

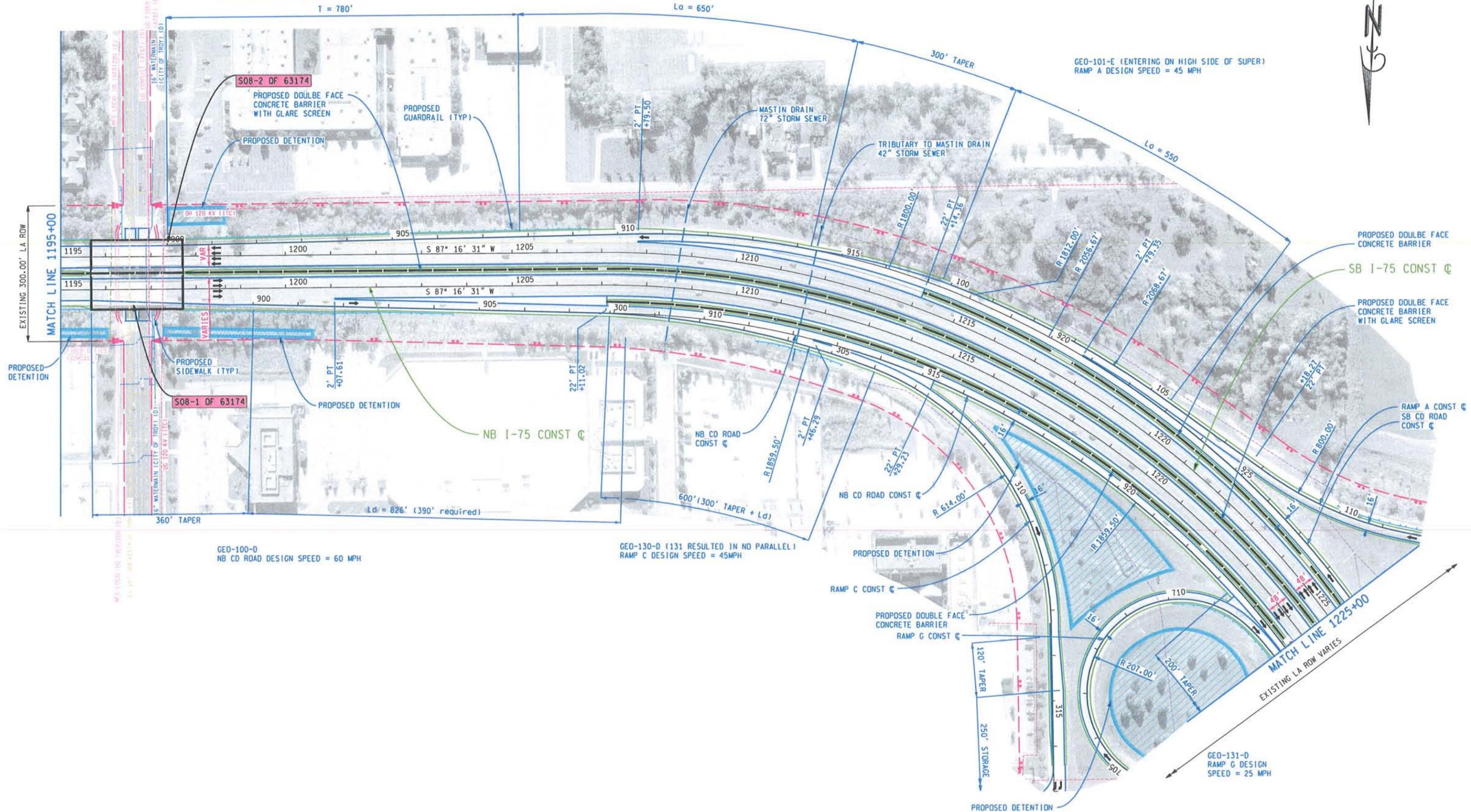
LIVERNOIS ROAD

GEO-100-E (101 RESULTED IN NO PARALLEL)
SB CD ROAD DESIGN SPEED = 60 MPH

T = 780'

Ld = 650'

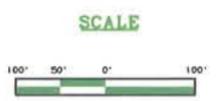
GEO-101-E (ENTERING ON HIGH SIDE OF SUPER)
RAMP A DESIGN SPEED = 45 MPH



GEO-100-D
NB CD ROAD DESIGN SPEED = 60 MPH

GEO-130-D (131 RESULTED IN NO PARALLEL)
RAMP C DESIGN SPEED = 45MPH

GEO-131-D
RAMP G DESIGN SPEED = 25 MPH



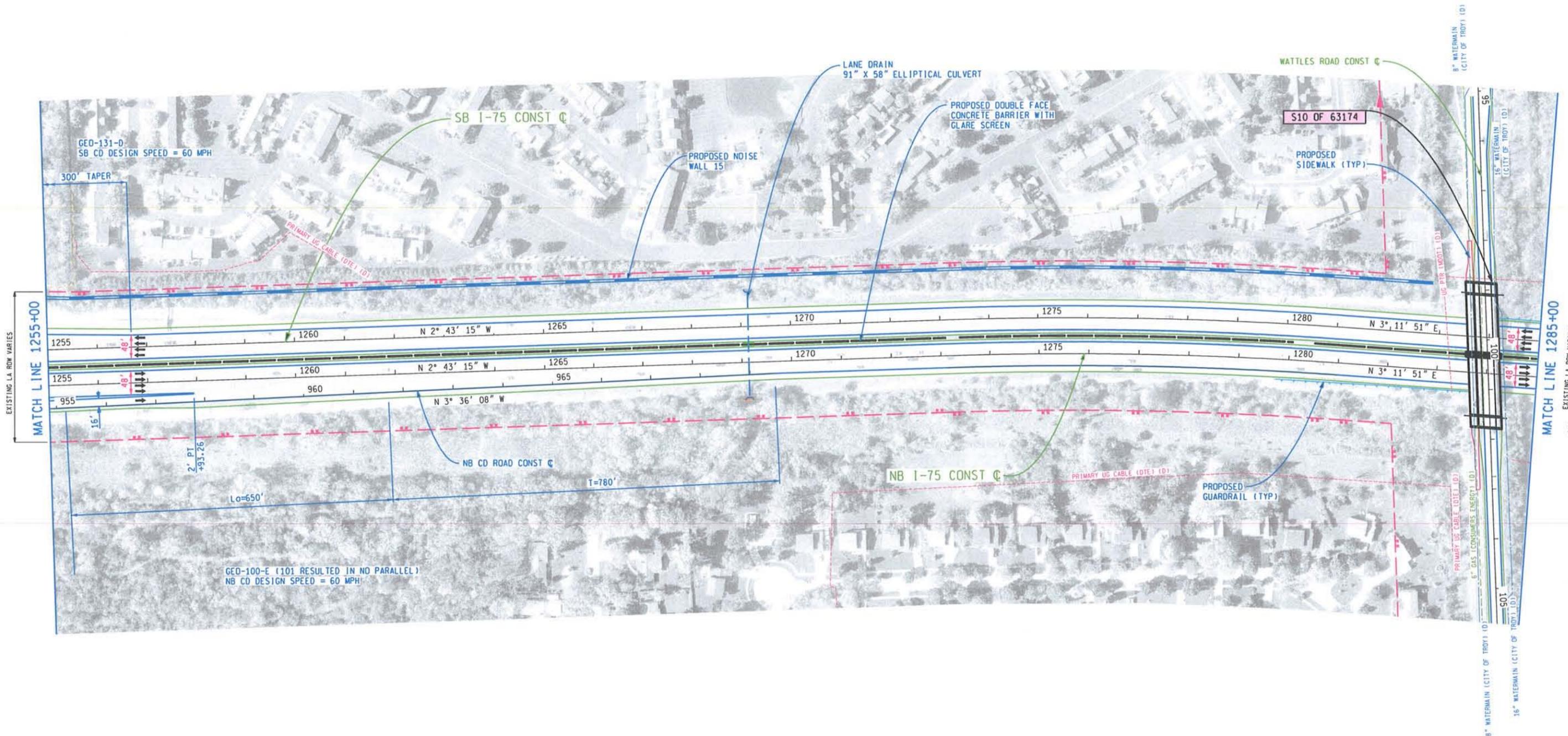
LEGEND	
	GAS LINE
	ELECTRIC LINE
	WATERMAIN
	EXISTING WETLAND
	EXISTING DRAINAGE FLOW
	PROP PAVEMENT EDGE
	PROP SHOULDER EDGE
	PROP BARRIER
	PROP RETAINING WALL
	PROPOSED CUL-DE-SAC
	PROP WETLAND
	EXISTING LA R-O-W
	EXISTING R-O-W
	PROP R-O-W
	PROP LA R-O-W
	NOISE WALL
	PROP BRIDGE
	PROP SIDEWALK
	PROP CONSTRUCTION
	PROP BRIDGE REPAIR
	PROP PARK & RIDE
	SIGNALIZED INTERSECTION

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MICHIGAN DEPARTMENT OF TRANSPORTATION
I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
GEOMETRIC STUDY
**I-75 STA 1195+00
TO STA 1225+00
BIG BEAVER ROAD INTERCHANGE**



SCALE



LEGEND

GAS LINE	EXISTING WETLAND	PROP WETLAND	PROP SIDEWALK
ELECTRIC LINE	EXISTING DRAINAGE FLOW	EXISTING LA R-O-W	PROP CONSTRUCTION C
FIBER OPTICS	PROP PAVEMENT EDGE	EXISTING R-O-W	PROP BRIDGE REPAIR
WATERMAIN	PROP SHOULDER EDGE	PROP R-O-W	PROP PARK & RIDE
(UNIDENTIFIED)	PROP BARRIER	PROP LA R-O-W	SIGNALIZED INTERSECTION
	PROP RETAINING WALL	NOISE WALL	
	PROPOSED CUL-DE-SAC	PROP BRIDGE	

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GEOMETRIC STUDY
**I-75 STA 1255+00
TO STA 1285+00
BIG BEAVER ROAD INTERCHANGE**

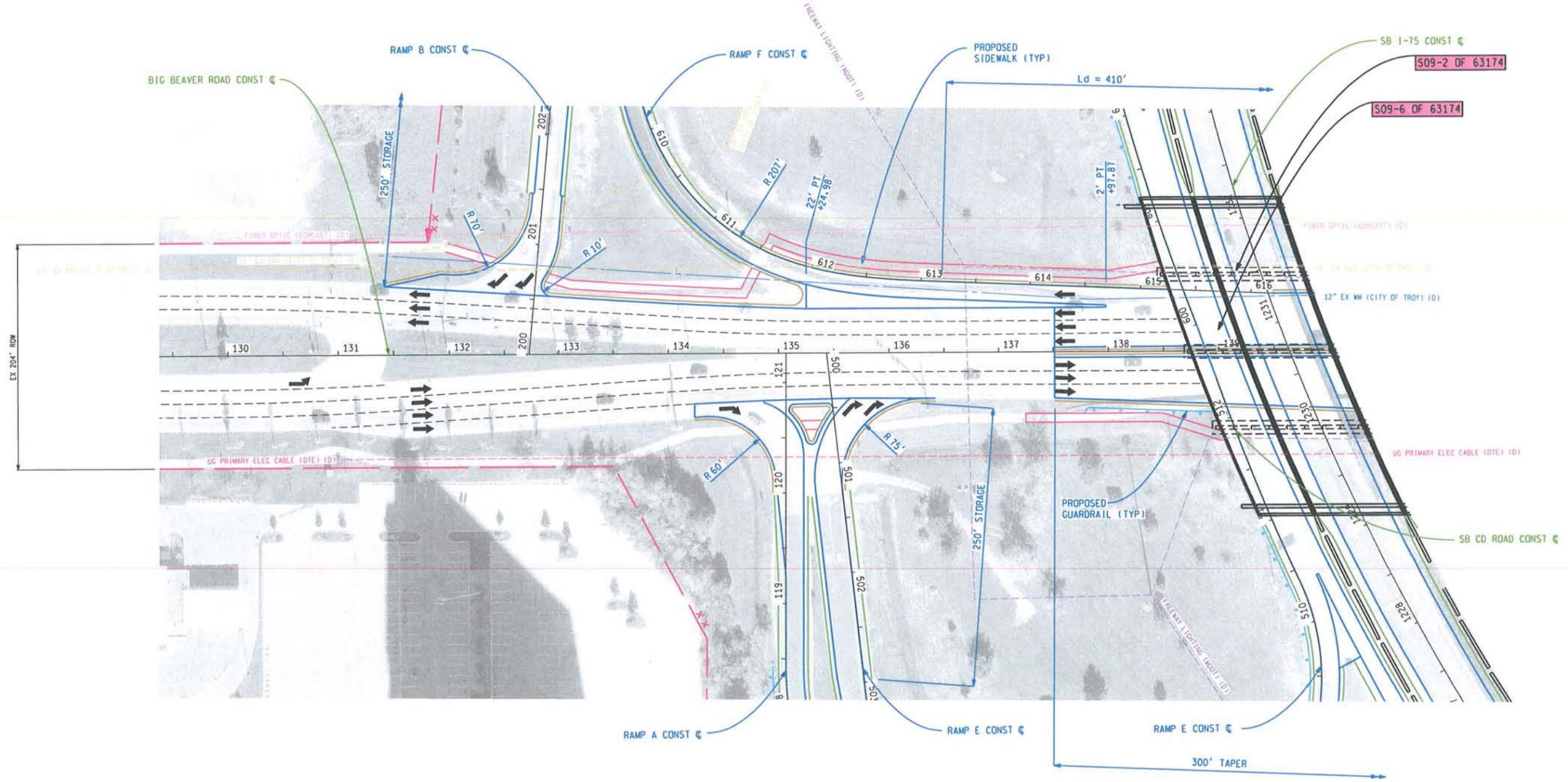
BIG BEAVER ROAD RAMP B BIG BEAVER ROAD RAMP F

SB I-75



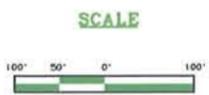
BIG BEAVER ROAD

BIG BEAVER ROAD



BIG BEAVER ROAD RAMP A BIG BEAVER ROAD RAMP E

SB I-75



LEGEND

GAS LINE	EXISTING WETLAND	PROP WETLAND	PROP SIDEWALK
ELECTRIC LINE	EXISTING DRAINAGE FLOW	EXISTING LA R-O-W	PROP CONSTRUCTION C
FIBER OPTIC	PROP PAVEMENT EDGE	EXISTING R-O-W	PROP BRIDGE REPAIR
WATERMAIN	PROP SHOULDER EDGE	PROP R-O-W	PROP PARK & RIDE
UG CONDUIT	PROP BARRIER	PROP LA R-O-W	SIGNALIZED INTERSECTION
	PROP RETAINING WALL	NOISE WALL	PROP BRIDGE
	PROP CUL-DE-SAC		

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**BIG BEAVER ROAD
WEST SIDE**

NB I-75

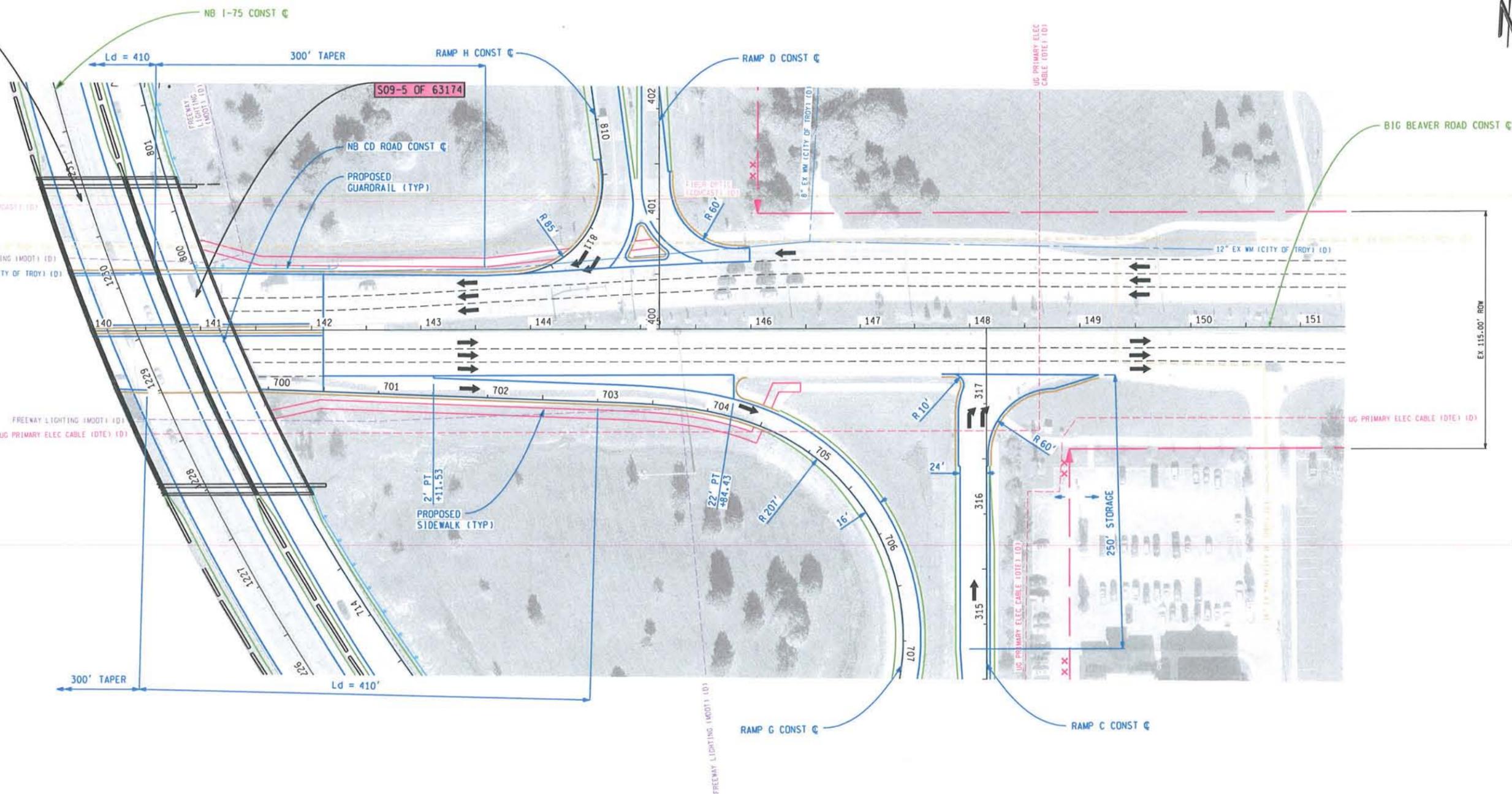
BIG BEAVER ROAD RAMP H BIG BEAVER ROAD RAMP D



S09-1 OF 63174

BIG BEAVER ROAD

BIG BEAVER ROAD



NB I-75

BIG BEAVER ROAD RAMP G BIG BEAVER ROAD RAMP C



LEGEND

GAS LINE	EXISTING WETLAND	PROP WETLAND	PROP SIDEWALK
ELECTRIC LINE	EXISTING DRAINAGE FLOW	EXISTING LA R-O-W	PROP CONSTRUCTION C
FIBER OPTIC	PROP PAVEMENT EDGE	EXISTING R-O-W	PROP BRIDGE REPAIR
WATERMAIN	PROP SHOULDER EDGE	PROP R-O-W	PROP PARK & RIDE
UG FIBER OPTIC	PROP BARRIER	PROP LA R-O-W	SIGNALIZED INTERSECTION
	PROP RETAINING WALL	NOISE WALL	
	PROPOSED CUL-DE-SAC	PROP BRIDGE	

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I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
GEOMETRIC STUDY

**BIG BEAVER ROAD
EAST SIDE**

4.6.5 Crooks Road Interchange

The proposed configuration at the Crooks Road Interchange maintains the existing three-leg trumpet type A interchange with single lane exit and entrance ramps located in the NW and SW quadrants, respectively. East of I-75 is a single lane loop entrance ramp and single lane diamond exit ramp. The four Crooks Road Interchange ramps converge to the west of I-75 to create Crooks Road Interchange which is a four lane boulevard section with a variable median width. The proposed cross section is shown in Figure 4-31.

In order to achieve the desired underclearance of 16.25 feet over NB and SB I-75, the NB ramp profiles were raised approximately 9 inches, while the NB and SB I-75 profiles were lowered approximately 9 inches.

No additional ROW is anticipated to construct this interchange.

The proposed Crooks Road Interchange is detailed in Figures 4-32 through 4-33.

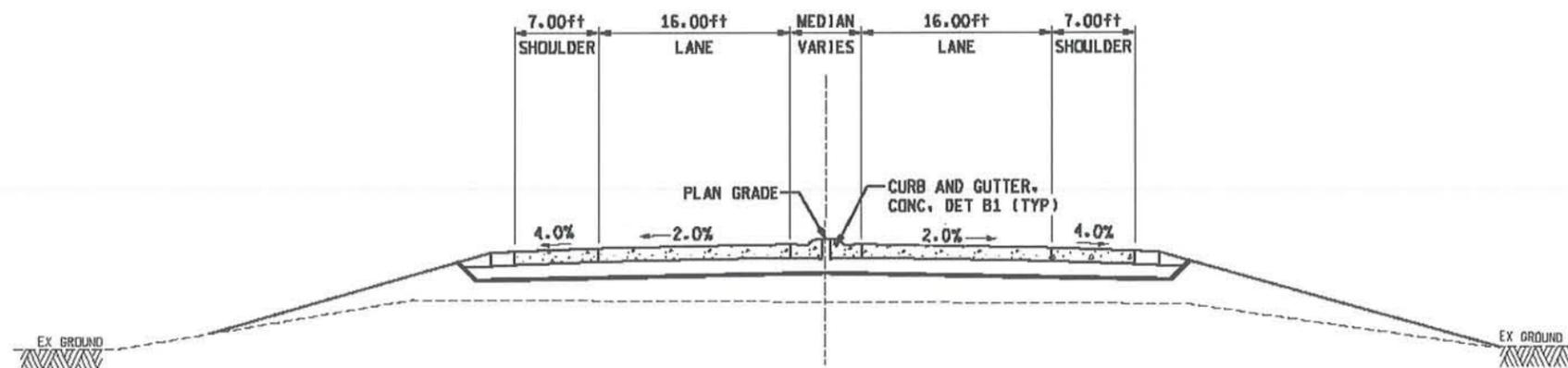
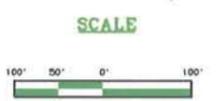
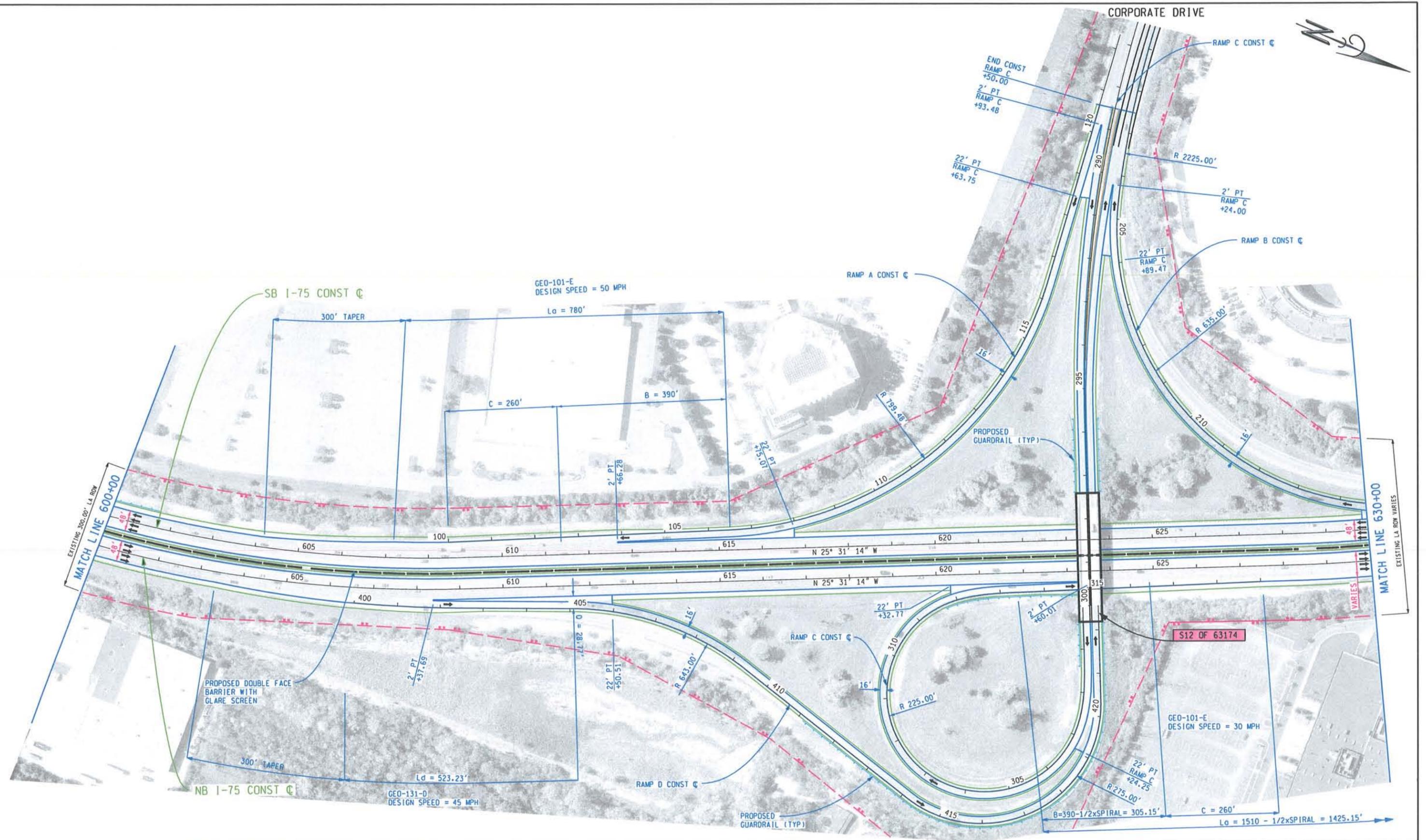


Figure 4-31 Proposed Cross Section for Crooks Road



LEGEND	
	GAS LINE
	ELECTRIC LINE
	WATERMAIN
	EXISTING WETLAND
	EXISTING DRAINAGE FLOW
	PROP PAVEMENT EDGE
	PROP SHOULDER EDGE
	PROP BARRIER
	PROP RETAINING WALL
	PROPOSED CUL-DE-SAC
	PROP WETLAND
	EXISTING LA R-O-W
	PROP R-O-W
	PROP LA R-O-W
	NOISE WALL
	PROP BRIDGE
	PROP SIDEWALK
	PROP CONSTRUCTION Q
	PROP BRIDGE REPAIR
	PROP PARK & RIDE
	SIGNALIZED INTERSECTION

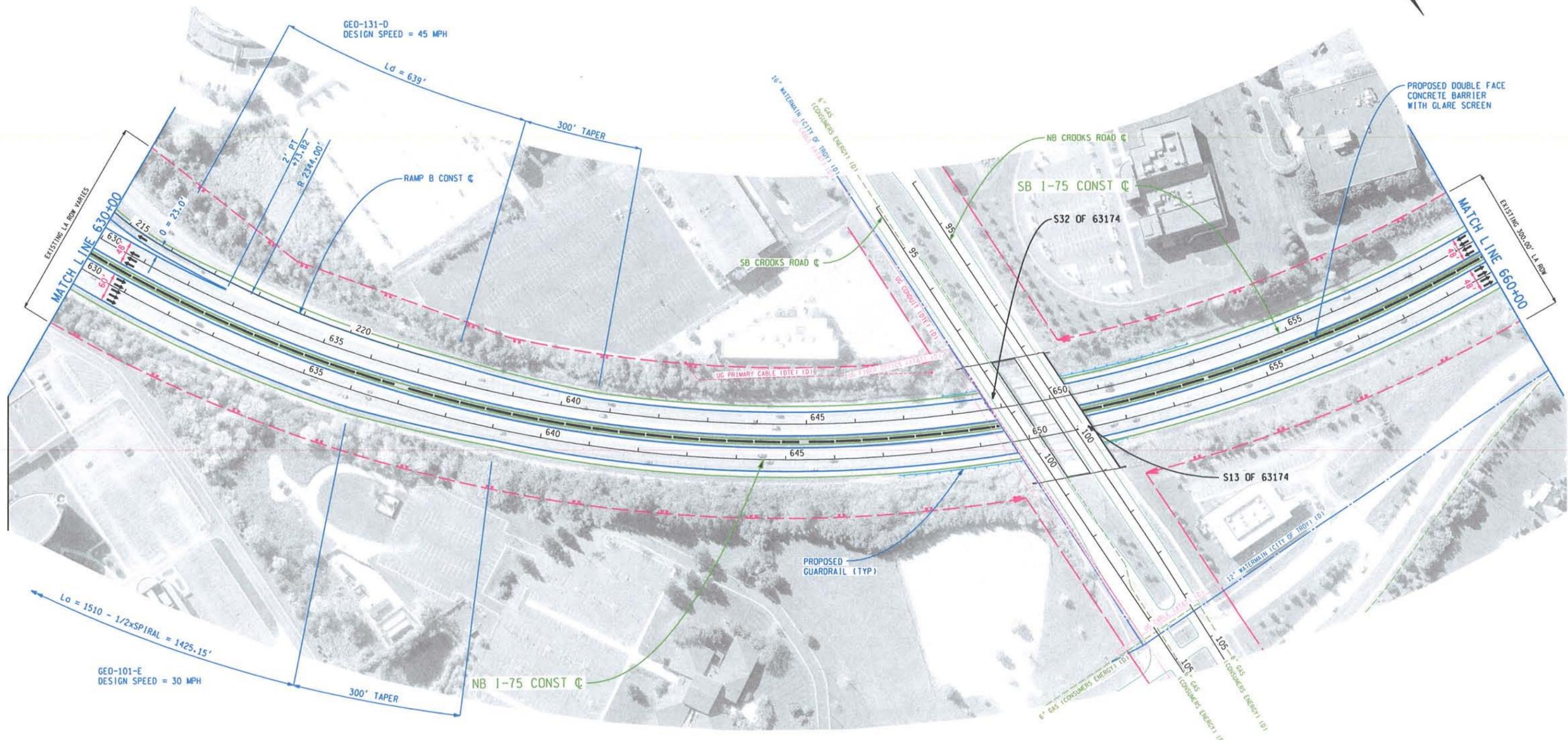
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MICHIGAN DEPARTMENT OF TRANSPORTATION
I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
GEOMETRIC STUDY
**I-75 STA 600-00
TO STA 630-00
CROOKS ROAD INTERCHANGE**
FIGURE 4-32

CROOKS ROAD



GEO-131-D
DESIGN SPEED = 45 MPH

Ld = 639'

300' TAPER

RAMP B CONST C

2' PI
+13.82
R 2334.00'

0 = 23.0'

MATCH LINE 630+00

MATCH LINE 660+00

PROPOSED DOUBLE FACE
CONCRETE BARRIER
WITH GLARE SCREEN

NB CROOKS ROAD C
SB I-75 CONST C
S32 OF 63174

SB CROOKS ROAD C

S13 OF 63174

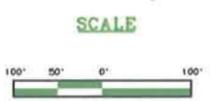
PROPOSED
GUARDRAIL (TYP)

NB I-75 CONST C

Lo = 1510 - 1/2xSPIRAL = 1425.15'

GEO-101-E
DESIGN SPEED = 30 MPH

300' TAPER



LEGEND

GAS LINE	EXISTING WETLAND	PROP WETLAND	PROP SIDEWALK
ELECTRIC LINE	EXISTING DRAINAGE FLOW	EXISTING LA R-O-W	PROP CONSTRUCTION & PROP BRIDGE REPAIR
FIBER OPTIC	PROP PAVEMENT EDGE	EXISTING R-O-W	PROP PARK & RIDE
WATERMAIN	PROP SHOULDER EDGE	PROP R-O-W	SIGNALIZED INTERSECTION
12" CONDUIT	PROP BARRIER	PROP LA R-O-W	NOISE WALL
	PROP RETAINING WALL	PROP BRIDGE	PROP BRIDGE
	PROPOSED CUL-DE-SAC		

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I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
GEOMETRIC STUDY
**I-75 STA 630+00
TO STA 660+00
CROOKS ROAD INTERCHANGE**
FIGURE 4-33

4.6.6 Adams Road Interchange

The proposed configuration at the Adams Road Interchange maintains the existing two-quadrant cloverleaf interchange. The NW quadrant consists of a single lane diamond entrance ramp that forms the continuous auxiliary lane with the Square Lake Road (I-75BL) interchange and a single lane loop exit ramp, while the SW quadrant consists of a single lane loop entrance ramp and single lane diamond exit ramp that is also a continuous auxiliary lane from the Square Lake Road (I-75BL) interchange. Weave merge lanes have been continued to the Square Lake Road Interchange to the north. The entrance and exit ramp terminals are separated by a corrugated median with rolled curb island. Right turn lanes have been provided to each of the entrance ramps.

The only proposed local road work along Adams Road consists of the reconstruction required to remove and replace the I-75 bridges and to add a right turn lane for the NB I-75 entrance ramp. Proposed local road work at Square Lake Road will be limited to ramp terminal reconstruction and the addition of a right turn lane to the SB I-75 entrance ramp. The proposed cross section under the I-75 bridge is shown in Figure 4-34.

In order to achieve the desired underclearance of 14.75 feet, the NB and SB I-75 profiles were raised by approximately 1 foot over Adams Road. Due to the limited amount of reconstruction along Adams Road, the local road will remain at the existing grade throughout the limits of the project.

No additional ROW is anticipated to construct this interchange.

The proposed Adams Road Interchange and local road is detailed in Figures 4-35 and 4-36.

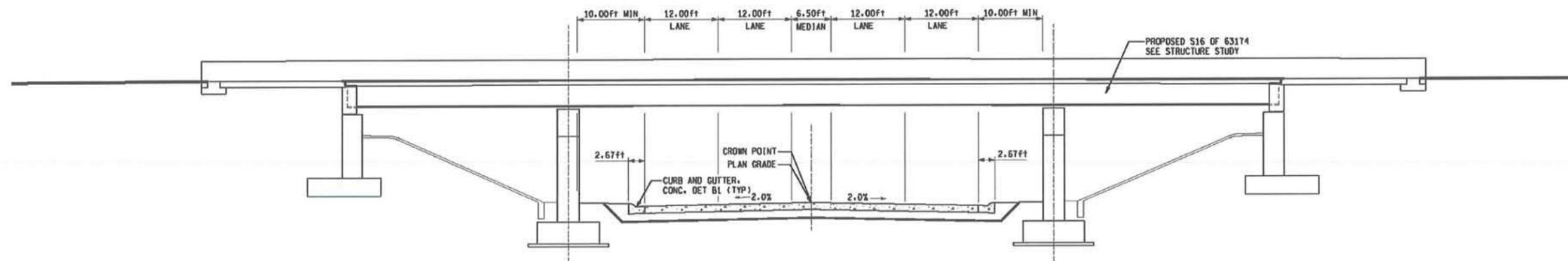
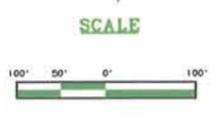
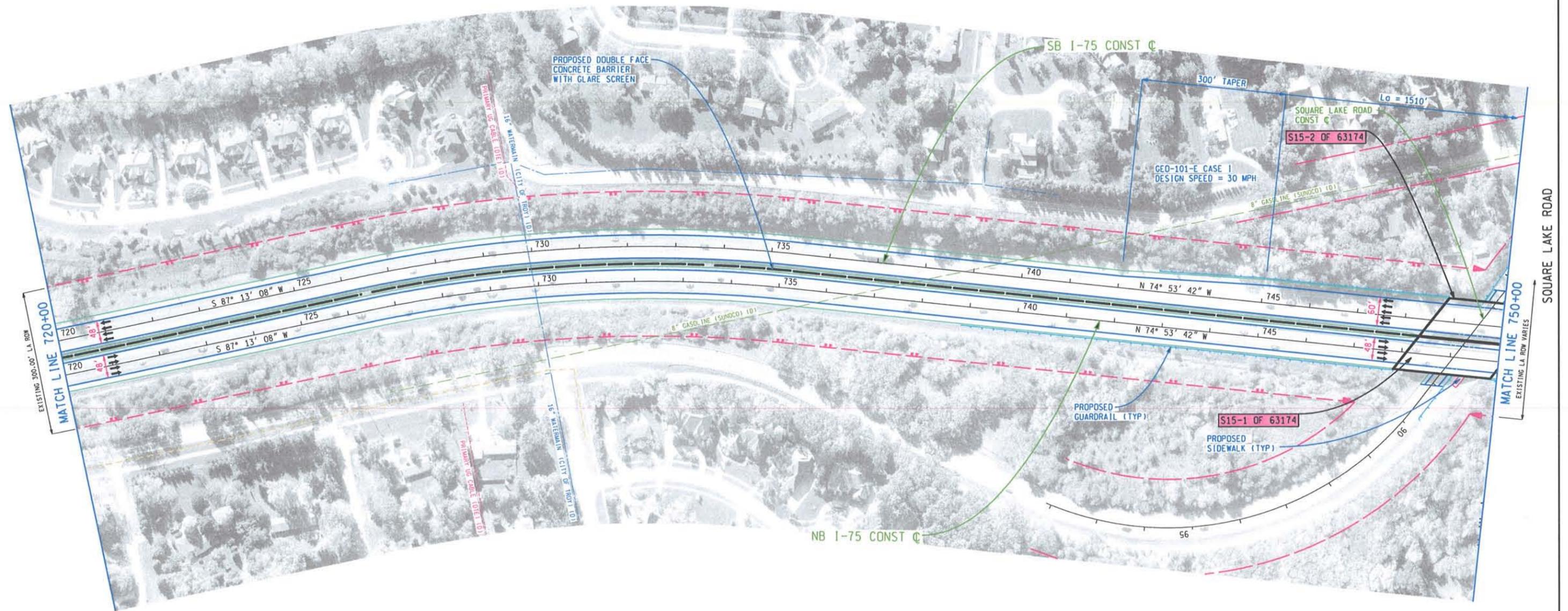


Figure 4-34 Proposed Cross Section for Adams Road



LEGEND	
GAS LINE	EXISTING WETLAND
ELECTRIC LINE	EXISTING DRAINAGE FLOW
WATERMAIN	PROP PAVEMENT EDGE
	PROP SHOULDER EDGE
	PROP BARRIER
	PROP RETAINING WALL
	PROPOSED CUL-DE-SAC
	PROP WETLAND
	EXISTING LA R-O-W
	PROP R-O-W
	PROP LA R-O-W
	NOISE WALL
	PROP BRIDGE
	PROP SIDEWALK
	PROP CONSTRUCTION & PROP BRIDGE REPAIR
	PROP PARK & RIDE
	SIGNALIZED INTERSECTION

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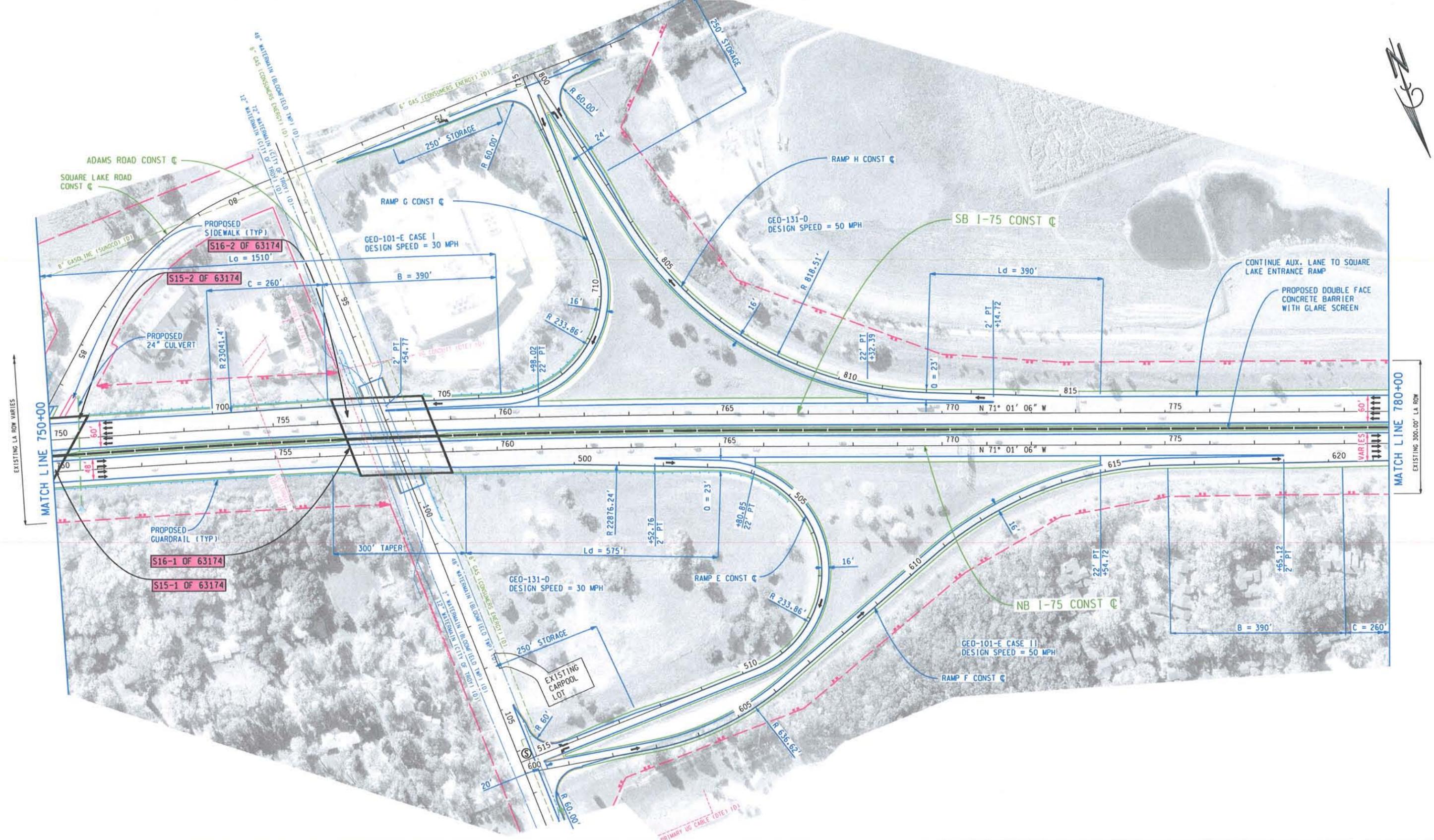
MICHIGAN DEPARTMENT OF TRANSPORTATION
I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
GEOMETRIC STUDY

I-75 STA 720+00
TO STA 750+00
ADAMS ROAD INTERCHANGE

FIGURE 4-35

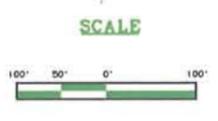
ADAMS ROAD

SQUARE LAKE ROAD



EXISTING LA ROW VARIES

EXISTING 300'-00" LA ROW



LEGEND	
GAS LINE	EXISTING WETLAND
ELECTRIC LINE	EXISTING DRAINAGE FLOW
WATERMAIN	PROP PAVEMENT EDGE
PROP SIDEWALK	PROP SHOULDER EDGE
PROP BARRIER	PROP RETAINING WALL
PROP CUL-DE-SAC	PROP WETLAND
PROP BRIDGE	EXISTING LA R-O-W
PROP BRIDGE	PROP R-O-W
PROP BRIDGE	PROP LA R-O-W
PROP BRIDGE	NOISE WALL
PROP BRIDGE	PROP BRIDGE
PROP BRIDGE	PROP SIDEWALK
PROP BRIDGE	PROP CONSTRUCTION
PROP BRIDGE	PROP BRIDGE REPAIR
PROP BRIDGE	PROP PARK & RIDE
PROP BRIDGE	SIGNALIZED INTERSECTION

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MICHIGAN DEPARTMENT OF TRANSPORTATION
I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-69
ENGINEERING REPORT

I-75 STA 750+00
TO STA 780+00
ADAMS ROAD INTERCHANGE

FIGURE 4-36

4.6.7 Square Lake Road Interchange

The proposed configuration at the Square Lake Road Interchange eliminates the free-flow left entrance and exit ramps along NB I-75. In addition, NB I-75 has been realigned horizontally to parallel SB I-75 within the limits of the interchange, which results in sufficient real estate to achieve the desired right entrance and exit ramps along NB I-75. To reduce the number of proposed structures within the interchange, both NB and SB I-75 make up the lowest level of the tri-level interchange and have a median separation of approximately 20 feet which allows sufficient space for the placement of the proposed piers supporting the two fly-over structures. The NB I-75 to WB I-75 BL ramp is the mid-level, while the EB I-75 BL to NB I-75 is the highest level of the tri-level interchange. Weave merge lanes have been continued to the Adams Road interchange to the south. The only work anticipated along the I-75 BL (Square Lake Road) at this location is the work required to reconstruct and upgrade the ramps to current standards. The proposed cross section and layout for NB and SB I-75 and the two lane entrance and exit ramps are shown in Figure 4-37.

A minimum underclearance of 16.25 feet has been maintained for all roadways within this interchange. Due to the horizontal alignment changes and reordering of the levels within the tri-level interchange, significant vertical changes were necessary. NB I-75 will require approximately 20 feet of excavation through the existing NW Ramp embankment to construct, while SB I-75 will require approximately 15 feet of excavation through the existing NW Ramp embankment. The NB I-75 to EB I-75 BL profile has been raised approximately 14 feet, while the EB I-75 BL to NB I-75 ramp profile has been raised approximately 11 feet.

No additional ROW is anticipated to construct this interchange.

The proposed Square Lake Road Interchange and local road is detailed in Figures 4-38 through 4-42.

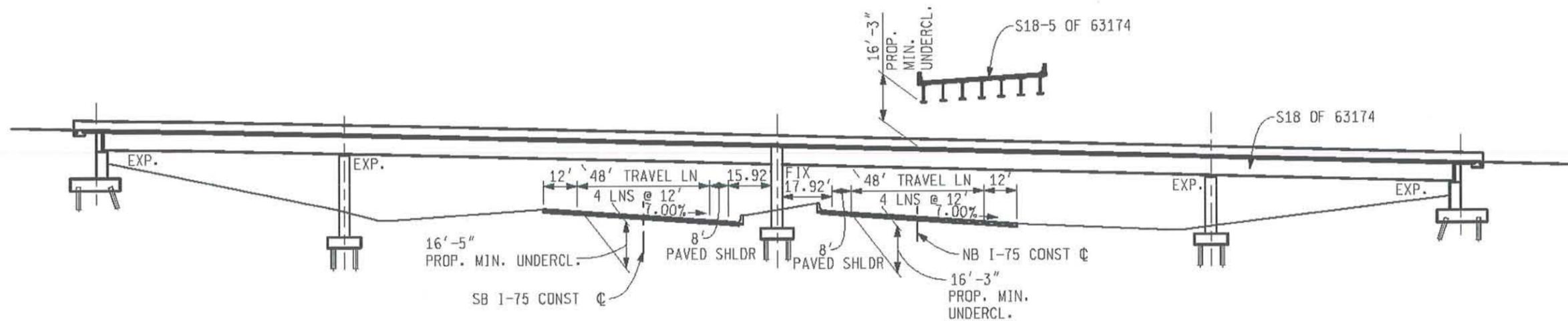
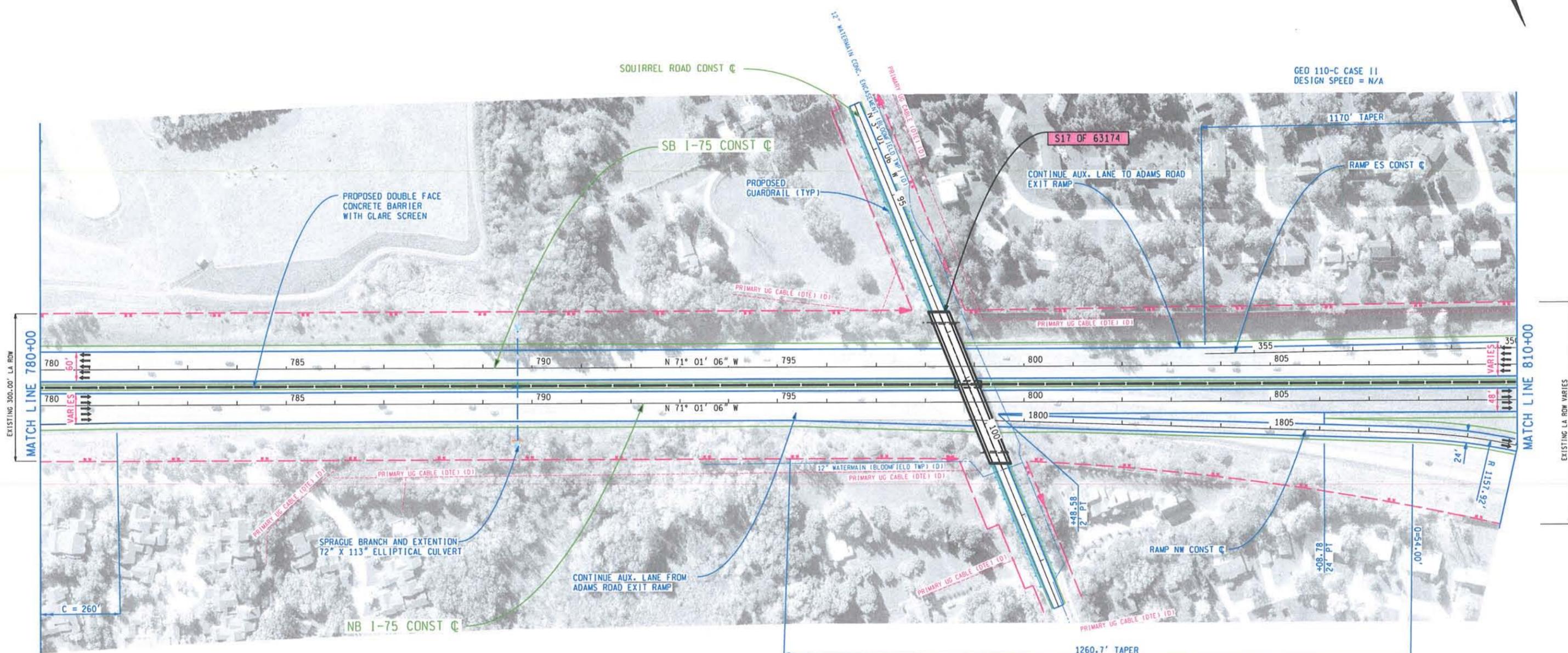


Figure 4-37 Proposed Cross Section for Square Lake Road Interchange

SQUIRREL ROAD



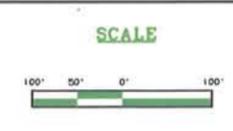
GEO 110-C CASE II
DESIGN SPEED = N/A

GEO-101-E CASE II
DESIGN SPEED = 50 MPH

GEO 140-B CASE II
EXCEPT DO NOT DROP A LANE

EXISTING 300.00' LA ROW
MATCH LINE 780+00

MATCH LINE 810+00
EXISTING LA ROW VARIES



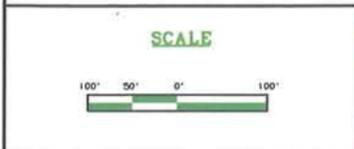
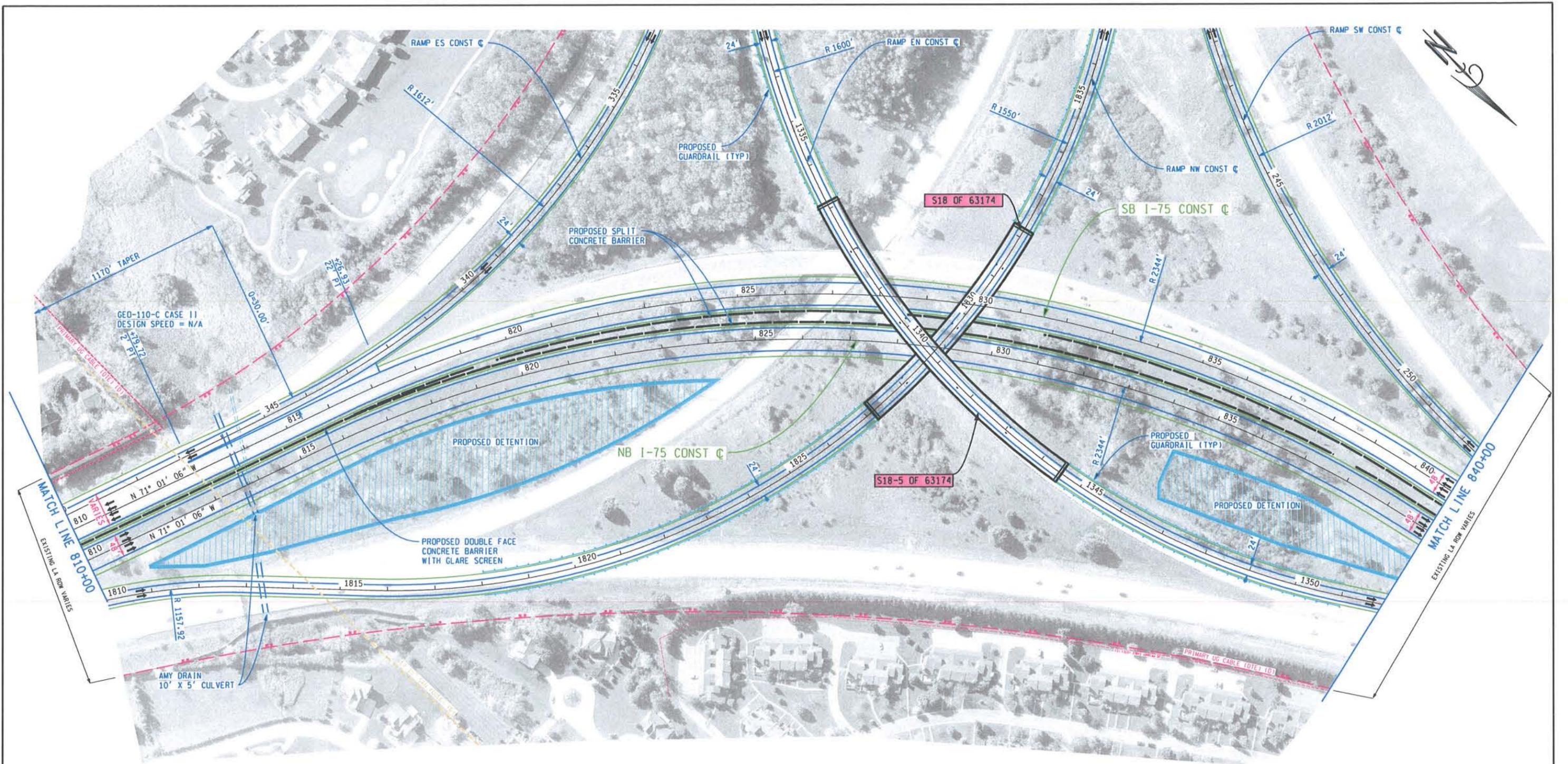
LEGEND	
	GAS LINE
	ELECTRIC LINE
	WATERMAIN
	EXISTING WETLAND
	EXISTING DRAINAGE FLOW
	PROP PAVEMENT EDGE
	PROP SHOULDER EDGE
	PROP BARRIER
	PROP RETAINING WALL
	PROPOSED CUL-DE-SAC
	PROP WETLAND
	EXISTING LA R-O-W
	EXISTING R-O-W
	PROP R-O-W
	PROP LA R-O-W
	NOISE WALL
	PROP BRIDGE
	PROP SIDEWALK
	PROP CONSTRUCTION & BRIDGE REPAIR
	PROP PARK & RIDE
	SIGNALIZED INTERSECTION

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I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-69
GEOMETRIC STUDY
I-75 STA 780+00
TO STA 810+00
SQUARE LAKE ROAD INTERCHANGE



LEGEND	
GAS LINE	EXISTING WETLAND
ELECTRIC LINE	EXISTING DRAINAGE FLOW
WATERMAIN	PROP PAVEMENT EDGE
FIBER OPTIC	PROP SHOULDER EDGE
PROP RETAINING WALL	PROP BARRIER
PROP BRIDGE	PROP RETAINING WALL
PROP WETLAND	PROP CUL-DE-SAC
EXISTING LA R-O-W	PROP BRIDGE
EXISTING R-O-W	PROP BRIDGE
PROP R-O-W	PROP BRIDGE
PROP LA R-O-W	PROP BRIDGE
NOISE WALL	PROP BRIDGE
PROP SIDEWALK	PROP BRIDGE
PROP CONSTRUCTION	PROP BRIDGE
PROP BRIDGE REPAIR	PROP BRIDGE
PROP PARK & RIDE	PROP BRIDGE
SIGNALIZED INTERSECTION	PROP BRIDGE

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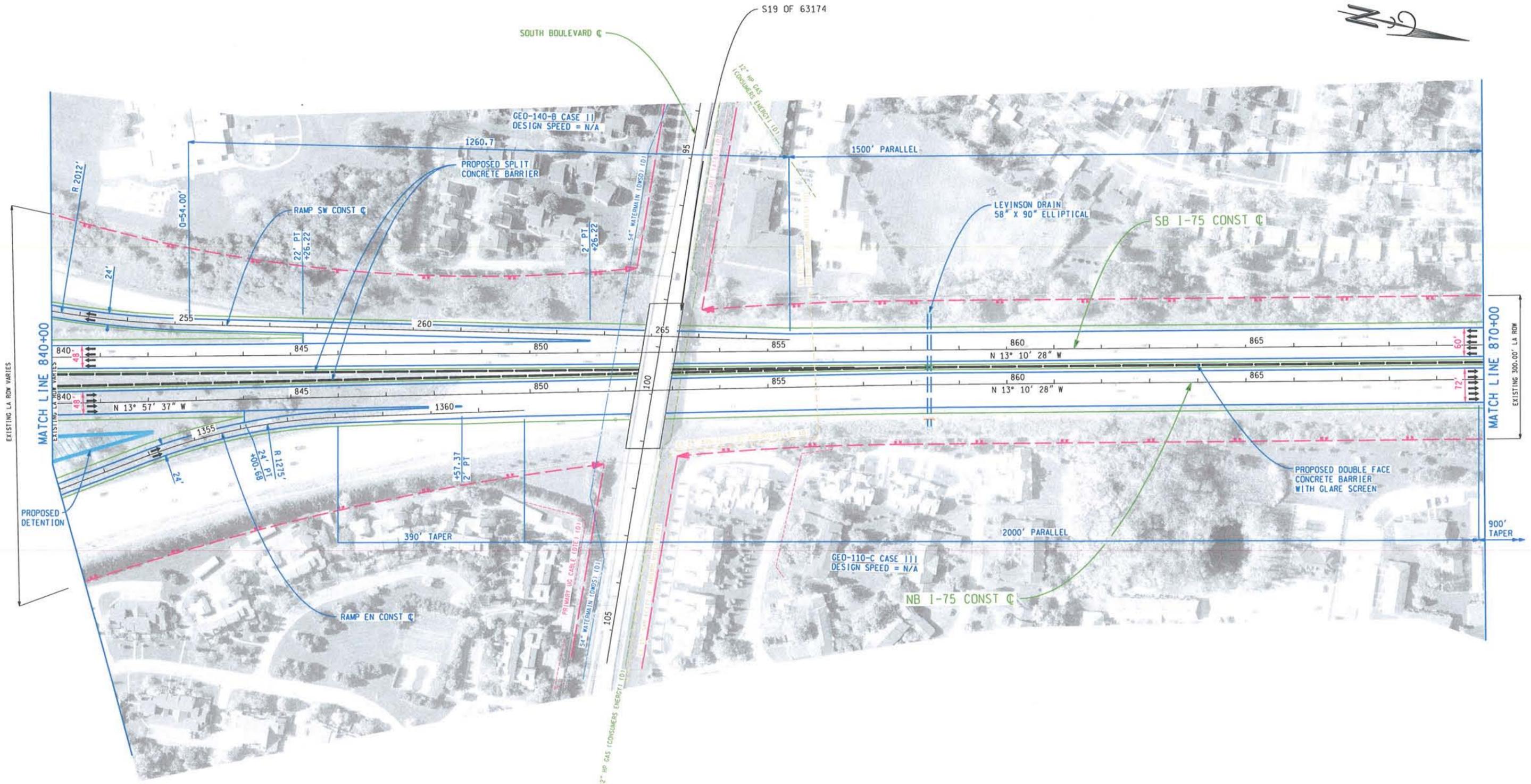
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MICHIGAN DEPARTMENT OF TRANSPORTATION
I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
GEOMETRIC STUDY

I-75 STA 810+00
TO STA 840+00
SQUARE LAKE ROAD INTERCHANGE

FIGURE 4-39

SOUTH BOULEVARD

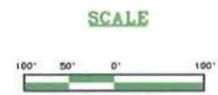


EXISTING LA ROW VARIES

MATCH LINE 840+00

MATCH LINE 870+00

EXISTING 300'-00\"/>



LEGEND

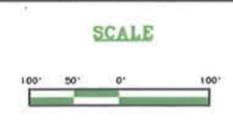
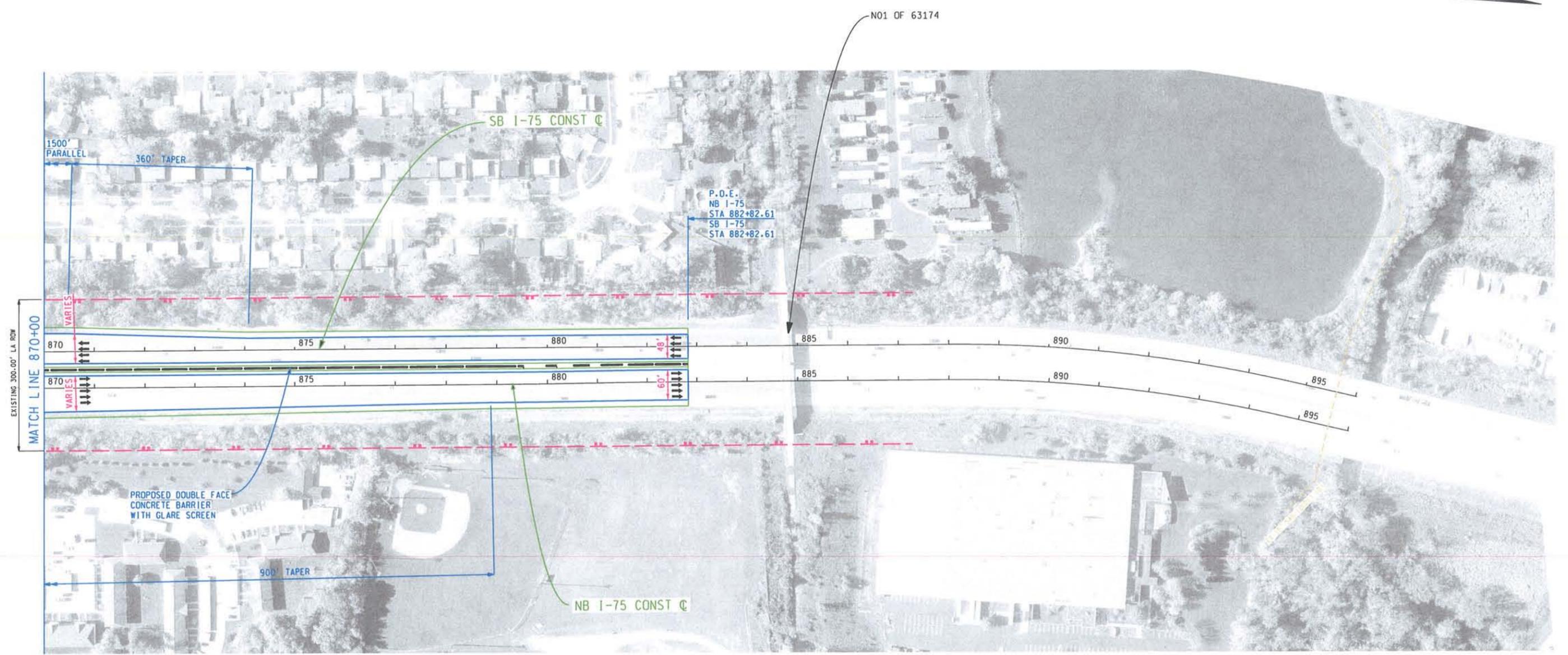
- GAS LINE
- ELECTRIC LINE
- WATERMAIN
- EXISTING WETLAND
- EXISTING DRAINAGE FLOW
- PROP PAVEMENT EDGE
- PROP SHOULDER EDGE
- PROP BARRIER
- PROP RETAINING WALL
- PROPOSED CUL-DE-SAC
- PROP WETLAND
- EXISTING LA R-D-W
- EXISTING R-O-W
- PROP R-O-W
- PROP LA R-D-W
- NOISE WALL
- PROP BRIDGE
- PROP SIDEWALK
- PROP CONSTRUCTION CL
- PROP BRIDGE REPAIR
- PROP PARK & RIDE
- SIGNALIZED INTERSECTION

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I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
GEOMETRIC STUDY
**I-75 STA 840+00
TO STA 870+00**
SQUARE LAKE ROAD INTERCHANGE



LEGEND

<p>EXISTING WETLAND</p> <p>EXISTING DRAINAGE FLOW</p> <p>PROP PAVEMENT EDGE</p> <p>PROP SHOULDER EDGE</p> <p>PROP BARRIER</p> <p>PROP RETAINING WALL</p> <p>PROPOSED CUL-DE-SAC</p>	<p>PROP WETLAND</p> <p>EXISTING LA R-O-W</p> <p>EXISTING R-O-W</p> <p>PROP R-O-W</p> <p>PROP LA R-O-W</p> <p>NOISE WALL</p> <p>PROP BRIDGE</p>	<p>PROP SIDEWALK</p> <p>PROP CONSTRUCTION & BRIDGE REPAIR</p> <p>PROP PARK & RIDE</p> <p>SIGNALIZED INTERSECTION</p>
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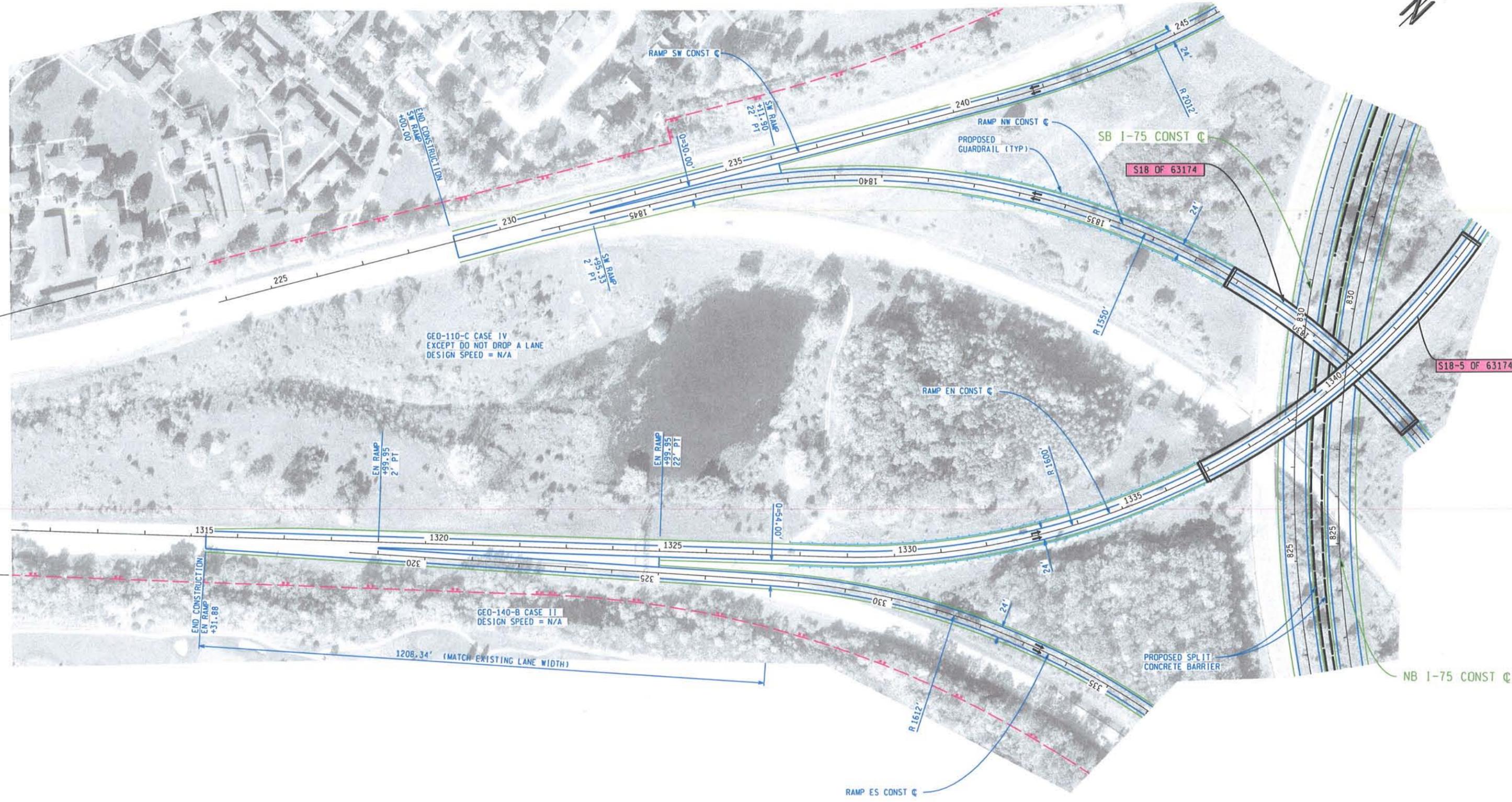
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GEOMETRIC STUDY

I-75 STA 870+00
TO 882+82.61 (POE)

SQUARE LAKE ROAD INTERCHANGE

FIGURE 4-41



EX. L.A. ROW VARIES

GEO-110-C CASE IV
EXCEPT DO NOT DROP A LANE
DESIGN SPEED = N/A

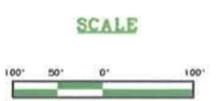
GEO-140-B CASE II
DESIGN SPEED = N/A

1208.34' (MATCH EXISTING LANE WIDTH)

S18 OF 63174

S18-5 OF 63174

NB I-75 CONST C



LEGEND	
GAS LINE	EXISTING WETLAND
ELECTRIC LINE	EXISTING DRAINAGE FLOW
TIE-IN	PROP PAVEMENT EDGE
WATERMAIN	PROP SHOULDER EDGE
	PROP BARRIER
	PROP RETAINING WALL
	PROPOSED CUL-DE-SAC
	PROP WETLAND
	EXISTING LA R-O-W
	EXISTING R-O-W
	PROP R-O-W
	PROP LA R-O-W
	NOISE WALL
	PROP BRIDGE
	PROP SIDEWALK
	PROP CONSTRUCTION
	PROP BRIDGE REPAIR
	PROP PARK & RIDE
	SIGNALIZED INTERSECTION

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88168
MDOT CONTROL SECTION
63174

MICHIGAN DEPARTMENT OF TRANSPORTATION
I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
GEOMETRIC STUDY
**RAMPS
SQUARE LAKE ROAD
INTERCHANGE**
FIGURE 4-42

4.7 Design Exceptions

Design criteria were created and set forth to meet both the current Michigan Department of Transportation standards and the Federal Highway Administration standards. This design criteria is detailed in Table 3-1. In some locations throughout the project, some of the criteria was unattainable due to physical and socioeconomic constraints, significant impacts and ROW limitations. While the proposed design maximized the attainment of all geometric standards, the areas where this was not obtainable are consistent with the recommendations developed in the FEIS.

Locations of design elements that have not met the required standard have been documented and attached in **Table 4-4** as design exceptions. Each design exception has a list of the design elements that are not to standard, the location of the design exception, the existing element design value, the proposed element design value, and the standard design value required. Each location also has a brief explanation of the cause of the design exception. Elements 1-14 of the table are elements that are below both the design speed requirement as well as the posted speed requirement. Elements A-E of the table detail design elements that are below the design speed requirements but meet the posted speed requirements. These elements do not require a design exception, but are provided for MDOT documentation purposes.

Table 4-4 Summary of Design Exceptions

DE #	DESIGN EXCEPTION ELEMENT	LOCATION	EXISTING	DESIGN	STANDARD	REASON	CRASH DATA (1)
1	Stopping Sight Distance - Horizontal	SB I-75 PI = 904+98.75 Approx 1,900 ft south of 12 Mile Rd	>=820' (75 mph)	569' (55 mph)	820' (75 mph)	Sight obstruction caused by median barrier	TOTAL CRASHES = 182, RE-ST = 120, SS-SM = 26, FXOBJ = 18, MSC-MLT = 5, MSC-SNG = 5, O-OBJ = 3, AN-ST = 2, DU-RT = 1, OTURN = 1, RE-LT = 1, INJ = 62, FATL = 0
2	Stopping Sight Distance - Horizontal	NB I-75 PI = 920+36.39 Approx 400 ft south of 12 Mile Rd	>=820' (75 mph)	569' (55 mph)	820' (75 mph)	Sight obstruction caused by median barrier	TOTAL CRASHES = 102, RE-ST = 45, FXOBJ = 19, SS-SM = 15, O-OBJ = 7, MSC-MLT = 6, ANIML = 2, AN-ST = 2, MSC-SNG = 2, SS-OP = 2, HD-ON = 1, PED = 1, INJ = 27, FATL = 0
3	Stopping Sight Distance - Horizontal	NB I-75 PI = 1125+51.56 Approx 2,300 ft south of Rochester Rd	>=820' (75 mph)	583' (60 mph)	820' (75 mph)	Sight obstruction caused by median barrier	TOTAL CRASHES = 34, SS-SM = 11, RE-ST = 8, FXOBJ = 5, O-TURN = 3, AN-ST = 2, MSC-MLT = 2, MSC-SNG = 2, OT-DR = 1, INJ = 12, FATL = 0
4	Stopping Sight Distance - Horizontal	NB I-75 PI = 1226+13.48 Approx 500 ft south of Big Beaver Rd	496' (55 mph)	524' (55 mph)	820' (75 mph)	Sight obstruction caused by median barrier	TOTAL CRASHES = 89, RE-ST = 39, FXOBJ = 18, SS-SM = 12, MSC-SNG = 9, MSC-MLT = 6, AN-ST = 2, O-OBJ = 1, OTURN = 1, RE-RT = 1, INJ = 25, FATL = 0
5	Stopping Sight Distance - Horizontal	SB I-75 PI = 1226+85.65 Approx 500 ft south of Big Beaver Rd	>=820' (75 mph)	516' (55 mph)	820' (75 mph)	Sight obstruction caused by median barrier	TOTAL CRASHES = 131, RE-ST = 66, FXOBJ = 24, SS-SM = 15, MSC-SNG = 10, RE-RT = 7, OTURN = 3, MSC-MLT = 2, SS-OP = 1, ANIML = 1, AN-ST = 1, DURT = 1, INJ = 50, FATL = 0
6	Stopping Sight Distance - Horizontal	NB I-75 PI = 603+44.78 Approx 2,000 ft south of Corporate Dr	>=820' (75 mph)	619' (60 mph)	820' (75 mph)	Sight obstruction caused by median barrier	TOTAL CRASHES = 20, SS-SM = 8, FXOBJ = 5, RE-ST = 2, MSC-SNG = 1, OTURN = 1, AN-ST = 1, ANIML = 1, MSC-MLT = 1, INJ = 12, FATL = 0
7	Stopping Sight Distance - Horizontal	NB I-75 PI = 647+40.79 Approx 300 ft south of Crooks Rd	>=820' (75 mph)	619' (60 mph)	820' (75 mph)	Sight obstruction caused by median barrier	TOTAL CRASHES = 25, RE-ST = 10, FXOBJ = 7, MSC-SNG = 3, MSC-MLT = 2, OTURN = 1, PKD-V = 1, SS-SM = 1, INJ = 11, FATL = 0
8	Stopping Sight Distance - Horizontal	SB I-75 PI = 730+99.23 Approx 1,800 ft south of Square Lake Rd	>=820' (75 mph)	628' (60 mph)	820' (75 mph)	Sight obstruction caused by median barrier	TOTAL CRASHES = 10, FXOBJ = 4, RE-ST = 3, SS-SM = 2, ANIML = 1, INJ = 2, FATL = 0
9	Stopping Sight Distance - Horizontal	SB I-75 PI = 829+29.56 At the Square Lake Rd interchange	>=425' (50 mph)	560' (55 mph)	820' (75 mph)	Sight obstruction caused by median barrier	TOTAL CRASHES = 12, FXOBJ = 3, O-OBJ = 3, RE-ST = 2, SS-SM = 2, SS-OP = 1, ANIML = 1, INJ = 5, FATL = 0
10	Superelevation (Distribution)	NB I-75 PI = 904+79.48 Approx 1,900 ft south of 12 Mile Rd	Not detailed on ex. plans	50/50	60/40	Major ROW Restrictions limit realignment	TOTAL CRASHES = 117, RE-ST = 53, FXOBJ = 22, SS-SM = 15, MSC-MLT = 7, O-OBJ = 7, ANST = 4, ANIML = 2, SS-OP = 2, MSC-SNG = 2, OTURN = 1, PED = 1, HD-ON = 1, INJ = 34, FATL = 0
11	Superelevation (Distribution)	SB I-75 PI = 904+98.75 Approx 1,900 ft south of 12 Mile Rd	Not detailed on ex. plans	50/50	60/40	Major ROW Restrictions limit realignment	TOTAL CRASHES = 183, RE-ST = 121, SS-SM = 26, FXOBJ = 18, MSC-MLT = 5, MSC-SNG = 5, O-OBJ = 3, ANST = 2, DU-RT = 1, OTURN = 1, RE-LT = 1, INJ = 63, FATL = 0
12	Superelevation (Distribution)	NB I-75 PI = 920+36.39 Approx 400 ft south of 12 Mile Rd	Not detailed on ex. plans	50/50	60/40	Major ROW Restrictions limit realignment	TOTAL CRASHES = 118, RE-ST = 51, FXOBJ = 23, SS-SM = 18, O-OBJ = 8, MSC-MLT = 7, AN-ST = 3, ANIML = 2, MSC-SNG = 2, SS-OP = 2, PED = 1, HD-ON = 1, INJ = 35, FATL = 0
13	Superelevation (Distribution)	SB I-75 PI = 920+17.78 Approx 400 ft south of 12 Mile Rd	Not detailed on ex. plans	50/50	60/40	Major ROW Restrictions limit realignment	TOTAL CRASHES = 189, RE-ST = 124, SS-SM = 29, FXOBJ = 18, MSC-MLT = 5, MSC-SNG = 5, O-OBJ = 3, AN-ST = 2, DU-RT = 1, OTURN = 1, RE-LT = 1, INJ = 69, FATL = 0
14	Superelevation (Distribution)	BIG BEAVER RAMP E PI = 515+92.08	Not detailed on ex. plans	0/100	60/40	Major ROW Restrictions limit realignment of interchange	TOTAL CRASHES = 129, RE-ST = 70, FXOBJ = 19, SS-SM = 14, MSC-SNG = 9, RE-RT = 7, MSC-MLT = 3, OTURN = 3, ANIML = 1, AN-ST = 1, DU-RT = 1, MSC-SNG = 1, INJ = 46, FATL = 0

DE #	DESIGN EXCEPTION ELEMENT	LOCATION	EXISTING	DESIGN	STANDARD	REASON	CRASH DATA MDOT 3 YEAR CRASH HISTORY 1/01/04 TO 12/31/06
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These elements are Design Speed = Posted Speed and are for information only.

A	Horizontal Alignment	NB I-75 PI = 1226+13.48 Approx 500 ft south of Big Beaver Rd	R=1909.86' (65 mph)	R=1922.00' (70 mph)	R=2344.00' (75 mph)	Major ROW Restrictions limit realignment	TOTAL CRASHES = 109, RE-ST = 43, FXOBJ = 26, SS-SM = 13, MSC-SNG = 12, MSC-MLT = 7, AN-ST = 5, O-OBJ = 1, O-TURN = 1, RE-RT = 1, INJ = 31, FATL = 0
B	Horizontal Alignment	SB I-75 PI = 1226+85.65 Approx 500 ft south of Big Beaver Rd	R=1991.86' (70 mph)	R=1994.17' (70 mph)	R=2344.00' (75 mph)	Major ROW Restrictions limit realignment	TOTAL CRASHES = 153, RE-ST = 76, FXOBJ = 25, SS-SM = 20, MSC-SNG = 12, RE-RT = 7, O-TURN = 3, AN-ST = 1, O-OBJ = 1, ANIML=1, DU-RT=1, SS-OP=1, INJ = 56, FATL = 0
C	Stopping Sight Distance - Horizontal	BIG BEAVER SB CD PI = 924+25.76	479' (50 mph)	512' (55 mph)	570' (60 mph)	Sight obstruction caused by median barrier	TOTAL CRASHES = 2, RE-ST = 1, RE-RT = 1, INJ = 1, FATL = 0
D	Stopping Sight Distance - Vertical	NB PVI = 922+90.00 Approx 100 ft south of 12 Mile Rd	K=210 (65mph) SSD=645	K=247 (70mph) SSD=730	K=312 (75 mph) SSD=820	Major ROW Restrictions limit realignment of interchange	TOTAL CRASHES = 121, RE-ST = 48, FXOBJ = 26, SS-SM = 20, O-OBJ = 8, MSC-MLT = 7, MSC-SNG = 3, AN-ST = 3, ANIML = 2, SS-OP = 2, HD-ON = 1, PED = 1, INJ = 35, FATL = 0
E	Stopping Sight Distance - Vertical	SB PVI = 923+32.01 At 12 Mile Rd	K=210 (65mph) SSD=645	K=247 (70mph) SSD=730	K=312 (75 mph) SSD=820	Major ROW Restrictions limit realignment of interchange	TOTAL CRASHES = 171, RE-ST = 111, SS-SM = 26, FXOBJ = 17, MSC-MLT = 5, MSC-SNG = 5, O-OBJ = 2, AN-ST = 2, DU-RT = 1, OTURN = 1, RE-LT = 1, INJ = 54, FATL = 0

(1) Source: MDOT, 3-year crash history 1/01/04 - 12/31/06

4.8 Drainage

A significant component of the proposed freeway reconstruction will be the replacement and improvements of the drainage system. Due to the addition of the HOV lane, the median ditch will be eliminated and replaced with barrier and valley gutter. The runoff in the median will be collected with storm sewer and discharged to the roadside ditch. Where feasible, the storm sewer will outlet to the NB side of the freeway.

Along with the addition of a lane and the geometric improvements, all of the culverts along I-75 will be replaced or upgraded. The culverts have been analyzed for existing conditions and designed to accommodate freeway widening and alignment shifts. Further discussion of the proposed culverts can be found below. The detailed analysis and design can be found in *VOLUME 5: DRAINAGE REPORT*

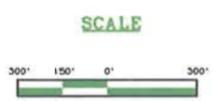
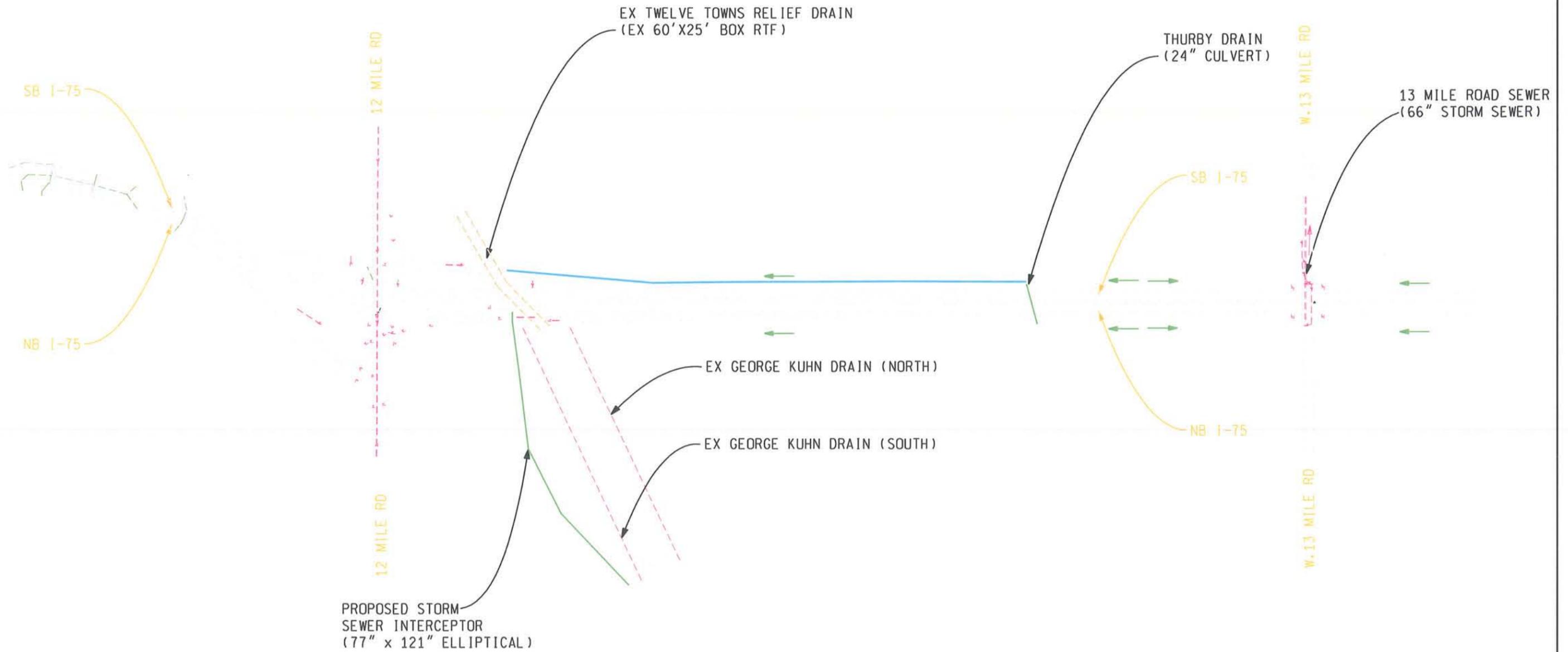
Due to capacity issues with the existing Twelve Towns combined sewer and RTF, MDOT is proposing to separate their storm water from the combined sewer system. This will require the project to the south to construct new pump stations along the NB side of the freeway, with an interceptor sewer under the NB service drive. Included in this portion of the project is the analysis and construction of the interceptor sewer from Gardenia Avenue to the outlet, east of Dequindre Road, into the Red Run Drain. This sewer is currently proposed as a 77 inch by 121 inch elliptical sewer.

Over the years, significant urban growth has led to the overburdening of the old county drains. Most of the drains along I-75 are already flowing at or above maximum capacity during major storm events. Therefore, the hydrology of each outfall was analyzed to determine if there is an increase in discharge due to the widening of the freeway. In areas of increased peak flows, detention has been proposed to attenuate the runoff to existing flow rates.

The proposed and temporary drainage designs will be critical components in determining construction staging and maintenance of traffic. One of the more crucial aspects of the staging will be the construction of the storm sewer interceptor. The interceptor sewer is the outfall for I-75 from 8 Mile Road to 12 Mile Road. Therefore, this must be constructed prior to or with the south project. To minimize the amount of temporary drainage needed during construction, the outlets for the median storm sewer are proposed to be installed on the side of the freeway being constructed first. The major drainage crossings along I-75 will likely require additional sheet piling and temporary drainage measures (such as pumping or diversion channels) to accommodate construction.

There are a total of 34 study points within the existing MDOT right-of-way which were subjected to analysis, see **Figures 4-43 through 4-50**. These study points are the locations of the major cross culverts carrying storm water under the entire width of I-75. The locations are identified by name, where known, and by their approximate proposed freeway stationing. A summary of study findings for each of these locations is listed below.

- **S. George W. Kuhn Drain** Station 931+50 The proposed median will discharge to the recently installed southerly relief storm sewer that was installed to reduce stormwater flow to the Twelve Towns Retention Treatment Facility (RTF) during large rain events.
- **N. George W. Kuhn Drain** - Station 933+00 The proposed median will discharge to the recently installed northerly relief storm sewer that was installed to reduce stormwater flow to the RTF during large rain events.
- **Unnamed (Thurby Drain)** - Station 963+00 The proposed work consists of construction of a 4 foot wide detention ditch, and installation of a 12 inch culvert in the detention ditch to restrict outflows. Additionally, the existing 24 inch concrete pipe under I-75 would be removed and replaced by a 24 inch concrete pipe of greater length. This is proposed because it will keep the end of the pipe outside of the clear zone, and extend the service period of this drain. The culvert is to be sloped to the west to bring runoff from the east side of the freeway to the proposed detention ditch on the west side. Runoff will ultimately discharge to the N. George W. Kuhn drain.
- **Unnamed (Lawson Drain)** - Station 974+00 This culvert has had both ends sealed and has been abandoned in place. This culvert is proposed to be removed.
- **13 Mile Road** - Station 979+50 The proposed work consists of removing and replacing four catch basins and reconstructing 1,800 feet of 4 foot bottom ditch. Additionally, the existing 60 inch concrete pipe under I-75 would be removed and replaced in kind. This is proposed because it will extend the service period of this drain.
- **Unnamed** - Station 1001+50 The proposed work consists of removing and reinstalling end sections, and constructing an 8 foot wide and a 16 foot wide detention ditch. Additionally, the existing 36 inch concrete pipe under I-75 would be removed and replaced by a 36 inch concrete pipe of greater length. This is proposed because it will keep the end of the pipe outside of the clear zone, and extend the service period of this drain.
- **Unnamed** - Station 1003+50 The proposed work consists of constructing 8 foot wide detention ditches. Additionally, the existing 24 inch concrete pipe under I-75 would be removed and replaced by a 24 inch concrete pipe of greater length. This is proposed because it would keep the end of the pipe outside of the clear zone, and extend the service period of this drain.
- **14 Mile Road** – Station 1031+25 North – The proposed work consists of removing and replacing the 24 inch CMP with a 24 inch concrete culvert under I-75 and constructing a detention pond.
- **14 Mile Road** – Station 1031+25 South – The proposed work consists of constructing a detention pond. Additionally, the existing 14 inch high density polyethylene (HDPE) pipe under I-75 will be removed and replaced by a 24 inch concrete pipe of greater length. This is proposed because it will keep the end of the pipe outside of the clear zone, and extend the service period of this drain.
- **Unnamed (Warner Drain)** – Station 1050+70 – The proposed work consists of constructing 8 foot wide detention ditches. Additionally, the existing 36 inch concrete pipe under I-75 will be removed and replaced by a 36 inch concrete pipe of greater length. This is proposed because it will keep the end of the pipe outside of the clear zone, and extend the service period of this drain.
- **McDonald Drain** – Station 1050+85 – This 78 inch diameter storm sewer is an enclosed drain which passes under the freeway. The existing 78 inch concrete pipe under I-75 will be removed and replaced in kind. This is proposed because it will extend the service period of this drain. Highway drainage is conveyed to the drain through a 36 inch diameter stub out from the drain.



LEGEND

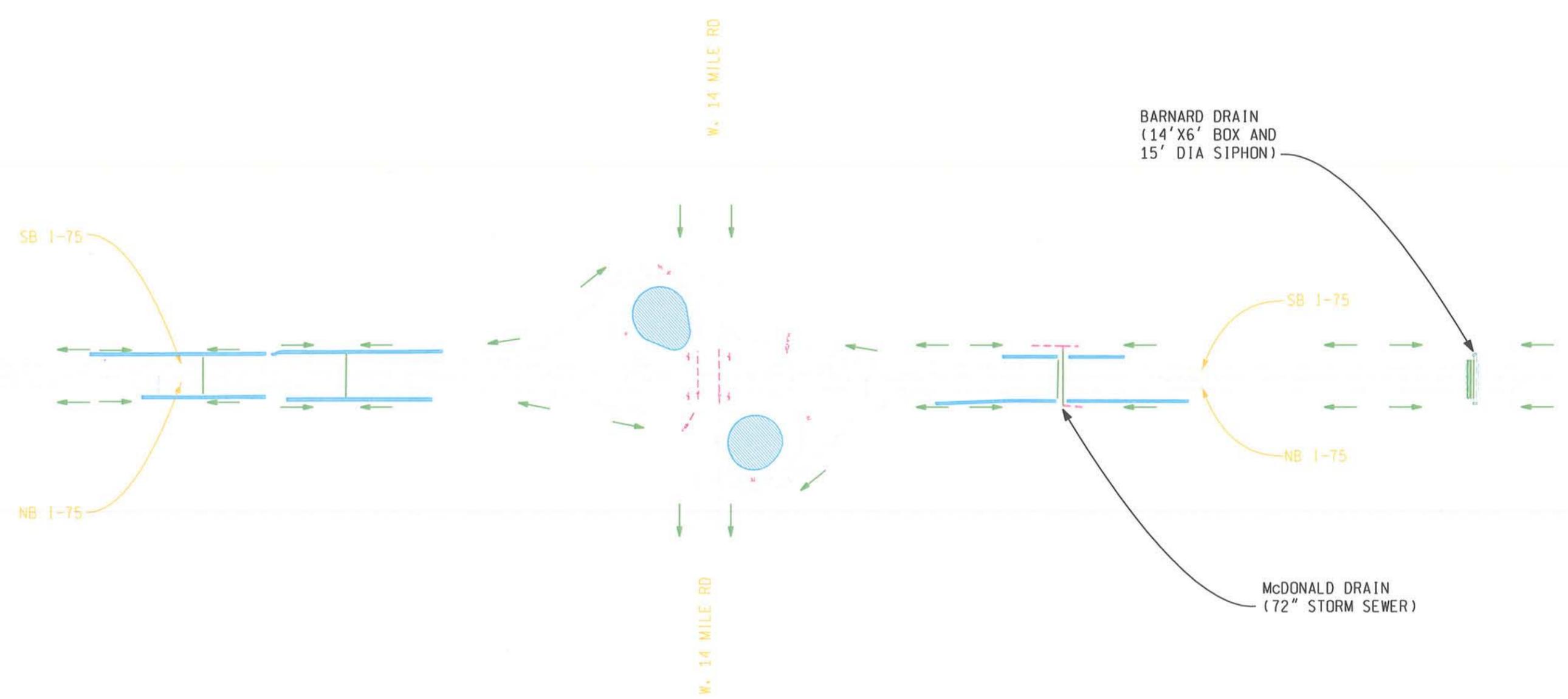
EXISTING DRAINAGE	
PROP DRAINAGE	
PROP DETENTION	

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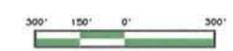


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MICHIGAN DEPARTMENT OF TRANSPORTATION
I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
ENGINEERING REPORT
DRAINAGE EXHIBIT A



SCALE



LEGEND

- EXISTING DRAINAGE
- PROP DRAINAGE
- PROP DETENTION

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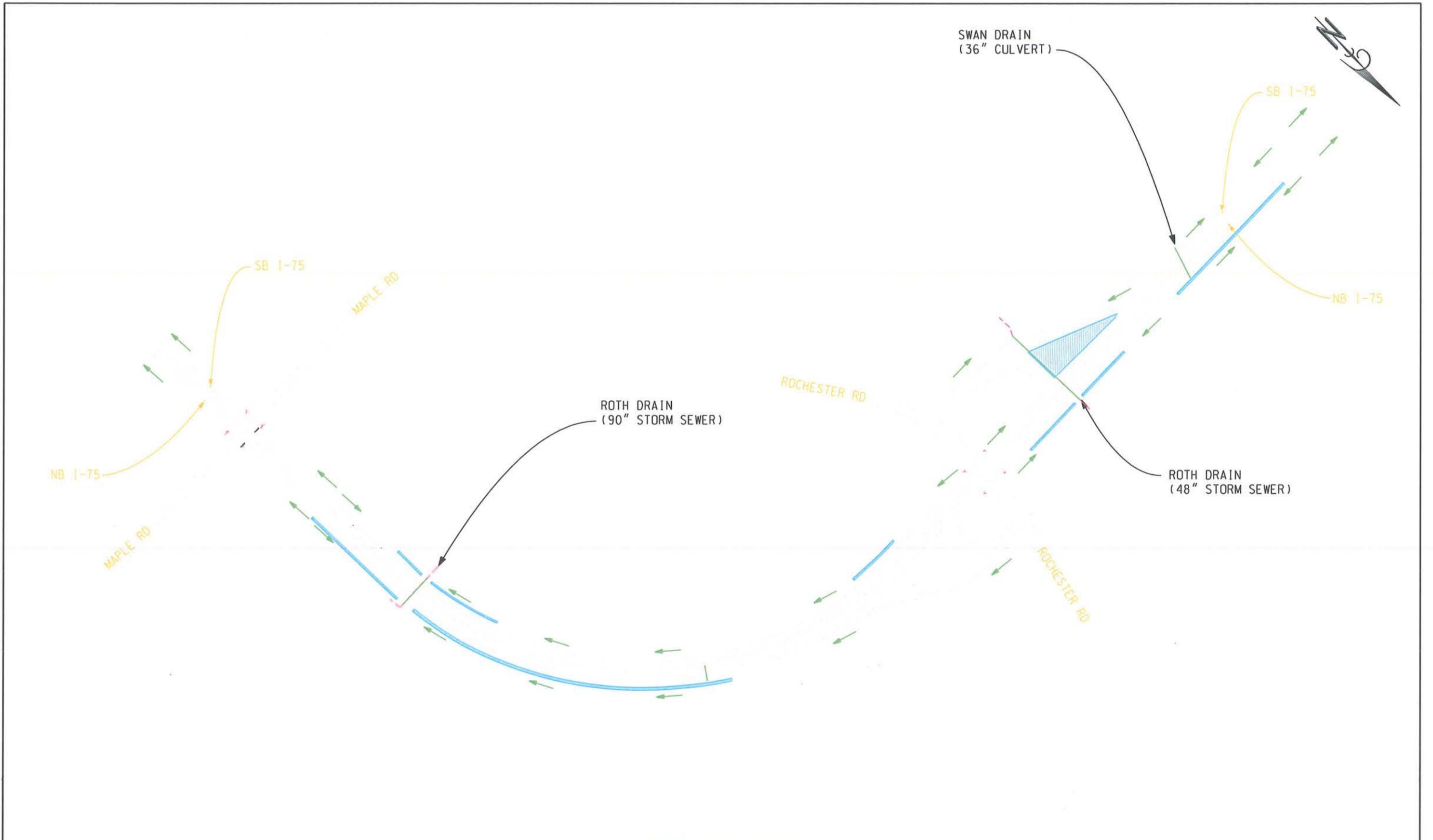


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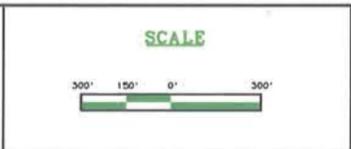
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MICHIGAN DEPARTMENT OF TRANSPORTATION
 OF 12 MILE RD TO SOUTH OF M-59
 ENGINEERING REPORT

DRAINAGE EXHIBIT B



MICHIGAN DEPARTMENT OF TRANSPORTATION
 1-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
 ENGINEERING REPORT



LEGEND

EXISTING DRAINAGE	
PROP DRAINAGE	
PROP DETENTION	

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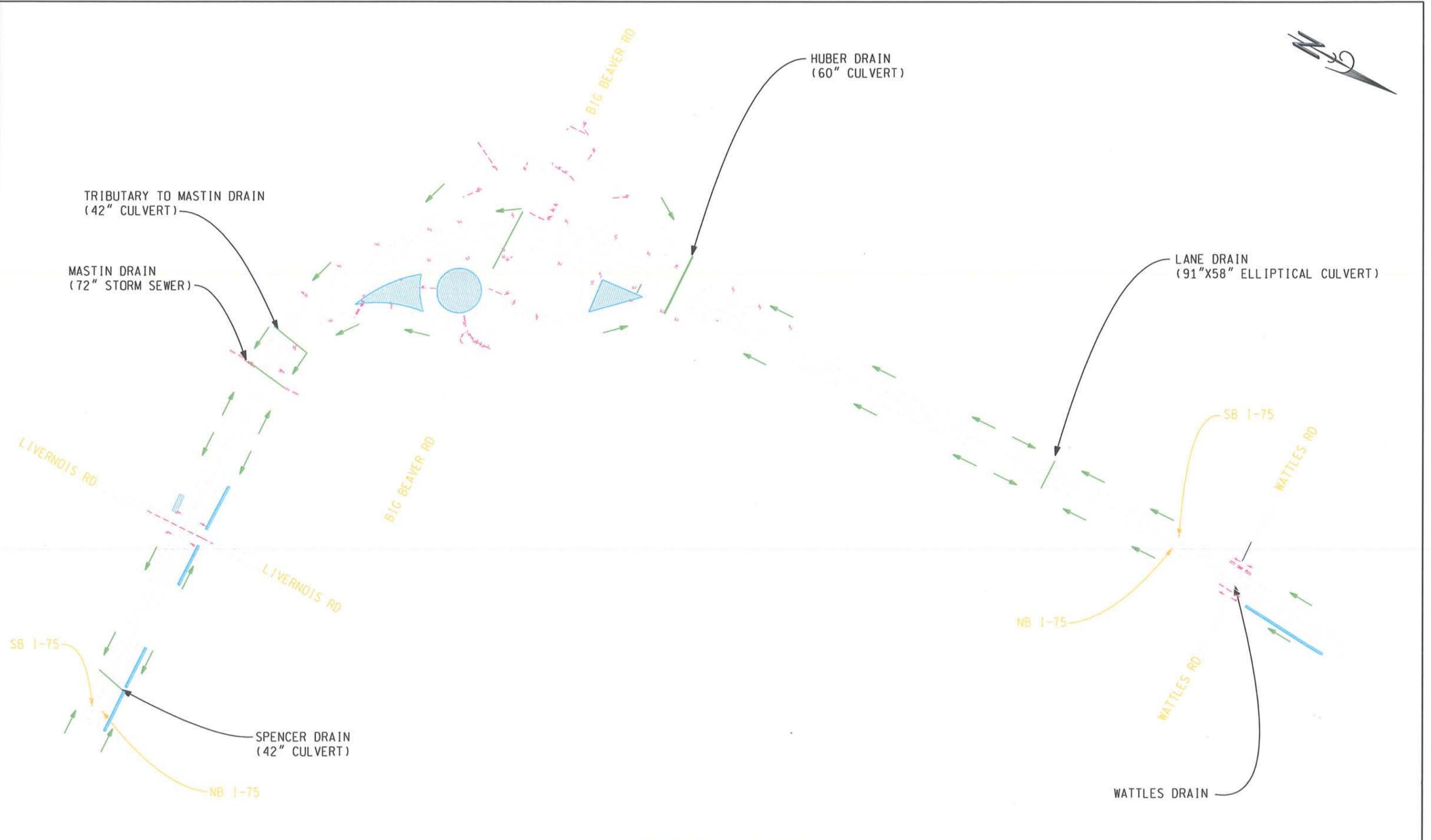
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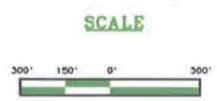
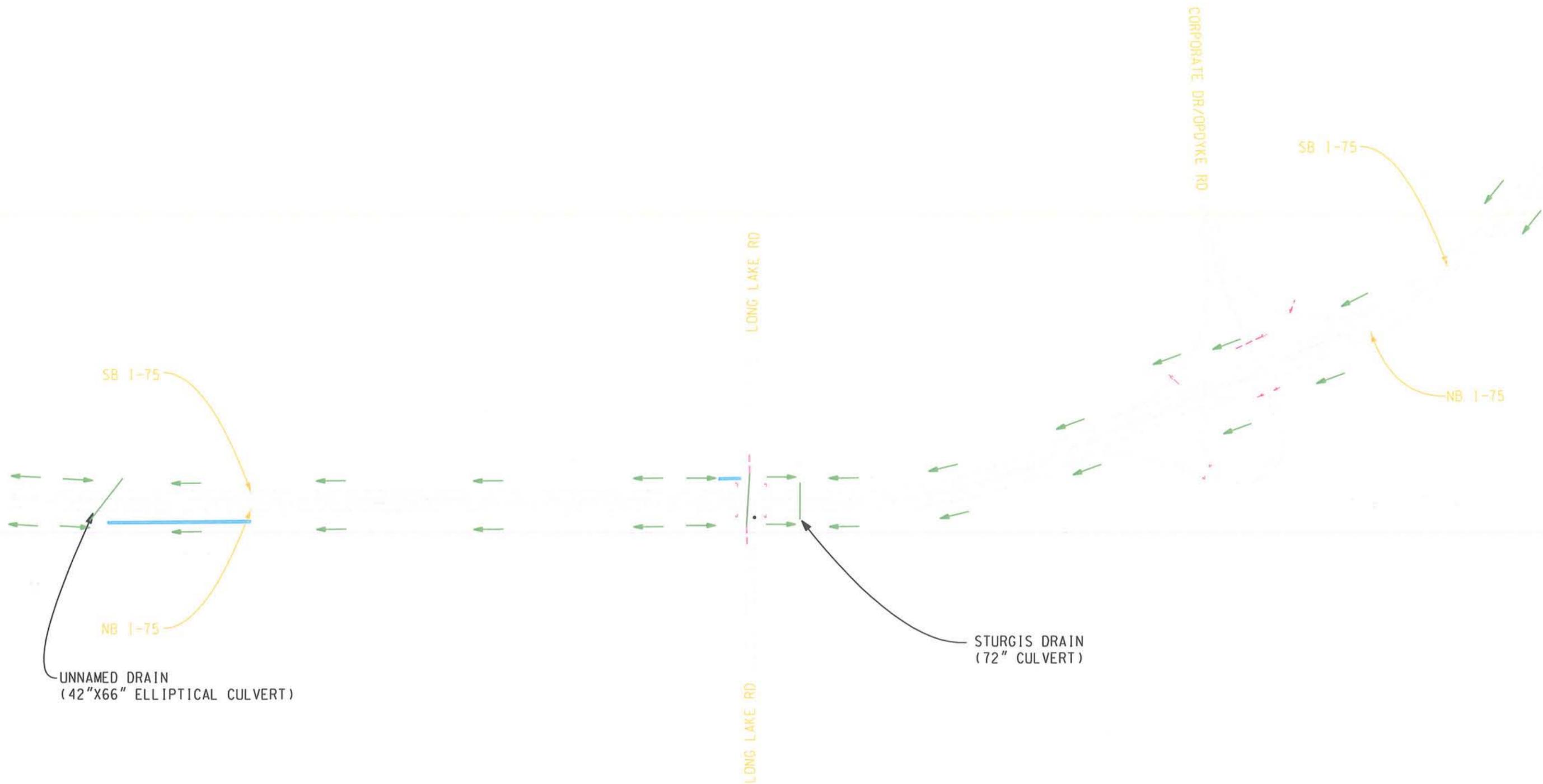
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DRAINAGE EXHIBIT C

FIGURE 4-45



<p>SCALE</p>	<p>LEGEND</p> <p>EXISTING DRAINAGE </p> <p>PROP DRAINAGE </p> <p>PROP DETENTION </p>	<p>URS</p> <p>Surface Transportation Grand Rapids . Southfield . Traverse City</p>	<p>MDOT</p> <p>Michigan Department of Transportation</p>	<p>MDOT JOB NO. 88168</p> <p>MDOT CONTROL SECTION 63174</p>	<p>MICHIGAN DEPARTMENT OF TRANSPORTATION OF 12 MILE RD TO SOUTH OF M-59 ENGINEERING REPORT</p> <p>DRAINAGE EXHIBIT D</p> <p>FIGURE 4-46</p>
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LEGEND

EXISTING DRAINAGE	
PROP DRAINAGE	
PROP DETENTION	

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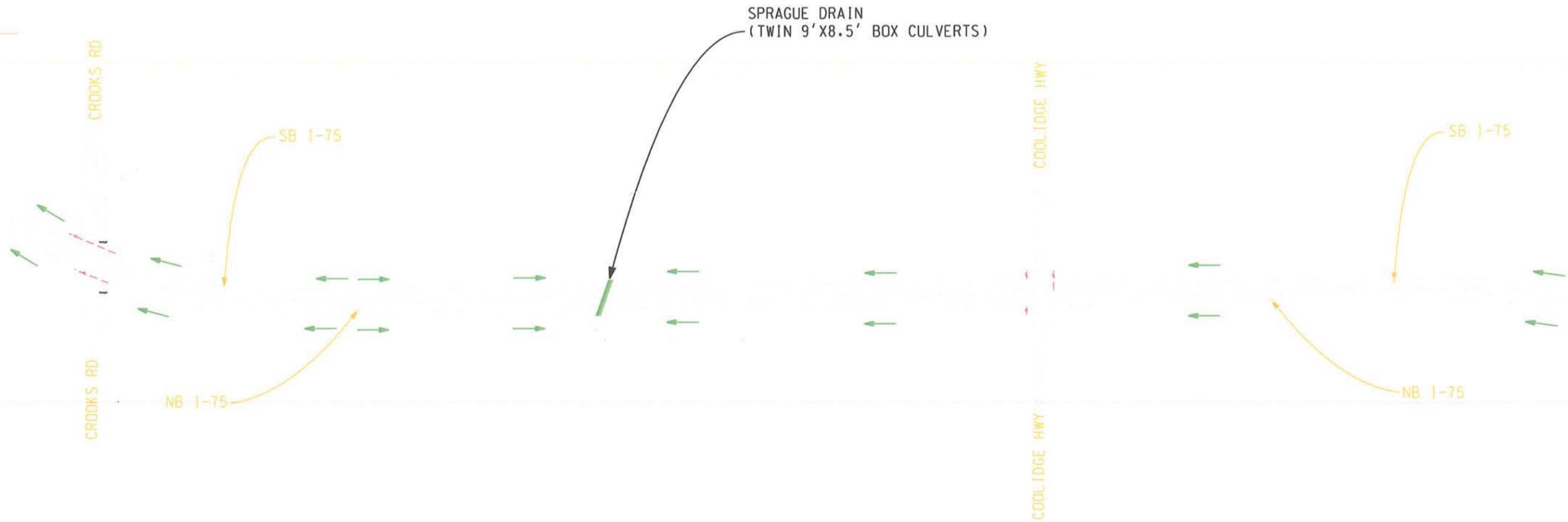


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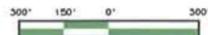
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 1-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
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DRAINAGE EXHIBIT E



SCALE



LEGEND

- EXISTING DRAINAGE
- PROP DRAINAGE
- PROP DETENTION

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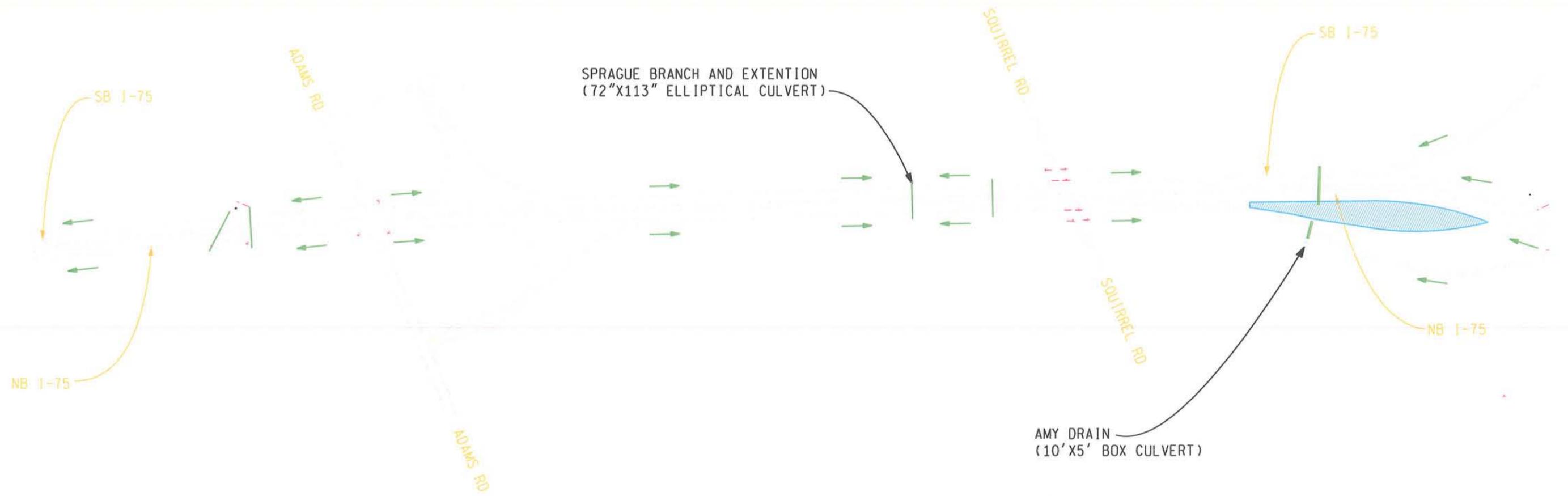


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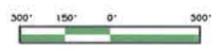
DRAINAGE EXHIBIT F



SPRAGUE BRANCH AND EXTENTION
(72"X113" ELLIPTICAL CULVERT)

AMY DRAIN
(10'X5' BOX CULVERT)

SCALE



LEGEND

- EXISTING DRAINAGE
- PROP DRAINAGE
- PROP DETENTION

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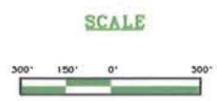
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I-75 SOUTH OF 12 MILE RD TO SOUTH OF M-59
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DRAINAGE EXHIBIT G



EB SQUARE LK RD



LEGEND

EXISTING DRAINAGE	
PROP DRAINAGE	
PROP DETENTION	

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 ENGINEERING REPORT

DRAINAGE EXHIBIT H

- **Barnard Drain (Spencer Drain)** – Station 1073+00 – This drain crossing consists of two complex structures including an inverted siphon. The existing 14 foot by 6 foot box culvert and 15 foot inverted siphon are proposed to be removed and replaced a 28 foot by 7 foot box culvert. See Figure 4-51.



Figure 4-51 Existing View of the Barnard Drain (Spencer Drain) Looking East

- **Roth Drain** – Station 1102+25 – The proposed work consists of removing and replacing end sections and inlet pipes, construction of 800 feet of an 8 foot wide detention ditch, construction of 820 feet of 16 foot wide detention ditch, and construction of 2,350 feet of a variable width detention ditch. The existing 78 inch concrete pipe under I-75 will be removed and replaced in kind. This will extend the service life of this drain.
- **Hawthorne Drain** – Station 1102+70 – This culvert has been filled; its ends sealed and has been abandoned in place. This culvert is proposed to be removed during construction.
- **Roth Ext.** – Station 1136+35 – The proposed work consists of re-grading the existing ditch, and construction of 375 feet of an 8 foot wide detention ditch.
- **Hawthorne Drain** – Station 1156+50 – This culvert has been filled, its ends plugged and has been abandoned in place. This culvert is proposed to be removed during construction.
- **Roth Drain** – Station 1157+00 – The proposed work consists of removing and replacing end sections and storm sewer pipe, construction of an 8 foot wide detention ditch, construction of one detention pond within the Rochester Road Interchange, and reconstructing a catch basin. The existing 48 inch concrete pipe under I-75

would be removed and replaced in kind. This will extend the service life of this drain.

- **Swan Drain (Swan Ditch)** – Station 1168+00 – The proposed work consists of removing and replacing an end section, construction of an 8 foot wide detention ditch and re-grading the highway ditch. Additionally, the existing 36 inch concrete pipe under I-75 will be removed and replaced by a 36 inch concrete pipe. This is proposed because it will extend the service period of this drain.
- **Unnamed (Spencer Drain)** – Station 1185+00 – The proposed work consists of removing the median inlet, construction of an 8 foot wide detention ditch and re-grading the highway ditch. Additionally, the existing 42 inch concrete pipe under I-75 will be removed and replaced by a 42 inch concrete pipe of greater length. This is proposed because it will keep the end of the pipe outside of the clear zone, and extend the service period of this drain.
- **Livernois Avenue** – Station 1196+85 – The proposed work consists of removing and replacing pipe and end sections, and the construction of three detention ditches. The existing 24 inch concrete pipe under I-75 would be removed and replaced in kind. This will extend the service life of this drain.
- **Mastin Drain** – Station 1209+00 – The proposed work consists of reconstructing a ditch. The existing 72 inch concrete pipe under I-75 will be removed and replaced in kind. This will extend the service life of this drain.
- **Unnamed** – Station 1211+50 – The proposed work consists of removing and replacing end sections, placement of riprap, construction of a 250 foot diameter detention pond, construction of a 400 foot by 200 foot triangular detention pond, culvert pipe modifications under two ramps and ditch reconstruction. Remove the existing 24 inch and 42 inch concrete culverts and replace with 24 inch and 42 inch concrete culverts with end sections. Replace the manhole in median that is located on the 42 inch culvert.
- **Lane Ext. (Huber Drain)** – Station 1240+50 – The proposed work consists of removing the existing 60 inch culvert under I-75, placement of heavy riprap for scour protection, installing a new 8 foot by 5 foot box culvert, channel reconstruction and construction of one detention pond.
- **Lane Drain** – Station 1269+25 – Work for this option includes replacing the existing 91 inch by 58 inch elliptical concrete pipe under I-75 with a 10 foot by 5 foot box culvert of greater length. This is proposed because it will keep the end of the pipe outside of the clear zone, and extend the service period of this drain.
- **Wattles Road** – Station 1284+19 – The proposed work consists of ditch cleanout, construction of an 8 foot wide detention ditch with a 24 inch diameter culvert outlet.
- **Unnamed** – Station 1297+00 – The proposed work consists of ditch cleanout and reconstruction, manhole reconstruction, construction of an 8 foot wide detention ditch with a 24 inch diameter culvert outlet, and riprap placement. The existing 43 inch by 68 inch concrete pipe under I-75 will be removed and replaced in kind. This would extend the service life of this drain.
- **Long Lake Road** – Station 591+50 – The proposed work consists of the construction of an 8 foot wide detention ditch. The existing 43 inch by 68 inch concrete pipe under I-75 will be removed and replaced in kind.

This will extend the service life of this drain.

- **Sturgis Drain** – Station 594+50 – It is anticipated that the proposed Crooks Road Interchange reconstruction will include detention within the interchange and that the proposed condition hydrologic and hydraulic analysis for the Sturgis Drain will be completed during the final design. However, the existing 60 inch culvert under I-75 is recommended to be replaced by a 72 inch culvert. In the SE quadrant of Long Lake Road, the existing 30 inch pipe that discharges the 60 inch and 43 inch by 68 inch pipes should be upsized to a 72 inch pipe with an end section.
- **Sprague Drain** – Station 679+60 – The existing twin 9 foot by 8.5 foot concrete box culverts under I-75 will be removed and replaced by an 18 foot by 9 foot concrete box culverts of greater length. This is proposed because it would keep the end of the pipe outside of the clear zone, and extend the service period of this drain.

Additionally, there is a storm sewer and culvert crossing underneath I-75 near at the Square Lake Road overpass. The existing 18 inch culvert under I-75 would be removed and replaced by a 24 inch concrete pipe of greater length. The 12 inch storm sewer under I-75 will also be removed and replaced. This is proposed because it will keep the end of the pipe outside of the clear zone, and extend the service period of this drain.

- **Sprague Branch & Ext.** – Station 790+00 – The proposed work consists of catch basin removal and ditch reconstruction. The 18 inch culvert crossing under I-75 west of the Sprague Drain will be removed and replaced by a 24 inch culvert of greater length. Additionally, the existing 72 inch by 113 inch concrete pipe under I-75 will be removed and replaced by a 72 inch by 113 inch concrete pipe of greater length. This is proposed because it will keep the end of the pipe outside of the clear zone, and extend the service period of this drain.
- **Amy Drain** – Station 814+00 – The proposed work consists of new 18 inch diameter culvert, the construction of a large detention pond and the placement of riprap for energy dissipation. Additionally, the existing 10 foot by 5 foot concrete box culverts under NB and SB I-75 would each be removed and replaced by 10 foot by 5 foot concrete box culverts of greater length. The existing 18 inch culvert at SB station 826+50 would be removed and replaced by a 24 inch culvert of greater length. The existing 18 inch culvert at SB station 827+50 will be removed and replaced by a 30 inch culvert of greater length. This is proposed because it will keep the end of the pipe outside of the clear zone, and extend the service period of this drain. See Figure 4-52
- **Levinson Drain** – Station 857+60 – This 108 inch diameter storm sewer is an enclosed drain which passes under the freeway. Freeway drainage is conveyed to the drain via a 24 inch diameter stubout from the drain. The existing 108 inch concrete pipe under I-75 will be removed and replaced in kind. This will extend the service life of this drain.
- **Unnamed (Amy Drain)** – Station 858+50 – The proposed work consists of fence repair, end section replacement and detention pond construction. Additionally, the existing 58 inch by 91 inch concrete pipe under I-75 would be removed and replaced by a 58 inch by 91 inch concrete pipe of greater length. This is proposed because it would keep the end of the pipe outside of the clear zone, and extend the service period of this drain.



Figure 4-52 Existing View of the Northbound Culvert at the Amy Drain

During then final design phase of the project, a detailed hydraulic analysis will be required for each major crossing, including a hydraulic survey of channels and downstream sewers. In addition, the storm sewer and detention designs will need to be updated in conjunction with the final geometric design.

4.9 Utilities

A preliminary utility investigation was completed for the I-75 corridor area. During the study, various alternatives were considered and utility impact was a factor in determining the best options. The utility companies were contacted and sent requests for utility locations within the study limits. The guidelines developed by the American Society of Civil Engineers (ASCE) for the collection and depiction of existing subsurface utility data was utilized. The standard guideline describes four quality levels of existing depiction:

- Quality Level D- Information derived from existing records or oral recollections.
- Quality Level C – Information obtained by surveying and plotting visible above-ground utility features and by using professional judgment in correlating this information to Quality Level D.
- Quality Level B – Information obtained through the application of appropriate surface geophysical methods to determine the existence and approximate horizontal position of subsurface utilities.

- Quality Level A – Precise horizontal and vertical location of utilities obtained by the actual exposure and subsequent measurement of subsurface utilities, usually at a specific point.

Preliminary plans showing all the underground utilities and significant aerial wires and high transmission lines were detailed using Quality Level D.

Some major utility concerns along the project limits include:

12 Mile Road – There are numerous utilities that exist under 12 Mile Road. The most notable include a City of Madison Heights 60 inch sanitary sewer located in the north span and a City of Madison Heights 66 inch sanitary sewer located approximately 10 feet south of the 12 Mile Road centerline. No impact is anticipated for either sanitary sewer. Other utilities crossing under the structures include: Consumers Energy gas line, Detroit Edison primary cable, City of Royal Oak 12 inch watermain and an AT&T conduit. The watermain and AT&T conduits are in conflict with the proposed pier location and relocation is recommended. The 12 inch watermain may be relocated within the existing ROW approximately 15 feet to the south. All utilities must be verified in the field during the final design phase.

Underbridge lighting may be required due to the width of the proposed structures as well as for the proposed sidewalks and the locations will be determined during final design.

Twelve Town RTF – There is a 60 foot by 25 foot box combined sanitary sewer located just north of 12 Mile Road which passes under the B02 structures. This facility is owned and maintained by the Oakland County Drain Commission. During the preparation phase of this report an additional watermain was installed along the Red Run Drain in the vicinity of the B02 Bridges, which will have to be located and accounted for during the design phase. Hand digging for exposing utilities is suggested to avoid impacts.

Just south of the Red Run Drain Structure and within the NW quadrant of the 12 Mile Road interchange is a high power overhead line owned by ITC. This ITC line will not be in conflict with the proposed B02 structures however it may restrict construction activities and operations. The tower in the NW quadrant of the 12 Mile Road interchange is in direct conflict with the Ramp E outside shoulder and will need to be relocated. If the ITC tower is located within a utility easement, then MDOT will need to program additional funds for the relocation of this tower. All utilities shall be verified in the field during the final design phase.

Between 12 Mile Road and 13 Mile Road - There are two watermain which cross I-75 between 12 Mile Road and 13 Mile Road around stations NB 955+75 and NB 962+00. These locations are approximate and will need to be field verified and confirmed by the City of Madison Heights. The size of one of the watermain facilities is 12 inches, the other is unknown at this time.

13 Mile Road – Existing DTE overhead utilities along 13 Mile Road cross I-75 at the existing south abutment which will require temporary or permanent relocation. Also DTE overhead utilities run parallel to the structure 75 feet to the west which will not require relocation. No existing utilities are currently on the bridge. An underground McLeod USA fiber optic cable and a Consumers Energy 24 inch gas line cross under the bridge in the existing south span along with an 8 inch gas line which parallels I-75. An AT&T conduit, and underground DTE primary cable conduit, a City of Madison Heights sanitary sewer and a City of Madison Heights watermain cross under the bridge in the existing center span.

The size of the watermain and sanitary sewer are unknown at this time. With the preferred structure replacement option, Consumers Energy 24 inch gas line and the AT&T conduits will be in conflict with the proposed south pier and will require relocation. All utilities shall be verified in the field and confirmed by the utility owner.

Between 13 Mile Road and 14 Mile Road - There is a watermain which crosses I-75 between 13 Mile Road and 14 Mile Road around NB station 1007+40. This location is approximate and will need to be field verified and confirmed by the City of Madison Heights. The size of the watermain facility is unknown at this time.

Under bridge lighting may be required due to the width of the proposed structures as well as for the proposed sidewalks and the locations will be determined during final design.

14 Mile Road – There is an 16 inch City of Troy watermain located on the north side of 14 Mile Road behind the existing pier. The Level D utility information provided for this study does not pinpoint the exact location or depth of this utility. The location of this utility obtained from record plan data indicates that it does not require relocation. On the south side of 14 Mile Road behind the existing pier is an 8 inch Consumers Energy gas high pressure gas main, two banks of AT&T conduits, and DTE street lighting. The gas main, AT&T lines, and DTE street lighting lines will require relocation for removal of the existing pier.

MDOT freeway lighting lines running parallel to I-75 are located east and west of the existing bridges. The line on the west side of I-75 will require relocation for construction of the proposed bridge. The line on the east side of I-75 is located approximately 55 feet from the proposed bridge fascia.

There is also a 24 inch culvert located under the bridge embankment slope on each side of 14 Mile Road. These culverts tie into the existing road side ditches. Relocation of these culverts will be required for the proposed bridge construction and costs are included in the estimates for reconstructing 14 Mile Road.

Underbridge lighting may be required due to the width of the proposed structures as well as for the proposed sidewalks and the locations will be determined during final design.

Currently there are no existing utilities carried by the bridge. All utilities must be verified in the field and confirmed by the utility owner during the final design phase.

Maple Road – An existing MDOT 18 inch culvert parallels Maple Road just south of the existing north pier. Existing ITS cameras overlooking NB and SB I-75 are also located north of the north abutment with the conduit along the north abutment face and will require relocation in coordination with the ITS work.

A Verizon underground conduit and a Consumer Energy 6 inch gas line cross under the bridge in the existing south span and will be in conflict with the proposed south pier and will require relocation. Three existing AT&T conduits and a City of Troy 24 inch watermain cross under the bridge in the existing north span and will be in conflict with the proposed north pier. The 24 inch watermain may be relocated approximately 25 feet to the south and stay within the existing road ROW. All utilities shall be verified in the field during the final design phase.

Underbridge lighting may be required due to the width of the proposed structures as well as for the proposed sidewalks and the locations will be determined during final design.

Rochester Road – Existing conduit runs along the abutment face and to the piers for under bridge lighting. Also, DTE overhead power lines cross I-75 west of the bridge. This line will not be in conflict with the proposed structure however may restrict construction activities and operations. All utilities shall be verified in the field during the final design phase.

Utilities which cross under the bridges include: a City of Troy 16 inch watermain and an AT&T conduit bank located close to the proposed west pier in the south interior span and relocation is recommended. Eight 1¼ inch and four 2 inch XO Communications conduits also cross under the bridge near the west pier. In the west interior span, nine MBT underground 4 inch conduits cross under the bridges. In addition, an existing City of Troy 12 inch watermain located approximately 15 feet east of the proposed east abutment and relocation is recommended. The 16 inch watermain may be relocated approximately 10 feet to the east and the 12 inch watermain could be relocated 40 feet to the west within the road ROW. The All utilities shall be verified in the field during the final design phase.

Underbridge lighting may be required due to the width of the proposed structures as well as for the proposed sidewalks and the locations will be determined during final design.

Livernois Road - There are numerous utilities that exist under Livernois Road. The most notable include a City of Troy 18 inch sanitary sewer, located 18 feet west of the proposed east pier and a City of Troy 16 inch watermain, located 15 feet east of the proposed west pier; both under the center span and there is no anticipated impact. An underground DTE conduit crosses the structures in the center span. Other underground utilities which cross under the structures include: McLeod USA fiber optic cable and an ITC 120 KV power line which cross under the bridges in the west tail span. A Verizon conduit, a Comcast fiber optic cable, and a Consumer Energy gas line cross under the bridges in the east tail span. The Verizon conduit is in conflict with the proposed pier and relocation is required.

Existing overhead utilities (owner unknown) cross Livernois Road approximately 100 feet south of the bridges which will not conflict with construction. No existing utilities are currently on the bridge. A fire hydrant is located 20 feet south of the bridge in the southwest quadrant. All utilities shall be verified in the field during the final design phase.

Underbridge lighting may be required due to the width of the proposed structures as well as for the proposed sidewalks and the locations will be determined during final design.

Big Beaver Road – Existing freeway lighting is located at the south abutments in the median and MDOT conduits are attached along the south abutment wall face. No other existing utilities are currently on the bridge.

An underground DTE primary cable crosses under the bridges in the proposed south tail span. In the north interior span, a City of Troy 12 inch watermain crosses under the bridges and is located approximately 13 feet south of the proposed north piers. The 12 inch watermain will require relocation for removal of the existing bridge. This relocation could be approximately 25 feet to the south and stay within ROW. The other underground utilities include a City of Troy 16 inch existing sanitary sewer close to the proposed north pier and an underground Comcast fiber optic cable crosses under the bridge in the proposed north tail span. The City of Troy 16 inch existing sanitary sewer will be in conflict with the proposed north pier and will require relocation. The existing sanitary sewer could be relocated approximately 20 feet to the north and stay within ROW. All utilities shall be verified in the field during the final design phase.

Underbridge lighting may be required due to the width of the proposed structures as well as for the proposed sidewalks and the locations will be determined during final design.

Wattles Road - Existing DTE overhead utilities cross Wattles Road outside the structures at each abutment therefore, temporary relocation is recommended. Also, street lighting poles located at each abutment will require relocation due to the widening of Wattles Road. The light poles could be relocated on the structure or at the approaches. A changeable message sign structure is located just north of the S10 structure as well as just south of the existing P07 structure. The removal and relocation of these signs will be completed in coordination with the project ITS design.

An underground DTE primary cable is located approximately 30 feet west of the proposed west abutment. The following utilities may be in conflict with the proposed structure and will require further verification and possible relocation: a City of Troy 8 inch watermain, a City of Troy 16 inch watermain and a 6 inch Consumer Energy gas line. The watermains could be relocated approximately 20 feet to the north and stay within the road ROW. All utilities shall be verified in the field during the final design phase.

Long Lake Road - Existing DTE overhead utilities cross I-75 over the north abutment and will require temporary or permanent relocation during construction. Existing ITS cameras overlooking NB and SB I-75 are located north of the bridge in the median and will need to be relocated. The removal and relocation of these cameras will be completed in coordination with the project ITS design.

Under bridge lighting is located on the piers with conduit supported on the beams. No other existing utilities are currently on the bridge.

A Consumer Energy 6 inch gas main and a City of Troy sanitary sewer (size unknown) cross the bridge in the center span. The utilities that cross under the bridge in the existing north tail span include a City of Troy 16 inch watermain and eight 1¼ inch and four 2 inch XO communication ducts. The City of Troy 16 inch watermain and the XO communications ducts will be in direct conflict with the proposed north pier and will require relocation. The 16 inch water main may be relocated approximately 20 feet to the north and stay within the road ROW. All utilities shall be verified in the field during the final design phase.

Underbridge lighting may be required due to the width of the proposed structures as well as for the proposed sidewalks and the locations will be determined during final design.

Crooks Road Interchange- There are no existing utilities on or under the bridge. However, this should be confirmed by the utility companies as well as field verified during the final design phase.

Coolidge Road- There are numerous utilities that exist under Coolidge Road. The most notable include an underground Consumer Energy 36 inch gas line located between the existing and proposed west abutment footings and must be verified in the field during the design phase. Relocation of the gas main is recommended. Also a City of Troy 16 inch watermain is located in vicinity of the proposed east pier under the east tail span and relocation is recommended. The watermain could be relocated approximately 10 feet to the east and stay within the road ROW. Underground Consumer Energy 12 inch and 6 inch gas lines cross the structures in the center span. An AT&T conduit is in conflict with the proposed east pier and relocation is recommended.

Existing DTE overhead utilities cross I-75 over the east abutment and will require temporary or permanent relocation. Existing ITS cameras overlooking NB and SB I-75 are located west of the bridge in the median and will require relocation in coordination with the project ITS design. All utilities shall be verified in the field during the final design phase.

Underbridge lighting may be required due to the width of the proposed structures as well as for the proposed sidewalks and the locations will be determined during final design.

Square Lake Road - There are no overhead utilities or utilities located on the bridges. However, all utilities shall be verified in the field during the final design phase.

Adams Road - No existing utilities are currently on the bridge. The underground utilities include a Consumers Energy 8 inch gas main, a Bloomfield Township 48 inch watermain, a Bloomfield Township watermain (size unknown), a City of Troy 84 inch transmission main and a DTE underground conduit and no impact is anticipated. A City of Troy 12 inch watermain interferes with the proposed pier and will require relocation. The 12 inch watermain could be relocated approximately 15 feet to the east and stay within the road ROW. An existing MDOT transmission monopole is located outside the east abutment between the two structures which will require relocation. All utilities shall be verified in the field during the final design phase.

Squirrel Road - There are DTE overhead power lines that run parallel to the bridge approximately 30 feet from the south fascia and temporary relocation is recommended. Based on the scoping report, there are abandoned utility conduits in bay four of the existing bridge. An underground Bloomfield Township 12 inch watermain concrete encasement runs north/south and is located approximately 35 feet west of the west slab fascia and no impact is anticipated. There is also an underground Bloomfield Township 12 inch watermain and an underground Detroit Edison primary cable locate approximately 30 feet north of the proposed north abutment and no impact is anticipated. All utilities shall be verified in the field during the final design phase.

Square Lake Road Interchange - There are no existing utilities within the influence of these structures. However, this should be confirmed by the utility companies as well as field verified during the final design phase.

4.10 Bridge and Structures

The following is a summary of the structures studied along I-75 from south of 12 Mile Road to south of M-59 and the recommended structures. I-75 is to be widened to four 12 foot lanes in each direction with standard median and outside shoulders. See *VOLUME 4: STRUCTURE STUDY* for a more detailed description of the I-75 bridges.

- **P01 of 63174 (Pedestrian Bridge Crossing I-75 South of 12 Mile Road)**

The preferred option for the pedestrian bridge is a two-span continuous structure with steel beams. The ramp approaches of the pedestrian bridge shall be constructed to meet the current ADA requirement. In order to maintain pedestrian traffic, the proposed bridge alignment was shifted approximately 145 feet south of the existing bridge to be outside the influence of the existing structure and ramps. This allows pedestrian traffic to be maintained over the existing bridge during construction.

- **S03-1, 2 and 5 of 63174 (I-75 over 12 Mile Road)**

Total structure replacements are recommended for the NB and SB I-75 bridges over 12 Mile Road (S03-1 and 2). Due to road geometric requirements, an additional structure is required for the EB 12 Mile Road to NB I-75 ramp (Ramp C). The structure will be labeled S03-5 of 63174 and the span configuration will match the NB and SB structures. Each will be three-span continuous with curved steel plate girders.

- **B02-1, 2, 5, and 6 of 63174 (I-75 over Red Run Drain)**

Total structure replacements are recommended for the NB and SB I-75 bridges over Red Run Drain (B02-1 and 2). Each of the bridges will be one span structures with steel plate girders. The crossing over the Red Run Drain will be significantly wider than the existing bridges due to the influence of the ramps servicing the 12 Mile Road Interchange. Two new structures are required and will be labeled B02-5 and B02-6 and each will be one span structures with steel plate girders. Adjacent to the NB bridge, B02-5 carries two ramp lanes (Ramp C and D) to NB I-75 across the Red Run Drain. B02-6, located just west of B02-2, carries one lane of SB I-75 to 12 Mile Road (Ramp E).

Retaining walls will be required between the ramp lane of the EB 12 Mile Road loop ramp to NB I-75 (Ramp C) and the WB 12 Mile Road ramp to NB I-75 (Ramp D) across the Red Run Drain as well as on the east side of the Ramp D. The walls will extend approximately 570 feet between the S03 of 63174 structures and the B02 structures.

- **S04-1 and 2 of 63174 (I-75 over 13 Mile Road)**

Total structure replacements are recommended for the 13 Mile Road bridges (S04-1 and 2). Each will be three-span simply supported structures with Type IV prestressed concrete beams (Type III in the tail spans) and continuous for live load. The center span will be widened to meet the required substructure horizontal clearance.

- **S05-1 and 2 of 63174 (I-75 over 14 Mile Road)**

Total structure replacements are recommended for the 14 Mile Road bridges (S05-1 and 2). Each will be single span structures with 70 inch deep prestressed concrete Michigan 1800 Girders.

- **S21-1 and 2 of 63174 (I-75 over Maple Road (15 Mile Road))**

Total structure replacements are recommended for the 15 Mile Road bridges. Each will be three-span continuous structures with Type IV prestressed concrete beams (Type III on the tail spans and continuous for live load). The center span will be widened to meet the required substructure horizontal clearance and recommended sight distance.

- **S06-1 and 2 of 63174 (I-75 over M-150 / Rochester Road)**

Total Structure Replacements are recommended for the Rochester Road bridges (S06-1 and 2). Each will be four-span continuous structures with steel beams. The interior spans will be widened to meet the required substructure horizontal clearance.

- **S08-1 and 2 of 63174 (I-75 over Livernois Avenue)**
Total structure replacement is recommended for the Livernois Avenue bridges (S08-1 and 2). Each will be three-span continuous structures with steel beams. The center span will be widened to meet the required substructure clearance and recommended sight distance.
- **S09-1, 2, 5 and 6 of 63174 (I-75 over Big Beaver Road)**
Due to the significant reconstruction of I-75, the changes in profile and the realignment of the ramps under the bridges which conflicts with the existing substructure locations, total structure replacements for the Big Beaver Road bridges (S09-1, 2, 5 and 6) are preferred. Each will be four-span continuous structures with curved steel plate girders. The proposed interior spans were sized to accommodate future widening of the boulevard under the bridges as well as the 10 foot minimum horizontal clearance to the outside piers.
- **S10 of 63174 (Wattles Road over I-75)**
P07 of 63174 (Pedestrian Bridge over I-75 at Wattles Road) – To Be Removed
A total structure replacement is recommended for the Wattles Road bridge (S10). The bridge will be a two-span continuous structure with steel plate girders. The proposed structure will include a non-motorized path separated from the Wattles Road travel lanes by a barrier and will eliminate the existing separate pedestrian structure (P07). The piers at the shoulders will be eliminated and replaced with one in the center of I-75. The crossing of Wattles Road over I-75 will be significantly longer than the existing bridges to accommodate the widening of I-75.
- **S11-1 and 2 of 63174 (I-75 over Long Lake Road)**
Total structure replacements are recommended for the Long Lake Road bridges (S11-1 and 2). Each will be three-span continuous structures with steel beams. The center span will be widened to meet the required substructure clearance and recommended decision sight distance.
- **S12 of 63174 (Crooks Road Interchange over I-75)**
A total structure replacement is recommended for the Crooks Road Interchange bridge (S12). The bridge will be a two-span continuous structure with steel plate girders. The piers at the shoulders will be eliminated and replaced with one in the center of I-75.
- **S14-1 and 2 of 63174 (I-75 over Coolidge Road)**
Total structure replacements are recommended for the Coolidge Road bridges (S14-1 and 2). Each will be three-span continuous structures with steel beams. The center span will be widened to meet the required substructure clearance.
- **S15-1 and 2 of 63174 (I-75 over Square Lake Road)**
Total structure replacements are recommended for the Square Lake Road bridges (S15-1 and 2). Each will be three span simply supported structures with Type IV prestressed concrete beams (Type III in the tail spans) and continuous for live load.
- **S16-1 and 2 of 63174 (I-75 over Adams Road)**
Total structure replacements are recommended for the Adams Road bridges (S16-1 and 2) to meet the changes in the I-75 profile and provide the required clear roadway. Each will be three-span continuous structures with steel beams.
- **S17 of 63174 (Squirrel Road over I-75)**
A total structure replacement is recommended for the Squirrel Road bridge (S17) to meet the changes in additional lanes, road profile, and to provide the required clear roadway. The bridge will be a two-span continuous structure with steel plate girders.
- **S18 of 63174 (Square Lake Road (I-75 BL) Interchange)**
S18-5 of 63174 (Square Lake Road (I-75 BL) Interchange)
Total structure replacements are recommended for S18 of 63174 and S18-5 as the Square Lake Road (I-75 BL) Interchange is being reconstructed to bring the geometrics up to current standards and eliminate the NB left entrance and exit ramps. S18 will be a four-span continuous structure with curved steel plate girders and S18-5 will be a five-span continuous structure with curved steel plate girders. An additional span was required at the north end of the S18-5 structure in order to maintain the 1 on 2 slopes from the abutment to the NB I-75 shoulder below.

The structure recommendations and costs are summarized in **Table 4-5**.

Table 4-5 Structure Summary

CONSTRUCTION SEGMENT AND ANTICIPATED CONSTRUCTION START DATE	STRUCTURE NUMBER	DESCRIPTION	EXISTING STRUCTURE	RECOMMENDED STRUCTURE	GRADE RAISE (FT)	2009 ESTIMATED COST
Construction Segment 1 - 2026	P01 of 63174	Pedestrian Bridge Crossing I-75 South Of 12 Mile Rd.	Two Span steel	Two-span cont. steel beams	-	\$ 2,663,000
	S03-1 of 63174	NB I-75 Over 12 Mile Road	Four span prestressed concrete beams	Three-span cont. curved steel girders	2.5	\$ 3,581,000
	S03-2 of 63174	SB I-75 Over 12 Mile Road			2.0	\$ 3,598,000
	S03-5 of 63174	NB I-75 On-Ramp 12 Mile Road-New Bridge	N/A		-	\$ 1,310,000
	B02-1 of 63174	NB I-75 Over Red Run Drain	Three span steel girders	One span steel girders	6.0	\$ 3,570,000
	B02-2 of 63174	SB I-75 Over Red Run Drain			4.5	\$ 3,388,000
	B02-5 of 63174	NB I-75 On-Ramp Over Read Run Drain-New Bridge	N/A		-	\$ 2,924,000
	B02-6 of 63174	SB I-75 Off-Ramp Over Read Run Drain-New Bridge	N/A		-	\$ 1,728,000
		Retaining Walls	N/A			\$ 1,405,000
	S04-1 of 63174	NB I-75 Over 13 Mile Road	Three span prestressed concrete beams	Three span prestressed concrete beams, LL cont.	0.5	\$ 2,434,000
S04-2 of 63174	SB I-75 Over 13 Mile Road	1.0			\$ 2,317,000	
Segment Subtotal						\$ 28,918,000
Construction Segment 2 - 2028	S05-1 of 63174	NB I-75 Over 14 Mile Road	Three span steel girders	One span MI 1800 girders	3.3	\$ 3,211,000
	S05-2 of 63174	SB I-75 Over 14 Mile Road			3.8	\$ 3,211,000
	S21-1 of 63174	NB I-75 Over 15 Mile Road	Three span prestressed concrete beams	Three-span cont. steel beams	1.0	\$ 2,749,000
	S21-2 of 63174	SB I-75 Over 15 Mile Road			1.5	\$ 2,295,000
	S06-1 of 63174	NB I-75 Over M-150/Rochester Road	Four span prestressed concrete beams	Four-span cont. steel beams	0.4	\$ 4,826,000
	S06-2 of 63174	SB I-75 Over M-150/Rochester Road			1.0	\$ 4,234,000
Segment Subtotal						\$ 20,526,000
Construction Segment 3 - 2029	S08-1 of 63174	NB I-75 Over Livernois Ave.	Three span prestressed concrete beams	Three-span cont. steel beams	0.4	\$ 2,932,000
	S08-2 of 63174	SB I-75 Over Livernois Ave.			1.0	\$ 2,581,000
	S09-1 of 63174	NB I-75 Over Big Beaver Road	Four simple span steel beams	Four-span cont. curved steel girders	2.2	\$ 6,038,000
	S09-2 of 63174	SB I-75 Over Big Beaver Road			3.6	\$ 5,289,000
	S09-5 of 63174	NB I-75 CD Over Big Beaver Road			3.1	\$ 3,363,000
	S09-6 of 63174	SB I-75 CD Over Big Beaver Road			3.8	\$ 3,398,000
	S10 of 63174	Wattles Road Over I-75	Four span prestressed concrete beams	Two-span cont. steel girders	0.0	\$ 4,832,000
	P07 of 63174	Pedestrian Bridge Over I-75 At Wattles Road-To Be Removed	Two span prestressed concrete beams	Removed	-	
Segment Subtotal						\$ 28,433,000
Construction Segment 4 - 2030	S11-1 of 63174	NB I-75 Over East Long Lake Road	Three span prestressed concrete beams	Three-span cont. steel beams	0.6	\$ 2,878,000
	S11-2 of 63174	SB I-75 Over East Long Lake Road			0.5	\$ 2,562,000

CONSTRUCTION SEGMENT AND ANTICIPATED CONSTRUCTION START DATE	STRUCTURE NUMBER	DESCRIPTION	EXISTING STRUCTURE	RECOMMENDED STRUCTURE	GRADE RAISE (FT)	2009 ESTIMATED COST
	S12 of 63174	Corporate Drive Over I-75	Four simple span steel beams	Two-span cont. steel girders	0.7	\$ 3,120,000
	S14-1 of 63174	NB I-75 Over Coolidge Road	Three span prestressed concrete beams	Three-span cont. steel beams	0.4	\$ 2,486,000
	S14-2 of 63174	SB I-75 Over Coolidge Road			0.5	\$ 2,244,000
	S15-1 of 63174	NB I-75 Over Square Lake Road	Three simple span steel beams	Three span prestressed concrete beams, LL cont.	3.3	\$ 2,402,000
	S15-2 of 63174	SB I-75 Over Square Lake Road			2.3	\$ 2,622,000
	S16-1 of 63174	NB I-75 Over Adams Road	Three span prestressed concrete beams	Three-span cont. steel beams	1.0	\$ 3,246,000
	S16-2 of 63174	SB I-75 Over Adams Road			1.0	\$ 3,226,000
Segment Subtotal						\$ 24,786,000
Construction Segment 5 - 2031	S17 of 63174	Squirrel Road Over I-75	Four simple span steel beams	Two-span cont. steel girders	1.3	\$ 2,856,000
	S18 of 63174	Square Lake Road (I-75 BL) Interchange	Three span steel beams	Four-span cont. steel girders	6.5 *	\$ 5,645,000
	S18-5 of 63174	Square Lake Road (I-75 BL) Interchange	Three span steel girders	Five-span cont. steel girders	10.7	\$ 8,424,000
Segment Subtotal						\$ 16,925,000

* Denotes grade raise from existing mid-level crossing