Building an Accurate Base Map & GIS Ideas

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City of Detroit Lakes

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Detroit Lakes Public Utilities
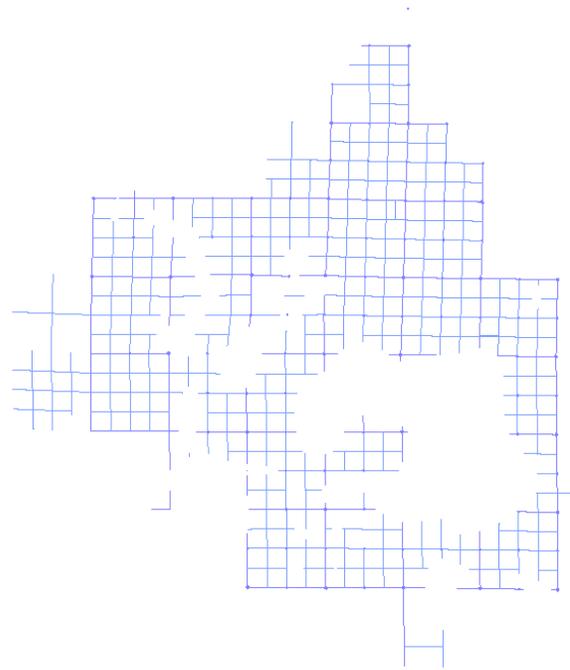
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I put this presentation together Tuesday afternoon before the Conference and did not have any notes, just the slides. I have now added a few notes, but please by all means, if you have a question about something we have done, feel free to contact me and we can go over it together. Thank you.

Steve

Start with Survey accurate Section Corners & Lines, lock them into your coordinate system.
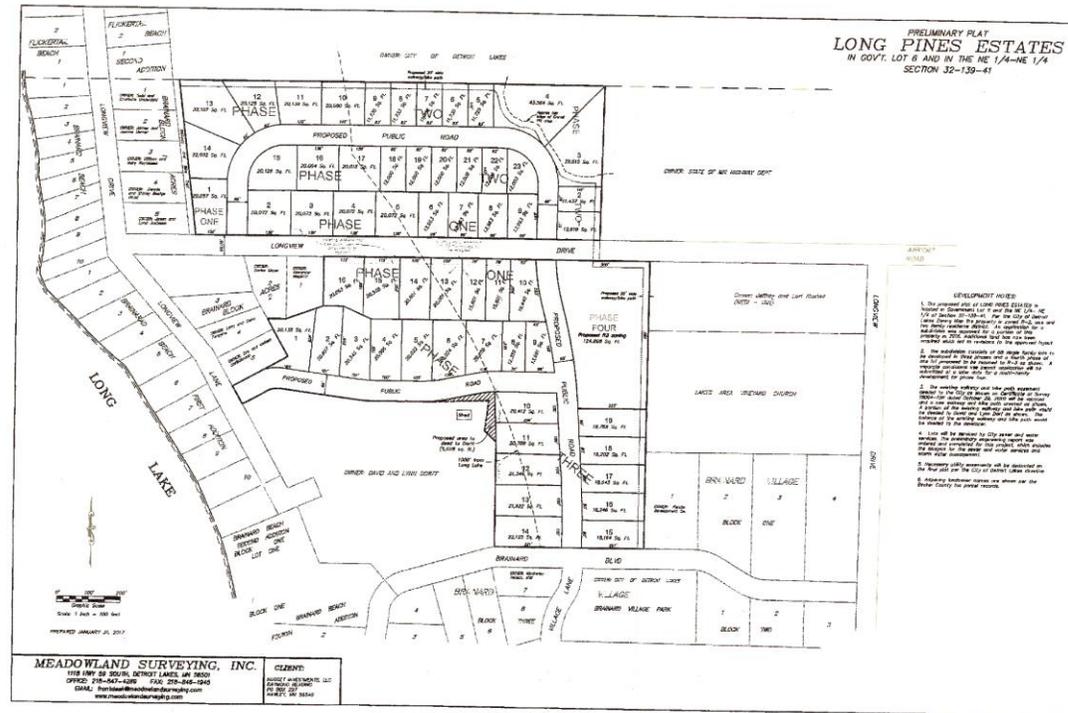
I started with paper and pencil, Mylar and ink and worked my way into Generic CAD and then to AutoCAD, which I still use today. Midland GIS is hosting our GIS Program in ESRI products. My background is in Land Surveying, so my maps are based on the Land Surveyor's Section Corners and Lines. I can measure from one end of our territory to the other end and be within a foot.

Placing new plats are not a problem, putting in old plats and unplatted lands are challenging.

All the new surveys that are brought into the City or our Electric Territory are based on the Becker County Coordinate System. All I have to do is drop them into place and they are located exactly as they should be. Old plats and Unplatted parcels are then worked into the puzzle and fit as best they can.

# Proposed plats per our coordinate system.

Proposed Plats and also brought in on the Becker County Coordinate System, this allows us to make sure the roads line up and it fits into the neighborhood. This also gives us an opportunity to draw in easements.

Utility Easements.

We require a 20' easement along all new roads and usually get a 5' to 10' wide easement along the back lot lines. Telephone and Cable TV usually are buried in the same trench.
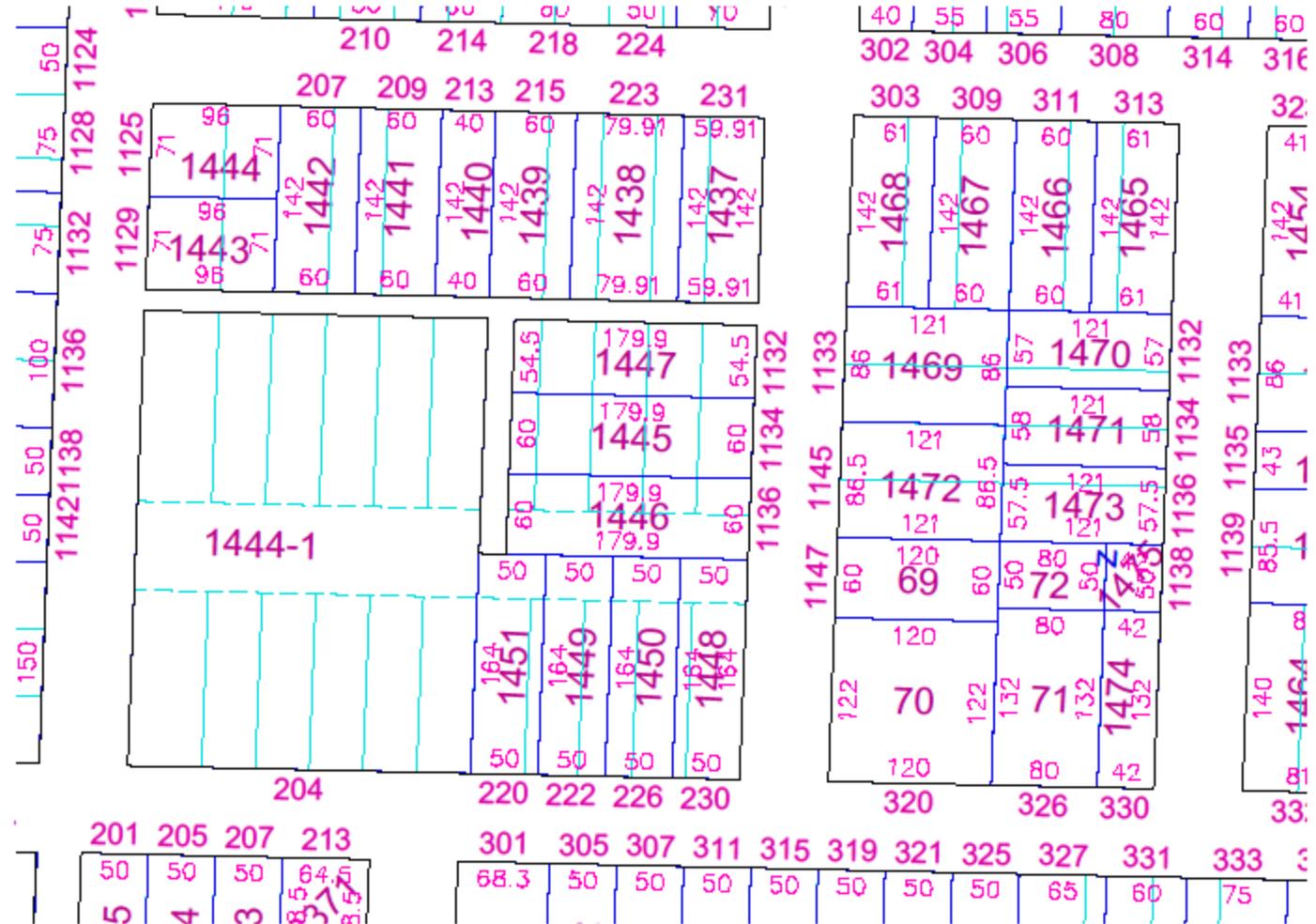
Roads and Street Names and correct widths.

Make sure you have the proper spelling of all roads in your system, McKinley Avenue had three different spellings on the Street Signs in this 5 block strip. Also Street widths are important to know, how much land do you have to work with within the right of way outside the curb and gutter.
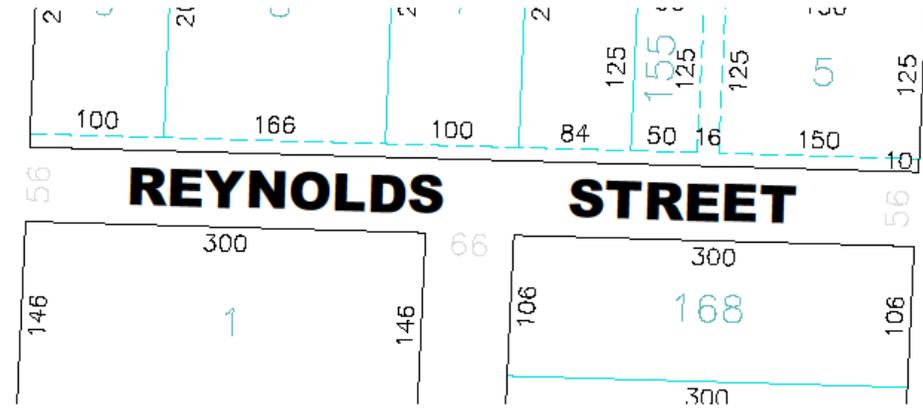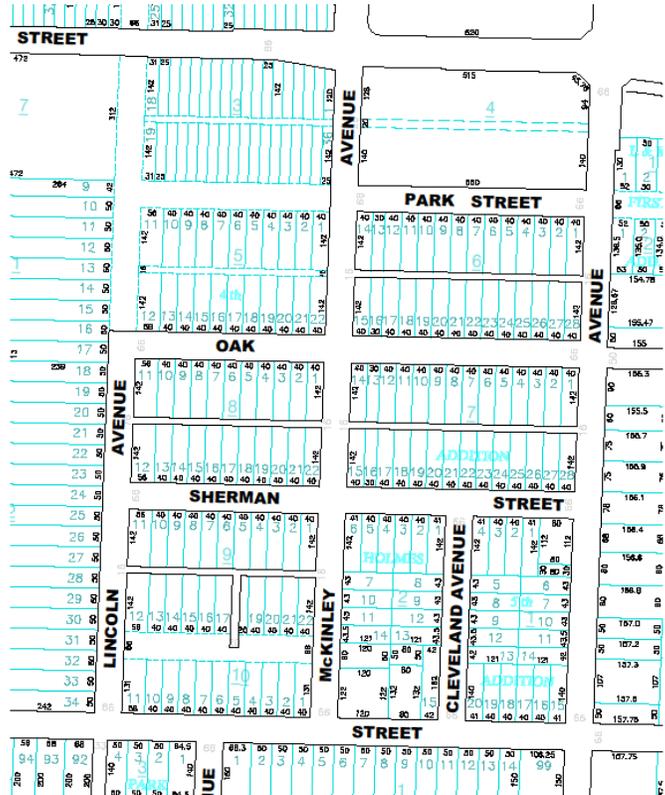
Parcels

We work with Becker County to get the Parcel info. Midland GIS works with the County as well to update the property information on a weekly basis.

Addressing and now drive points

The City had an address of every parcel in town, but the County Data was missing a lot of drive points. I added the drive points to our map and our GIS System. The crews now have addressing for most of the parcels in our area. The County is working on getting all the drive points in the County added, for vacant lots as well as occupied properties.

Aerial Photo 1939

Aerial Photo 1953

Aerial Photo 1965

Aerial Photo 1981

Aerial Photo 2013 & a new Aerial this Spring

Pictometry will be flying our area again this spring. This does include all the City, it's 3 mile buffer and our Electric Distribution area.
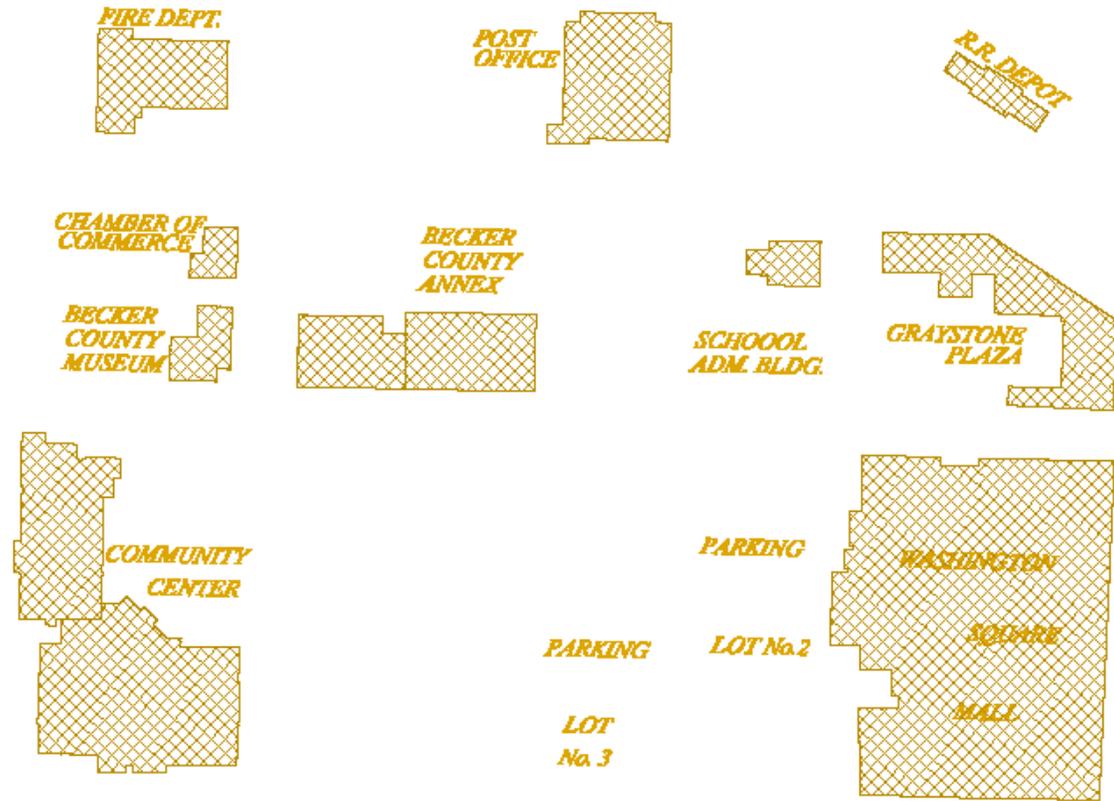
https://www.lib.umn.edu/apps/mhapo/
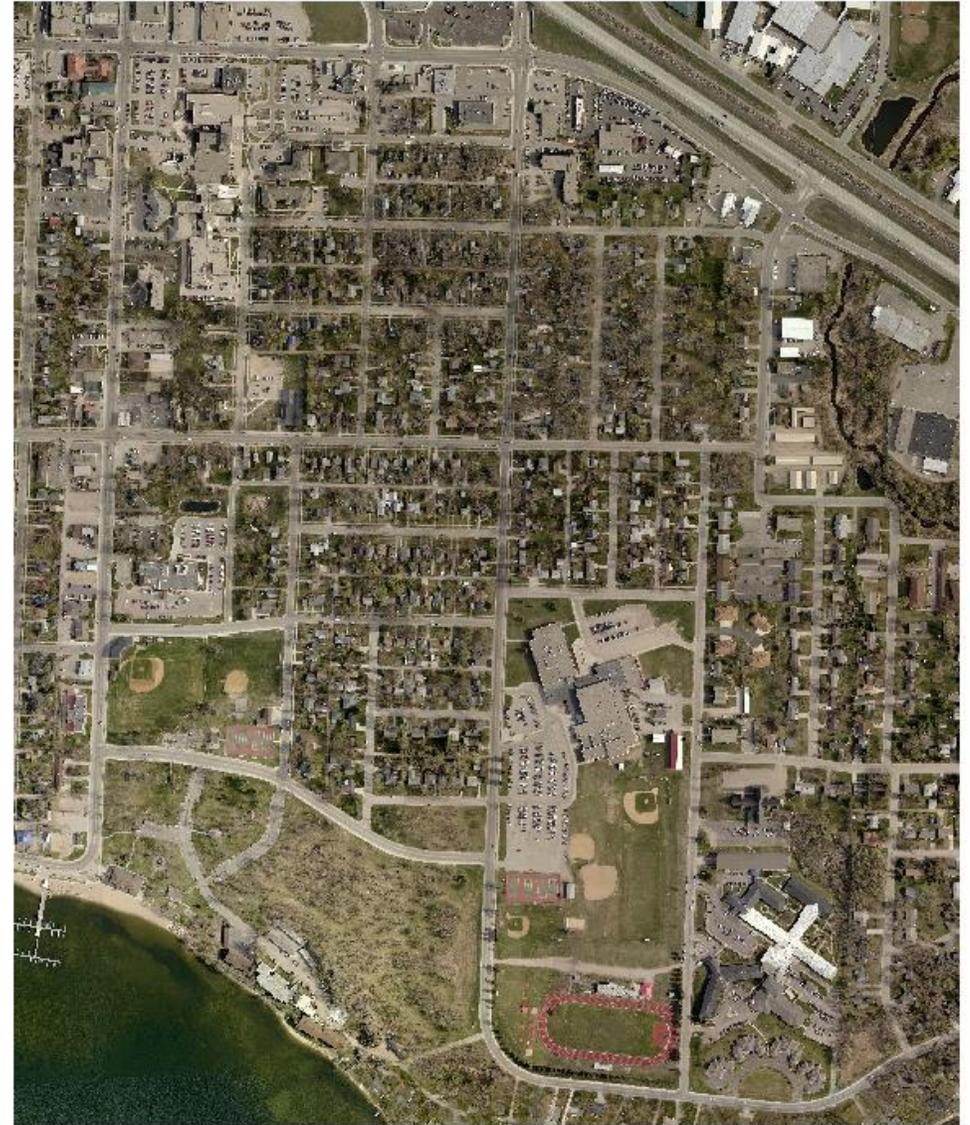
The website to find old aerial maps.

Public Bldgs.
This year Pictometry will be digitally marking the Bldg. Footprints for us.

Our City Map has all the public buildings marked and labeled. These footprints were taken from our aerial maps.

Pictometry will be placing every building footprint on our map with this spring's flight. All of our building permits will then be applied to the map, when we re-fly our system in three years, we will be able to compare now to then and see which buildings got a permit and which ones are not in compliance.
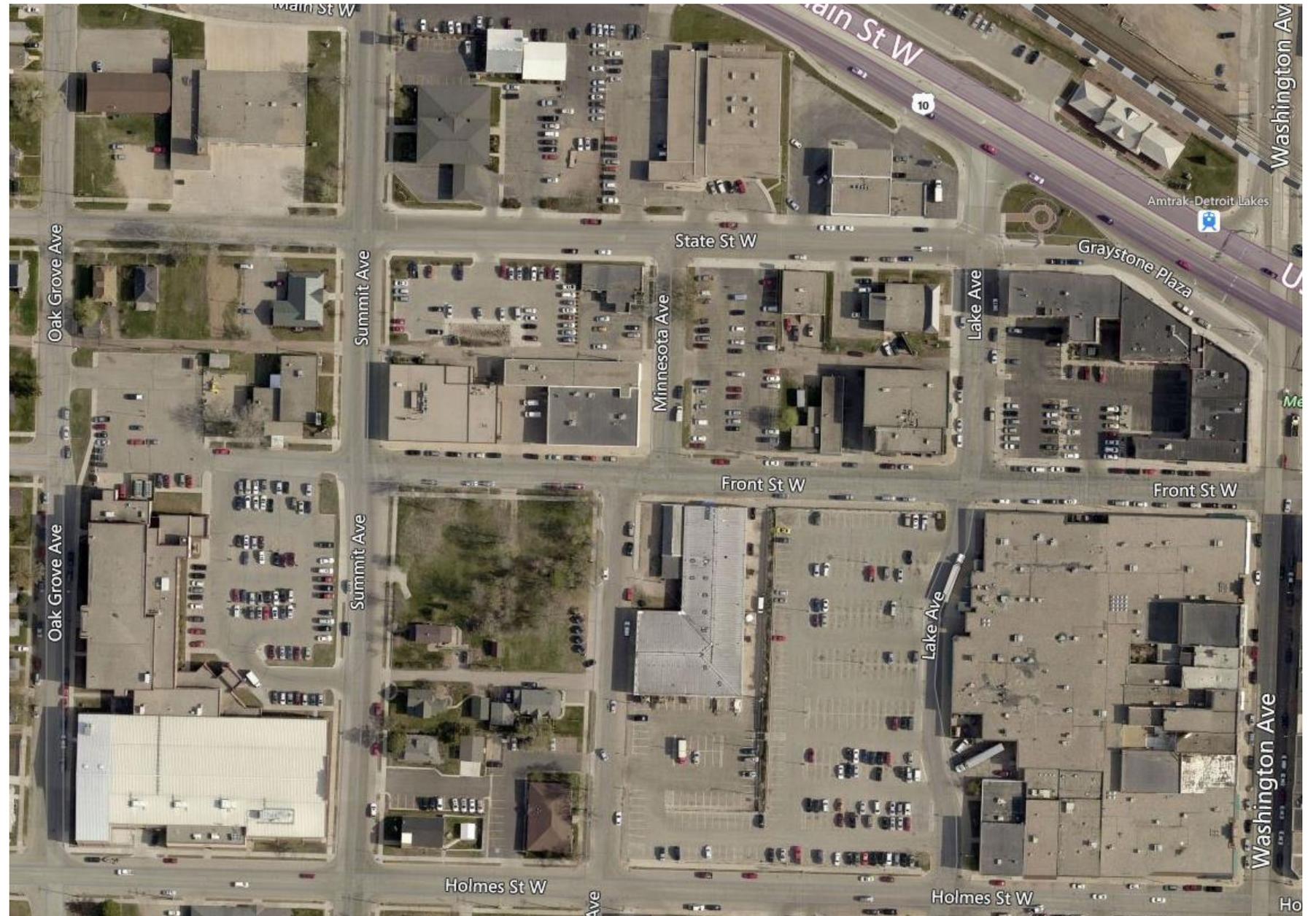
It's easy to get the footprints of building when your aerials are 4" accuracy. Our Community Center from the South and North.
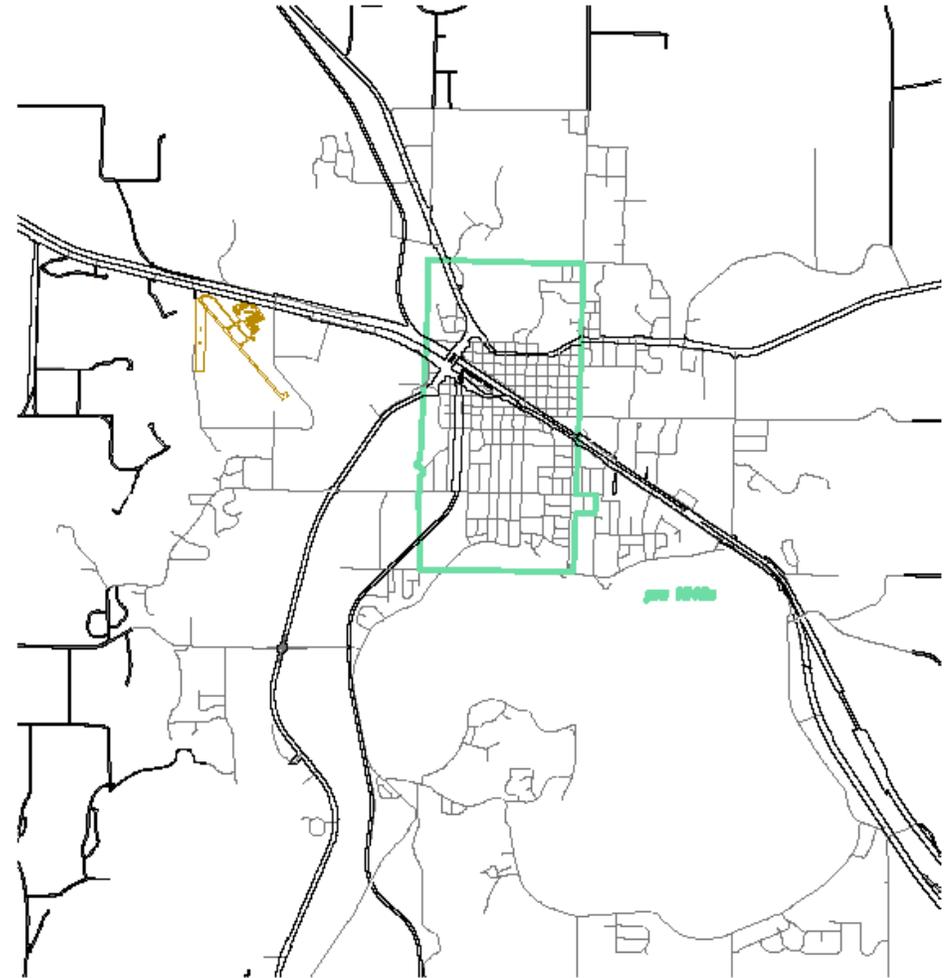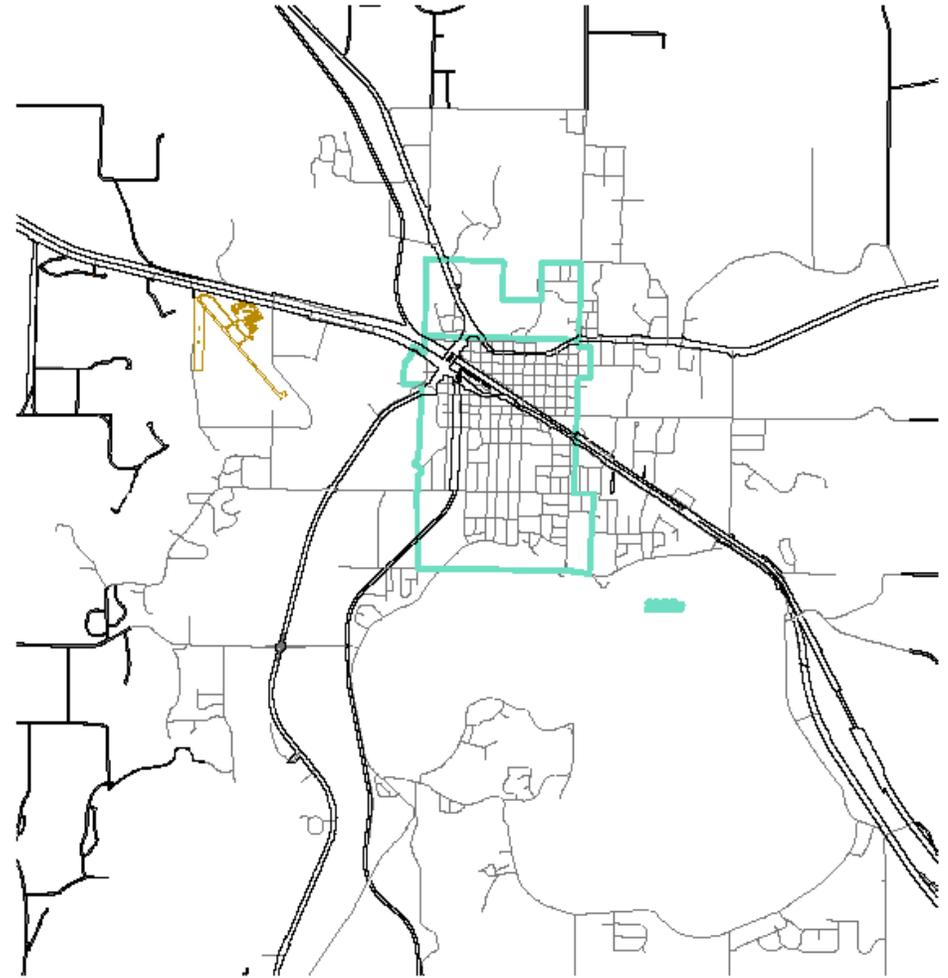
From the East.

And from the West.

Corporate Limits in the 1940's

Our city has grown over the years and we have a detailed description of each one of our annexations.
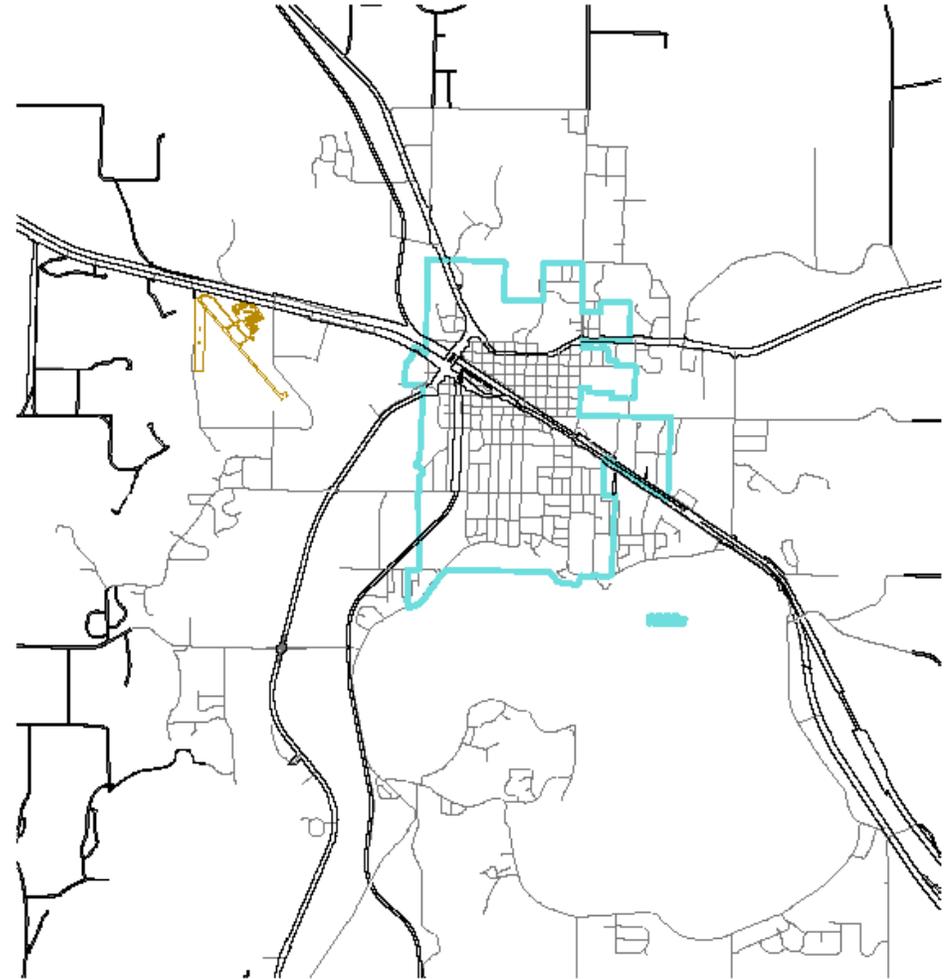
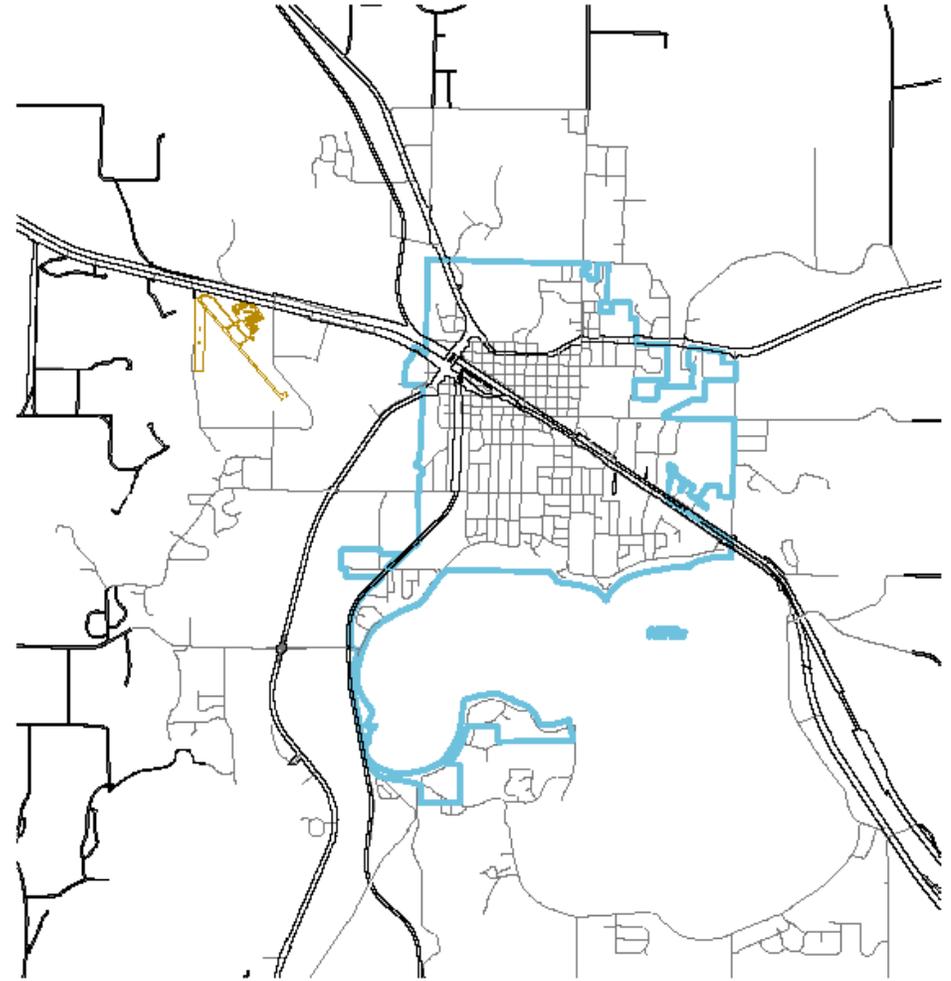# Corporate Limits 1950

All those from the 1950's

Corporate Limits 1960
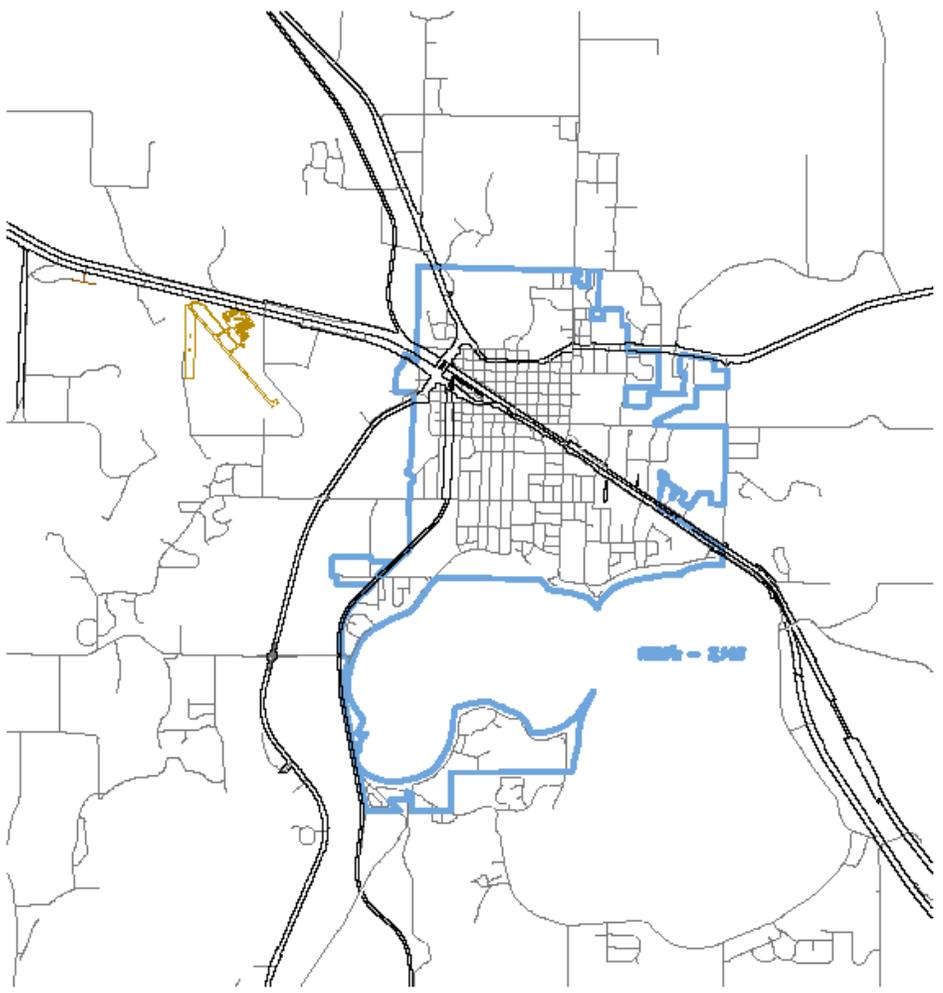
All those in the 1960's

Corporate Limits 1970

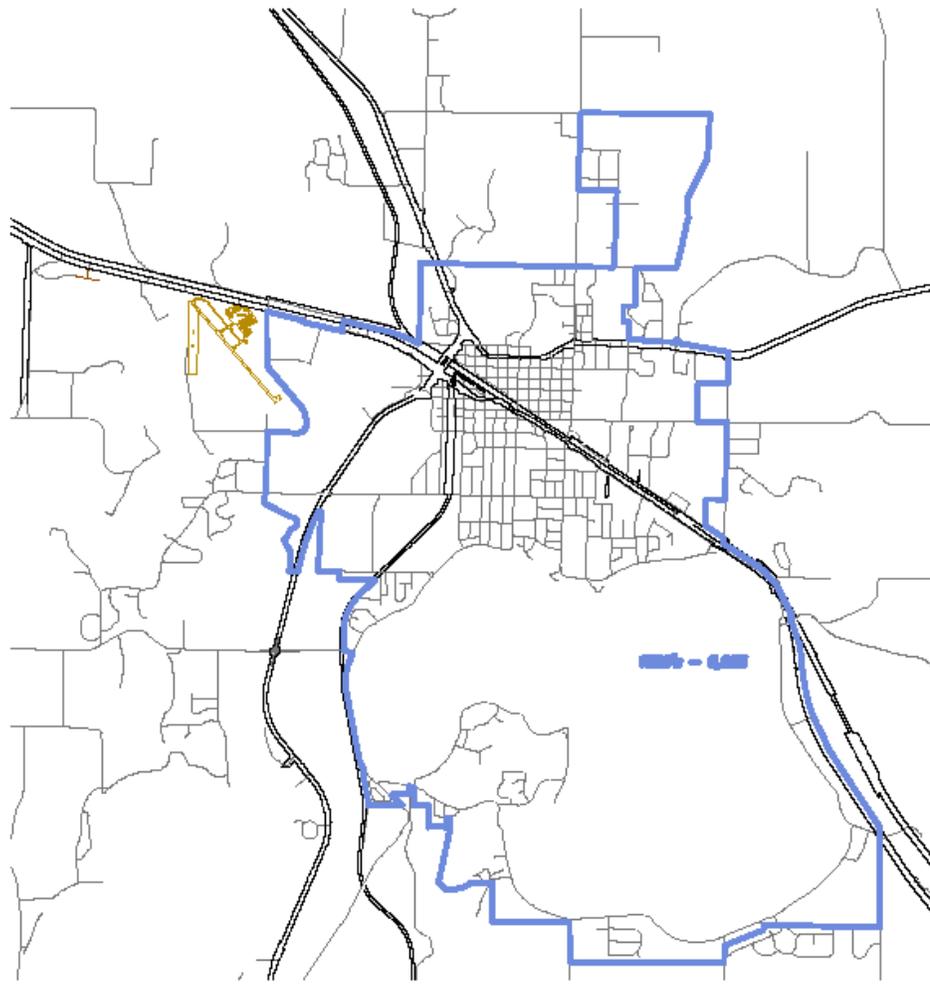All those from the 1970's

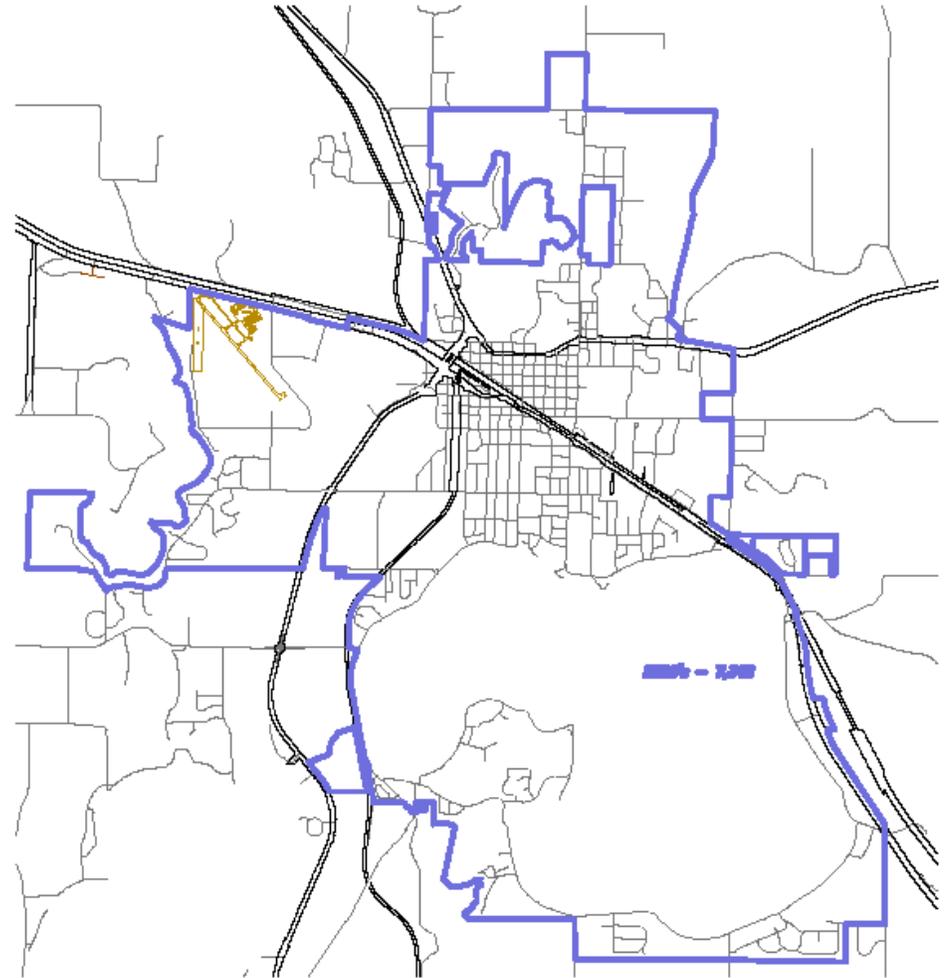# Corporate Limits 1980

The 1980's

Corporate Limits 1990

The Nineties

Corporate Limits 2000

All those from the 2000's

Corporate Limits 2010

Those additions so far in the 2010'S
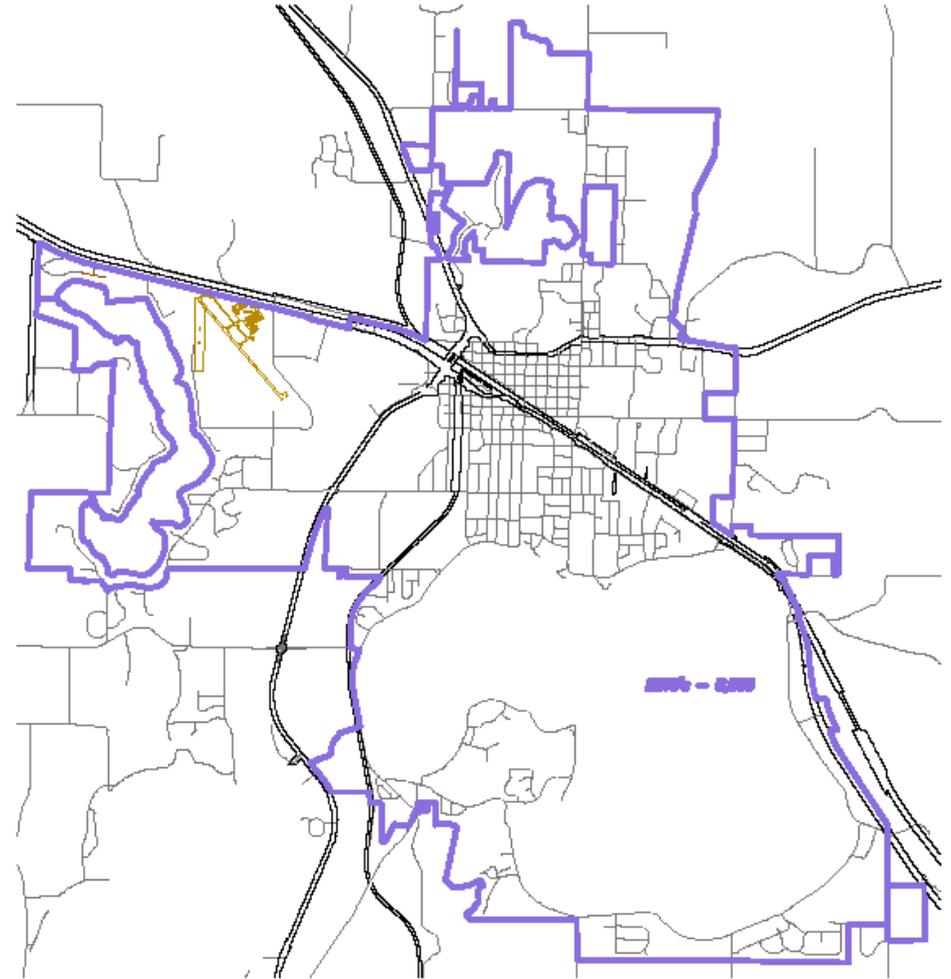
Corporate Limits Current

And our current Corporate Limits
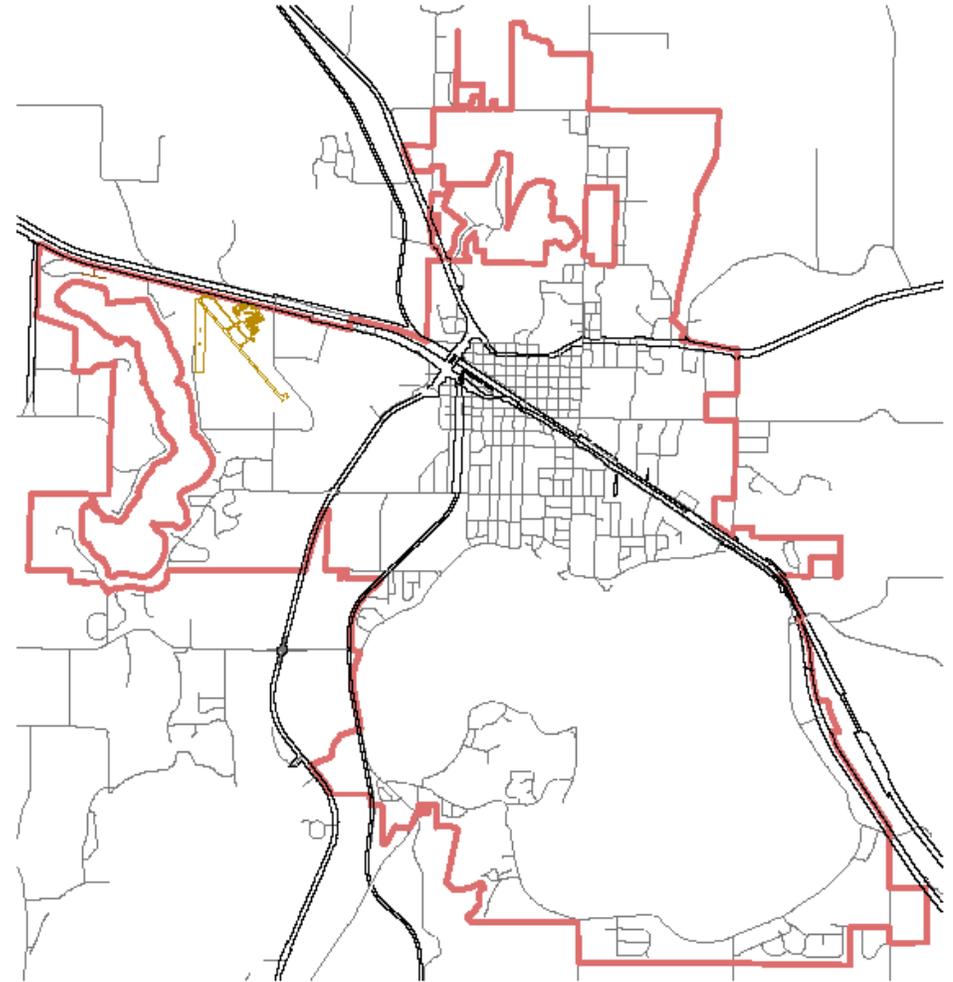
Contours

We recently annexed the west side of Long Lake as it shows in the previous slides. This will bring on some interesting engineering. The elevations on this side are 20 to 30 feet higher than the main portion of Detroit Lakes. So we will need to address the water pressure on this side of the Lake. Whether this means a different pressure zone with pumps, or building a taller water tower.

http://arcgis.dnr.state.mn.us/maps/mntopo/
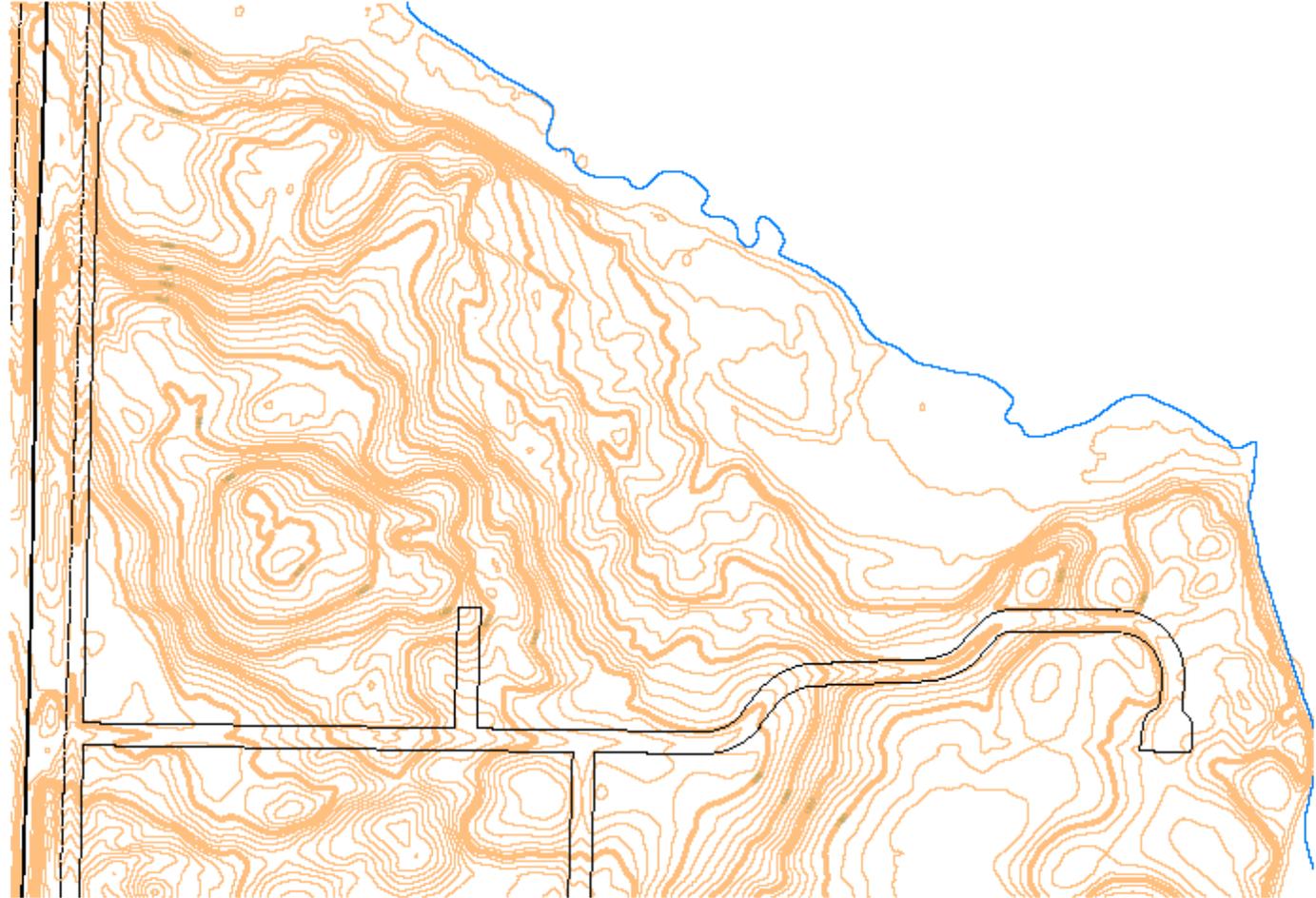
One of the many places to get contours for the State of MN.

Airport Zones

Make sure you have your Airport Zones located and labeled on your maps, height restriction might prevent you from putting in certain power poles, or any at all.
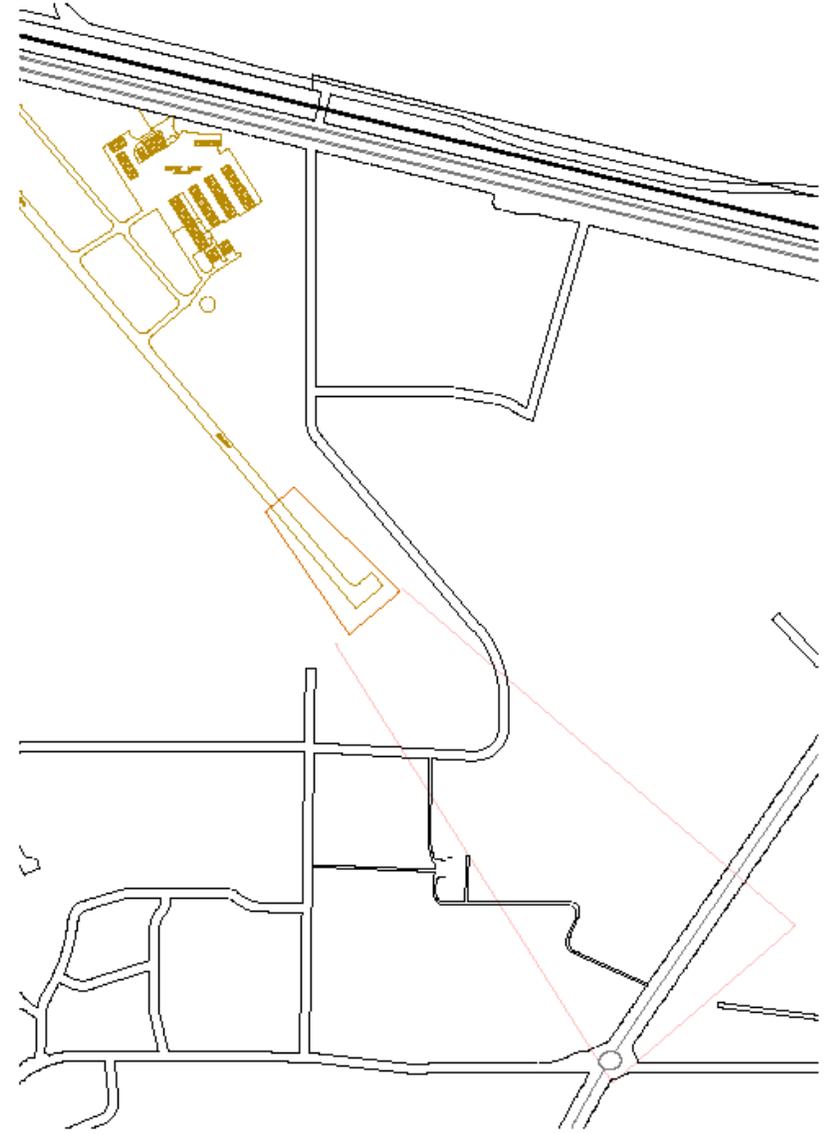
Ton Roads

We have added the ton streets to our maps as well, this will allow the planning department to restrict a company from building on a 5 ton road and eliminating the traffic and larger trucks from using a 5 or 7 ton road.

5 TON
7 TON
9 TON
10 TON
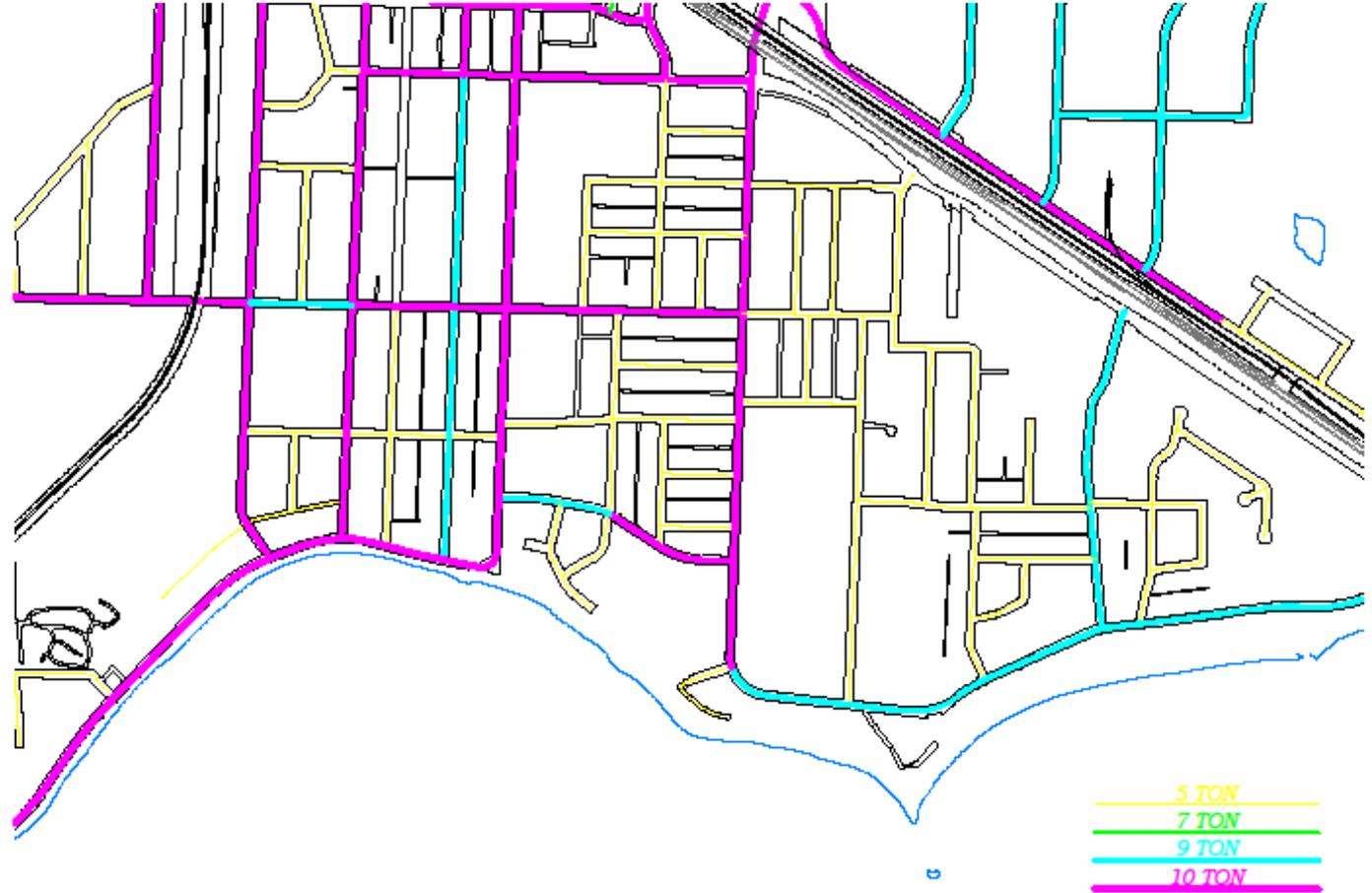
Bike Paths

It's the new wave, bikes paths through out your community. We have marked our current bike paths and future trails, now any time any work is being done in those areas, we include adding the bike trials on the project and into our system.

HEARTLAND TRAILS - WEST
To Audubon and Hamden Slough NWR

City Bike Trails - 16.8 Miles
County Bike Trails - 4.4 Miles + 1.25 USF&W
Heartland Trail - 2.4 miles
Undeveloped / Proposed Trails - 25.0 Miles

HEARTLAND TRAILS - EAST
To Frazee/Wolf Lake
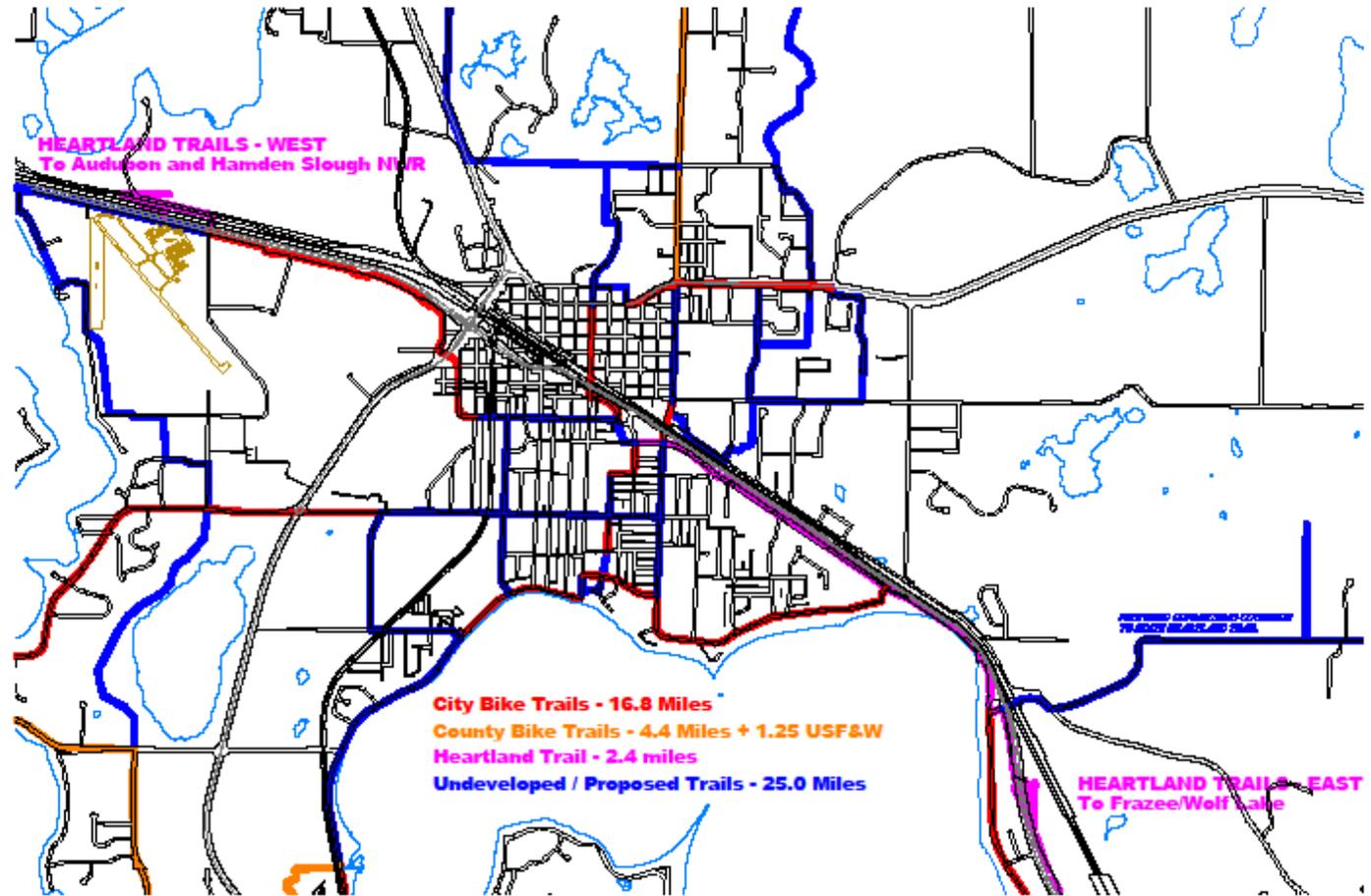
Wards

We received a lot of calls around election time, by adding this to our website we have eliminated a lot of those calls. Each property has their Ward marked and where they should be voting.
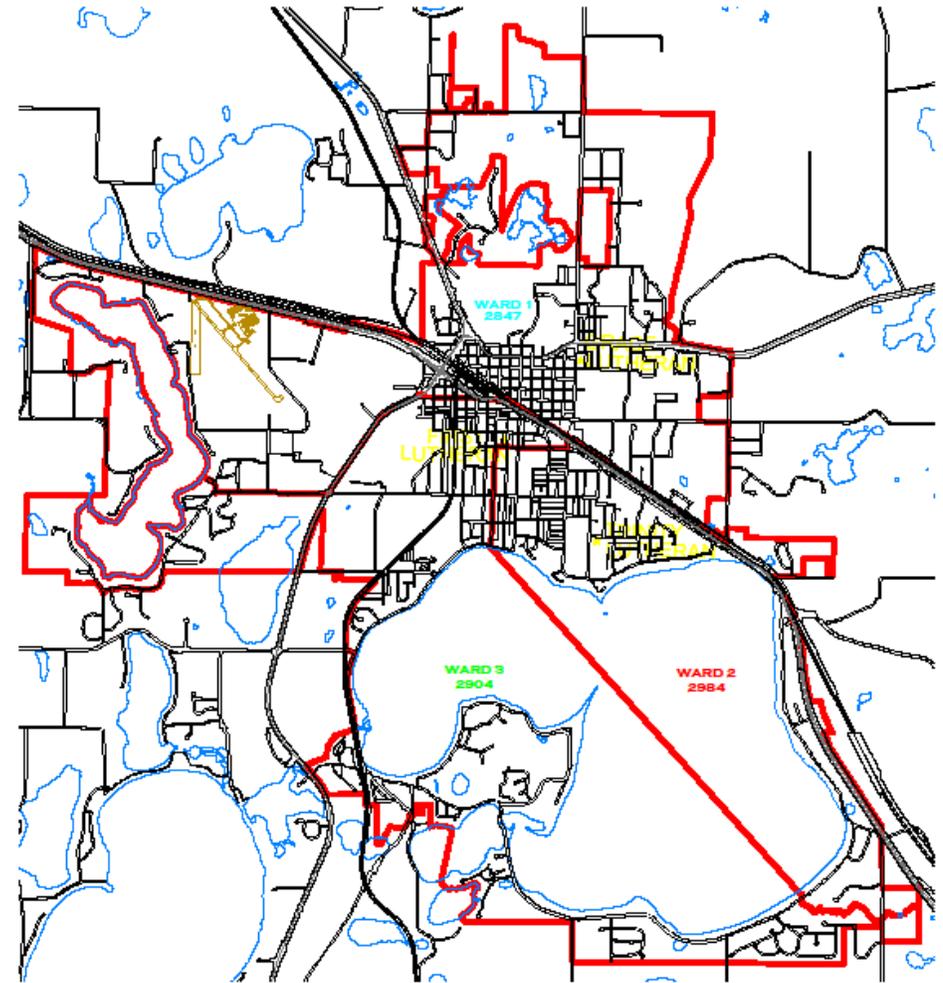
Zoning

The same is true with our Zoning, we received a lot of calls, usually from Realtors, by adding this to our website we have eliminated a lot of those calls. Each property has their Zone marked and the Zoning Ordinance is also available to the Public.
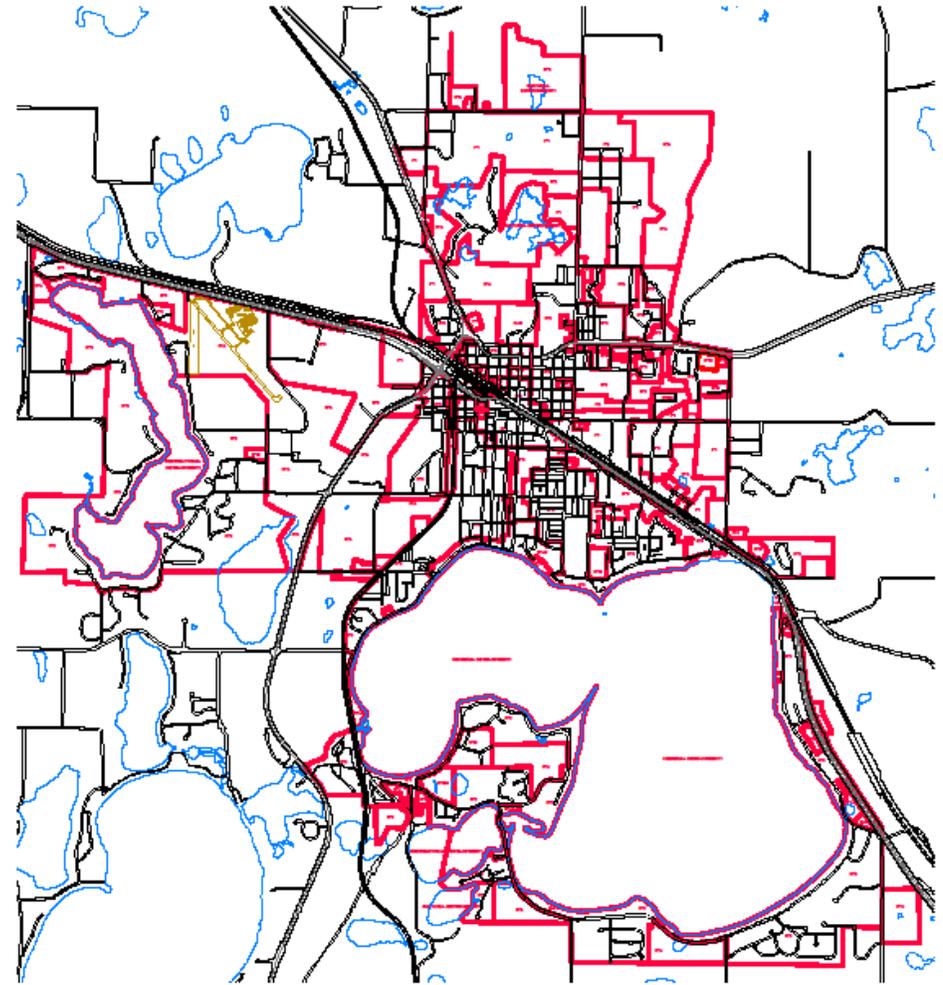
Watermains Paper

This is our Paper Map of the Water Distribution System. Everything is drawn out to see it at most scales.
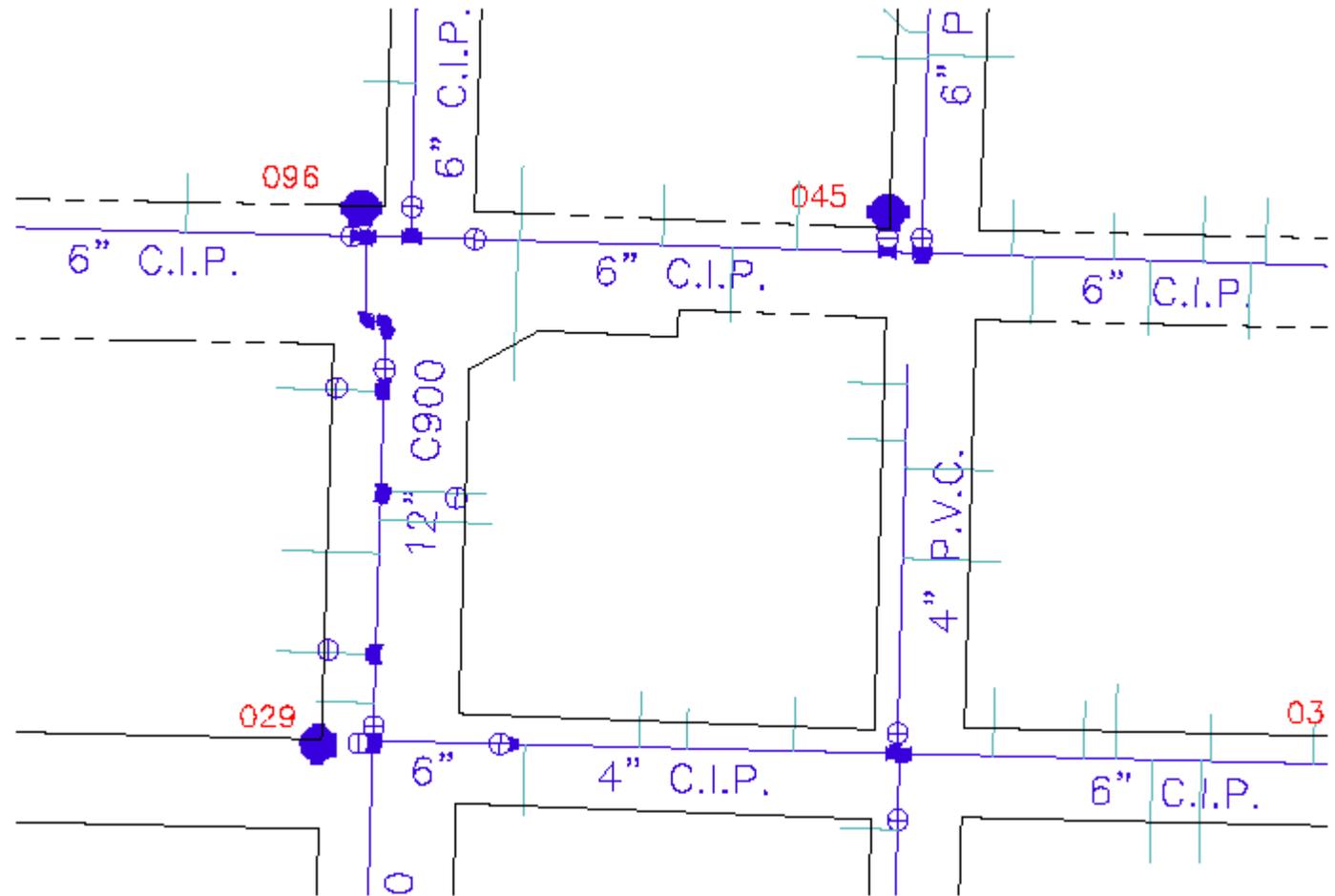
Watermains

This is our Computer Map of the same area. Note how small the Hydrant's are and you can barely see the Gate Valves.
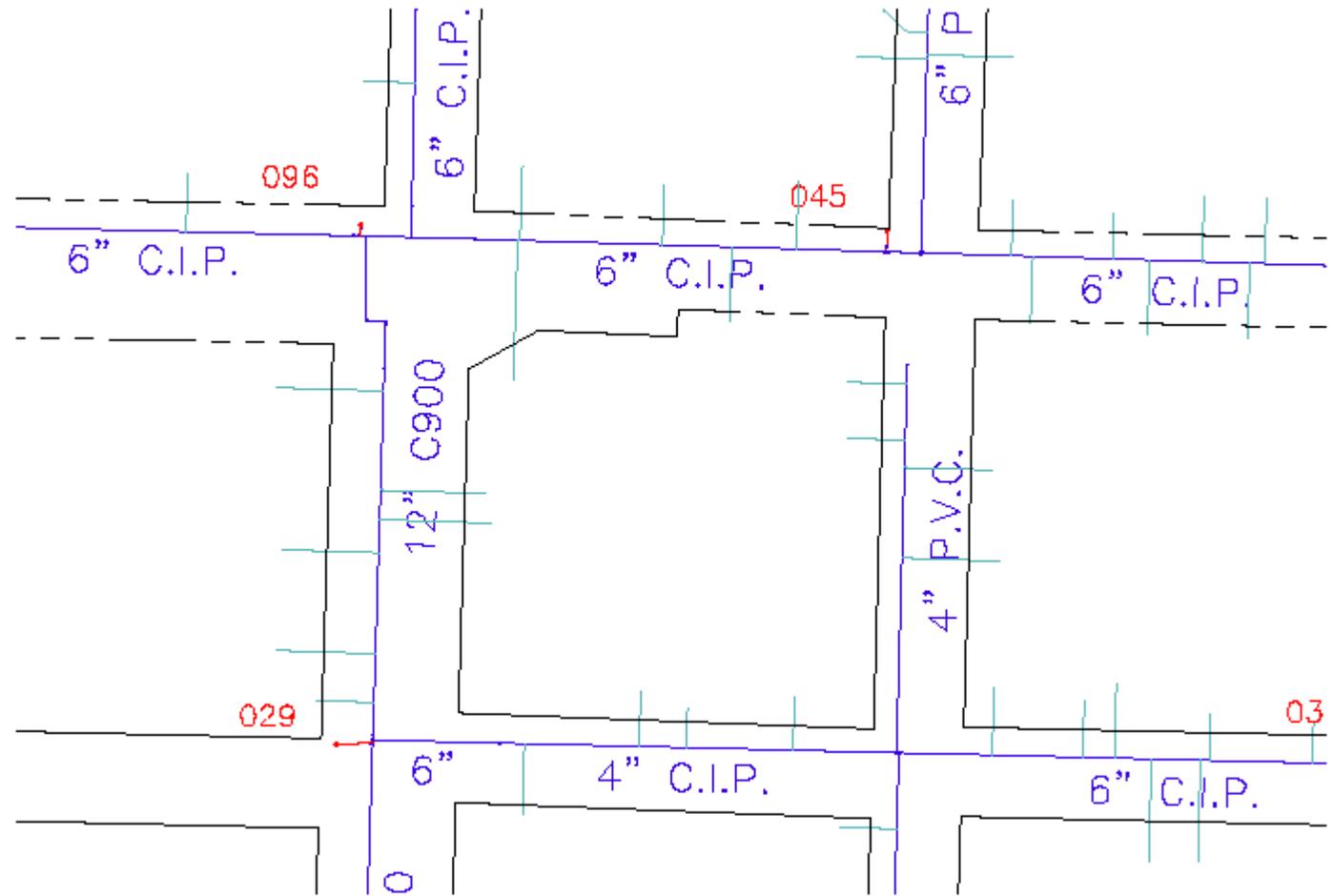
Water GIS

This is our GIS map, Integrity from Midland GIS. All the information collected on items can be found by using the Rectangle Identify button. Midland GPS'ed all of our Water System, which included the Gate Values and Fire Hydrants, giving x and y coordinates as well as z elevations accurate to the hundredth.

Water Data

From that data collected we can add to the list. As you can see anything we would want to search for later should be in your data.

Water Hydrants

Zoom to Feature | Pan to Feature | Create a Report
Copy to Drawing | Add to Selected | Export Feature Attachments

Details | Attributes

Field Name	Field Value	
Manufacturer	American Darling	
Base Color	Red	
Cap Color	Red	
Hydrant Year	1999	
Steamer	True	
Picture_Number	IMG_1882.JPG	
Northing	138962.526158	
Easting	459480.179764	
Elevation	1374.637	
LocatedBy	MidlandGIS	

Water Mains

Zoom to Feature | Pan to Feature | Create a Report
Copy to Drawing | Add to Selected | Export Feature Attachments

Details | Attributes

Field Name	Field Value	
Install Date	1917	
Material	CIP	
Diameter	6	
Water Type		
Project Number		

Water System Valves

Zoom to Feature | Pan to Feature | Create a Report
Copy to Drawing | Add to Selected | Export Feature Attachments

Details | Attributes

| Field Name	Field Value	
Valve Type	Hydrant	
Bypass Valve	False	
Clockwise To Close	True	
Normally Open	True	
Turns To Close		
Currently Open	True	
Northing	138959.692174	
Easting	459480.071825	
Elevation	1371.3994	
Depth to Main		
MAPPING_TYPE	GPS-Survey	
PROJECT_NUMBER		
InstallBy		
InstallYear		
LocatedBy	MidlandGIS	

CB Data

We have been spotting the Curb Boxes in house. Again whatever data you want to query at a later date, should be included. Notice the mistake in the diameter of the first location, it says 1", but lower in the report it states ¾", just one of the many things you need to make sure you are correct, thus wrong information in means bad data out.

Curb Stop

Details | Attributes | CurbBoxLocations

Field Name	Field Value
Status	
Comments	
Location Description	815 WEST AVENUE
Diameter	1"
Valve Type	Roundway
Normally Open	True
Turns To Close	
Operable	True
Currently Open	True
Last Update Date	
Last Editor	
GroundSurface	
MappingType	GPS-Subfoot
PROJECT_NUMBER	
InstallBy	
InstallYear	
ApproxDepth	
Brand	
PIN	
Needs_Raised	
Raised_Depth	
CurbstopType	
SanitarySameDitch	
CurbstopID	
LocateDate	
Photo	
Cant_Find	
LocatedBy	DLHMO
CB_Location	¾ cu. (1948) CB is 2 ½ ft S of N side of house and 8 ft E of curb
Notes	
Sewer_Lines	SSD

Curb Stop

Details | Attributes

Field Name	Field Value
Status	Good Condition
Comments	
Location Description	2404 LONG LAKE ROAD
Diameter	1"
Valve Type	Roundway
Normally Open	True
Turns To Close	
Operable	True
Currently Open	True
Last Update Date	5/19/2016 5:00:00 AM
Last Editor	SMH
GroundSurface	Other
MappingType	GPS-Subfoot
PROJECT_NUMBER	504.220
InstallBy	Spruce Valley
InstallYear	2006
ApproxDepth	
Brand	
PIN	
Needs_Raised	
Raised_Depth	
CurbstopType	Water
SanitarySameDitch	Yes
CurbstopID	
LocateDate	10/1/2015 12:00:00 AM
Photo	
Cant_Find	
LocatedBy	DLHMO
CB_Location	CB is 18 ft N of blacktop road and 2 ft S of S side of garage
Notes	CB in flower garden
Sewer_Lines	

Watermains
Date Installed:
Size:
Type:

We have old paper maps of different things within the Water Department. Along with type and size we also had the year the water main was installed. I simply scanned this map and inserted it into my AutoCAD Map and it made it easier to add the data to the mains, the dates were easily found and the data inputted into GIS.
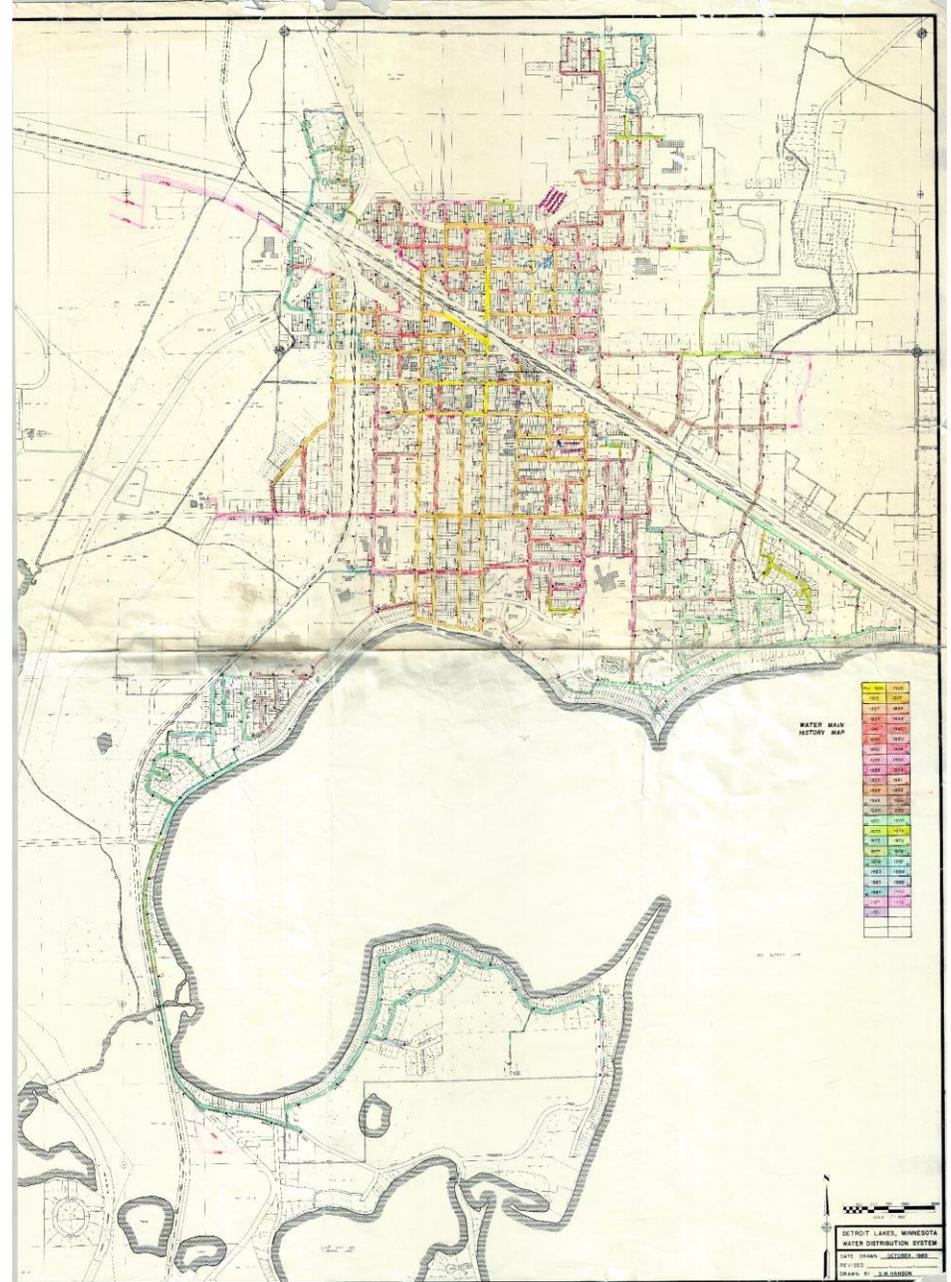
Wellhead Protection Zone

This is our Time of Travel Map for our Wellhead Protection Zone. We will eventually add this to our GIS System. The City of Detroit Lakes had their Water Carbon dated and found it to be 500 to 1,000 years old. We do not want someone placing a well in the area and having any chance of contaminating our water source.
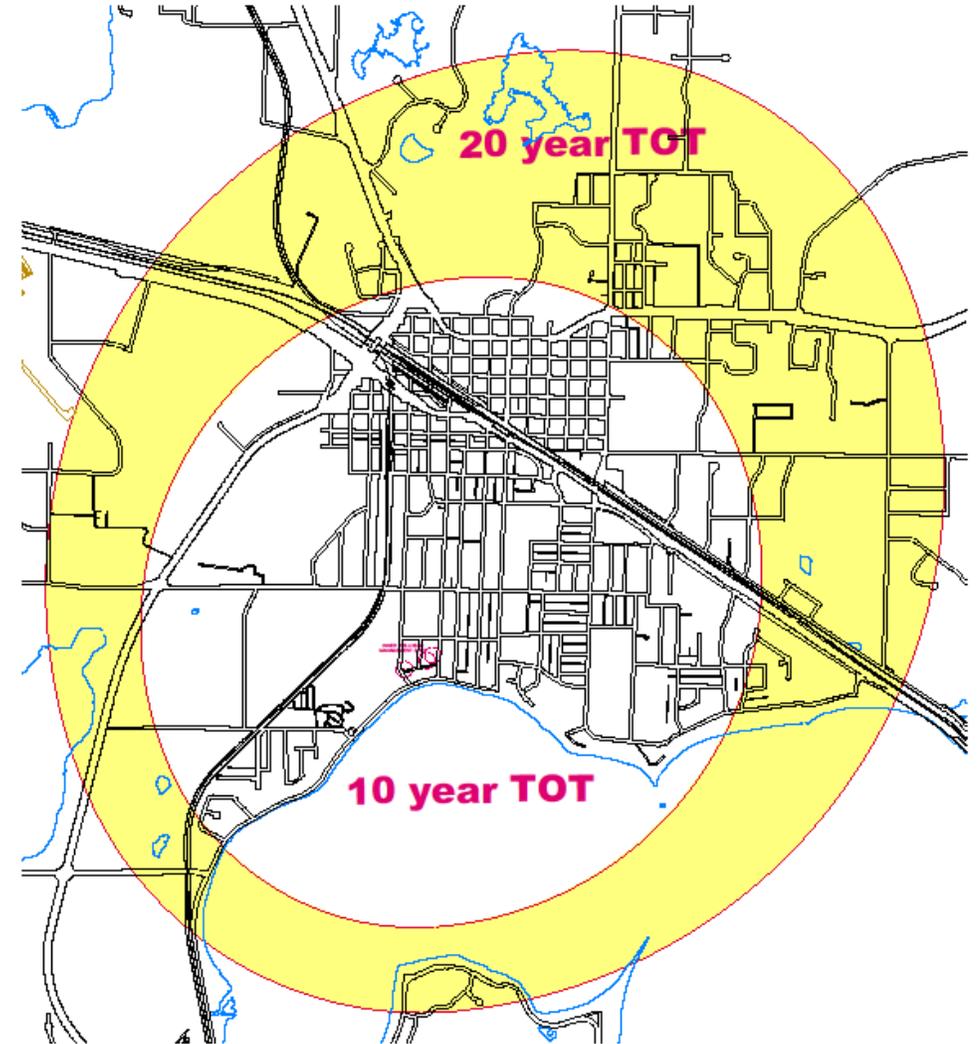
Sanitary Sewer

This is our GIS map of the Sanitary Sewer System, which appears exactly like our paper maps. Everything is labeled so you can read it at most scales.
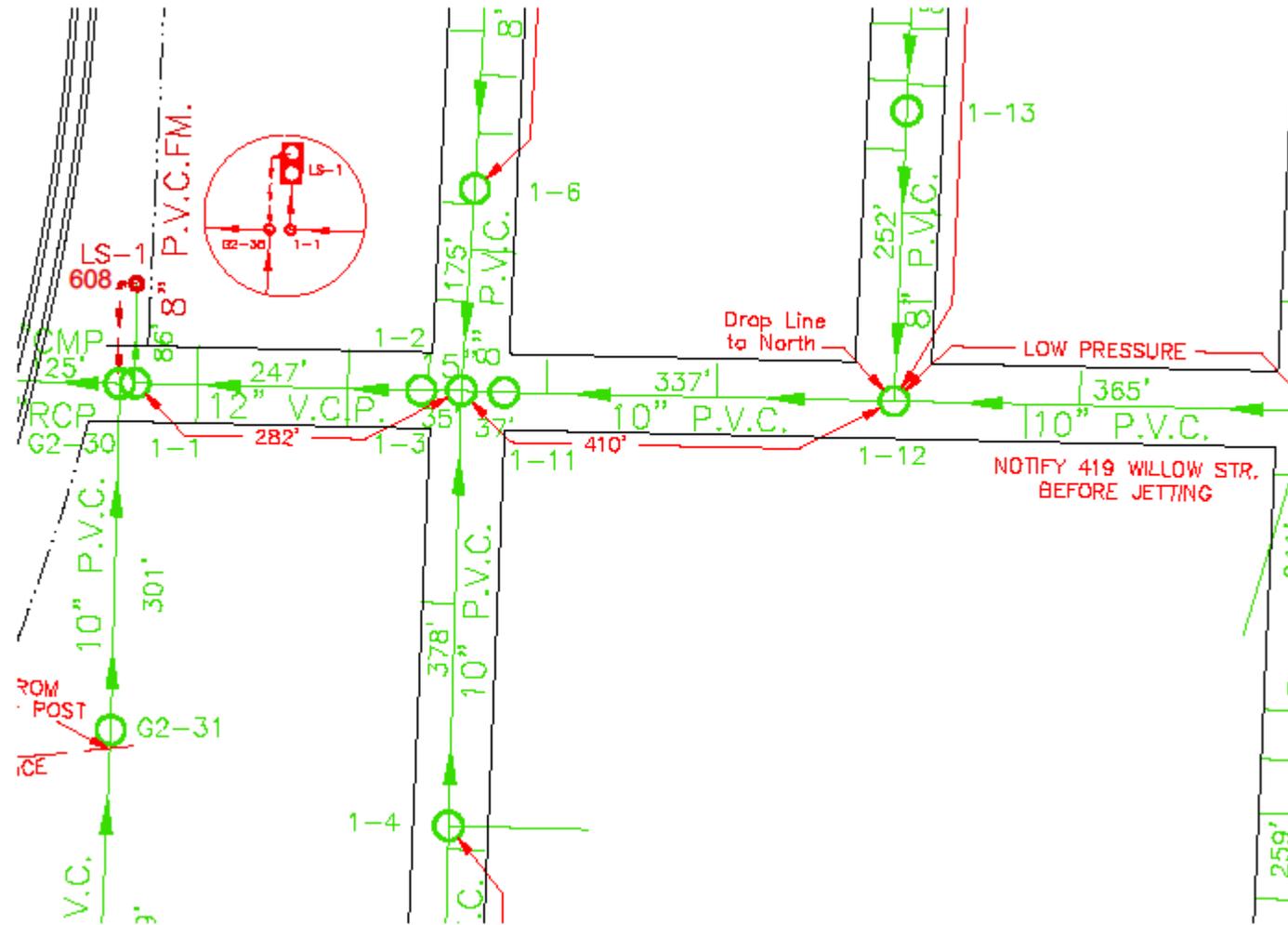
Sanitary Sewer GIS

This is our GIS map. Midland spotted each Manhole, took the x, y and z coordinates of each cover and the z coordinates of each inlet.

MH Data

From that information we can pull up many reports and actually see a picture of the condition of each MH.

Manhole Inspection

Zoom to Feature | Pan to Feature | Create a Report
Copy to Drawing | Add to Selected | Export Feature Attachments

Details | **Attributes** | **Links**

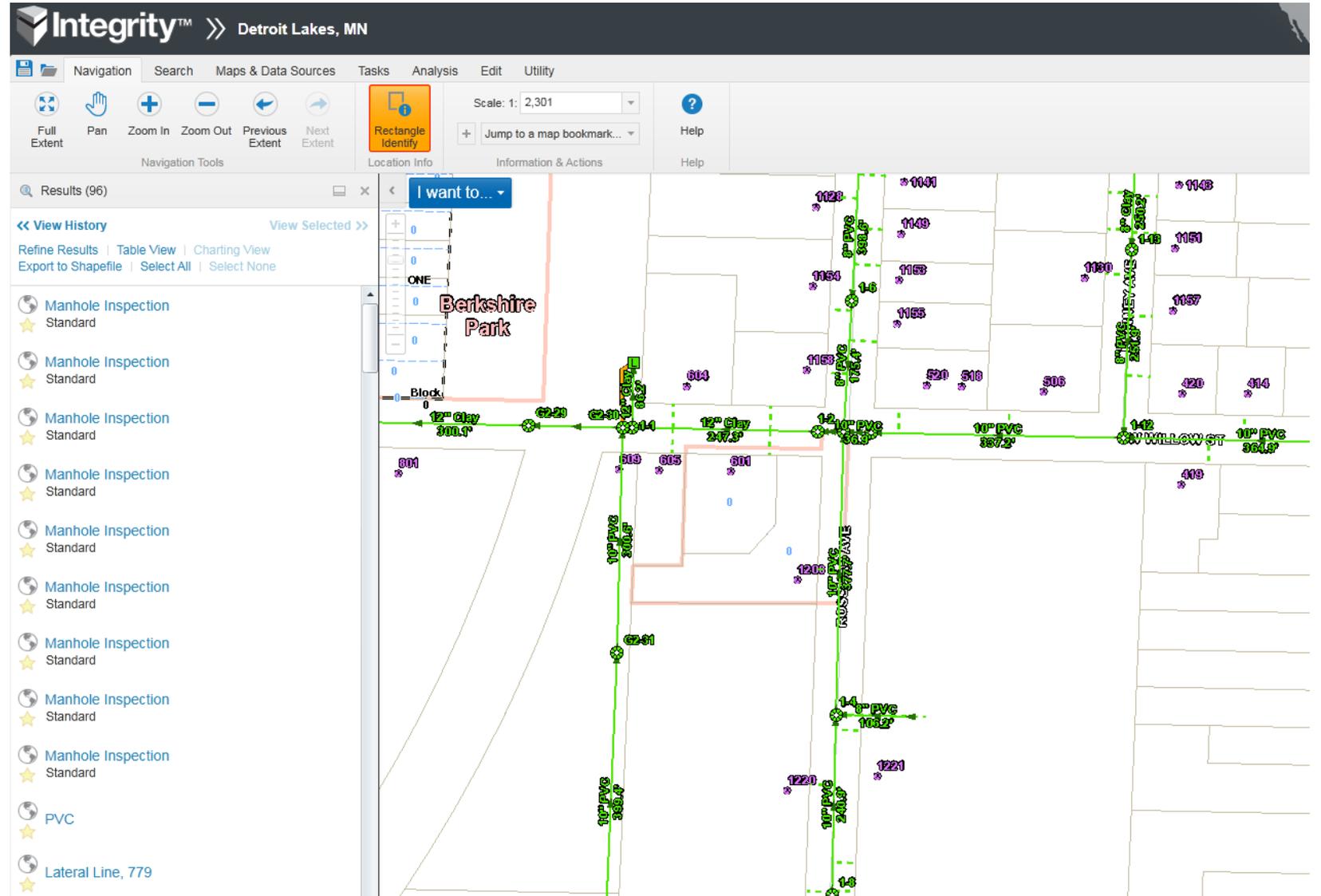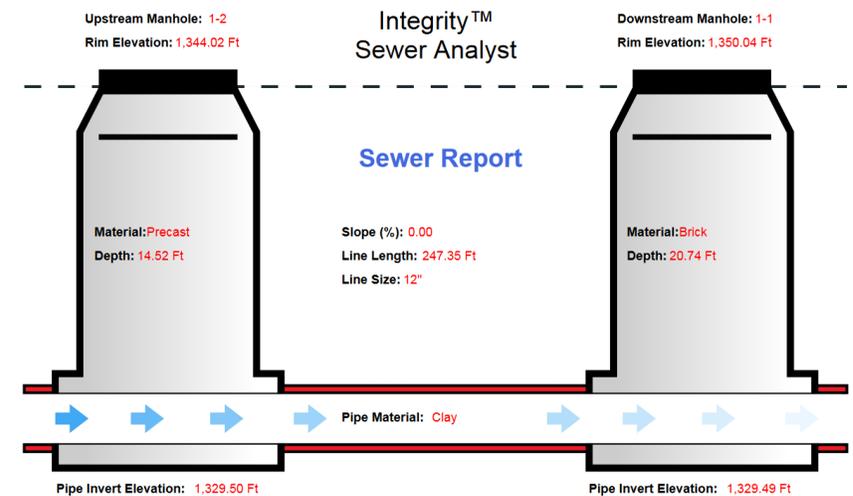| Field Name	Field Value
MH_ID	1-2
MH_Type	Standard
Material	Precast
Comments	0
Northing	134206.490395
Easting	457481.520047
Elevation	1344.0151
Condition	Good
Infiltration	False
VertG_Grade	Even
Depth_Buried	0.0
P1_Num	1-3
P1_Diam	12
P1_Mat	VCP
P1_Depth	14.5
P1_Out	F
P2_Num	1-1
P2_Diam	12
P2_Mat	VCP

Upstream Manhole: 1-2
Rim Elevation: 1,344.02 Ft

Integrity™
Sewer Analyst

Downstream Manhole: 1-1
Rim Elevation: 1,350.04 Ft

Sewer Report

Material: Precast
Depth: 14.52 Ft

Slope (%): 0.00
Line Length: 247.35 Ft
Line Size: 12"

Material: Brick
Depth: 20.74 Ft

Pipe Material: Clay

Pipe Invert Elevation: 1,329.50 Ft

Pipe Invert Elevation: 1,329.49 Ft

Record Maps

We have 1500 Record Maps of our system. 500 are scanned and attached to our base map, 500 are scanned and not attached yet and 500 are left to do. It's a tedious job and only gets done when no other jobs are waiting to be finished. Eventually our field crews will be able to click on the icon of the Record Map, which is hyperlinked, and it will pop up and the crew will be able to see every detail.
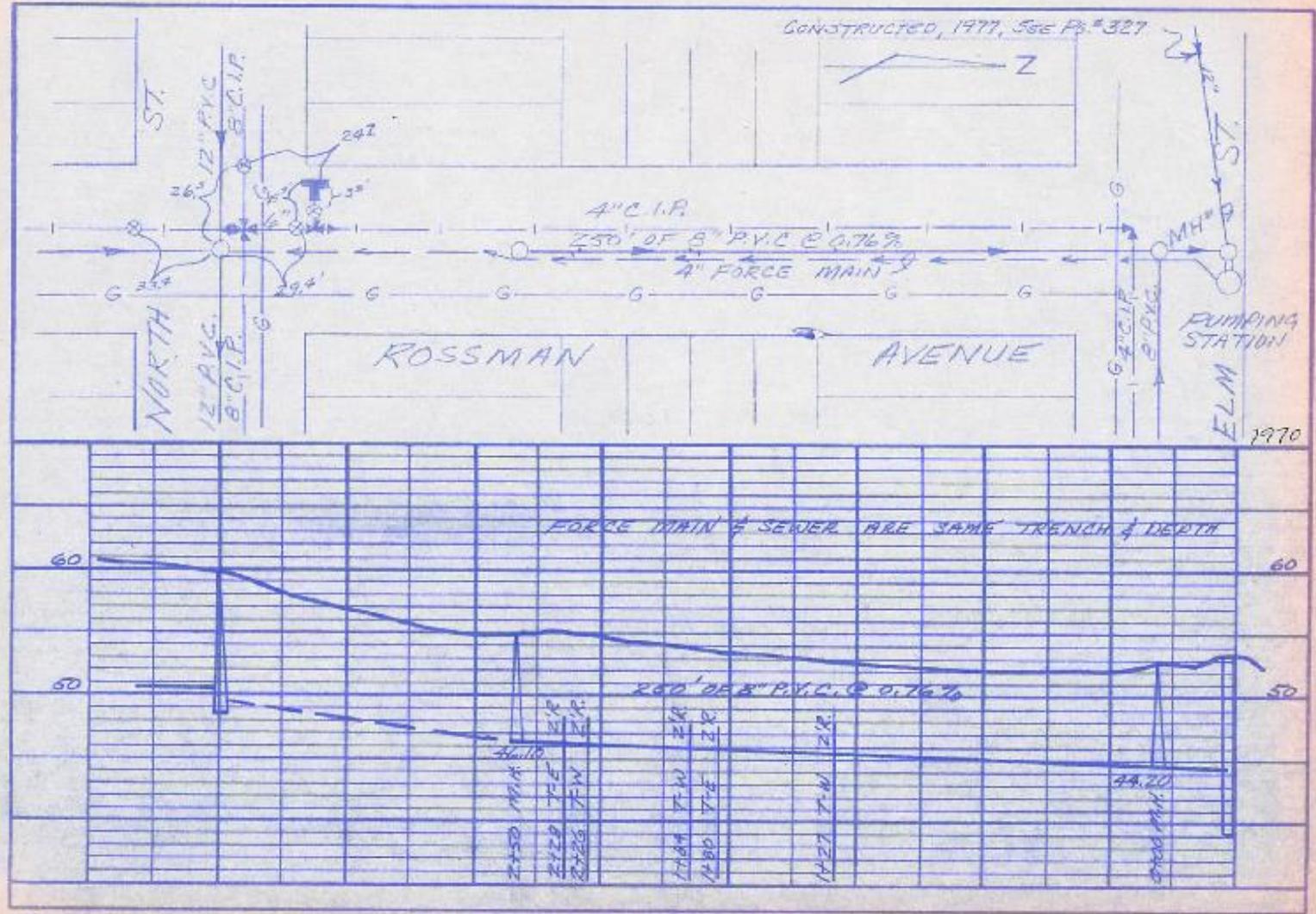
Checks and Balances

One of the things I want to stress is the importance of making sure all the Data you want on your maps gets added. This is a Spread Sheet that checks to make sure several people have added their portion of data to a property. Once all items have been checked, that information is then installed within said property. Anyone can then click on that hyperlink and all this data will be available to them. Note, I have since added two columns to this list, they are - all items checked and added to Integrity.

	A	B	C	D	E	F	G	H	I	J
1	Address	YEAR	Bldg Appl.	Bldg. Permit	Wtr. Swr. Conn.	R/W Permit	Inspect Report	Pictures	Comments	
2	104 West Lake Drive	2016	X	X					No Wtr Swr Permit	
3	1071 Shorewood Drive	2016	N/A	N/A	X				Required Hookup	
4	1109 Linden Lane	2016		X	X				Repair Existing Line	
5	111 Union Street West	2016	X	X	X		X	X		
6	1116 South Shore Drive	2016	X	X	X	X				
7	1152 Village Lane	2016	X	X	X					
8	1155 Longbridge Circle	2016	X	X	X	X	X	X		
9	1175 Longbridge Circle	2016	X	X	X	X	X	X		
10	1216 Bayridge Drive	2016	X	X	X	X	X	X		
11	1406 Long Lake Drive	2016	X	X	X		X	X		
12	1421 Long Lake Drive	2016	X	X		X			No Wtr Swr Permit	
13	1488 Huron Drive	2016		X	X		X			
14	1606 Huron Drive	2016	X	X					No Wtr Swr Permit	
15	1711_1713 Brainard Blvd	2016	X	X	X	X	X	X		
16	1751_1753 Brainard Blvd	2016	X	X	X	X	X	X		
17	1783 North Tower Road	2016	X	X	X		X	X		
18	1818 Brainard Blvd	2016	X	X	N/A				Wtr Swr Not Available	
19	1830 Brainard Blvd	2016		X	X	X	X	X		
20	1837 Spruce Grove Trail	2016		X	X		X	X		
21	1842 Long Lake Road	2016	X	X	X					
22	1845 Aspen Drive	2016	X	X	X					
23	1855 Long Lake Road	2016			X				Not Built Yet	

Storm Water

Midland did not spot any of our Storm Sewer System, because of the cost, we are doing that in-house. We have 100 drainage areas within the City, some are very small with only 2 catch basins and an outlet as in Zone 32, others are larger with Detention Ponds at the end as in Zone 34. Like our Sanitary Sewer Mains and each Lift Station Zone, the Storm Sewer is labeled the same, each zone is numbered, the first manhole from the Pond in that Zone is 1 then 2 and so on, each catch basin is numbered off the MH they flow into. Thus Zone 34 – MH 3 – Catch Basins 1 or 2 = 34-3-2
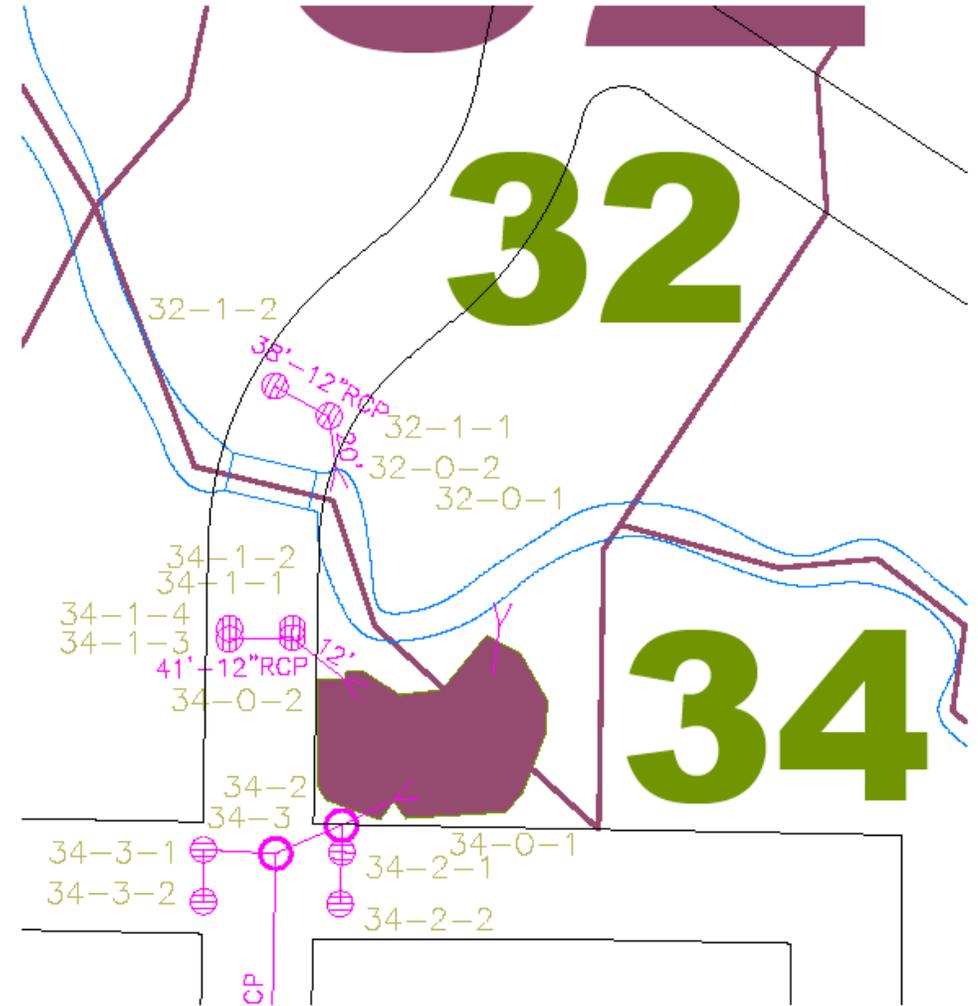
Storm Data

Even tho Midland did not collect data on our Storm Sewer, the crews are required to collect the data in the same manor.

Yes

Zoom to Feature | Pan to Feature | Create a Report | Copy to Drawing | Add to Selected
Export Feature Attachments

Details   Attributes

| Field Name	Field Value
OBJECTID	810
DATE_	
INPSECTED	Yes
REASON_NOT_INSPECT	
MH_LOCATION	Paved Street
MH_TYPE	MH
MH_VERT_STATUS	Even
MH_MATERIAL	Precast
LINED	Yes
P1_NUM	16-28
P1_SIZE	18"
P1_OUT	RCP
P1_DEPTH	82
P2_NUM	

Telecommunication

At this point nothing as been done on the Telecommunication side as far as GIS, but we do have an accurate map of the locations of the peds and wires we have installed. We hope to get this into our system this summer.
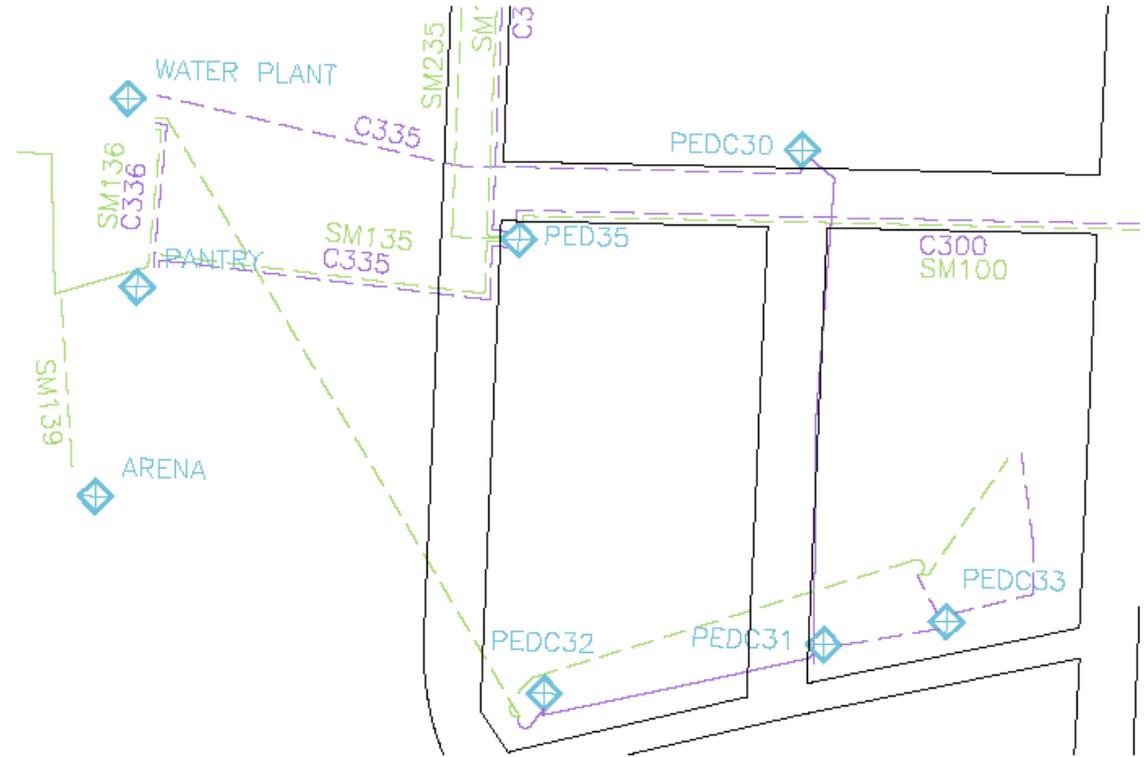
Electric Territory

Our Electric Utility Territory covers 9 mile north and south and 6 miles east and west. We are surrounded by Wild Rice Electric to the North, Lake Region Electric in the South with two smaller areas of Otter Tail Power in the mix.


DETROIT LAKES AND SURROUNDING ELECTRIC SERVICE BOUNDARIES
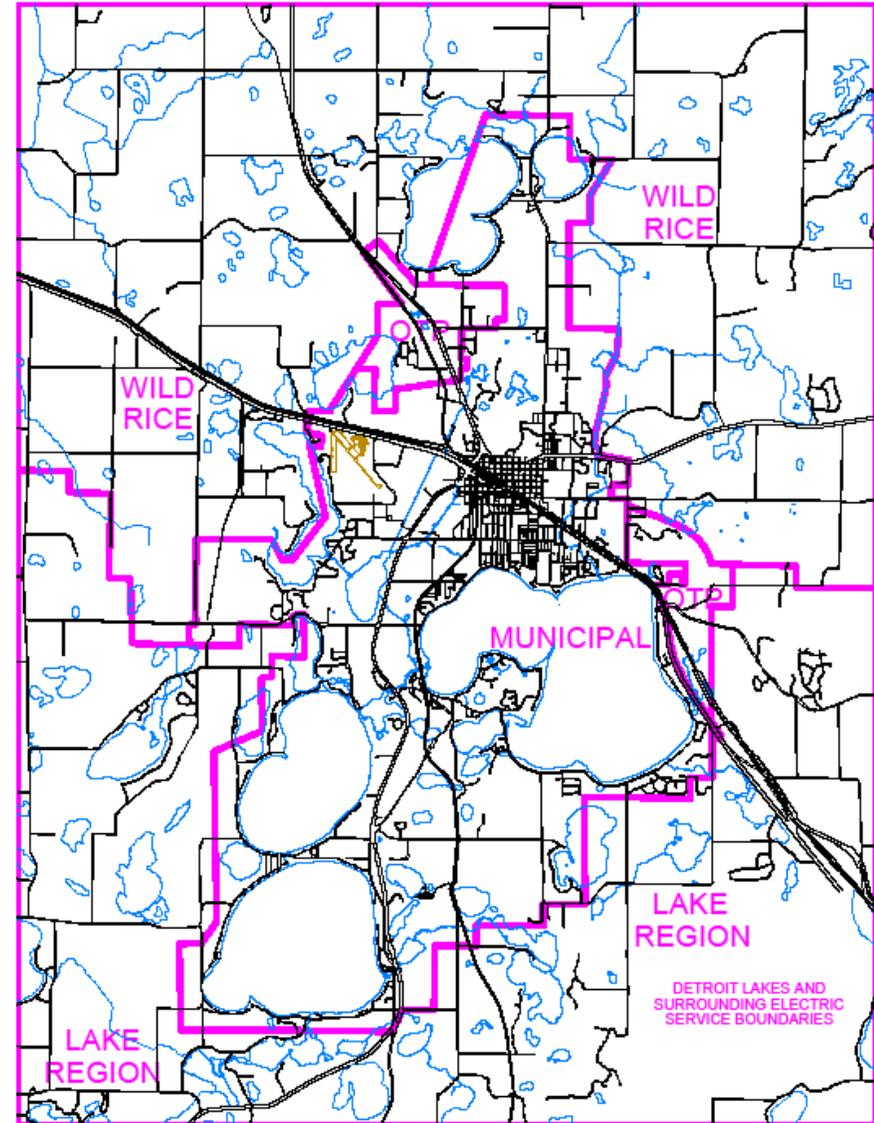
3 Substations
25 Feeders

Our system is labeled like this;
Each Substation has a name, each Feeder is numbered, from that each fuse, switch or disconnect is numbered. The ID number for a certain fuse labeled W22-14, means it's from the West Substation, Feeder 22 and it's labeled No. 14. Transformers will carry a similar number as well.
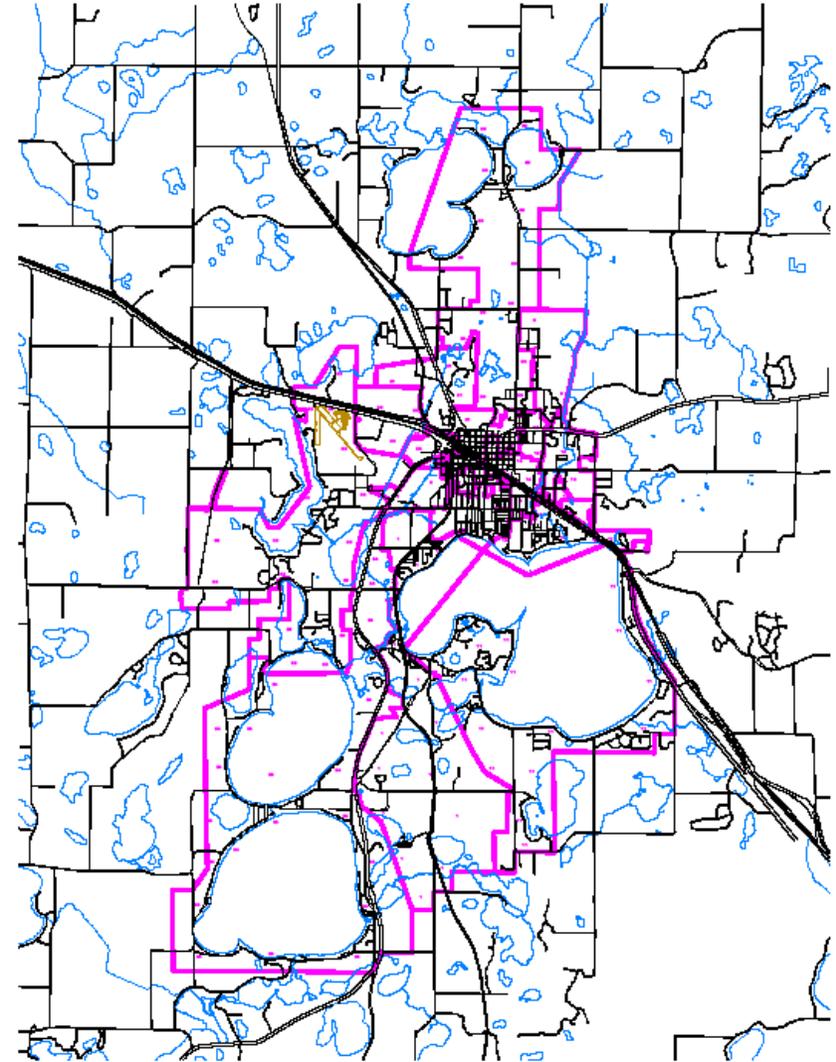
Electric Lines

Our computer and paper maps.
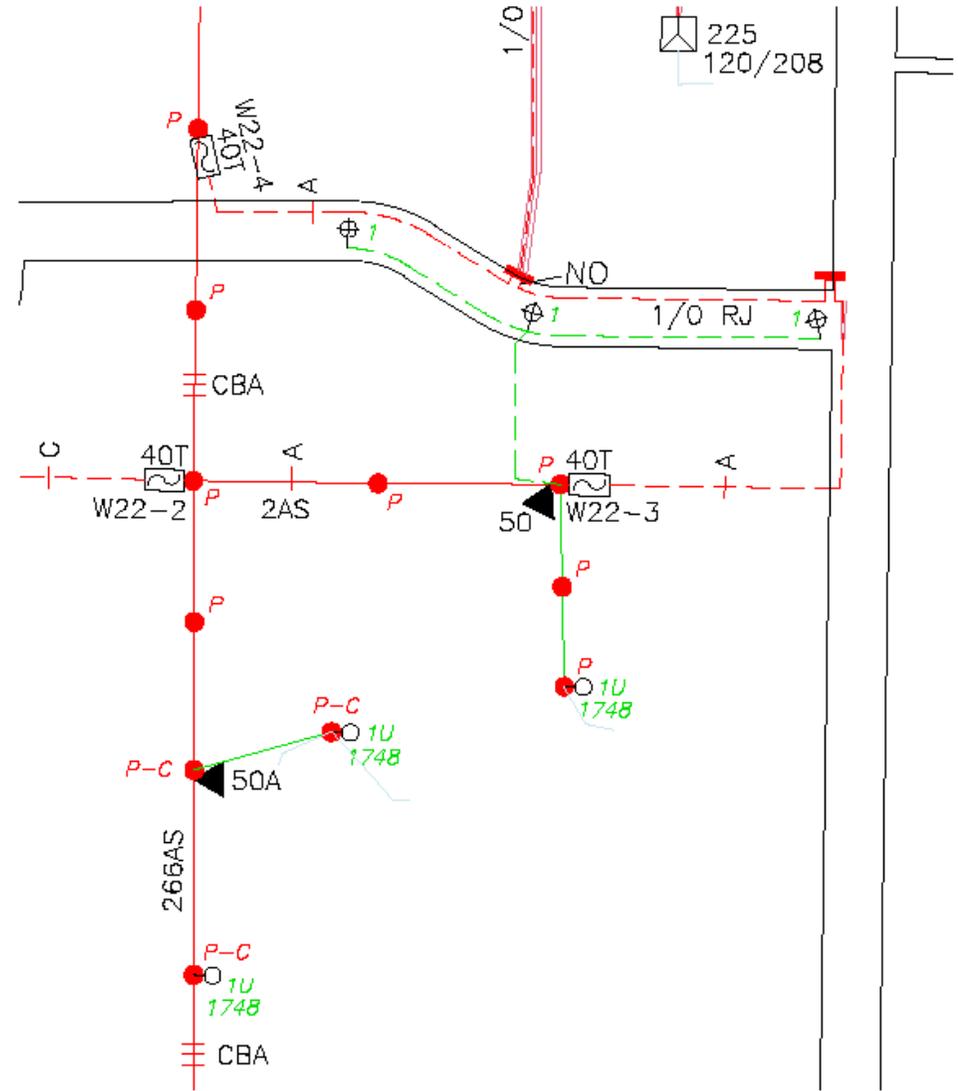
Electric Data

This is our Integrity Map, Midland spotted each power pole and took a picture of each pole with any apparatus on it. Since we had Pictometry to line up the location of each of our poles prior to GPSing each one, it didn't take long to move each pole to it's exact location. Once that was complete we installed our computer map into Integrity and each time a line is located, the location is added to the map, as shown by the red diamonds.
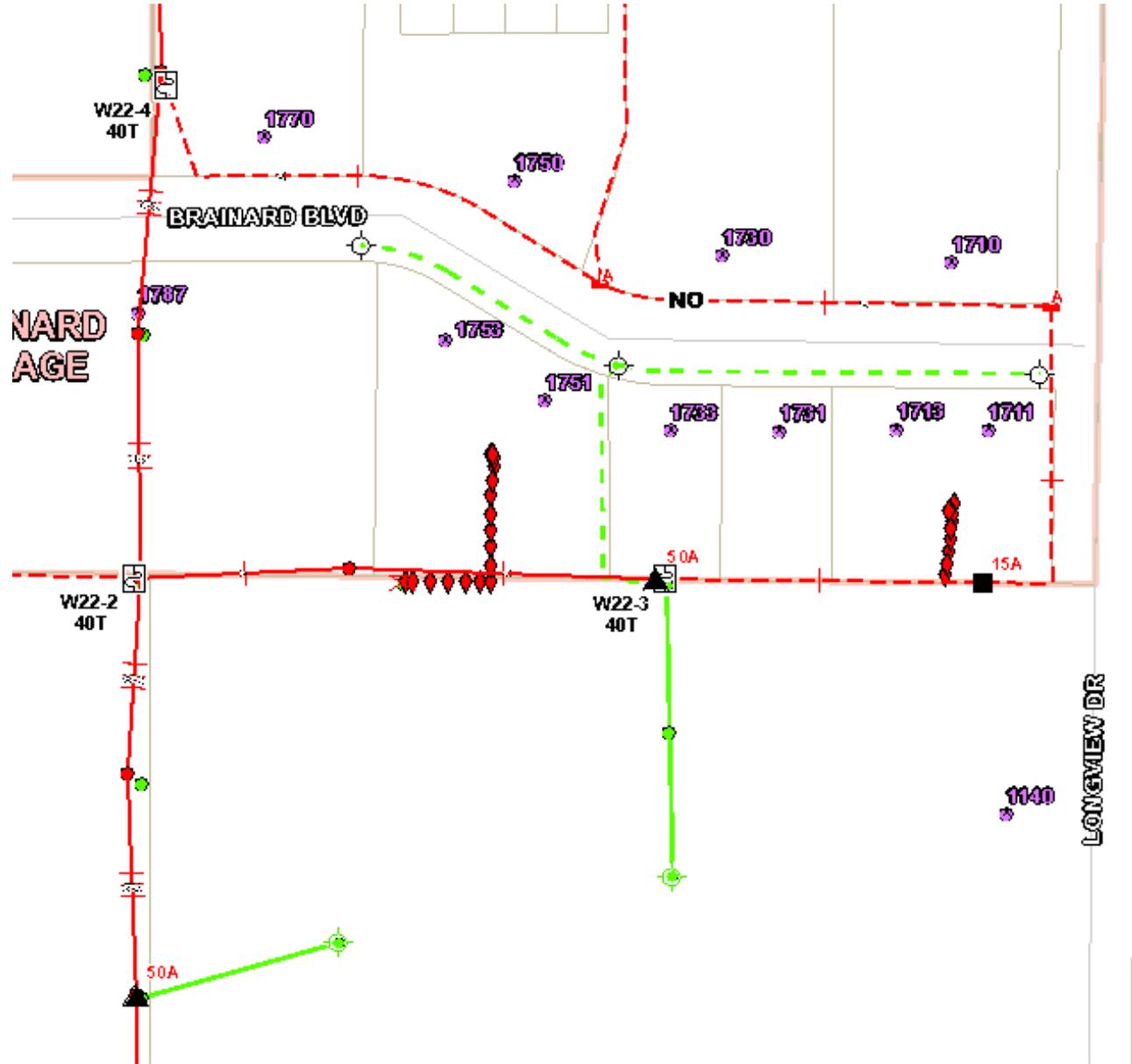
Just the aerial of the previous slide.

Transformer Data

We want all of the Transformer Data locked to each transformer in our system. Currently only the underground transformers are done, we still have to get the data on each overhead transformer and put that info into our system.

Pad Transformer □ ×

Zoom to Feature | Pan to Feature | Create a Report | Copy to Drawing | Add to Selected
Export Feature Attachments

Details | Attributes

Field Name	Field Value
Subtype	Unknown
Installation Date	8/16/2016 5:00:00 AM
KVA	15
Serial_Number	M14C21740
Number_Of_Customers	
Fault_Indicator	False
Loop_Feed	True
Feeder	22
Feature_ID	5992
System	
Brand_Name	Prolec
Voltage	120/240
Impedence	1.61
Phase	1 Phase
Line_Phase	A
Address	1713 Brainard Blvd
PCB_Info	Non-PCB (<1 PPM)
PCB_Test_Num	
PCB_PPM	
QualityControl	
Normal_Open	
SedondaryType	One Phase
GroundRodResistance	
LocatedBy	
SubStation	WEST
Fault Current	
IFD	Yes
Gallons of Oil	25
Inventory_Status	Used
OBJECTID	50
Transformer_number	5992

|	
Inventory_Status	Used
OBJECTID	50
Transformer_number	5992
Brand_names	PROLEC
Serial_Num	M14C21740
Size_KVA	15 KVA
Voltage	120/240
PCB_class	Non-PCB (Less than 1ppm)
PCB_test	
PCB_PPM	
New_Used	New
Date	12/28/2015 12:00:00 AM
Impedence	1.610000
IFD	YES
Address	POLEYARD
Name_plate_information_picture	Transformer Nameplate\5992.JPG
Phase	1.000000

Integrity

The GPS'ed location of our underground wires are identified with the red diamonds, the CAD drawings are the dashed lines.
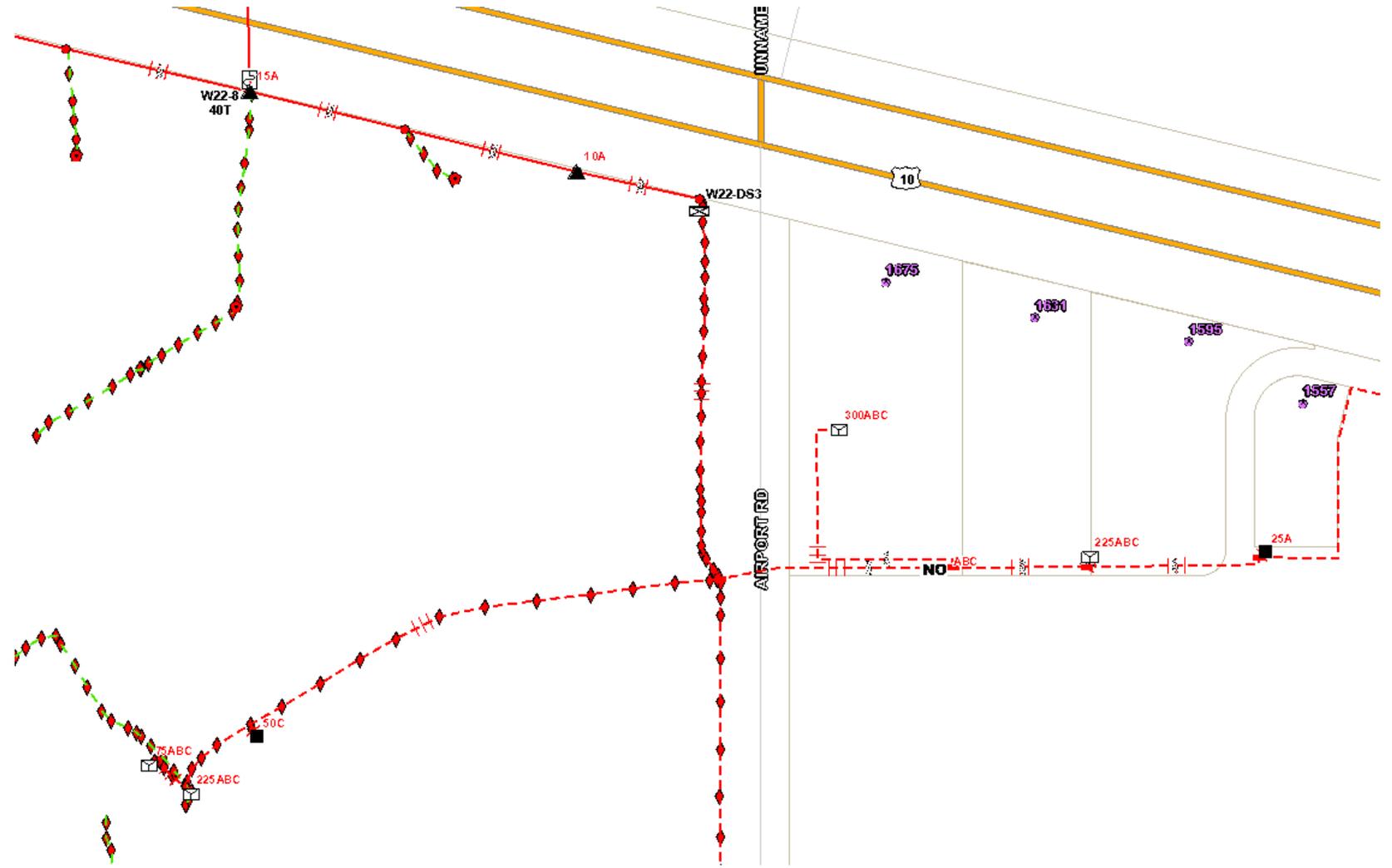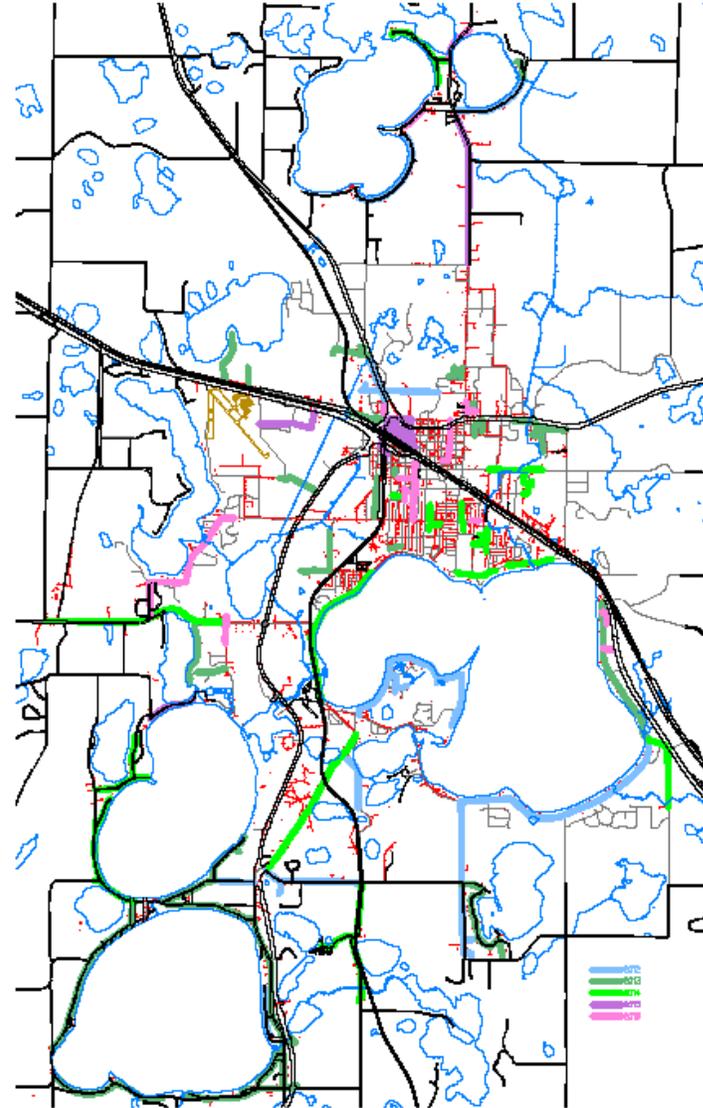
Underground Service and Meter info

In Integrity we can use the Rectangle Identify button to see any data that was collected.
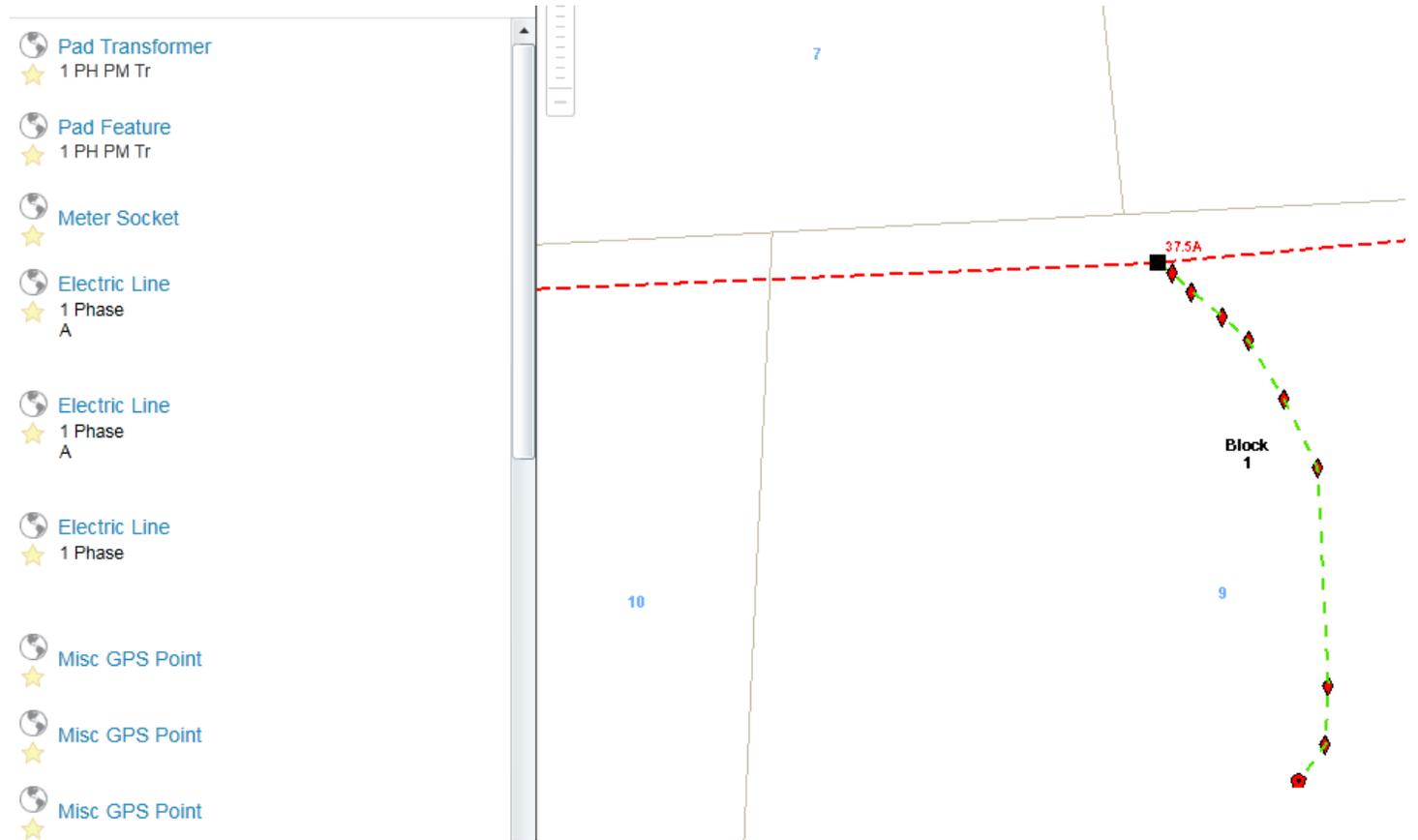
Tree Trimming

Currently we have 5 years of tree trimming data for our Electric Lines, this will be added to GIS eventually and we will be able to foresee which lines will need to be trimmed next year and the years after that.

Thank you for checking out my presentation, again if you have any questions, do not hesitate to contact me and we can discuss it. Steve