



US Army Corps  
of Engineers®  
Seattle District



# Skagit River Flood Risk Management General Investigation

Skagit County, Washington

Draft Feasibility Report and  
Environmental Impact Statement

Appendix H – Civil Design

May 2014



## **1. Civil Engineering**

This appendix summarizes the civil design effort during the TSP selection phase of the Skagit River General Investigation.

Data Sources Include:

Skagit County BNRR Tracks Near District Line Road Profile

1999 NAVD 29 USACE Planimetric and Topographic files

2008 Skagit County Dike District 12, Skagit River Levee Plan and Profile

2008 Skagit County Dike District 12, Skagit River Levee Plan and Profile Cross-Section

2009 City of Mount Vernon- Downtown Flood Protection Project

2009 USACE Field Cross Sections

2010 Woolpert Survey for NLD – Group 5A – Levee Centerline, Profile, and Cross-Sections

2012 NHC Lidar GIS data imported to InRoads Digital Terrain Model

2013 Cascade Natural Gas GIS Data

2013 City of Mount Vernon Storm and Sanitary GIS Data

2013 City of Burlington Storm and Sanitary Data As-Built Drawings

2013 City of Burlington Water Distribution Data

2013 Puget Sound Energy Electrical Distribution Information

### ***1.1 Project Description***

The Tentatively Selected Project is the Comprehensive Urban Improvement Levee Alternative. This alternative primarily improves the existing levee system also adding three new levee/floodwall segments. The alternative also provides non-structural improvements to the Sedro Woolley Waste Water Treatment Plant and the United General Hospital at Sterling. Most of the work described below supports the refinement of this alternative.

### ***1.2 Levee Earthwork Quantities***

Earthwork quantities are generally performed in four phases: 1) rough estimates based on assumed design criteria; 2) estimates based on hydraulic data; 3) estimates based on hydraulic data and estimated cross-sections; and 4) estimates based on hydraulic data with lidar data compared with estimated cross-sections.

The TSP was selected using rough estimates based on hydraulic data and estimated cross-sections (3).

The 100-yr earthwork quantity estimates were determined by comparing the data (4) with estimates utilizing lidar data and resolving differences to produce a conservative estimate. Generally, the Lidar (4) estimates were less than the cross-section (3) estimates.

There are a few data gaps in the Lidar information, specifically West Mount Vernon north of Division Street bridge, SKDD17 3-Bridge Corridor, SKDD12 3-Bridge Corridor, and SKDD12 BNSF embankment. These specific areas and others require further topographic information during the following phases.

### ***1.3 NED Support Strategy***

Following quantity comparison and agreement, conservative estimates using method (3) will be utilized in support of Economics Section's National Economic Development (NED) plan analysis. This method would allow the economist to quickly alter levee height values to narrow down the NED level.

### ***1.4 Road Earthwork Crossing***

Road crossings earthwork estimates are generally based on sight distance constraints and 35 mph design speed, and 24 foot wide asphaltic concrete roads. For estimating purposes this resulted in 580,100 square foot of asphaltic concrete road crossings.

### ***1.5 Existing Utilities***

Existing storm, sanitary and fiber optic utilities are estimated from the City of Mount Vernon GIS data. In the Lions Park Connector area this information was supplemented by engineering drawings to the south. The City of Burlington (storm/sewer), Skagit PUD (water), Puget Sound Energy (electric) and Cascade Natural Gas also provided information. Electrical information from Puget Sound Energy arrived too late for inclusion, but the affects would not be significant. Major storm and sanitary utilities should be replaced to prevent damage from settlement.

### ***1.6 Culverts and Drainage Structures***

The Riverbend Cutoff will create an area impounded by water during an event that overtops the existing left bank SKDD17 Riverbend levee. Culverts and drainage structures are required to relieve the existing left bank SKDD17 Riverbend Levee area and facilitate drainage of the area as the river water surface lowers. Two 48-inch diameter culverts with flap gates supported on piles are assumed.

### ***1.7 Construction Considerations***

Applicable Best Management Practices minimizing run-off, turbidity and, prevention and containment of contamination spills shall be utilized.

Levee construction would generally be constructed during the drier months and during non-flood season.

All aspects of construction need to be carefully phased to avoid elevated flood risks and comply with any in-water work windows.

### ***1.8 Information Needed for Subsequent Design***

The information described above were developed based on readily available information without the level of site-specific survey and investigation necessary to support subsequent design and implementation.

Additional information will be required at the feasibility and later design stages to confirm the design assumptions, refine quantity estimates, address property and regulatory issues, and fill in data gaps. The

extent to which this information is collected for feasibility design (or later design stage) will depend upon the available budget, schedule and other factors. This sections attempts to define the most essential information needs for this action. Additional data required during future phases include:

Property and Topographic, planimetric and utility data (including utility size and depths) along the proposed alignments. The surveys would be useful in providing more accurate designs and quantities for roadways, utilities, and removal of existing features. Survey data would be used in designing the alignment and specific features.

Hydraulic Analysis for Culvert flows and sizes

Erosion Protection areas including overtopping areas

Roads, pavement designs

Refinement of ramps and closure structures

Geotechnical analysis to refined design of levees, roads, and rail infrastructure, and to address slope stability and settlement considerations at utilities, roads and structures.

Working Draft

This lists affected roads, not including Road Crossings and top of levee											
Feature	Type	LF	Width Assumed, ft	SF	Assumed thickness inch	CY, AC	Base, inch	Base, CY	Fill, CY	Data Gap	notes
Sedro Woolley Waste Water Treatment Plant Floodwall											
United General Hospital Floodwall											
Burlington Hill Cross Levee											
North Burlington Floodgate											
SCDD #12 Upstream											
SCDD #12 BNSF Embankment						0					check Lidar at sat 84+00 RR seems low in elevation
SCDD #12 3-Bridge Corridor	AC	4,500	24.0	108,000	4.00	1,333	12	4,167			used 4" over 12" based on design drawings DD 12 Withmarsh Road Realignment 105+00 to 160+00 less 140+00 to 150+00
SCDD #17 3-Bridge Corridor	AC	0		0		0					bad Lidar b Parking and buildings affected
Riverbend Cutoff Levee				0		0					
SCDD #17 South Riverbend Road	AC	1,000	24.0	24,000	4.00	296	12	926			City of Mount Vernon Min. 4" Class B Asphalt Concrete Pavement (ACP) over 2" Crushed Surfacing Top Course (CSTC) over 12" Gravel Borrow over filter fabric.
Lions Park Connector	AC	1,325	24.0	31,800	4.00	393	12	1,227			
SCDD#17 Mount Vernon Floodwall				0		0					
SCDD #1 West Mount Vernon		7,670	24.0	184,080	4.00	2,273	12	7,102			bad Lidar n 25+50 to 76+00 +2620
SCDD #3 South Mount Vernon	AC			0	4.00	0					
SCDD #17 Riverbend Left Bank				0		0					
<b>Total Road Improvement</b>		<b>14,495</b>		<b>347,880</b>		<b>4,295</b>					
<b>Road Crossings</b>		<b>4,954</b>	<b>24.0</b>	<b>279,431</b>	<b>4.00</b>	<b>3,450</b>	<b>12</b>	<b>4,587</b>	<b>35,017</b>		
<b>Total Road improvement + Crossings</b>		<b>19,449</b>		<b>627,311</b>		<b>7,745</b>			<b>35,017</b>		

This lists affected roads, not including Road Crossings												
Feature	Type	LF	Existing Utilities			Sanitary		Storm		Fiber		Description
			Water	Gas	Electric	Sanitary	Sanitary Affect	Storm	Storm Affect	Fiber	Fiber Affect	
Sedro Woolley Waste Water Treatment Plant Floodwall												
United General Hospital Floodwall				2" Coated steel								2 Crossings at Collins Rd
Burlington Hill Cross Levee West	Valves		x									Cluster of Valves at Highway 99
Burlington Hill Cross Levee West				3"								3" unknown west of RR running N/S
Burlington Hill Cross Levee West				4" Plastic		8" along Peter Anderson Rd						Along N. Hill Blvd Not Affected
Burlington Hill Cross Levee West								36"	none			15' South of Gear Road
Burlington Hill Cross Levee East		700	4" AC	2"								Along Peter Anderson Rd
Burlington Hill Cross Levee East		200	6" PL	2"								Along Gardner Rd
Burlington Hill Cross Levee East		1,350	6" PL	2"								Along Aliston Lane
North Burlington Floodgate												
SCDD #12 Upstream								18" Sta 255+00				Waste water discharge Somewhere
SCDD #12 BNSF Embankment		120	2" PL	none		none		none		?		east of RR running N/S to Blow off valve
SCDD #12 3-Bridge Corridor		1,100	2" PL									along East Whitmarsh Rd from Burlington Blvd to BNSF blow off
SCDD #12 3-Bridge Corridor		1,300	10" PL									along Withmarsh rd west of S. Burlington Blvd
SCDD #12 3-Bridge Corridor		1,900	8" PVC									along Withmarsh rd west of I-5
SCDD #12 3-Bridge Corridor		150						32" crosses Withmarsh Rd @ E of Division St				
SCDD #12 3-Bridge Corridor		360						12" crosses whitmarsh Rd 3 places				Both sides of Division St
SCDD #17 3-Bridge Corridor						no		no		yes crosses west of 99	No Effect	no
Riverbend Cutoff Levee			18"								No Effect	Between W. Stewart rd and River (Raney Well) move alignment to miss
Riverbend Cutoff Levee			16" CCP							yes Crosses at north end with Stewart Rd	No Effect	Crosses at West Stewart Rd
SCDD #17 South Riverbend Road		1,350		2" and 4" PL						landside of S Riverbend rd at Cameron Way	Possible Affect	along S. Riverbend rd
SCDD #17 South Riverbend Road		1,350	12" DI									along S. Riverbend rd
SCDD #17 South Riverbend Road	Valves		6" 8"									at S. Riverbend rd and Freeway Dr.
SCDD #17 South Riverbend Road	Hydrant											along S. Riverbend rd
SCDD #17 South Riverbend Road						5 MH						5 MH
SCDD #17 South Riverbend Road						12" crossing S. Riverbend Road						12" crossing S. Riverbend Road
SCDD #17 South Riverbend Road						8" parallel to S. Riverbend Rd landside						8" parallel to S. Riverbend Rd landside
Lions Park Connector						yes			yes			yes
Lions Park Connector		850		4" Plastic								Along Freeway Dr with other connections
Lions Park Connector						4 MH	No Effect	outfall 42" Crosses Cameron Way about station 18+00	Floodwall will cross this line	crosses S Riverbend rd and riverward of Cameron Way	Flood wall will cross this line	
Lions Park Connector						12" crossing S Riverbend rd and riverward of Freeway Drive	Flood wall will cross this line					
SCDD#17 Mount Vernon Floodwall												

This lists affected roads, not including Road Crossings		Existing Utilities				Sanitary		Storm		Fiber		Description
Feature	Type	LF	Water	Gas	Electric	Sanitary	Sanitary Affect	Storm	Storm Affect	Fiber	Fiber Affect	
SCDD #1 West Mount Vernon				4" Steel								Crosses at S. Baker St, not affected?
SCDD #1 West Mount Vernon		500		2"								Along Behrens Millett Rd
SCDD #1 West Mount Vernon		1,500		4" AC								Along Dunbar Road 2000'
SCDD #1 West Mount Vernon				12" DI								Along Division St Not affected
SCDD #1 West Mount Vernon		650		3" PVC								Along Behrens Millett Rd
SCDD #1 West Mount Vernon		100		3" Service Connection								Along Behrens Millett Rd
SCDD #1 West Mount Vernon		80		6" AC								Blow off at S. Baker St
SCDD #1 West Mount Vernon						1 MH	Raise	2 CB @ S. Ball St Sta 61+00	Raise/remove			
SCDD #1 West Mount Vernon						1 pump crossing 10" @ Maple Lane Sta 45+00	No Affect	1 crossing 1 outfall 30" concrete @ S Wall Street	No Affect			10" pump @ sta 50+00 2 CB @ 61+00 in levee?
SCDD #1 West Mount Vernon						6" abandoned pressure @ S Baker St Sta 56+00	Remove and plug					
SCDD #3 South Mount Vernon			8" DI					no		no		Along Dike Rd (Kimble Rd) Not affected
SCDD #17 Riverbend Left Bank												



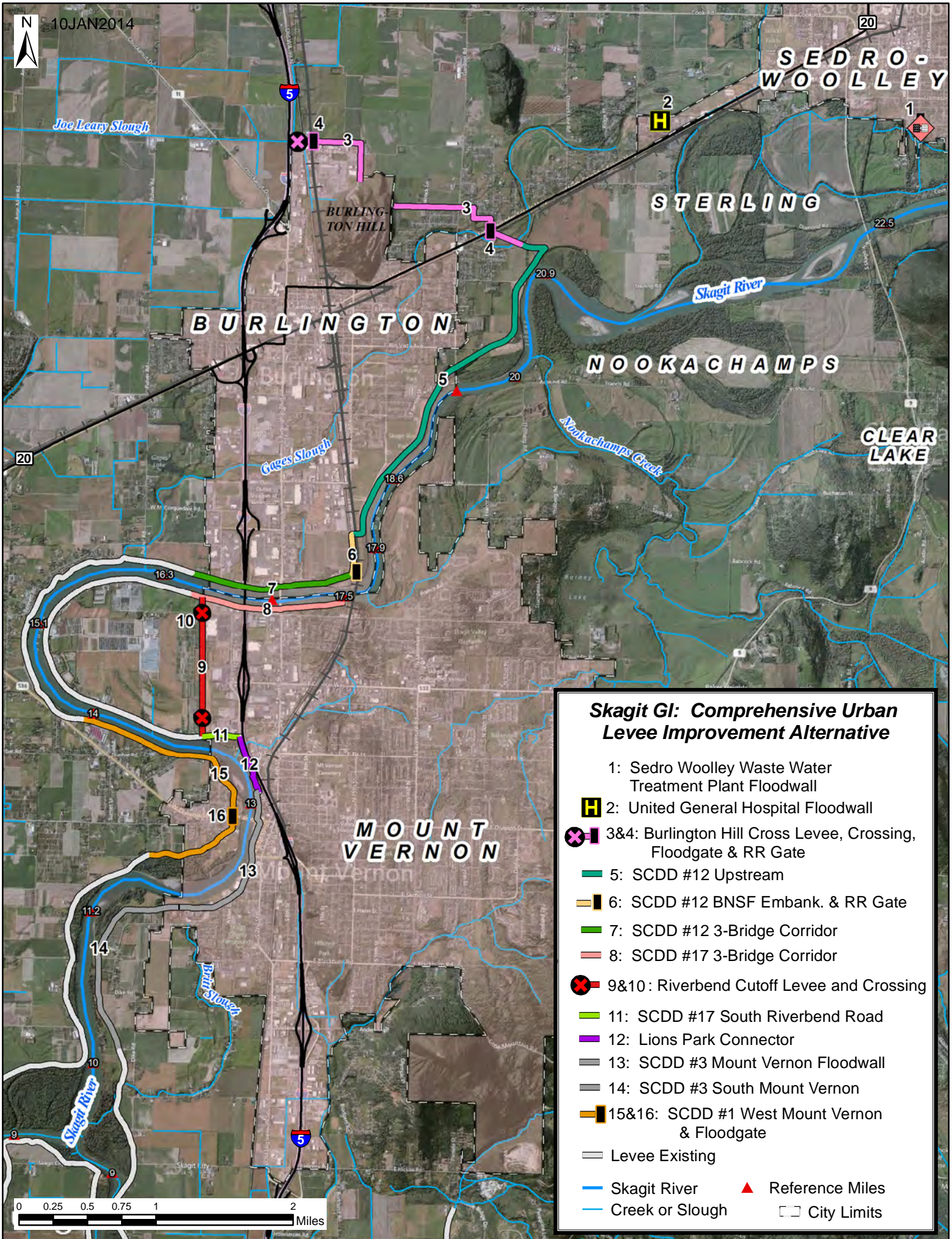
Drainage Features	Culvert/Drainage Features	
Feature		
Sedro Woolley Waste Water Treatment Plant Floodwall		
United General Hospital Floodwall		
Burlington Hill Cross Levee		
North Burlington Floodgate		
Gages Slough Culvert	1-48" concrete with riprap 12'x8'x3' each side	
SCDD #12 Upstream		
SCDD #12 BNSF Embankment		
SCDD #12 3-Bridge Corridor		
SCDD #17 3-Bridge Corridor		
Riverbend Cutoff Levee	2-48" with flap gates, pile and riprap 12'x8'x3' protection each	
SCDD #17 South Riverbend Road		
Lions Park Connector		
SCDD#17 Mount Vernon Floodwall		
SCDD #1 West Mount Vernon		
SCDD #3 South Mount Vernon		
SCDD #17 Riverbend Left Bank		

Riprap Toe Protection from H&H				
	Right Bank	Cubic Feet of Rock per Linear Foot	Rock Volume in Cubic Yards	Rock Volume in Cubic Yards
RM	RM			Rounded
20.9	20.4	400	39,111	39,000
20.4	20.2	100	3,911	3,900
20.2	19.5	0	0	0
19.5	19.3	100	3,911	3,900
19.3	19	0	0	0
19	18.2	400	62,578	63,000
18.2	17.5	0	0	0
17.5	16.5	100	19,556	20,000
14	13	100	19,556	20,000
	Left Bank	Cubic Feet of Rock per Linear Foot	Rock Volume in Cubic Yards	Rock Volume in Cubic Yards
RM	RM			
17.5	16.5	100	19,556	20,000
16.5	15.7	0	0	0
Total			168,178	169,800

Number of Gates		
Feature	Gate	Number
Sedro Woolley Waste Water Treatment Plant Floodwall	yes	3.0
United General Hospital Floodwall	yes	8.0
Burlington Hill Cross Levee	no	
North Burlington Floodgate	yes	1.0
SCDD #12 Upstream	no	
SCDD #12 BNSF Embankment	no	
SCDD #12 3-Bridge Corridor	no	
SCDD #17 3-Bridge Corridor	no	
Riverbend Cutoff Levee	yes	2.0
SCDD #17 South Riverbend Road	no	
Lions Park Connector	no	
SCDD#17 Mount Vernon Floodwall	no	
SCDD #1 West Mount Vernon	Yes	1.0
SCDD #3 South Mount Vernon	no	
SCDD #17 Riverbend Left Bank	no	

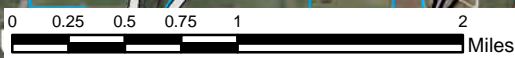


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### Skagit GI: Comprehensive Urban Levee Improvement Alternative

- 1: Sedro Woolley Waste Water Treatment Plant Floodwall
- H** 2: United General Hospital Floodwall
- X** 3&4: Burlington Hill Cross Levee, Crossing, Floodgate & RR Gate
- 5**: SCDD #12 Upstream
- 6**: SCDD #12 BNSF Embank. & RR Gate
- 7**: SCDD #12 3-Bridge Corridor
- 8**: SCDD #17 3-Bridge Corridor
- X** 9&10: Riverbend Cutoff Levee and Crossing
- 11**: SCDD #17 South Riverbend Road
- 12**: Lions Park Connector
- 13**: SCDD #3 Mount Vernon Floodwall
- 14**: SCDD #3 South Mount Vernon
- 15&16**: SCDD #1 West Mount Vernon & Floodgate
- Levee Existing
- Skagit River
- Creek or Slough
- ▲** Reference Miles
- City Limits





Imagery Date: 8/25/2011 1998

48°29'44.34" N 122°14'10.18" W elev. 43 ft

Graph: Min, Avg, Max Elevation: 43, 40, 53 ft  
Range Totals: Distance: 0.53 mi Elev Gain/Loss: 28.6 ft, -26.5 ft Max Slope: 19.7%, -13.3% Avg Slope: 1.9%, -1.7%





Imagery Date: 8/25/2011

1998

Graph: Min: Avg: Max: Elevation: 39, 45, 49 ft

Range Total: Distance: 0.87 mi

Clev Gain/Loss: 40.5 ft, -42.5 ft

Max Slope: 13.0%, -9.1%

Avg Slope: 1.8%, -1.4%

45 ft

39 ft

33 ft

27 ft

21 ft

15 ft

9 ft

3 ft

-3 ft

-9 ft

-15 ft

-21 ft

-27 ft

-33 ft

-39 ft

-45 ft

0.07 mi

0.15 mi

0.22 mi

0.30 mi

0.37 mi

0.45 mi

0.52 mi

0.60 mi

0.67 mi

0.75 mi

0.82 mi

0.89 mi

0.97 mi

1.04 mi

1.11 mi

1.19 mi

1.26 mi

1.34 mi

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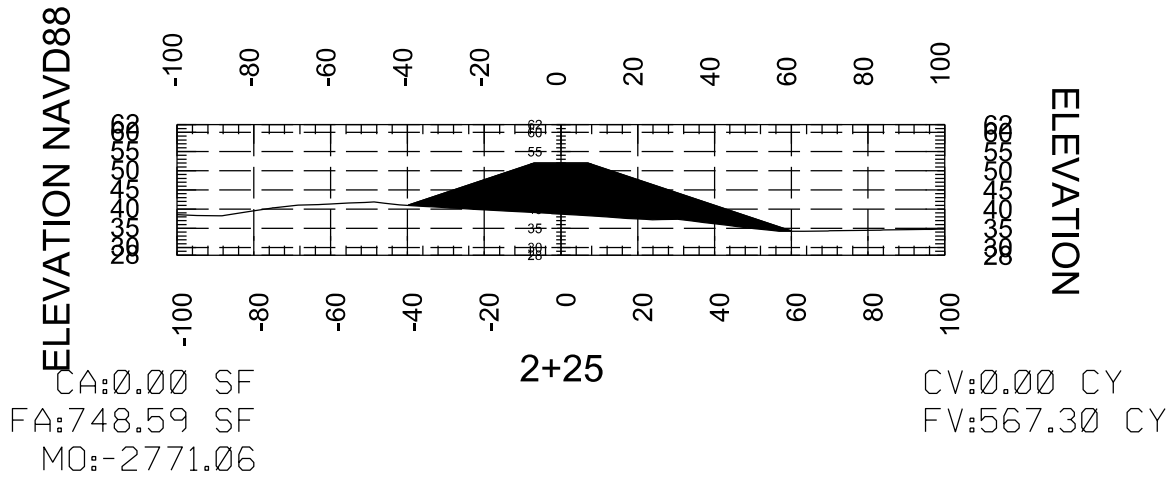
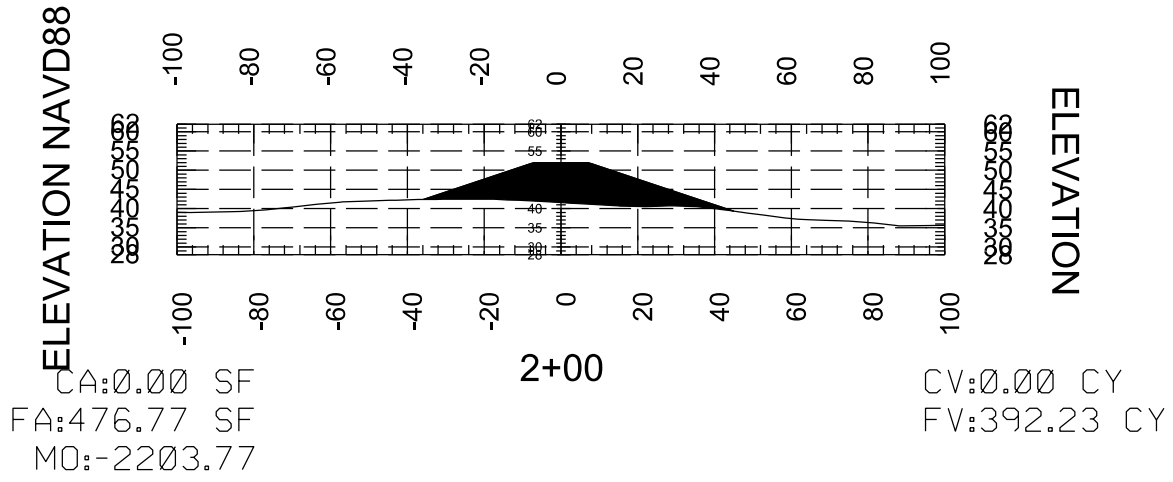
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-33 ft

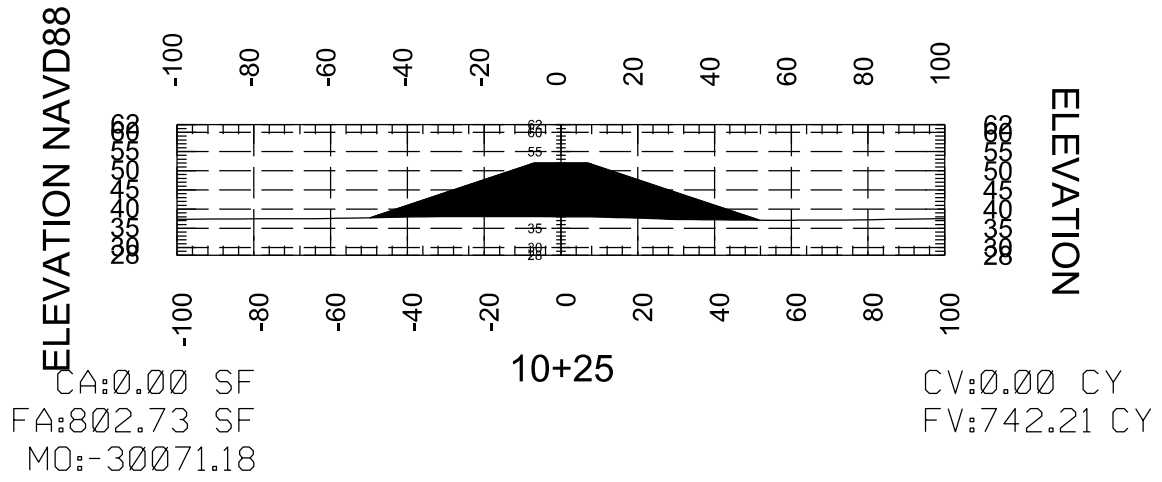
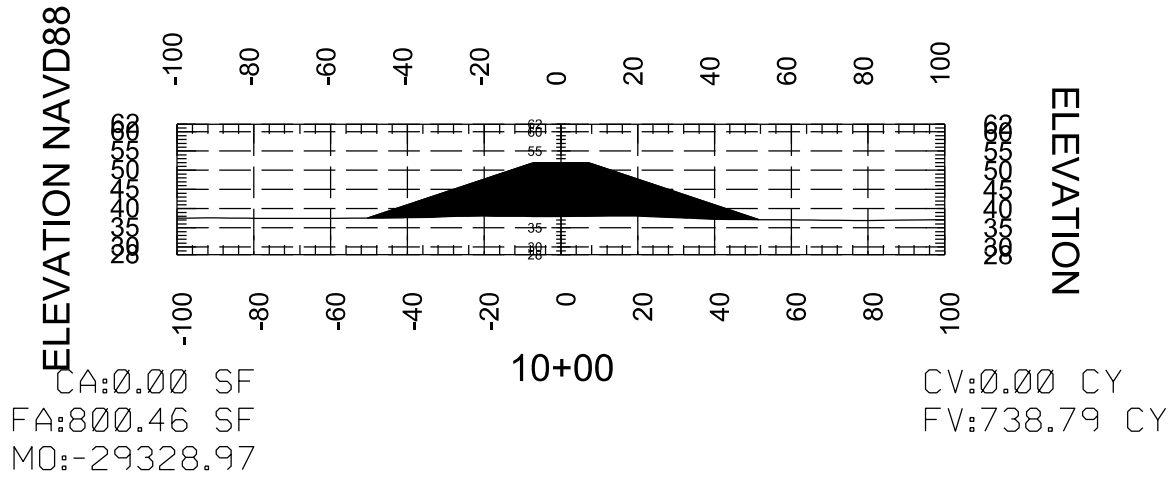
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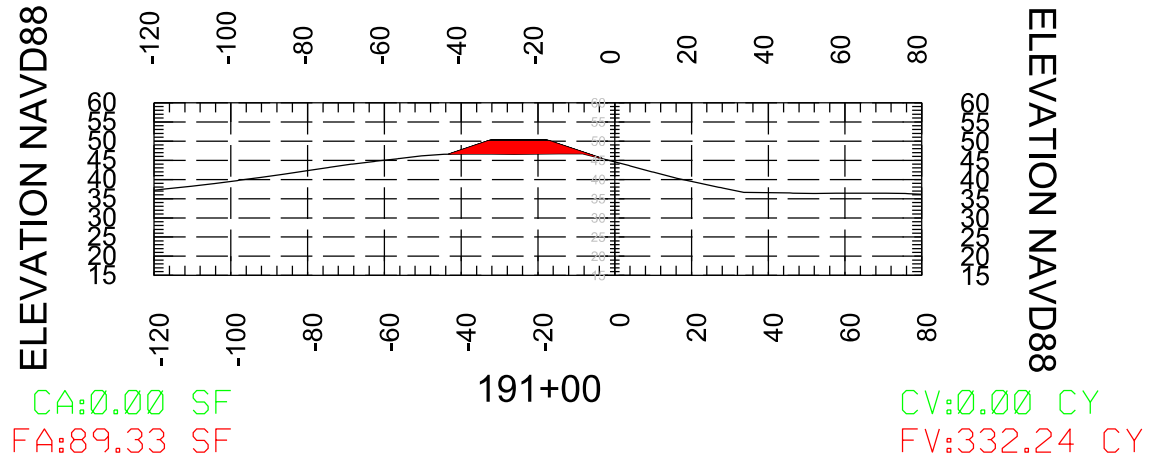
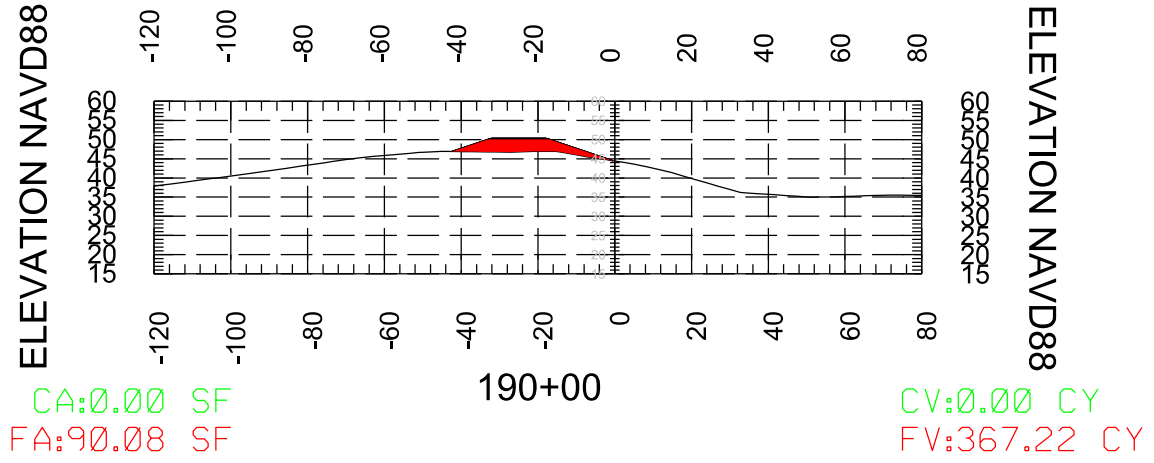


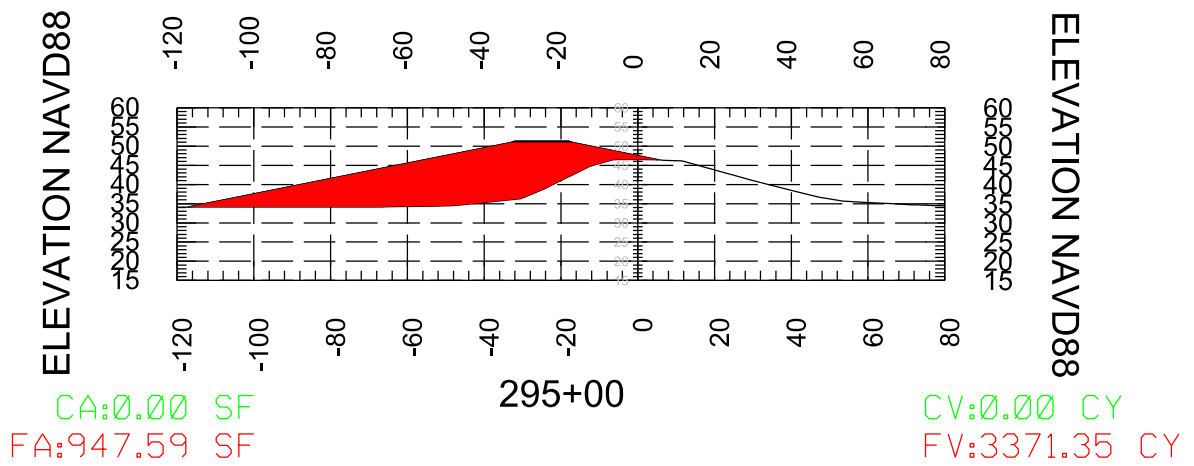
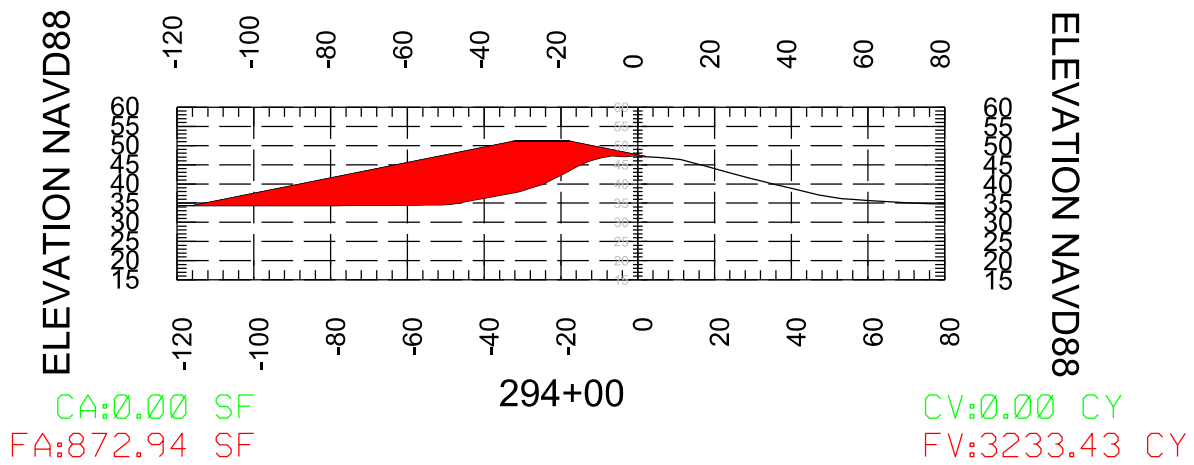
Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
	Type		Volume		Volume	Mass Ordinate?	Ordinate
	Normal Cut:		59.3		59.3	Yes	
	Normal Fill:		87574.5		87574.5	Yes	
	Added Cut:		0.0		0.0	Yes	
	Added Fill:		0.0		0.0	Yes	
	Wearing:		1786.7		1786.7	No	

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.









Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
		0.0	9.3	1.000	9.3	No	

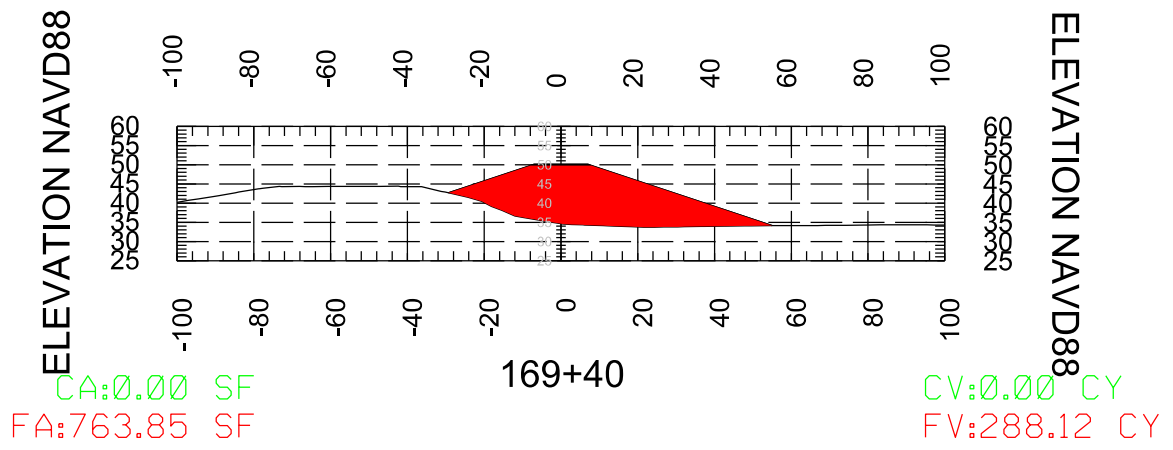
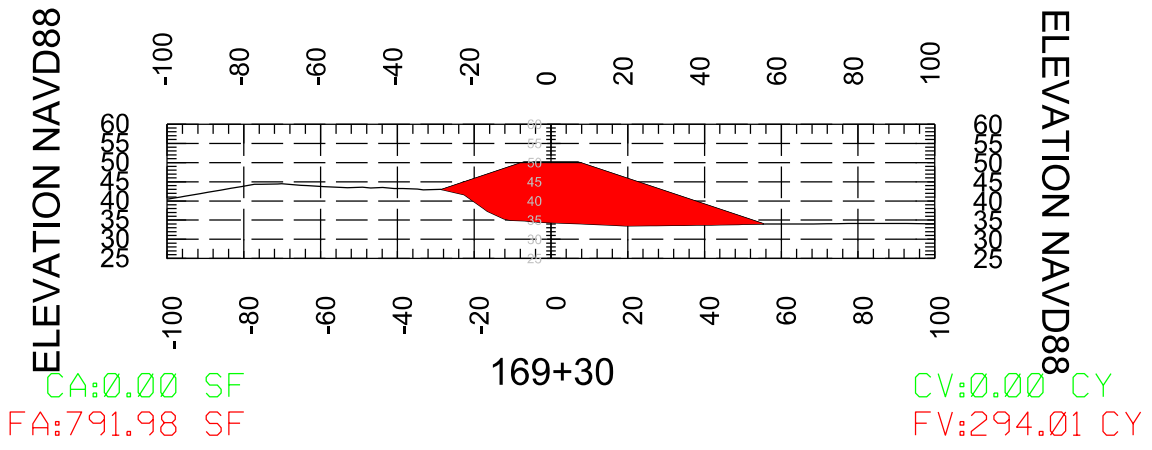
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Totals:	Type	Volume	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
	Normal Cut:	673.5	673.5	Yes	
	Normal Fill:	186868.2	186868.2	Yes	
	Added Cut:	0.0	0.0	Yes	
	Added Fill:	0.0	0.0	Yes	
	Wearing:	2718.2	2718.2	No	

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.







Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
		0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	365.8	150.6	1.000	150.6	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	5.0	1.9	1.000	1.9	No	
<b>184+10.000</b>							-40805.4
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	282.8	120.1	1.000	120.1	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	5.0	1.9	1.000	1.9	No	
<b>184+20.000</b>							-40898.8
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	221.5	93.4	1.000	93.4	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	5.0	1.9	1.000	1.9	No	
<b>184+30.000</b>							-40939.8
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	0.0	41.0	1.000	41.0	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	0.0	0.9	1.000	0.9	No	

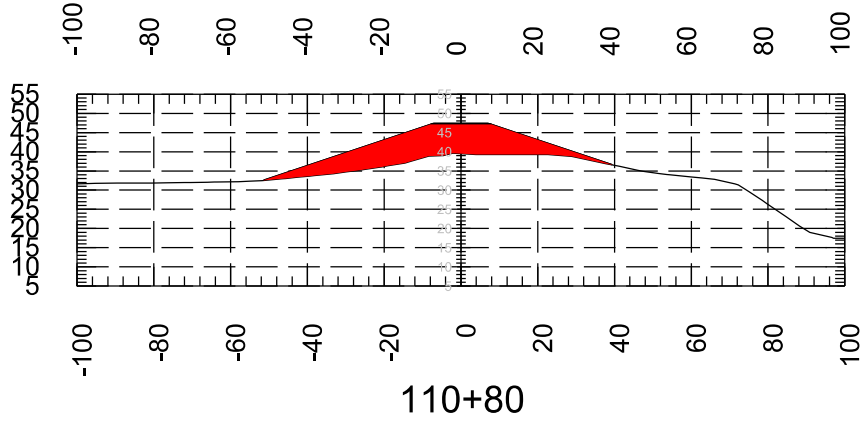
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Totals:	Type	Volume	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
	Normal Cut:	0.0	0.0	Yes	
	Normal Fill:	40939.8	40939.8	Yes	
	Added Cut:	0.0	0.0	Yes	
	Added Fill:	0.0	0.0	Yes	
	Wearing:	286.1	286.1	No	

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

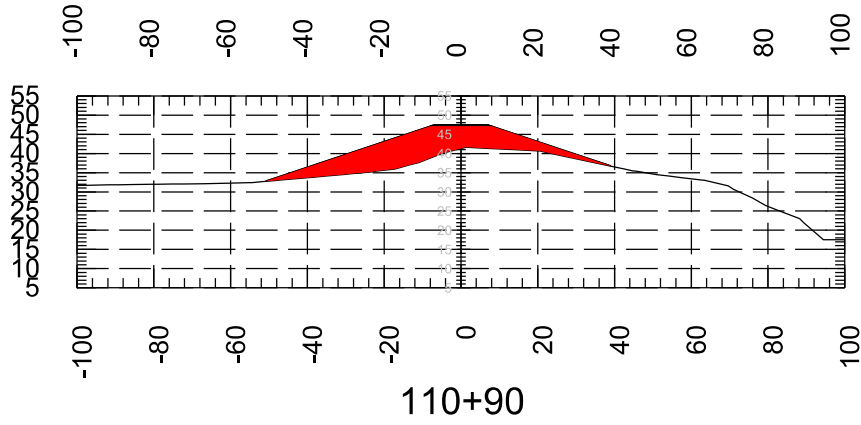


### ELEVATION NAVD88



### ELEVATION NAVD88

### ELEVATION NAVD88

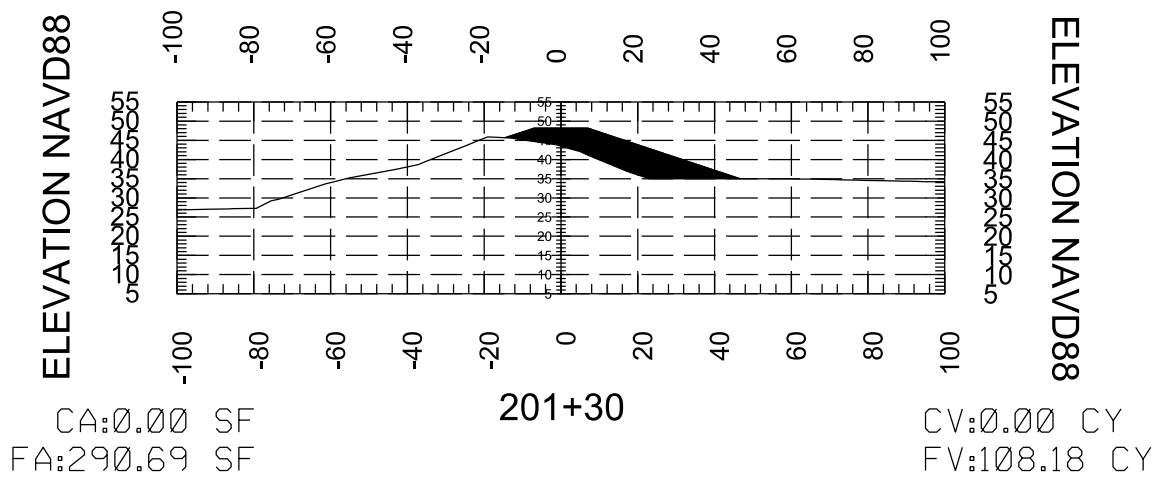
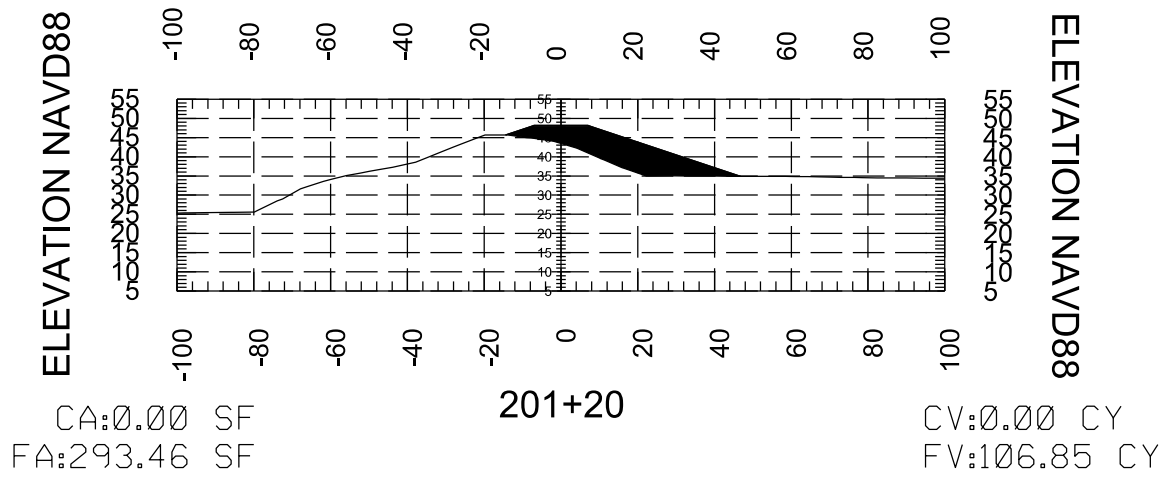


### ELEVATION NAVD88

Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
	Type		Volume		Volume	Mass Ordinate?	Ordinate
	Normal Cut:		1655.7		1655.7	Yes	
	Normal Fill:		78896.5		78896.5	Yes	
	Added Cut:		0.0		0.0	Yes	
	Added Fill:		0.0		0.0	Yes	
	Wearing:		1132.2		1132.2	No	

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.





Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
		23.4	10.4	1.000	10.4	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	5.0	1.9	1.000	1.9	No	
<b>220+60.000</b>							-38051.6
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	18.2	7.7	1.000	7.7	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	5.0	1.9	1.000	1.9	No	
<b>220+70.000</b>							-38055.8
	Normal Cut:	0.6	0.1	1.000	0.1	Yes	
	Normal Fill:	4.7	4.2	1.000	4.2	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	5.0	1.9	1.000	1.9	No	
<b>220+80.000</b>							-38056.5
	Normal Cut:	0.0	0.1	1.000	0.1	Yes	
	Normal Fill:	0.0	0.9	1.000	0.9	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	0.0	0.9	1.000	0.9	No	
<b>220+90.000</b>							-38056.5
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	0.0	0.0	1.000	0.0	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	0.0	0.0	1.000	0.0	No	
<b>221+00.000</b>							-38056.5
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	0.0	0.0	1.000	0.0	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	0.0	0.0	1.000	0.0	No	

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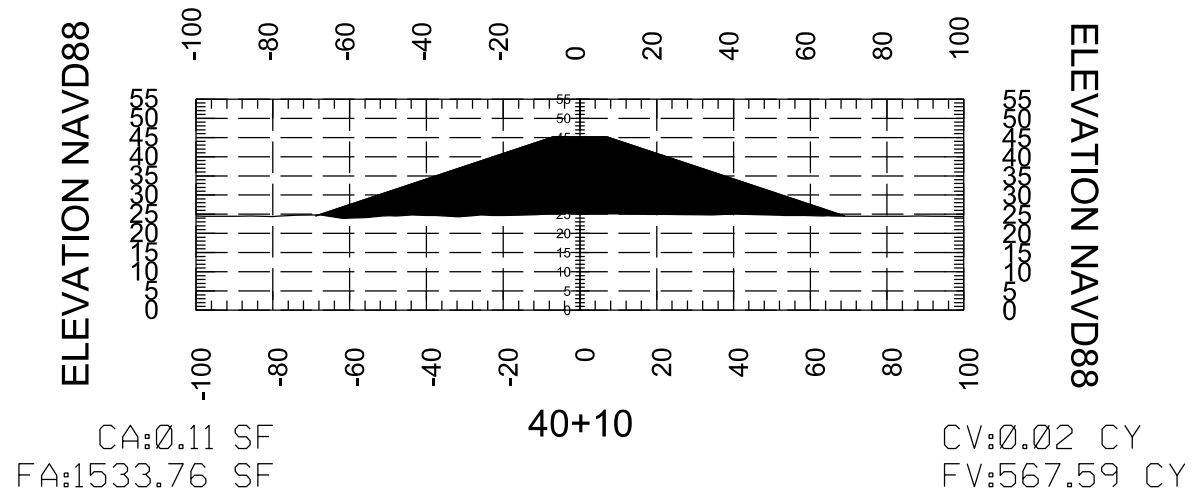
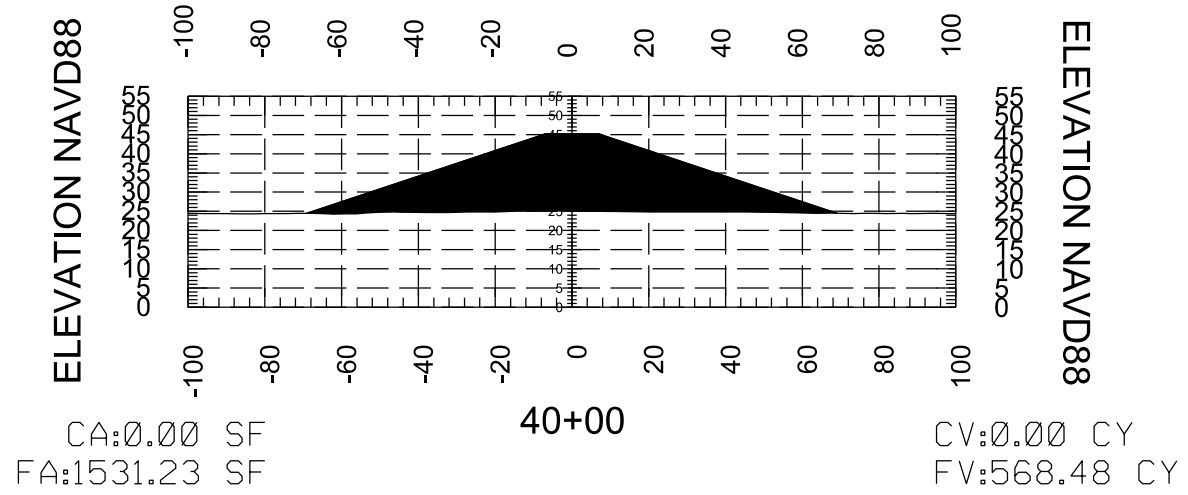
Totals:	Type	Volume	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
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Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
	Normal Cut:		2.5		2.5	Yes	
	Normal Fill:		38059.0		38059.0	Yes	
	Added Cut:		0.0		0.0	Yes	
	Added Fill:		0.0		0.0	Yes	
	Wearing:		1050.8		1050.8	No	

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.



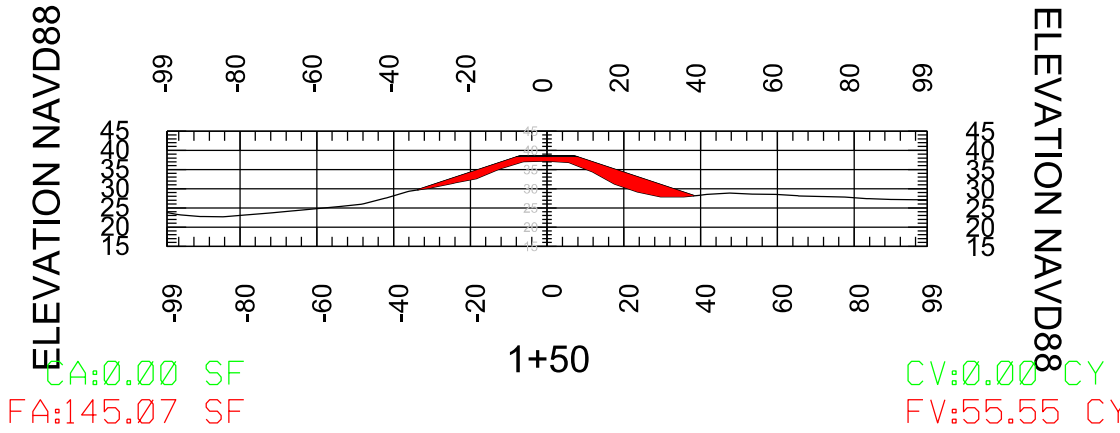
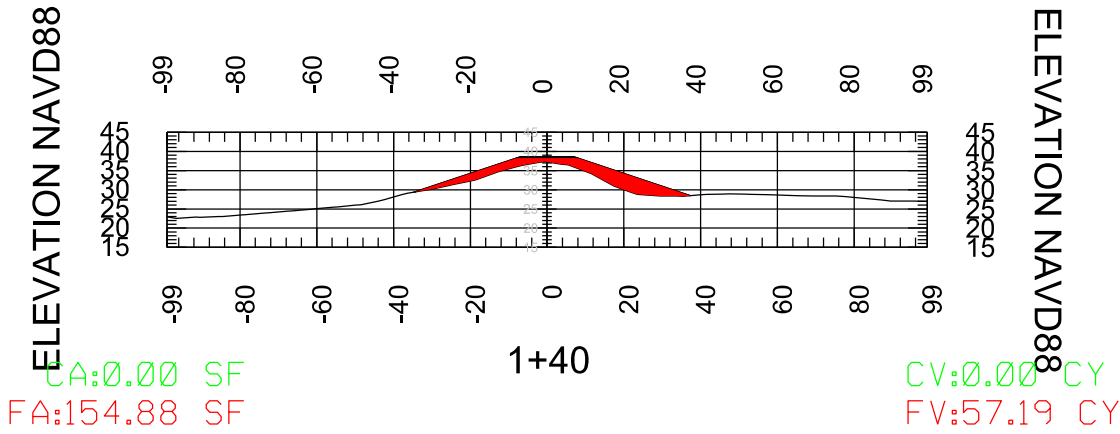


Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
			0.0	1.000	0.0	Yes	
	Wearing:	0.0	0.9	1.000	0.9	No	
<b>54+10.000</b>							-248947.6
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	0.0	0.0	1.000	0.0	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	0.0	0.0	1.000	0.0	No	
<b>54+20.000</b>							-248947.6
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	0.0	0.0	1.000	0.0	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	0.0	0.0	1.000	0.0	No	
<b>54+30.000</b>							-248947.6
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	0.0	0.0	1.000	0.0	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	0.0	0.0	1.000	0.0	No	
<b>54+40.000</b>							-248947.6
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	0.0	0.0	1.000	0.0	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	0.0	0.0	1.000	0.0	No	
<b>54+41.513</b>							-248947.6
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	0.0	0.0	1.000	0.0	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	0.0	0.0	1.000	0.0	No	
<hr/>							
<b>Totals:</b>	<u>Type</u>		<u>Volume</u>		<u>Adjusted Volume</u>	<u>Included in Mass Ordinate?</u>	<u>Mass Ordinate</u>
	Normal Cut:		64.7		64.7	Yes	
	Normal Fill:		249012.3		249012.3	Yes	

Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
	Added Cut:		0.0		0.0	Yes	
	Added Fill:		0.0		0.0	Yes	
	Wearing:		996.7		996.7	No	

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.





Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
			0.0	1.000	0.0	Yes	
	Wearing:	5.0	1.9	1.000	1.9	No	
<b>9+70.000</b>							-7089.4
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	200.0	73.8	1.000	73.8	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	5.0	1.9	1.000	1.9	No	
<b>9+80.000</b>							-7163.1
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	197.9	73.7	1.000	73.7	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	5.0	1.9	1.000	1.9	No	
<b>9+90.000</b>							-7235.4
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	192.3	72.3	1.000	72.3	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	5.0	1.9	1.000	1.9	No	

11 SCDD17 LB South Riverbend road

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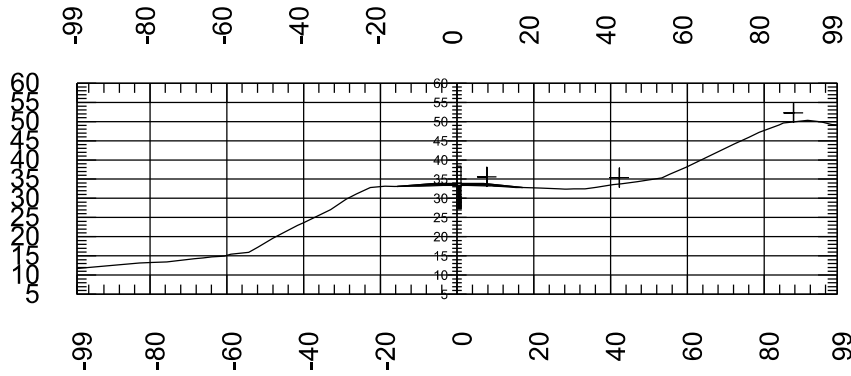
Totals:	Type	Volume	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
	Normal Cut:	0.0	0.0	Yes	
	Normal Fill:	7235.4	7235.4	Yes	
	Added Cut:	0.0	0.0	Yes	
	Added Fill:	0.0	0.0	Yes	
	Wearing:	183.3	183.3	No	

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.





ELEVATION NAVD88



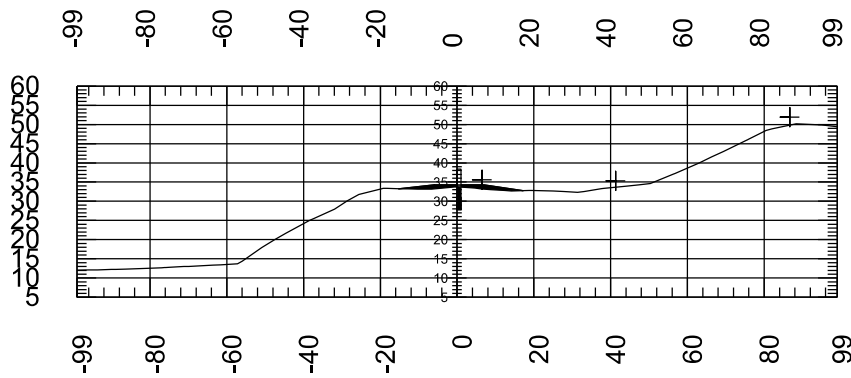
ELEVATION NAVD88

CA:6.60 SF  
FA:12.53 SF

12+00

CV:2.45 CY  
FV:4.35 CY

ELEVATION NAVD88



ELEVATION NAVD88

CA:6.56 SF  
FA:21.13 SF

12+10

CV:2.44 CY  
FV:6.23 CY

Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
		18.2	5.7	1.000	5.7	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	C-T-Wall:	9.6	3.5	1.000	3.5	No	

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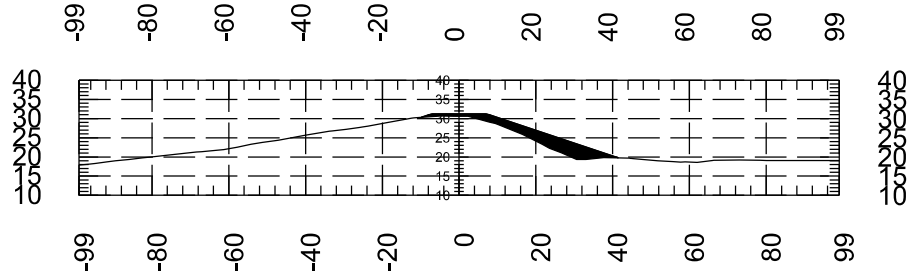
Totals:	Type	Volume	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
	Normal Cut:	636.1	636.1	Yes	
	Normal Fill:	1556.8	1556.8	Yes	
	Added Cut:	0.0	0.0	Yes	
	Added Fill:	0.0	0.0	Yes	
	C-T-Wall:	892.0	892.0	No	

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.



ELEVATION NAVD88

CA:0.00 SF  
FA:93.96 SF



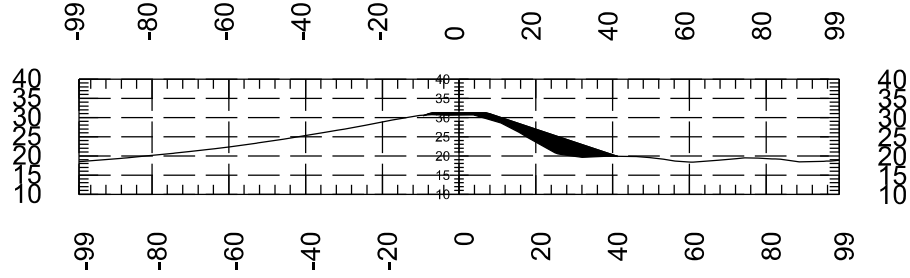
73+00

CV:0.00 CY  
FV:85.56 CY

ELEVATION NAVD88

ELEVATION NAVD88

CA:0.05 SF  
FA:93.95 SF



73+25

CV:0.02 CY  
FV:87.00 CY

ELEVATION NAVD88

Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
			0.0	1.000	0.0	Yes	
	Wearing:	5.0	4.6	1.000	4.6	No	
<b>143+75.000</b>							-42895.9
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	37.0	34.5	1.000	34.5	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	5.0	4.6	1.000	4.6	No	
<b>144+00.000</b>							-42931.7
	Normal Cut:	0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	40.4	35.8	1.000	35.8	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	5.0	4.6	1.000	4.6	No	

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Totals:	Type	Volume	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
	Normal Cut:	262.6	262.6	Yes	
	Normal Fill:	43194.3	43194.3	Yes	
	Added Cut:	0.0	0.0	Yes	
	Added Fill:	0.0	0.0	Yes	
	Wearing:	1499.7	1499.7	No	

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

A B C D

1

2

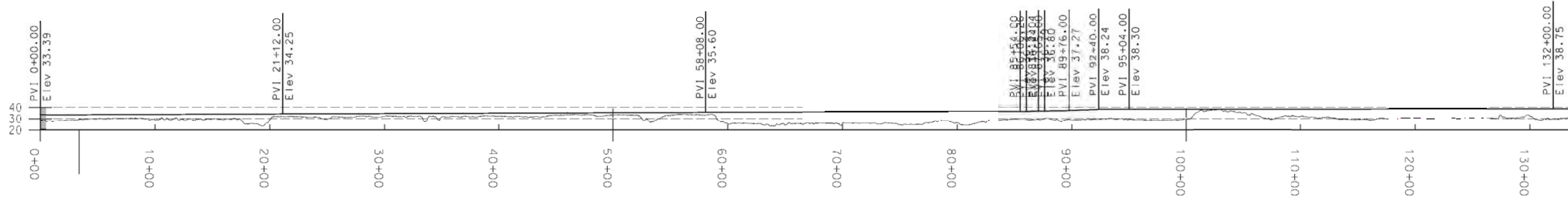
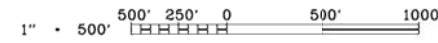
3

4

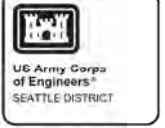
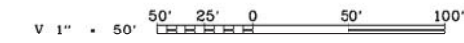
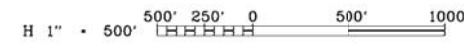
5



WEST MT. VERNON LEVEE RAISE PLAN 1



WEST MT. VERNON LEVEE RAISE PROFILE 1



MARK	DESCRIPTION	DATE	APPR.	MARK	DESCRIPTION	DATE	APPR.

DESIGNED BY: U.S. ARMY CORPS OF ENGINEERS SEATTLE DISTRICT SEATTLE, WASHINGTON	DATE: 5/16/2013	SOLICITATION NO.:
DWN BY:	CONTRACT NO.:	
SUBMITTED BY:	FILE NUMBER:	00000-00-00
PLOT DATE: 5/16/2013 4:46:28 PM	FILE NAME:	
SIZE: ANSI D		

SKAGIT RIVER GENERAL INVESTIGATION  
FOCUSED ARRAY OF ALTERNATIVES

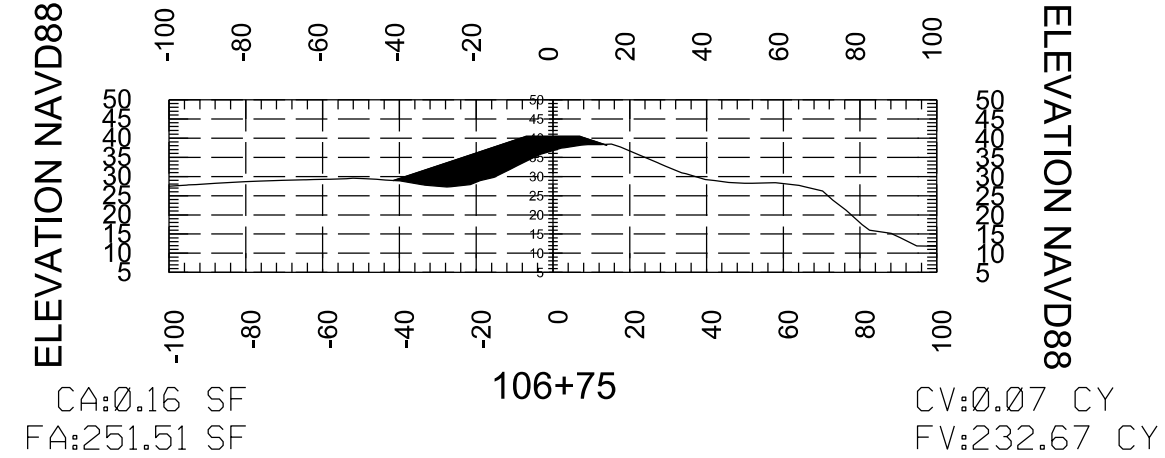
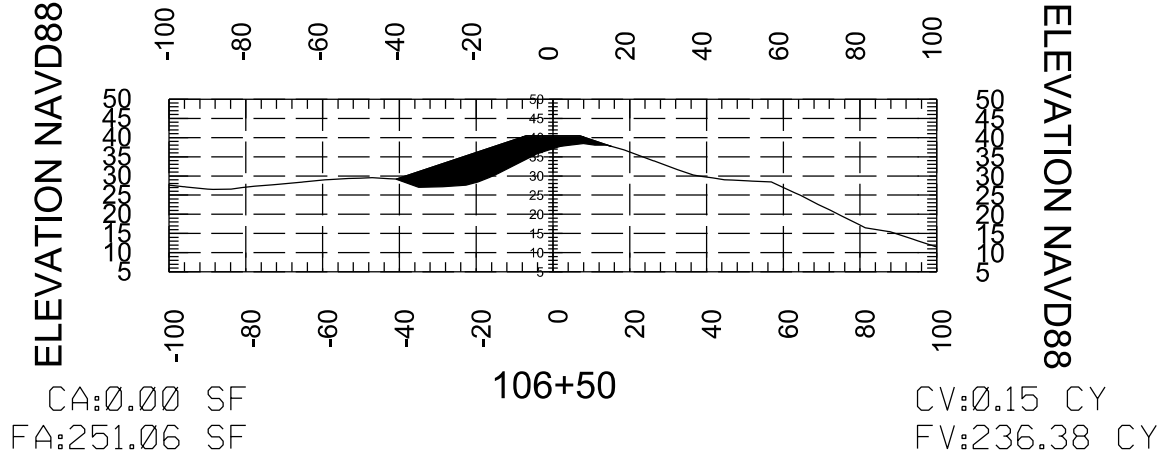
SKAGIT COUNTY, WASHINGTON

SHEET IDENTIFICATION

SHEET OF







Station	Type	Area	Volume	Factor	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
		0.0	0.0	1.000	0.0	Yes	
	Normal Fill:	62.0	76.4	1.000	76.4	Yes	
	Added Cut:		0.0	1.000	0.0	Yes	
	Added Fill:		0.0	1.000	0.0	Yes	
	Wearing:	5.0	4.6	1.000	4.6	No	

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Totals:	Type	Volume	Adjusted Volume	Included in Mass Ordinate?	Mass Ordinate
	Normal Cut:	15.7	15.7	Yes	
	Normal Fill:	83921.6	83921.6	Yes	
	Added Cut:	0.0	0.0	Yes	
	Added Fill:	0.0	0.0	Yes	
	Wearing:	2036.7	2036.7	No	

Input Grid Factor: **Note:** All units in this report are in feet, square feet and cubic yards unless specified otherwise.

Skagit River GI - Road crossings

Design Speed	Stopping Sight Distance (sag)	Design K	Design K (Crest)
15	80	10	3
20	115	17	7
25	155	26	12
30	200	37	19
35	250	49	29
40	305	64	44
45	360	79	64
50	425	96	84
55	495	115	114
60	570	136	151
65	645	157	193
70	730	181	247
75	820	206	312
80	910	231	384

Equations used (based on stopping sight distance)

Crest Curves:  
Eq. 3-43  $L = (A * S^2) / 2158$

Sag Curves:  
Eq. 3-44  $L = (2 * S) - (2158 / A)$   
Eq. 3-48  $L = (A * S^2) / (400 + 3.5 * S)$   
Eq. 4-50  $L = (2 * S) - ((400 + 3.5 * S) / A)$

h1 (Height of Eye) (ft)

3.5

h2 (Height of Object) (ft)

2

Total Fill Quantity

945,469 SQ FT  
35,017 CY

Assumed Road width (ft):  
24

(use "goal seek" function to determine design grade)

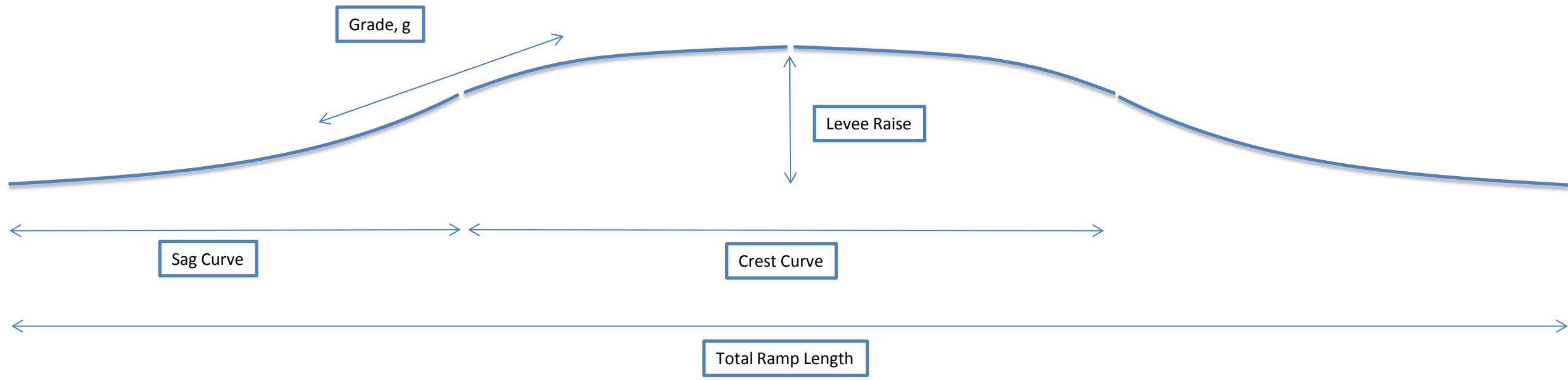
NORTH BURLINGTON ALIGNMENT ROAD CROSSINGS

Approx RM	Road Name	Type	Crossing	Design Speed (mph)	Design Grade	Stopping Distance (S)	g1	g2	A	Sag Curve Length (ft)	K = L/A	g1	g2	A	Crest Curve Length (ft)	K = L/A	Total Ramp Length (LF)	Approx Footprint of Ramp (SF)	Proposed Raise Height (ft)	Grade OK?	Calculated Height per grade (ft)	Total Fill Quantity (SQ FT)
	SR 99	State HWY	Ramp	45	1.7	360	0.0	1.7	-1.7	135	78	1.7	-1.7	3.5	96	28	366	8791	4	OK	4.0	17582
	Railroad	County	Gate			-		0.0	0.0	#VALUE!	#VALUE!	0.0	0.0	0.0	#VALUE!	#VALUE!	#VALUE!	#VALUE!	4	#VALUE!	#VALUE!	
	Park Lane	Driveway	Ramp	25	2.9	155	0.0	2.9	-2.9	73	25	2.9	-2.9	5.7	67	12	140	0	4	OK	4.0	6702
	Private Driveways	Driveway	Ramp	25	2.9	155	0.0	2.9	-2.9	73	25	2.9	-2.9	5.7	67	12	140	0	4	OK	4.0	6702
	Piper Cub Road	County	Ramp	30	3.1	200	0.0	3.1	-3.1	112	36	3.1	-3.1	6.2	50	8	274	0	5	OK	5.0	16457
	Peacock Road	County	Ramp	30	3.1	200	0.0	3.1	-3.1	112	36	3.1	-3.1	6.2	50	8	274	0	5	OK	5.0	16457
	Gardner Road	County	Ramp	30	3.1	200	0.0	3.1	-3.1	112	36	3.1	-3.1	6.2	50	8	274	#VALUE!	5	OK	5.0	16457
	Revilo Road	County	Ramp	30	3.1	200	0.0	3.1	-3.1	112	36	3.1	-3.1	6.2	50	8	274	0	5	OK	5.0	16457
	Aliston Road	County	Ramp	30	3.1	200	0.0	3.1	-3.1	112	36	3.1	-3.1	6.2	50	8	274	474	5	OK	5.0	16457
	SR 20	State HWY	Gate			-		0.0	0.0	#VALUE!	#VALUE!	0.0	0.0	0.0	#VALUE!	#VALUE!	#VALUE!	#VALUE!	14	#VALUE!	#VALUE!	
	Peter Anderson Rd	County	Gate			-		0.0	0.0	#VALUE!	#VALUE!	0.0	0.0	0.0	#VALUE!	#VALUE!	#VALUE!	#VALUE!	15	#VALUE!	#VALUE!	
20.9	Lafayette Rd	County	Ramp	30	2.9	200	0.0	2.9	-2.9	106	36	2.9	-2.9	5.8	31	5	243	697	4	OK	4.0	11671
DIKING DISTRICT 12																						
20.8	Monroe	County	Ramp	30	1.8	200	5.0	1.8	3.2	56	18	1.8	-1.8	3.6	199	55	312	962	5	OK	4.6	17229
20.5	East Rio Vista	County	Ramp	30	1.9	200	5.0	1.9	3.1	44	14	1.9	-1.9	3.8	165	43	254	783	4	OK	4.0	12182
19.48	South Gardner	County	Ramp	30	0.2	200	11.0	0.2	10.8	391	36	0.2	-0.2	0.5	9	19	791	2439	1	Reduce Grade	1.0	9496
18.57	Access Road near South Skagit Rd	County	Ramp	30	2.7	200	7.0	2.7	4.3	143	33	2.7	-2.7	5.5	4	1	289	892	4	Reduce Grade	4.0	13893
18	East Whitmarsh	Railroad	Ramp	30	3.6	200	2.0	3.6	-1.6	60	36	3.6	-3.6	7.3	104	14	224	0	6	OK	6.0	16156
17.55	East Whitmarsh	County	Ramp	30	0.2	200	11.0	0.2	10.8	391	36	0.2	-0.2	0.5	9	19	791	0	1	OK	1.0	9496
17.55	Pacific Railroad	Railroad	Ramp	30	0.4	200	23.0	0.4	22.6	823	36	0.4	-0.4	0.7	13	19	1660	4850	3	Reduce Grade	3.0	59762
17.52	7 Private Access Drives	County	Ramp	30	1.8	200	5.0	1.8	3.2	56	18	1.8	-1.8	3.6	200	56	313	0	5	OK	4.6	17313
17.1	East Whitmarsh Circle Drive	County	Ramp	30	2.9	200	0.0	2.9	-2.9	106	36	2.9	-2.9	5.8	31	5	243	438	4	OK	4.0	11671
17.08	Hwy 99	State HWY	n/a			-	4.0	0.0	4.0	#VALUE!	#VALUE!	0.0	0.0	0.0	#VALUE!	#VALUE!	#VALUE!	#VALUE!	-11	#VALUE!	#VALUE!	
17.04	West Whitmarsh Circle Drive	County	Ramp	30	3.3	200	1.0	3.3	-2.3	83	36	3.3	-3.3	6.5	70	11	235	59	5	Reduce Grade	5.0	14125
17.04	Marketplace Drive	County	Ramp	30	1.5	200	6.0	1.5	4.5	156	35	1.5	-1.5	3.0	56	19	367	999	3	Reduce Grade	3.2	13939
16.8	I-5	Interstate	n/a	65	0.0	645	11.0	0.0	11.0	1722	157	0.0	0.0	0.0	0	193	3444	12571	0	OK	0.0	0
16.65	Bouslog private access	County	Ramp	30	2.1	200	6.0	2.1	3.9	118	30	2.1	-2.1	4.2	114	27	350	87	5	Reduce Grade	4.9	20424
16.5	West Whitmarsh at South End of DD	County	Ramp																			
12				30	4.0	200	4.0	4.0	0.0	0	36	4.0	-4.0	8.0	131	16	132	47	5	OK	5.3	8317
DIKING DISTRICT 17																						
17.55	Railroad	Railroad	n/a			-	0.0	0.0	0.0	#VALUE!	#VALUE!	0.0	0.0	0.0	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0	#VALUE!	#VALUE!	
17.08	Hwy 99	State HWY	n/a			-	0.0	0.0	0.0	#VALUE!	#VALUE!	0.0	0.0	0.0	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0	#VALUE!	#VALUE!	
16.8	I 5	Interstate	Ramp	65	1.1	645	0.0	1.1	-1.1	179	157	1.1	-1.1	2.3	346	151	704	2303	6	OK	6.0	50679
16.6	West Stewart	County	Gate			-	0.0	0.0	0.0	#VALUE!	#VALUE!	0.0	0.0	0.0	#VALUE!	#VALUE!	#VALUE!	#VALUE!	17	#VALUE!	#VALUE!	
13.8	River Bend	County	Gate			-	0.0	0.0	0.0	#VALUE!	#VALUE!	0.0	0.0	0.0	#VALUE!	#VALUE!	#VALUE!	#VALUE!	8	#VALUE!	#VALUE!	
13.1	Freeway Road	County	Ramp	30	3.6	200	2.0	3.6	-1.6	58	36	3.6	-3.6	7.2	100	14	217	455	6	OK	5.7	14830
13.1	Cameron Road	County	Ramp	30	3.6	200	1.0	3.6	-2.6	94	36	3.6	-3.6	7.2	100	14	289	1159	7	OK	7.0	24278
	North End Mt Vernon Floodwall Freeway Road Tie-in	County	Ramp Down after tie-in at Mt Vernon Freeway Road Tie-in																			
13.05				30	3.6	200	2.0	3.6	-1.6	60	36	3.6	-3.6	7.3	104	14	224	0	6	OK	6.0	16156
DIKING DISTRICT 3																						
11.7	River View		Ramp	30	4.0	200	4.0	4.0	0.0	0	36	4.0	-4.0	8.0	131	16	132	0	5	OK	5.3	8317
DIKING DISTRICT 1																						

14	Jackpot	County	Ramp	30	1.2	200	7	1.2	5.8	212	36	1.2	-1.2	2.3	44	19	467	0	3	OK	3.0	16818
13.8	Dunbar	County	Ramp	30	1.3	200	5	1.3	3.7	99	27	1.3	-1.3	2.7	50	19	248	0	2	Reduce Grade	2.0	5960
3 Private Access Drives between Dunbar & Moore's																						
17.75	Garden	County	Ramp	30	1.3	200	5	1.3	3.7	99	27	1.3	-1.3	2.7	50	19	248	894	2	OK	2.0	5960
13.7	Moore's Garden Rd	County	Ramp	30	2.1	200	5	2.1	2.9	24	8	2.1	-2.1	4.1	120	29	169	608	3	Reduce Grade	3.0	6077
3 private residence access drives between Moore's Garden Rd and																						
13.4	North Barker	County	Ramp	30	0.6	200	19	0.6	18.4	670	36	0.6	-0.6	1.2	21	19	1361	4968	4	Reduce Grade	4.0	65338
13.1	North Barker Rd	County	Ramp	30	6.0	200	6	6.0	0.0	#DIV/0!	#DIV/0!	6.0	-6.0	12.0	222	19	#DIV/0!	#DIV/0!	4	#DIV/0!	#DIV/0!	
Private Access																						
13.1	Drives	County	Ramp	30	0.4	200	19	0.4	18.6	675	36	0.4	-0.4	0.9	16	19	1366	5479	3	OK	3.0	49191
13.1	North Baker Rd	County	Ramp	30	0.6	200	18	0.6	17.4	632	36	0.6	-0.6	1.2	23	19	1287	0	4	OK	4.0	61792
12.95	West Division SR 536	SR	Gate			-	15	0.0	15.0	#VALUE!	#VALUE!	0.0	0.0	0.0	#VALUE!	#VALUE!	#VALUE!	#VALUE!	8	#VALUE!	#VALUE!	
3 private access drives between SR																						
12.92	536 & South Baker	County	Ramp	30	0.8	200	17	0.8	16.2	589	36	0.8	-0.8	1.6	30	19	1208	1621	5	Reduce Grade	5.0	72453
12.8	South Baker	County	Ramp	30	0.8	200	17	0.8	16.2	589	36	0.8	-0.8	1.6	30	19	1208	1621	5	Reduce Grade	5.0	72453
Private Access																						
Drive on Behren's Millett road by																						
12.5	Edgewater Park	County	Ramp	30	0.6	200	17	0.6	16.4	595	36	0.6	-0.6	1.3	24	19	1213	2515	4	Reduce Grade	4.0	58239
Private Access																						
Drive on Behren's Millett road South																						
12.4	of Edgewater Park	County	Ramp	30	0.9	200	16	0.9	15.1	551	36	0.9	-0.9	1.7	32	19	1133	656	5	OK	5.0	67982

945,469 SQ FT
35,017 CY

TYPICAL RAMP PROFILE



TYPICAL RAMP PLAN



DIKE DISTRICT: NORTH BURLINGTON ALIGNMENT ROAD CROSSINGS

ROAD NAME	APPROX. RIVER MILE	EXISTING GROUND SURFACE EL (FT) At Location of Levee Raise	EXISTING GROUND SURFACE EL (FT) At Adjacent Road to Levee Raise	Existing Ground Surface El data Source	Geotechs nomenclature for location	ESTIMATED LEEVE RAISE (FT) per Geotech	ESTIMATED LEEVE RAISE Per H&H (FT)	ESTIMATED ROAD RAISING PROPOSED TOP OF LEEVE -AJACENT GROUND (FT)	DESIGN EL (FT)	DESIGN EL (FT) SOURCE	DESIGN EL (FT) Per H&H assuming 2 FT freeboard	TYPE ROAD	TYPE CROSSING
SR 99	N/A			Google earth	BN-3	4	4		not provided			State HWY	Ramp
Railroad	N/A			Google earth	BN-3	4	4		not provided			County	Gate
Park Lane	N/A			Google earth	BN-3	4	4		not provided			County	Ramp
Private Driveways	N/A			Google earth	BN-3	4	4		not provided			County	Ramp
Piper Cub Road	N/A	38	38	GIS LiDAR	BN-2	5	5	7	45	H&H	45	County	Ramp
Peacock Road	N/A	39.6	39.6	GIS LiDAR	BN-2	5	5	5.4	45	H&H	45	County	Ramp
Gardner Road	N/A	43	43	GIS LiDAR	BN-2	5	5	4	47	H&H	47	County	Ramp
Revalo Road	N/A	43	43	GIS LiDAR	BN-2	5	5	4.5	48	H&H	48	County	Ramp
Aliston Road	N/A	45	45	GIS LiDAR	BN-2	5	5	3	48	H&H	48	County	Ramp
SR 20	N/A	38.3	38.3	GIS LiDAR	BN-2	5	14	13.7	52	H&H	52	State HWY	Gate
Peter Anderson Rd	N/A	38.5	38.5	GIS LiDAR	BN-1	15	15	13.5	52	H&H	52	County	Gate
Lafayette Rd	20.9	48	46	GIS LiDAR	12-1	4	4	6	52	H&H	52	County	Ramp
Railroad	20.9	39.7	35	GIS LiDAR	12-1	4	4	17	52	H&H	52	County	Gate

DIKE DISTRICT: 12 Right Bank ROAD CROSSINGS

Dike Dist 12

ROAD NAME	APPROX. RIVER MILE	EXISTING GROUND SURFACE EL (FT) At Location of Levee Raise	EXISTING GROUND SURFACE EL (FT) At Adjacent Road to Levee Raise	Existing Ground Surface El data Source	Geotechs nomenclature for location	ESTIMATED LEEVE RAISE (FT) per Geotech	ESTIMATED LEEVE RAISE (FT)= H&H EL - GS EL from GIS	ESTIMATED ROAD RAISING PROPOSED TOP OF LEEVE -AJACENT GROUND (FT)	DESIGN EL (FT)	DESIGN EL (FT) SOURCE	DESIGN EL (FT) Per H&H assuming 2 FT freeboard	TYPE ROAD	TYPE CROSSING
Monroe	20.8	46.6	36.6	GIS LiDAR		4	5	15	50.6		51.6	County	Ramp
East Rio Vista	20.5	47	37.5	GIS LiDAR		4	4	13.5	51		51	County	Ramp
South Gardner	19.48	50	28.6	GIS LiDAR	12-2	4	0.8	22.2	54		50.8	County	Ramp
Access Road near South Skagit Rd	18.57	47	34	GIS LiDAR	12-3	4.5	3.5	16.5	51.5		50.5	County	Ramp
East Whitmarsh	18	44	41	GIS LiDAR		4.5	6.1	9.1	50.1		50.1	Railroad	Ramp
East Whitmarsh	17.55	48	27	GIS LiDAR		6	1.3	22.3	49.3		49.3	County	Ramp
Pacific Railroad	17.55	46.5		GIS LiDAR	12-BNSF	6	2.8	2.8	52.5		49.3	Railroad	Gate
7 Private Access Drives	17.52	44	35	GIS LiDAR			5.3	14.3			49.3	County	Ramp
East Whitmarsh Circle Drive	17.1	43.8	43	GIS LiDAR			4.4	5.2			48.2	County	Ramp
Hwy 99	17.08	59.2	52	GIS LiDAR		3	-11	-3.8			48.2	State HWY	n/a
West Whitmarsh Circle Drive	17.04	43	42	GIS LiDAR			4.92	5.92			47.92	County	Ramp
Marketplace Drive	17.04	44.9	33.8	GIS LiDAR			3.02	14.12			47.92	County	Ramp
I-5	16.8	53.4	32	GIS LiDAR		3	-5.9	15.5			47.5	Interstate	n/a
Bouslog	16.65	42.3	30.7	GIS LiDAR			4.56	16.16			46.86	County	Ramp
private access West Whitmarsh at South End of DD 12	16.5	41.4	33	GIS LiDAR			5.46	13.86			46.86	County	Ramp

DIKE DISTRICT: 17 Left Bank ROAD CROSSINGS

Dike Dist 17

ROAD NAME	APPROX. RIVER MILE	EXISTING GROUND SURFACE EL (FT) At Location of Levee Raise	EXISTING GROUND SURFACE EL (FT) At Adjacent Road to Levee Raise	Existing Ground Surface El data Source	Geotechs nomenclature for location	ESTIMATED LEVEE RAISE (FT) per Geotech	ESTIMATED LEVEE RAISE (FT) per H&H & GIS	DESIGN EL (FT)	DESIGN EL (FT) SOURCE	DESIGN EL (FT) Per H&H assuming 2 FT freeboard	TYPE ROAD	TYPE CROSSING
Railroad	17.55	51.3		GIS			0			49.3	Railroad	n/a
2 Access Roads near 17.4	17.4	47.5	35.8									
Hwy 99	17.08	52.9		GIS			0			48.2	State HWY	n/a
I 5	16.8	50.7		GIS			0			47.5	Interstate	n/a
Access Road near 16.6	16.6	44.7		GIS			2.16			46.86	County	Ramp

Walmart Levee ROAD CROSSINGS

Walmart Levee

ROAD NAME	APPROX. RIVER MILE	EXISTING GROUND SURFACE EL (FT) At Location of Levee Raise	EXISTING GROUND SURFACE EL (FT) At Adjacent Road to Levee Raise	Existing Ground Surface El data Source	Geotechs nomenclature for location	ESTIMATED LEVEE RAISE (FT) per Geotech	ESTIMATED LEVEE RAISE (FT) per H&H & GIS	DESIGN EL (FT)	DESIGN EL (FT) SOURCE	DESIGN EL (FT) Per H&H assuming 2 FT freeboard	TYPE ROAD	TYPE CROSSING
River Bend/West Stewart	16.6	30.4	30.4	GIS			16.46			46.86	county	Ramp
River Bend	13.4	36.73	27.9	GIS			3.75			40.48	County	Ramp

DD 17 22, 23 ROAD CROSSINGS

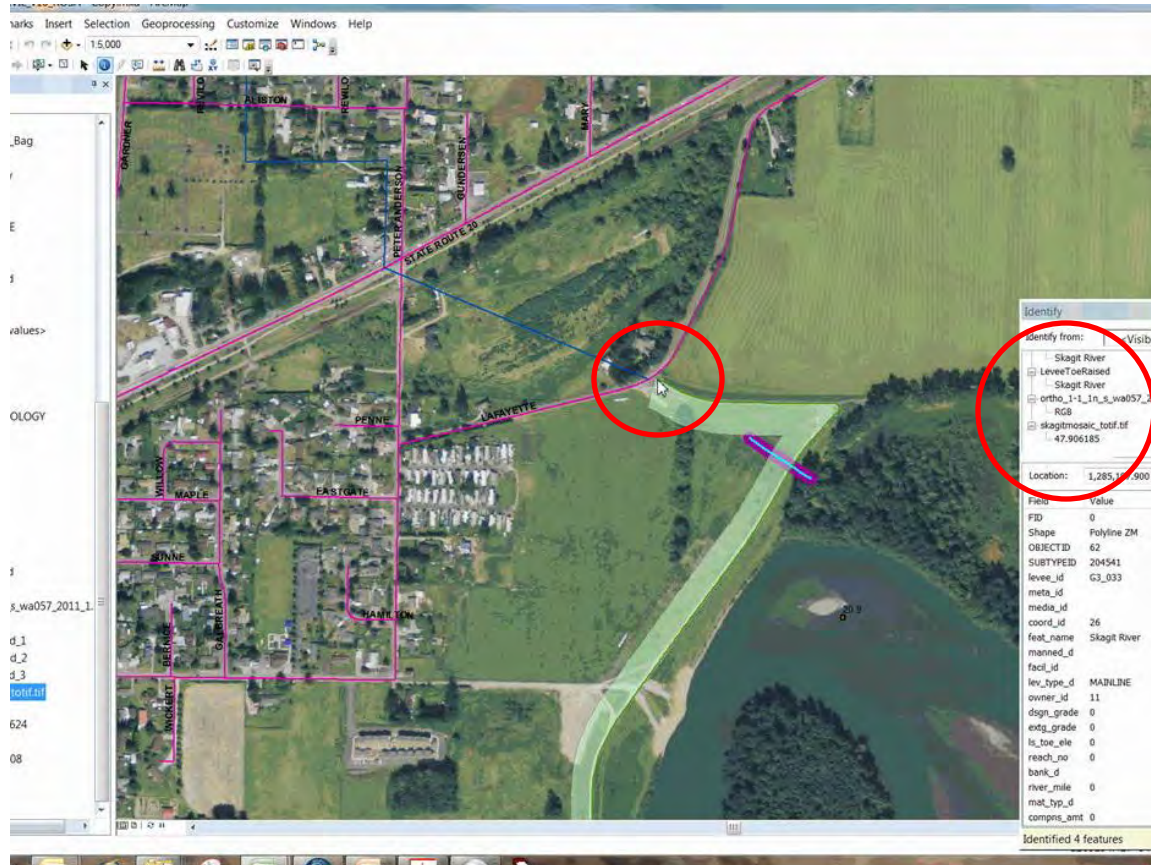
DD 17, 22& 23

ROAD NAME	APPROX. RIVER MILE	EXISTING GROUND SURFACE EL (FT) At Location of Levee Raise	EXISTING GROUND SURFACE EL (FT) At Adjacent Road to Levee Raise	Existing Ground Surface El data Source	Geotechs nomenclature for location	ESTIMATED LEVEE RAISE (FT) per Geotech	ESTIMATED LEVEE RAISE (FT) per H&H & GIS	DESIGN EL (FT)	DESIGN EL (FT) SOURCE	DESIGN EL (FT) Per H&H assuming 2 FT freeboard	TYPE ROAD	TYPE CROSSING
Freeway Drive	13.1	35.8	31.9	GIS			4.68			40.48	County	Ramp Elevating Freeway Road
Freeway Drive at Cameron Road	13.1	34.9	33.9	GIS			5.58			40.48	County	Assume 1,00 feet of floodwall from Mt Vernon to approx 300 feet north of

	North End Mt Vernon Floodwall Freeway Road Tie-in	13.02	33.5	30.5	GIS			6.9			40.4	County	Ramp Down after tie-in at Mt Vernon Floodwall.	
DIKE DISTRICT: 3 Left Bank ROAD CROSSINGS														
Dike Dist 3	ROAD NAME	APPROX. RIVER MILE	EXISTING GROUND SURFACE EL (FT) At Location of Levee Raise	EXISTING GROUND SURFACE EL (FT) At Adjacent Road to Levee Raise	Existing Ground Surface El data Source	Geotechs nomenclature for location	ESTIMATED LEEVE RAISE (FT) per Geotech	ESTIMATED LEEVE RAISE (FT) per H&H & GIS		DESIGN EL (FT)	DESIGN EL (FT) SOURCE	DESIGN EL (FT) Per H&H assuming 2 FT freeboard	TYPE ROAD	TYPE CROSSING
	River View	11.7	31	22.9	GIS		5.36					36.36	Ramp	
DIKE DISTRICT: 1 Right Bank ROAD CROSSINGS														
Dike Dist 1	ROAD NAME	APPROX. RIVER MILE	EXISTING GROUND SURFACE EL (FT) At Location of Levee Raise	EXISTING GROUND SURFACE EL (FT) At Adjacent Road to Levee Raise	Existing Ground Surface El data Source	Geotechs nomenclature for location	ESTIMATED LEEVE RAISE (FT) per Geotech	ESTIMATED LEEVE RAISE (FT) per H&H & GIS		DESIGN EL (FT)	DESIGN EL (FT) SOURCE	DESIGN EL (FT) Per H&H assuming 2 FT freeboard	TYPE ROAD	TYPE CROSSING
	Jackpot	14	39.2	24.6	GIS			2.81				42.01	County	Ramp
	Dunbar	13.8	38.6	27.9	GIS			2.33				40.93	County	Ramp
	3 Private Access Drives between Dunbar & Moore's Garden	13.75	38.5	27.7	GIS			2.43				40.93	County	Ramp
	Moore's Garden Rd	13.7	38.5	28.7	GIS			2.43				40.93	County	Ramp
	3 private residence access drives between Moore's Garden Rd and North Barker	13.6	37		GIS			3.93				40.93	County	Ramp
	North Barker Rd	13.1	36.9	24.4	GIS			3.5				40.4	County	Ramp
	Private Access Drives	13.1	37		GIS			3.48				40.48	County	Ramp
	West Division SR 536 at N & S Ball Alignment	12.93	30.85	26	GIS			8.09				38.94	SR	Gate
	3 private access drives between SR 536 & South Baker	12.92	34	27	GIS			4.94				38.94	County	Ramp
	S Baker at Behrens Millett	12.8	33.5	24.7	GIS			5.05				38.55	County	Ramp
	2 Private Access Drives on Behren's Millett road by Edgewater Park	12.4	32.6	28.4	GIS			5.13				37.73	County	Ramp

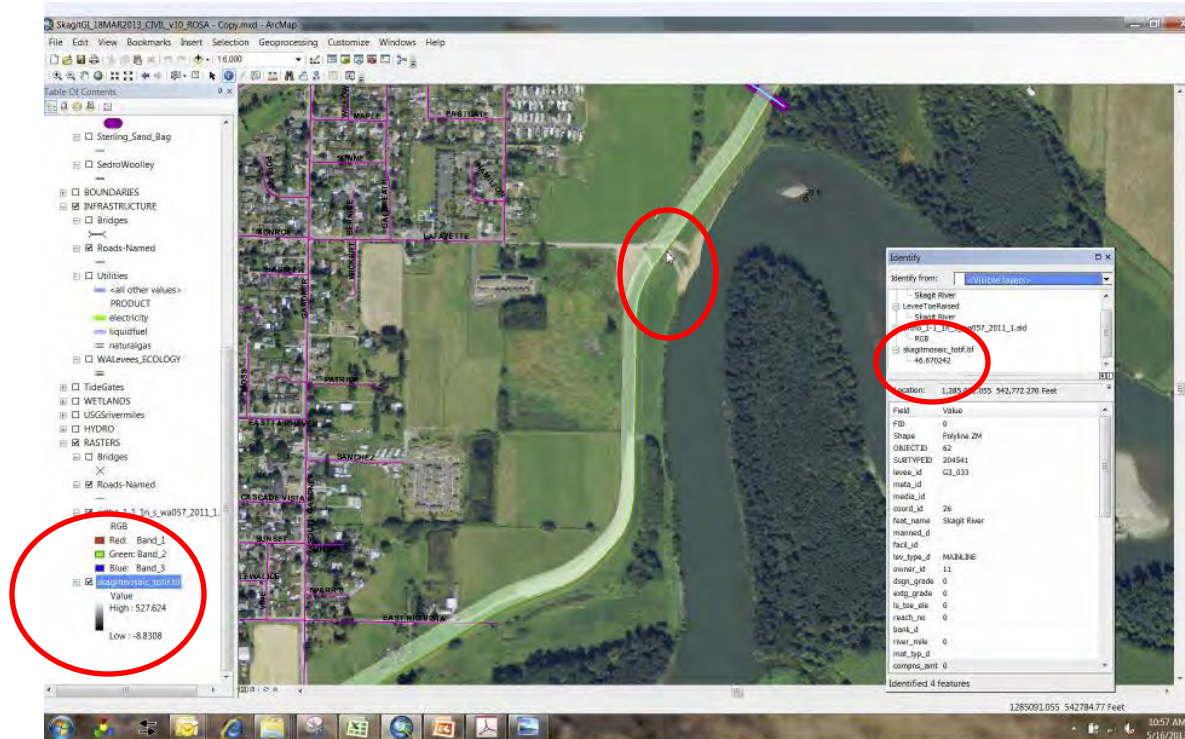
COME BACK after the work stoppage to RE-EVAL POINT ELEVATIONS WITH TRAVIS's SURVEY DATA  
Not updating with Travis Survey data due to lack of funding. Accept that this is rough first cut





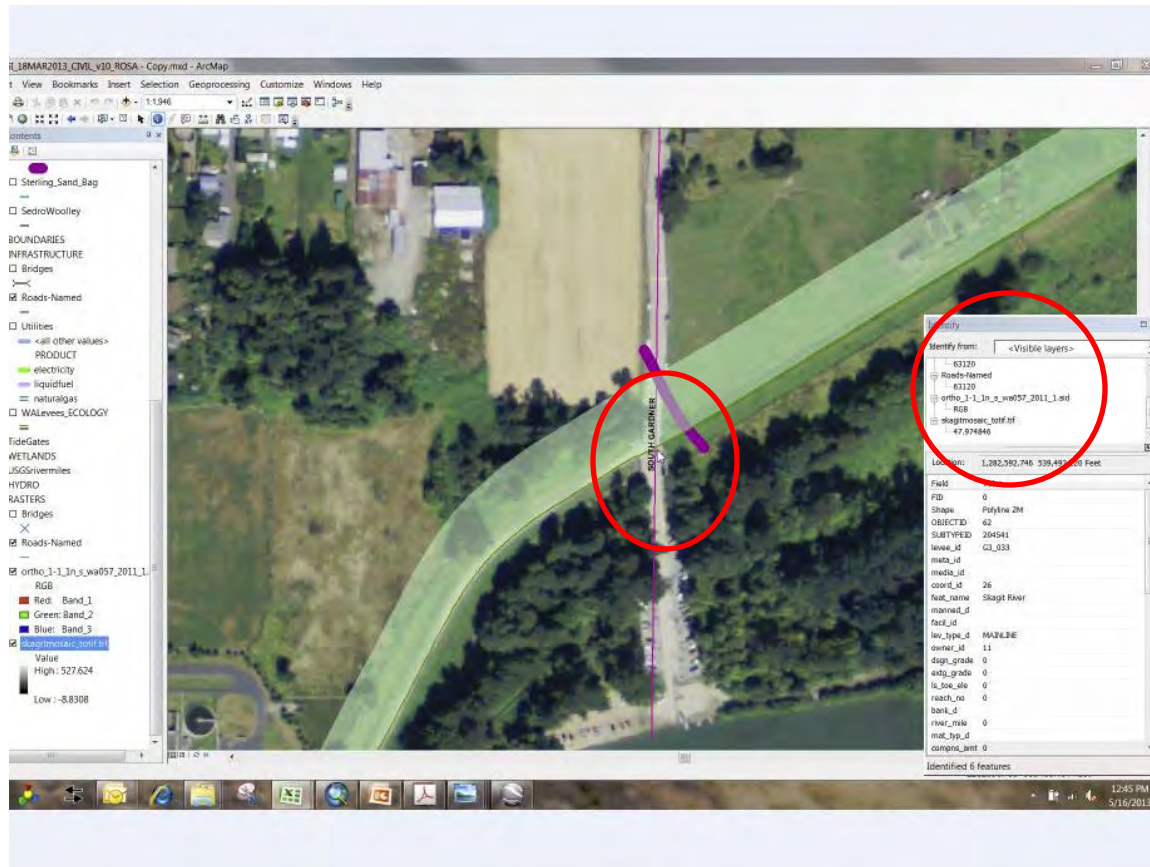
## DD-12 Existing Grade (Ft ) at Lafayette Rd RM 20.9

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## DD-12 Existing Grade (Ft ) at Monroe Rd RM 20.8

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



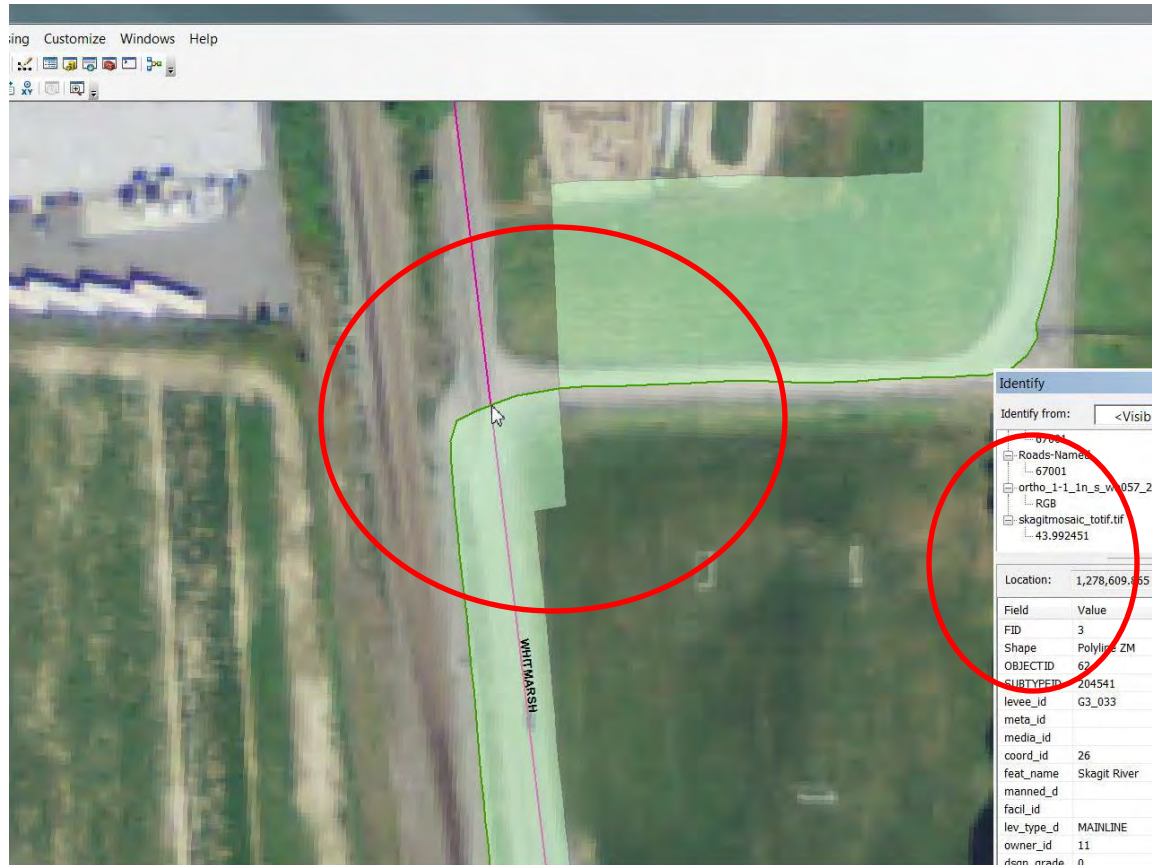
## DD-12 Existing Grade (Ft ) at S Gardner

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



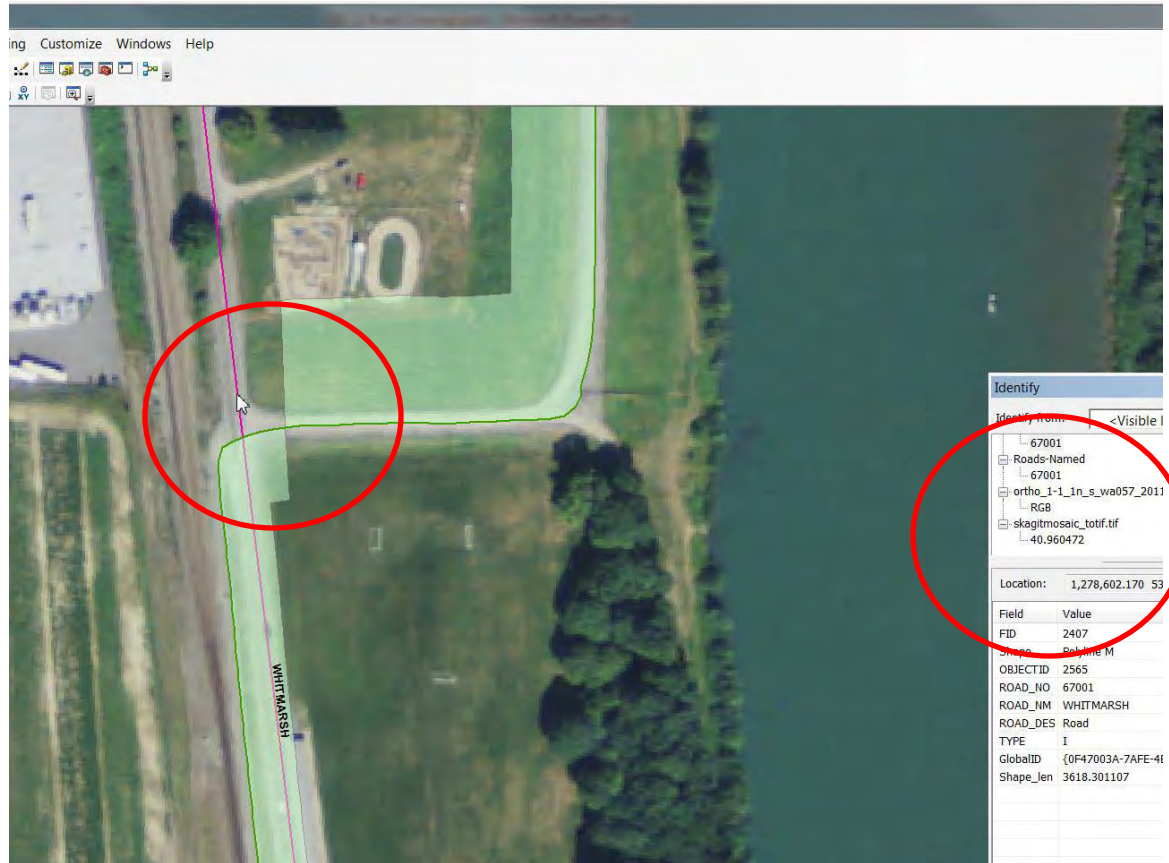
## DD-12 Existing Grade (Ft ) at East Rio Vista RM 20.5

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



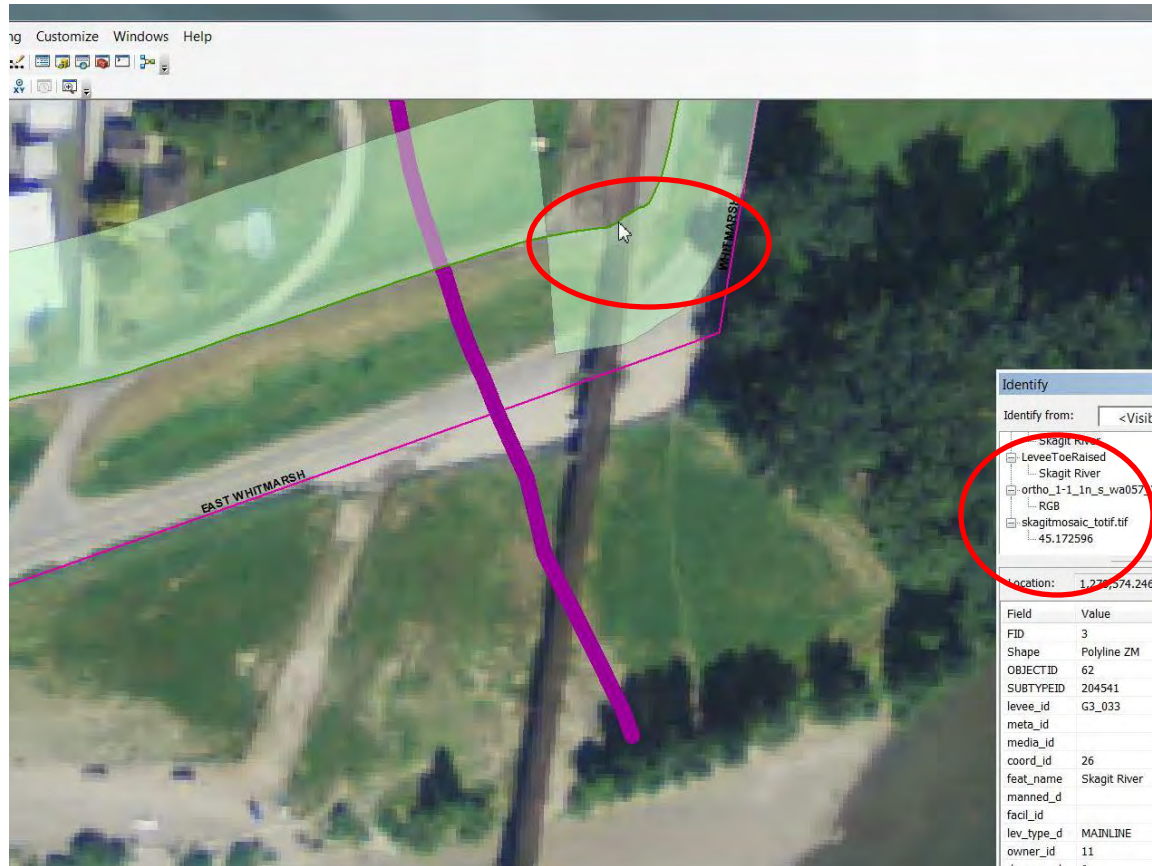
## DD-12 Existing Grade (Ft ) at East Whitmarsh RM 18

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



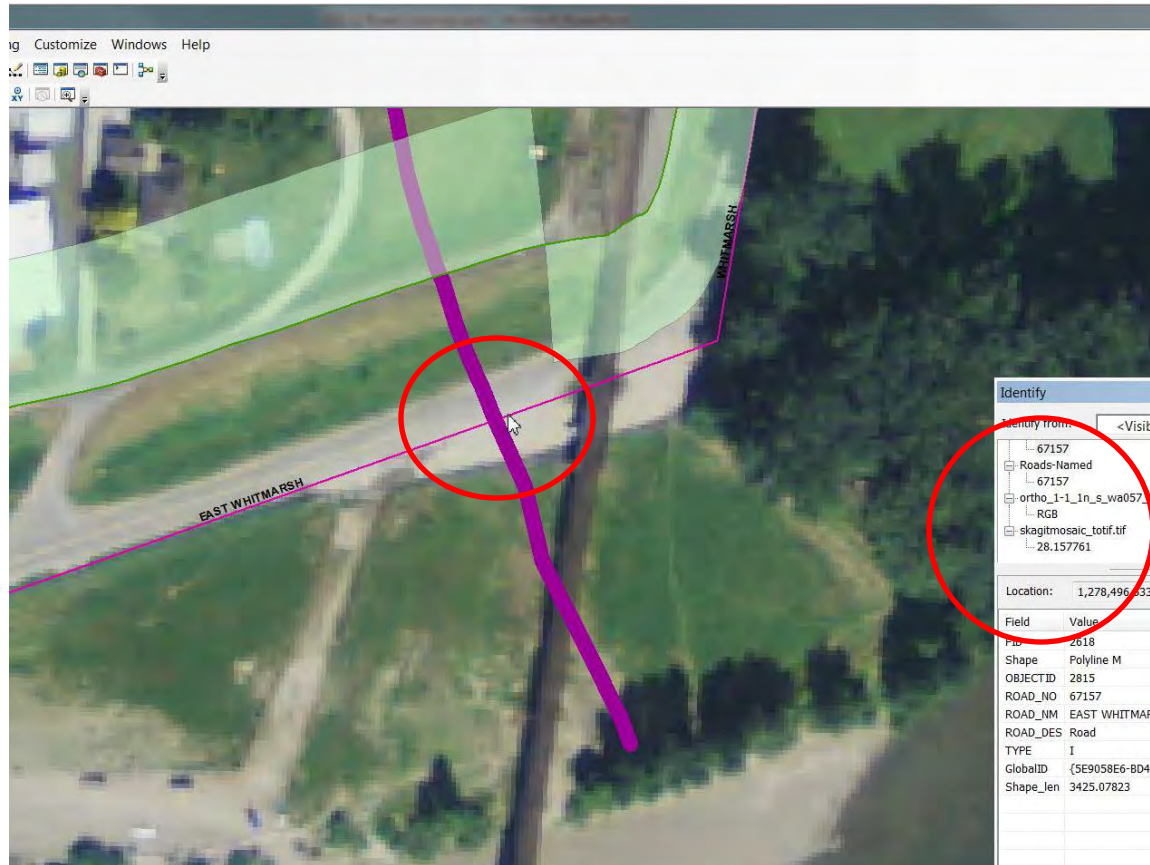
## DD-12 Existing Grade (Ft ) at East Whitmarsh RM 18

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## DD-12 Existing Grade (Ft ) at East Whitmarsh RM 17.55

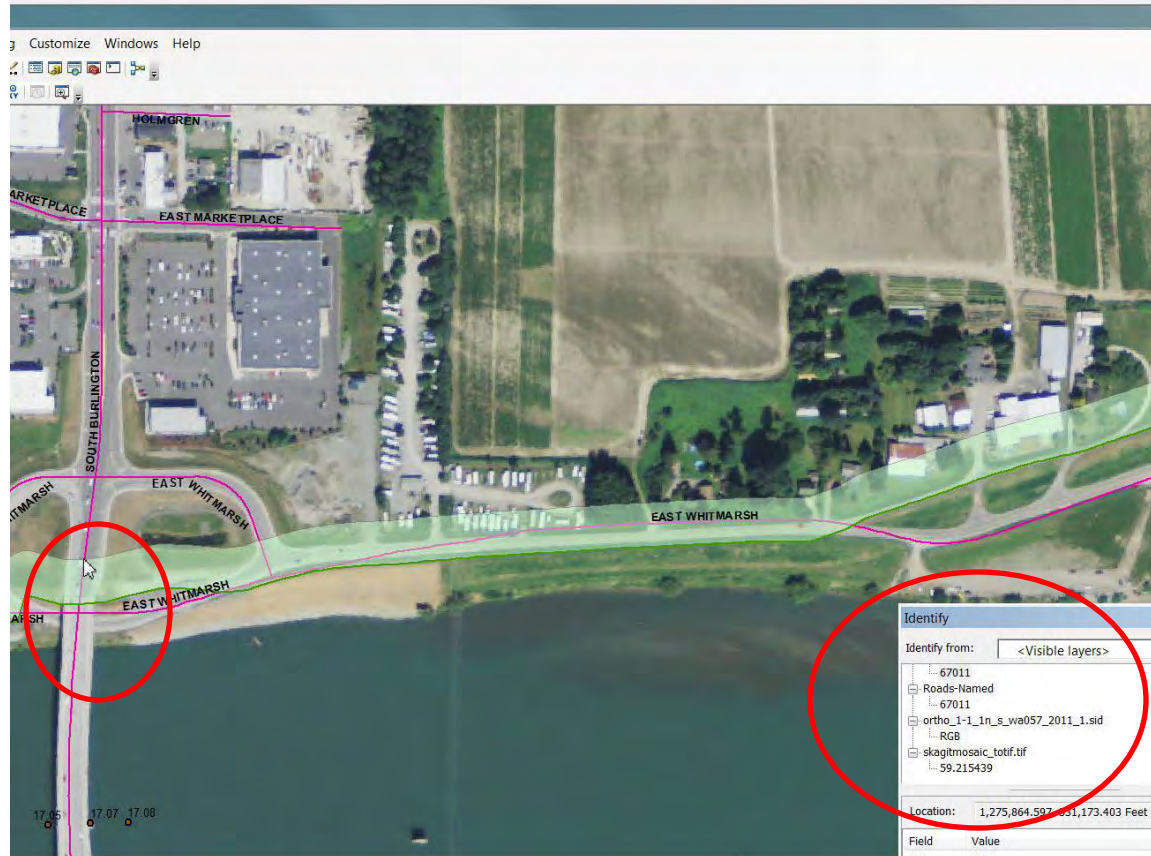
Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## DD-12 Existing Grade (Ft ) at East Whitmarsh RM 17.55

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88





## DD-12 Existing Grade (Ft ) at HWY 99 RM 17.07

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## DD-12 Existing Grade (Ft ) at Boulog RM 16.7

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



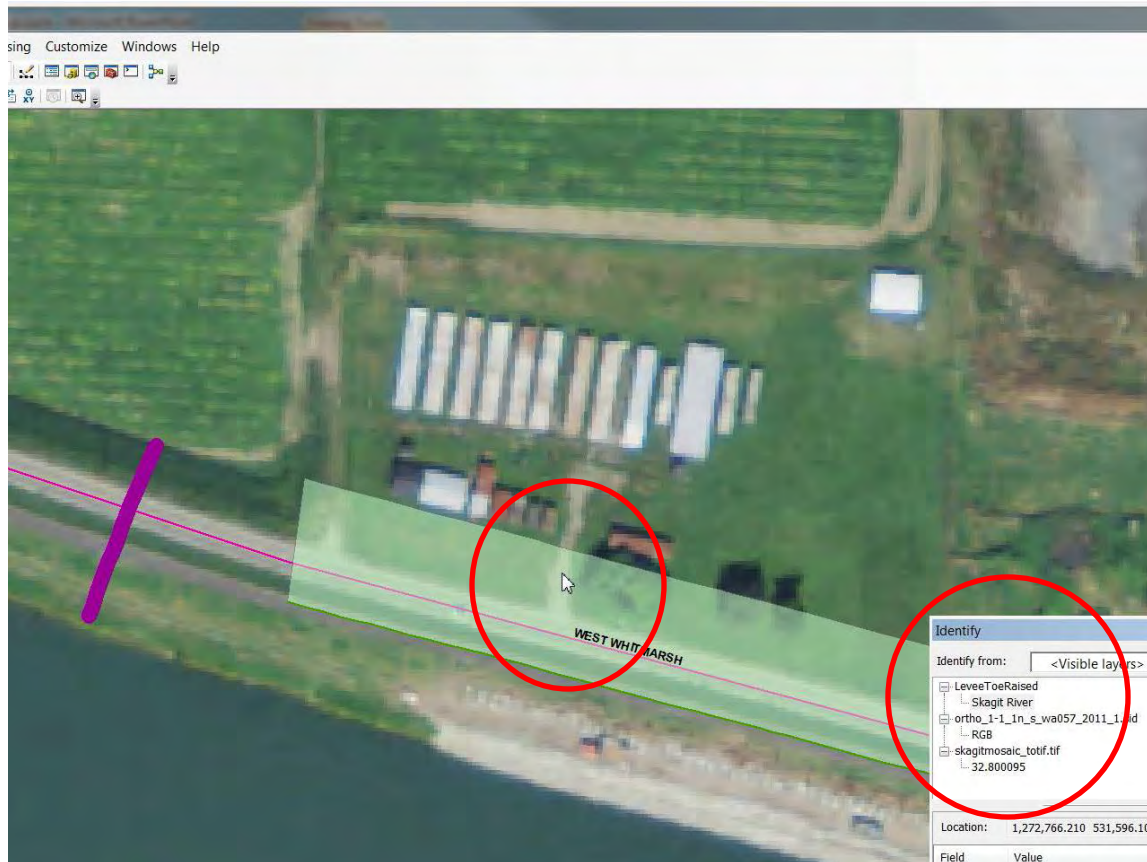
## DD-12 Existing Grade (Ft ) at Boulog RM 16.7

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



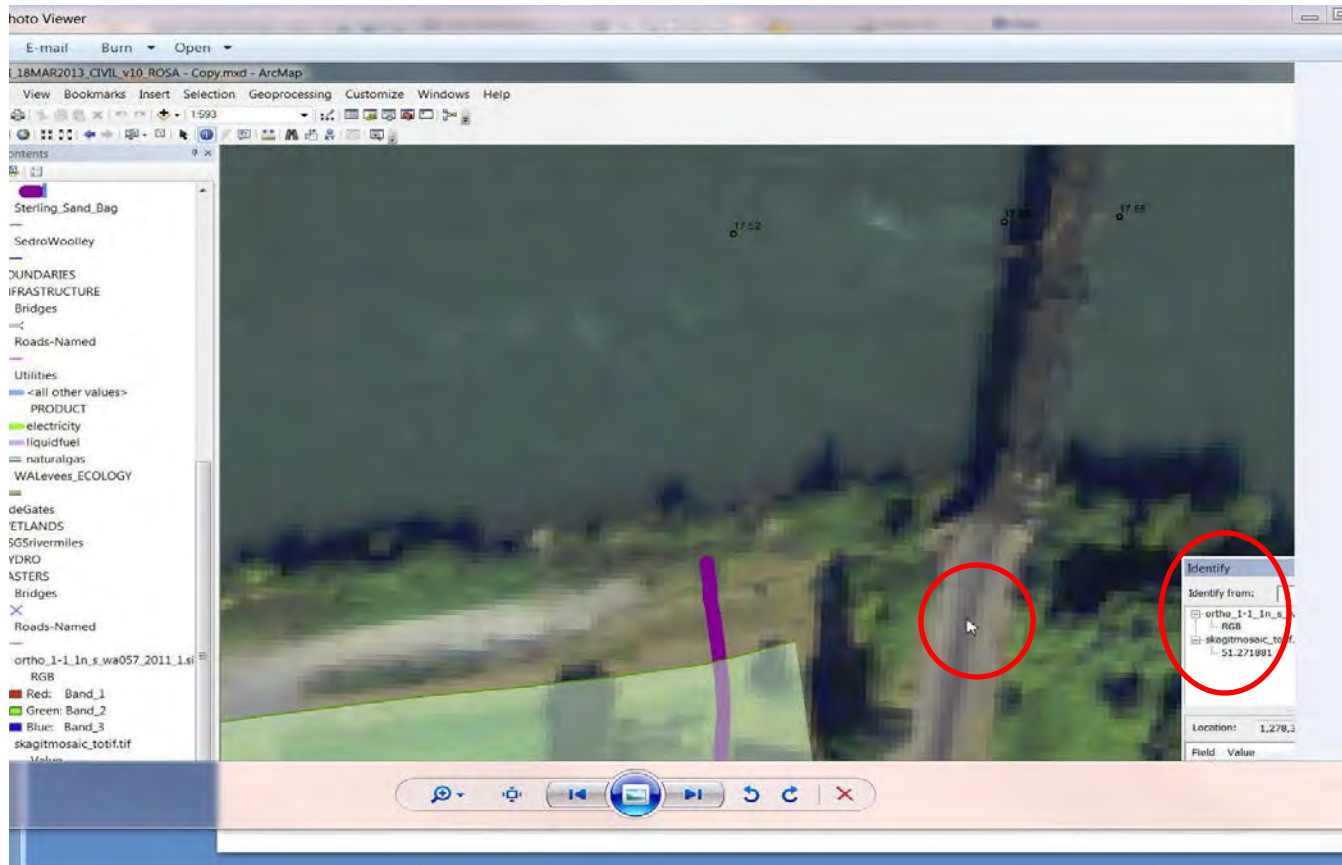
## DD-12 Existing Grade (Ft ) at West Whitmarsh RM 16.5

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



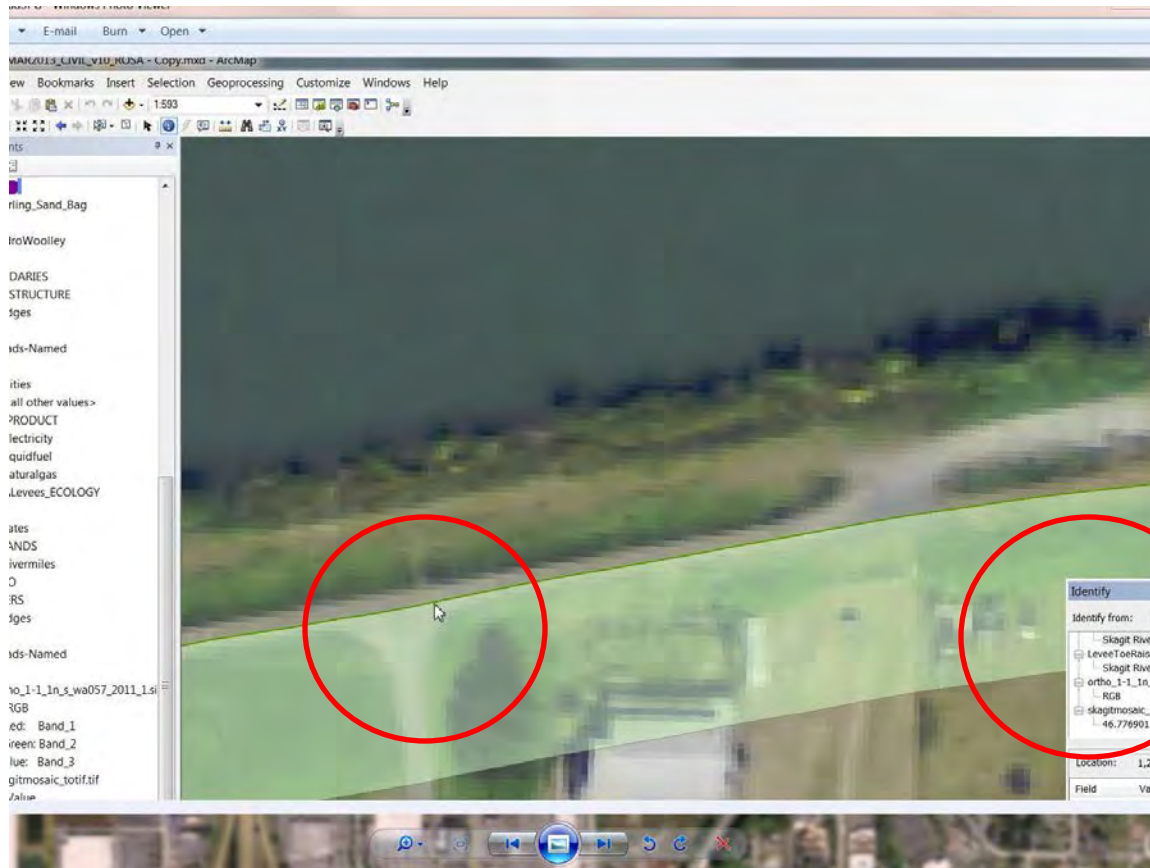
## DD-12 Existing Grade (Ft ) at West Whitmarsh RM 16.5

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



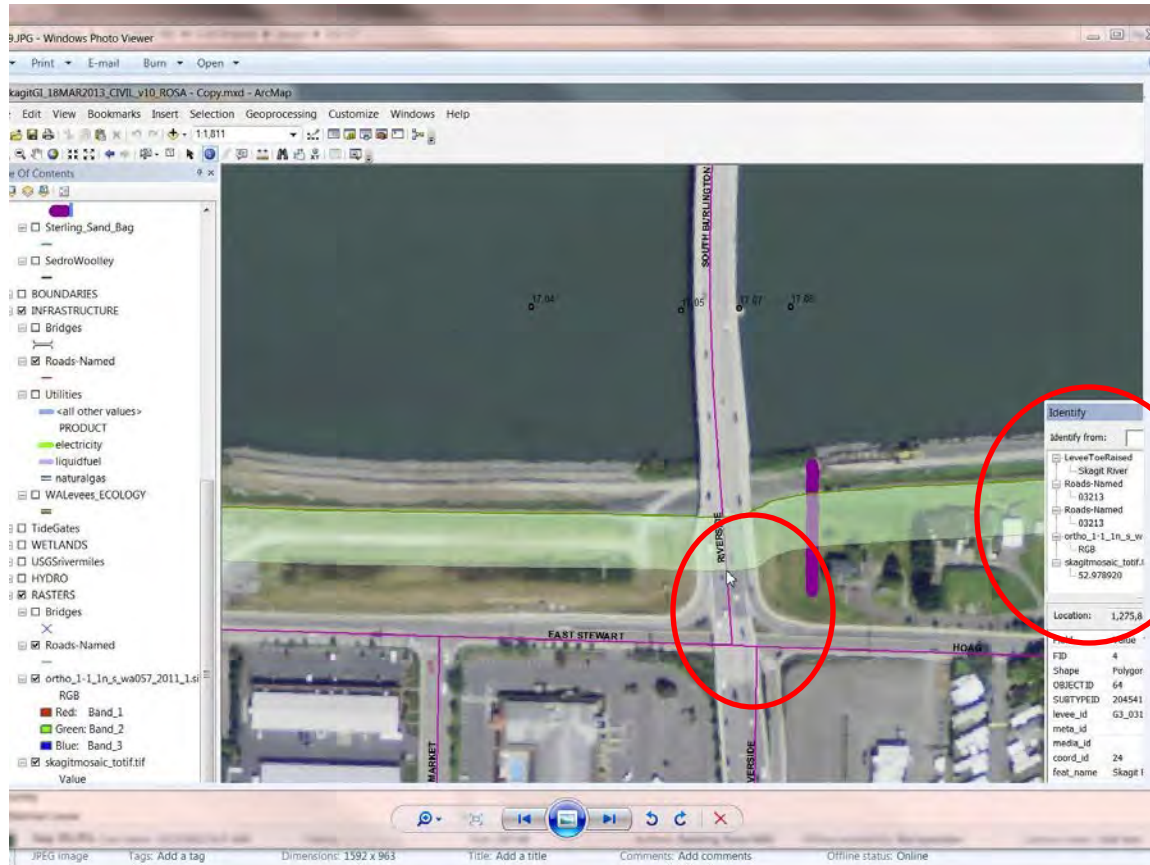
## DD-17 Existing Grade (Ft ) at railroad RM 17.55

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## DD-17 Existing Grade (Ft ) at gravel access road RM 17.4

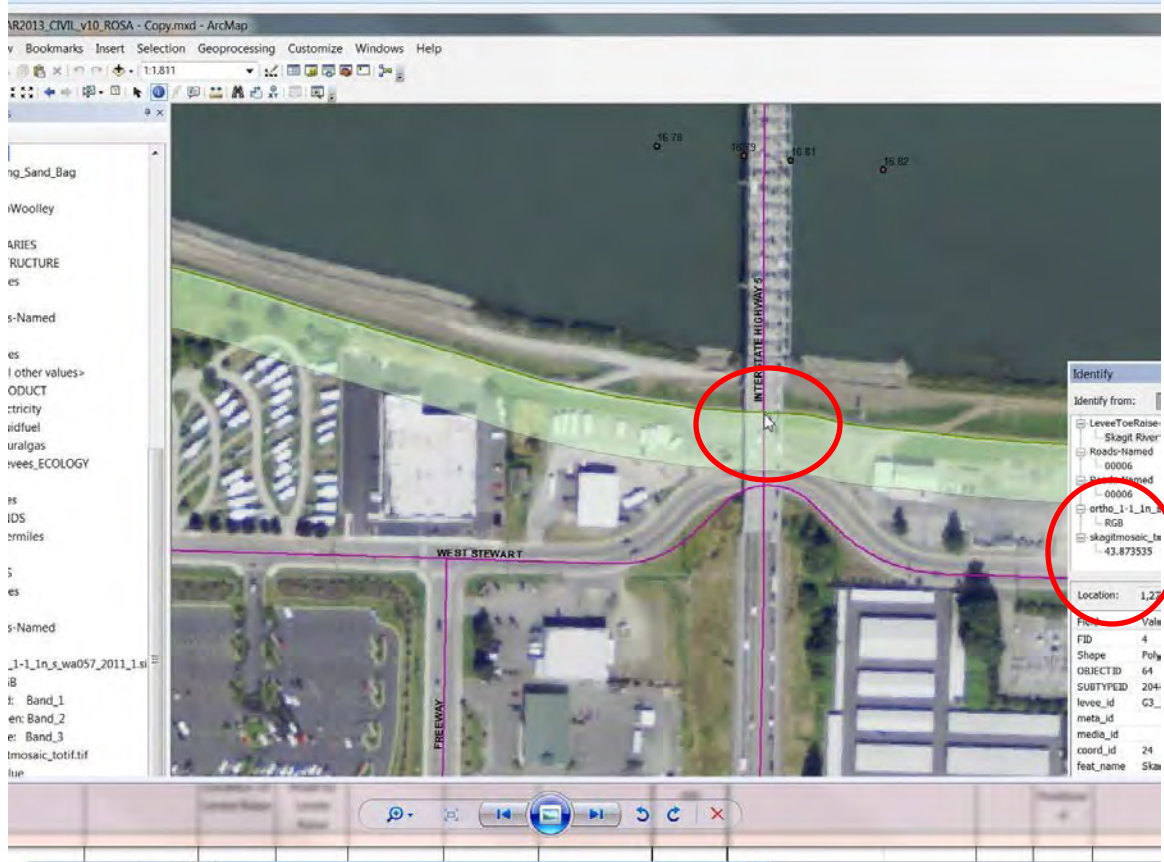
Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## DD-17 Existing Grade (Ft ) at Hwy 99 RM 17.07

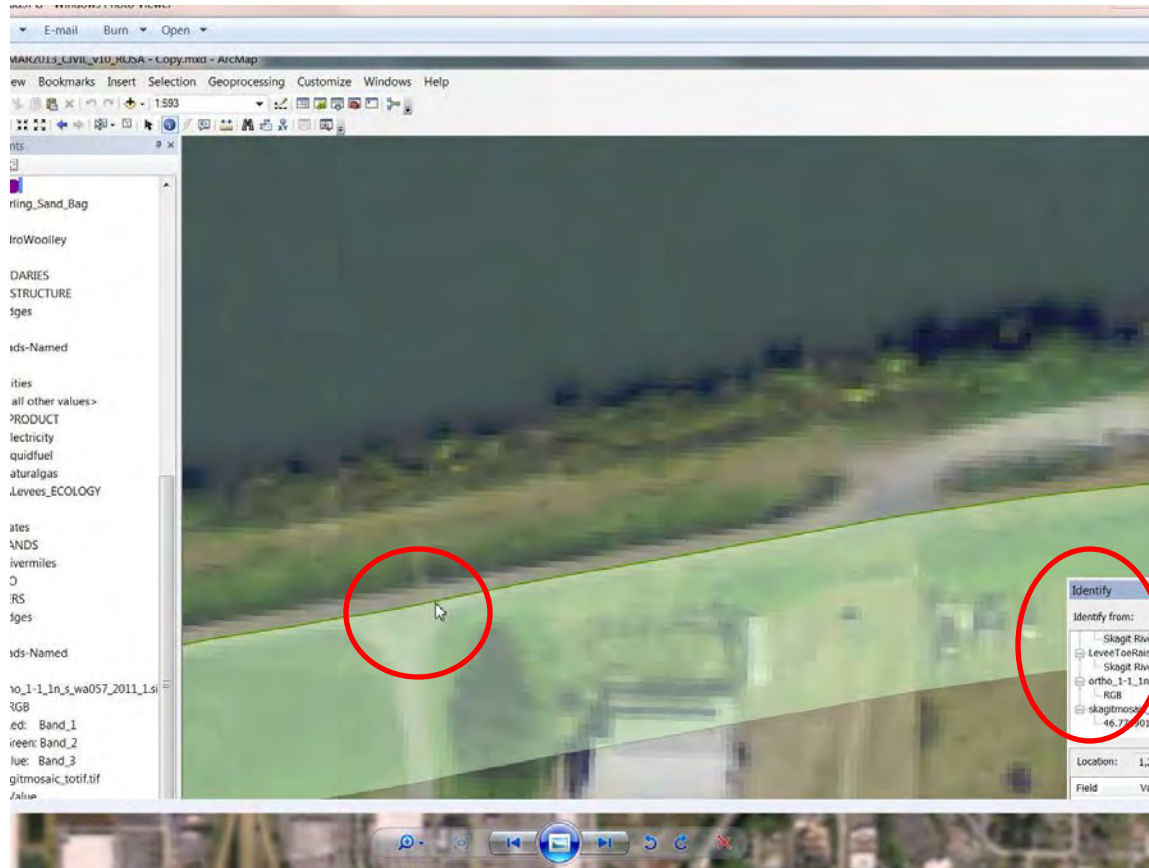
Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88





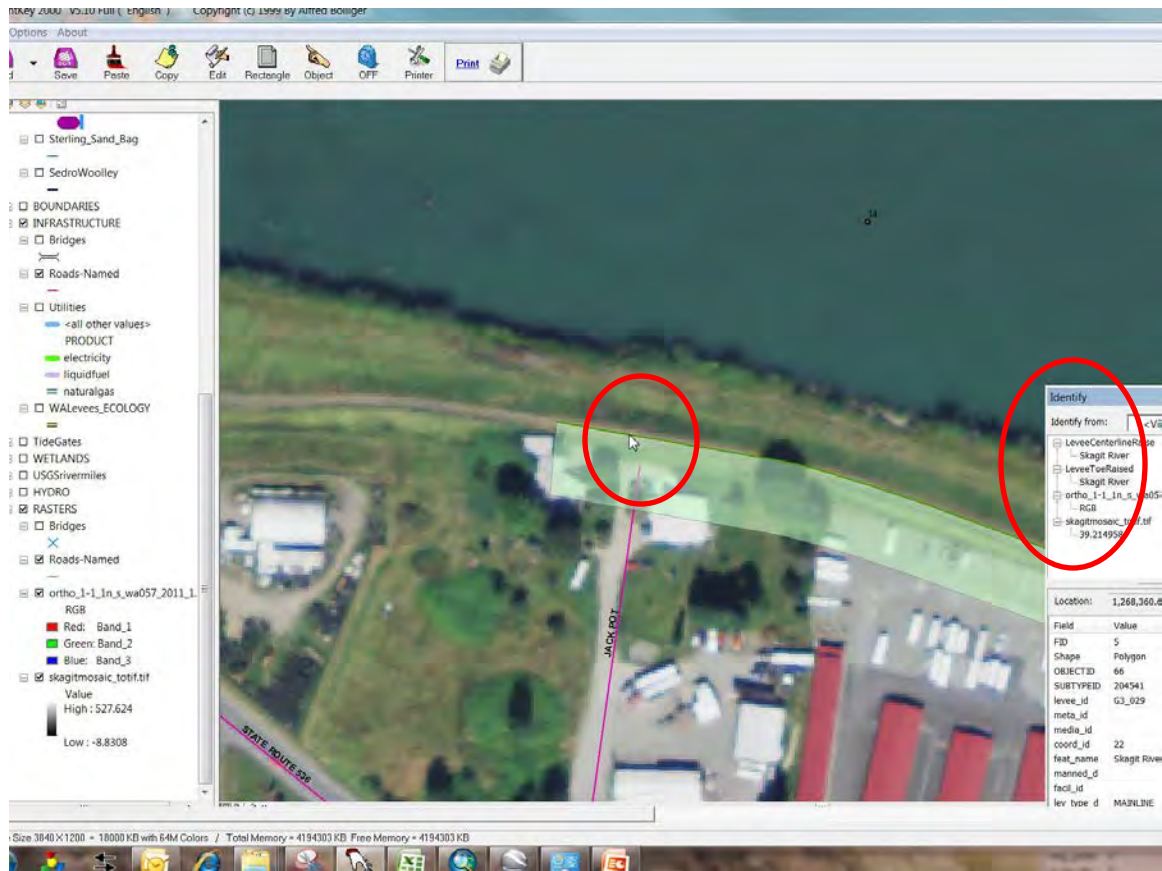
## DD-17 Existing Grade (Ft ) I-5 RM 16.81

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



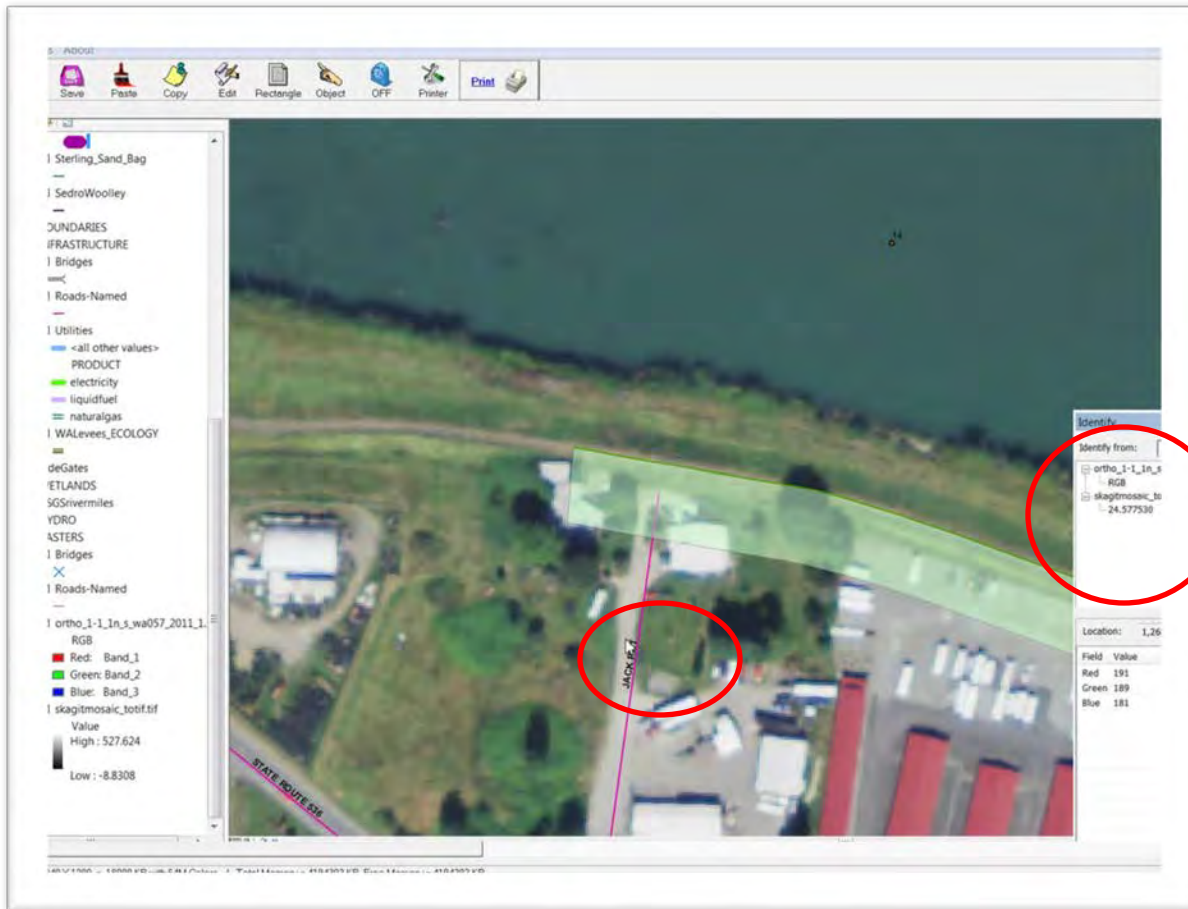
## DD-17 Existing Grade (Ft ) at access road 16.6RM

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



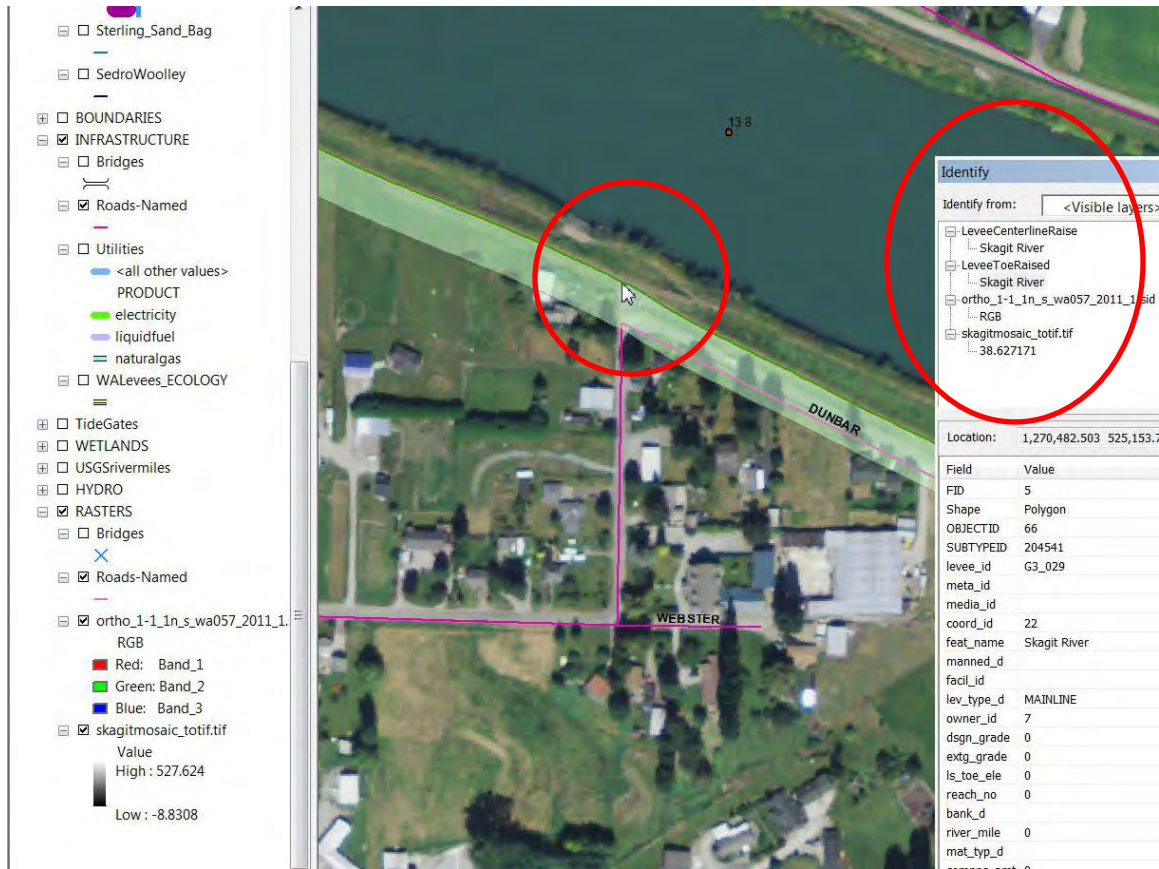
## DD-1 Existing Grade (Ft ) at Jackpot Rd RM 14.0

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



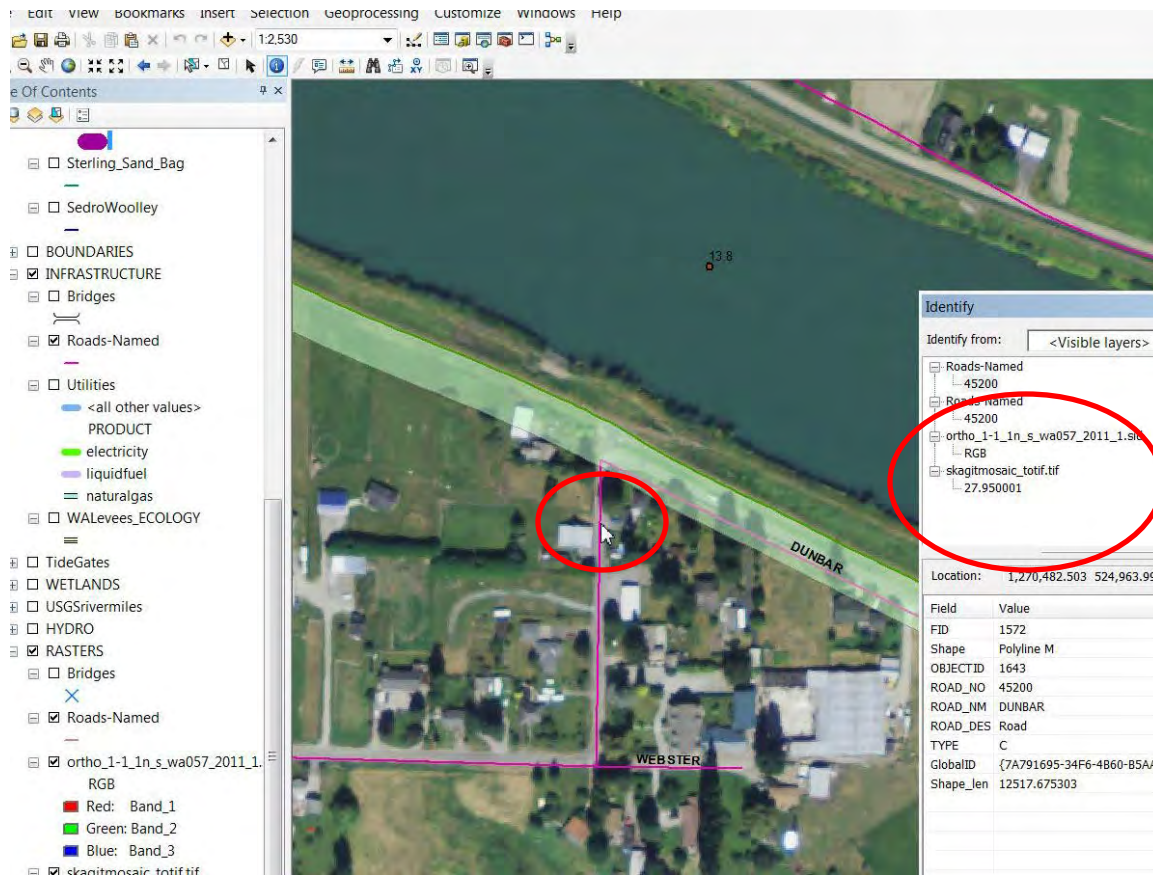
## DD-1 Existing Grade (Ft ) at Jackpot Rd RM 14.0

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



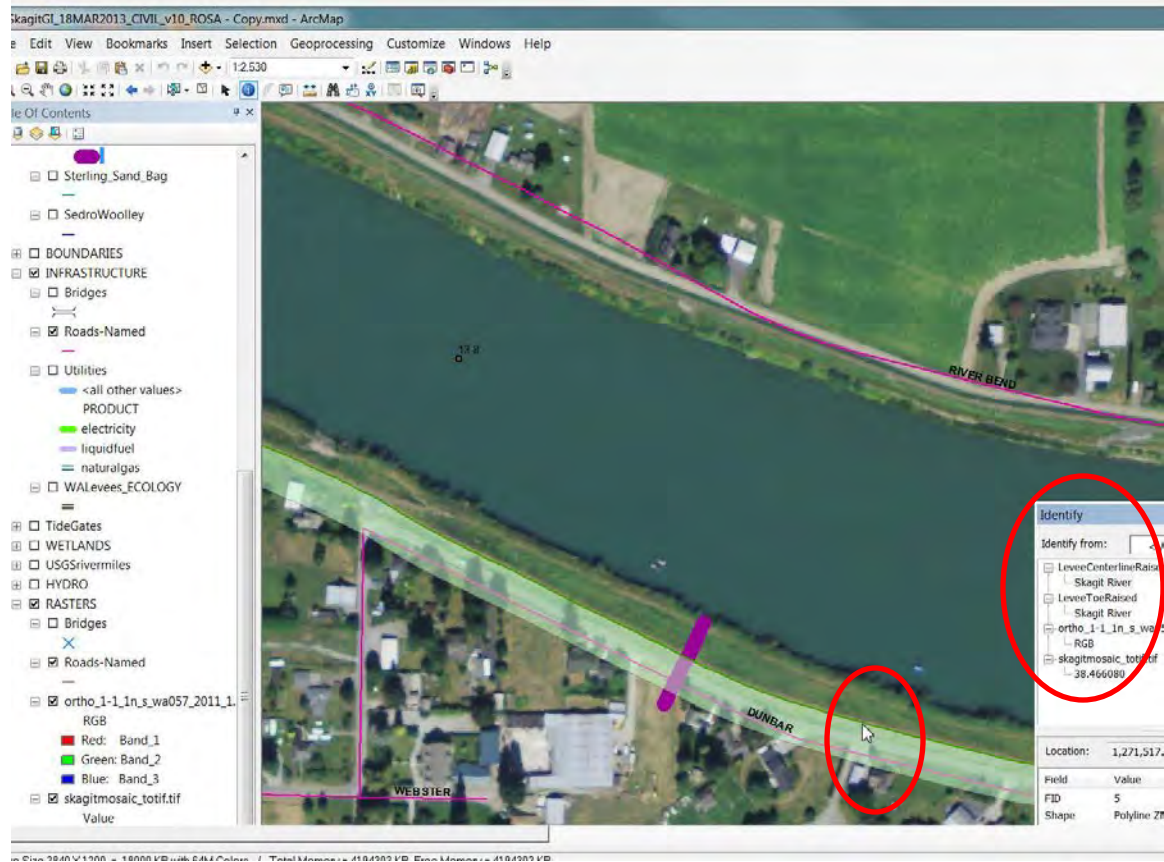
## DD-1 Existing Grade (Ft ) at Dunbar Rd RM 13.8

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



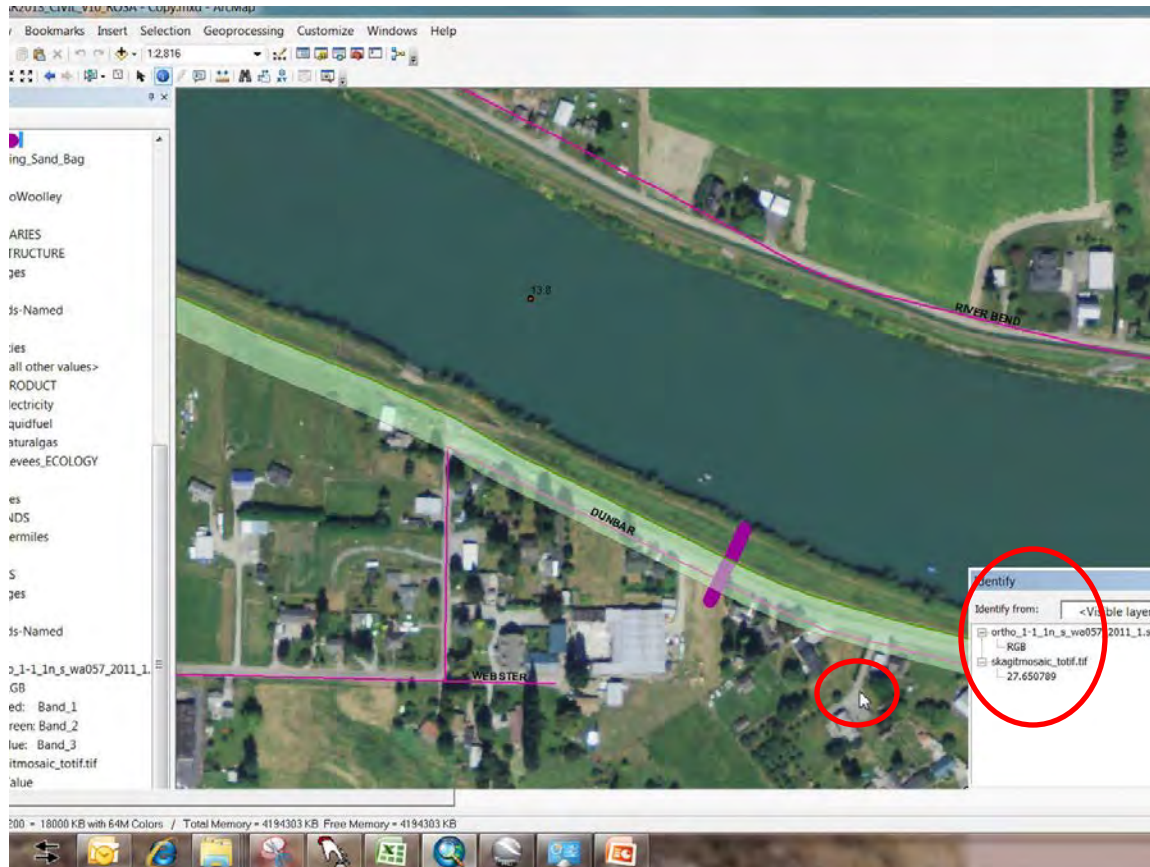
## DD-1 Existing Grade (Ft ) at Dunbar Rd RM 13.8

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## DD-1 Existing Grade (Ft ) at Dunbar Rd RM 13.8

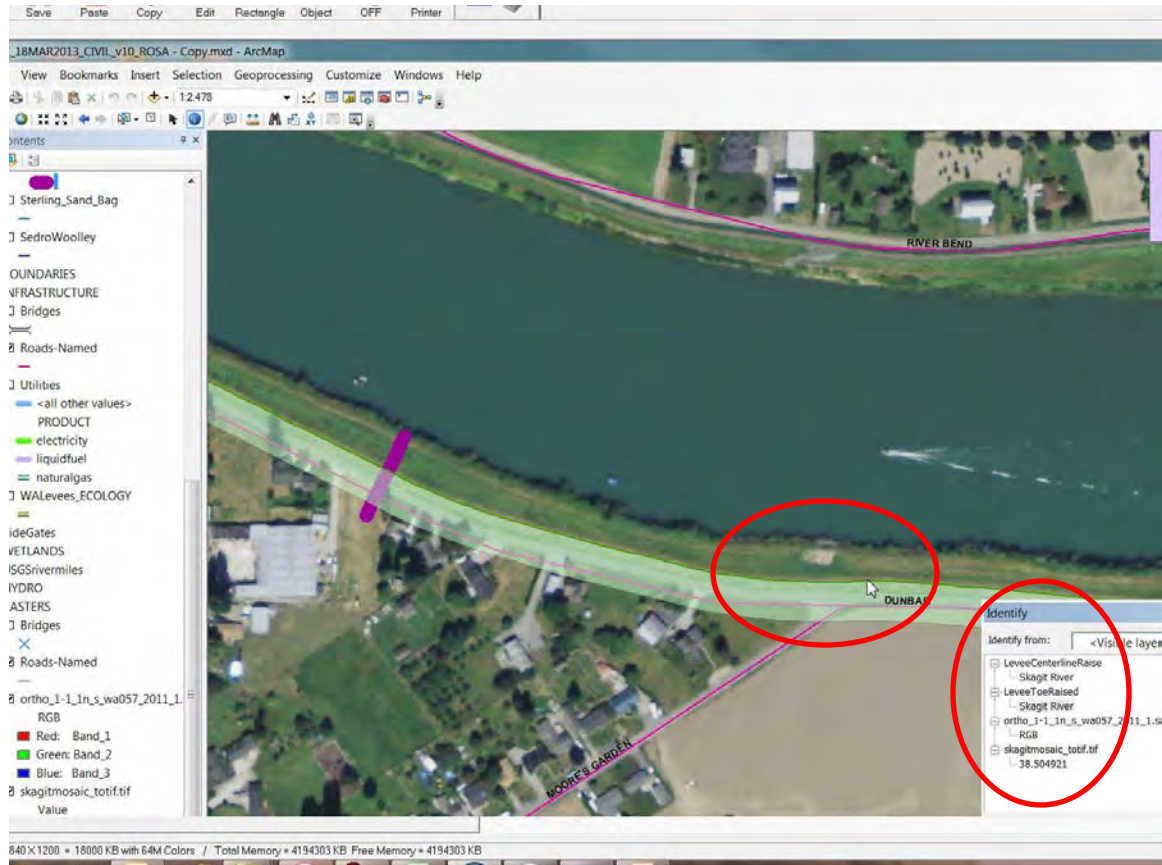
Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## DD-1 Existing Grade (Ft ) at Dunbar Rd approx RM 13.75

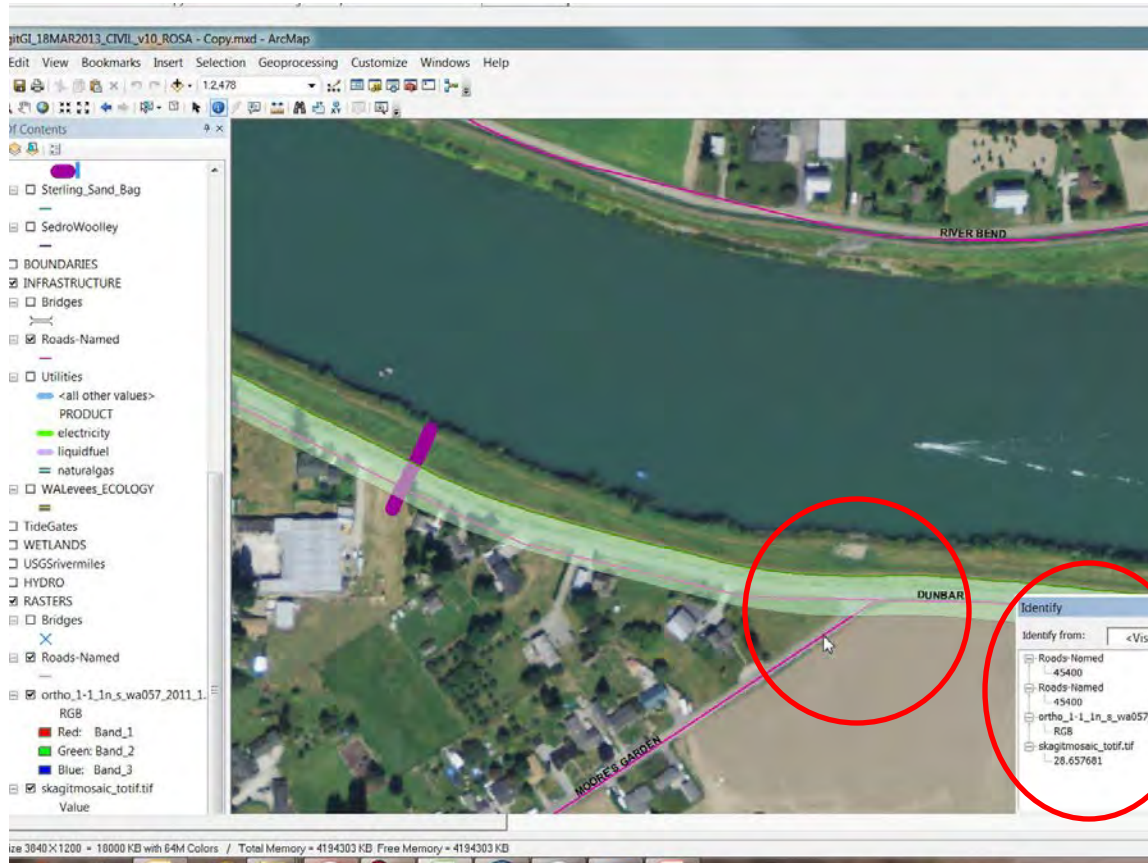
Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88





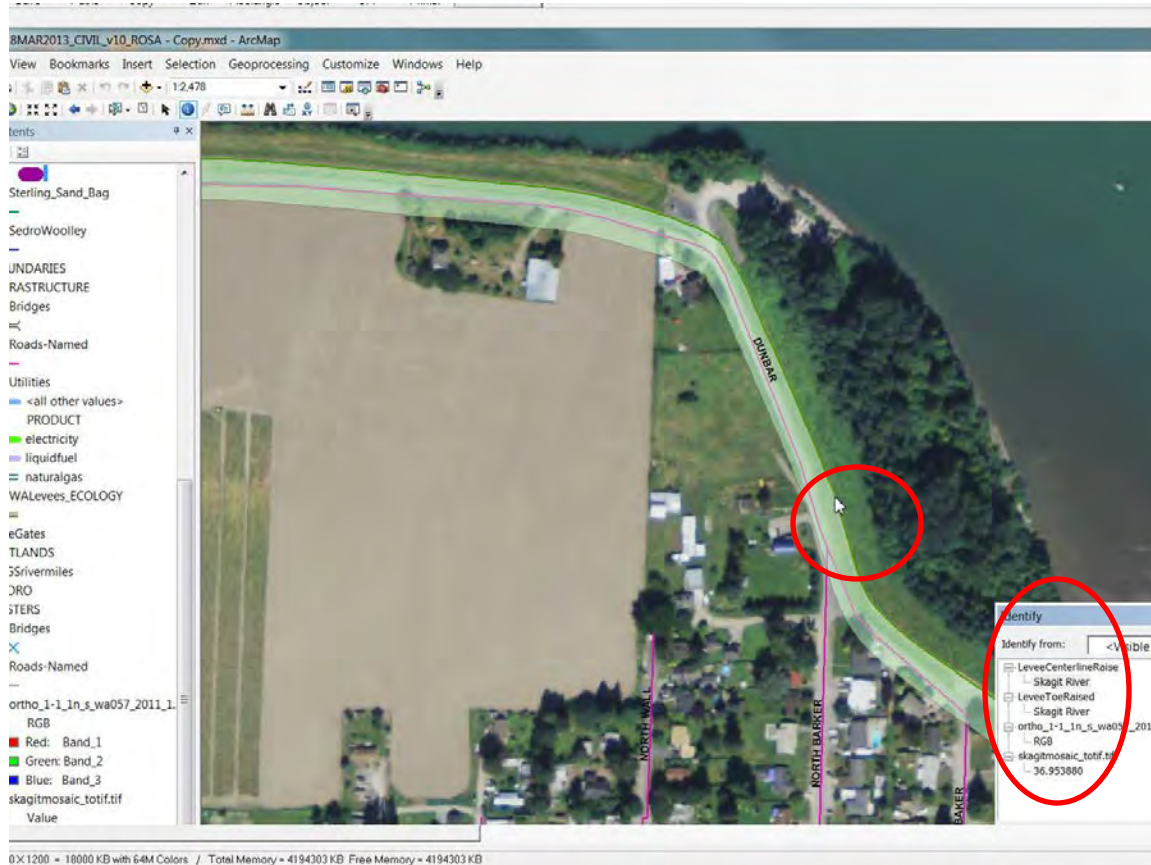
## DD-1 Existing Grade (Ft ) at Moore Garden Rd approx RM 13.7

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



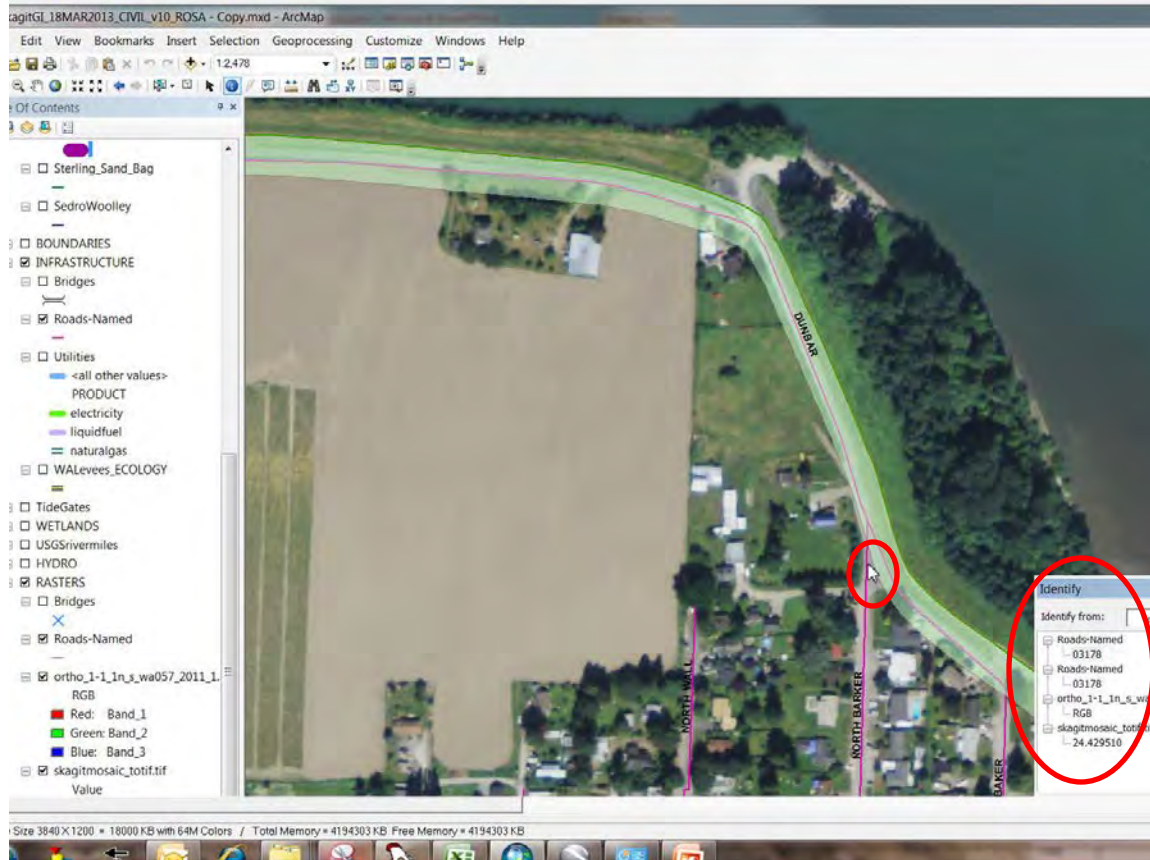
## DD-1 Existing Grade (Ft ) at Moore Garden Rd approx RM 13.7

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



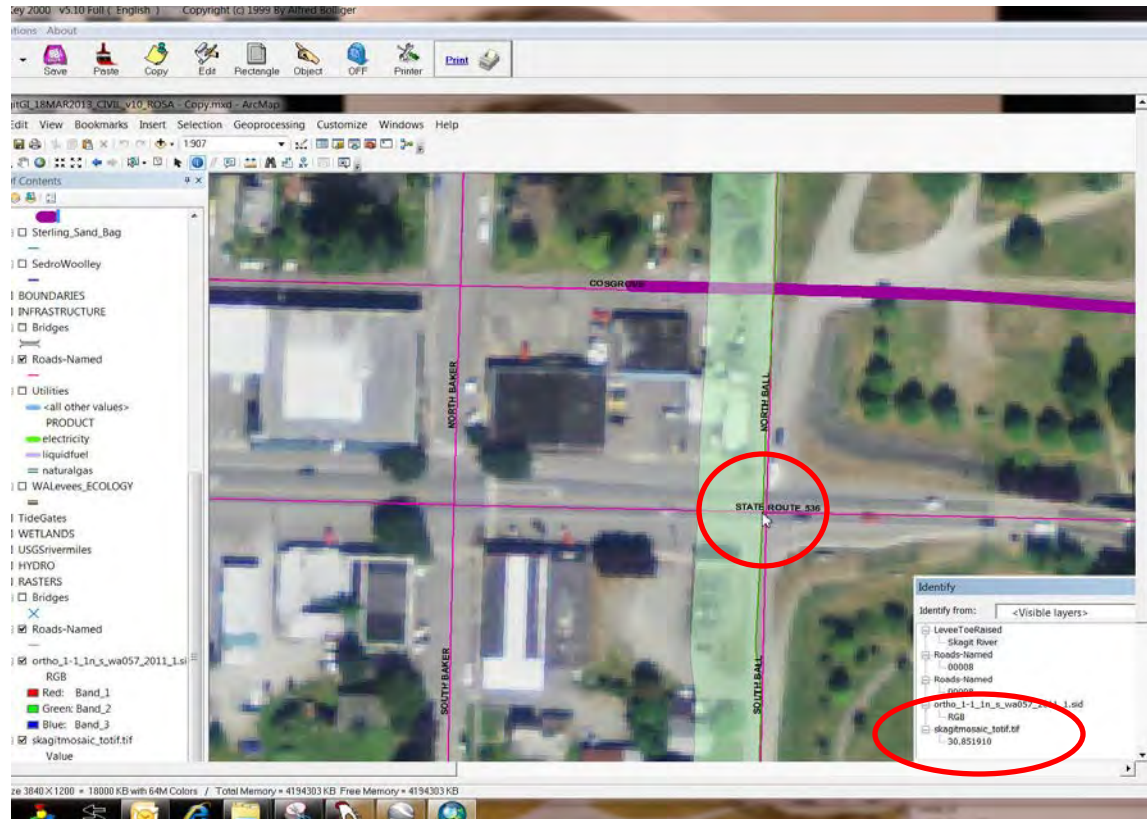
## DD-1 Existing Grade (Ft ) at N Barker Rd approx RM 13.1

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



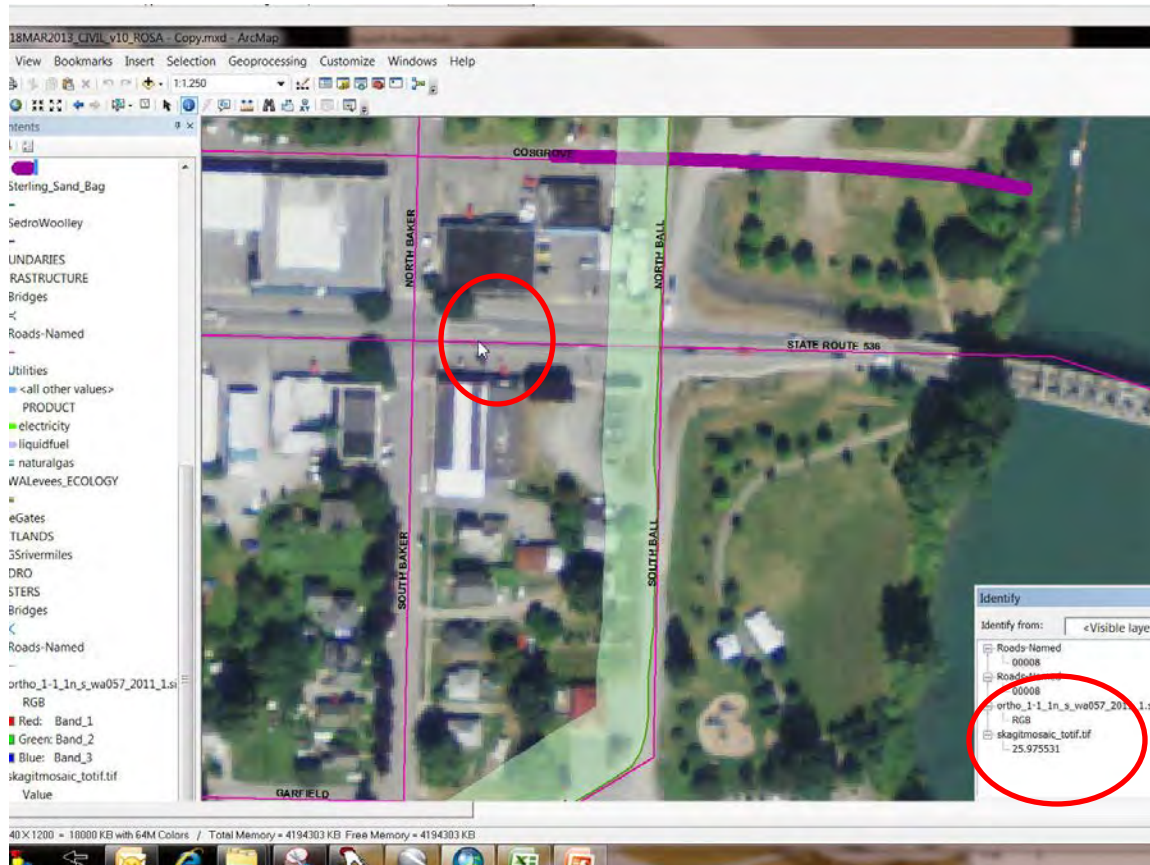
## DD-1 Existing Grade (Ft ) at N Barker Rd approx RM 13.1

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



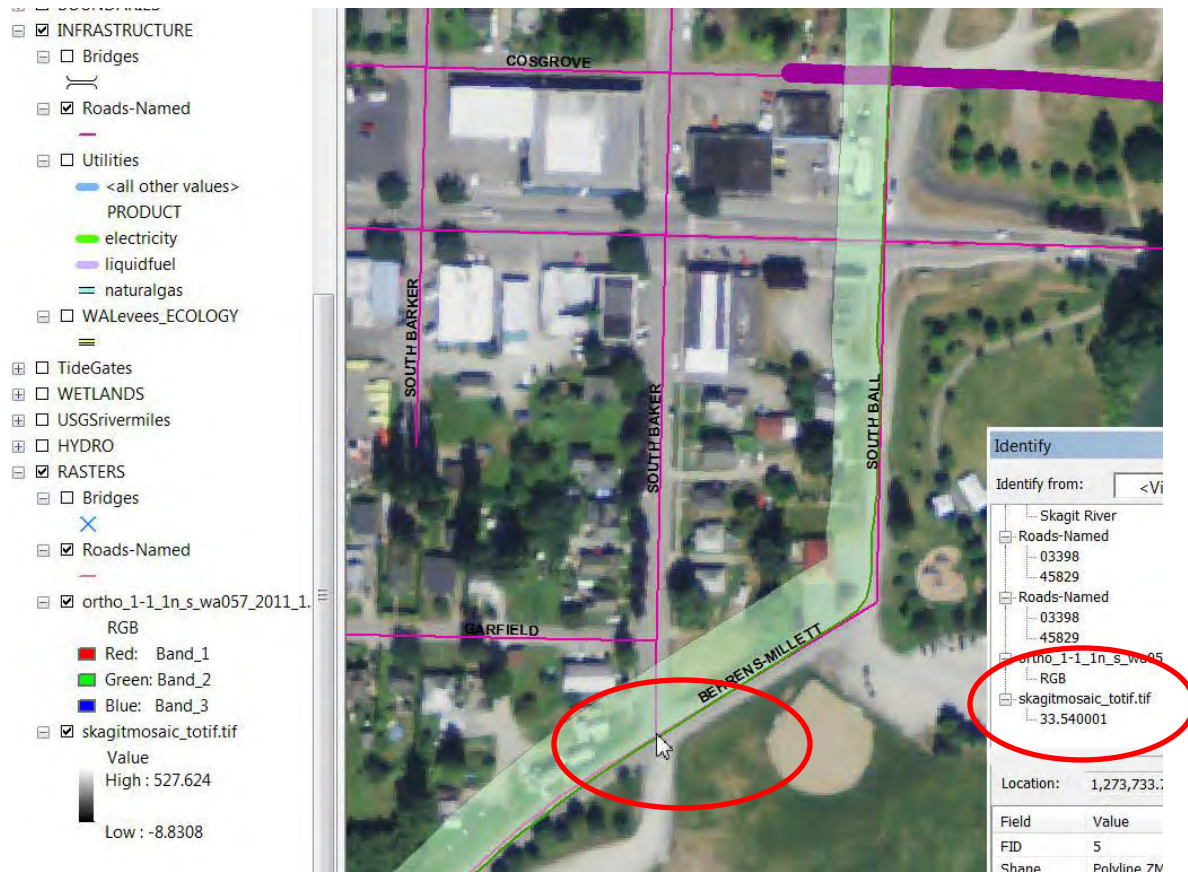
## DD-1 Existing Grade (Ft ) at SR 536 approx RM 12.93

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## DD-1 Existing Grade (Ft ) at SR 536 approx RM 12.93

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## DD-1 Existing Grade (Ft ) at S Baker at Behrens Millett approx RM 12.8

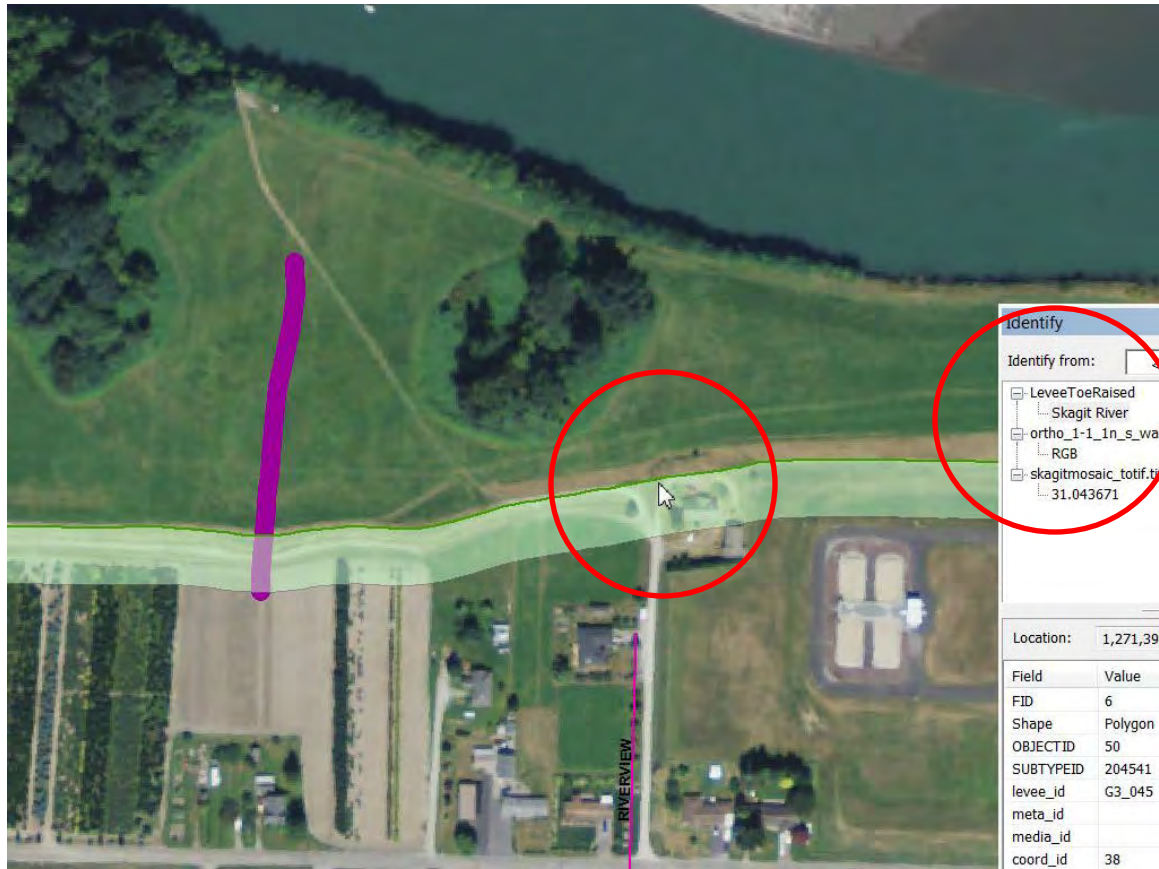
Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## DD-1 Existing Grade (Ft ) at S Baker at Behrens Millett approx RM 12.8

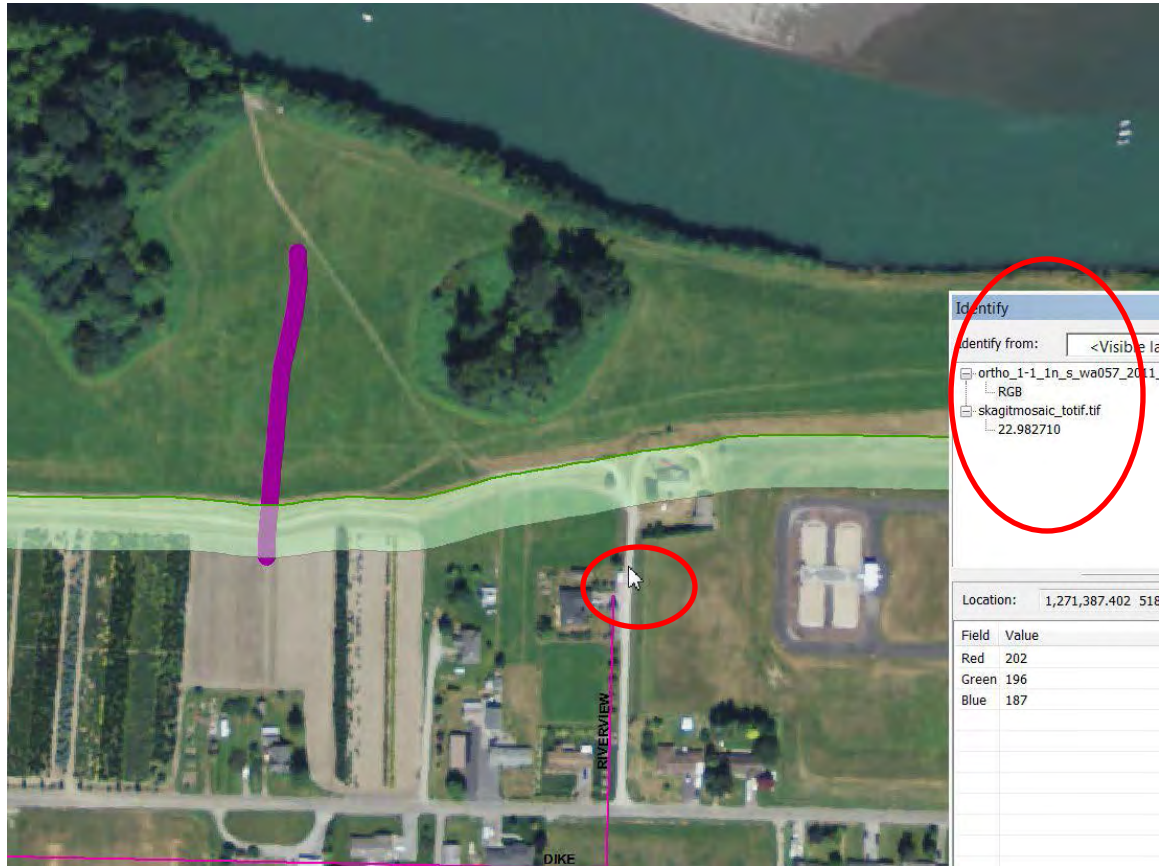
Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88





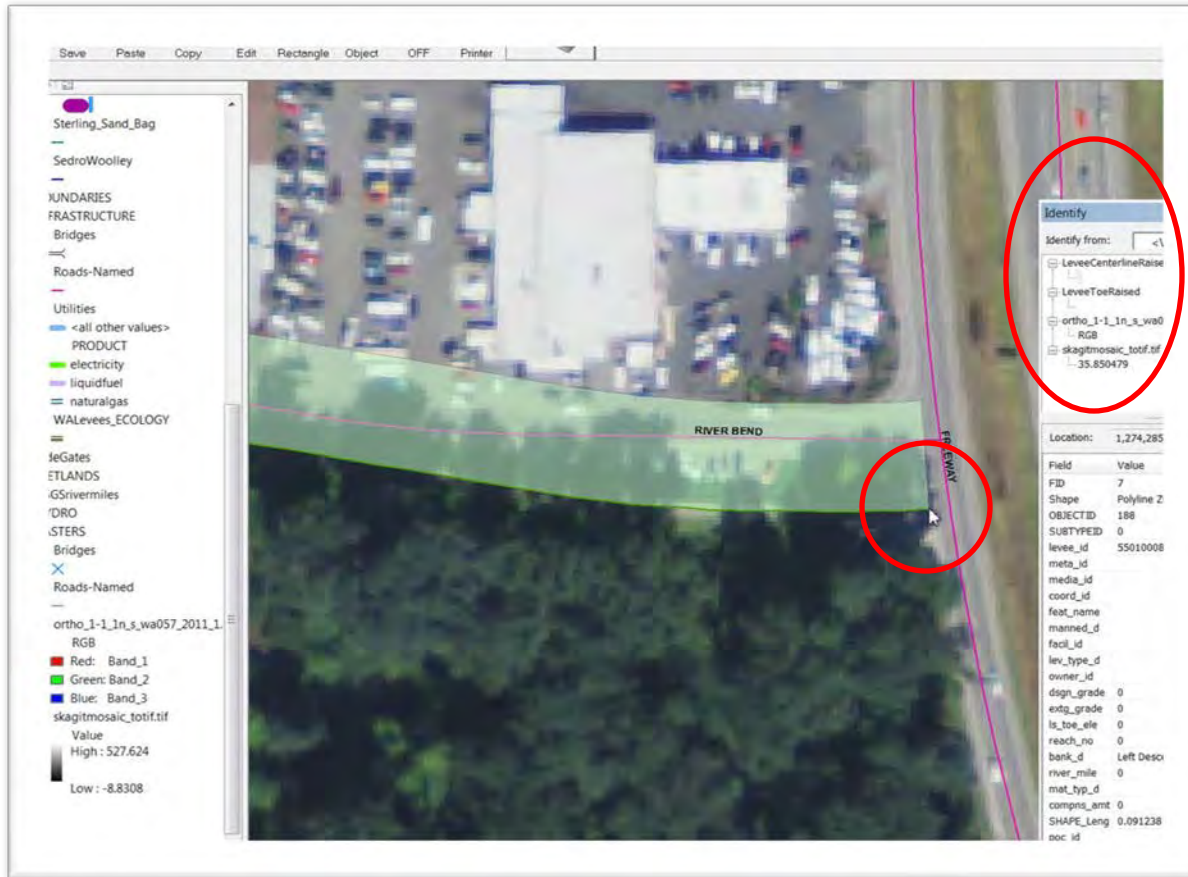
## DD-3 Existing Grade (Ft ) at Riverview Rd RM 11.7

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## DD-3 Existing Grade (Ft) at Riverview Rd RM 11.7

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## Lions Park Existing Grade (Ft ) at Freeway Drive RM 13.1

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## Freeway Drive Existing Grade (Ft ) at RM 13.1

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



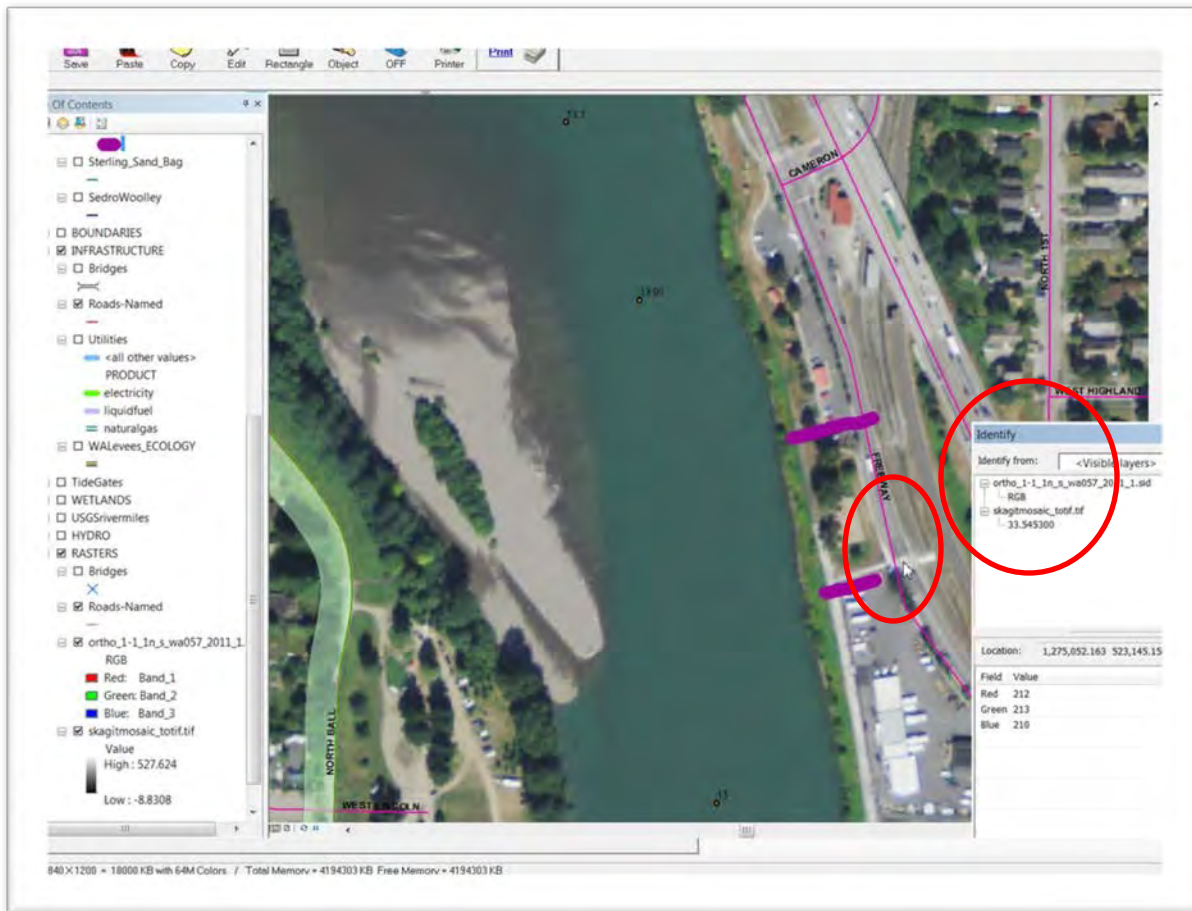
## Existing Grade (Ft ) Freeway Drive at Cameron RM 13.07

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



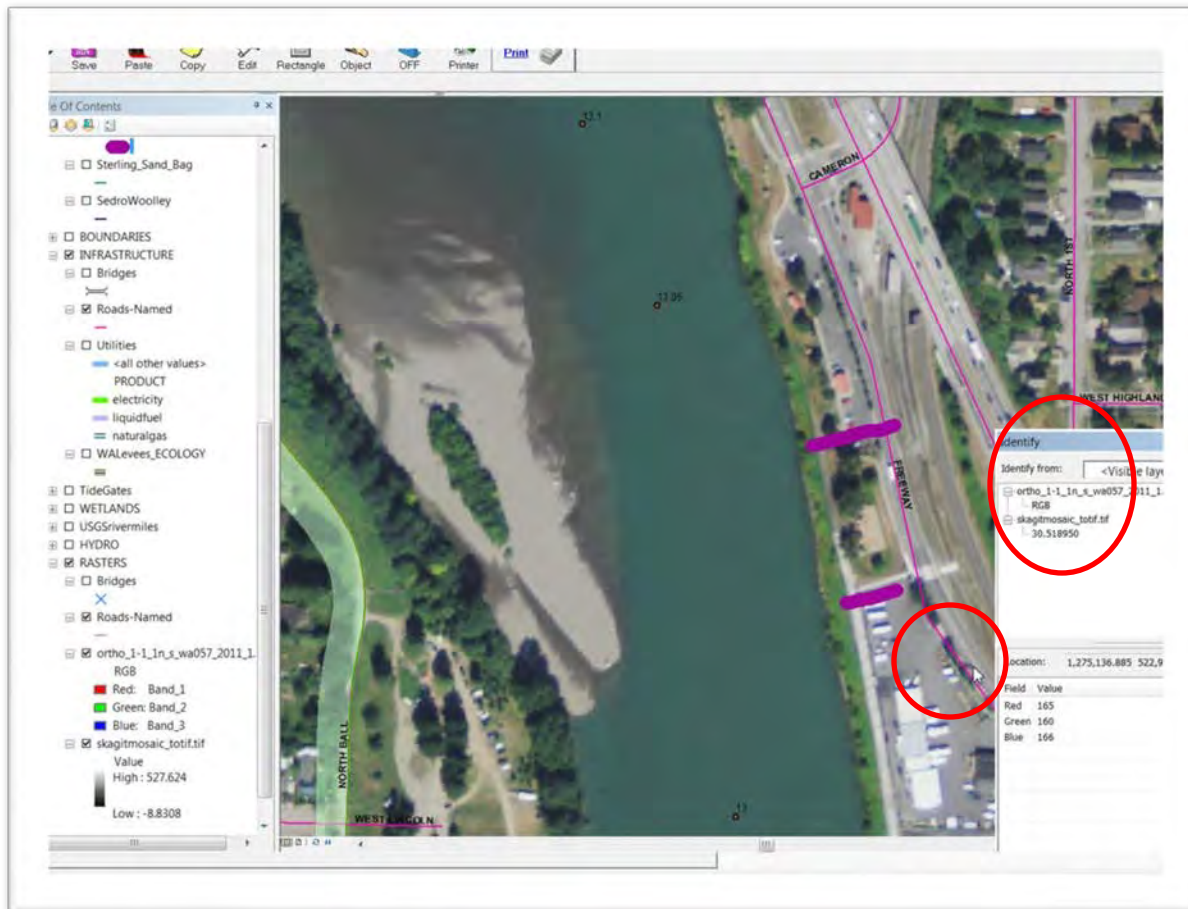
## Existing Grade (Ft ) at Freeway Drive Approx 600ft upriver of Cameron Way Approx RM 13.15

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## Existing Grade (Ft ) at Freeway Drive at Mt. Vernon Floodwall tie-in Approx RM 13.02

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



**Existing Grade (Ft ) at Freeway Drive approx 200ft down river of Mt. Vernon Floodwall tie-in Approx RM 13.0**

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



4 northern  
Private drive  
ramps

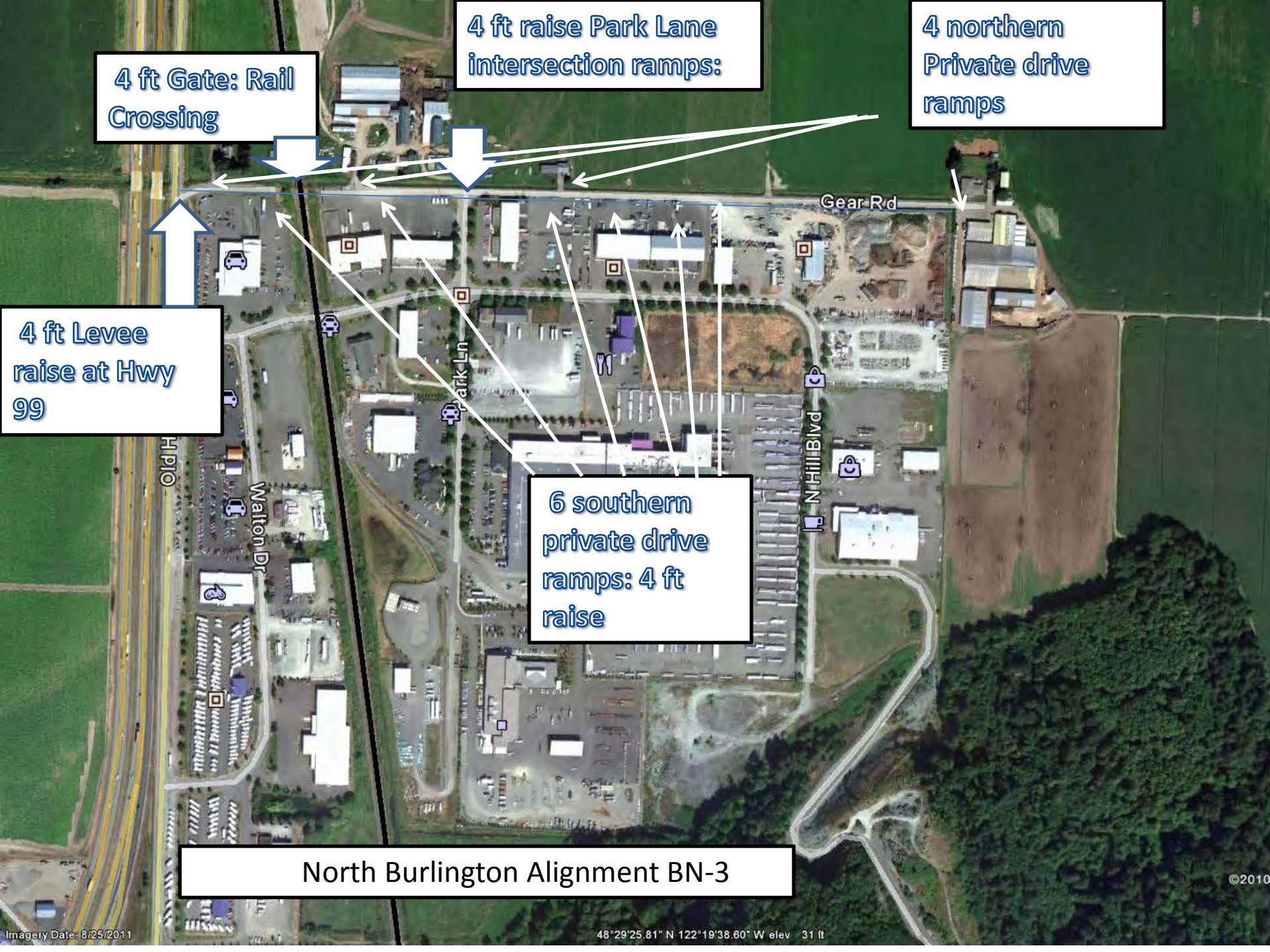
4 ft raise Park Lane  
intersection ramps:

4 ft Gate: Rail  
Crossing

4 ft Levee  
raise at Hwy  
99

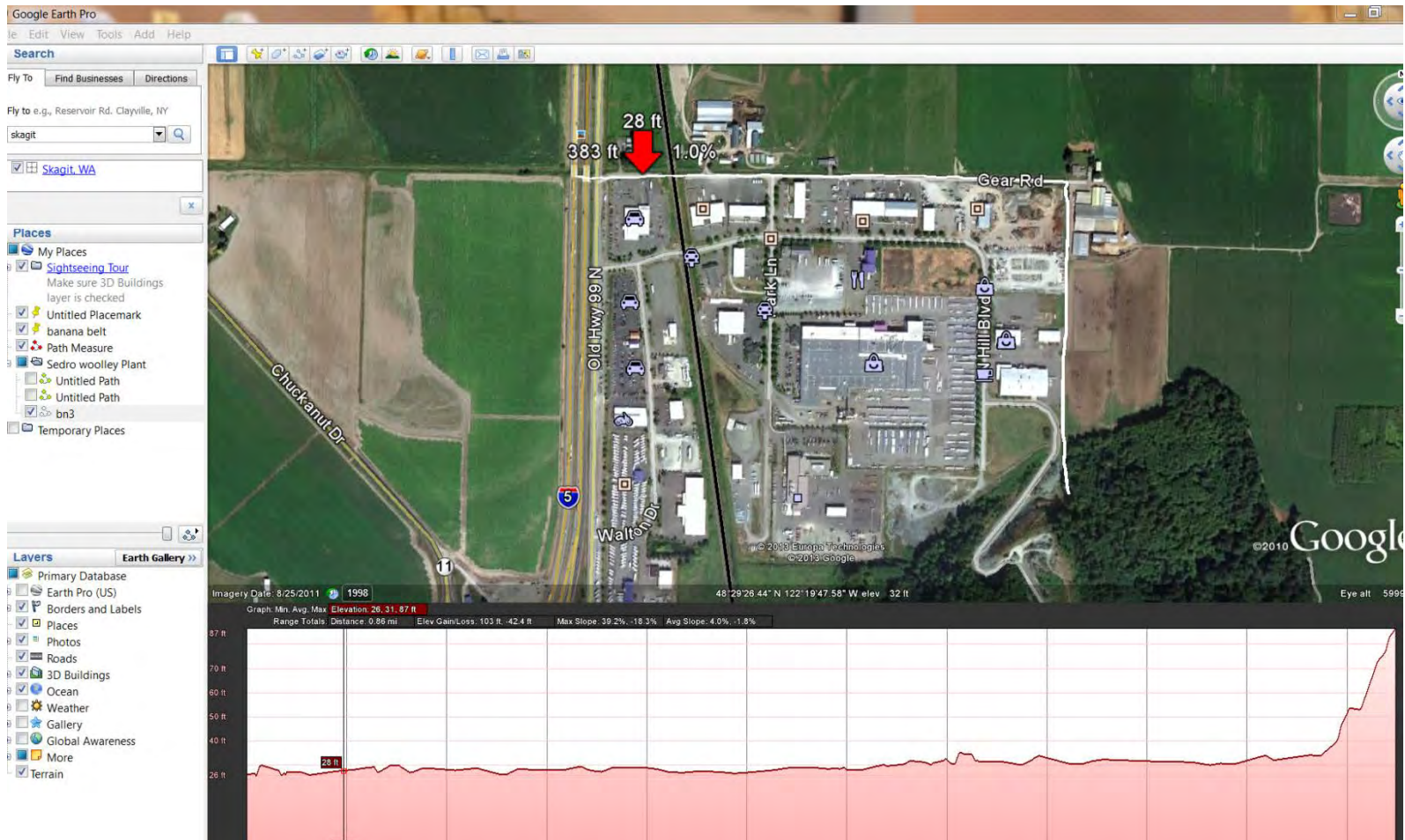
6 southern  
private drive  
ramps: 4 ft  
raise

North Burlington Alignment BN-3

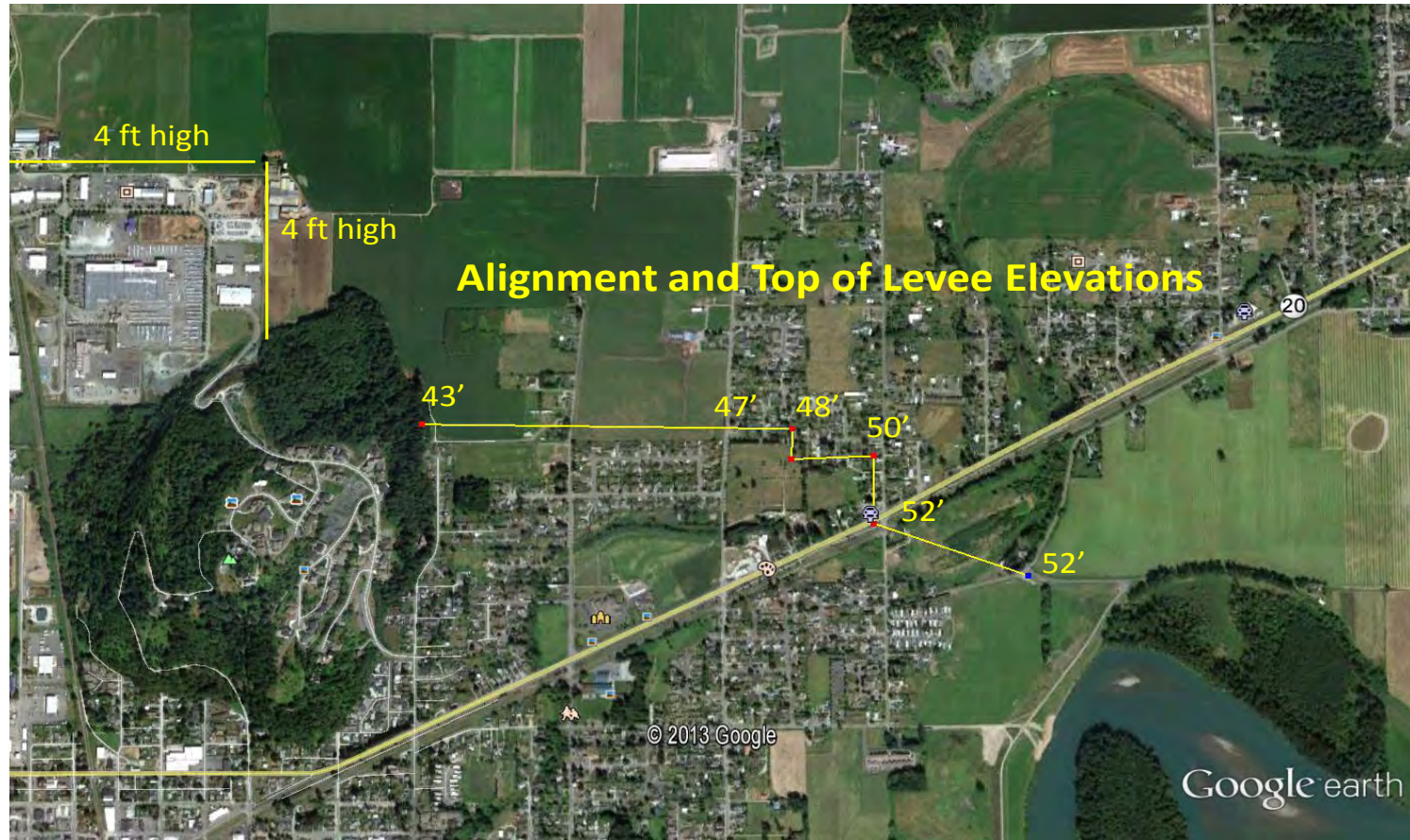


# North Burlington Alignment

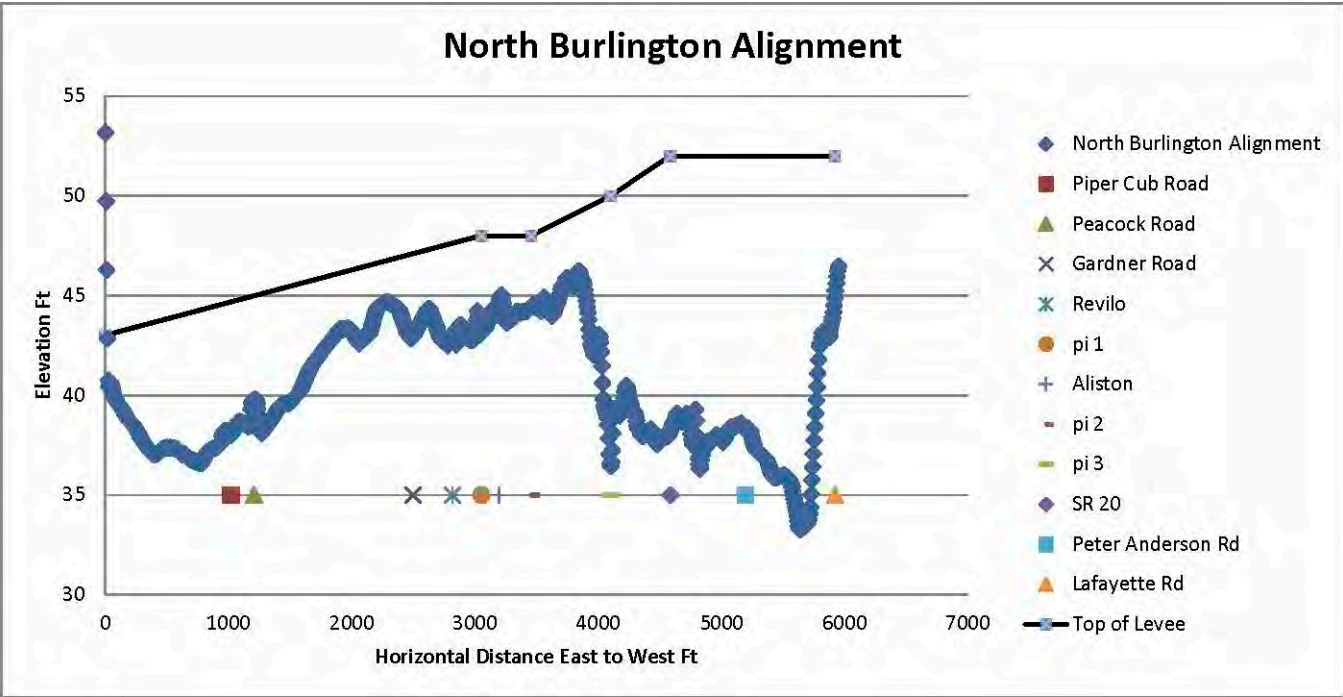
## GS Elevations Source: Google Earth

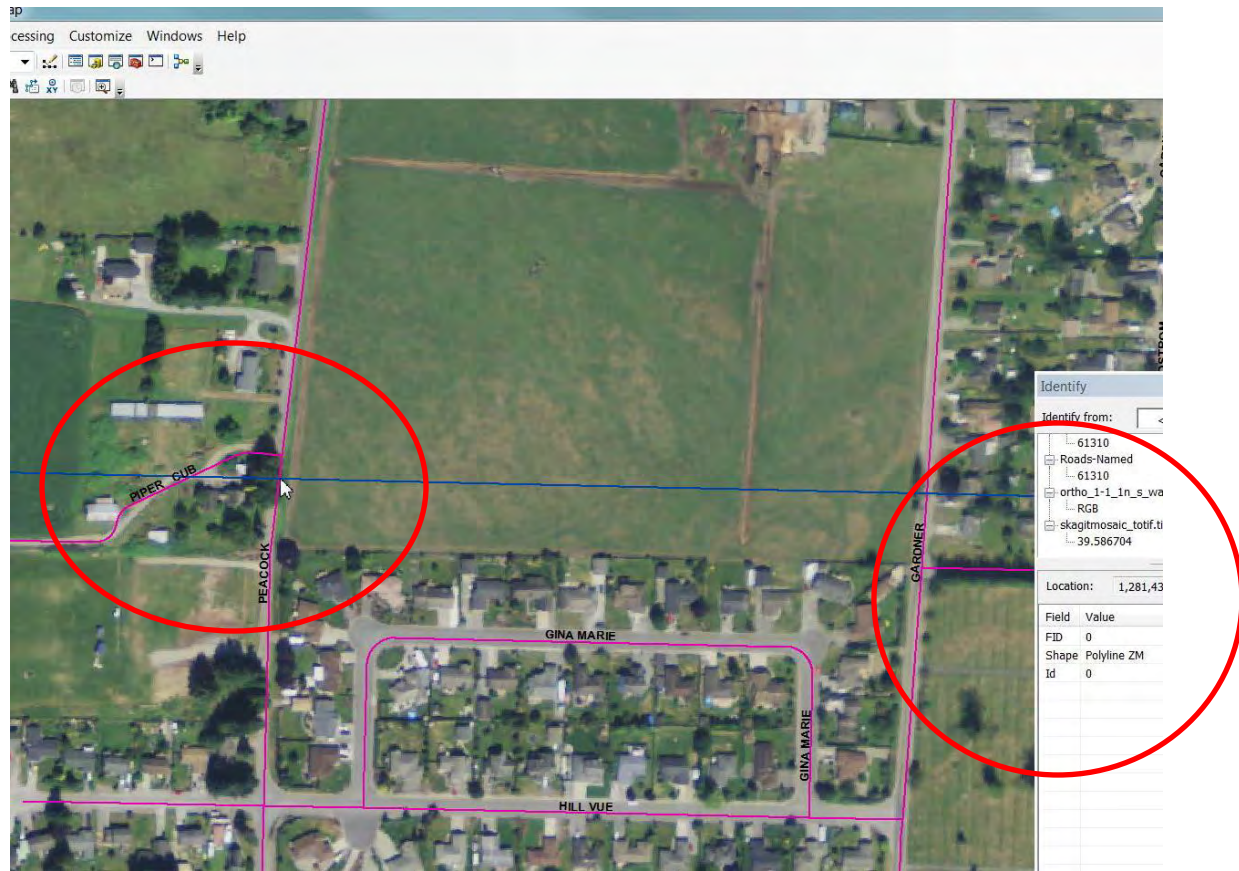


# H&H AVE LEVEE RAISE & TARGET LEVEE ELEVATIONS



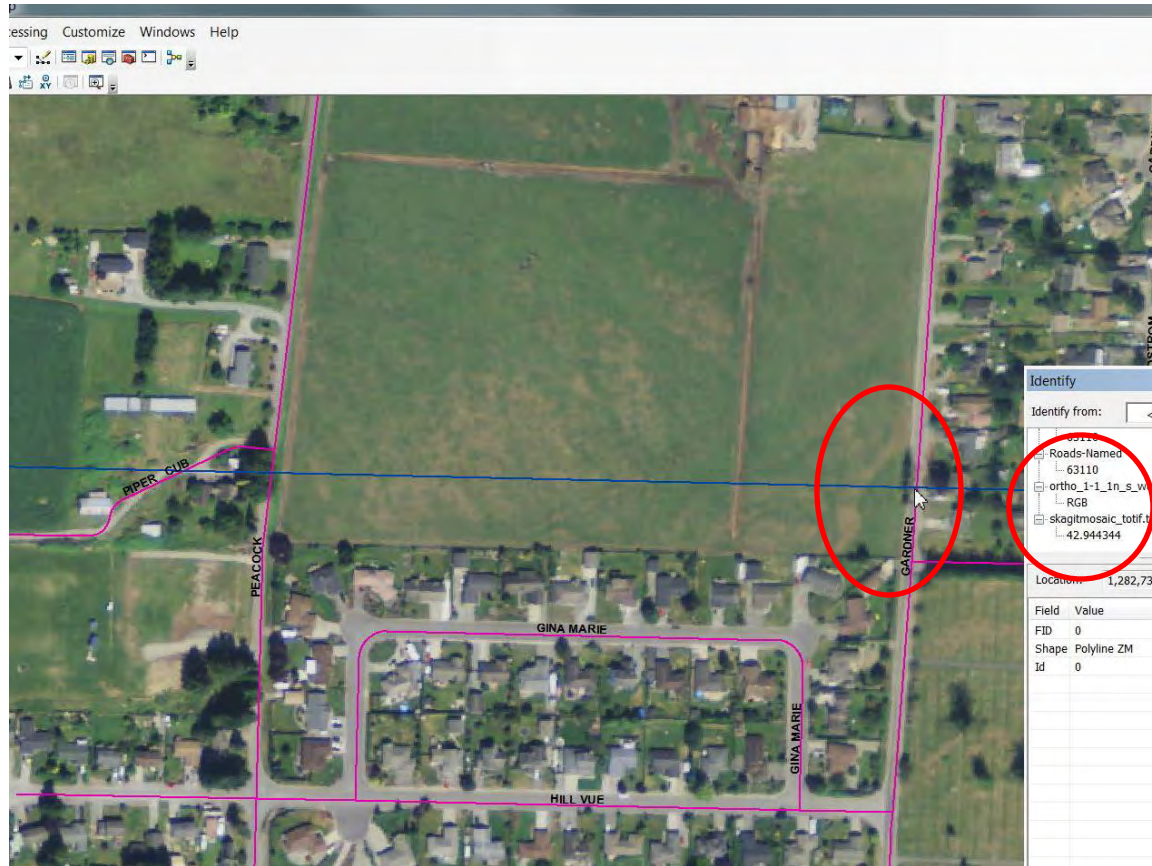
# Proposed Alignment BN-2 Existing Ground Surface Elevations (Ft) Source: GIS Lidar





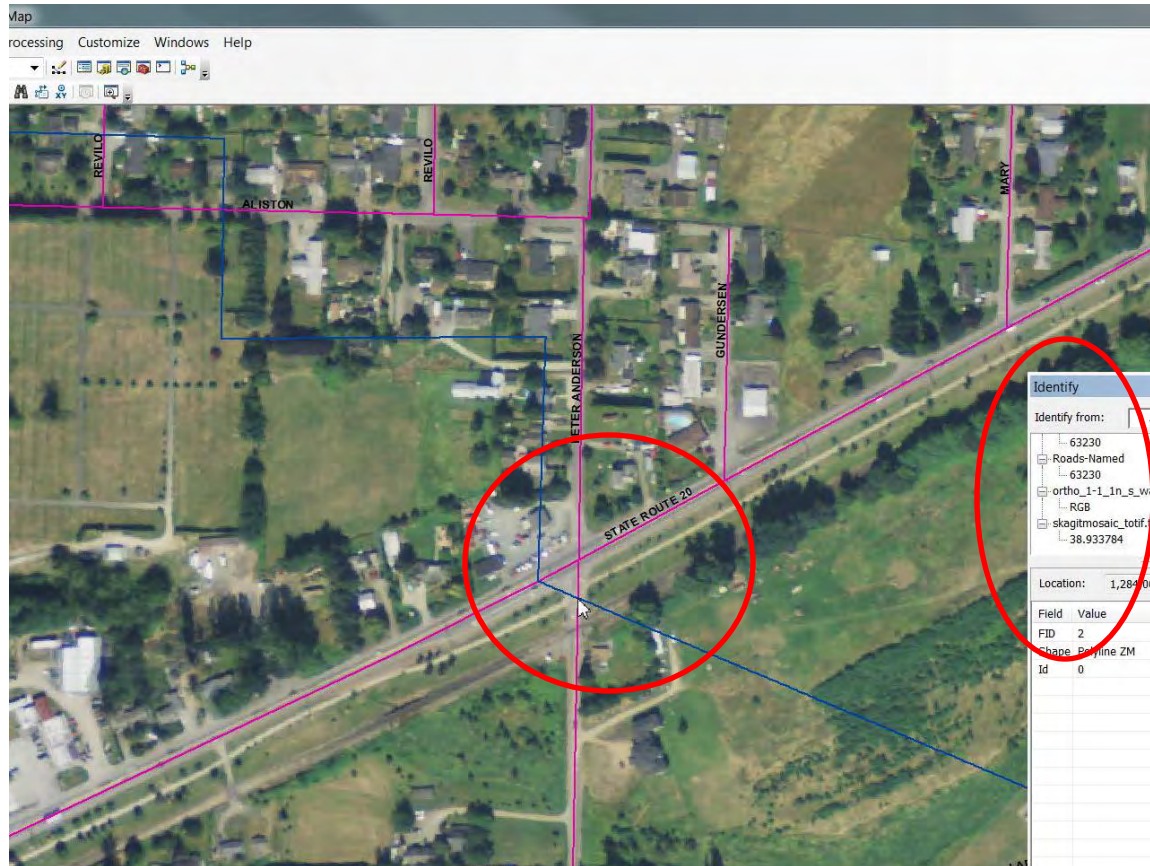
## N Burlington Existing Grade (Ft) at Peacock Rd

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## N Burlington Existing Grade (Ft ) at Gardner Rd

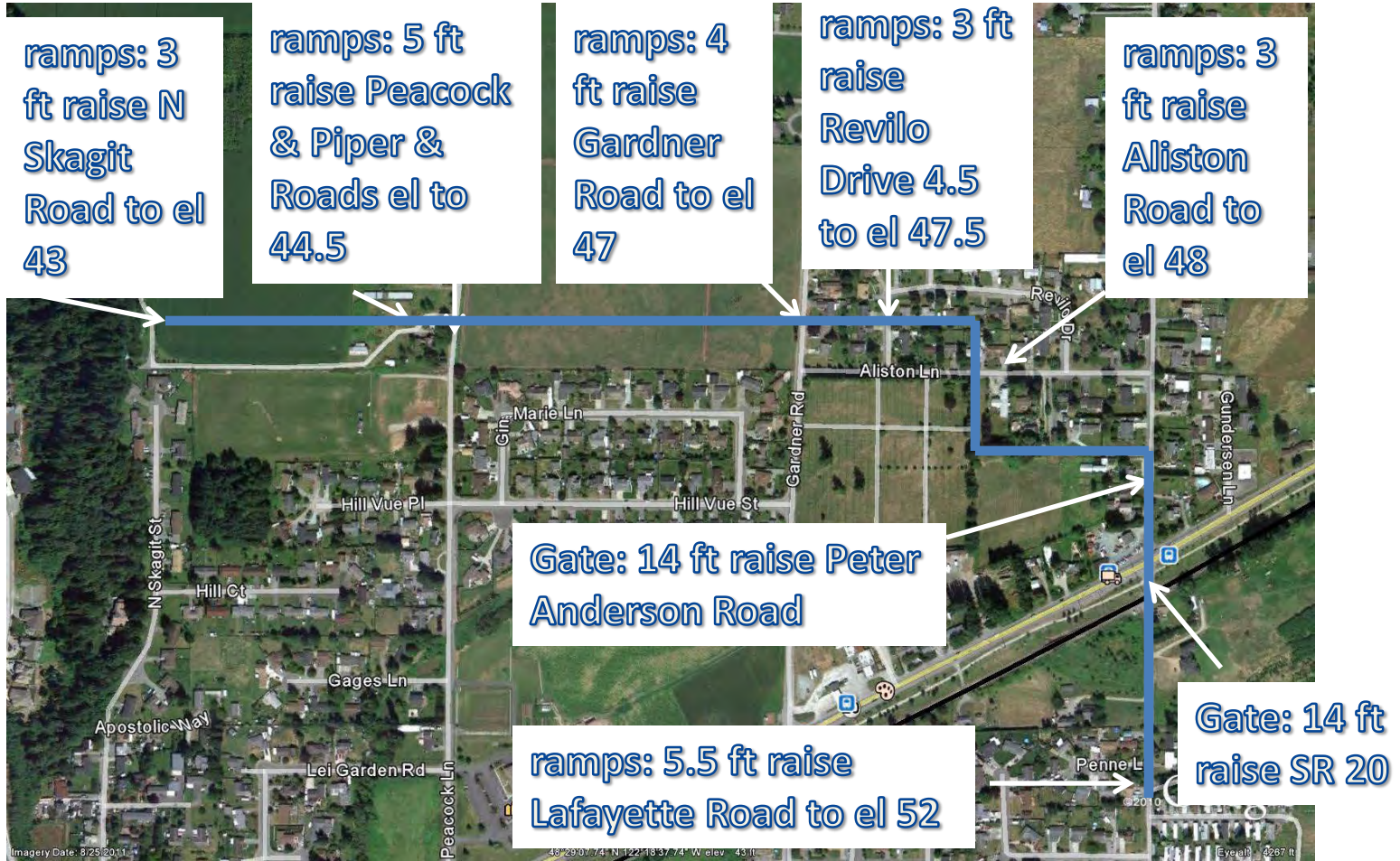
Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## N Burlington Existing Grade (Ft ) at Peter Anderson Rd

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88

# North Burlington Alignment BN-2









## Walmart Levee Existing Grade (Ft ) at River Bend Rd RM 16.6

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## Walmart Levee Existing Grade (Ft ) at Riverbend Road RM 13.4

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88



## Walmart Levee Existing Grade (Ft ) at Riverbend Road RM 13.4

Source: GIS Lidar Skagit\_Mosaic Burlington 2009 converted to NAVD 88

## Utility Points of Contact

City of Mount Vernon  
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Community & Economic Development  
City of Mount Vernon  
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www.mountvernonwa.gov

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City of Burlington Engineering Dept  
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Burlington, WA 98233  
360-755-9715  
johna@ci.burlington.wa.us

Skagit PUD  
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Engineering Department  
P.U.D. No. 1 of Skagit County  
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Mount Vernon, WA 98273-1436  
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Direct (360) 848-4469  
heidt@skagitpud.org

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Enterprise GIS Group  
Utility Operations Support  
Montana-Dakota Utilities Co.  
A Subsidiary of MDU Resources Group, Inc.  
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509-734-4557 [phone]  
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Puget Sound Energy  
Lynn Murphy  
Community Services Manager - Whatcom County  
Puget Sound Energy  
1329 State Street  
Bellingham WA 98225  
360-647-6525 work  
360-770-2106 cell  
lynn.murphy@pse.com  
Kerri Muphy 360-766-5509

The Cascade Natural GIS PDF images are overlaid onto the Skagit CADD files.

#### Gas Legend

Thick yellow w/black lines = 16 inch gas main

Thick yellow lines = 8 inch gas main

Thick orange lines = 6 inch gas main

Thick green lines = 4 inch gas main

Thick light blue lines = 3 inch gas main

Thick red lines = 2 inch gas main

Thin red lines = plastic gas service line

Thin blue lines = steel gas service line

Red target symbols = gas regulator stations

Black bow-tie symbols = gas valves



*In the Community to Serve®*

8113 W Grandridge Blvd, Kennewick, Wa 99336  
(509) 734-4500

**Date:** 11/22/2013  
**To:** Glenn Kato, USACE

**IMPORTANT- READ THIS NOTICE BEFORE ACCEPTING THE ENCLOSED COMPUTER DATA**

**TERMS OF AGREEMENT**

Your acceptance of the enclosed computer data acknowledges the following:

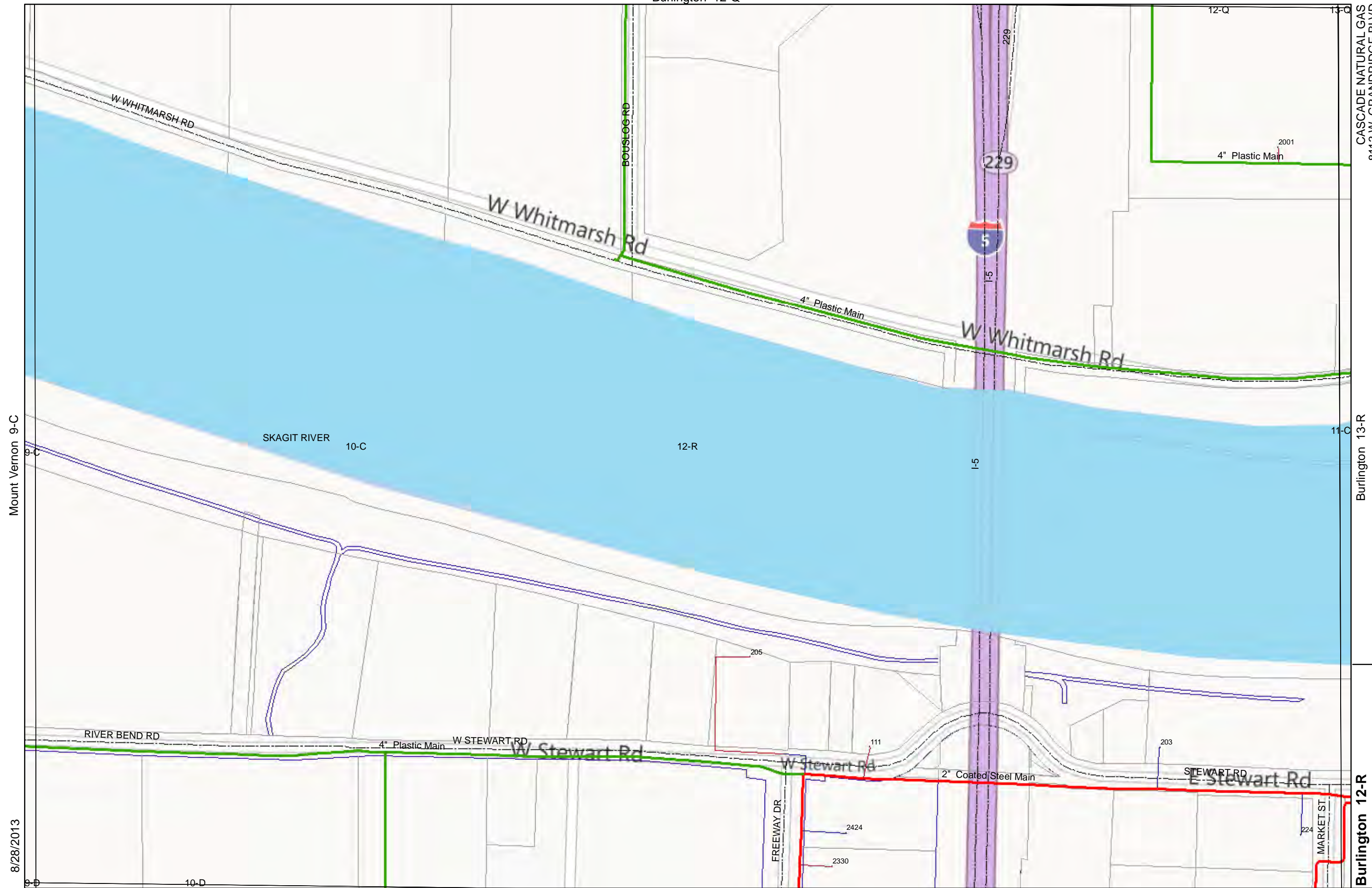
- Any information on attached computer media is for informational purposes only. It is not to be relied upon for construction purposes. It is provided for planning purposes only. Field locates are required for location of gas facilities.
- Any additions or modifications to the information contained on, or generated from, this data made by anyone other than Cascade Natural Gas Corporation, may result in adverse consequences which Cascade Natural Gas Corporation can neither predict nor control.
- The recipient agrees to the fullest extent permitted by law to release, indemnify, defend and hold harmless Cascade Natural Gas Corporation from and against all claims, liabilities, losses, damages, and costs, including, but not limited to, attorney's fees arising out of, or in any way connected with, the modification, misinterpretation, misuse, or reuse by others of the computer media and/or data provided by Cascade Natural Gas Corporation under this Agreement. This release and indemnification applies without limitation to any use of the project documentation on other projects, for additions to this project, or for completion of this project by others.
- Cascade Natural Gas Corporation assumes no responsibility to update the information provided.

Quantity	Description
1	PDF drawing of section of Mt Vernon (13 pages)
1	PDF drawing of section of Burlington (19 pages)

**Remarks:** Any questions, please feel free to contact me at (509) 734-4557.

Mark Bitton, GIS Analyst, Engineering Services

8113 W Grandridge Blvd, Kennewick, Washington 99336 **Phone** (509) 734-4557 **Fax** (509) 737-9834



Mount Vernon 9-C

Burlington 13-R

8/28/2013

Burlington 12-R

Mount Vernon 10-D

0 250 500 1,000 Feet



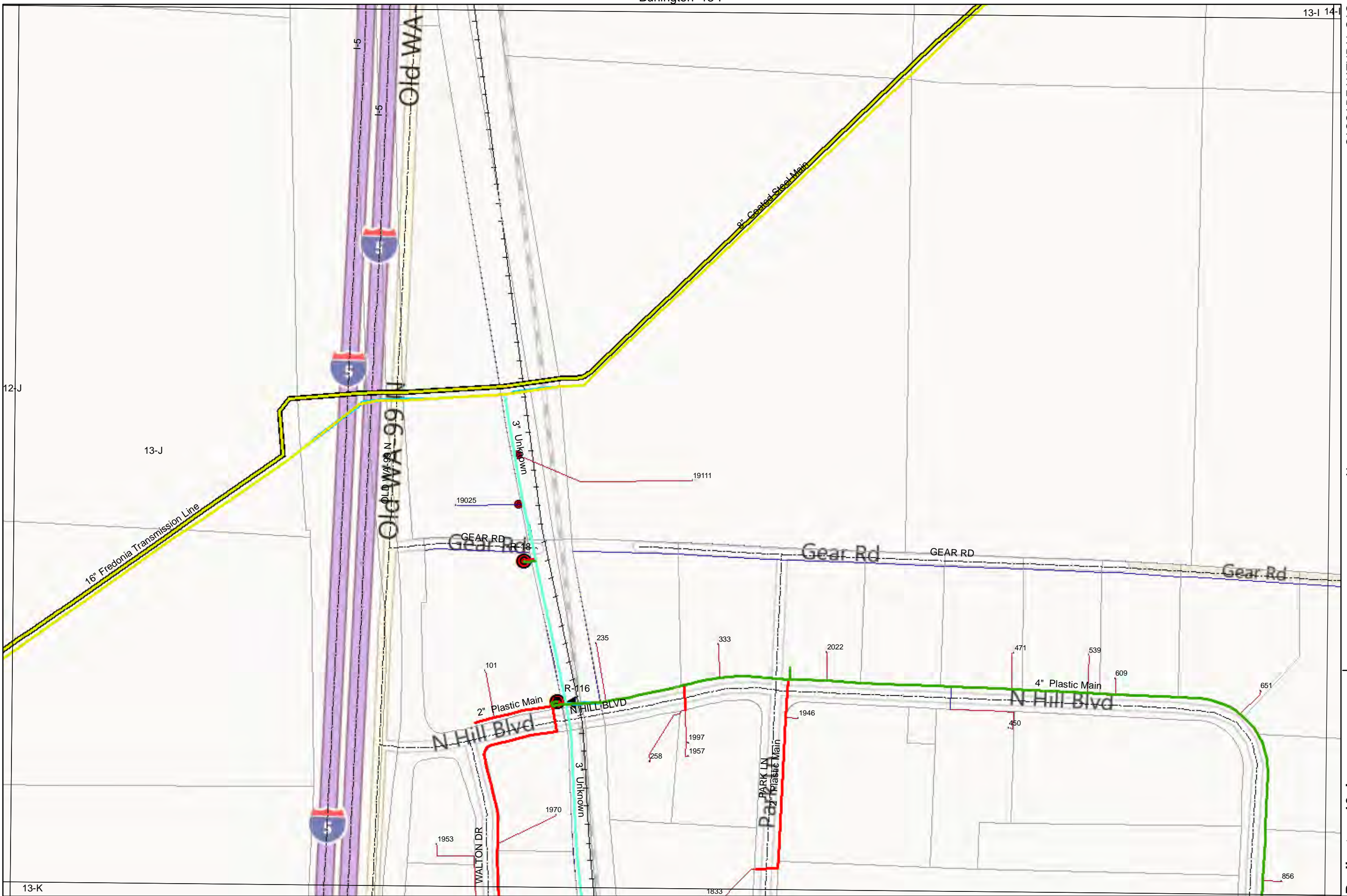
Burlington 12-J

8/28/2013

13-K

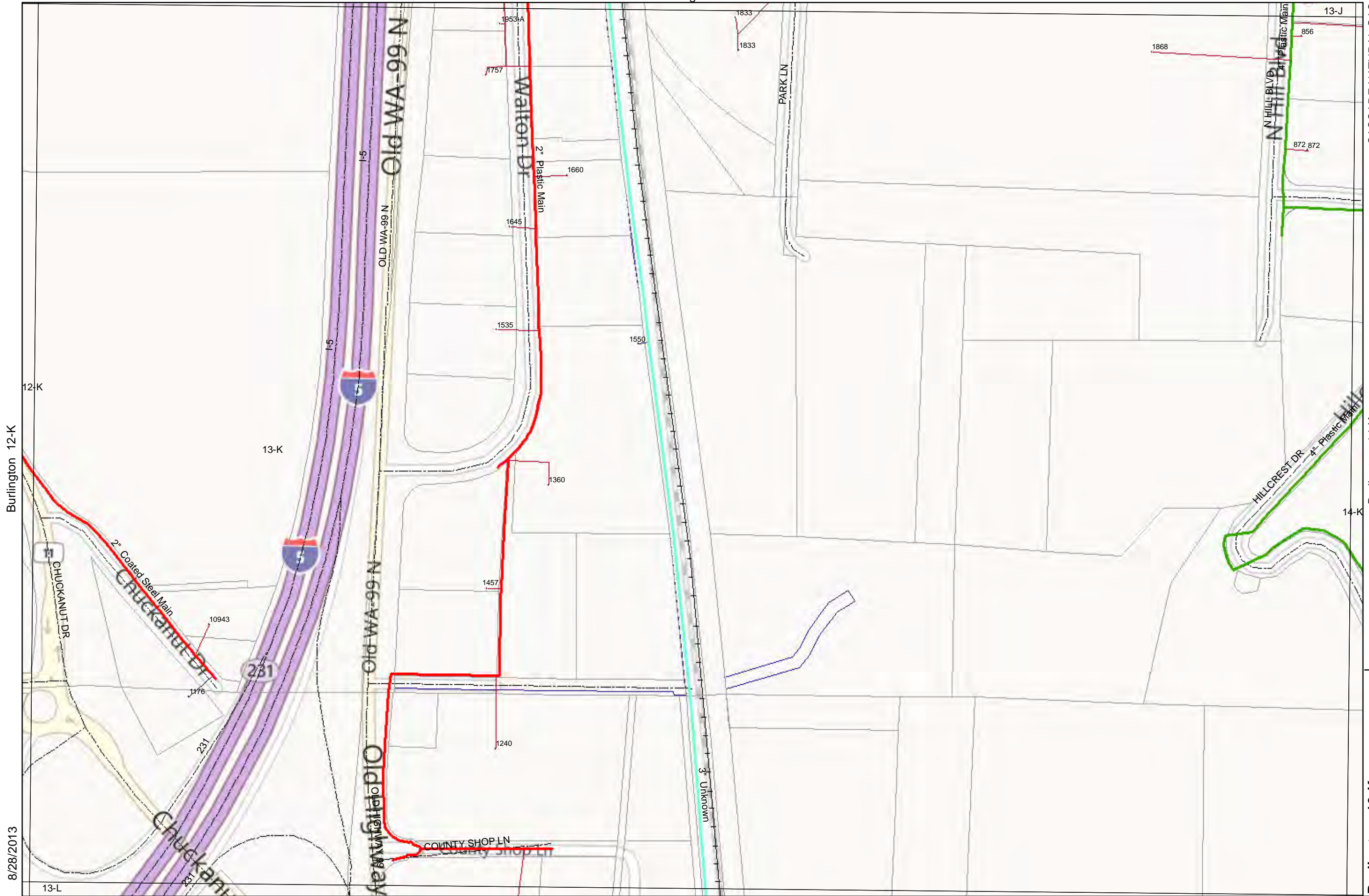
None

Burlington 13-J



0 250 500 1,000 Feet

Burlington 13-K



CASCADE NATURAL GAS  
 8113 W, GRANDRIDGE BLVD  
 KENNEWICK, WA 99336

8/28/2013

0 250 500 1,000 Feet

Burlington 13-L

Burlington 13-K

Burlington 14-K

13-J

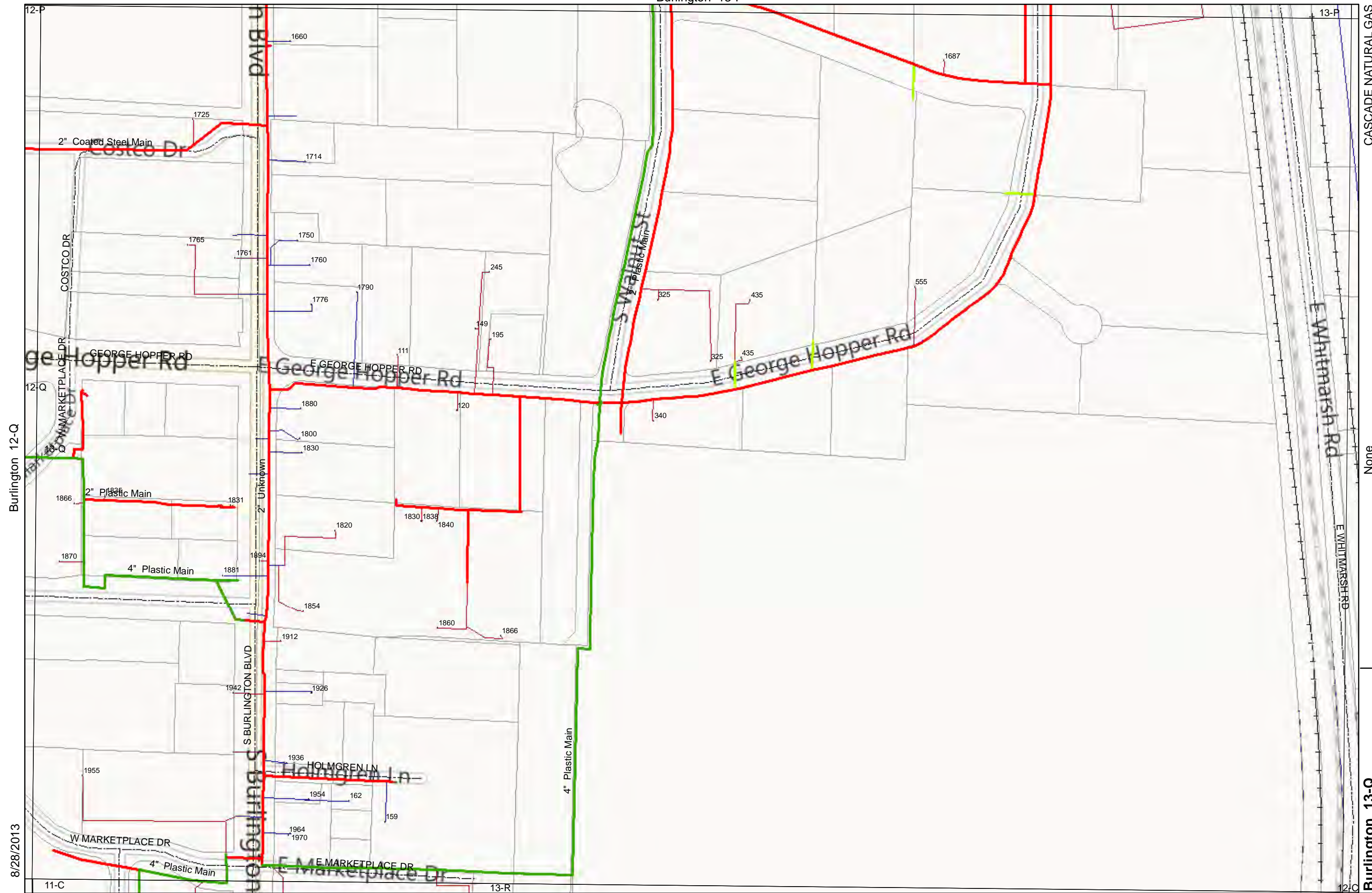
14-K

12-K

13-K

13-L





Burlington 12-Q

8/28/2013

11-C

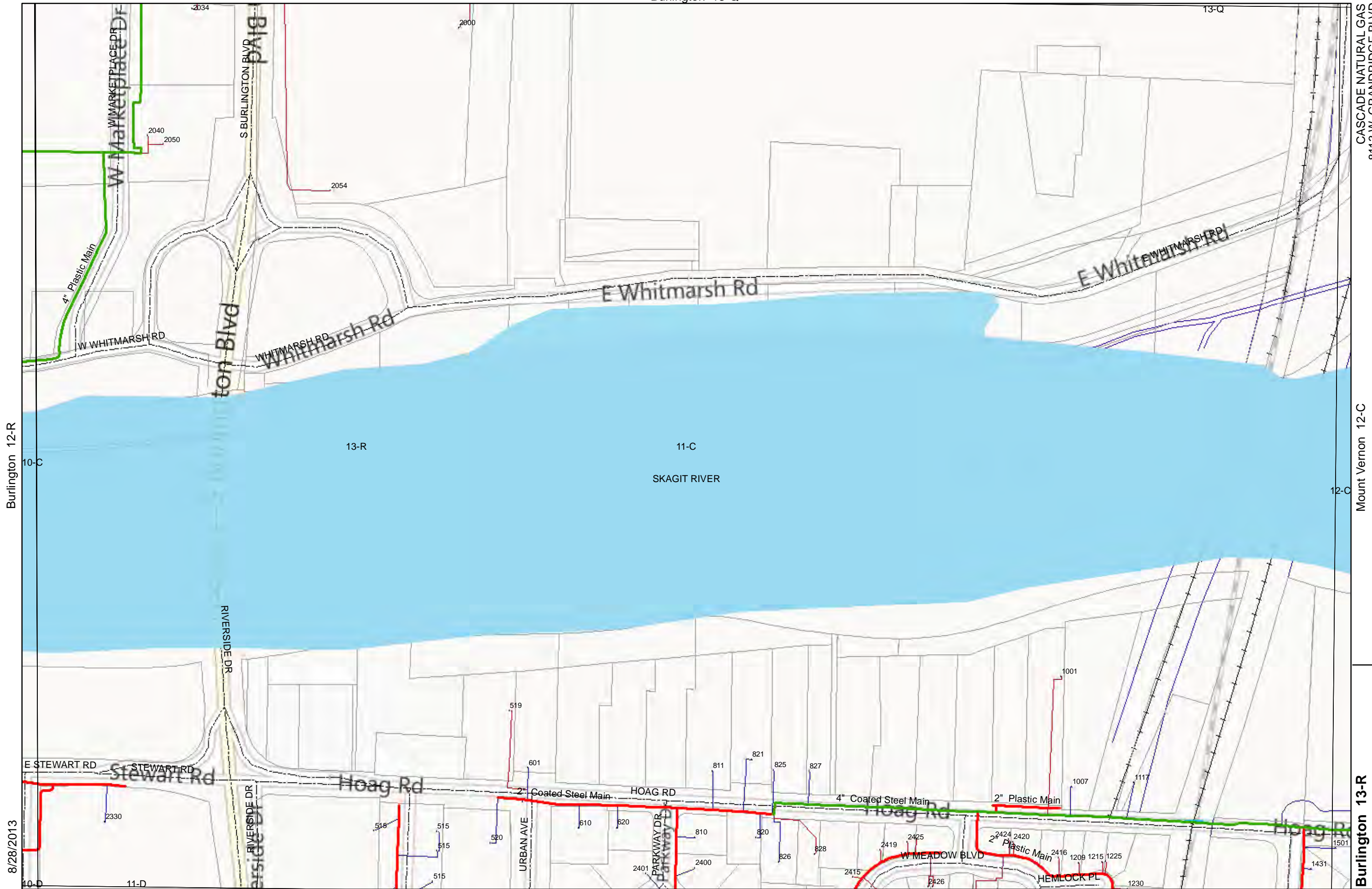
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Burlington 13-R

Burlington 13-Q

None

12-C



CASCADE NATURAL GAS  
 8113 W. GRANDRIDGE BLVD  
 KENNEWICK, WA 99336

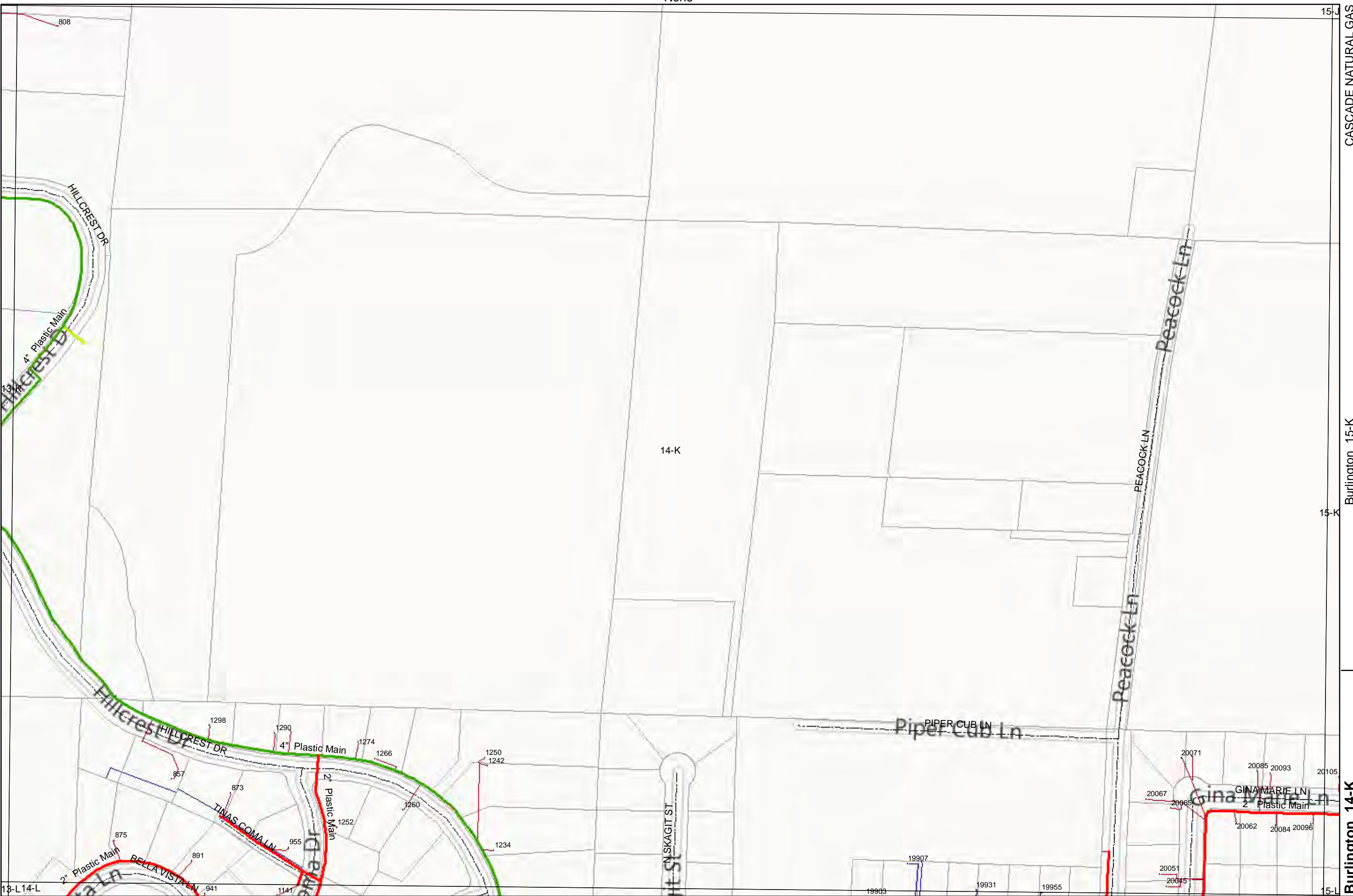
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KENNEWICK, WA 99336

Burlington 13-K

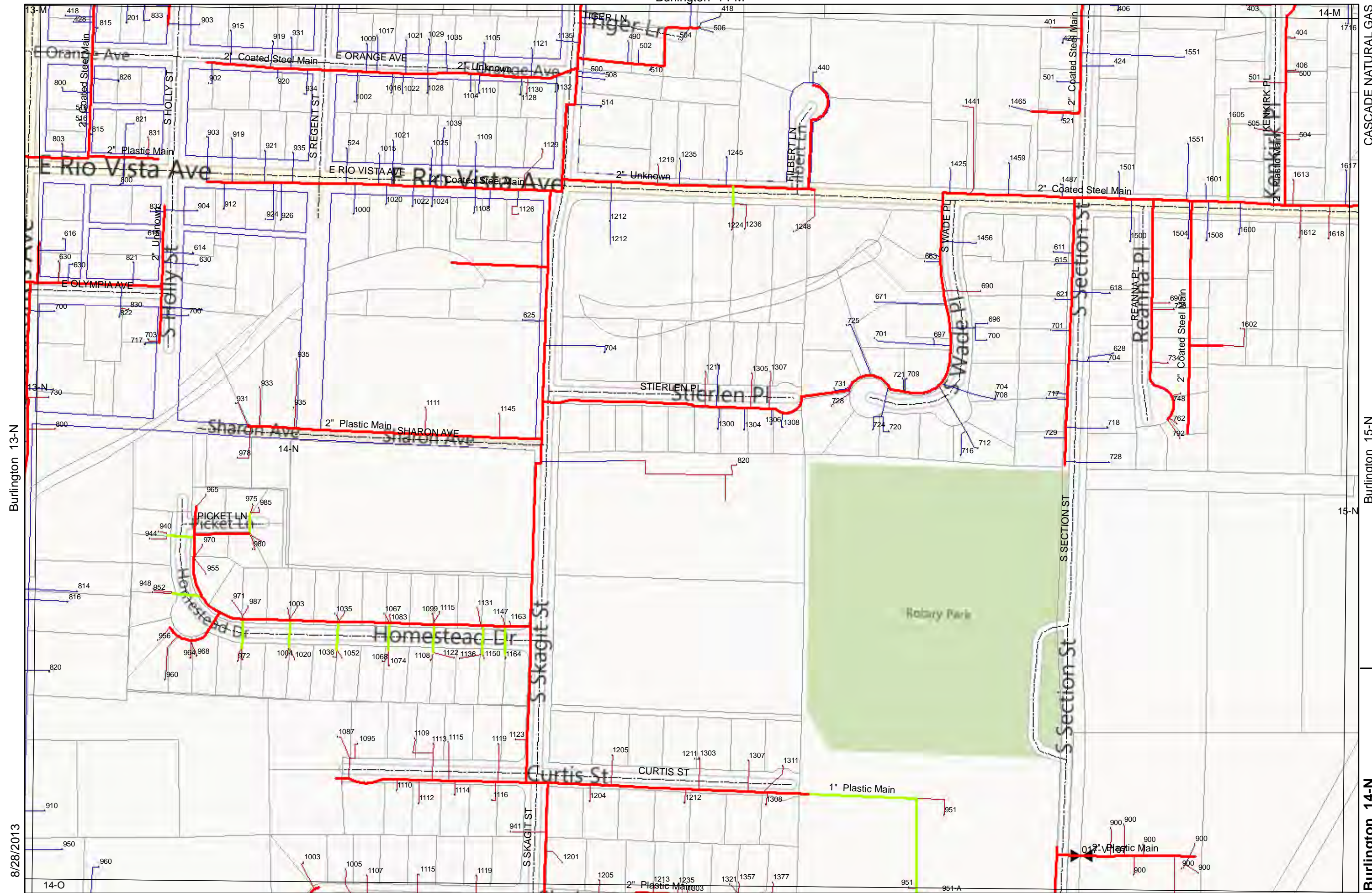
Burlington 15-K

8/28/2013



Burlington 14-L

Burlington 14-K



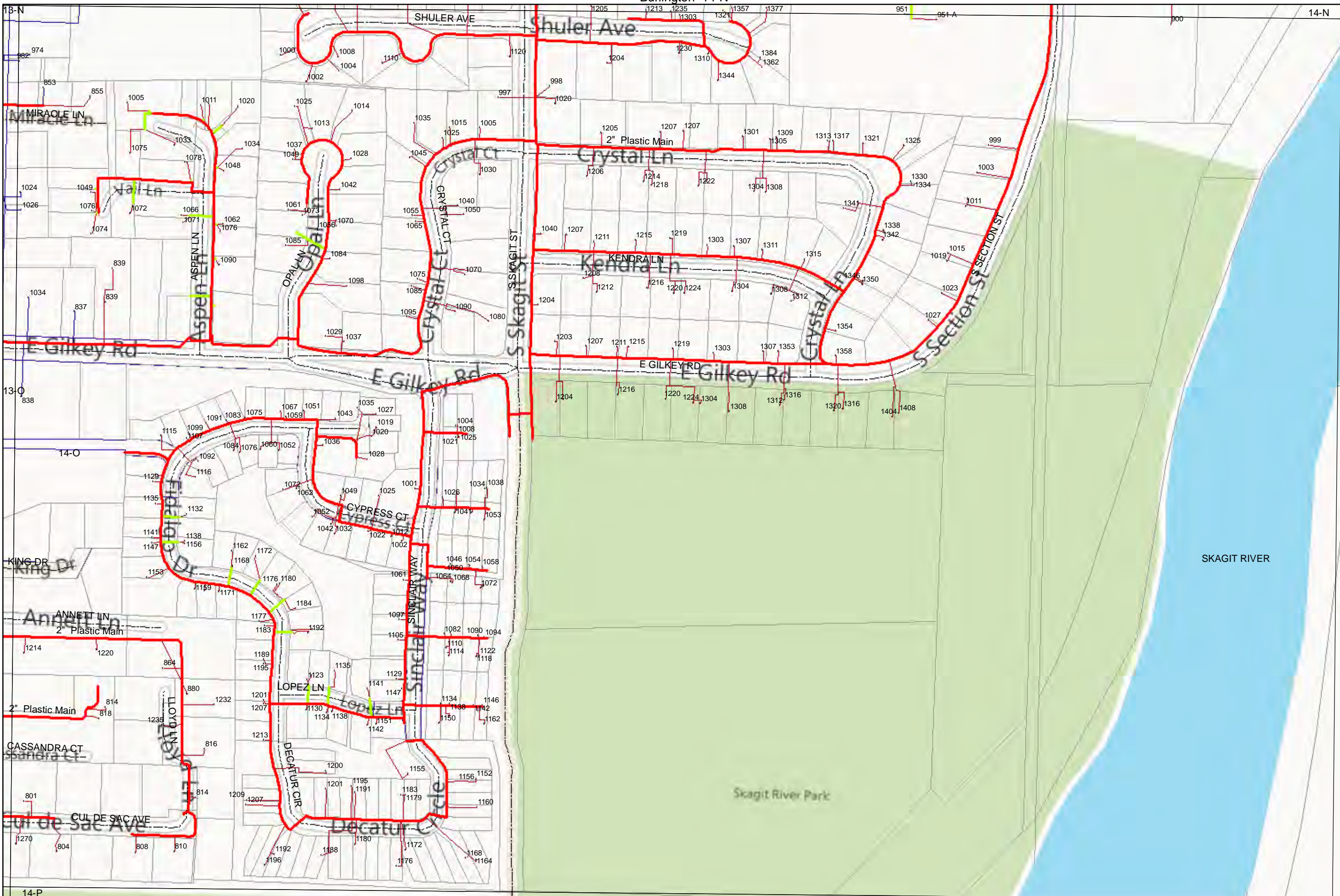
Burlington 13-N

Burlington 15-N

8/28/2013

Burlington 14-N





CASCADE NATURAL GAS  
 8113 W. GRANDRIDGE BLVD  
 KENNEWICK, WA 99336

None

Burlington 14-O

Burlington 13-O

8/28/2013





13-D

14-O

1370-A

1370

13-P

SKAGIT RIVER

14-P

Burlington 13-P

LINDGREN RD

None

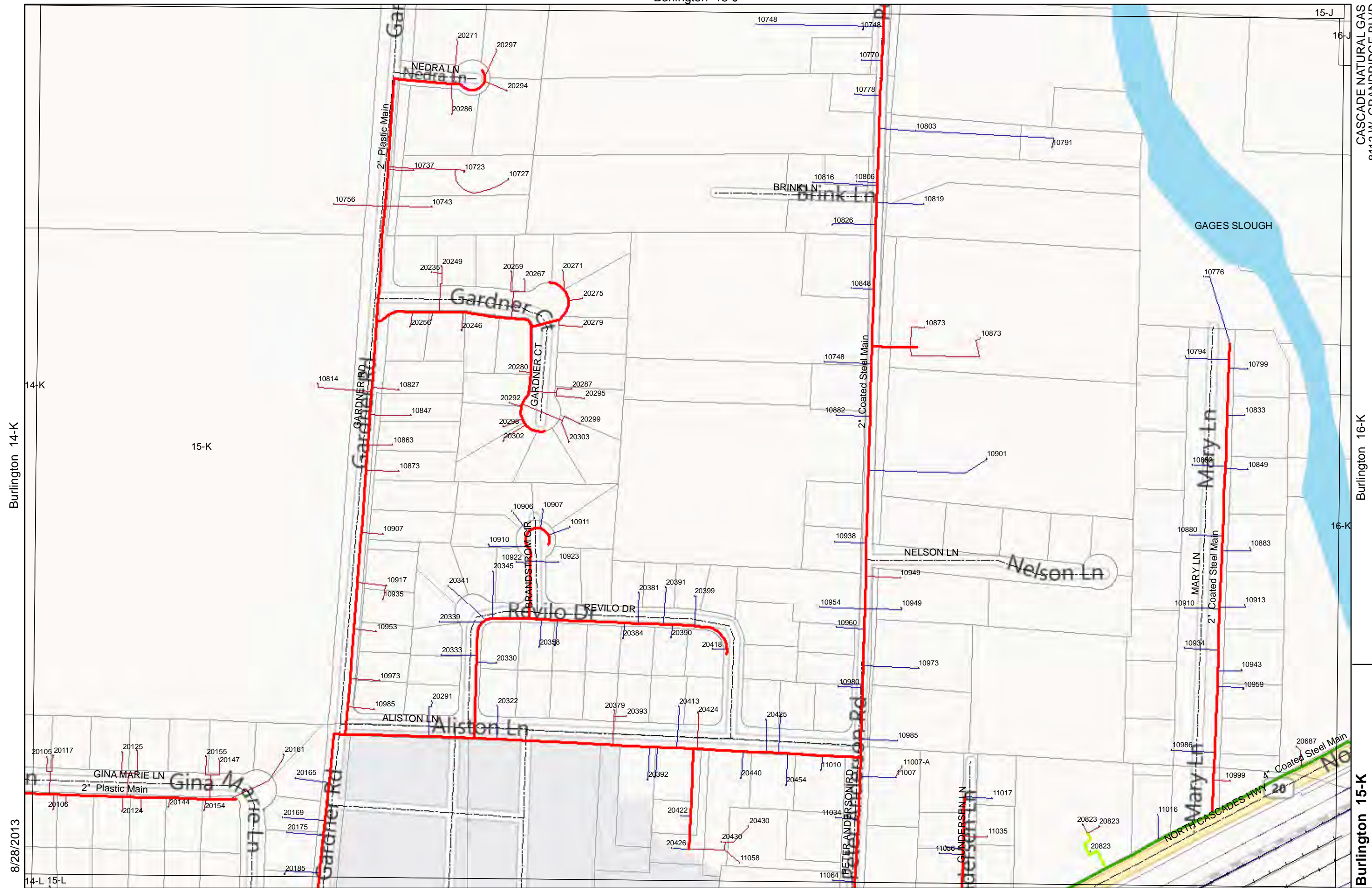
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13-Q

Burlington 14-P



None



Burlington 14-K

15-K

Burlington 16-K

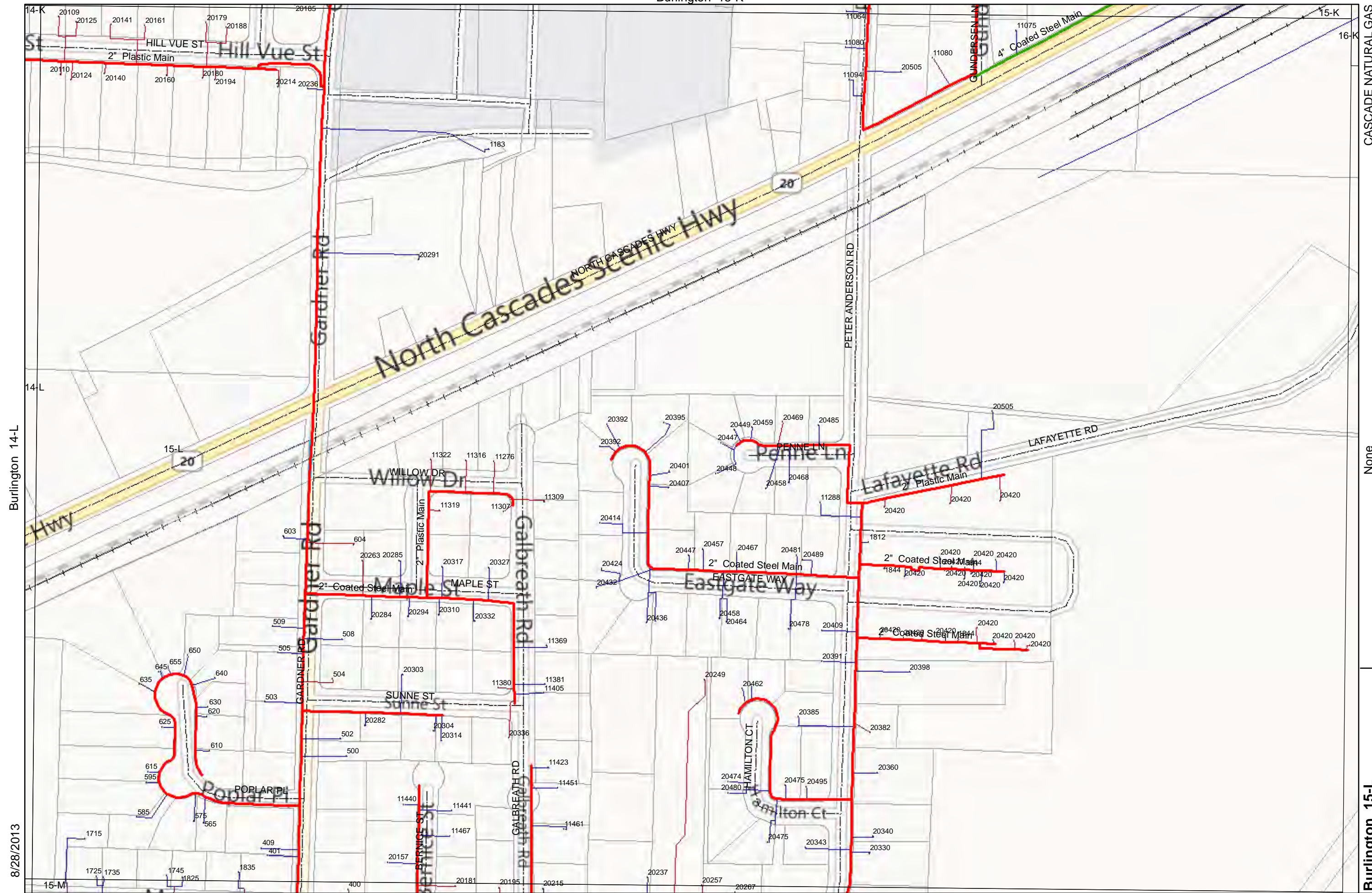
8/28/2013

14-L 15-L

Burlington 15-L

Burlington 15-K

0 250 500 1,000 Feet



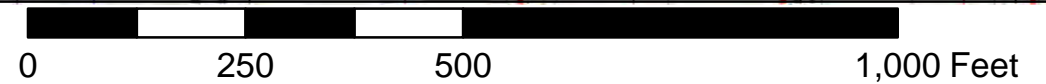
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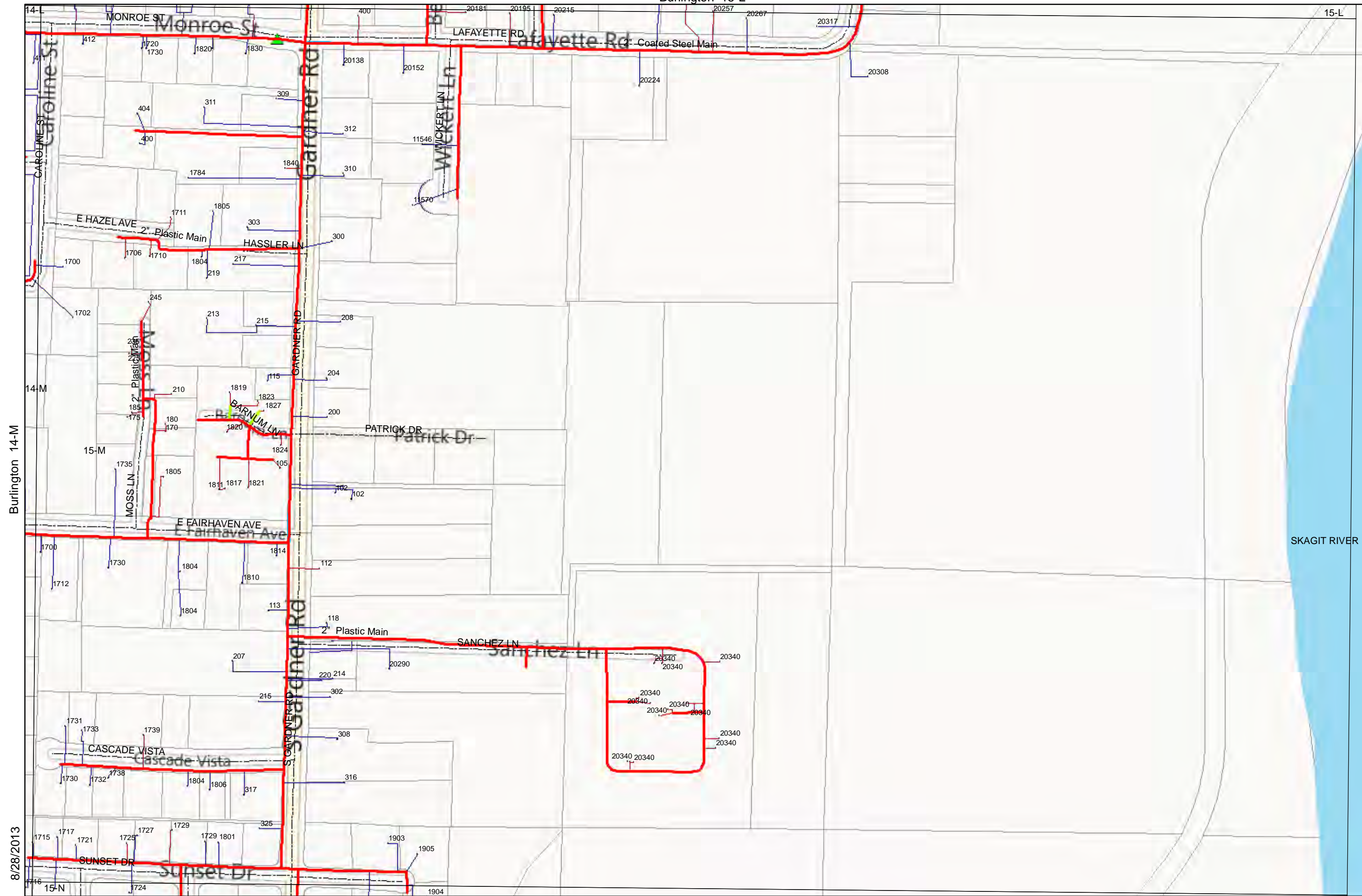
8/28/2013

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Burlington 15-L

CASCADE NATURAL GAS  
 8113 W. GRANDRIDGE BLVD  
 KENNEWICK, WA 99336





Burlington 14-M

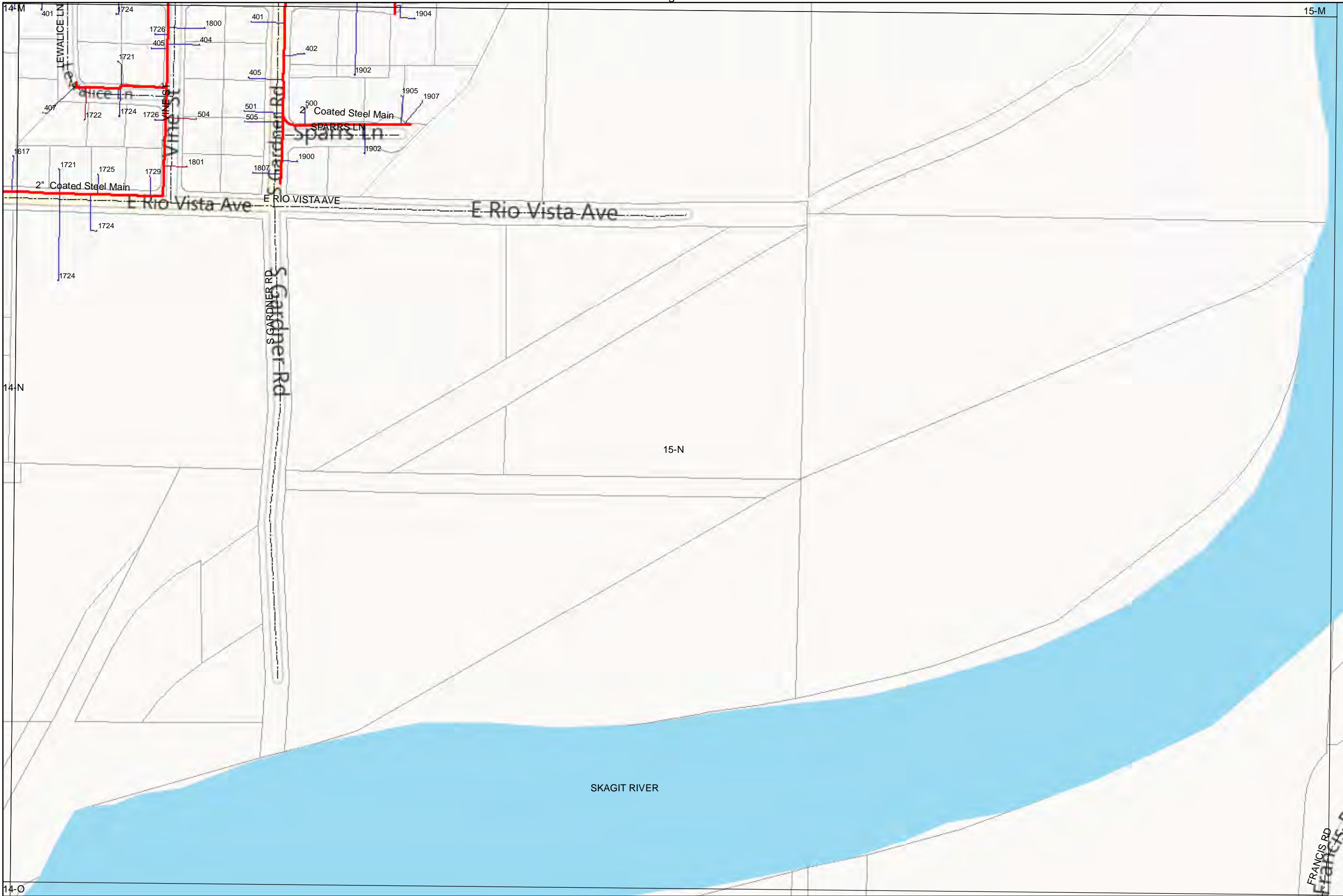
8/28/2013

SKAGIT RIVER

None

Burlington 15-M





Burlington 14-N

8/28/2013

0 250 500 1,000 Feet

15-N

SKAGIT RIVER

None

Burlington 15-N

CASCADE NATURAL GAS  
8113 W, GRANDRIDGE BLVD  
KENNEWICK, WA 99336

FRANCIS RD  
Francis Rd

Burlington 16-H

16-H

CASCADE NATURAL GAS  
8113 W, GRANDRIDGE BLVD  
KENNEWICK, WA 99336

Sedro-Woolley 2-J

Burlington 16-I

Burlington 16-J

None

8/28/2013

0 250 500 1,000 Feet











Burlington 16-1

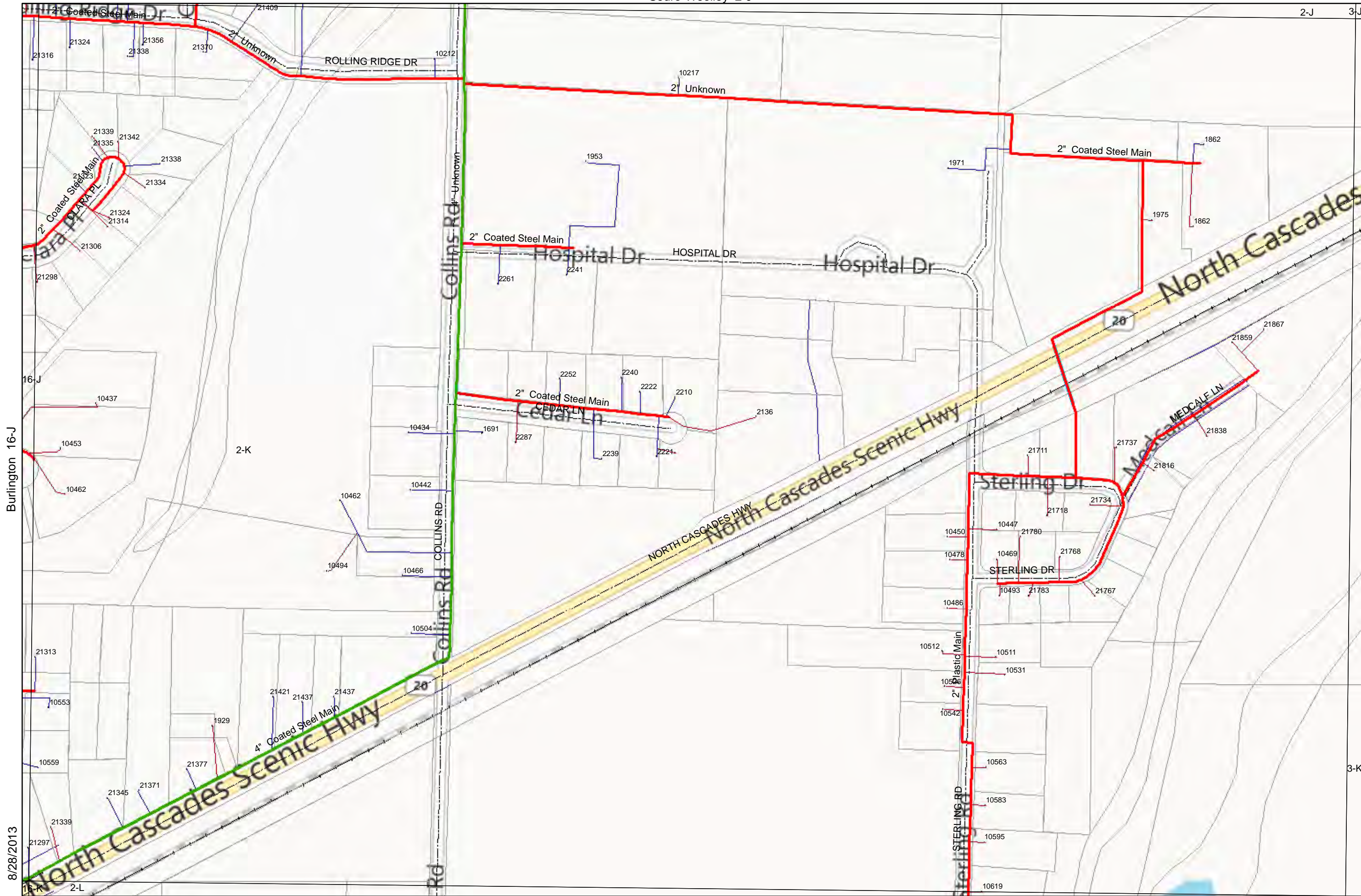
8/28/2013

0 250 500 1,000 Feet

Sedro-Woolley 2-K

Sedro-Woolley 3-J

Sedro-Woolley 2-J

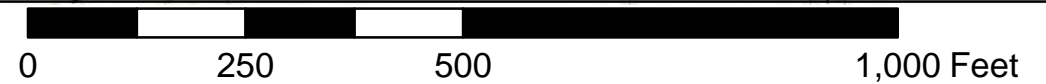


Burlington 16-J

8/28/2013

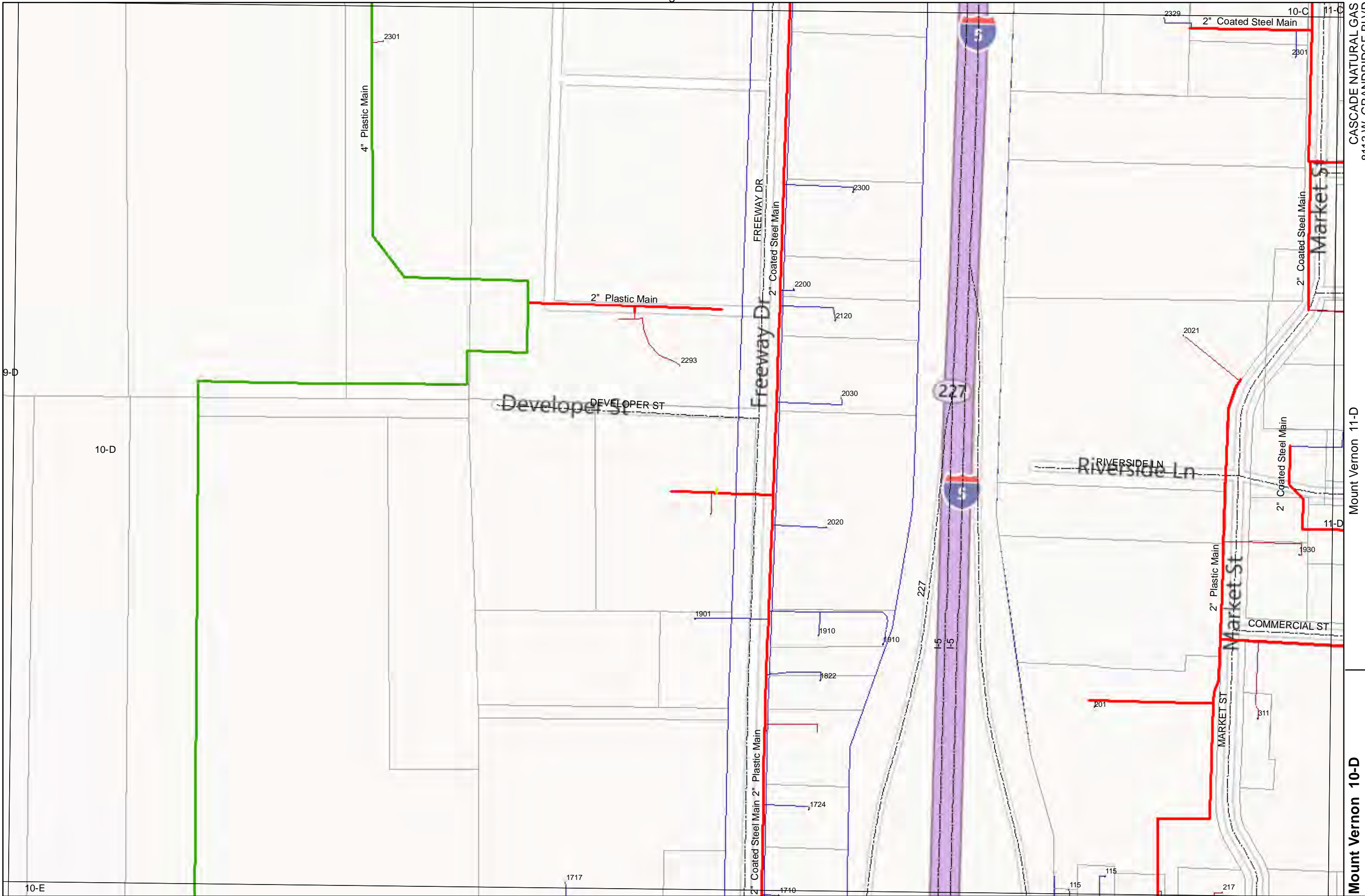
Sedro-Woolley 3-K

Sedro-Woolley 2-K



Mount Vernon 9-D

8/28/2013



0 250 500 1,000 Feet

Mount Vernon 10-E

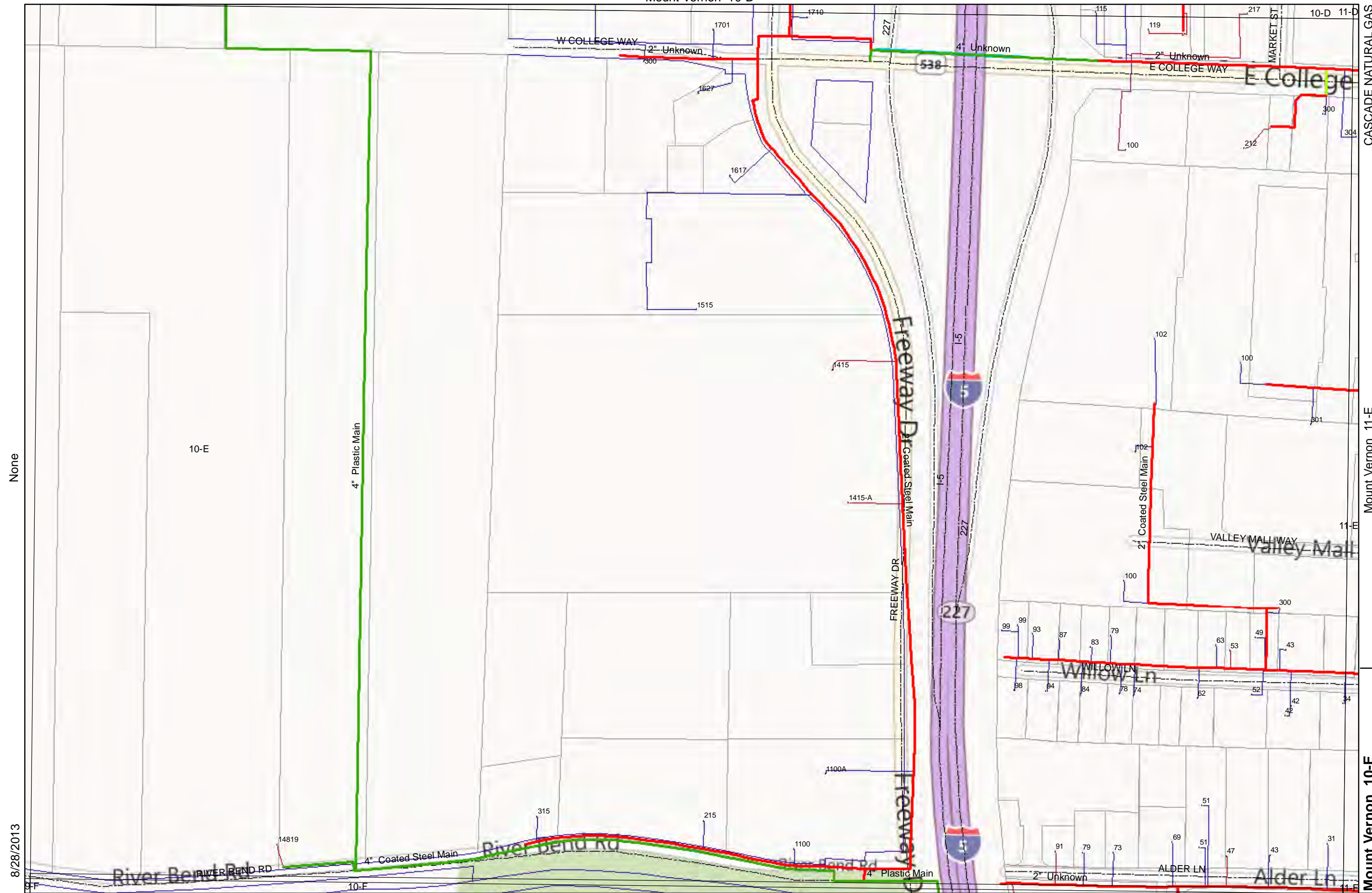
Mount Vernon 10-D

Mount Vernon 11-D

CASCADE NATURAL GAS  
8113 W, GRANDRIDGE BLVD  
KENNEWICK, WA 99336

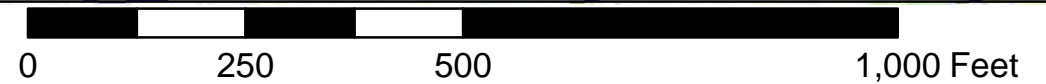
Mount Vernon 10-D

CASCADE NATURAL GAS  
8113 W, GRANDRIDGE BLVD  
KENNEWICK, WA 99336



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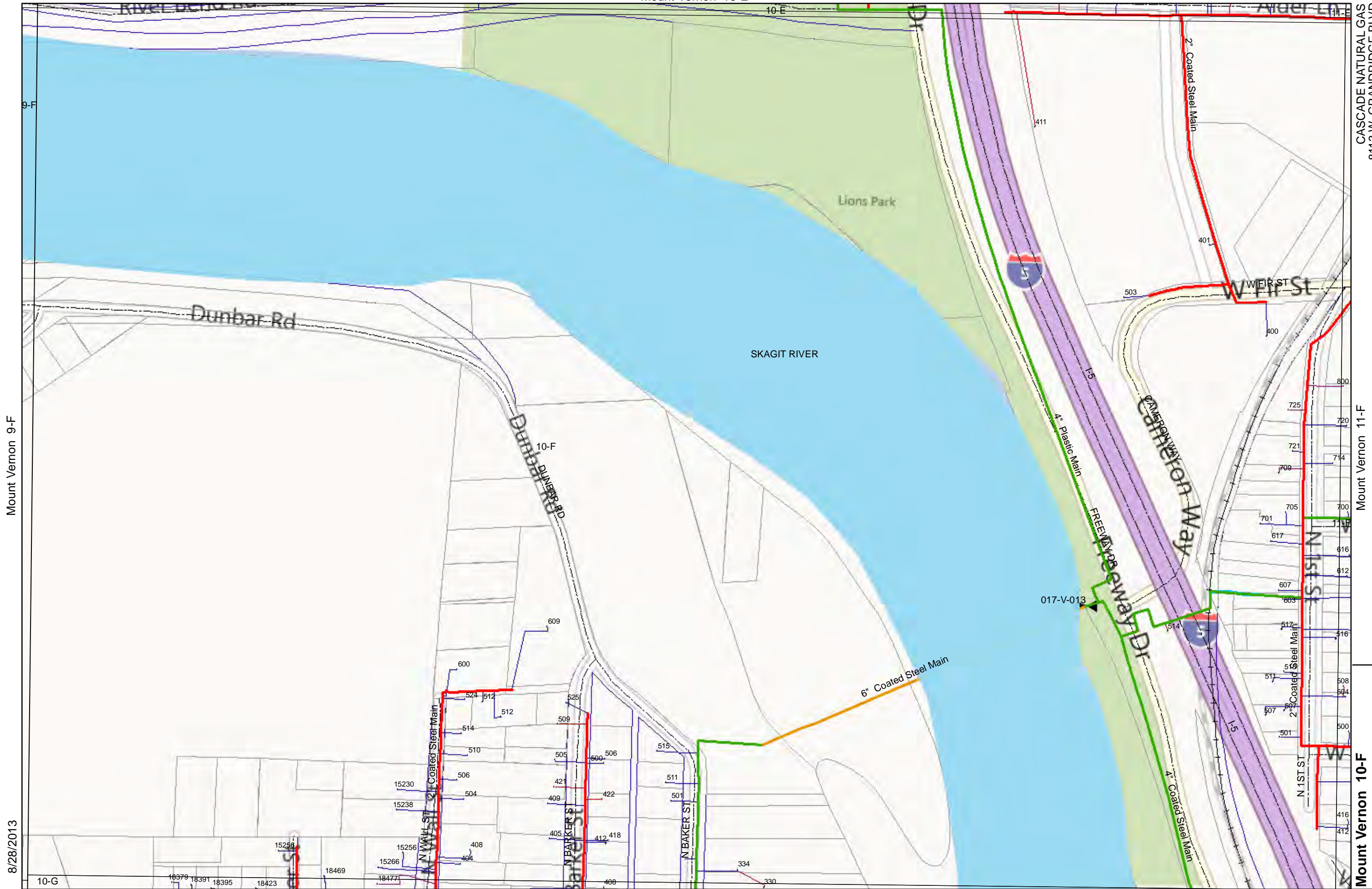
8/28/2013



Mount Vernon 10-F

Mount Vernon 11-E

Mount Vernon 10-E



Mount Vernon 9-F

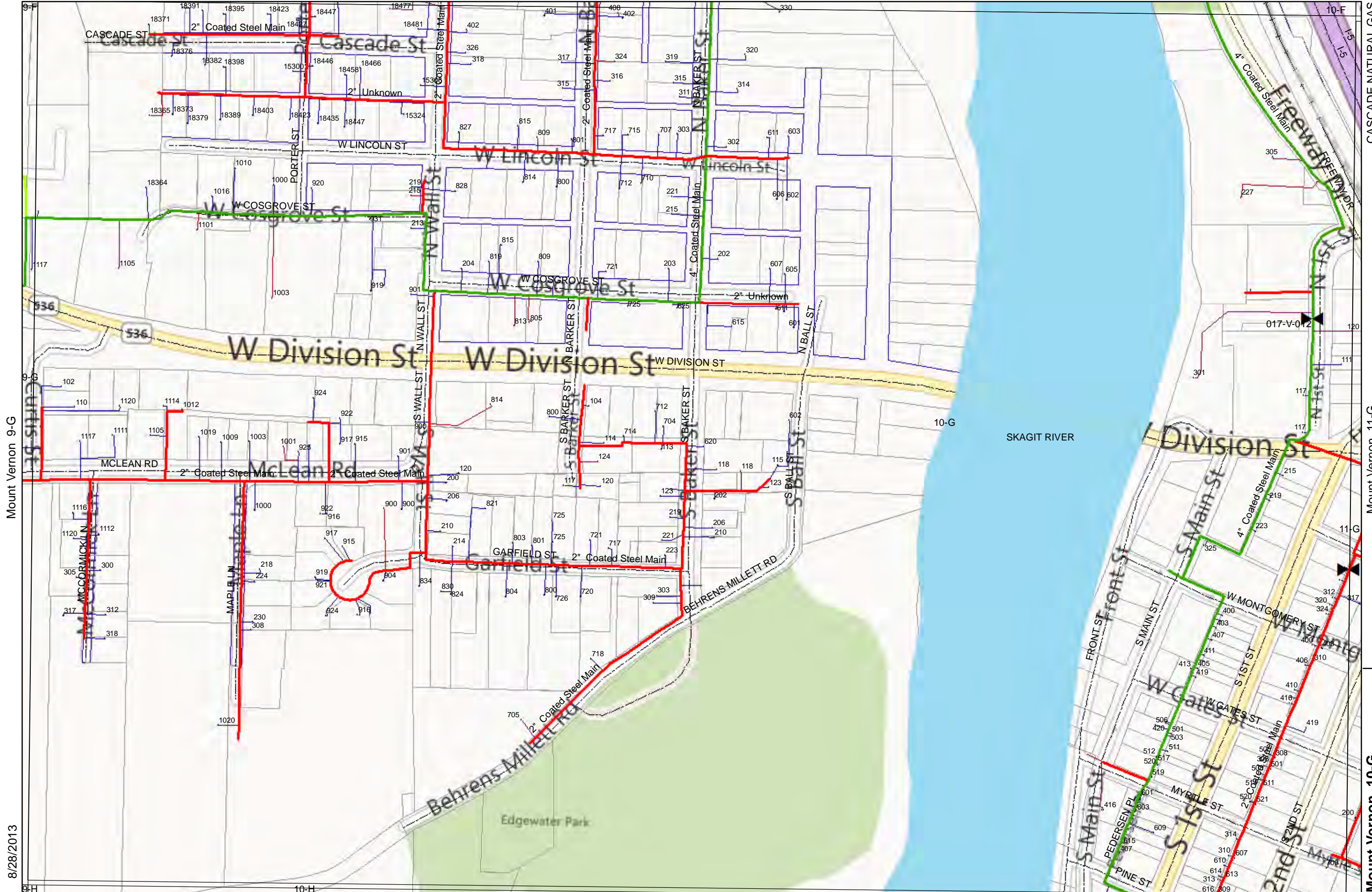
Mount Vernon 11-F

8/28/2013

Mount Vernon 10-F

Mount Vernon 10-G

0 250 500 1,000 Feet



Mount Vernon 9-G

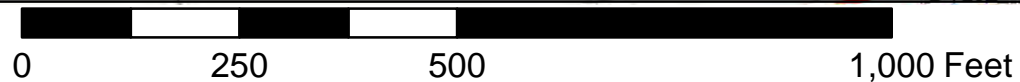
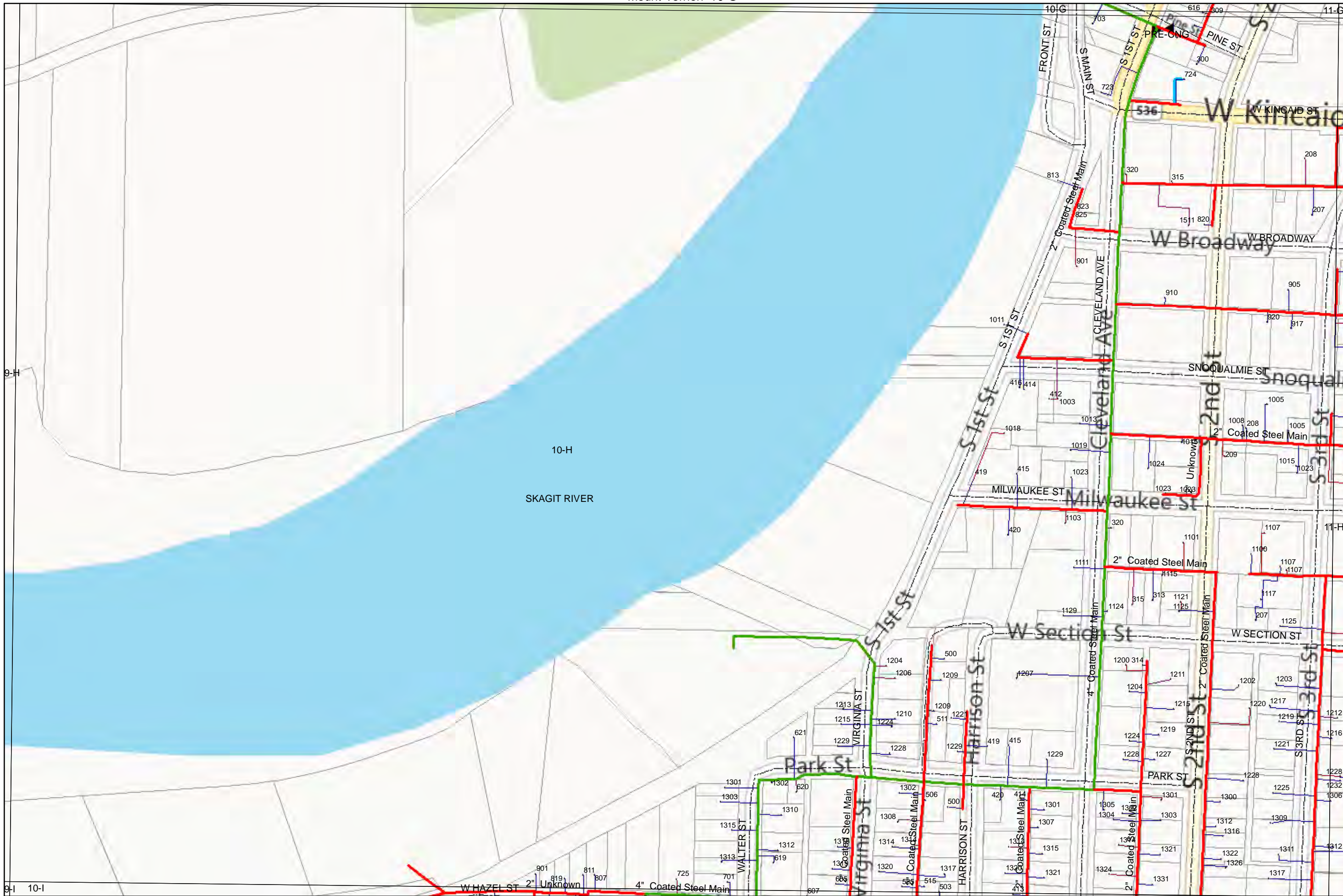
Mount Vernon 11-G

8/28/2013

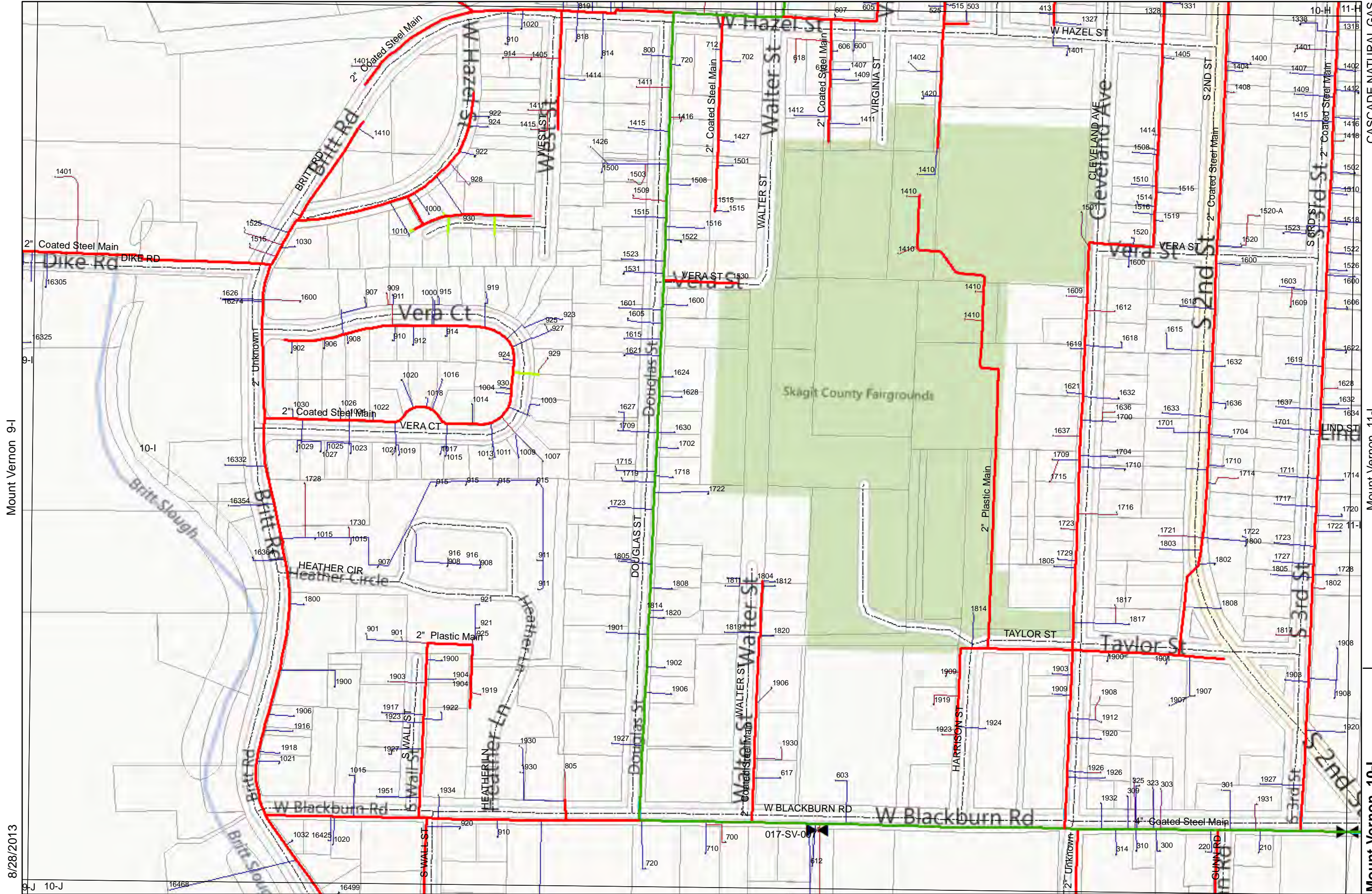
Mount Vernon 10-G

0 250 500 1,000 Feet

CASCADE NATURAL GAS  
8113 W, GRANDRIDGE BLVD  
KENNEWICK, WA 99336



Mount Vernon 10-H



Mount Vernon 9-I

Mount Vernon 10-I

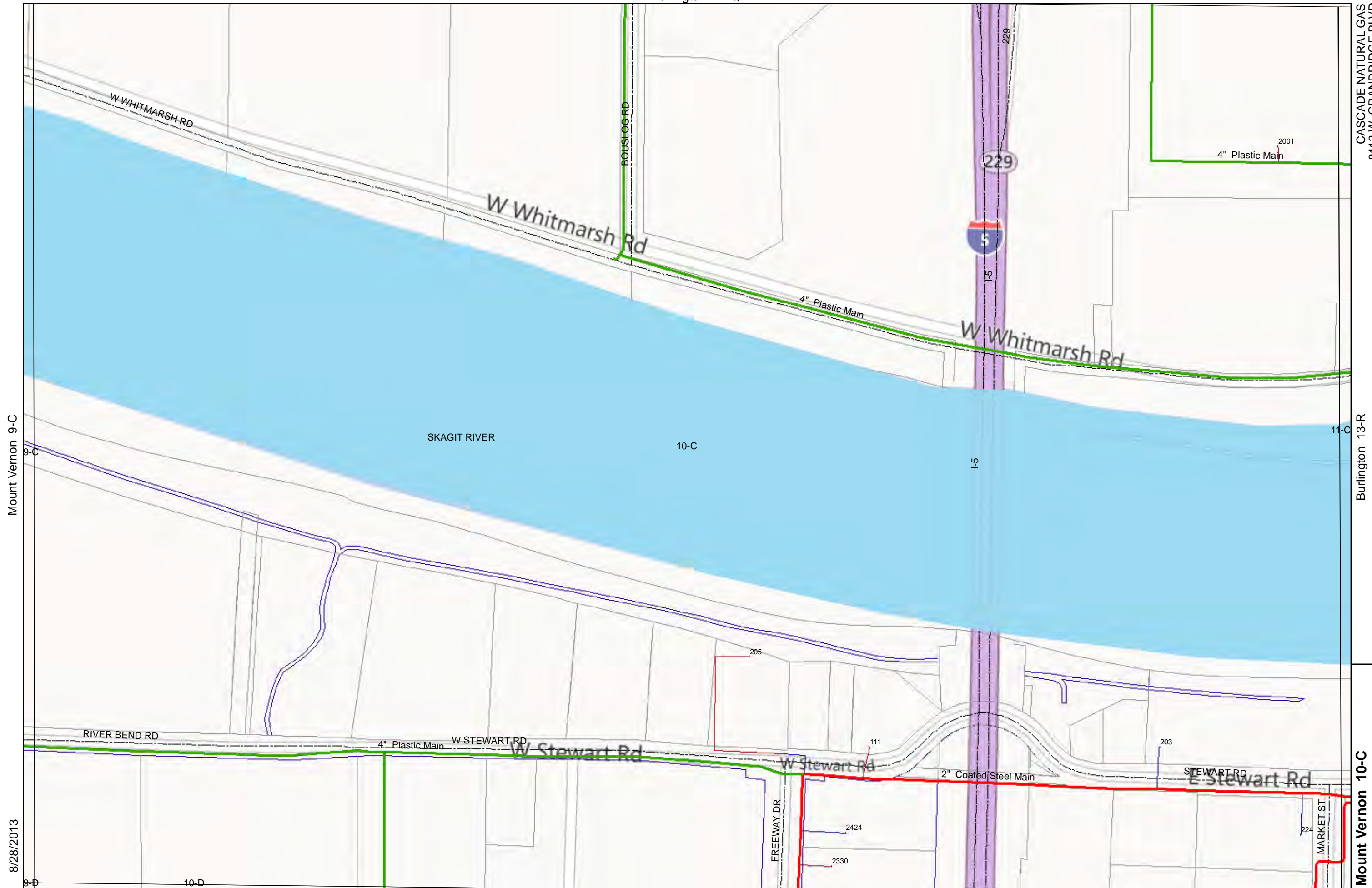
8/28/2013

Mount Vernon 10-J



CASCADE NATURAL GAS  
 8113 W. GRANDRIDGE BLVD  
 KENNEWICK, WA 99336





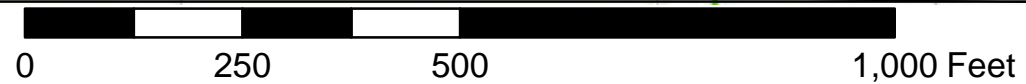
Mount Vernon 9-C

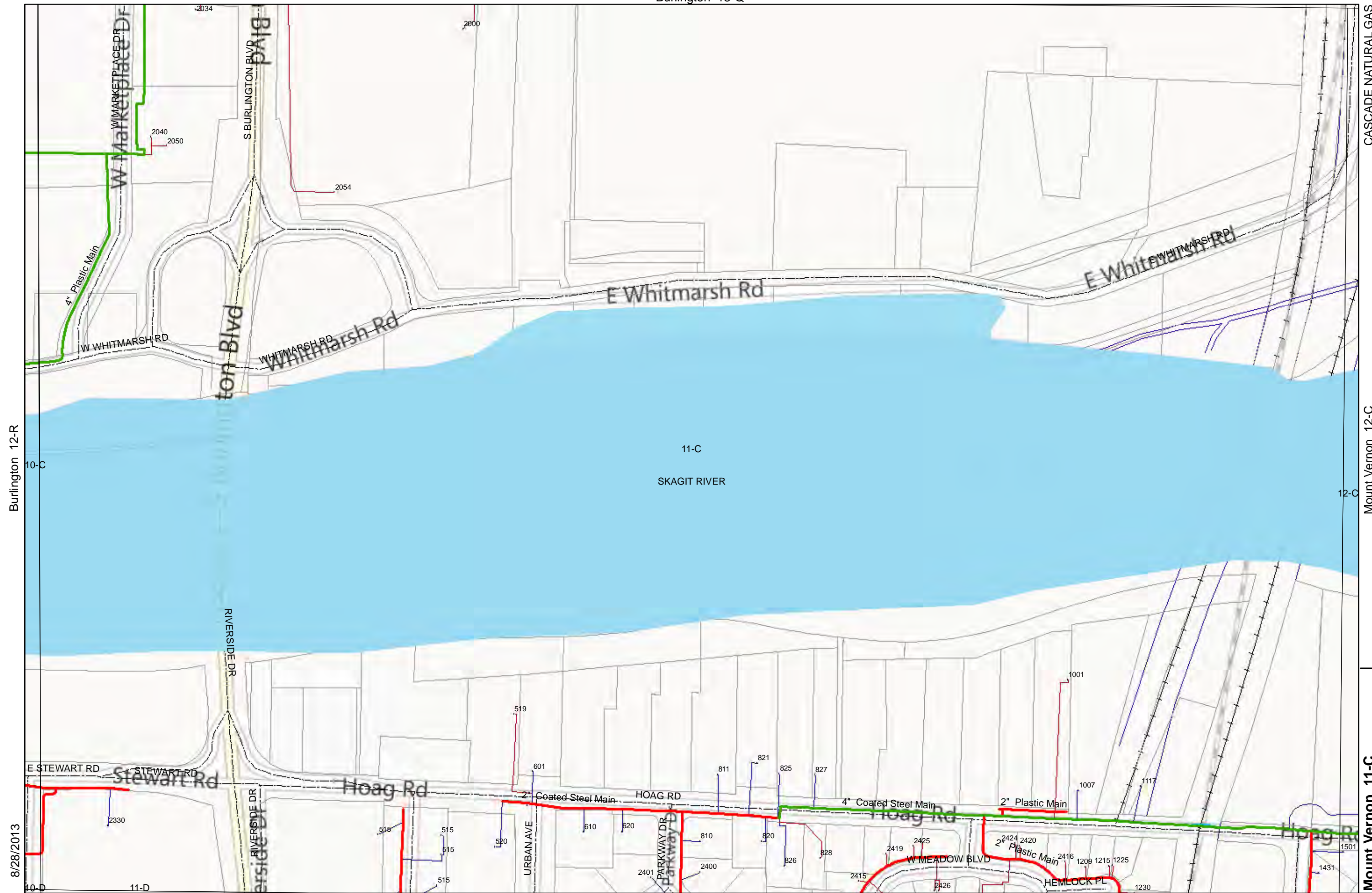
Burlington 13-R

8/28/2013

Mount Vernon 10-C

Mount Vernon 10-D





Burlington 12-R

8/28/2013



Mount Vernon 11-D

Mount Vernon 12-C

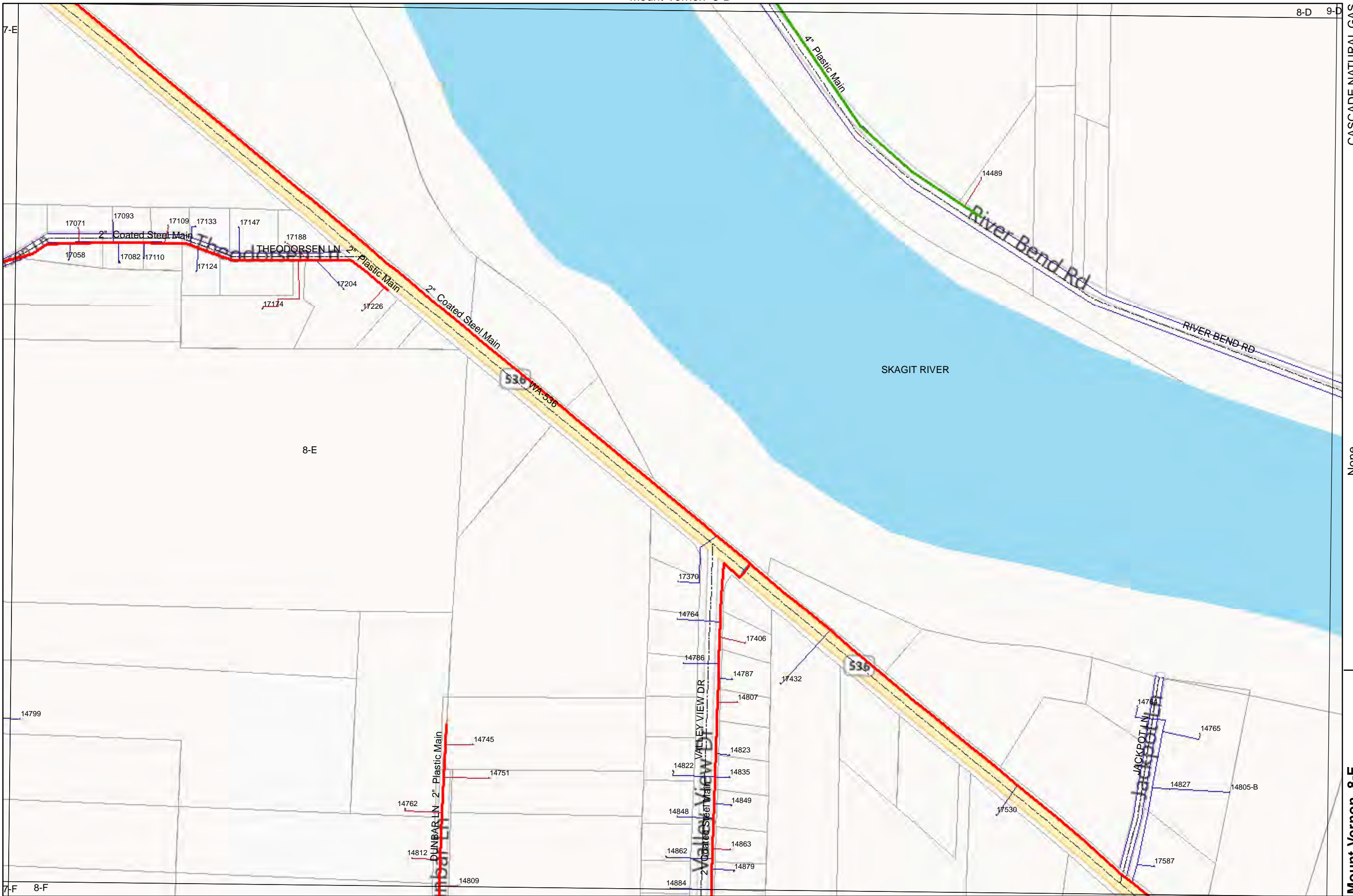
Mount Vernon 11-C

Mount Vernon 7-E

None

8/28/2013

Mount Vernon 8-E







SKAGIT RIVER

9-H 10-H

CASCADE NATURAL GAS  
8113 W, GRANDRIDGE BLVD  
KENNEWICK, WA 99336

None

9-I

Mount Vernon 10-I

10-I

Mount Vernon 9-I

8/28/2013

9-J

Mount Vernon 9-J

0 250 500 1,000 Feet



None

8/28/2013

9-K

Mount Vernon 10-J

10-J

Mount Vernon 9-J

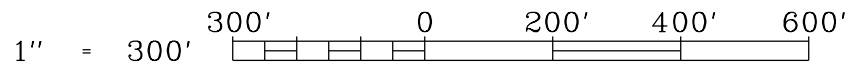
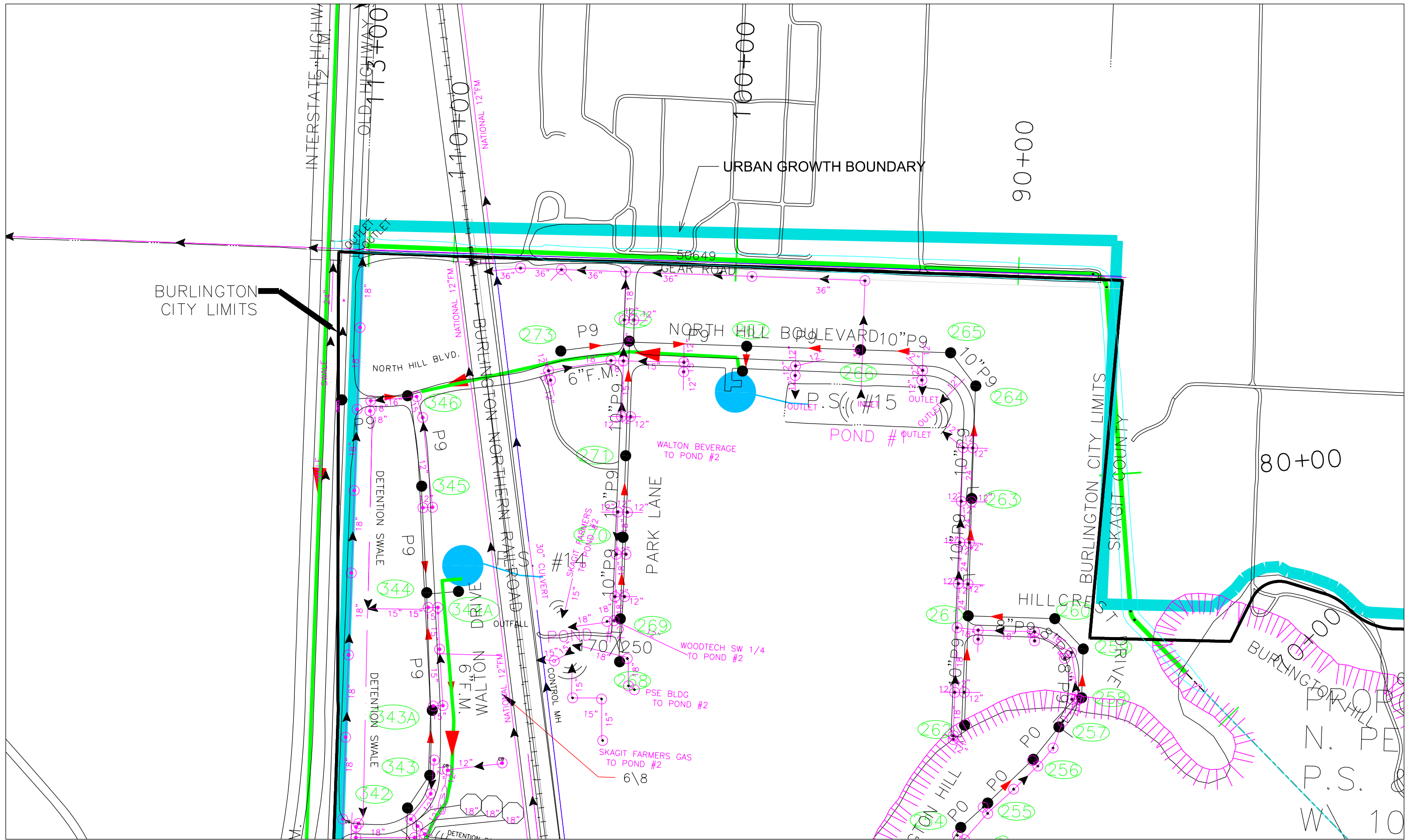
Mount Vernon 9-K



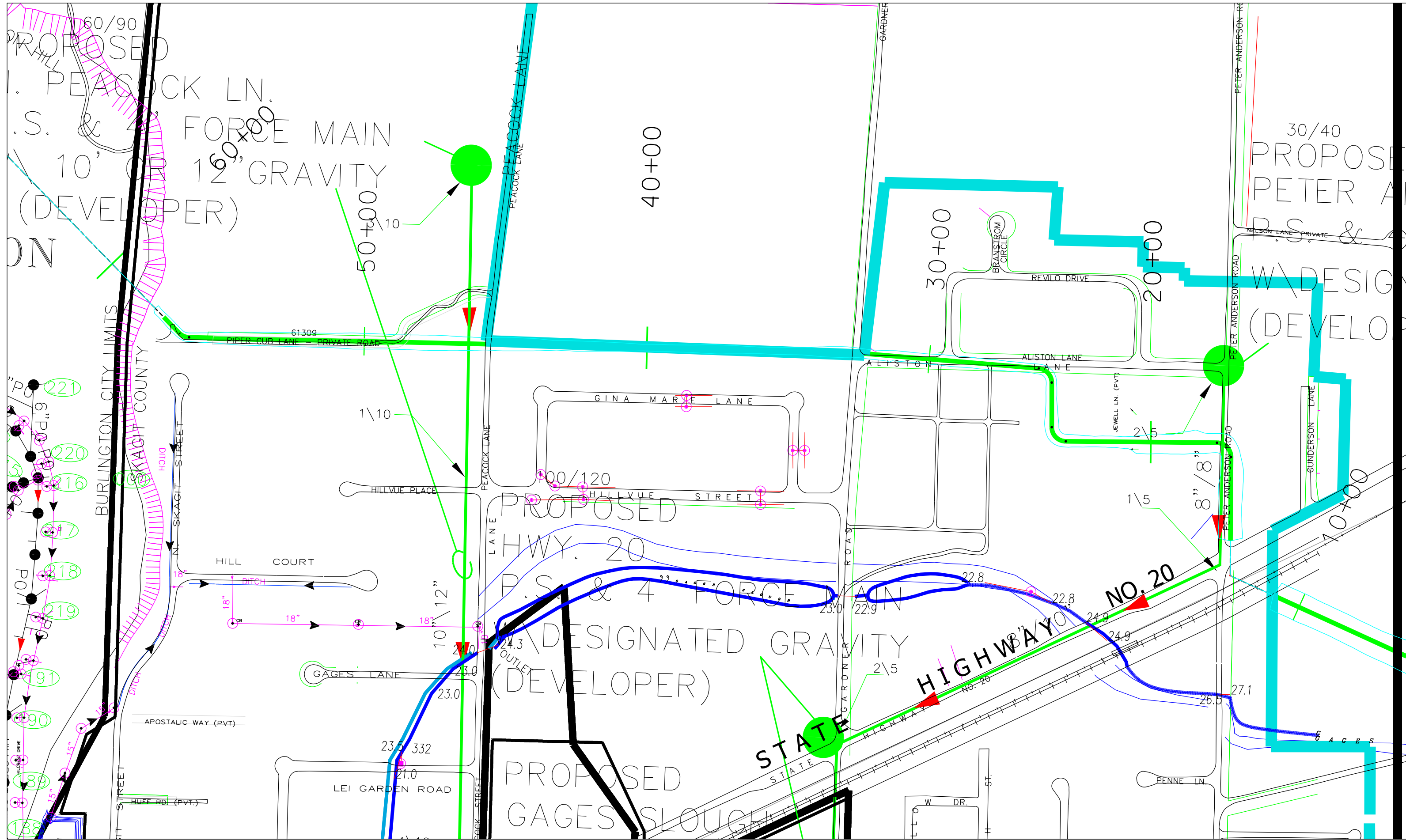
0 250 500 1,000 Feet

The City of Burlington storm and sanitary dwg data were overlayed onto the Skagit CADD files.  
The information is from the city wide infrastructure maps. As-Builts of projects in the areas are also available.

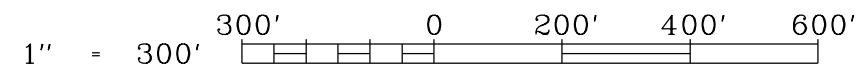


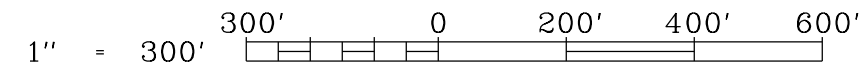
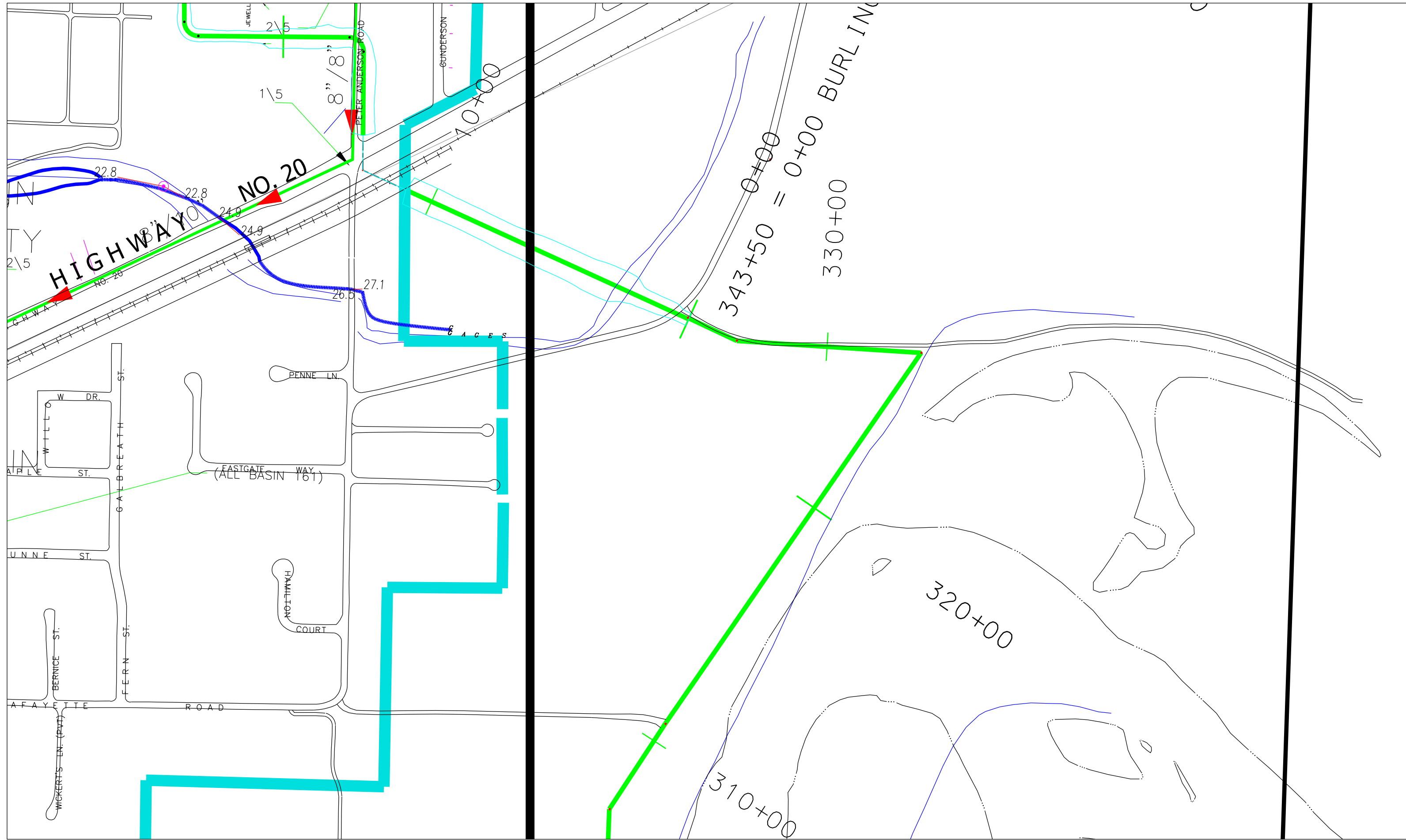


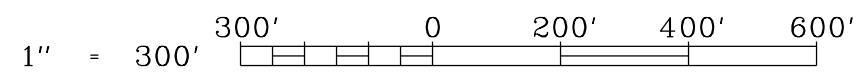
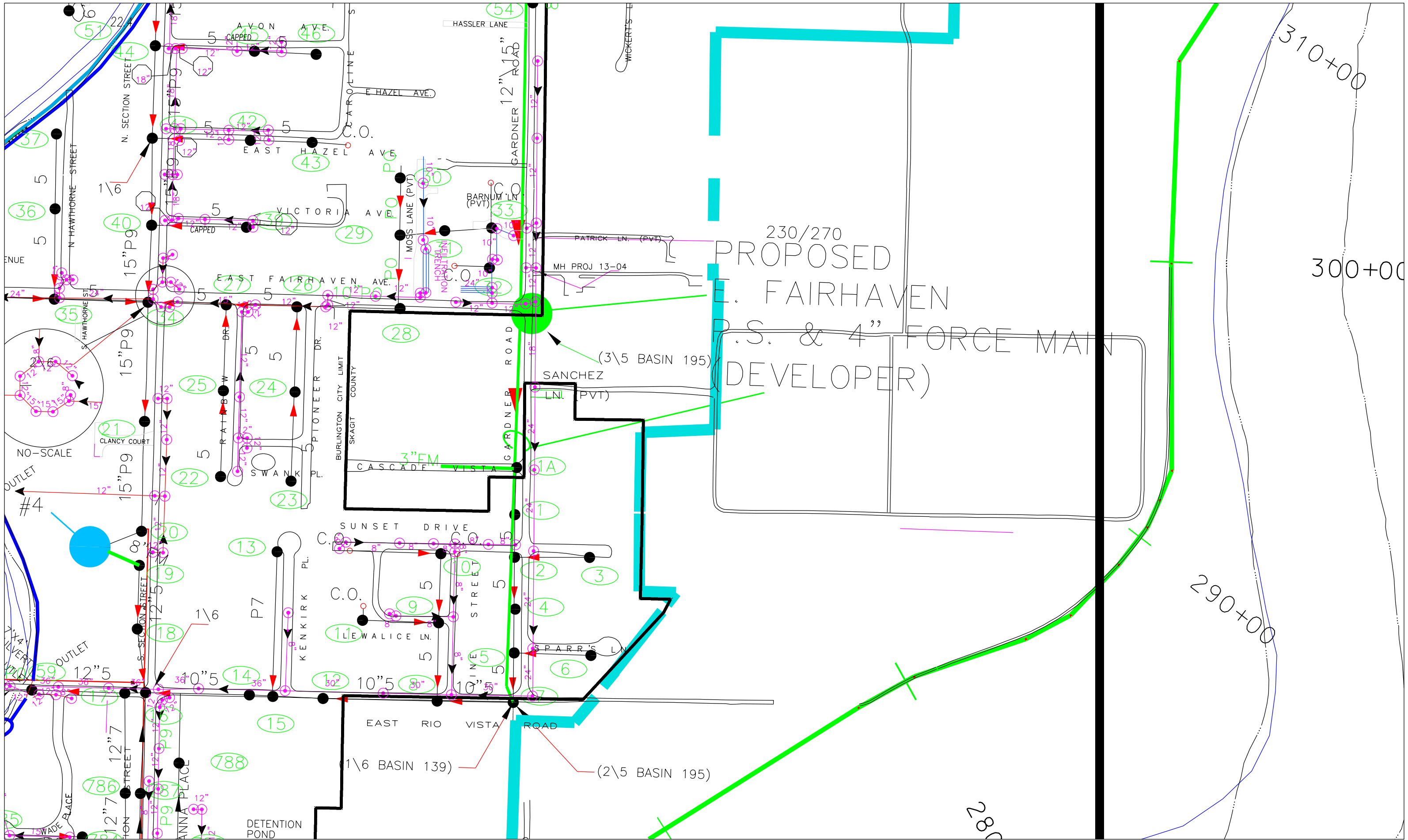
DATA FROM CITY OF BURLINGTON  
 DWG FILES, LOCATIONS ARE APPROXIMATE



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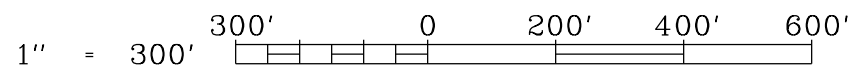
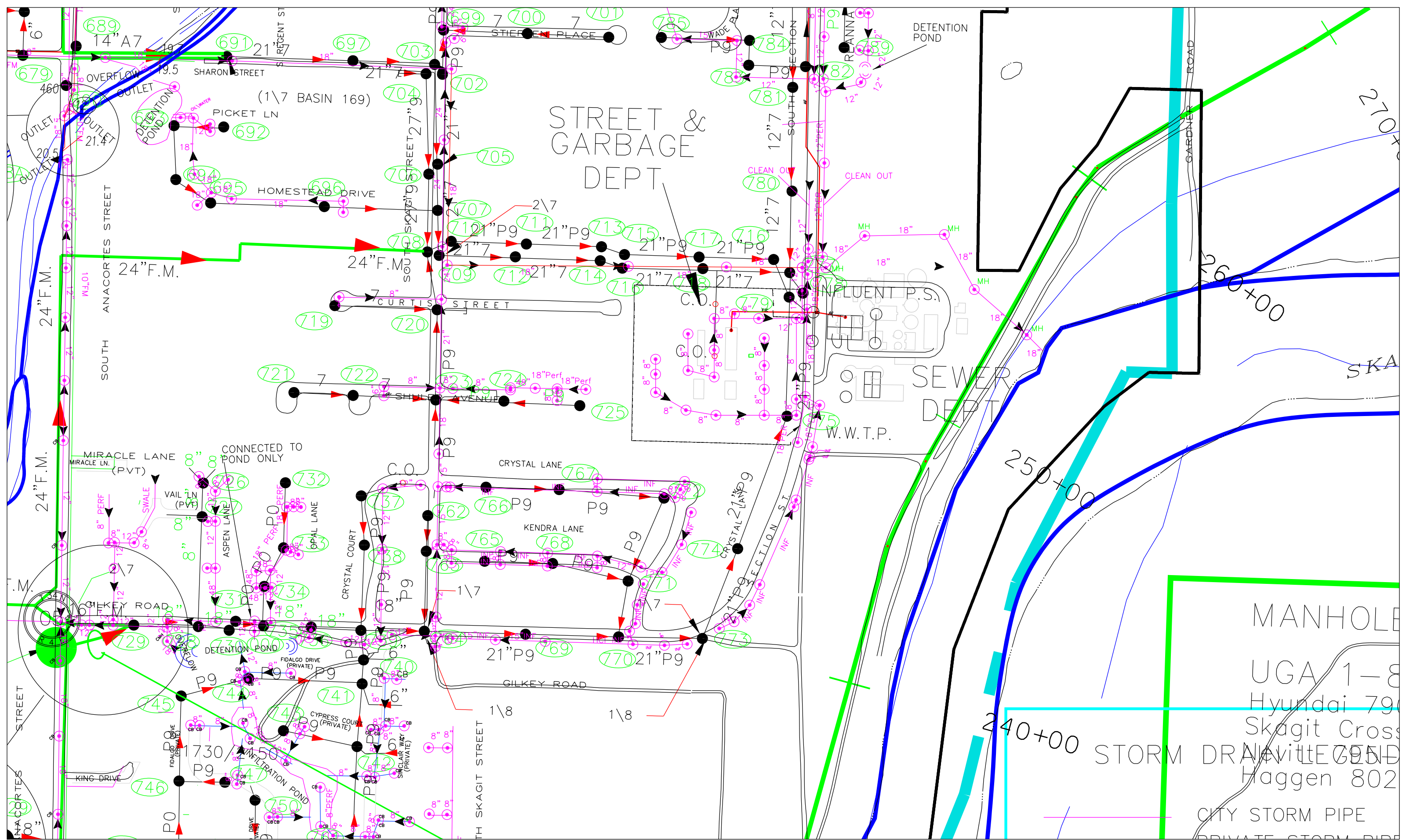




300+00

290+00

280

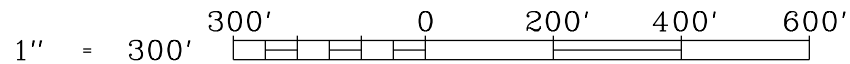
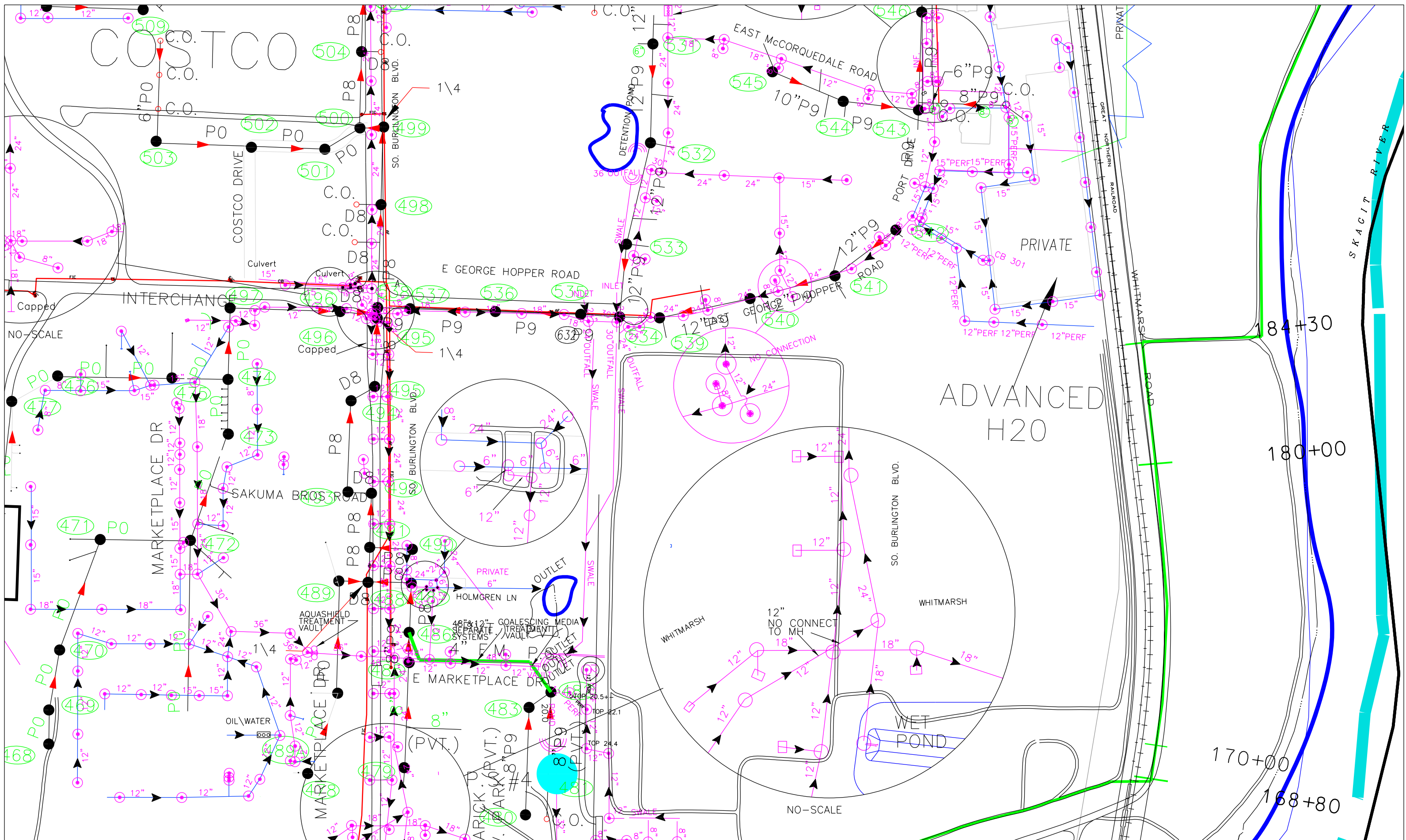


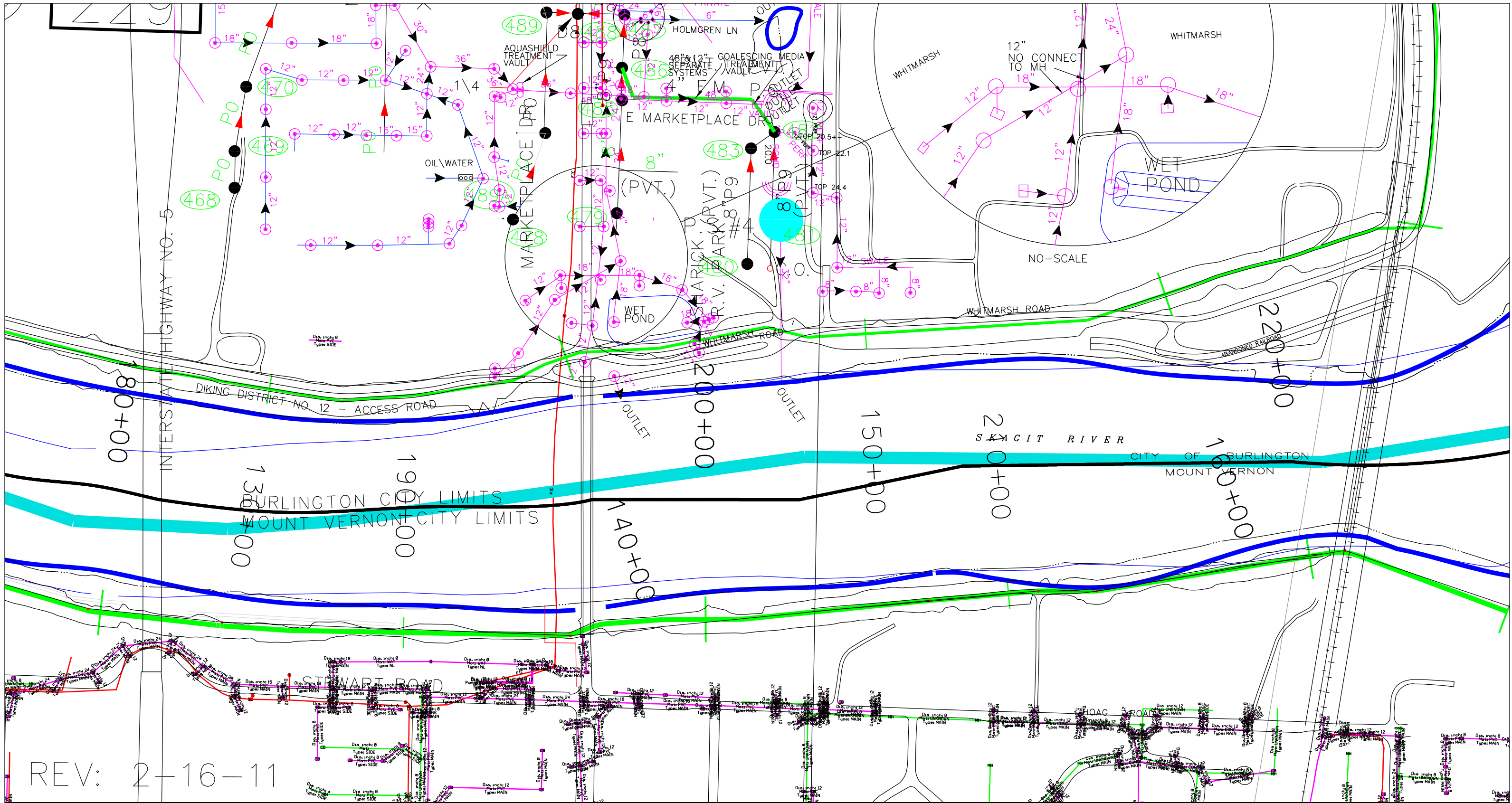
MANHOLE  
 UGA 1-8  
 Hyundai 79  
 Skagit Cross  
 Nevitte 801  
 Haggan 802

240+00 STORM DRAIN

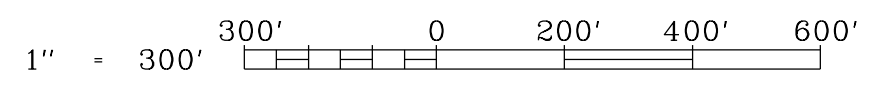
CITY STORM PIPE  
 PRIVATE STORM PIPE







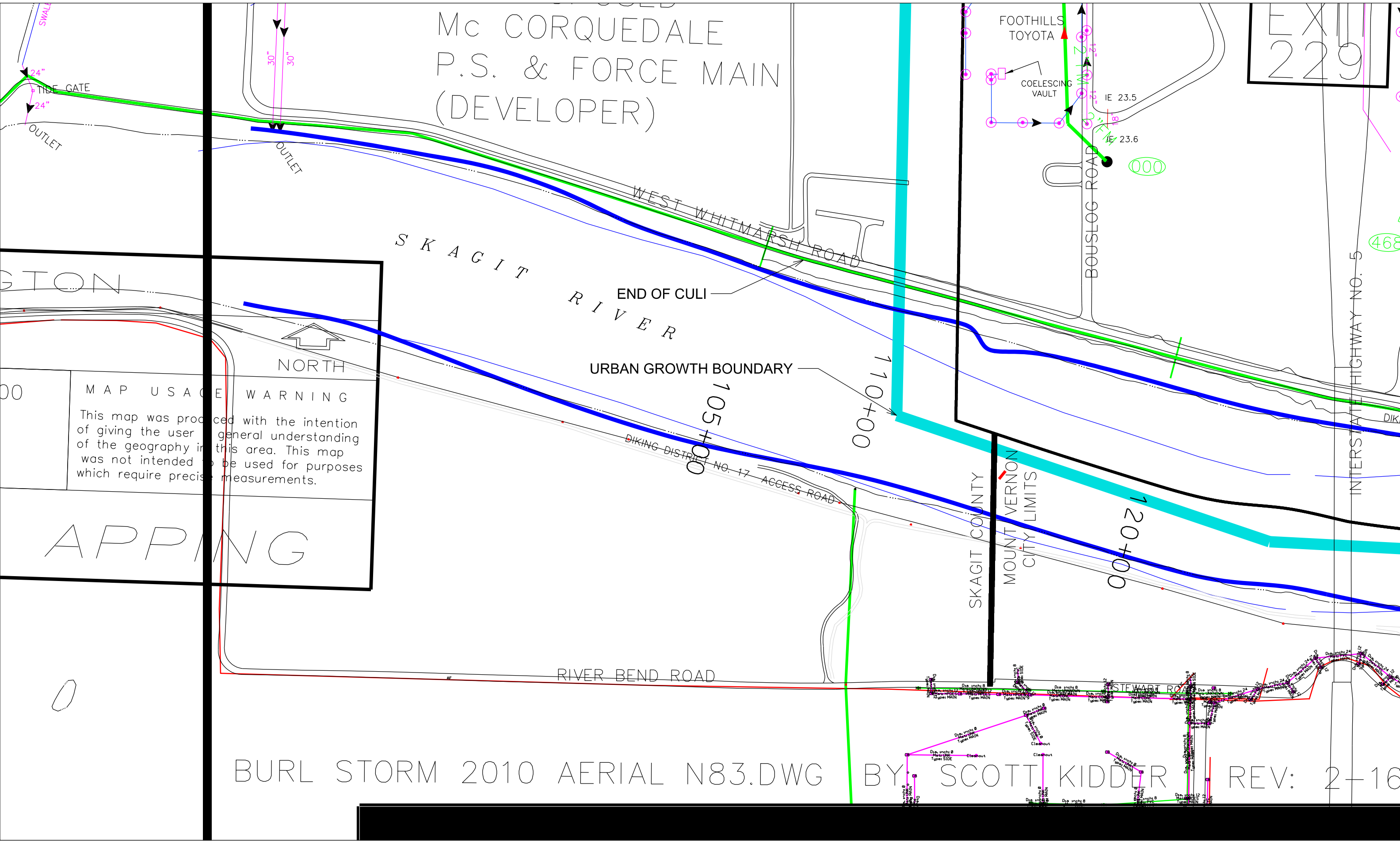
REV: 2-16-11





Mc CORQUEDALE  
P.S. & FORCE MAIN  
(DEVELOPER)

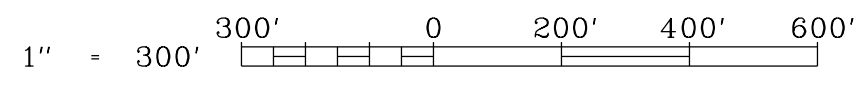
EX 111  
229

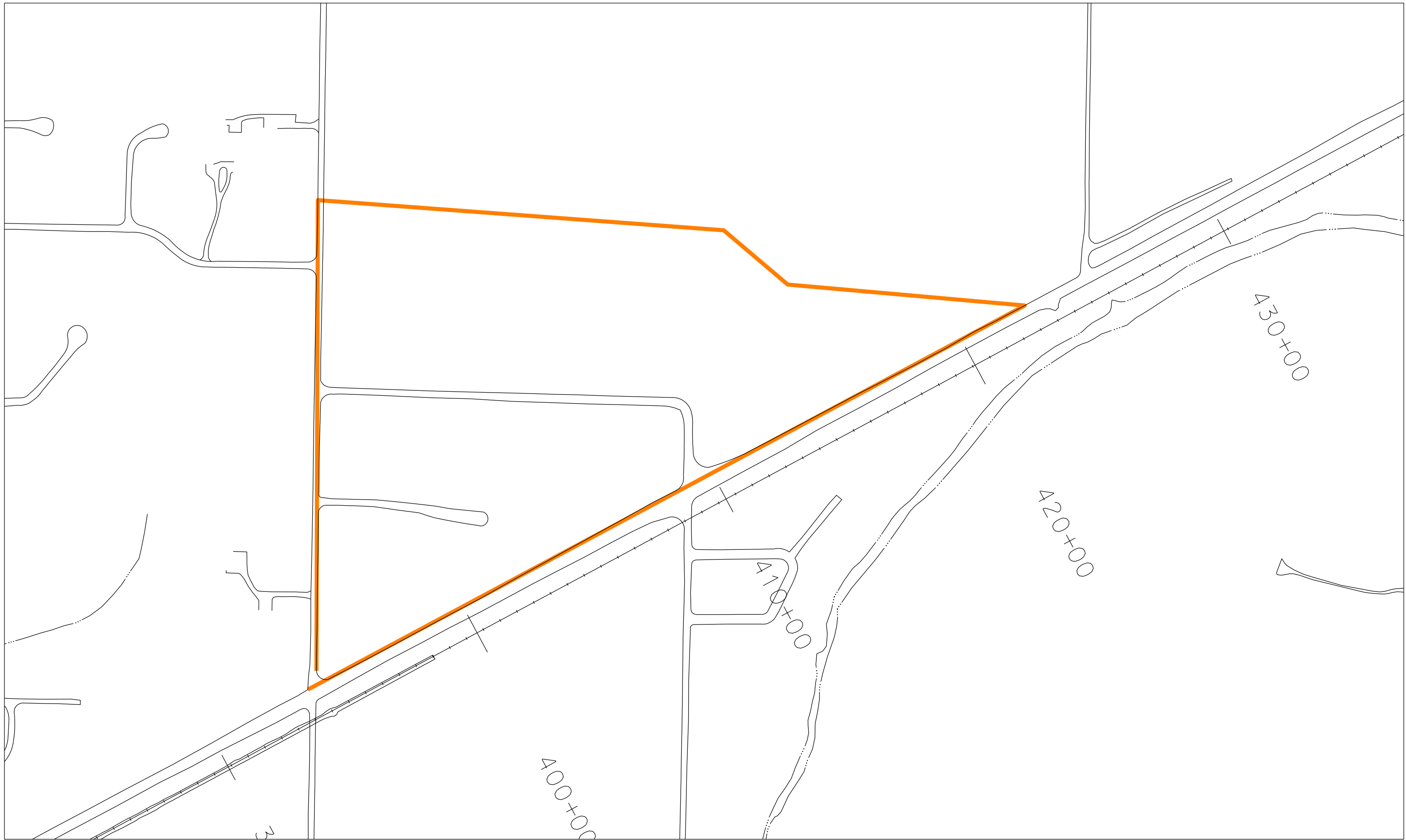


MAP USAGE WARNING  
This map was produced with the intention of giving the user a general understanding of the geography in this area. This map was not intended to be used for purposes which require precise measurements.

APPENDING

BURL STORM 2010 AERIAL N83.DWG BY SCOTT KIDDER REV: 2-16



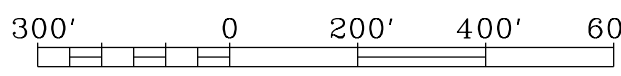


1" = 300'

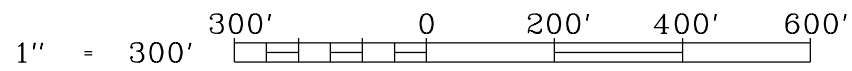
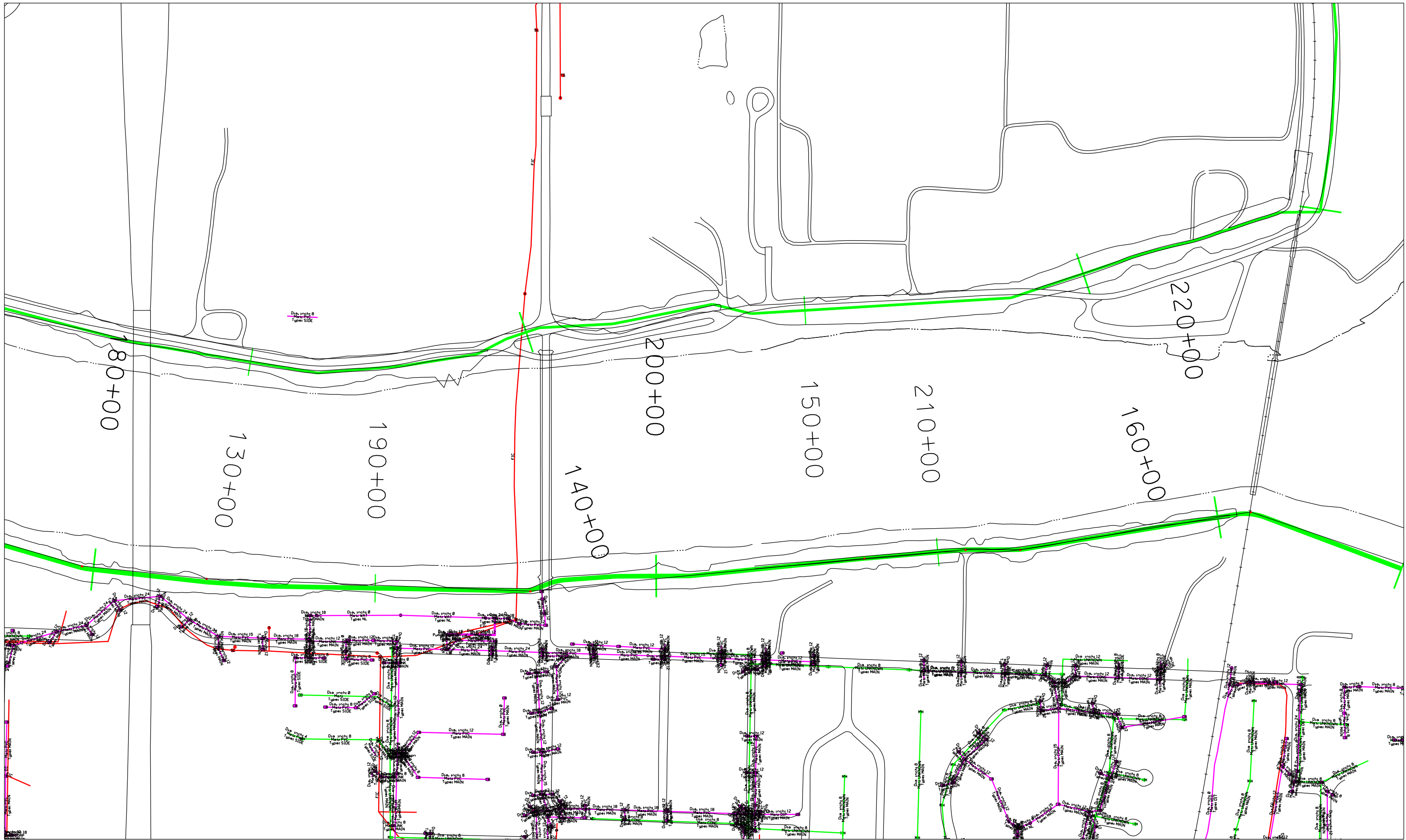
300' 0 200' 400' 600'

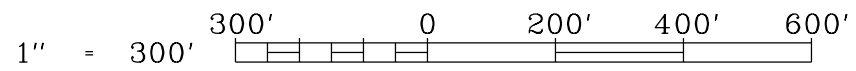
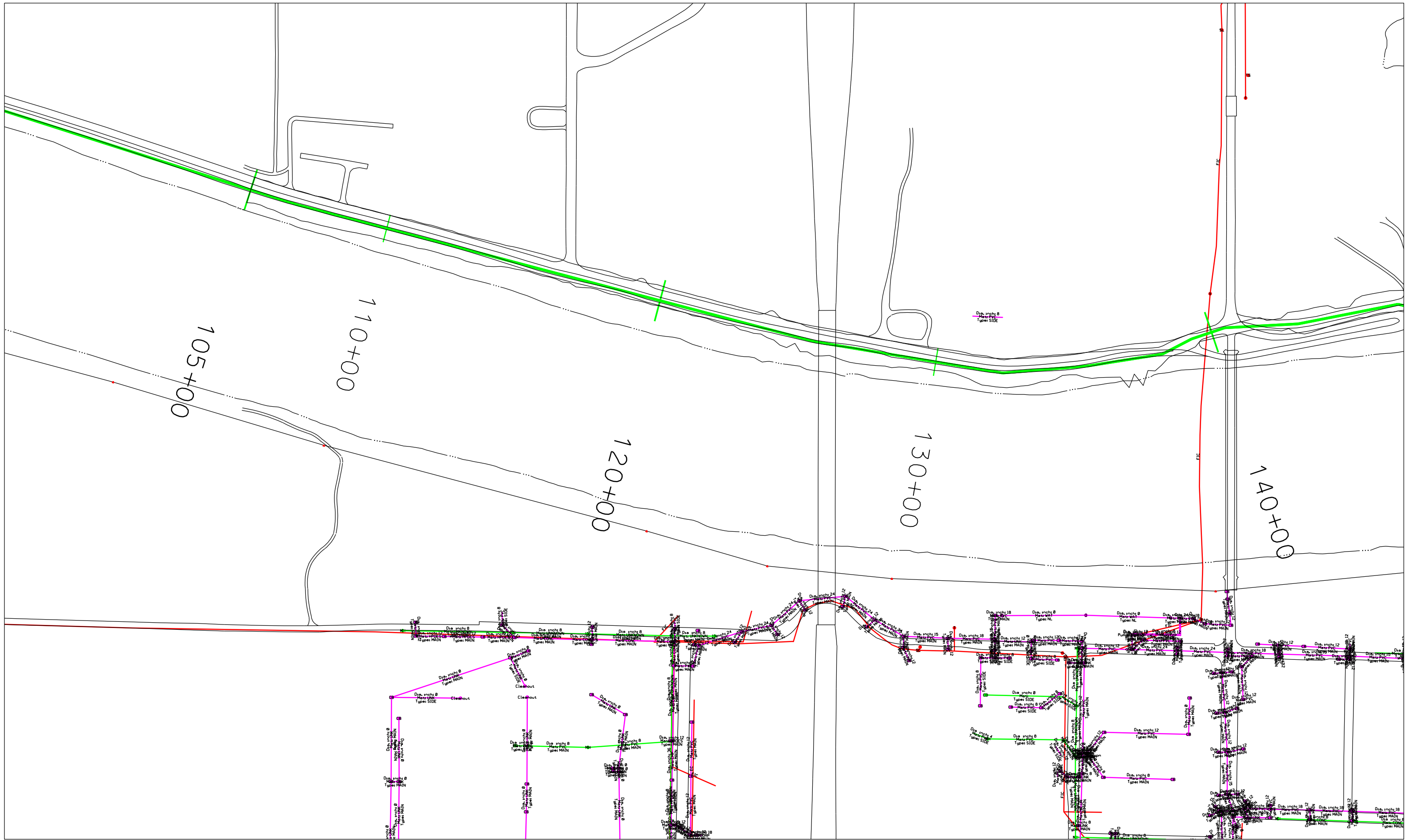


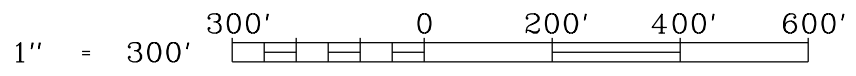
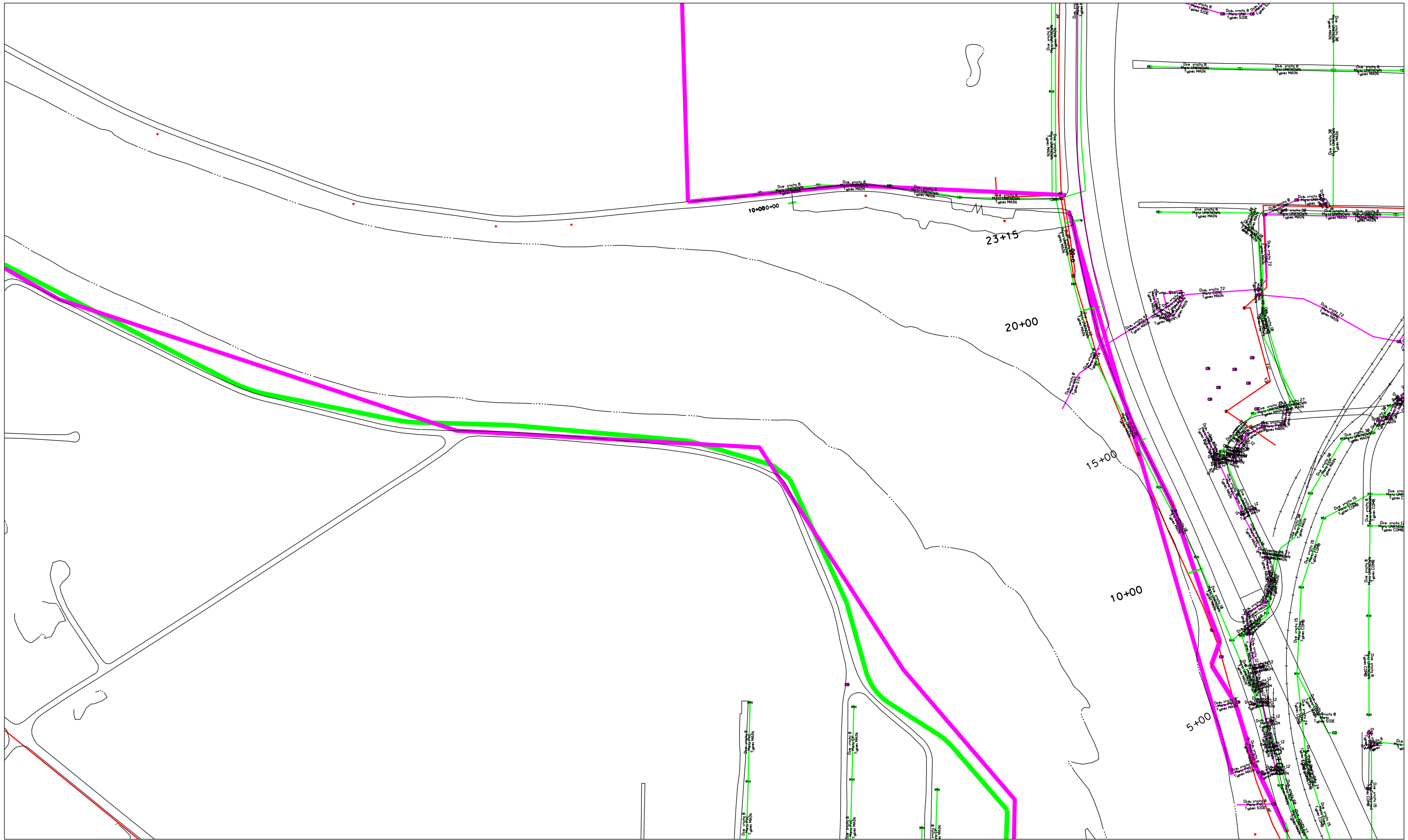
1" = 300'

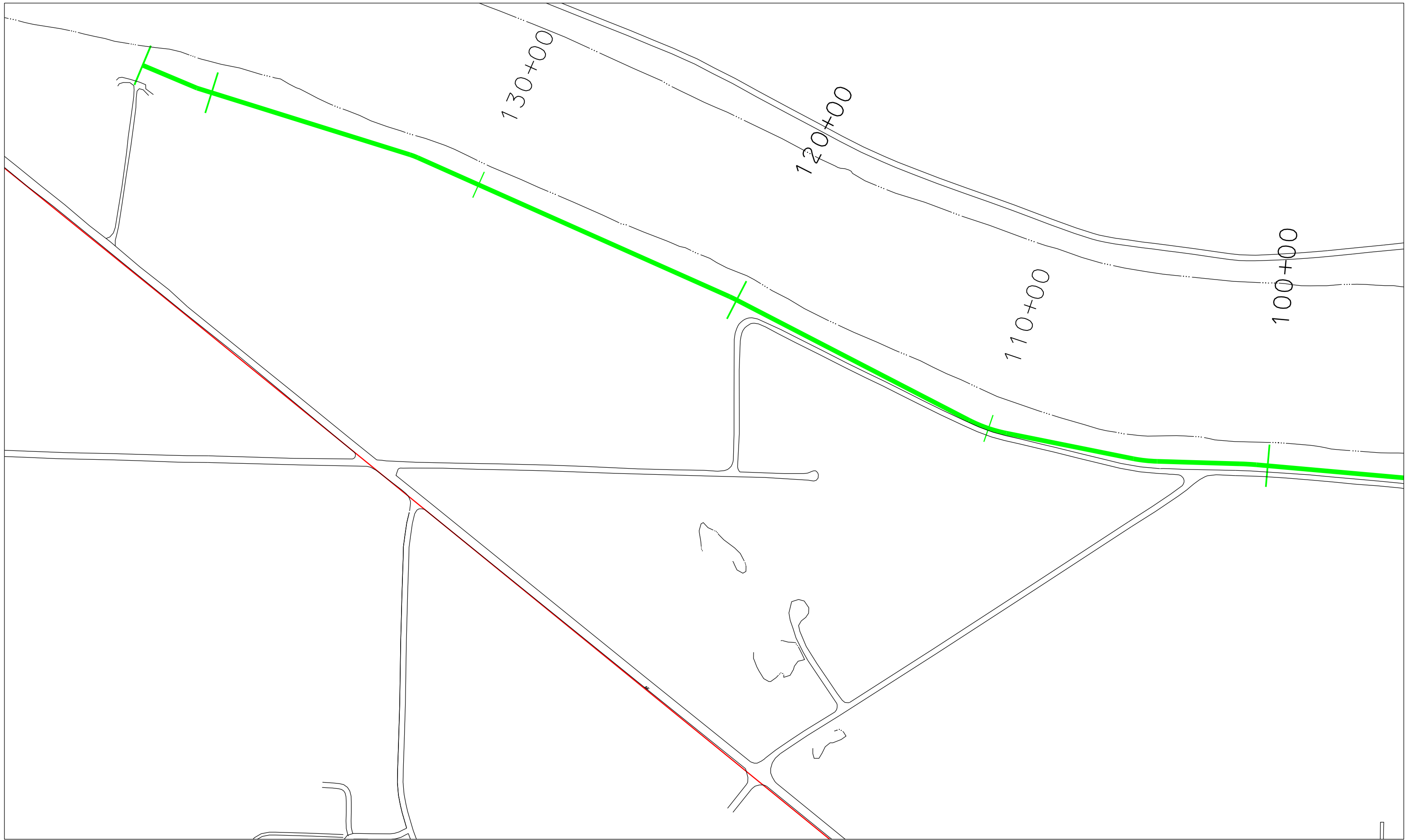


The City of Mount Vernon GIS storm/sanitary and fiber data is overlaid onto the Skagit CADD file





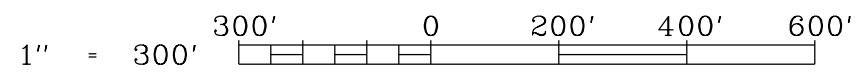
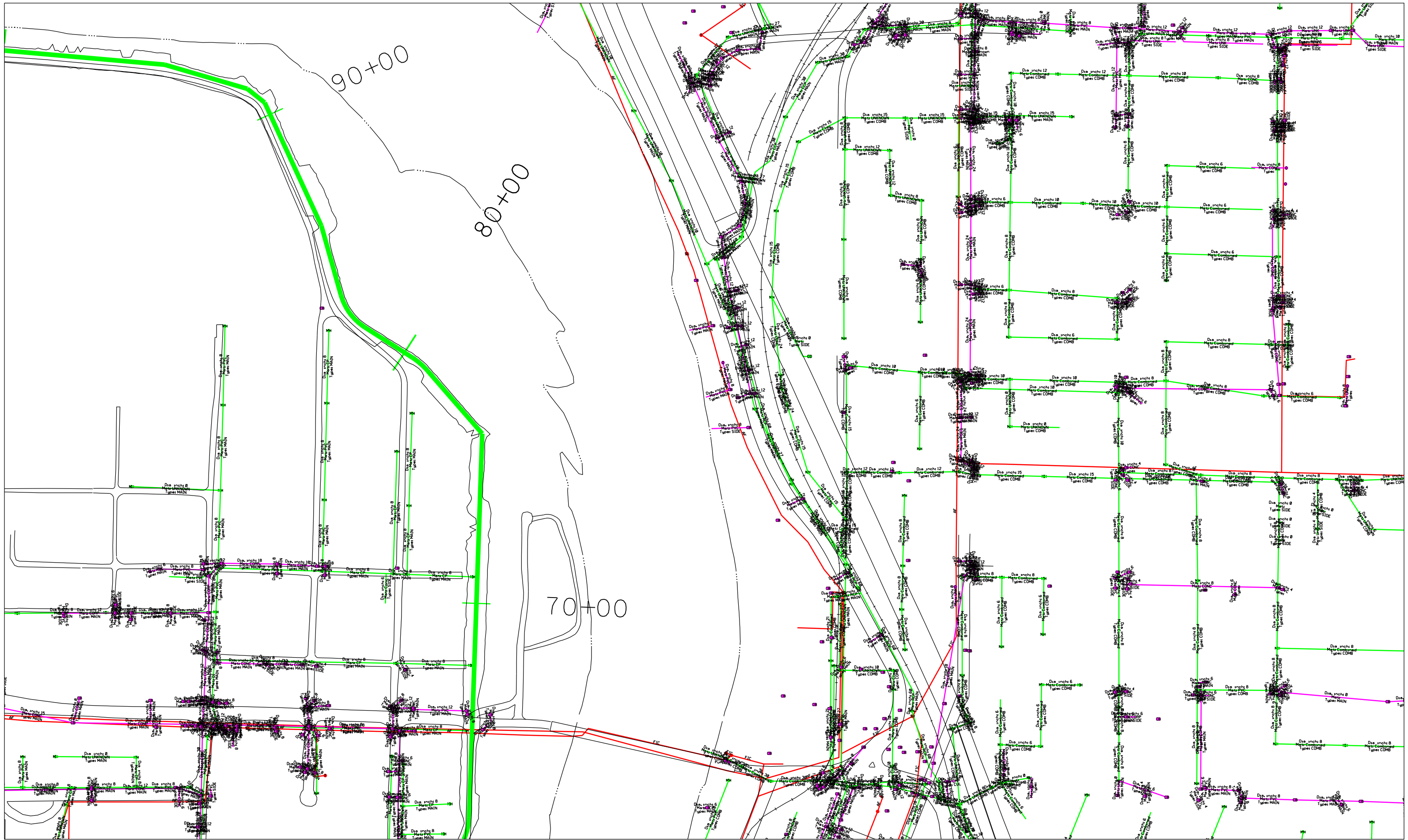


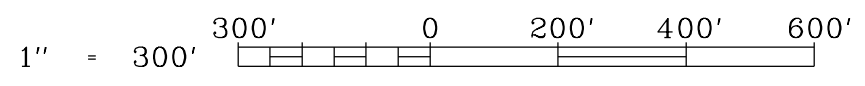
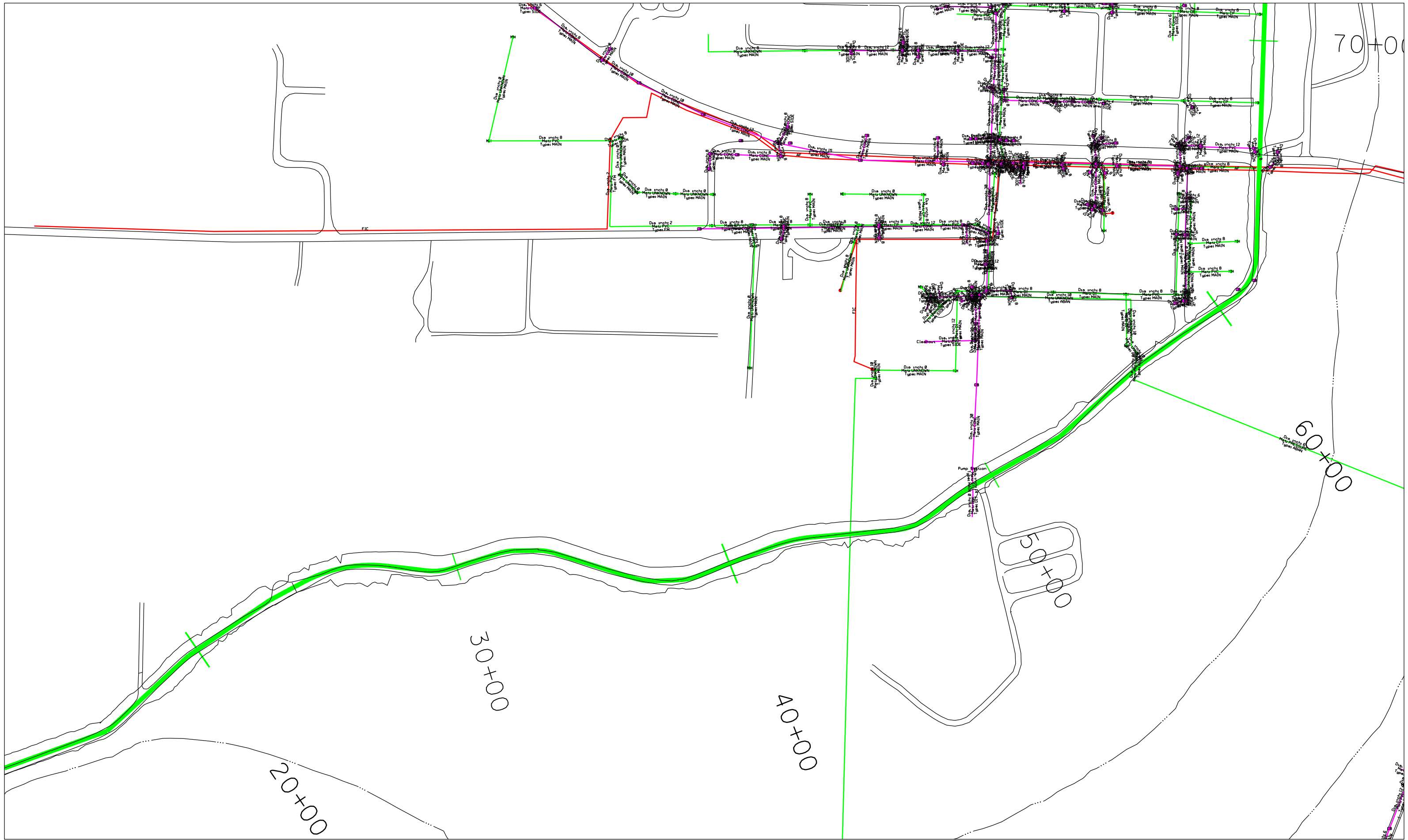


1" = 300'

300' 0 200' 400' 600'







Die inch 8 Meter MAIN  
Die inch 12 Meter MAIN  
Die inch 18 Meter MAIN



1" = 300'

300'	0	200'	400'	600'
------	---	------	------	------



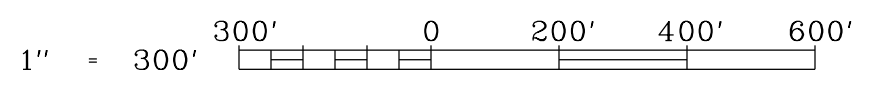
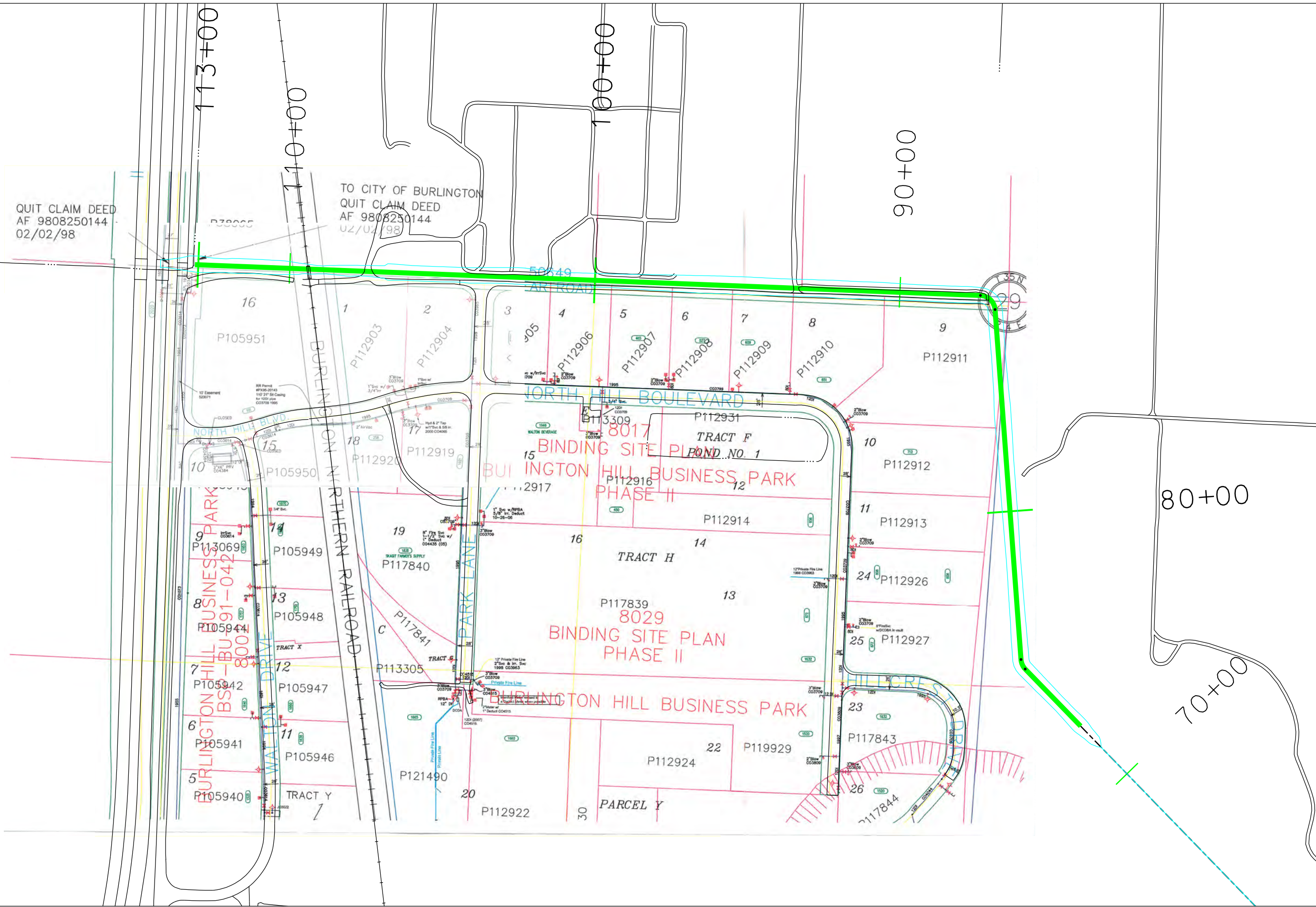
1" = 300'

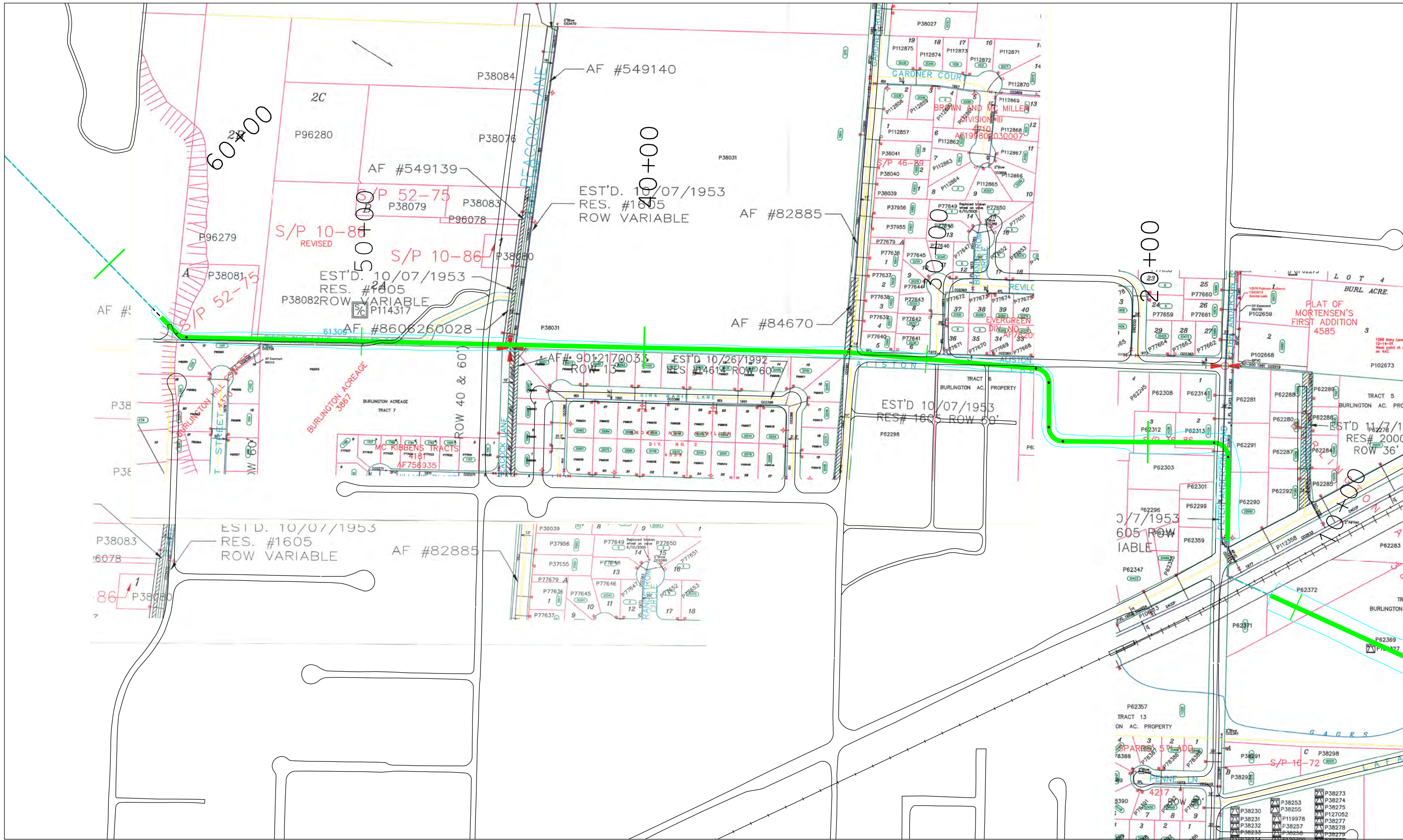
300'	0	200'	400'	600'
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The Skagit PUD water data was scanned and overlaid onto the Skagit CADD files.

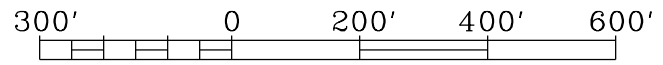
QUIT CLAIM DEED  
AF 9808250144  
02/02/98

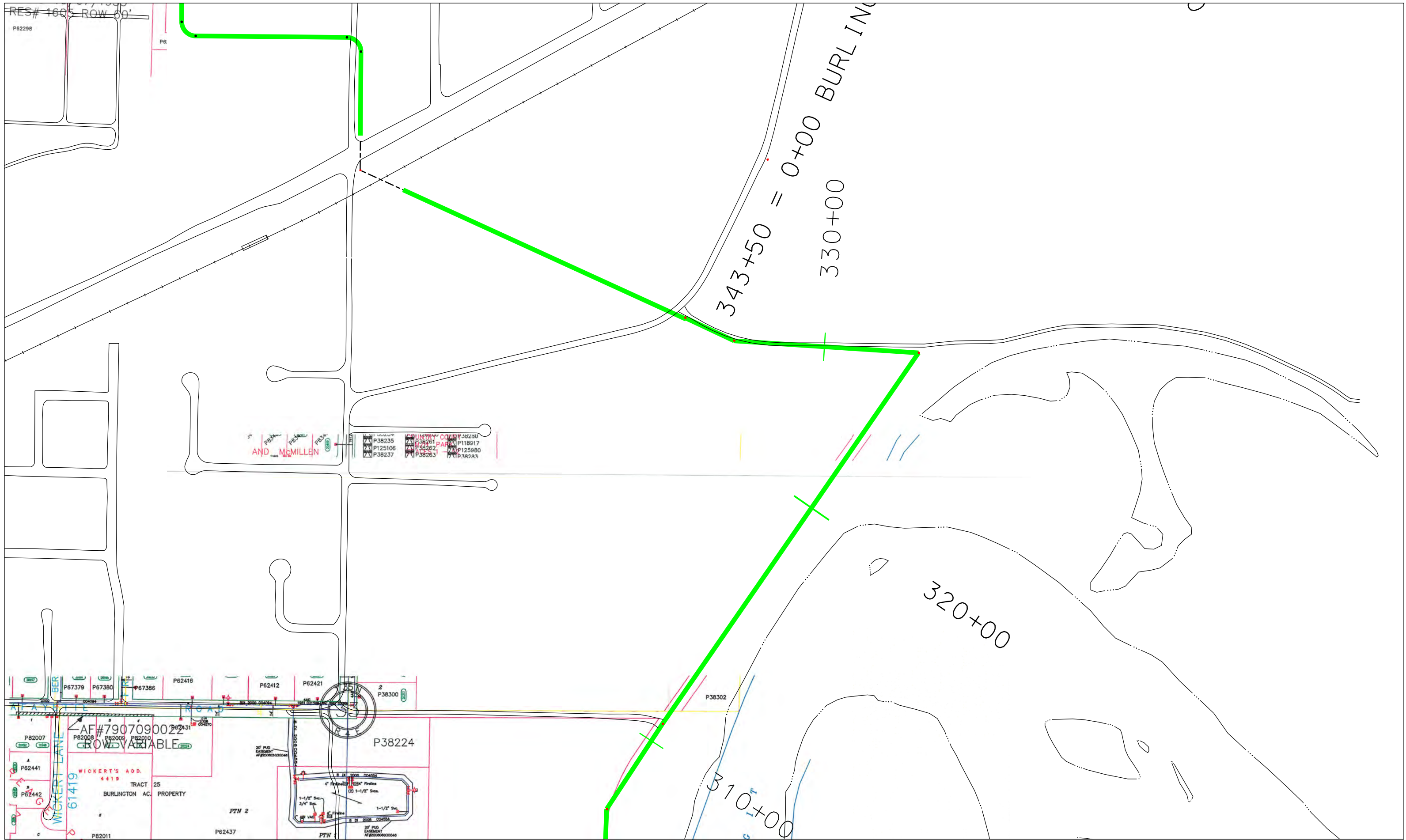
TO CITY OF BURLINGTON  
QUIT CLAIM DEED  
AF 9808250144  
02/02/98





1" = 300'





RES# 1605 ROW 60'

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P6:

P62416

P62412

P62421

P62441

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P62007

P62008

P62009

P62010

P62011

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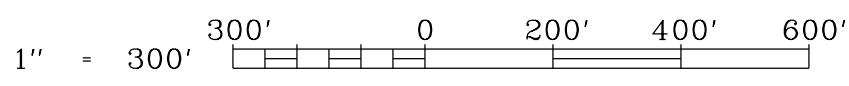
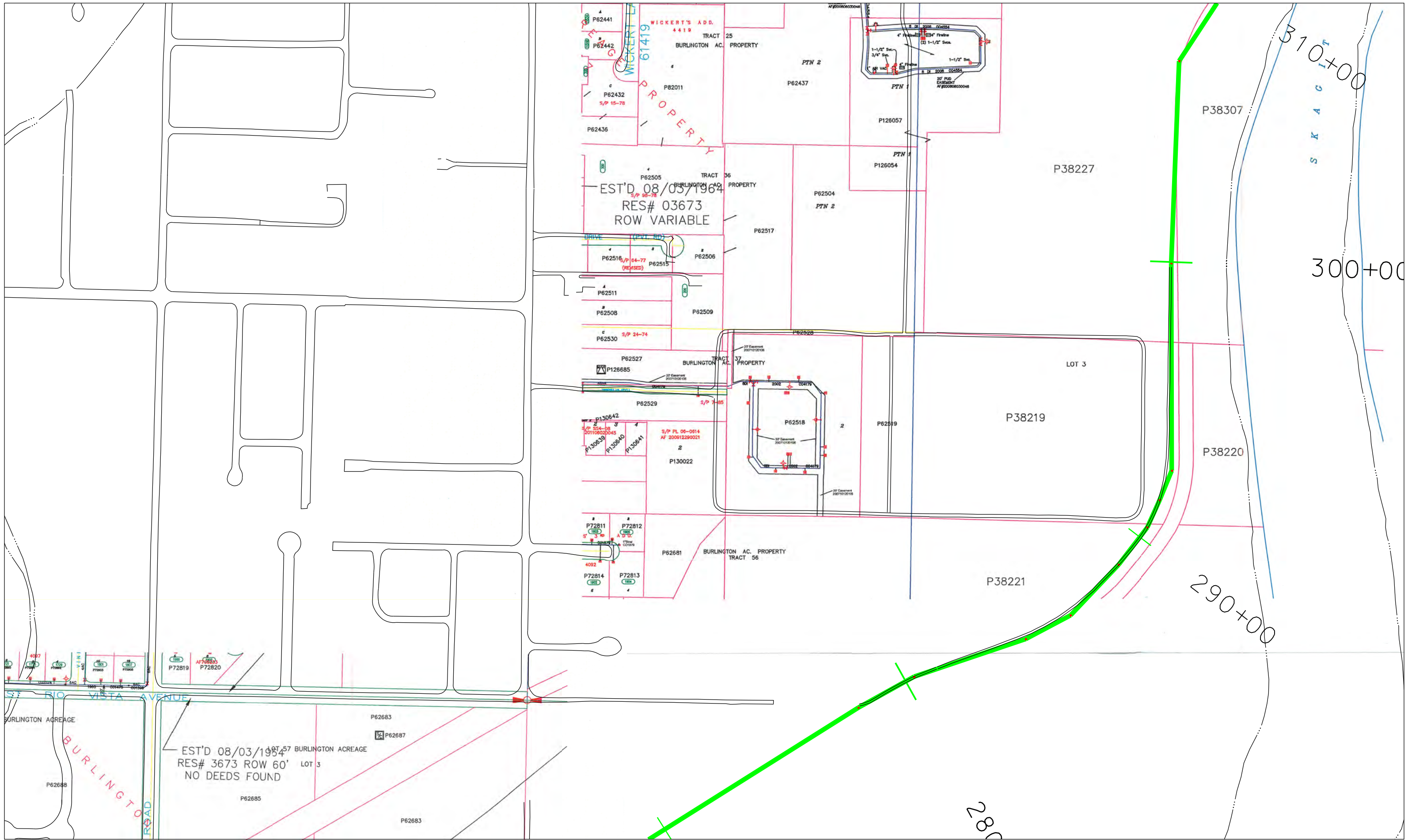
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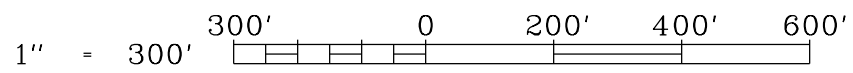
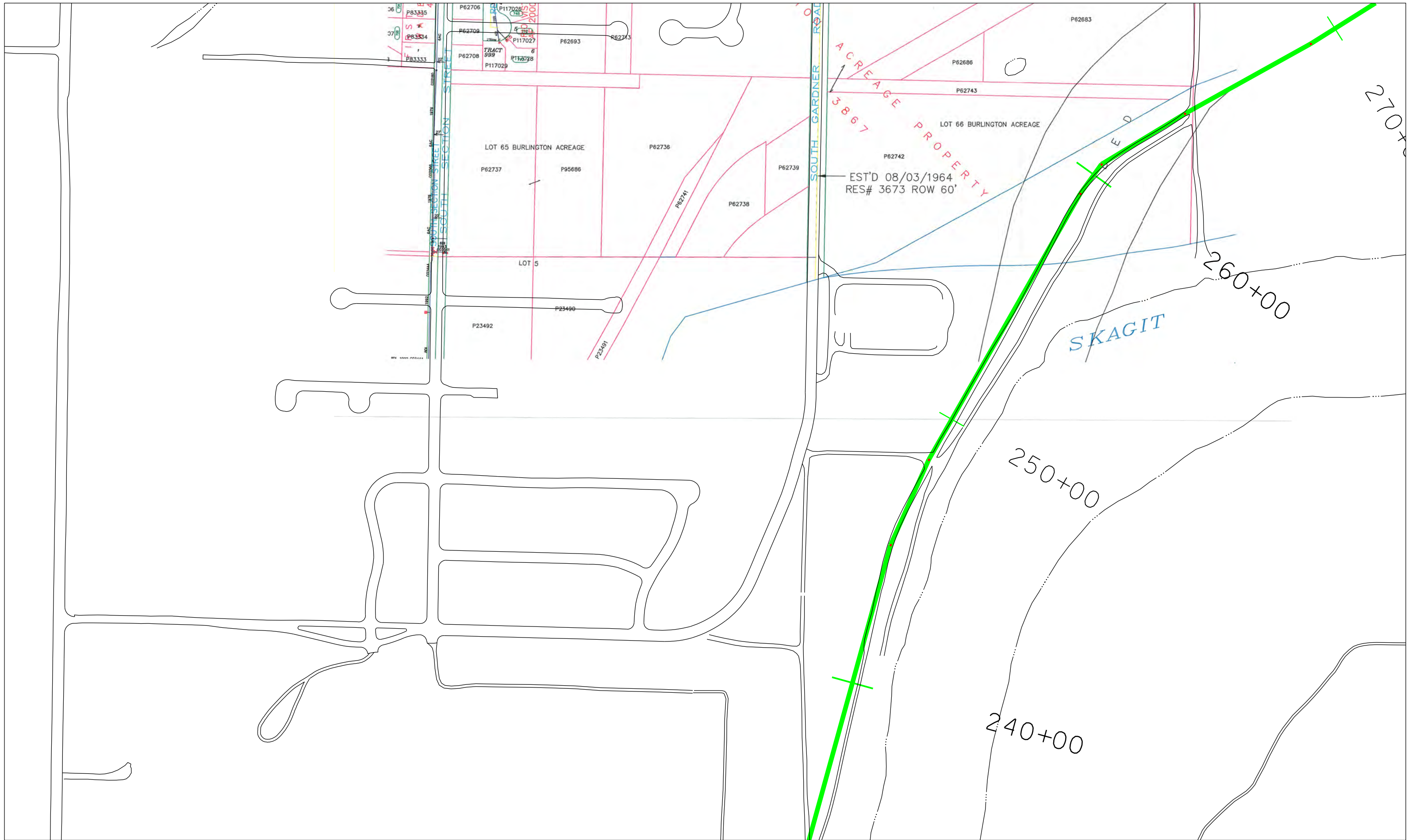
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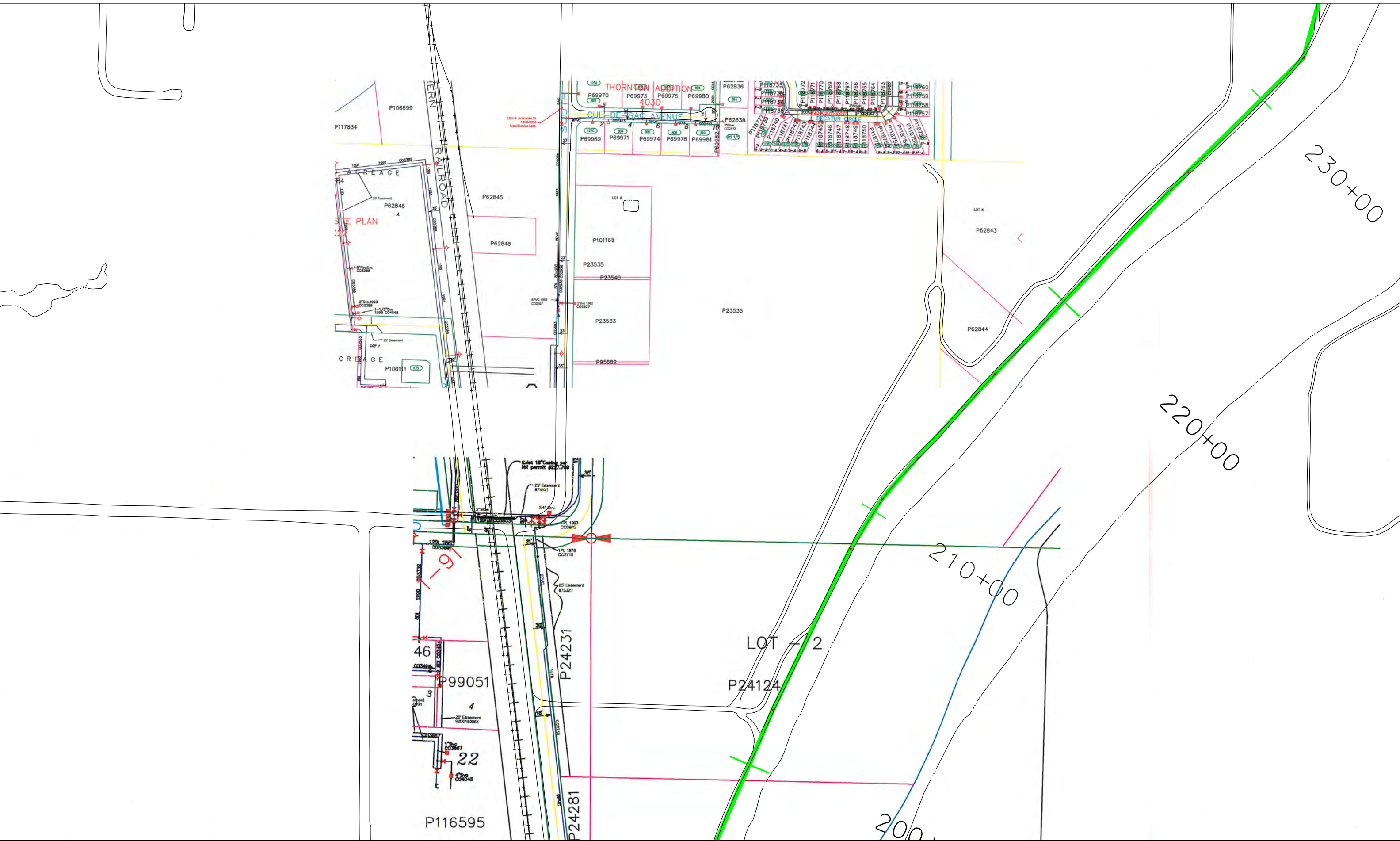
1" = 300'

300' 0 200' 400' 600'









THORNTON ADDITION  
CHILDERS AVENUE  
DECATUR CIRCLE

SITE PLAN

CREAGE

230+00

220+00

210+00

200+00

LOT - 2

P24124

P24231

P24281

P99051

P116595

46

3

22

4

P117834

P62846

P100111

P62845

P62848

LOT 6

P101168

P23535

P23540

P23533

P95682

P23535

LOT 4

P62843

P62844

130 S. Aurora St  
13040002  
Main/Corner Lot

Exit 187 Conley rd  
NE permit 622,709

25' Easement  
875321

5'4" P.C.

1" PL 1978  
002716

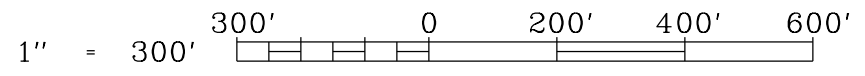
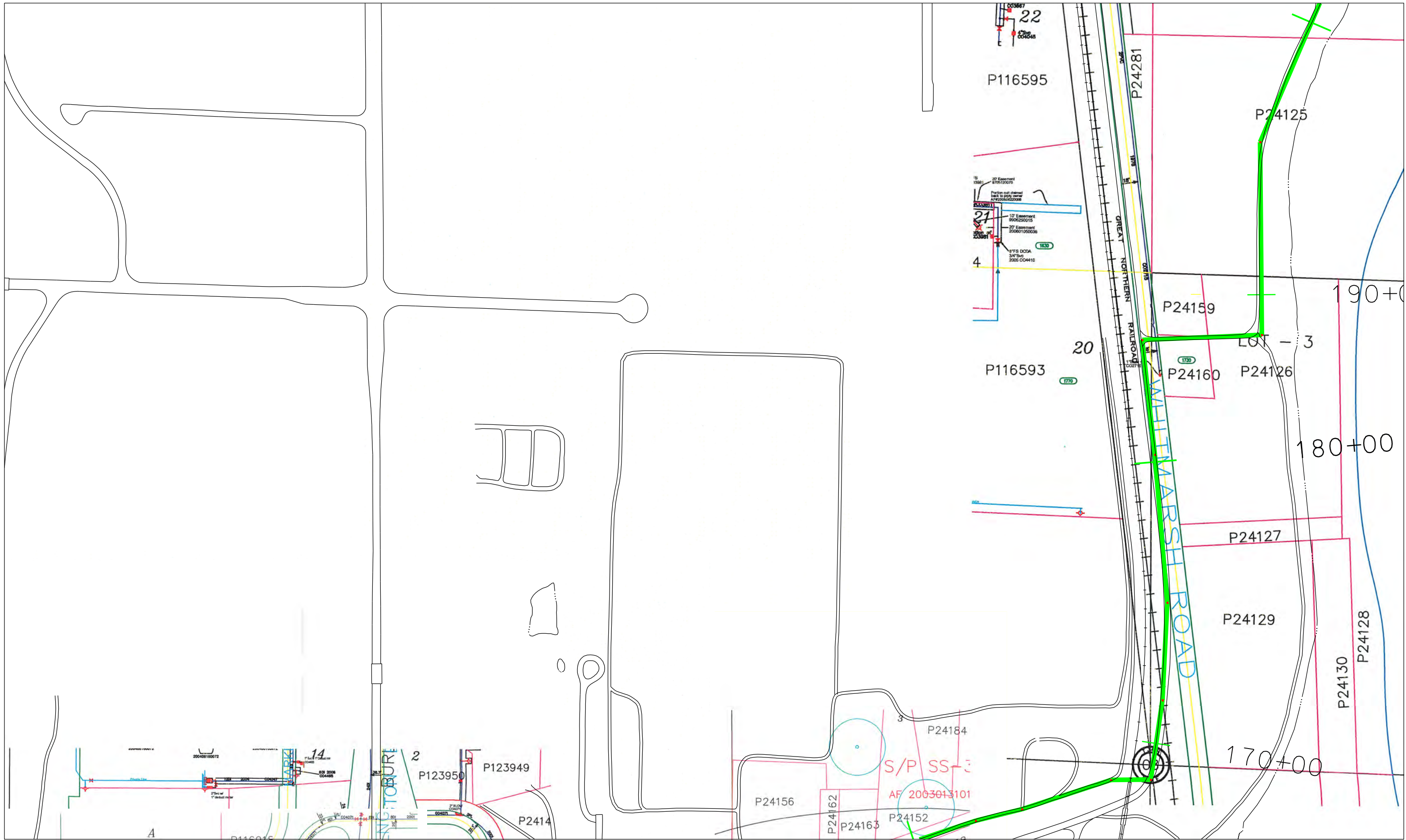
25' Easement  
875321

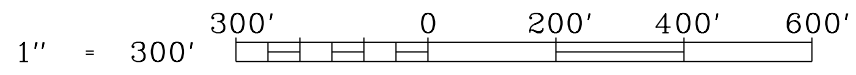
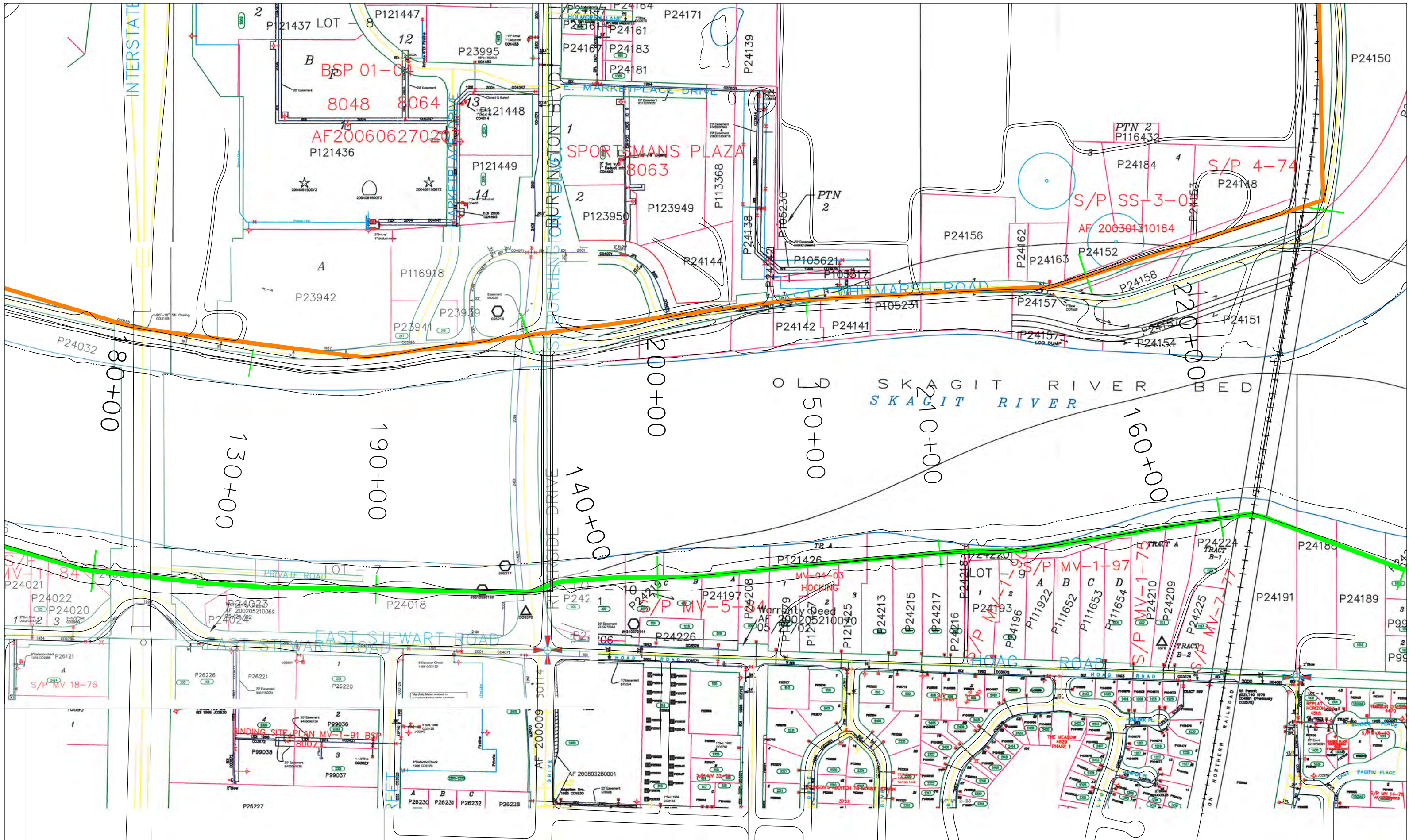
25' Easement  
8200180064

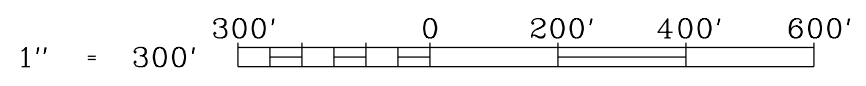
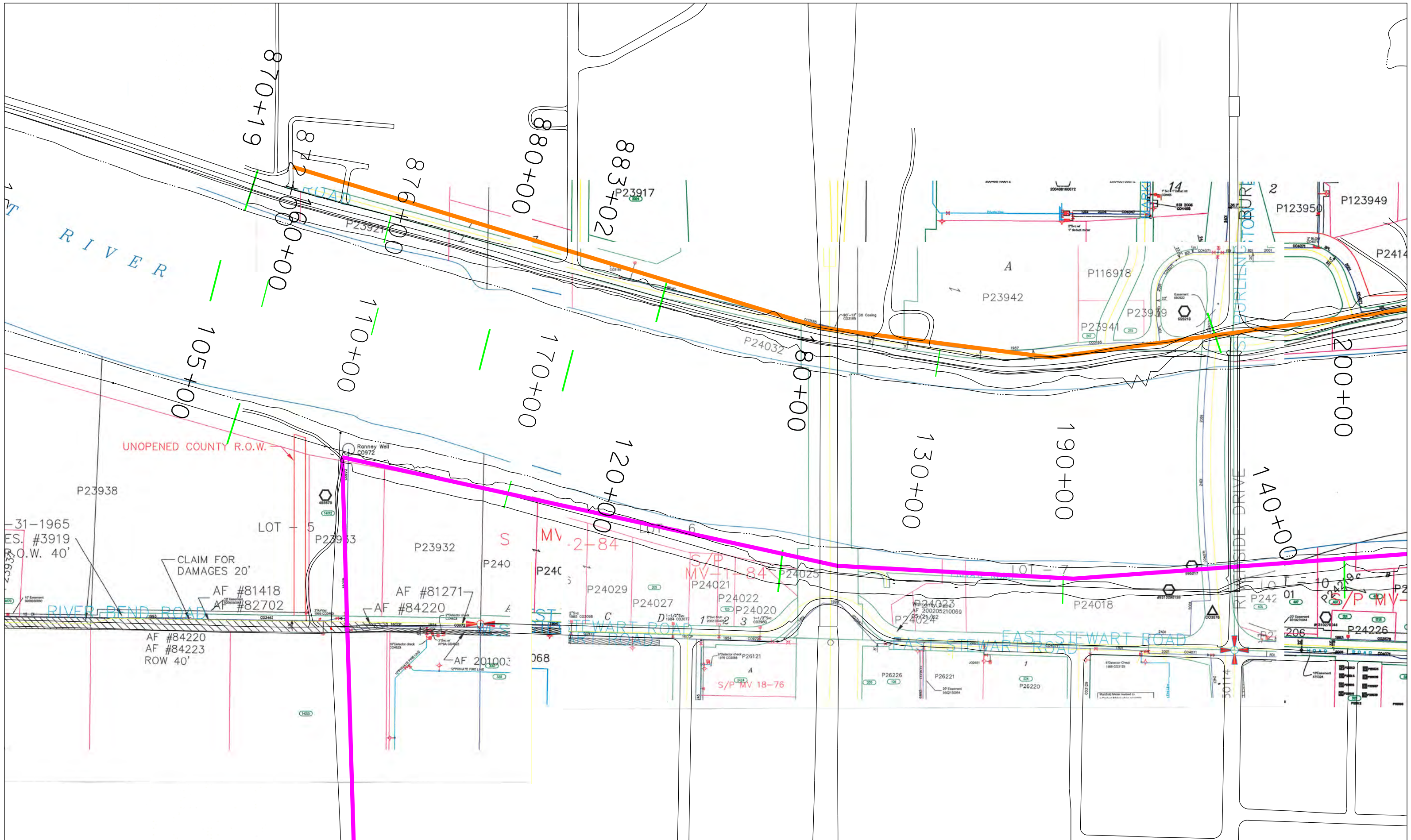
1" PL 1978  
002716

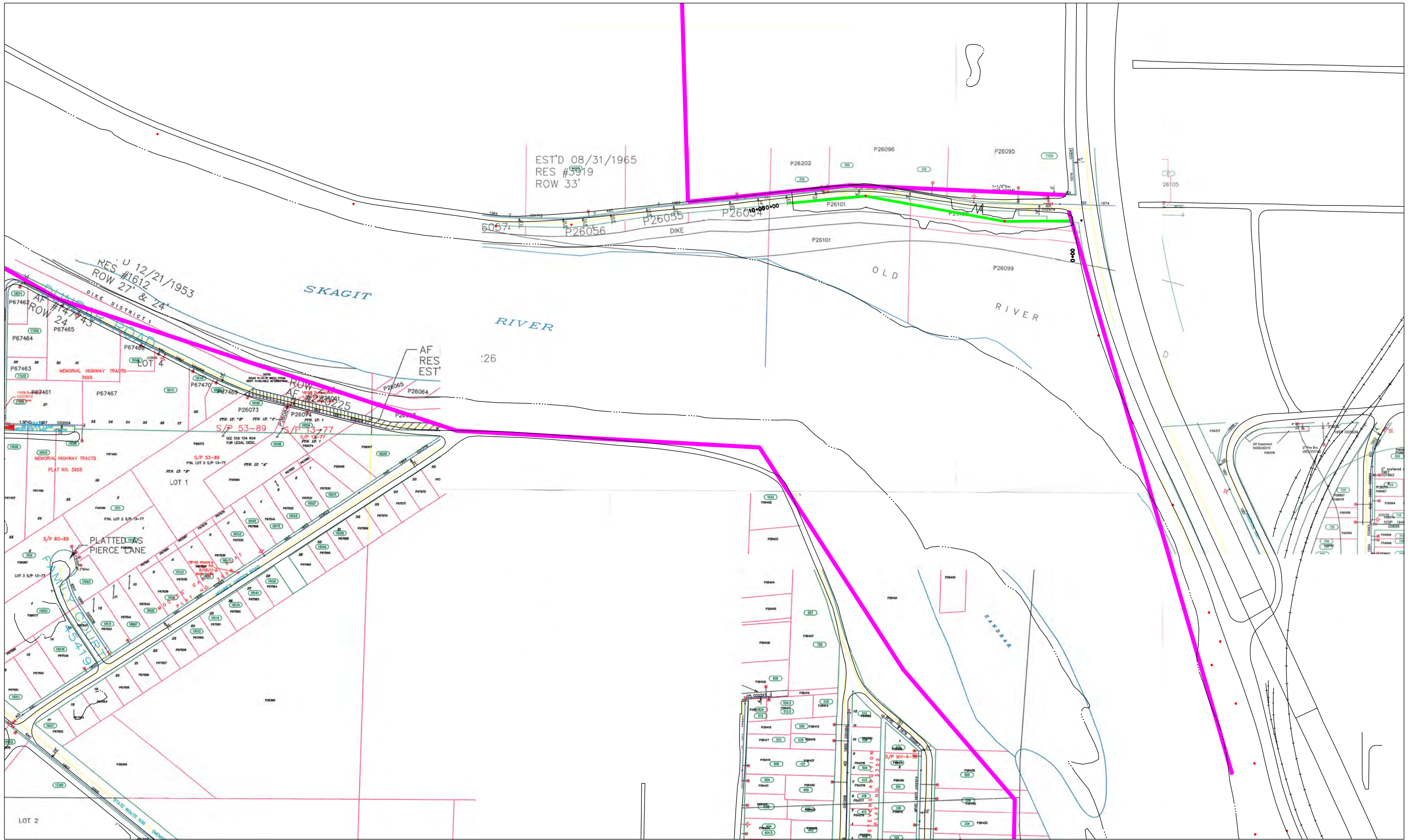
25' Easement  
8200180064

1" PL 1978  
002716









EST'D 08/31/1965  
RES #3919  
ROW 33'

8

SKAGIT

RIVER

OLD

RIVER

AF  
RES  
EST

:26

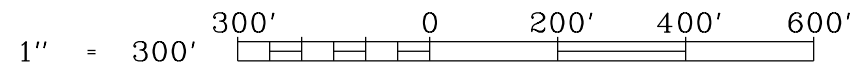
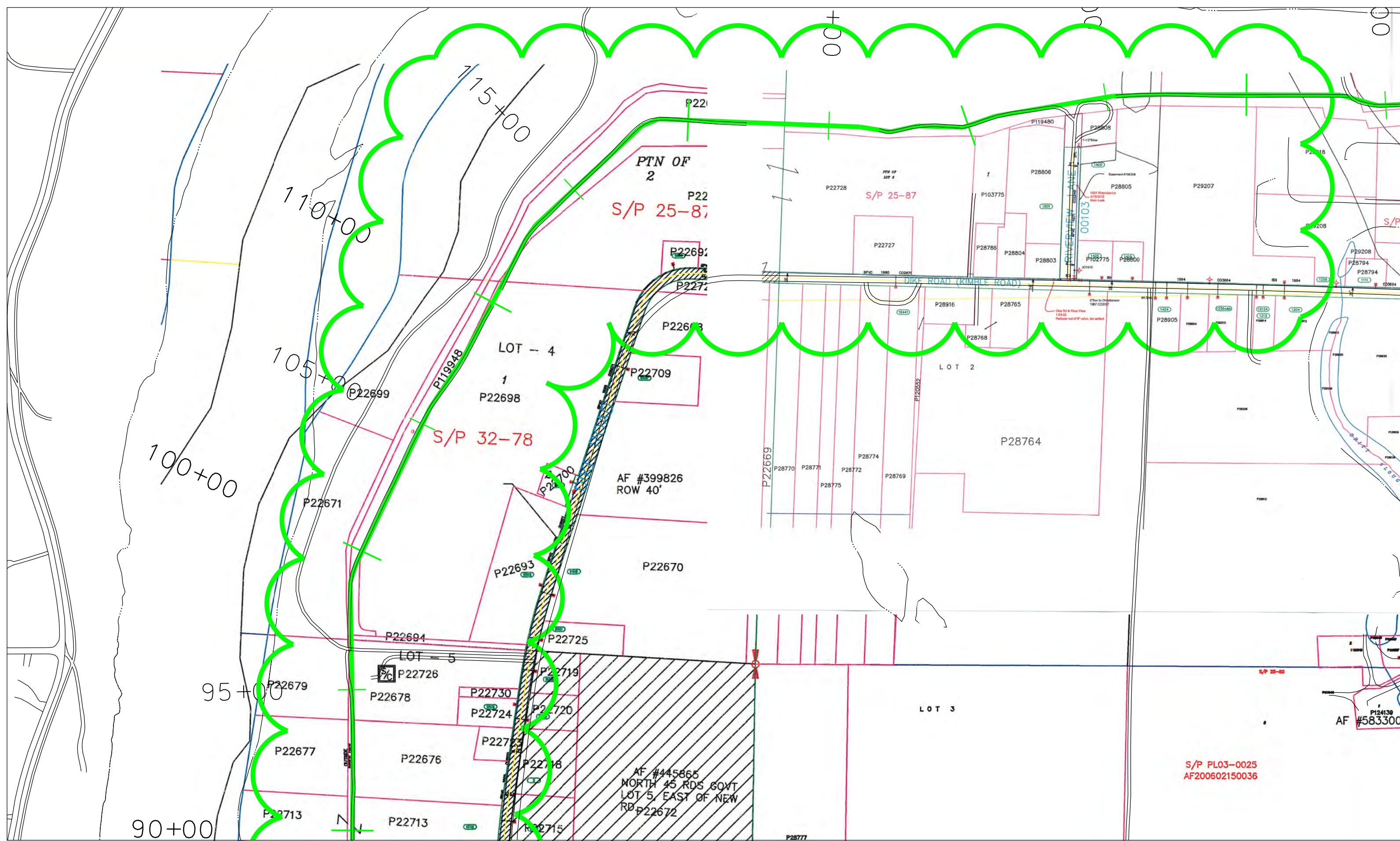
RES U 12/21/1953  
RES #1612  
ROW 27' & 24'

DIKE DISTRICT 1  
ROW 24'  
LOT 4  
MEMORIAL HIGHWAY TRACTS  
PLAT NO. 3955

PLATTED AS  
PIERCE LANE

LOT 2

STATE ROUTE 101  
S/P MV-4-70  
S/PL 375.8



PTN OF  
2  
P22  
S/P 25-87

S/P 32-78

AF #399826  
ROW 40'

AF #445865  
NORTH 45 RDS GOVT  
LOT 5, EAST OF NEW  
RD P22672

S/P PL03-0025  
AF200602150036

110+00  
105+00  
100+00  
95+00  
90+00

LOT - 4  
1  
P22698

LOT 2

LOT 3

LOT - 5

S/P 25-87

N

RIVERVIEW LANE  
00103

DIKE ROAD (KIMBLE ROAD)

P221

P22691

P2272

P22673

P22709

P22699

P22671

P22693

P22670

P22694

P22725

P22679

P22726

P22678

P22730

P22724

P22720

P22677

P22676

P22723

P22718

P22713

P22713

P22715

P22777

P119480

P28808

P28806

P28805

P29207

P103775

P28786

P28804

P28803

P102775

P28800

S/P

P29208

P28794

P28794

P28794

P28794

P28794

P28794

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P28794

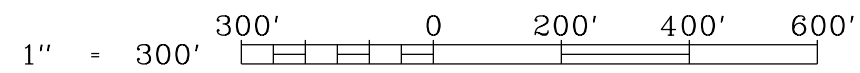
P28794

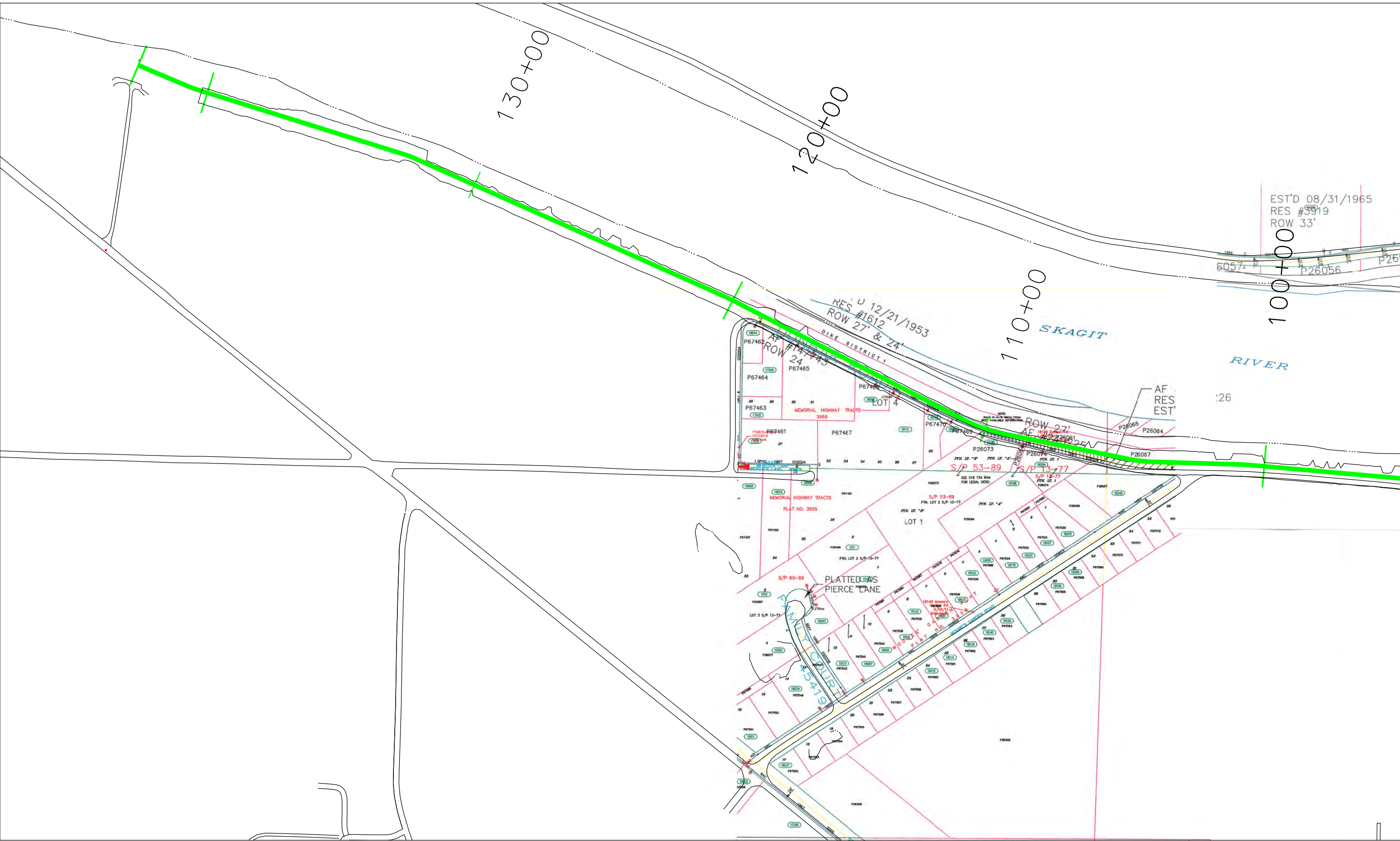
P28794

P28794

P28794







EST'D 08/31/1965  
RES #5919  
ROW 33'

RES'D 12/21/1953  
ROW #1612  
ROW 27' & 24'

SKAGIT RIVER

DIKE DISTRICT  
LOT 4  
LOT 1  
LOT 2  
LOT 3

MEMORIAL HIGHWAY TRACTS  
PLAT NO. 3955  
PLATTED LOTS  
PIERCE LANE  
CULVERT  
S/P 53-89  
S/P 13-77

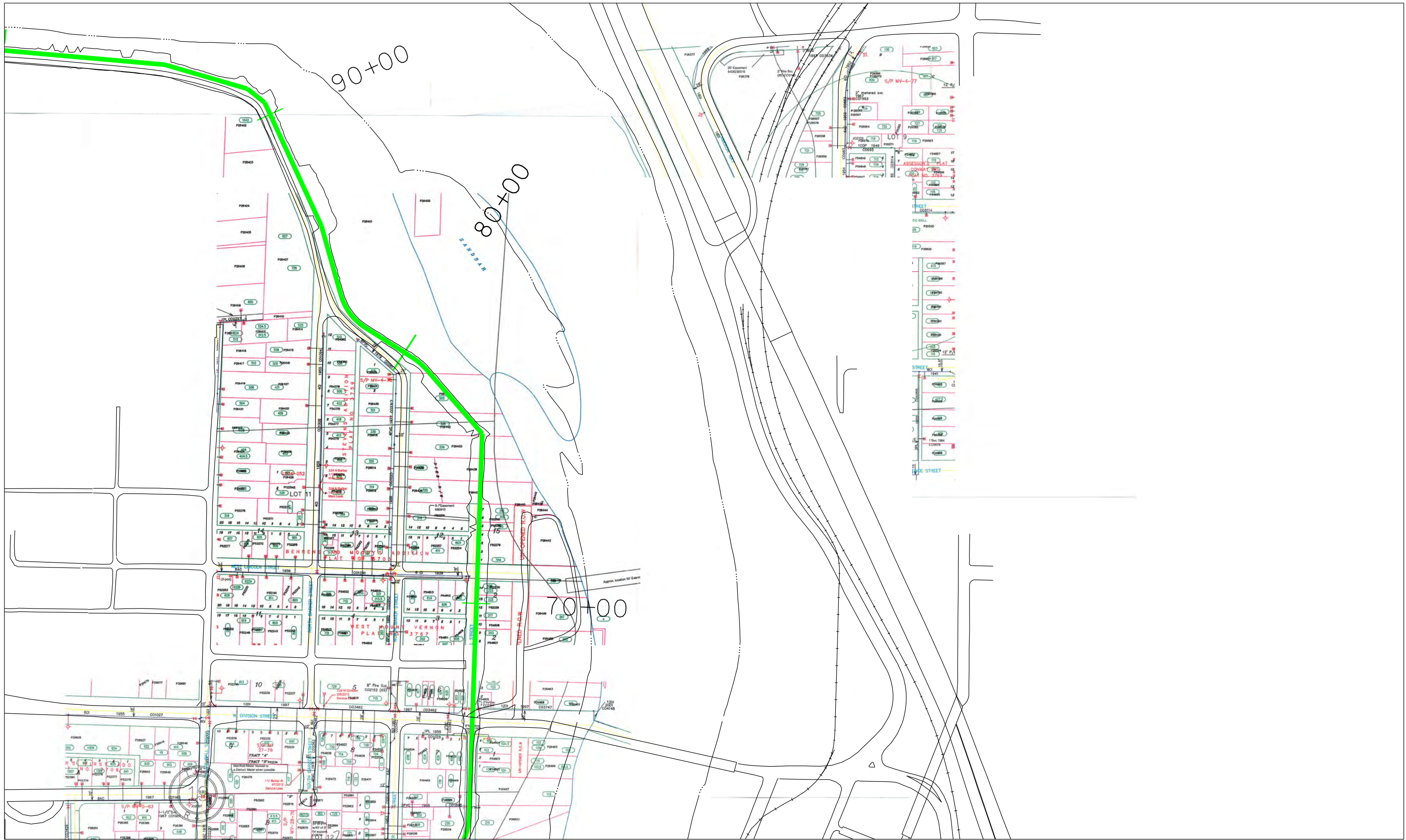
AF RES EST

PLATTED LOTS  
PIERCE LANE  
CULVERT  
S/P 60-89

PLAT NO. 15419

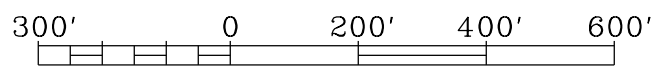
PIERCE LANE

CULVERT





1" = 300'



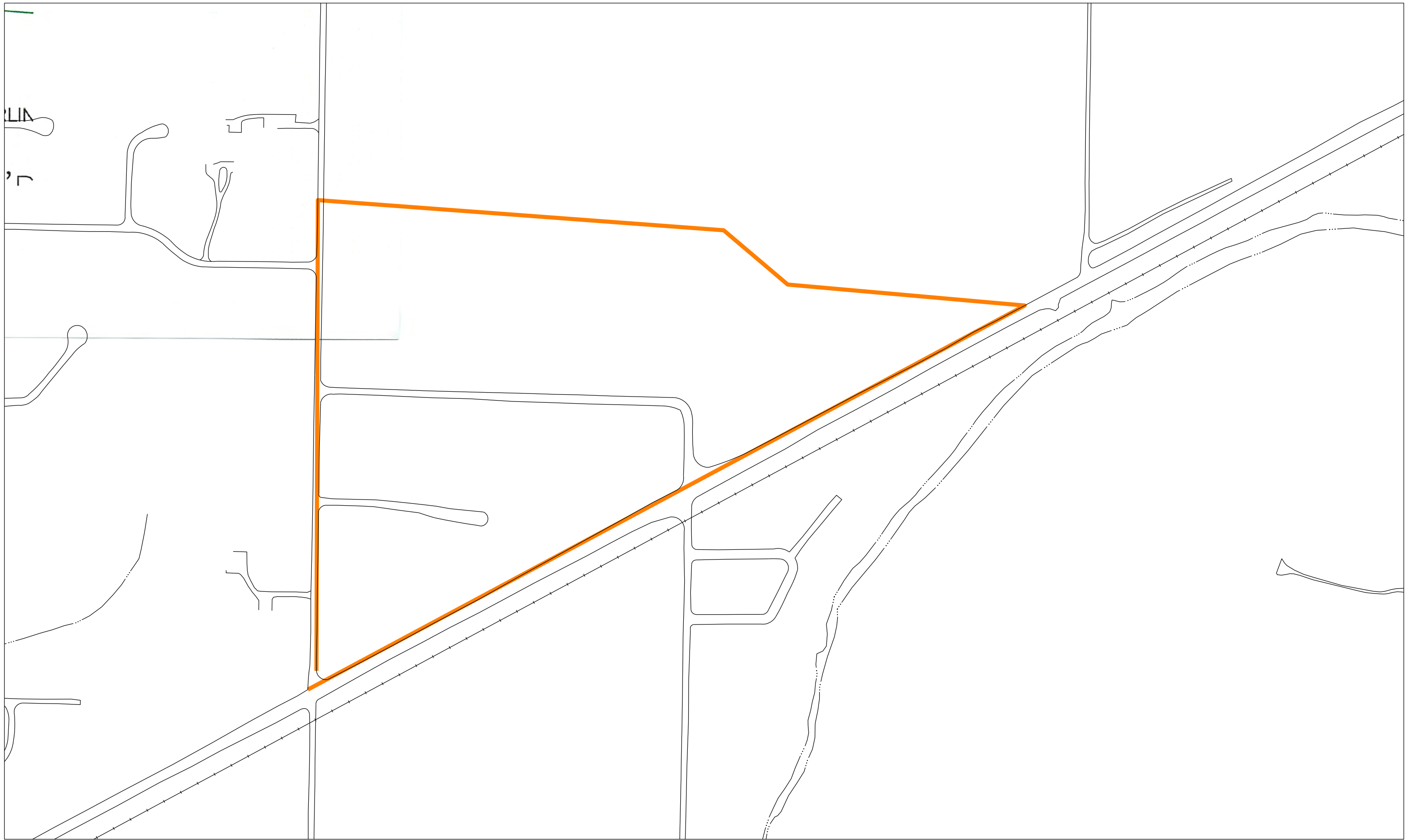
30+00

40+00

50+00

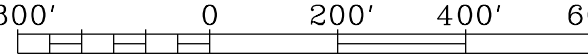
60+00

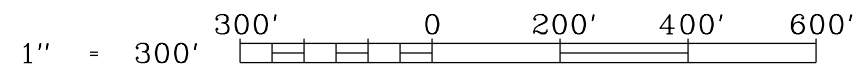
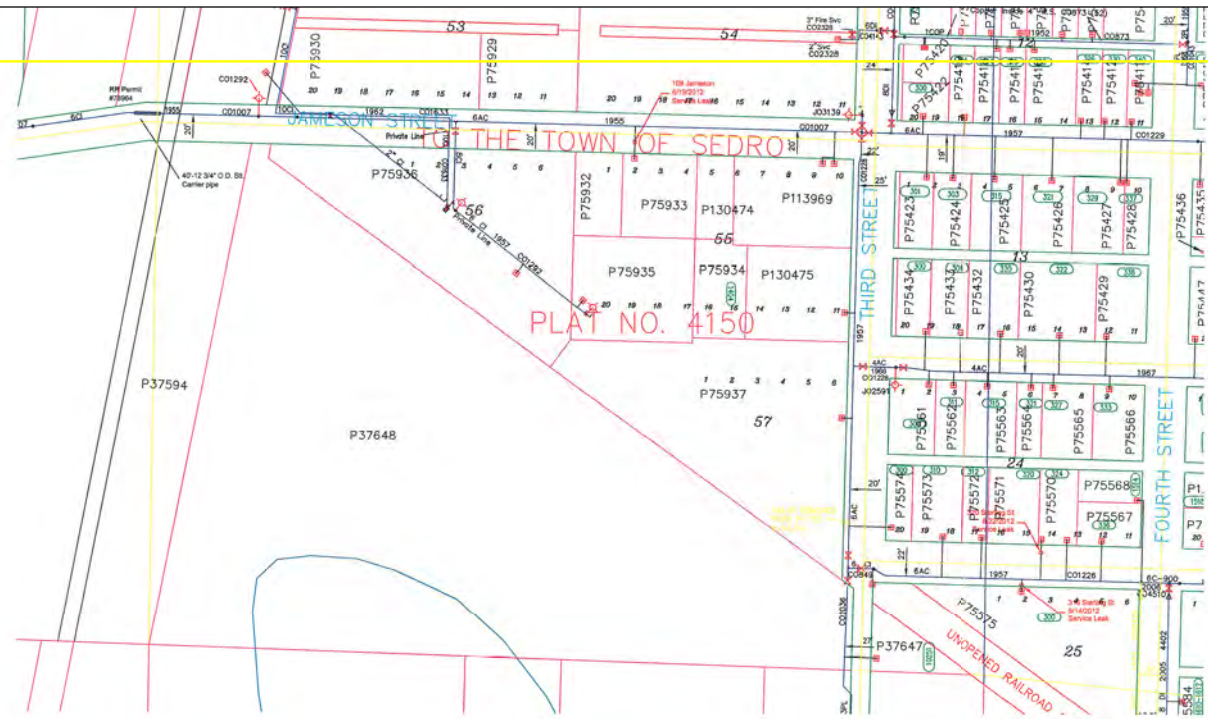
SKACIT

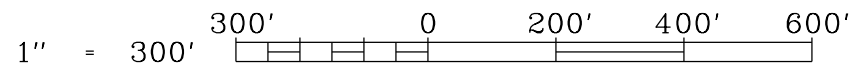
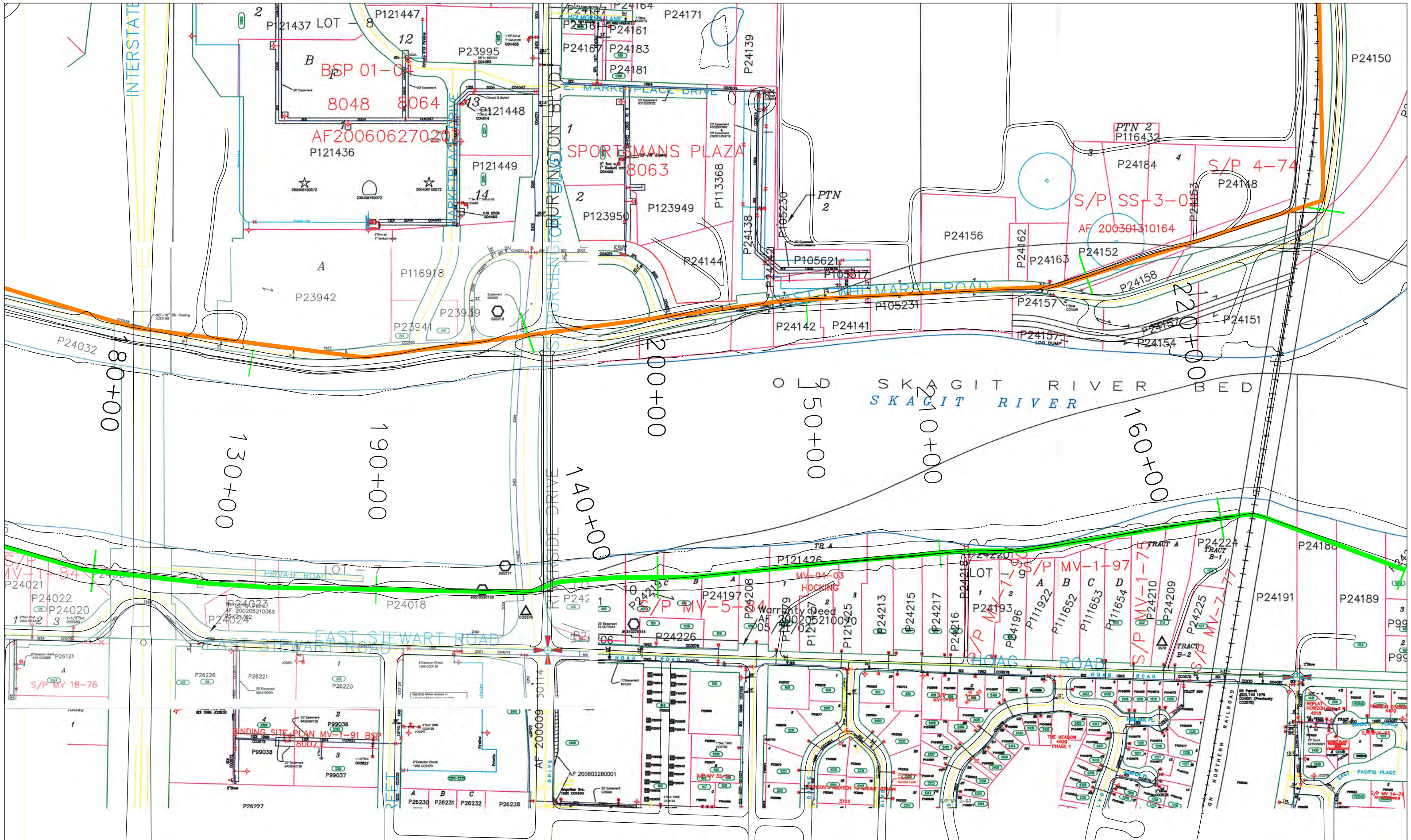


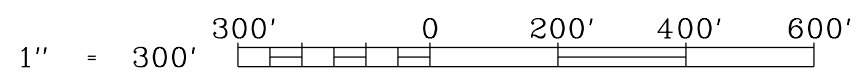
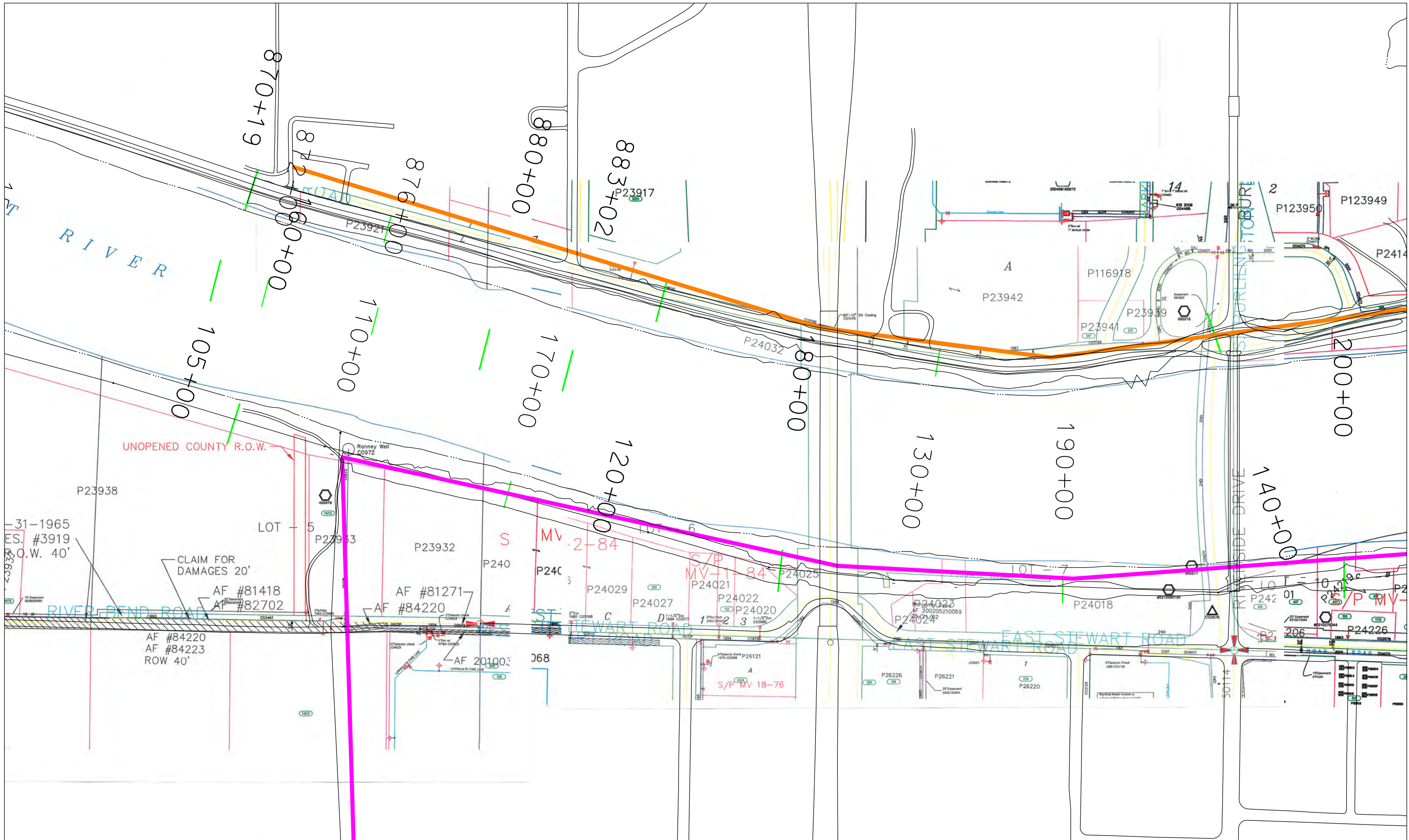
PLA  
'r

1" = 300'

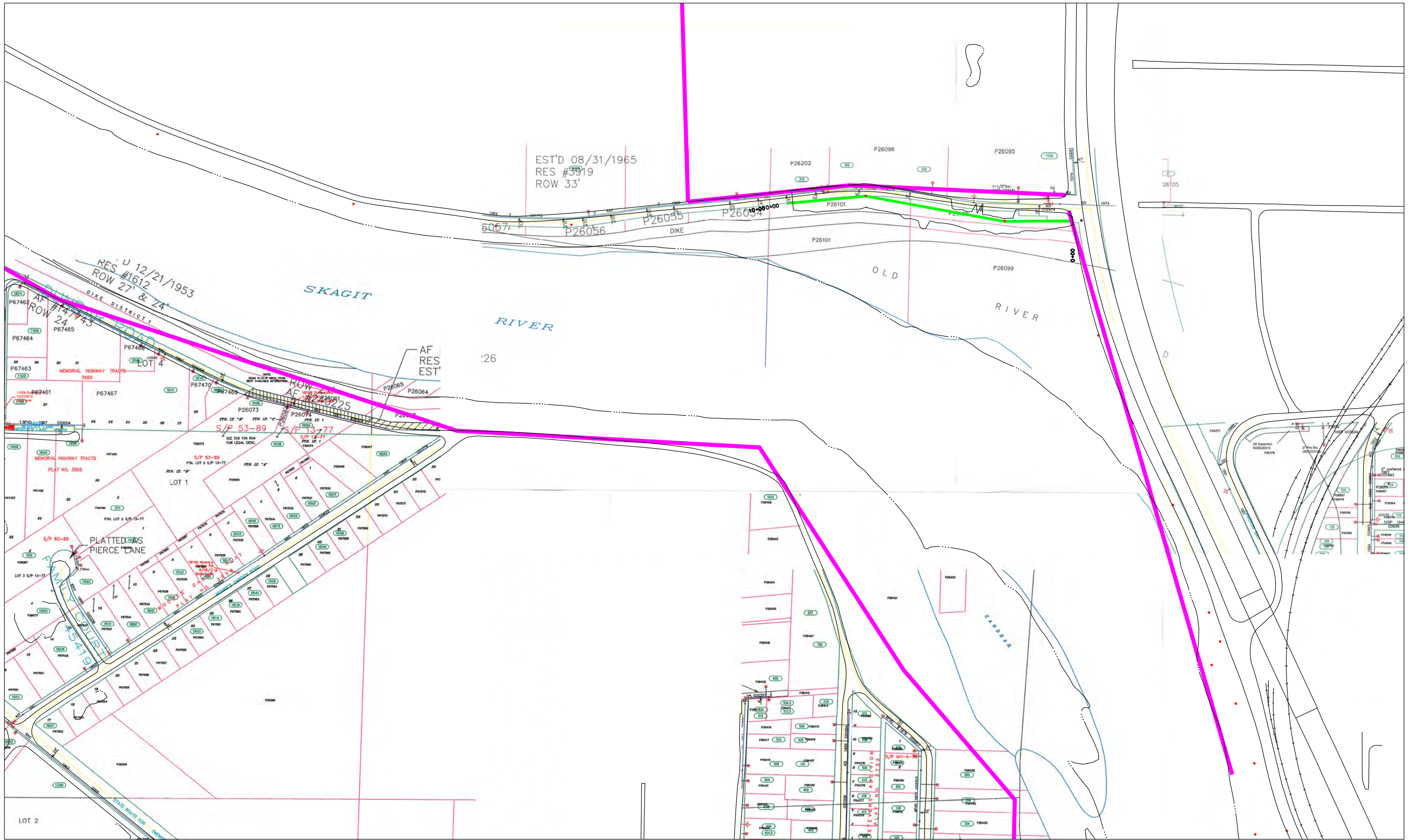












EST'D 08/31/1965  
RES #3919  
ROW 33'

RES #12/21/1953  
ROW 27' & 24'

SKAGIT RIVER

OLD RIVER

ROW 24'  
LOT 4  
MEMORIAL HIGHWAY TRACTS  
PLAT NO. 3955

AF RES EST

LOT 1  
S/P 53-89  
S/P 13-77

PLATTED AS PIERCE LANE  
LOT 2  
S/P 60-89  
LOT 3 S/P 13-77

LOT 2

8

26105

P26099

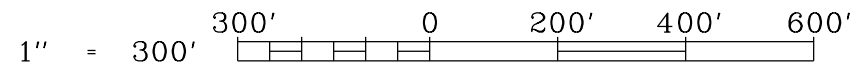
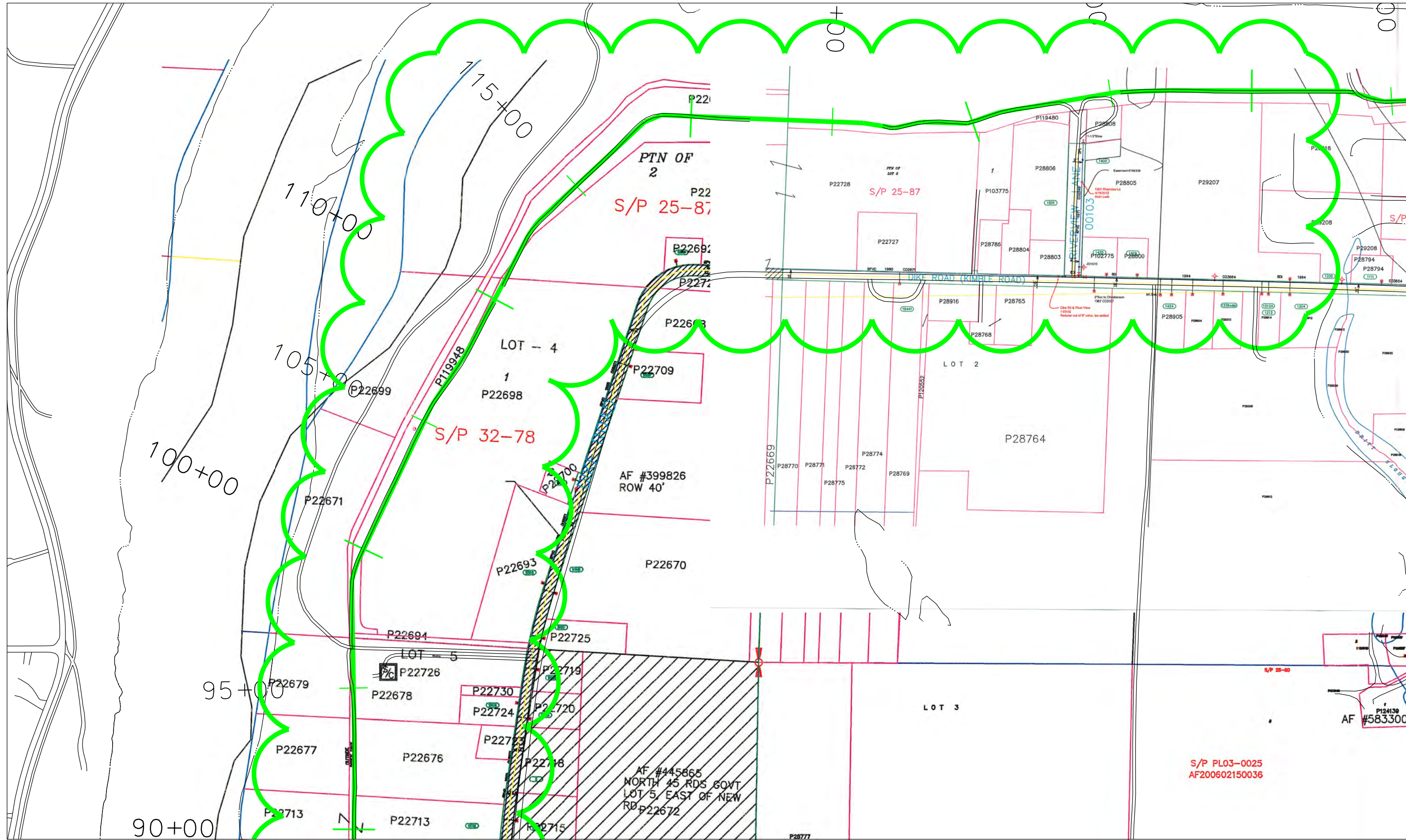
RIVER

26

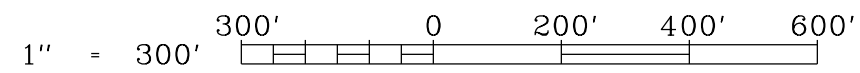
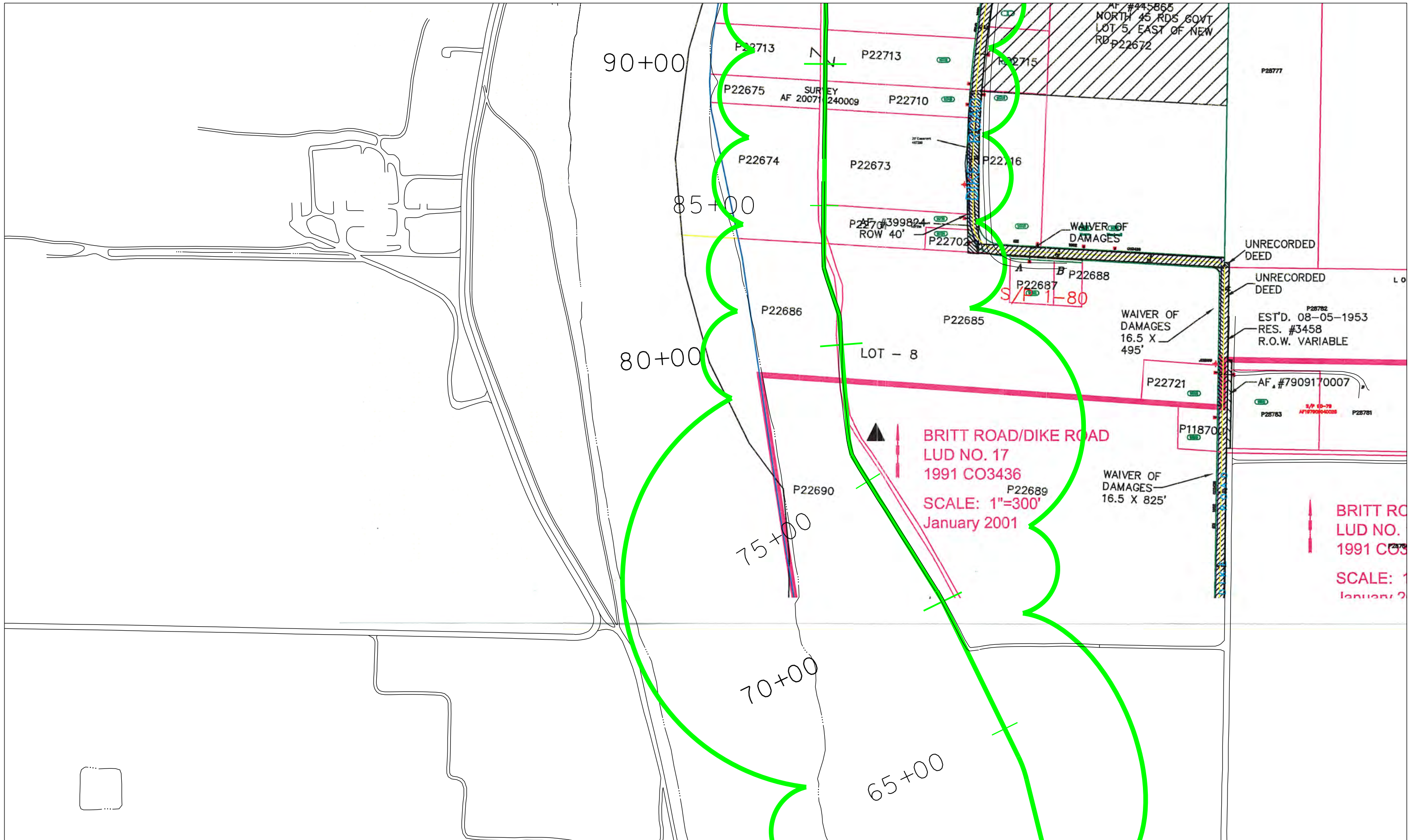
S/P 53-89  
S/P 13-77

STATE ROUTE 101  
S/P 13-77  
S/P 60-89  
LOT 2

SAGDAR



S/P PL03-0025  
 AF200602150036



BRITT ROAD  
LUD NO. 17  
1991 CO3436  
SCALE: 1"=300'  
January 2001

AF #445865  
NORTH 45 RDS GOVT  
LOT 5, EAST OF NEW  
RD P22672

UNRECORDED DEED

UNRECORDED DEED

EST'D. 08-05-1953  
RES. #3458  
R.O.W. VARIABLE

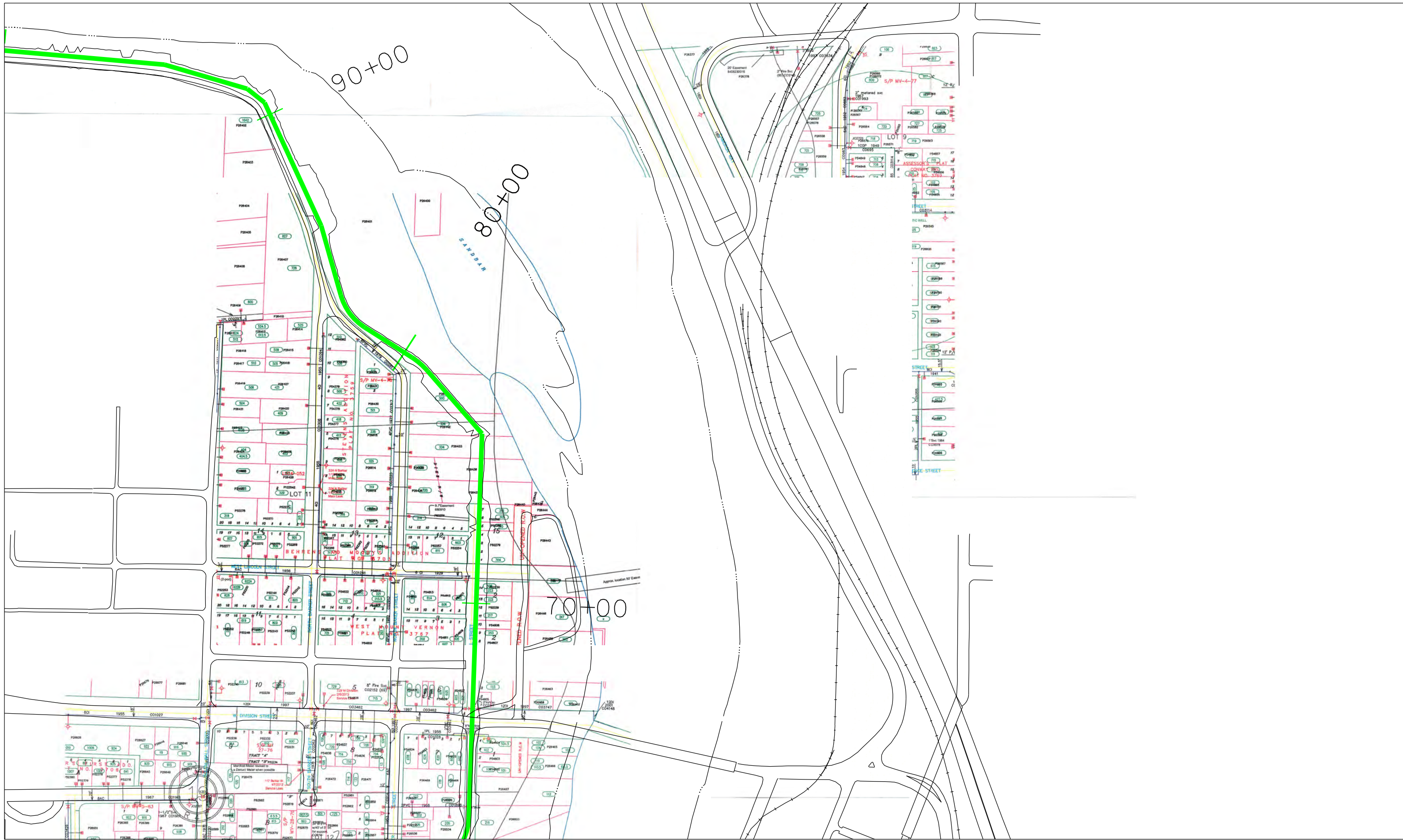
AF #7909170007

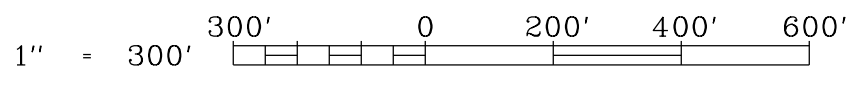
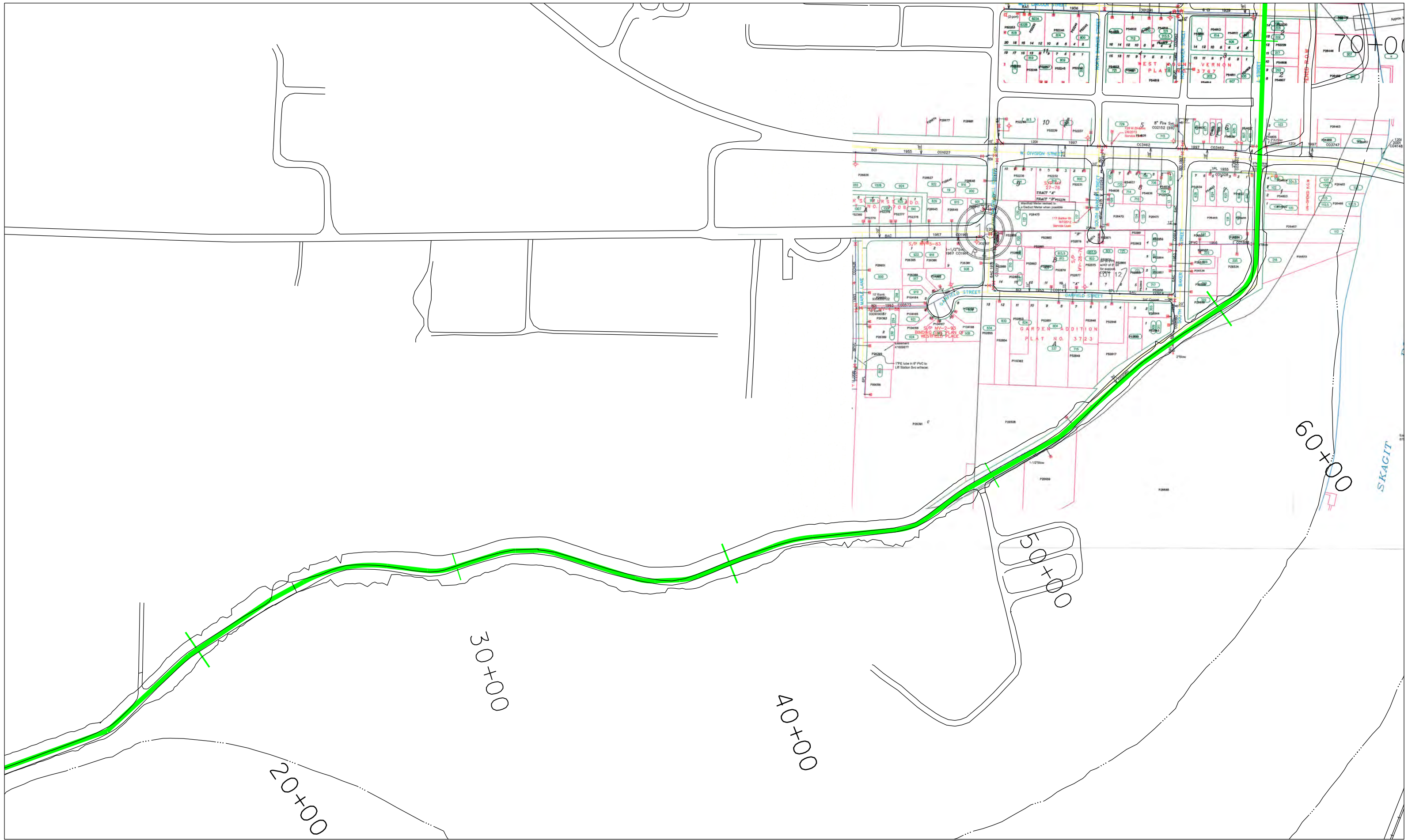
WAIVER OF DAMAGES  
16.5 X 495'

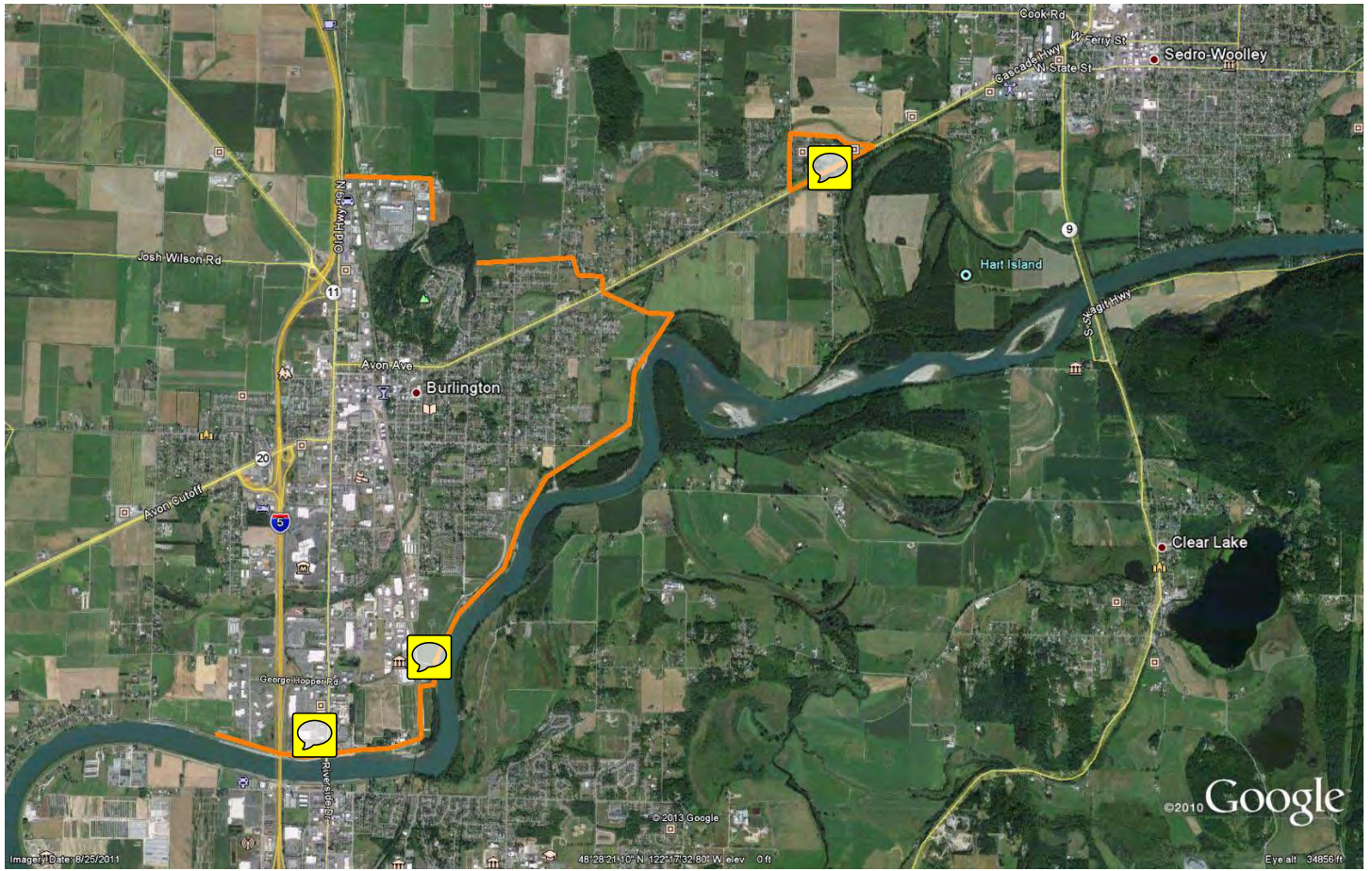
WAIVER OF DAMAGES  
16.5 X 825'

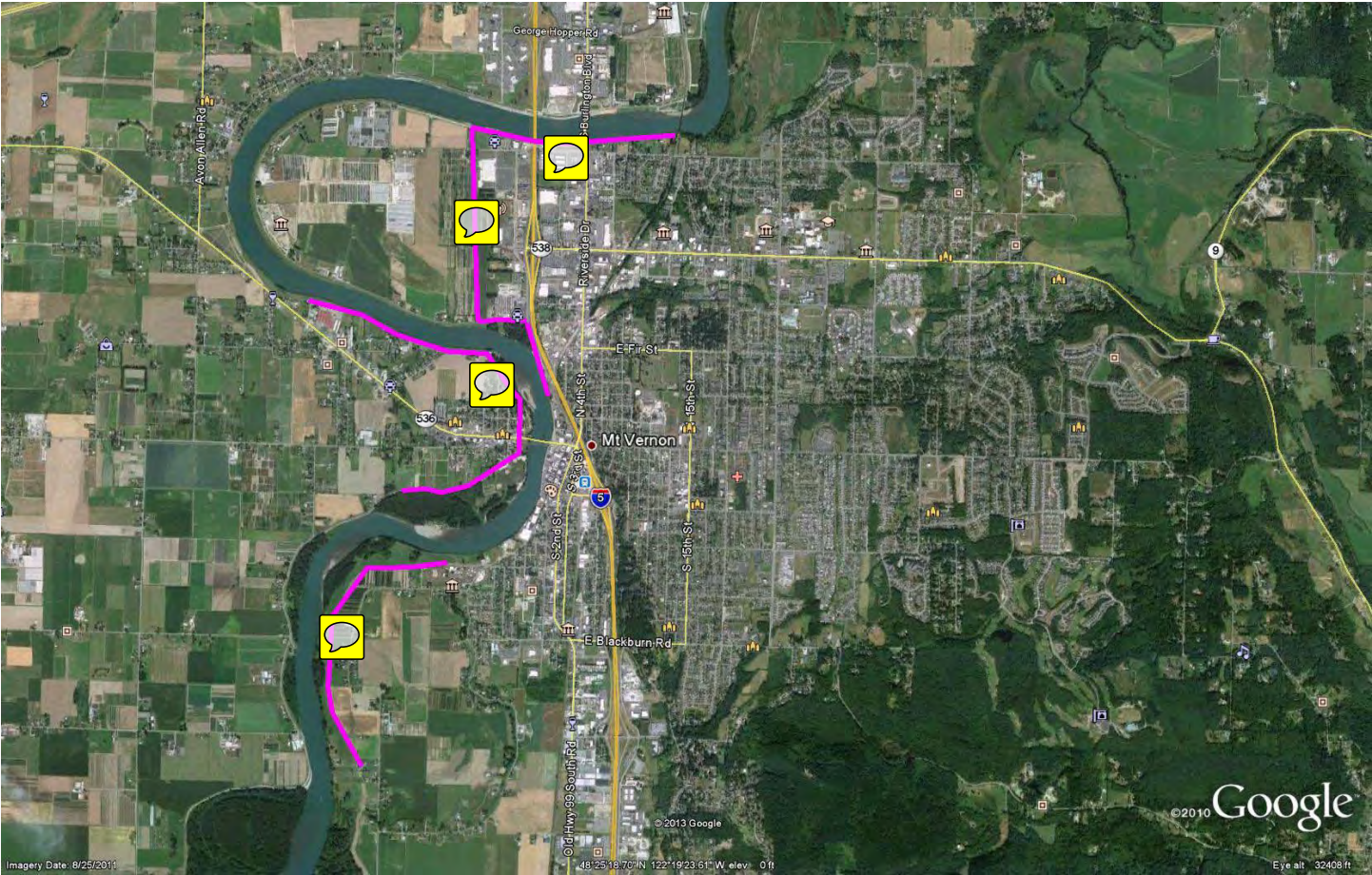
BRITT ROAD/DIKE ROAD  
LUD NO. 17  
1991 CO3436  
SCALE: 1"=300'  
January 2001



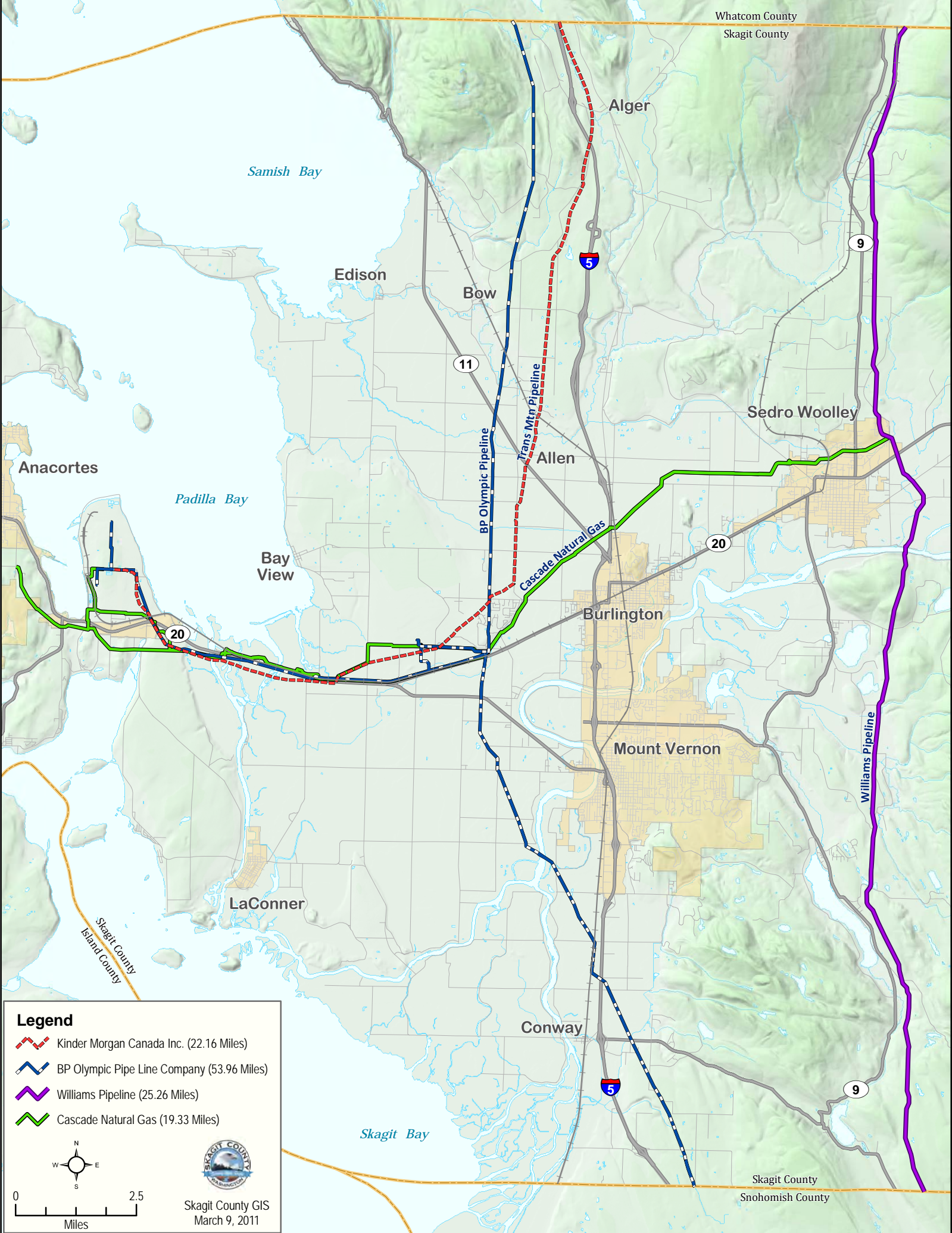










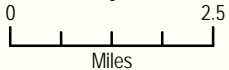




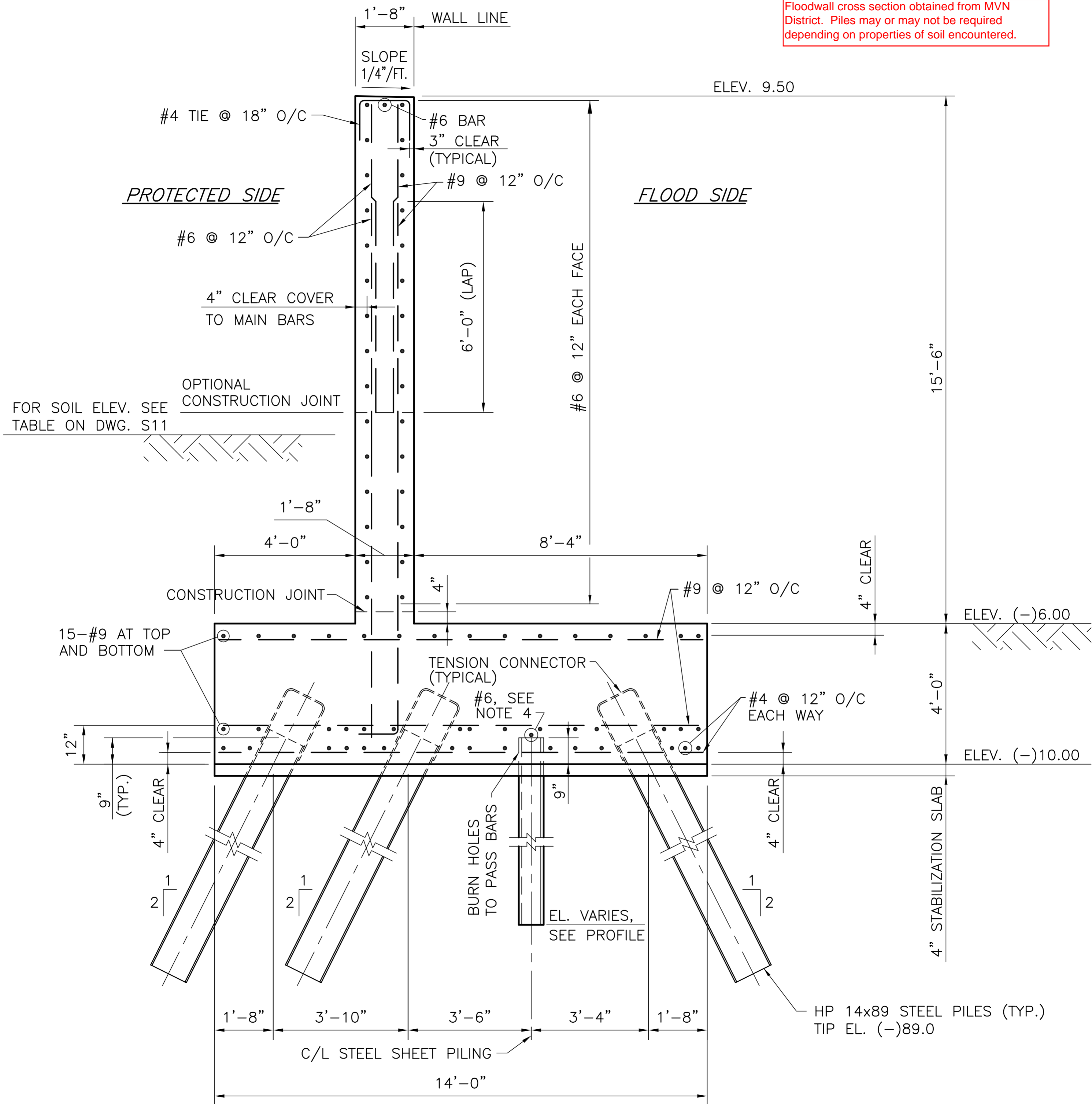


**Legend**

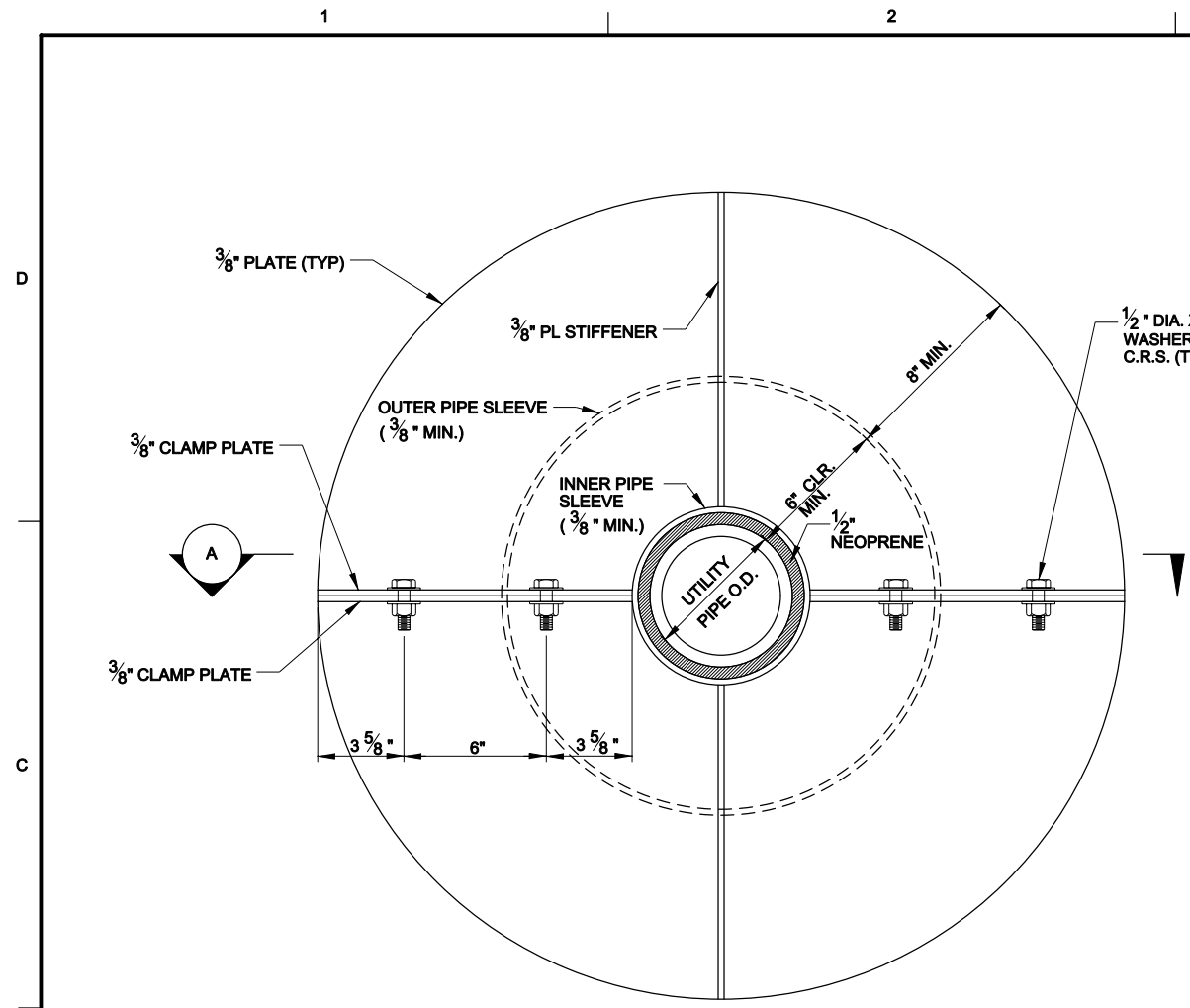
-  Kinder Morgan Canada Inc. (22.16 Miles)
-  BP Olympic Pipe Line Company (53.96 Miles)
-  Williams Pipeline (25.26 Miles)
-  Cascade Natural Gas (19.33 Miles)



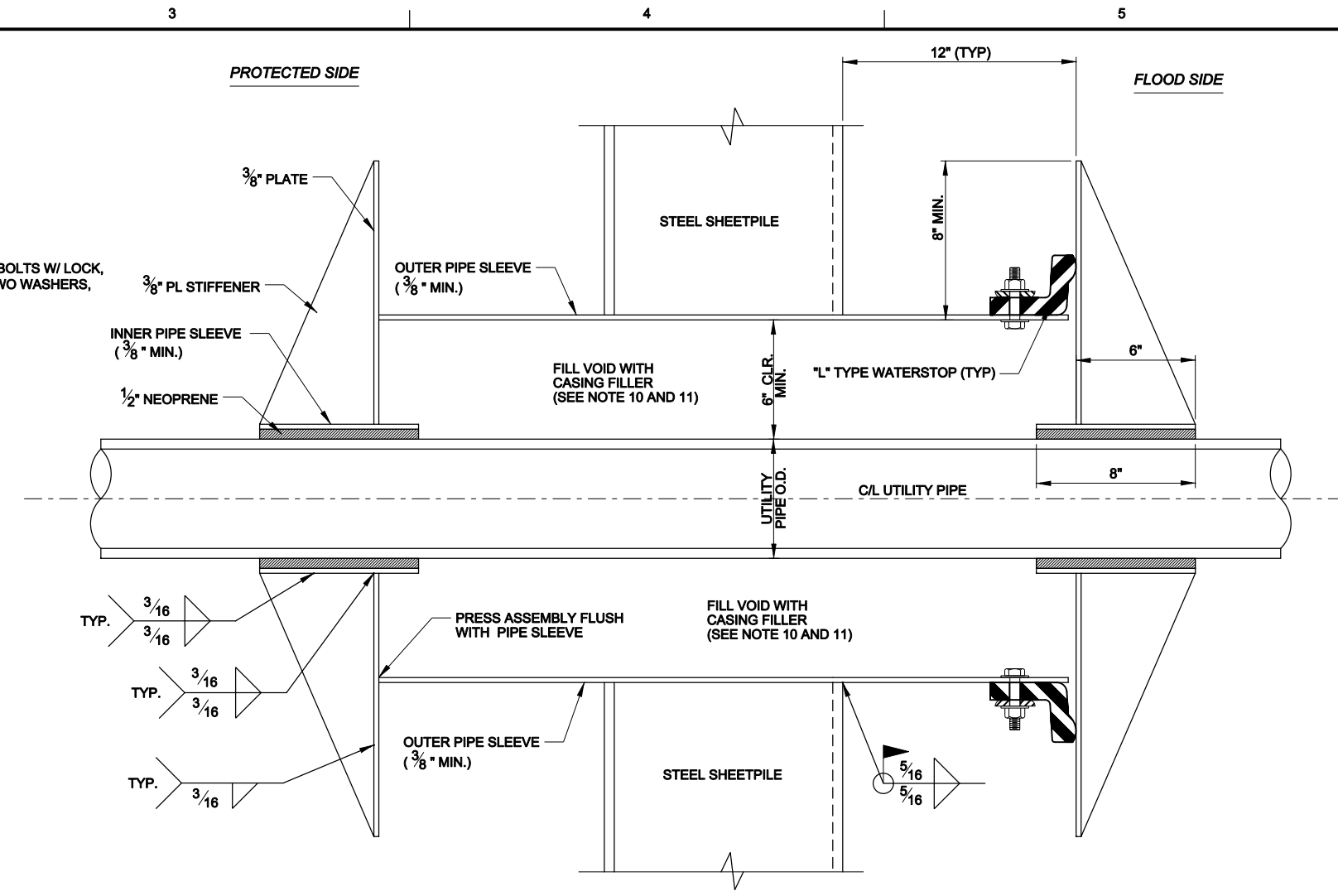
Floodwall cross section obtained from MVN District. Piles may or may not be required depending on properties of soil encountered.



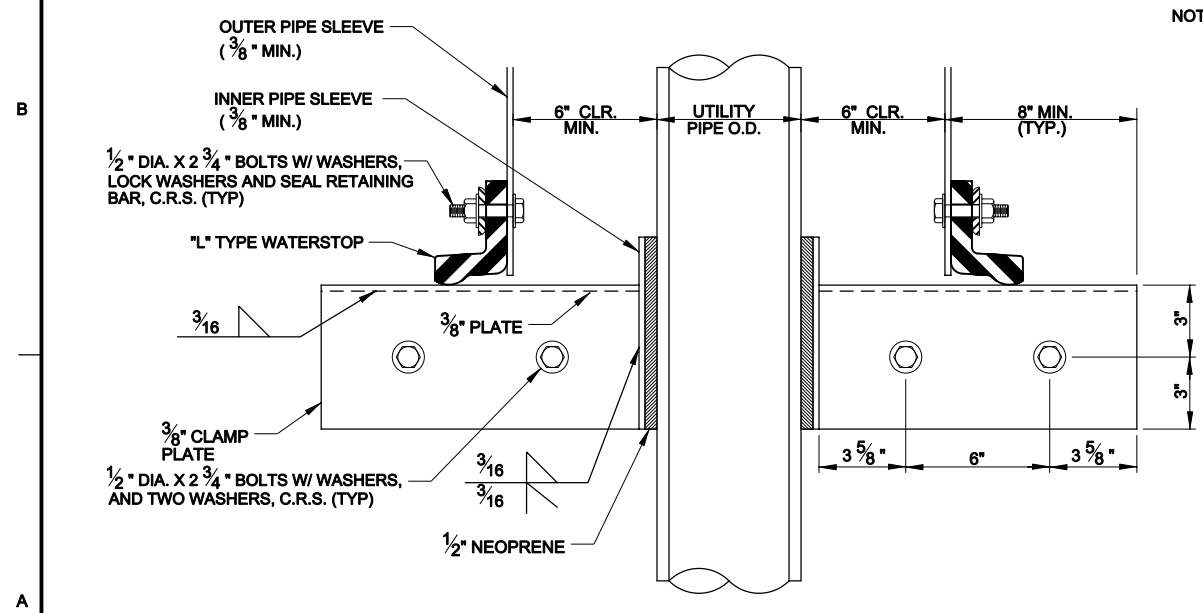
T-WALL SECTION



**UTILITY PROTECTION ELEVATION**



**SECTION THRU SHEETPILE WALL**

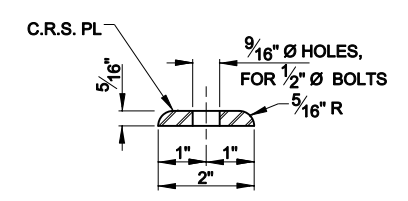


**SECTION A**

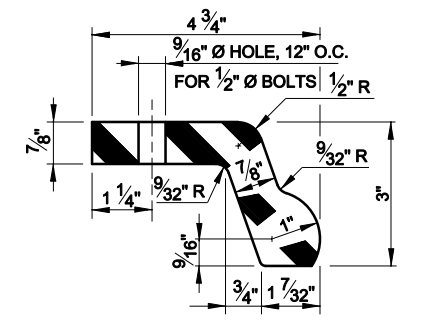
**NOTES:**

1. THIS DETAIL IS FOR NEW WALLS WHICH ARE PERPENDICULAR TO THE UTILITY.
2. DUE TO THE STIFFNESS OF THE WATERSTOP, SMALL UTILITIES MAY REQUIRE THE OUTER PIPE SLEEVE TO BE REPLACED BY A BOX FRAME. ALL DIMENSIONS SHALL BE ADJUSTED ACCORDINGLY.
3. GAS AND PETROLEUM PIPELINES MAY REQUIRE THAT A 1.5" MINIMUM CONCRETE COATING BE APPLIED BEFORE THE SLEEVE IS INSTALLED.
4. ALL MATERIAL FOR THE UTILITY PROTECTION ASSEMBLY SHALL BE STAINLESS STEEL, UNLESS OTHERWISE NOTED.
5. THE OUTER PIPE SLEEVE SHALL BE ASTM A36 STEEL AND COATED AS PER THE SPECIFICATION.
6. THICKNESS OF NEOPRENE MAY BE ADJUSTED SO THAT A TIGHT FIT AROUND THE PIPE SLEEVE IS ENSURED.
7. AFTER THE TWO FRAMES ARE LOOSELY CLAMPED AROUND THE PIPE ON THE PROTECTED SIDE, THE TOTAL ASSEMBLY SHALL BE PRESSED FLUSH AGAINST THE PIPE SLEEVE BEFORE TIGHTENING THE CLAMP PLATES.
8. AFTER THE TWO FRAMES ON THE FLOOD SIDE ARE LOOSELY CLAMPED AROUND THE PIPE, THE TOTAL ASSEMBLY SHALL BE PRESSED FLUSH TO THE WATERSTOP W/ MIN. 1/4" DEFLECTION BEFORE TIGHTENING THE CLAMP PLATES.
9. UPON COMPLETION OF THE ASSEMBLY, APPLY AN ANAEROBIC ADHESIVE (LOCTITE THREADLOCKER 290 OR EQUAL) TO ALL NUT AND BOLT JUNCTURES.
10. CASING FILLER SHALL BE TRENTON FILL-COAT NO. 6 CASING FILLER (BY TRENTON CORP.) OR APPROVED SIMILAR.
11. THE CASING VOID FILLER SHALL BE INSTALLED AS PER THE MANUFACTURER'S RECOMMENDATION. AFTER INSTALLATION IS COMPLETE, ALL HOLES FOR PUMPING AND VERIFICATION SHALL BE WELD SEALED OR FIT WITH A THREADED PLUG.

BUCKHORN RUBBER PRODUCTS, INC.  
MOLD NO. 6404.  
SPECIFICATION: NATURAL-177  
OR EQUAL



**SEAL RETAINING BAR**  
SCALE: 6" = 1'-0"



**" L " TYPE WATERSTOP**  
SCALE: 6" = 1'-0"

 <b>U.S. Army Corps of Engineers</b> NEW ORLEANS DISTRICT	
DESIGNED BY: _____ DWN BY: _____ U.S. ARMY CORPS OF ENGINEERS NEW ORLEANS DISTRICT NEW ORLEANS, LOUISIANA	SOLICITATION NO.: _____ CONTRACT NO.: _____ PLOT SCALE: _____ PLOT DATE: _____ FILE NUMBER: _____ FILE NAME: _____ ANSI D _____
UNDERGROUND UTILITY PENETRATION DETAIL	SHEET IDENTIFICATION