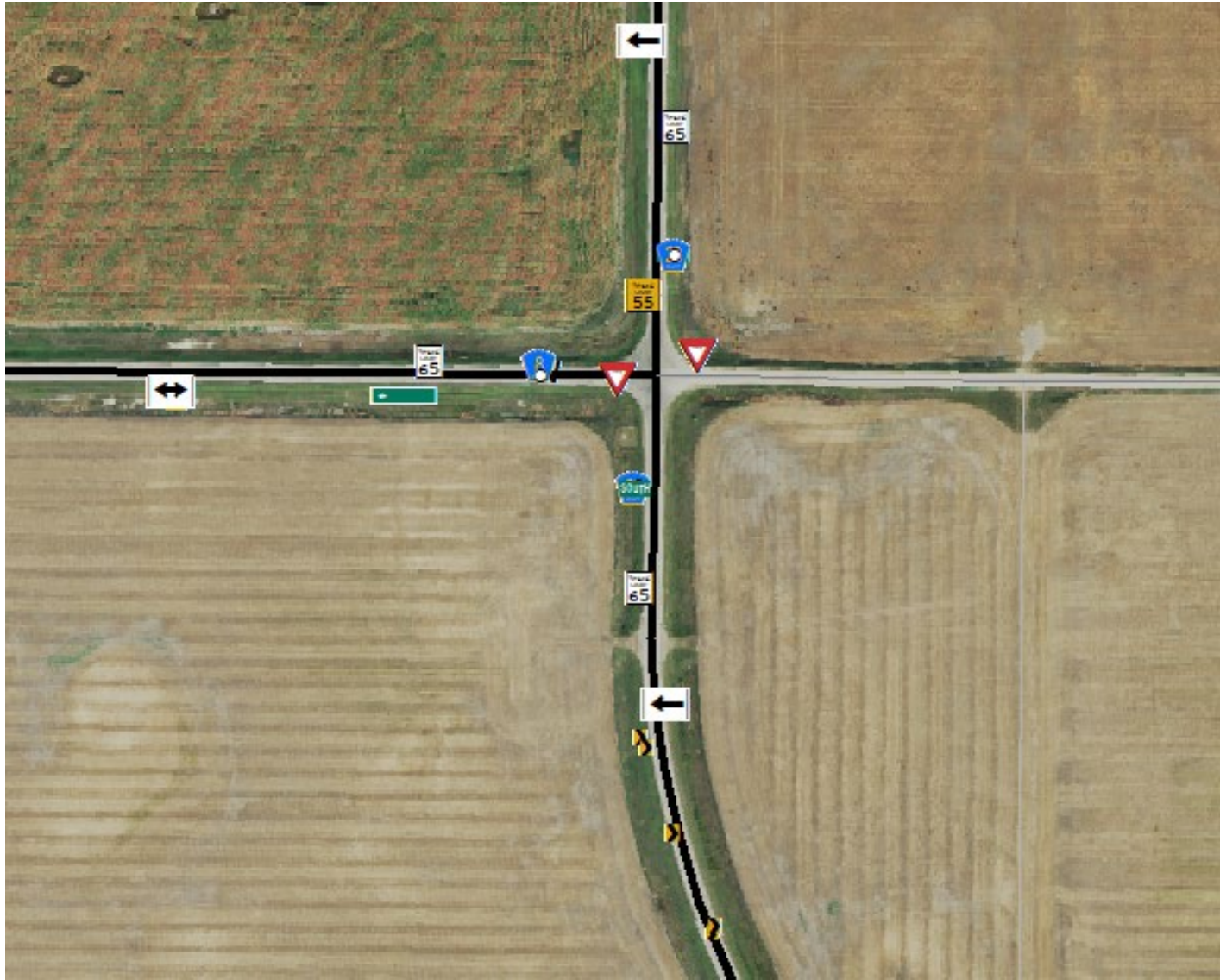




# Culvert Layer



# 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 1312
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  
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)
7/14	0010	0201	4	missing	(-)
7/26	0030 31+32	1516	4	ran over	Anchor 12' T-Post
7/26	0010	1318	4	ran over	10' T-Post
7/26	0071	0923	4	MISSING	(HI)
7/26	0010	1005	4	shot up	(F)

# Sign Data



**WARD COUNTY HIGHWAY DEPT.**  
**REFLECTOMETRY BY SIGN NUMBER/PASS-FAIL**

08/12/2015

1 of 1

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,                      ALUMINUM    HI PRISMATIC                      6                      Telespar®                      YES  
 GRAVEL

# 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
WrkCompte	



# 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)  
0910 right in Barthold

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	PopuInfo	HasLaL	LabelID							
0	SIGN 01010010	0	-1	0.000000000000	<table border="1"> <tr> <td>Sign Type - R1-1-30</td> </tr> <tr> <td>Sign Description - STOP</td> </tr> <tr> <td>Sign Location -</td> </tr> <tr> <td>Sheeting - HI PRISMATIC</td> </tr> <tr> <td>Blank - ALUMINUM</td> </tr> <tr> <td>Road Number - 0101</td> </tr> <tr> <td>Latitude - 48.6726</td> </tr> </table>	Sign Type - R1-1-30	Sign Description - STOP	Sign Location -	Sheeting - HI PRISMATIC	Blank - ALUMINUM	Road Number - 0101	Latitude - 48.6726	-1	0
Sign Type - R1-1-30														
Sign Description - STOP														
Sign Location -														
Sheeting - HI PRISMATIC														
Blank - ALUMINUM														
Road Number - 0101														
Latitude - 48.6726														
0	SIGN 01010020	0	-1	0.000000000000	<table border="1"> <tr> <td>Sign Type - M1-6-1A</td> </tr> <tr> <td>Sign Description - WARD COUNTY 1A</td> </tr> <tr> <td>Sign Location -</td> </tr> <tr> <td>Sheeting - HI PRISMATIC</td> </tr> <tr> <td>Blank - ALUMINUM</td> </tr> <tr> <td>Road Number - 0101</td> </tr> <tr> <td>Latitude</td> </tr> </table>	Sign Type - M1-6-1A	Sign Description - WARD COUNTY 1A	Sign Location -	Sheeting - HI PRISMATIC	Blank - ALUMINUM	Road Number - 0101	Latitude	-1	0
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Sign Description - WARD COUNTY 1A														
Sign Location -														
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Latitude														
0	SIGN 01010021	0	-1	0.000000000000	<table border="1"> <tr> <td>Sign Type - M6-1A-21</td> </tr> <tr> <td>Sign Description - HORIZONTAL SINGLE ARROW</td> </tr> <tr> <td>Sign Location -</td> </tr> <tr> <td>Sheeting - HI PRISMATIC</td> </tr> <tr> <td>Blank - ALUMINUM</td> </tr> <tr> <td>Road Number - 0101</td> </tr> <tr> <td>Latitude</td> </tr> </table>	Sign Type - M6-1A-21	Sign Description - HORIZONTAL SINGLE ARROW	Sign Location -	Sheeting - HI PRISMATIC	Blank - ALUMINUM	Road Number - 0101	Latitude	-1	0
Sign Type - M6-1A-21														
Sign Description - HORIZONTAL SINGLE ARROW														
Sign Location -														
Sheeting - HI PRISMATIC														
Blank - ALUMINUM														
Road Number - 0101														
Latitude														

Name	PopuInfo	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}**

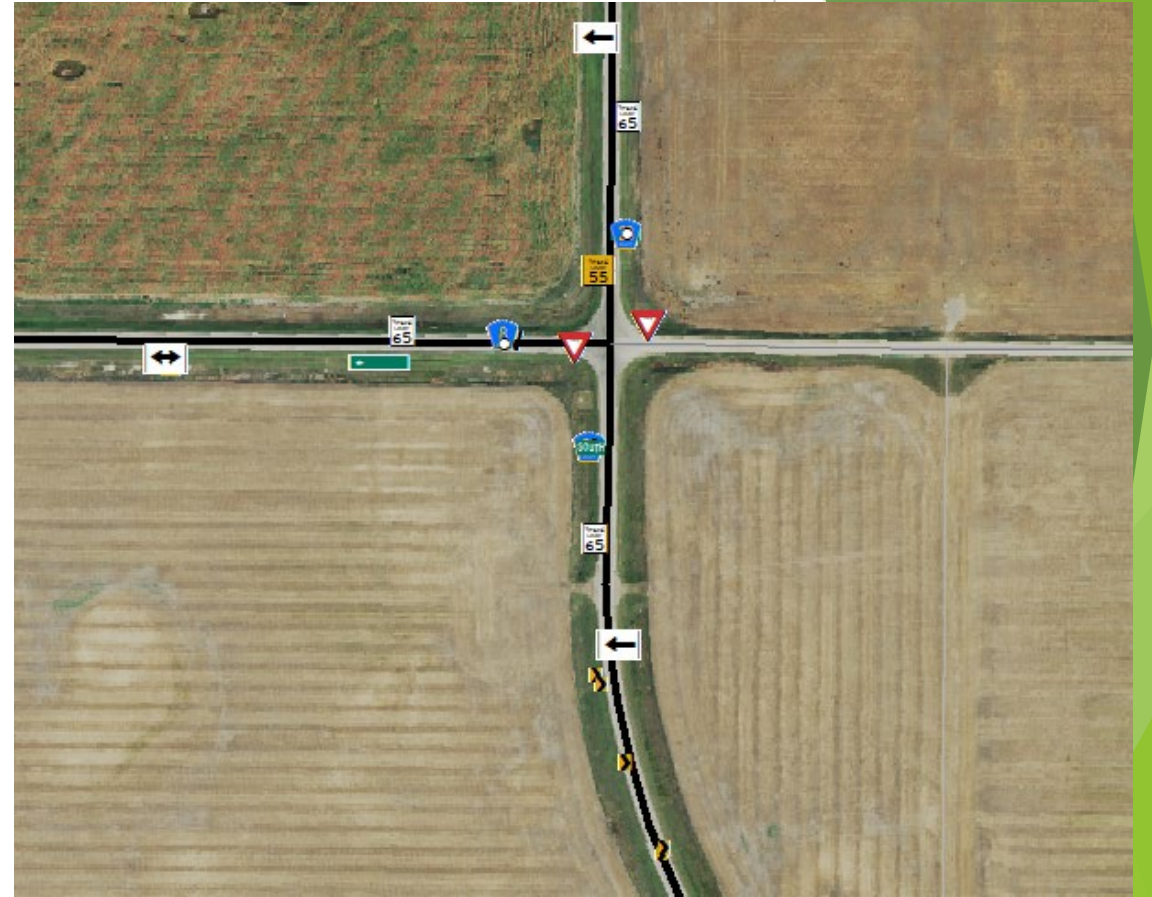
FROM DATE: 1/1/1997

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

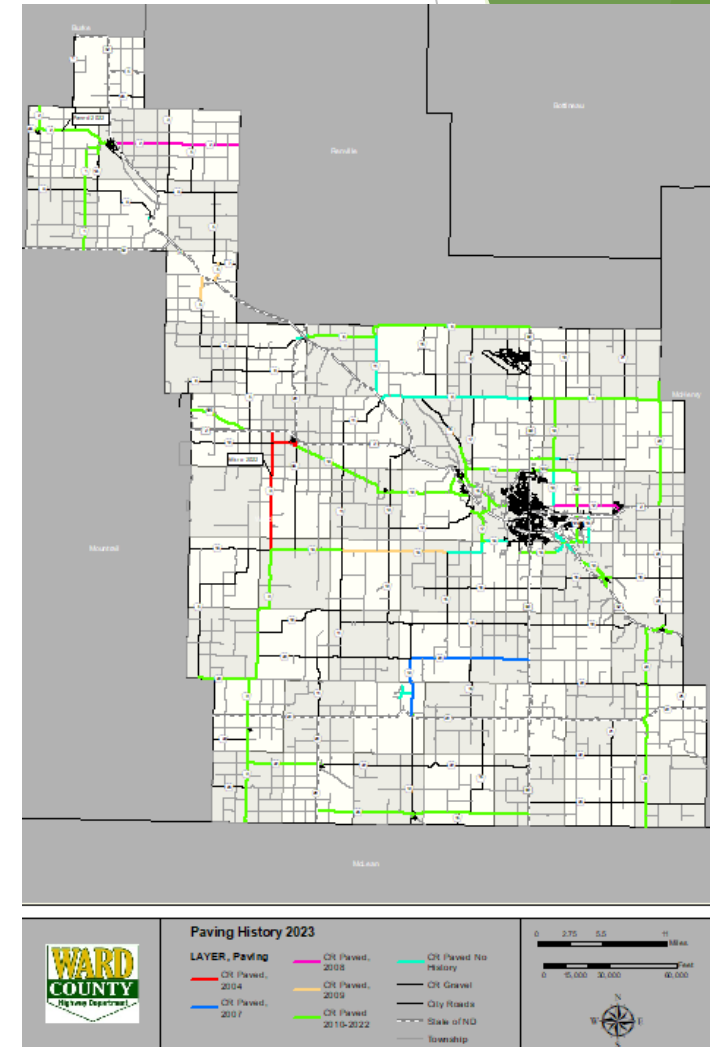
# Symbolize Sign database

- ▶ 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](#)

