CORRESPONDENCE/MEMORANDUM _____ **State of Wisconsin**

Date: May 24, 2017

To: David Stertz, P.E.
Design Oversight & Standards Section Chief
Bureau of Project Development

ATTN: Will Anderson, PE
Mega/Major Projects Oversight Engineer for SE Region
Bureau of Project Development

From: Roberto Gutierrez
Project Development Chief
SE Region

Subject: DESIGN STUDY REPORT
Project I.D. 1100-34-00
IH 894
84TH St to National Ave
Milwaukee County

Having considered the economic and social effects of this project, its impact on the environment, and its consistency with the goals of community planning, we request your approval of the attached design study report.

Project Development Chief
SE Region

5/31/17
Date

Concur:

William R. anderson
For Design Oversight & Standards Section Chief

6/05/17
Date

DESIGN STUDY REPORT

1.0 PROJECT DESCRIPTION AND NEED

The proposed project is located in the Cities of Greenfield, Milwaukee, and West Allis in Milwaukee County. Proposed improvements include rehabilitating the median, inside shoulders and outside shoulders, and resurfacing the driving lanes along IH 894/41/43 & USH 45 from 84th St to National Ave. Rehabilitation of the IH 894 bridges over Coldspring Rd, Oklahoma Ave and National Ave along with three structures in the Hale Interchange (E-N Ramp, N-E Ramp & S-N Ramp) will also be included with the proposed project.

1.1. Federal Oversight Project (Yes or No): Yes

1.2. Project Length & Termini

Project Length: 3.59 Miles

Termini/Limits: The project limits are from the Hale Interchange to approximately 700' west of 84th St at STA 88EW+99.10 along IH 894/41/43 and from the Hale Interchange to National Ave at STA 189NS+76.07 along IH 894/41 & USH 45. The construction limits for restriping extend north from National Ave approximately 2,500' to STA 215NS+00.

See Attachment 1, Project Location Overview map

1.3. Functional Classification/Access Control

Roadway Name	Functional Class (Arterial, Collector or Local)	Rural, Urban or Transitional	Corridors 2020 or Backbone (No or State which)	NHS Route (Yes or No)	Long Truck Route(No or state Federal or State)	Access Control Tier	On Ped. Trans. Plan (Yes or No)	On Bike Trans. Plan (Yes or No)
IH 894/ 43/ 41 & USH 45	Arterial	Urban	Backbone	Yes	Federal	Tier 1	No	No

1.4. Need for the Project

The pavement condition is poor and is in need of rehabilitation to extend its useful life. The last rehabilitation project was completed in 2003. The drainage structures in the median and outside shoulders are deteriorating and are in need of replacement. Preventative maintenance work is needed on the mainline bridges to extend the life of the structures.

2.0 PRESENT FACILITY

2.1. Posted Speed

Roadway or Roadway Segment	Posted Speed	Advisory Speed
IH 894/ 43/ 41 & USH 45	55 mph	(1)

Comments: (1) There are no advisory speeds posted on the mainline freeway, however the following are the advisory speeds for the system ramps within the Hale Interchange:

- Ramp EN 50 mph
- Ramp NE 50 mph
- Ramp SN 50 mph

2.2. Geometrics

2.2.1. * Horizontal Alignment Features Outside of Desirable or Minimum Design Standards.

* Horizontal Feature (Curve, P.I. Deflection, etc.)	Location (Stationing)	* Size (Radius, P.I. Deflection, etc.)*	* Super-Elevation (s.e.)	Speed Rating
IH 894/41&USH 45 Curve NS1	94+02.30NS	2864.78' Radius	3.1%	45mph
IH 894/41&USH 45 Curve NS2	106+63.59NS	1909.86' Radius	4.2%	45mph
IH 894/41&USH 45 Curve NS3	141+88.47NS	5731.11' Radius	2.0%	50mph
IH 894/41&USH 45 Curve NS4	154+53.03NS	2847.37' Radius	3.0%	45mph
IH 894/41&USH 45 Curve NS5	182+90.96NS	5729.58' Radius	2.0%	50mph
IH 894/41/43 Curve EW1	85+28.96EW	2864.79' Radius	3.1%	45mph
USH 45 Curve RSN3	210+02.19RSN	1206.23' Radius	6.0%	55mph
IH 43 Curve RES3	207+92.07RES	763.94' Radius	6.1%	35mph
IH 894/41 Curve RENA1	39+75.76RENA	1762.94' Radius	4.5%	45mph
IH 894/41 Curve RENA2	56+87.27RENA	1637.03 Radius	7.5%	60mph
IH 894/41 Curve RENB1	30+06.10RENB	1637.01' Radius	4.6%	45mph
IH 894/41 Curve RNE1	32+93.62RNE	1909.86' Radius	4.2%	45mph
IH 894/41 Curve RNE2	43+31.64RNE	1432.40' Radius	4.2%	40mph
IH 894/41/43 Curve RNE4	61+07.30RNE	3819.75' Radius	2.5%	45mph
IH 894/41 Curve RNS1	43+35.55RNS	3274.04' Radius	3.4%	50mph

*Controlling Criteria

Comments:

2.2.2. Vertical Alignment Features/*SSD Outside Desirable or Minimum Design Standards.

* Vertical Feature (Curve, Vertical Grade Deflection, etc.)	Location (Stationing)	Sag or Crest	* % Grades	K Value/ Grade Deflection	Speed Rating	* SSD** Met (Yes or No/ Length)	DSD Met (Yes or No/ Length)
IH 894/41&USH 45 Curve NS	87+50	Crest	2.47%/-2.72%	K=109	50 mph	N/425’	N/425’
IH 894/41&USH 45 Curve NS	110+20	Crest	2.73%/-2.39%	K=98	50 mph	N/425’	N/425’
IH 894/41&USH 45 Curve NS	150+25	Crest	1.21%/-2.79%	K=103	50 mph	N/425’	N/425’
IH 894/41&USH 45 Curve NS	189+25	Crest	3.23%/-2.23%	K=110	50 mph	N/425’	N/425’
IH 894/41&USH 45 Curve Ramp ENB	31+80	Crest	1.09%/-3.07%	K=77	45 mph	N/360’	N/360’
IH 894/41&USH 45 Curve Ramp NS	37+70	Crest	1.52%/-3.00%	K=66	45 mph	N/360’	N/360’

*Controlling Criteria **SSD = Stopping Sight Distance

Comments:

2.2.3 * Grades and Vertical Clearance Outside Desirable or Minimum Design Standards.

Location (Stationing, Overpass Structures, etc.)	* % Grade	* Vertical Clearance
B-40-118 (Beloit Rd over IH 894/41 & USH 45)	-	16.02’ (Cardinal) 16.77’ (NonCardinal)
B-40-119 (SB IH 894/41 & USH 45 over Oklahoma Ave)	-	14.75’ (Cardinal) 14.80’ (NonCardinal)
B-40-120 (NB IH 894/41 & USH 45 over Oklahoma Ave)	-	15.32’ (Cardinal) 15.22’ (NonCardinal)
B-40-123 (SB IH 894/41 & USH 45 over National Ave)	-	15.77’ (Cardinal) 15.87’ (NonCardinal)
B-40-124 (NB IH 894/41 & USH 45 over National Ave)	-	14.29’ (Cardinal) 14.26’ (NonCardinal)
B-40-185 (Howard Ave over IH 894/41 & USH 45)	-	16.04’ (Cardinal) 16.04’ (NonCardinal)
B-40-186 (SB IH 894/41 & USH 45 over Coldspring Rd)	-	14.98’
B-40-187 (NB IH 894/41 & USH 45 over Coldspring Rd)	-	15.61’
B-40-188 (IH 894/41 N-E Ramp over USH 45 S-N Ramp)	-	16.35’
B-40-189 (USH 45 S-N Ramp over IH 43 E-S Ramp)	-	15.84’
B-40-190 (92nd Street over IH 894/41/43)	-	17.2’ (Cardinal) 17.5’ (NonCardinal)

*Controlling Criteria

Comments:

Vertical clearances are from the Highway Structure Information System.

2.3 Side-Roads/Intersections/Interchanges

2.3.1 Side-roads

Roadway Name	Functional Class	Posted Speed (MPH)	Existing Traffic*** (AADT)	Approach Grades	Pedestrian Facilities (Yes or No)	Bicycle Facilities (Yes or No)
None						

***If Existing Traffic volumes are not available, then state at a minimum whether AADT is assumed to be <100 or >100.

Comments:

2.3.2 Intersections

Intersecting Roadway Names	Intersect. Type	Intersect. Angle	Traffic Control	* SSD** Met [(Y/N) / Length]	ISD** Met [(Y/N) / Length]	DSD** Met [(Y/N) / Length]	Vision Triangle (Y/N)	Corner Clearance To Driveways Present (Y/N)
None								

*Controlling Criteria

**SSD=Stopping Sight Distance, ISD=Intersection Sight Distance, and DSD=Decision Sight Distance (See FDM 11-25-1).

Comments:

Has intersection control evaluation (ICE) worksheet been coordinated (Yes or No)? Not Required

2.3.3 Interchanges

Intersecting Roadway Names	Interchange Type	Ramp Types	Ramp Design Speed - Posted Speed	Horizontal Curve on Ramp	Vertical Curve on Ramp	Ramp Grades	* SSD** [(Met (Y/N) / Length]	DSD** [Met (Y/N) / Length]
Ramp S-N	System	Directional	60mph – 50mph	Y	N	1.82%	Y/425' (Posted Speed) N/570' (Design Speed)	Y/425' (Posted Speed) N/570' (Design Speed)
Ramp N-S	System	Directional	60mph – Not Posted	Y	Y	0.51% to 3.00%	Y/570'	Y/570'
Ramp N-E	System	Directional	60mph – 50mph	Y	Y	0.51& to 3.02%	Y/425' (Posted Speed) N/570' (Design Speed)	Y/425' (Posted Speed) N/570' (Design Speed)
Ramp E-N	System	Directional	60mph – 50mph	Y	Y	0.50% to 3.07%	Y/570'	Y/570'

*Controlling Criteria

**SSD = Stopping Sight Distance & DSD = Decision Sight Distance (See FDM 11-25-1).

Comments:

Each of the system ramps are also included in the Horizontal Alignment and Vertical Alignment Features tables since the system ramps are meant to be operating at the same speed as mainline IH 894/41. There are three legs to the Hale Interchange. The East leg, IH 894/41/43, traffic will split north to continue on IH 894/41 and south to travel on IH 43. The South leg, IH 43/USH 45, traffic will split to travel east on IH 43/41/894 EB and north to travel on IH 894/41/USH 45 WB. The North leg, IH 894/41 & USH 45, traffic will split east to continue on IH 894/41/43 and south to travel on IH 43/USH 45. The system ramps should have the same design speed as the mainline, 60mph, but have operating speeds posted lower than that because of the horizontal curves. The E-S Ramp and S-E Ramp are not having any work completed on them and thus are outside of the project limits.

Ramp S-N does not meet Horizontal Stopping Sight Distance for the Design Speed of 60mph because the bridge slope paving (B-40-188) is in the line of sight.

Ramp N-E does not meet Horizontal Stopping Sight Distance for the Design Speed of 60mph because the bridge parapet is in the line of sight (there is a vertical curve prior to the structure that is on a horizontal curve).

2.4 Cross Section

Element Description	IH 894 / IH 43 / IH 41 / USH 45	System Ramps
Number of Roadways	2	4
Number of Lanes	3 driving lanes each direction	Varies, 1 to 2
Median width	28’	None
*** Lane width**	12’	12’
*** Shoulder width (Total and Paved or Curb & Gutter)**	Varies, 2’ to 11’	Varies, 6’ to 10’
Bicycle Facility Type	None	None
Sidewalk and curb ramps	None	None
*** Cross Slope**	Varies, 1.5% to 2%	Varies, 2%
*** Superelevation**	Varies, 1.5% to 4.2%	Varies, 2% to 7.5%
Horizontal Clearance	2-11’ (Shoulder Width)	6-10’ (Shoulder Width)
Clear Zone	Varies	Varies
*** Vertical clearance**	Varies, 16.02’ minimum	Varies, 15.84’ minimum
Side-slopes and Ditch sections	Varies	Varies

*Controlling Criteria

Comments: See Attachment 2, Existing Typical Sections.

2.5 Pavement Structure/Condition

Roadway	Pavement Types & Thicknesses	Physical Description
IH 894 / IH 43 /IH 41 / USH 45	5 ¼” Asphalt over 8” Reinforced Concrete (Concrete Rubblized at various locations)	Extensive amounts of transverse, longitudinal, reflective and alligator cracking
System Ramps	5 ¼” Asphalt over 8” Concrete (Rubblized at various locations)	Extensive amounts of transverse, longitudinal, reflective and alligator cracking

2.6 Right Of Way

2.6.1 Encroachments

Location (Station & Distance Left or Right)	Encroachment Type
None	

2.6.2 Unique Right of Way Issues:

None

2.7 Structures

Existing Structure I.D. #	Feature Crossed	Structure Type	Sufficiency Rating	Clear Roadway Width	Railing Type	Structurally Deficient or Functionally Obsolete	* Inventory Load Rating
B-40-119	SB IH 894/41 & USH 45 over Oklahoma Ave	Prestressed Concrete Girder	93.8	58.0’	Sloped Parapet	No	HS21
B-40-120	NB IH 894/41 & USH 45 over Oklahoma Ave	Prestressed Concrete Girder	93.9	58.0’	Sloped Parapet	No	HS21
B-40-123	SB IH 894/41 & USH 45 over National Ave	Continuous Steel	79.2	67.6’	Sloped Parapet	No	HS17
B-40-124	NB IH 894/41 & USH 45 over National Ave	Continuous Steel	82.4	68.4’	Sloped Parapet	No	HS21
B-40-186	SB IH 894/41 & USH 45 over Coldspring Rd	Continuous Steel	91.7	59.0’	Sloped Parapet	No	HS22
B-40-187	NB IH 894/41 & USH 45 over Coldspring Rd	Continuous Steel	94.1	71.0’	Sloped Parapet	No	HS24
B-40-188	IH 894/41 N-E Ramp over IH USH 45 S-N Ramp	Continuous Steel	90.0	39.4’	Sloped Parapet	Functionally Obsolete	HS19
B-40-189	USH 45 S-N Ramp over IH 43 E-S Ramp	Continuous Concrete Haunched Slab	75.4	35.7’	Sloped Parapet	No	HS18
B-40-324	WB IH 894/41/43 over Root River Marsh	Prestressed Concrete Girder	81.6	66.3’	Sloped Parapet	No	HS27

*Controlling Criteria

Comments:

2.8 Utilities

Utility Name	Type of Utility	General Location	Underground/ Overhead/Both
American Transmission Company	ELCTY	In a corridor along the east side of IH 894/41 & USH 45 from the Hale IC to Lincoln Ave; along the north side of IH 43/894/41 from the Hale IC to 84th Street; crossing IH 43 at the southwest side of the Hale IC	Overhead
AT&T Corporation	COMLN	Along the east fence line of IH 894/41 & USH 45 from Lincoln Ave to the Hale IC and continuing east along the north fence line of IH 43/894/41 from the Hale IC to 84th Street	
AT&T Wisconsin	COMLN	An underground crossing below IH 894/41 & USH 45 at approximate Station 178NS+00; overhead crossings of IH 43/894/41 on We Energies electric poles throughout the project limits	Both
Charter Communications	COMLN	An underground crossing below IH 894/41 & USH 45 on the south side of Cold Spring Road; an overhead crossing of IH 894/41 & USH 45 approximately 55' south of the Dakota Street Pedestrian Bridge; an overhead crossing of the National Avenue on & off ramps east of IH 894/41 & USH 45	Both
Greenfield - Lighting, City of	SLTG	Light poles and underground electric on the Howard Avenue structure crossing over IH 894/41 & USH 45 and east along Howard Avenue	Both
Greenfield - Sewer, City of	SEWR	Crossing below IH 894/41 & USH 45 at Cold Spring Road	Underground
Midwest Fiber Networks	COMLN	An underground crossing below IH 894/41 & USH 45 along the north side of Cold Spring Road; an overhead crossing of the National Avenue on & off ramps east of IH 894/41 & USH 45;	Both
Milwaukee Metropolitan Sewerage District	SEWR	An abandoned sewer crossing below IH 894/41 & USH 45 at Harrison Avenue	Underground
Milwaukee Water Works	WATR	Crossing below IH 43/894/41 approximately 110 east of 92nd Street; crossing below IH 894/41 & USH 45 at Cold Spring Road; crossing below IH 894/41 & USH 45 approximately 50' north of Howard Avenue; crossing below IH 894/41 & USH 45 at the	Underground

		south side of Oklahoma Avenue	
We Energies - Electric	ELCTY	An overhead crossing of IH 43/894/41 on the west side of 92nd Street; underground crossings below IH 894/41 & USH 45 at the north and south RW's of Cold Spring Road; an overhead crossing of IH 894/41 & USH 45 at approximate Station 77NS+25; an overhead crossing of IH 894/41 & USH 45 at approximate Station 94NS+00; an overhead crossing of IH 894/41 & USH 45 at approximate Station 105NS+70; an overhead crossing of IH 894/41 & USH 45 at approximate Station 147NS+65; an overhead crossing of IH 894/41 & USH 45 approximately 55' south of the Dakota Street Pedestrian Bridge; an overhead crossing of IH 894/41 & USH 45 at approximate Station 174NS+60; an overhead crossing of the National Avenue on & off ramps east of IH 894/41 & USH 45	Both
We Energies - Gas	GSPTR	Crossing below the Hale IC at approximate Stations 206RSE+00, 44RNE+00, 210RES+75 and 41RENA+80; crossing below IH 894/41 & USH 45 along the north side of Cold Spring Road; crossing below IH 894/41 & USH 45 approximately 40' south of Howard Avenue; two lines crossing above IH 894/41 & USH 45 on the Howard Avenue structure; crossing above IH 894/41 & USH 45 on the Beloit Avenue structure; crossing below IH 894/41 & USH 45 at the north side of Oklahoma Avenue; crossing below IH 894/41 & USH 45 approximately 20' south of the Dakota Street Pedestrian Bridge; crossing below IH 894/41 & USH 45 at the north side of National Avenue then turning and crossing below the on & off ramps east of IH 894/41 & USH 45 at National Avenue;	Underground
West Allis / West Milwaukee School District	COMLN	An crossing below IH 894/41 & USH 45 south of the Dakota Street Pedestrian Bridge	Underground
West Allis - Lighting, City of	SLTG	Light poles and underground electric along the median of Oklahoma Avenue below IH 894/41 & USH 45; light poles and electric lines on the Dakota Street Pedestrian Bridge over IH 894/41 & USH 45; light poles and electric lines on the Cleveland	Both

		Avenue structure over IH 894/41 & USH 45; light poles and underground electric on the north and south sides of National Avenue below IH 894/41 & USH 45	
West Allis - Sewer, City of	SEWR	Crossing below IH 894/41 & USH 45 approximately 50' south of the Dakota Street Pedestrian Bridge; crossing below IH 894/41 & USH 45 at the south side of National Avenue	Underground
West Allis Municipal Water Utility	WATR	Crossing below IH 894/41 & USH 45 at the north side of Oklahoma Avenue; crossing below IH 894/41 & USH 45 approximately 85' north of Cleveland Avenue; crossing below IH 894/41 & USH 45 at the south side of National Avenue	Underground
WisDOT - Lighting	WISLTG	High mast lighting and underground electric lines throughout the Hale IC; light poles and underground electric lines along the median of IH 43/894/41; light poles and underground electric lines along the median of IH 894/41 & USH 45; light poles and underground electric lines along the on & off ramps at the Beloit Road, Oklahoma Avenue and National Avenue Interchanges	Both
WisDOT - Signals	WISGN	Signals and underground electric lines at the on & off ramps at the IH 894/41 & USH 45 interchanges at Beloit Road, Oklahoma Avenue and National Avenue	Both
WisDOT - STOC	ITSNet	Overhead message signs, underground electric lines, ramp meters, cameras, loop detectors and traffic monitoring devices throughout the RW of IH 43/894/41, the Hale IC and IH 894/41 & USH 45	Both

Comments:

2.9 Railroad Crossings

Location (Sta.)	Railroad Name	No. of Tracks	Function	Crossing Type
None				

Comments:

2.10 Special Soils Conditions

A Phase 1 HazMat report was completed and indicated several potential contaminated soil/groundwater locations. However, no further investigations are recommended based on the location of the contaminated sites in relationship to the proposed improvements, the clean-up measures used to remediate the spills, and the age of the spills (greater than 20 years old).

2.11 Unique Project Features

None

3.0 TRAFFIC

3.1 TRAFFIC VOLUMES/CONDITIONS

3.1.1 See attached Traffic Forecast Report – (Attachment 3)

3.1.2 Highway Capacity Analysis – (Attachment 4)

3.2 Crash Analysis

3.2.1 Project Crash Information

Roadway	Crash Rate [1] (2007-2009, 2011-2012)	Statewide Crash Rate [1] (2008-2012)	Number & Severity of Crashes			
			Fatal	Injury	Property Damage	Total No. Crashes
I-894 EB/I-41 SB & USH 45 SB from Lincoln Ave to Oklahoma Ave	178.9	73.0	0	62	164	226
I-894 EB/I-41 SB & USH 45 from Oklahoma Ave to Hale Int	87.4	73.0	0	41	120	161
I-894/41 EB thru Hale Int (N-E System Ramp)	51.0	73.0	0	5	9	14
I-894 EB/I-43 NB/I-41 SB from Hale Int to 84th St	55.9	73.0	0	14	29	43
I-894 WB/I-43 SB/I-41 NB from 84th St to Hale Int	50.1	73.0	0	14	24	38
I-894 WB/I-41 NB thru Hale Int (E-N System Ramp)	31.3	73.0	0	2	4	6
I-894 WB/I-41 NB/USH 45 NB from Hale Int to Oklahoma Ave	135.2	73.0	0	65	209	274
I-894 WB/I-41 NB/USH 45 NB from Oklahoma Ave to Lincoln Ave	208.2	73.0	0	72	189	261

[1] Crash rate based on 100 million vehicles miles traveled (100 MVMT)

Comments:

- Larger roadway portion crash rates shown above were calculated based on the weighted averages of individual, smaller roadway segment crash rates
- Crash data from 2010 was excluded due to the Zoo Interchange Emergency Bridge Repair project which influenced traffic demand and travel patterns on I-894/I-41 inconsistent with the preceding and subsequent years

3.2.2 Significant Crash Locations or Patterns

Location	Years	Number & Severity of Crashes				Crash Rate[(2)]	Possible Factors Contributing to Crashes
		Fatal	Injury	Property Damage	Total		
I-894 EB/I-41 SB/USH 45 SB from Lincoln Ave to National Ave Exit Ramp	2007-2009, 2011-2012	0	25	68	93	264.7	A, B
I-894 EB/I-41 SB/USH 45 SB btwn National Ave Exit and Entr Ramps		0	28	73	101	367.3	A, B, C, D
I-894 EB/I-41 SB/USH 45 SB btwn Beloit Rd Exit and Entr Ramps		0	16	46	62	181.5	A, B, D
I-894 WB/I-41 NB/USH 45 NB btwn Beloit Rd Exit and Entr Ramps		0	30	83	113	487.5	A, B, D
I-894 WB/I-41 NB/USH 45 NB btwn National Ave Exit and Entr Ramps		0	21	73	94	313.8	A, B, D
I-894 WB/I-41 NB/USH 45 NB from National Ave Entr Ramp to Lincoln Ave		0	37	79	116	196.2	A, B, C

[(2)] Crashes per million entering vehicles (MEV)

Comments:

A – Peak hour traffic congestion (rear-end crashes prevalent)

B – Merge/diverge and/or weaving operational issues (sideswipe and angle crashes prevalent)

C – High service ramp entering or exiting volumes (sideswipe and angle crashes prevalent)

D – Horizontal and/or vertical geometric issues (all crash types plus single vehicle crashes prevalent)

4.0 PROPOSED DESIGN CRITERIA

4.1 Design Class

Roadway or Roadway Segment	Design Class
IH 894/IH 43/IH 41 & USH 45	A3

4.2 * Design Speed

Roadway or Roadway Segment	Design Speed	Posted Speed
IH 894/IH 43/IH 41 & USH 45	60 mph	55 mph
System Ramps	50-60 mph	N/A

* Controlling Criteria

4.3 Design Criteria Outside Of Desirable Standards

The design features listed below include maximum deflection without horizontal curves, vertical curves outside of desirable standards, bridge width, and vertical clearance.

Desirable and maximum deflection without horizontal curves is outlined in WisDOT Facilities Development Manual for low speed and high speed posted roadways.

IH 894/41 & USH 45 SB:

The deflection angel without horizontal curve is 1°8'2.6" at STA 31RNS+01.33 (31.93' LT) which is greater than desirable and maximum deflection angle of 1 degree for a posted speed of 55 mph.

Desirable K-values listed are based on sight distance categories as outlined in the WisDOT Facilities Development Manual for crest vertical curves.

IH 894/41 & USH 45:

The crest vertical curve at STA 87NS+50 has a K-value of 109, which is less than the desirable K-value of 245 and the minimum K-value of 151 for the design speed of 60 mph.

The crest vertical curve at STA 110NS+20 has a K-value of 98, which is less than the desirable K-value of 245 and the minimum K-value of 151 for the design speed of 60 mph.

The crest vertical curve at STA 150NS+25 has a K-value of 103, which is less than the desirable K-value of 245 and the minimum K-value of 151 for the design speed of 60 mph.

The crest vertical curve at STA 189NS+25 has a K-value of 110, which is less than the desirable K-value of 245 and the minimum K-value of 151 for the design speed of 55 mph

The crash analysis report identifies significant crash locations and patterns near crest vertical curves near STA 110NS+20 and STA 189NS+25. Please see DSR Sections **3.2.1 Project Crash Information** and **3.2.2 Significant Crash Locations or Patterns.**

Ramp ENB:

The crest vertical curve at STA 31ENB+80 has a K-value of 77, which is less than the desirable K-value of 185 and the minimum K-value of 114 for the design speed of 55 mph. There is an advisory speed of 50 mph therefore desirable and minimum values are used for design speed of 55mph.

The crash analysis report does not identify significant crash locations and patterns near crest vertical curve at STA 31ENB+80. Crash Rate appears to be below statewide crash rate for Ramp EN. Please see DSR Sections **3.2.1 Project Crash Information** and **3.2.2 Significant Crash Locations or Patterns.**

Ramp NS:

The crest vertical curve at STA 37RNS+70 has a K-value of 66, which is less than the desirable K-value of 245 and the minimum K-value of 151 for the design speed of 60 mph. There is no advisory speed at this location therefore desirable and minimum values are used for design speed of 60mph.

The crash analysis report does not identify significant crash locations and patterns near crest vertical curve at STA 37RNS+70. Please see DSR Sections **3.2.1 Project Crash Information** and **3.2.2 Significant Crash Locations or Patterns.**

The substandard K-values listed above are proposed to remain since this project is programmed as a rehabilitation project with temporary lane and shoulder re-striping to extend the serviceable roadway life and provide for a temporary transition section between the newly constructed Zoo Interchange and existing IH 894/IH 43/IH 41/USH 45 roadway and Hale Interchange to temporarily improve traffic operations and safety. As such, changes to the alignment and profile of the roadway are not proposed. Please see already approved ESR for reduced sight obstruction.

Bridge widths listed are based on 4R projects outlined in WisDOT Facilities Development Manual for bridges to remain in place.

IH 894/41 & USH 45 NB/SB:

B-40-187 (NB IH 894/41 & USH 45 over Coldspring Rd) has a combination of 11- foot and 12-foot lanes in which the 11-foot lanes are less than the required 12-foot lane width. It also has 11-foot inside and 8-foot outside shoulder widths in which the 8-foot outside shoulder is less than and/or greater than the required 10-foot shoulder width.

B-40-186 (SB IH 894/41 & USH 45 over Coldspring Rd) has a combination of 11- foot and 12-foot lanes in which the 11-foot Lane widths are less than the required 12-foot lane widths. It also has 7.5-8.7-foot inside and 4.2-5.4-foot outside shoulder widths which are less than the required 10-foot shoulder widths.

B-40-120 (NB IH 894/41 & USH 45 over Oklahoma Ave) has combination of 11- foot and 12-foot lanes in which the 11-foot lane widths are less than the required 12-foot lane widths. It also has 2.4-foot inside and 10-foot outside shoulder widths in which the inside shoulder is less than the required 10-foot shoulder width.

B-40-119 (SB IH 894/41 & USH 45 over Oklahoma Ave) has a combination of 11- foot and 12-foot lanes in which the 11-foot lanes are less than the required 12-foot lane widths. It also has 2.2-foot inside and 11-foot outside shoulder widths in which the 2.2-foot inside shoulders are less than the required 10-foot width.

B-40-124 (NB IH 894/41 & USH 45 over National Ave) has a combination of 11- foot and 12-foot lanes which ~~is~~ are less than the required 12-foot lane widths. It also has 2-foot inside and 3.2-foot outside shoulder widths which are less than the required 10-foot widths.

B-40-123 (SB IH 894/41 & USH 45 over National Ave) has a combination of 11- foot and 12-foot lanes in which the 11-foot lanes are less than the required 12-foot lane widths. It also has 2-foot inside and 3.2-3.8-foot outside shoulder widths which are less than the required 10-foot widths.

B-40-188 (IH 894/41 N-E Ramp over USH 45 S-N Ramp) has a combination of 11- foot and 12-foot lanes in which the 11-foot lanes are less than the required 12-foot lane widths. It also has 3.9-foot inside and 1.5-foot outside shoulder widths which are less than the required 10-foot widths.

B-40-324 (WB IH 894/41/43 over Root River Marsh) has a combination of 11- foot and 12-foot lanes in which the 11-foot lanes are less than the required 12-foot lane widths. It also has 3.5-9.3-foot inside and 18-22.7-foot outside shoulder widths which are less than and/or greater than the required 10-foot widths.

The substandard shoulder widths listed above are proposed to remain since this project is programmed as a rehabilitation project with temporary lane and shoulder re-striping to extend the serviceable roadway life and provide for a temporary transition section between the newly constructed Zoo Interchange and existing IH 894/IH 43/IH 41/USH 45 roadway and Hale Interchange to temporarily improve traffic operations and safety. As such, changes to the existing substandard bridge lane and shoulder widths are not proposed.

Minimum vertical clearances are based on WisDOT Facilities Development Manual for existing bridges which are not being replaced and for existing bridges on which the superstructure in not being replaced.

- The minimum vertical clearance for a local road over freeway is 16'-0" min. or ES
- The minimum vertical clearance for a freeway (at an interchange) over or under the arterial, the following criteria applies
    - If existing is < 15'-3'' then increase to 15'-3'' min. or ES
    - If existing is $\geq$ 15'-3'', but < 16'-0'' then maintain existing min. or ES
    - If existing is $\geq$ 16'0'' then 16'-0'' min. or ES

B-40-185 (Howard Ave over IH 894/41 & USH 45) has 16.04' minimum vertical clearance. Existing minimum vertical clearance will be maintained by changing typical section under structure and matching the existing grades.

B-40-118 (Beloit Rd over IH 894/41 & USH 45) has 16.02' minimum vertical clearance. Existing minimum vertical clearance will be maintained by changing typical section under structure and matching the existing grades.

B-40-119 (SB IH 894/41 & USH 45 over Oklahoma Ave) has 14.75' minimum vertical clearance. Existing

minimum vertical clearance will be maintained by changing typical section under structure and matching the existing grades.

B-40-120 (NB IH 894/41 & USH 45 over Oklahoma Ave) has 15.22' minimum vertical clearance. Existing minimum vertical clearance will be maintained by changing typical section under structure and matching the existing grades.

B-40-123 (SB IH 894/41 & USH 45 over National Ave) has 15.77' minimum vertical clearance. Vertical clearance will not be impacted at this structure. The substandard vertical clearance at this location will be considered for improvement during a future project.

B-40-124 (NB IH 894/41 & USH 45 over National Ave) has 14.26' minimum vertical clearance. Vertical clearance will not be impacted at this structure. The substandard vertical clearance at this location will be considered for improvement during a future project.

IH 894/IH 43/IH 41:

A single run of 42 inch median barrier will be constructed on I894 EB &WB/I-41 NB & SB/USH 45 NB & SB between Sta 75NS+00.00 to Sta 187NS48.19 and on I-894 EB & WB/I-41 NB & SB/I-43 NB & SB between Sta 68EW+10.60 to Sta 81EW+94.69 with freeway lighting installed on top. Usual WisDOT practice is to install 2 lines of 42 inch concrete safety barrier with the lighting placed in the middle to shield it from both directions of traffic. In order to provide for the restriping of additional lanes in each direction as part of this proposed project in a way as to maximize the lane and shoulder widths by using width from the existing median so as to not widen the roadway on the outside, a single run of concrete safety barrier is proposed

42 inch single slope barrier will be constructed on the shoulders where sign structures are offset 10' from the flow line. 56 inch single slope barrier will be constructed on the shoulders where sign structures are offset 2.5' from the flow line.

IH 894/IH 43/IH 41:

Variable slope from 1.5% to 2% is proposed to be maintained within the resurfacing sections along IH 894/IH 41/IH 43/USH 45 throughout the project. Please see DSR Sections 3.2.1 Project Crash Information and 3.2.2 Significant Crash Locations or Patterns.

Ramp ENB:

7.5% super-elevated section is proposed to be maintained along Ramp EN. The crash analysis report does not identify significant crash locations and patterns near this super-elevated section. The Crash Rate is below the statewide crash rate for Ramp EN. Please see DSR Sections 3.2.1 Project Crash Information and 3.2.2 Significant Crash Locations or Patterns.

SIGN BRIDGE STRUCTURES:

The minimum horizontal clearance at any sign bridge structure on this project is 2.2'. Please see table 5.7.4 Sign Bridge Structures for more information.

IH 894/IH 43/IH 41:

Due to narrow shoulders, non-break-away lighting fixtures will be constructed along IH 894/IH 41/IH 43/USH 45 throughout the project limits to avoid secondary impacts that might be caused by falling light fixtures.

Magnitude of cost to reconstruct the entire IH 894/IH 41/IH 43/USH 45 corridor from W. National Avenue to 84th Street with interchange reconstructions would be approximately $650 million; which would result in significant adverse impacts including right of way acquisitions, potential property relocations, and various social and environmental impacts.

Magnitude of cost for just reconstructing the Hale Interchange: including earthwork and excavations, pavement and structure replacement, potential local road access modifications, as well as reconstruction of the HWY 100 Interchange and 92nd Street bridge would be approximately $350 million - $400 million which would result in

various adverse impacts: including right of way acquisitions, potential property relocations, and various social and environmental impacts.

Reconstruction in the magnitude of either of these above options will require completing a major Environmental Document Process Action, such as an Environmental Impact Statement (EIS) or Environmental Assessment (EA), which could take up to 3 – 5 years to complete. Funding availability for these alternatives is likely not going to be available for some time beyond the 3- 5 years as other project studies that are either already underway or scheduled to occur before this project have not yet secured their funding. These timeframes in themselves require an interim project to be completed to preserve this roadway prior to when its reconstruction can be completed. Also, a good portion of the proposed rehabilitation cost is reusable for traffic control and staging that will be needed to be completed in advance of beginning any of this reconstruction work.

4.4 Exceptions To Standards

The following substandard features are documented in an already approved Exception to Standards Report:

1. A 50mph design speed has been approved for use along the mainline roadways of IH 894/IH 41 passing through the Hale Interchange described as Ramp EN and Ramp NE
2. 11-ft minimum lane widths have been approved for use on 3 of the 4 proposed restriped lanes along IH 894/IH 41/IH 43/USH 45 throughout the project, rather than the standard 12' lane width
3. 2-4ft minimum median/inside shoulder widths along IH 894/IH 41/IH 43/USH 45 have been approved for use throughout the project.

   In addition, 1.92-ft median/inside shoulder widths have been approved for use at sign structures S-40-3004, S-40-3005, S-40-3006, S-40-3007 and S-40-018 (existing).

   Also, 3-9.38-ft outside shoulder widths along IH 894/IH 41/IH 43 have been approved for use from the north end of the Hale Interchange to 84th Street, rather than the standard 10' shoulder width for 4R projects
4. Horizontal Stopping Sight Distance exceptions
5. Super-elevation Rate exceptions
6. Vertical Clearance exceptions at the Ramp SN bridge (B-40-189) under the NE Ramp

4.4.1 Safety Screening Analysis (SSA) and Programmatic Exception to Standards per FDM 11-1-4 (3R projects and Preventive Maintenance (PM) Group I and Group II pavement strategy projects (FDM 3-1 Exhibit 5.1))

See attached Safety Screening worksheets for locations and details of Crash Flags, Improvement Flags, and Programmatic Exceptions to Standards within the project limits.

National Highway System (NHS) Roadway- Substandard Geometric Features Covered by a Programmatic Exception to Standards (3R & PM projects)

NHS roadway name:

Location				Feature Type	Magnitude of Variance
Sta.	to Sta.	RP	to RP		

* This documentation is required only for 3R projects on the National Highway System.

These substandard features are located on highway segments containing no flags or only Crash Type Flags. These

features do not contribute significantly to the crash situation on these segments of highway so these highway segments are covered by the Programmatic Exception to Standards.

See attached map

Comments:

Substandard Geometric Features NOT Covered by a Programmatic Exception to Standards and NOT corrected as part of PM project (PM Group I and Group II pavement strategy projects)

Roadway Name:

Location				Feature Type	Magnitude of Variance	Operational Improvements
Sta.	to Sta.	RP	to RP			

Construction is required for safety improvements or to correct the above sub-standard features. The region will either consider this construction for HSIP funding or address this construction with future programming. Operational improvements will be incorporated into the PM project at these locations that are consistent with the scope of the preventive maintenance work and appropriate based on the analysis of crash types.

Comments:

4.5 Typical Cross Section Elements Considered

A typical cross-section of three 11-ft lanes and one 12-ft lane with 10-ft outside shoulders and 4-ft inside shoulders is proposed. Typical section alternatives considered consisted of different side by side configurations of 11-ft and 12-ft lanes widths leading to the final proposed typical sections. The Proposed Typical sections are attached to this Design Study report.

5.0 PROPOSED DESIGN IMPROVEMENT

5.1 Improvement Type

This is a resurfacing, shoulder and storm sewer rehabilitation and restriping project with operational improvements.

5.2 Geometrics

5.2.1 Horizontal alignment

The Horizontal alignment is not proposed to be changed with this project.

5.2.2 Vertical alignment/*Stopping sight distance

The Vertical alignment is not proposed to be changed with this project.

5.2.3 * Grades

Vertical grades for this project are not proposed to be changed with this project.

* Controlling Criteria

5.3 Sideroads/Intersections/Interchanges

5.3.1 Side-roads

Roadway Name	Functional Class	Design Speed (MPH)	Design Year Traffic (AADT)	Design Class	Approach Grades	Ped. Facilities (Y / N)	Bike Facilities (Y / N)
None							

Comments:

5.3.2 Intersections

Intersecting Roadway Names	Intersect. Type	Intersect. Angle	Traffic Control	* SSD** Met [(Y/N) / Length]	ISD** Met [(Y/N) / Length]	DSD** Met [(Y/N)/ Length]	Vision Triangles Proposed (Y / N)	Corner Clearance To Driveways Met (Y / N)
None								

* Controlling Criteria

**SSD = Stopping Sight Distance, ISD = Intersection Sight Distance & DSD = Decision Sight Distance (See FDM 11-25-1).

Comments:

Has intersection control evaluation (ICE) worksheet been coordinated (Yes or No)? Not Required

5.3.3 Interchanges

Name of Intersecting Roadways	Interchange Type	Ramp Type	Ramp Design Speed	Ramp Grades	* SSD** Met [(Y/N) / Length]	DSD** Met [(Y/N) / Length]	Vision Triangle (Yes or No)

* Controlling Criteria

**SSD = Stopping Sight Distance & DSD = Decision Sight Distance (See FDM 11-25-1).

Comments: This is a resurfacing project in which interchange geometric features are not proposed to be changed from existing interchange features as shown in DSR section 5.3.3.

5.4 Roundabouts

None exist or are proposed to be constructed on this project.

5.5 CROSS SECTION/PAVEMENT STRUCTURE

Element Description	IH 894 / IH 43 /IH 41/USH 45	System Ramps
Number of Roadways	2	1
Number of Lanes	4 lanes each direction	Varies, 1 to 3
Median width	Varies, 6 to 10’	None
*** Lane width/Type (Driving, Parking, Bike Lane, etc.)**	Varies, 11’ to 12’	Varies, 11’ to 12’
*** Shoulder width (Total and Paved or Curb & Gutter)**	Varies, 1.92’ to 10’	Varies, 3’ to 10’
Bicycle facilities proposed	No(Bikes Prohibited)	No(Bikes Prohibited)

Pedestrian facilities/ sidewalk proposed	No(Pedestrians Prohibited)	No(Pedestrians Prohibited)
*** Cross Slope**	Varies, 1.5% to 2% For constructability reasons and to minimize the level of impacts on the project, maintaining the minimum cross slope as is at 1.5% is proposed. (See DSR Section 4.3 for further information)	2%
*** Superelevation**	Varies, 1.5% to 4.2%	Varies, 2% to 7.5% (See ESR Substandard Feature #5 for justification for maintaining super-elevations above 6%)
Horizontal Clearance	1.92' minimum	2' minimum
*** Vertical clearance**	Varies, 16.02' minimum	Varies, 15.84' minimum
Pavement Structure	Shoulders and Inside Lane (Lane 1): 9 ¾-inch HMA pavement over 6-inch Base Aggregate Dense 1-1/4-Inch over 16-inch Select Crushed Material Existing lanes: Mill 2-inch existing asphaltic surface and place 4-inch HMA Pavement over existing pavement structure Existing lanes (between W Oklahoma Ave and W National Ave): Mill 5 ¼-inch existing asphaltic surface and place 51/4-inch HMA Pavement over existing pavement structure	Mill 2-inch existing asphaltic surface and place 4-inch HMA Pavement over existing pavement structure
Clear Zone	Varies or Concrete Barrier	
Side-slopes and Ditch sections	Concrete Barrier, C&G, 4:1 Backslope or Ditch, 6:1 Foreslope, 4:1 Foreslope, 3:1 Backslope, 2.5:1 max Backslope	Concrete Barrier, C&G, 4:1 Backslope or Ditch, 6:1 Foreslope, 4:1 Foreslope, 3:1 Backslope, 2.5:1 max Backslope

* Controlling Criteria

5.6 Street Lighting

Location	Type	Break-away Requirements
Lights on top of median concrete barrier along the freeway from Sta. 68EW+10.60 – Sta. 100EW+00	LED D, Type F Pole, Type F Pole bolt circle and 4-FT Arm	No
Lights along the ramps and outside of the freeway from Sta. 68EW+10.60 – Sta. 100EW+00	LED C and D, Type 5, 7 and E Pole, 11-Inch and 15-Inch Bolt Circle, 4-FT, 6-FT, 10-FT, 15-FT and 20-FT Arm.	Yes
Lights on top of median concrete barrier along the freeway from Sta. 70NS+90.30 – Sta. 190NS+00	LED D, Type F Pole, Type F Pole Bolt Circle and 4-FT Arm	No
Lights on top of median along the freeway from Sta. 70NS+90.30 – Sta. 73NS+75.00	LED D, Type A Pole, 15-Inch Bolt Circle and 4-FT Arm	Yes
Lights along the ramps and outside of the freeway from Sta. 70NS+90.3 – Sta. 190NS+00	LED C and D, Type 5, 7 and E Pole, 11-Inch and 15-Inch Bolt Circle, 4-FT, 6-FT, 10-FT, 15-FT and 20-FT Arm.	Yes
Lights under the bridge decks	Replace existing HPS Underdeck Lighting (UDL) with Luminaires Underdeck LED C	No

5.7 Structures

5.7.1 Bridge Structures

Structure work included as part of this project is shown in the table below.

Structure I.D. #	Proposed Improvement/Type of Work
B-40-119	Polyester Polymer Concrete (PPC) Overlay
B-40-120	PPC Overlay
B-40-123	PPC Overlay, Paint Girders
B-40-124	PPC Overlay, Paint Girders
B-40-186	PPC Overlay, Spot Paint Girders
B-40-187	PPC Overlay, Spot Paint Girders
B-40-188	PPC Overlay, Paint Girders
B-40-189	PPC Overlay
B-40-324	PPC Overlay

Comments:

5.7.2 Box Culverts and Multiple Pipe Structures

Structure I.D. #	Location	Type	Length	No. Pipes
None				

Comments:

5.7.3 Retaining Walls and Noise Barrier Structures

Structure I.D. #	Location	Type	Length	Height
none				
	Proposed Improvement:			
	Proposed Improvement:			

Comments:

5.7.4 Sign Bridge Structures

Structure I.D. #	Location	Type	Length	Clear Roadway Width	* Vertical Clearance	Horizontal Clearance	Clear Zone Under
S-40-459	IH 894/41 & USH 45 NB ¼ mile south of National Ave	DMS Full span 4 chord truss	78.0	67.0	18.3	2.2/7.2	N/A
S-40-3006	IH 894/41 & USH 45 SB 1/4 mile prior to Oklahoma Ave	Median butterfly	N/A	N/A	18.3	2.2/2.2	N/A
S-40-3005	IH 894/41 & USH 45 NB 3/4 mile prior to National Ave	Median butterfly	N/A	N/A	18.3	2.2/2.2	N/A
S-40-3004	IH 894/41 & USH 45 NB and SB 1/2 mile prior to Beloit Rd NB exit	Median butterfly	N/A	N/A	18.3	2.2/2.2	N/A
S-40-3007	IH 894/41/43 EB and WB 1/2 mile prior to Hale Interchange WB	Median butterfly	N/A	N/A	18.3	2.2/2.2	N/A
S-40-3010	IH 894/41/43 WB at Hale Interchange split to IH 43 South/IH 894/41 North	Full span 4 chord truss	81.0	59.9	18.3	10.0/10.0	N/A
S-40-810	IH 894/41/43 WB at Hale Interchange near 92nd St	Salvaged Full span 4 chord truss	66.3	58.4	20.8	2.2/4.7	N/A
S-40-3011	IH 894/41/43 WB about 600ft east of 84th St	Full span	74.0	60.6	18.3	2.2/10.3	N/A
S-40-3008	IH 894/41/43 EB at drop from 4 to 3 lanes (84th St Exit Ramp)	Cantilever	23.0	N/A	18.3	4.6	N/A
S-40-3009	IH 894/41/43 EB ½ mile prior to 84th St Exit	Cantilever	32.0	N/A	18.3	10.0	N/A
S-40-805	IH 894/41 EB at Hale Interchange 600 ft north of W. Coldspring Road	Salvaged Full span 4 chord truss	67.0	57.0	23.4	2.4/6.4	N/A
S-40-460	IH 894/41 EB at Hale Interchange near W. Coldspring Road	DMS Full span 4 chord truss	68.0	56.0	18.3	2.2/6.9	N/A

* Controlling Criteria

Comments:

5.7.5 Tunnel Structures

Structure I.D. #	Location	Type (Veh.,Ped., Bicycle, etc.)	Length	Lighting Type	* Vertical Clearance	Horizontal Clearance
None						

* Controlling Criteria

Comments:

5.8 Permanent Traffic Control

Will permanent signs be installed (Yes or No)? Yes

Are non-standard sign layout details needed (Yes or no)? Yes

Comments: WisDOT will be coordinating with the SE Region Traffic Section and BTO

5.9 Transportation Management Plan

See Attachment 7 for the Transportation Management Plan that was approved for 60%.

5.10 Safety Enhancements/Mitigation Measures

- New pavement surface with improved surface friction and structural stability
- Added driving/auxiliary lanes for short term operational and safety improvements
- New crashworthy roadside barrier replacing old damaged non-crash worthy compliant roadside barrier
- New better performing lighting fixtures improving driver sightlines during nighttime

5.11 Real Estate

5.11.1 Real Estate Acquisition

Plat I.D.:

Relocations		Land	Permanent	Temporary	Construction
Type	Number	(Acres)	Easements	Easements	Permits
None					

Comments:

5.11.2 Encroachment Actions

Encroachment Location	Encroachment Type	What is to be Done? (Removed, Revocable Permit, etc.)
None		

Comments:

5.12 Utilities

Is Project Trans 220 Utility Project (Yes or No)? Yes

Describe any special design features to accommodate utilities:

None have been identified

Major Utility Agreements:

None are anticipated

Comments:

5.13 Railroads

Describe improvements to Railroad Facilities:

No Railroad Facilities on Project

Railroad Agreements:

None

Comments:

5.14 Financing And Scheduling

Construction I.D.	Cost Estimate	Type of Funding			Proposed Timeframe For Construction	Ties to Other Work or Projects	Incentive/ Disincentive Clauses (Yes or No)
		% Fed.	% State	% Local			
1100-34-70	$41,000,000	50	50	-	2018	1060-33-81 2010-14-70	Yes

Describe Incentive/Disincentive Clauses:

The final language for Incentive/Disincentive Clauses is still pending. However, the contract documents will include both incentives and disincentives for interim and overall completion dates.

Non-participating Work:

None

Deferred Construction Work (Preventative Maintenance projects)

None

5.15 Unique Or Non-standard Features

5.15.1 Hazardous Waste

No Hazardous waste impacts are anticipated with this project. HazMat Phase 1 was completed on August 1, 2016 and reviewed by SE Region HAZMAT/Environmental Engineer on August 9, 2016. The Phase 1 is complete for the environmental document (ER) and no further investigation is recommended.

An asbestos inspection of structures B-40-0188, B-40-0189, and B-40-0324 was conducted on October 27, 2015 by John Roelke, AII-119523. An asbestos inspection of structures B-40-0119, B-40-0120, B-40-0123, B-40-0124, B-40-0186, and B-40-0187 was conducted on September 24, 2015 by Jennifer Reed, AII-155710.

Asbestos-containing material is not present on these structures.

5.15.2 Environmental Commitments

Wetland impacts will be avoided and/or minimized wherever possible. Proper control measures will be used during construction to prevent material from falling into wetlands from bridge work. Temporary access permits will be obtained from the DNR for minor work during construction. The temporary access permit will be obtained during final design, prior to construction. Any other commitments will be determined during final design phase.

WisDOT will follow TRANS 401 and the WisDOT/DNR Cooperative Agreement regarding erosion control to minimize potential adverse effects.

Comments: FHWA approved the Environmental Document 05/17/2017

5.15.3 Community Sensitive Design/Public Involvement

A project information letter and invitation to the public involvement meeting was mailed to 1,500 addresses and additional copies were left at the West Allis and Greenfield City Hall offices. The meeting was advertised in the Milwaukee Journal Sentinel on June 30, 2016. WisDOT created a project website with information about the project including the project newsletter and meeting exhibits (http://wisconsindot.gov/Pages/projects/by-region/se/894study/default.aspx). A notice for the public involvement meeting was published on the City of Greenfield's website.

The mailing list was created for this project, targeting properties near the freeway corridor, institutions and stakeholders impacted by the corridor, local elected and appointed officials, and stakeholder groups which have expressed concern about projects proposing to add additional driving lane capacity and other traffic operational improvements to other segments of the southeast freeway system.

The Public Involvement Meeting was held on July 13, 2016 at Irving Elementary School.

No additional public involvement is scheduled for the design study phase. The project website will be continually updated as information becomes available. An additional public involvement meeting will be held prior to construction.

5.15.4 Value Engineering

Not Required

6.0 SYNOPSIS

	Completion/Approval Dates	Status of Coordination or Other Information as Needed
Concept Definition Report	9/7/2011	Complete
Scoping Document	As part of Environmental Document process	
Public Involvement Plan	2/15/2017	60% Plan Approved
Final Aesthetic & Visual Level of Impact Worksheet	Not Required	Not Required
Speed Limit Change Declaration	Not Required	Not Required
Environmental Document (Type: ER)	5/17/2017	
Public Hearing/Public Involvement Meetings	PIM – July 2016	
SHPO Involvement	Placed on WisDOT Section 106 Screening List 12/20/2016	Complete
DNR Involvement	Received Initial Project Review Letter 10/27/2016	Met with DNR regarding wetland impacts 1/9/2017 Final concurrence anticipated in final design
Agricultural Impact Statement	Not Required	Not Required
Pavement Design Report	6/21/2016	Complete
Roundabout Review	Not Required	Not Required
Transportation Management Plan (Type 3)	60% approved on 03/13/2017	90% TMP approval prior to Final PS&E
Permits Required (Types: 404)	To be obtained prior to construction	
Local Project Agreements	Not Required	
Value Engineering Study	Not Required	Not Required
Status of Statutory Actions	Not Required	Not Required

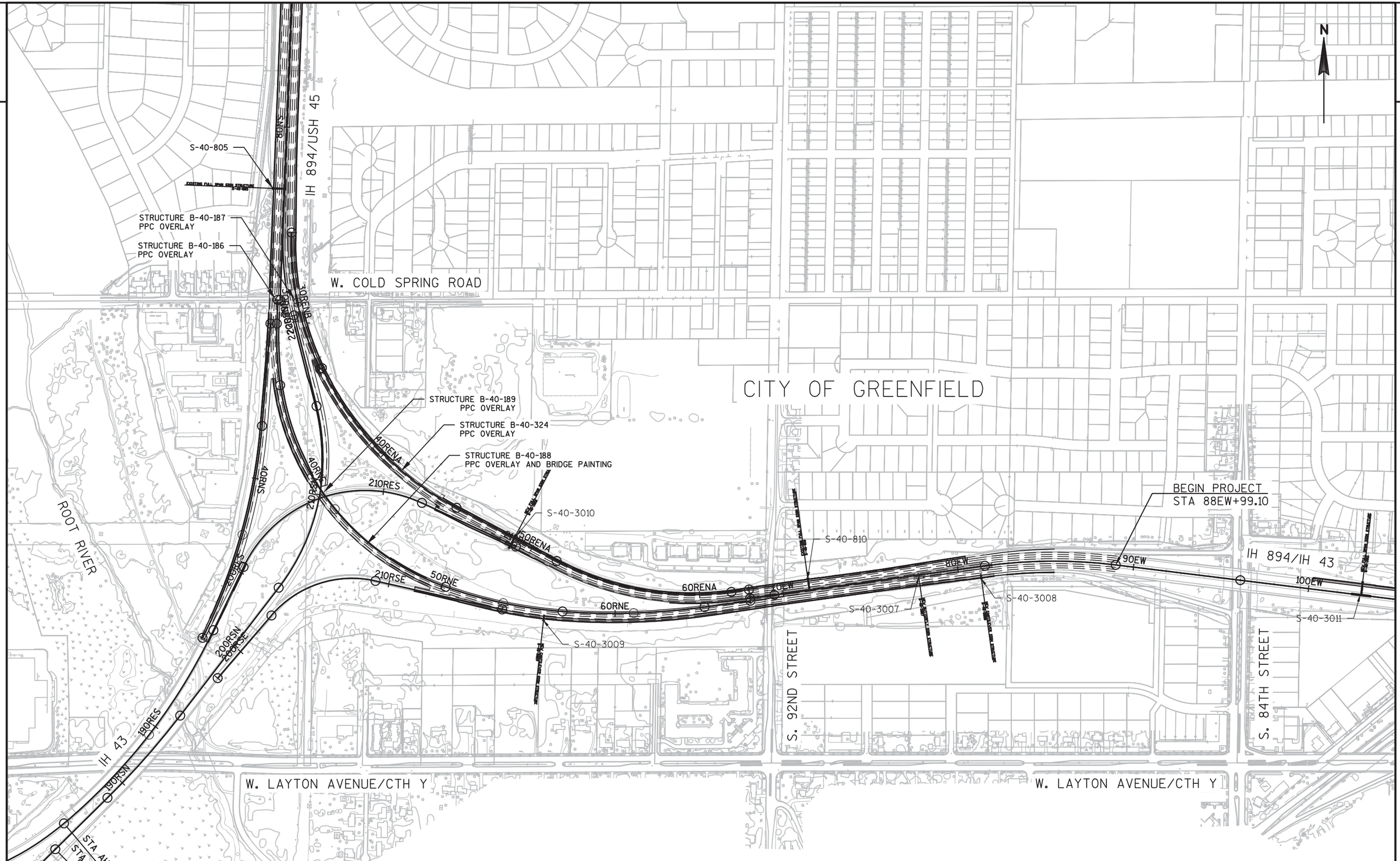
7.0 ATTACHMENTS

Attachment 1 - Project Location/Overview Map
Attachment 2 - Existing and Proposed Typical Sections
Attachment 3 - Traffic Forecast Report
Attachment 4 - Highway Capacity Analysis
Attachment 5 - Preliminary Plan Sheets
Attachment 6 - Finished/Proposed Typical Sections
Attachment 7 - Transportation Management Plan Documentation and Request for Approval Form
Attachment 8 - Environmental Commitments Basic Sheet
Attachment 9 - Complete Streets
Attachment 10 - Exceptions to Standards Report
Attachment 11 - Roadside Hazard Analysis form template

ATTACHMENT 1

Project Overview

Attachment 1



PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PROJECT OVERVIEW	SHEET E

PRE_4

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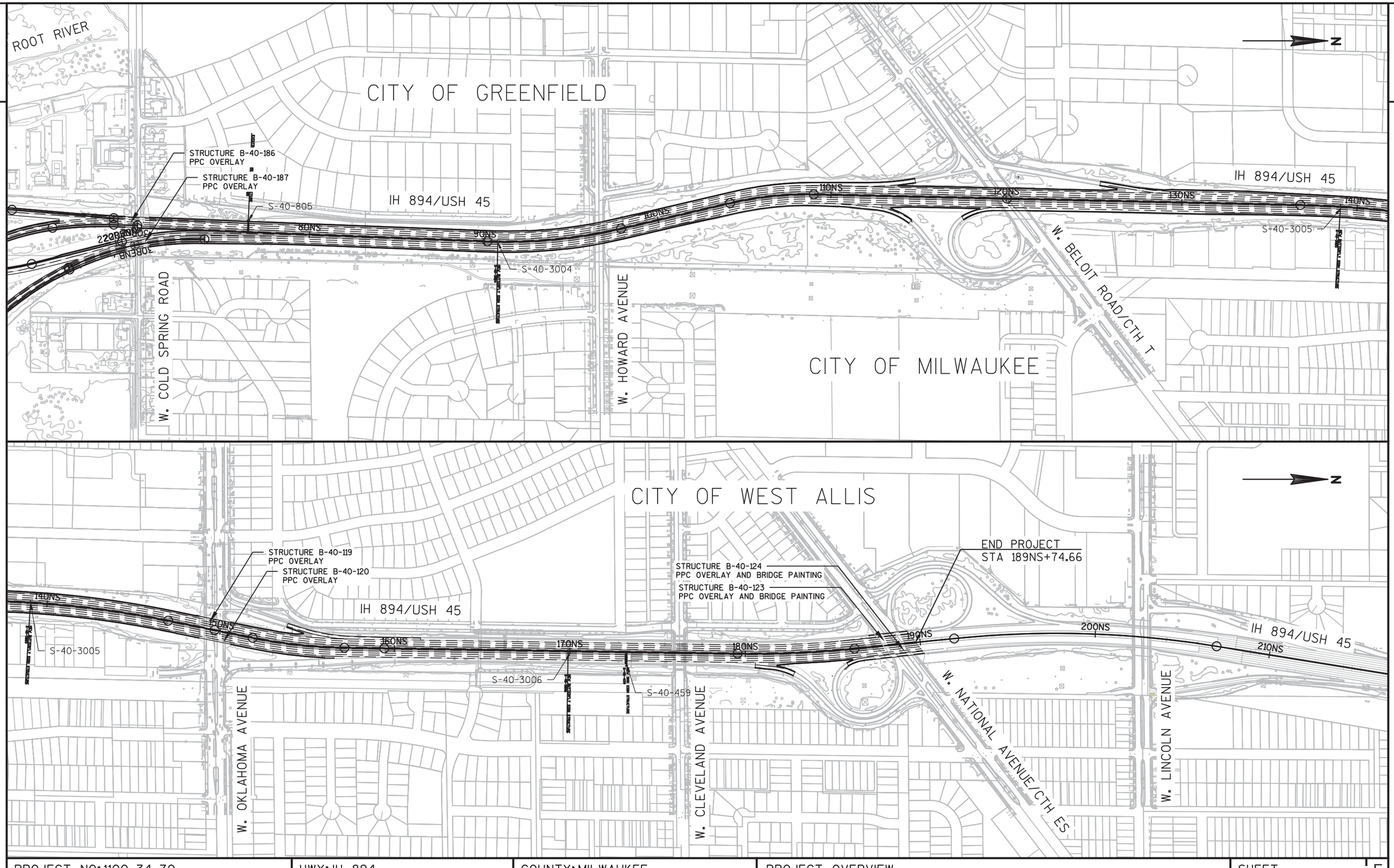
LAYOUT NAME - 020201_PO

PLOT DATE : 5/1/2017 2:58 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : **********

WISDOT/CADDS SHEET 42

Attachment 1



PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PROJECT OVERVIEW	SHEET E

PRE_5

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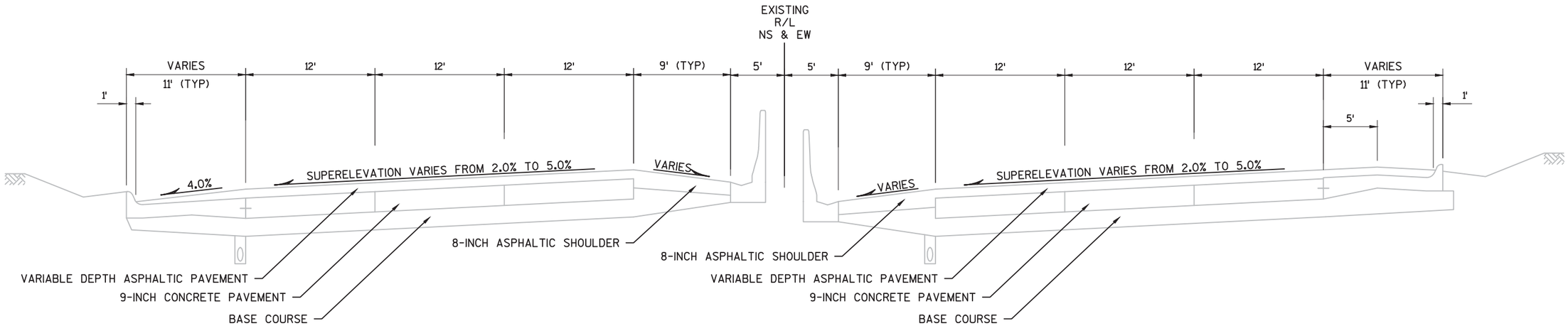
LAYOUT NAME - 020202_PO

PLOT DATE : 5/1/2017 2:59 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:500 FT

WISDOT/CADDS SHEET 42

ATTACHMENT 2

Existing Typical Sections



TYPICAL EXISTING SECTION

IH 894/IH 43/USH 45 SUPERELEVATED

STA. 81EW+54.60 TO STA. 88EW+99.10
STA. 90NS+15.71 TO STA. 97NS+84.25
STA. 104NS+21.88 TO STA. 109NS+02.74
STA. 136NS+76.73 TO STA. 146NS+97.51
STA. 151NS+88.94 TO STA. 155NS+70.76 WB
STA. 151NS+88.94 TO STA. 157NS+15.61 EB
STA. 180NS+57.75 TO STA. 186NS+24.46 WB

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

PRE_6

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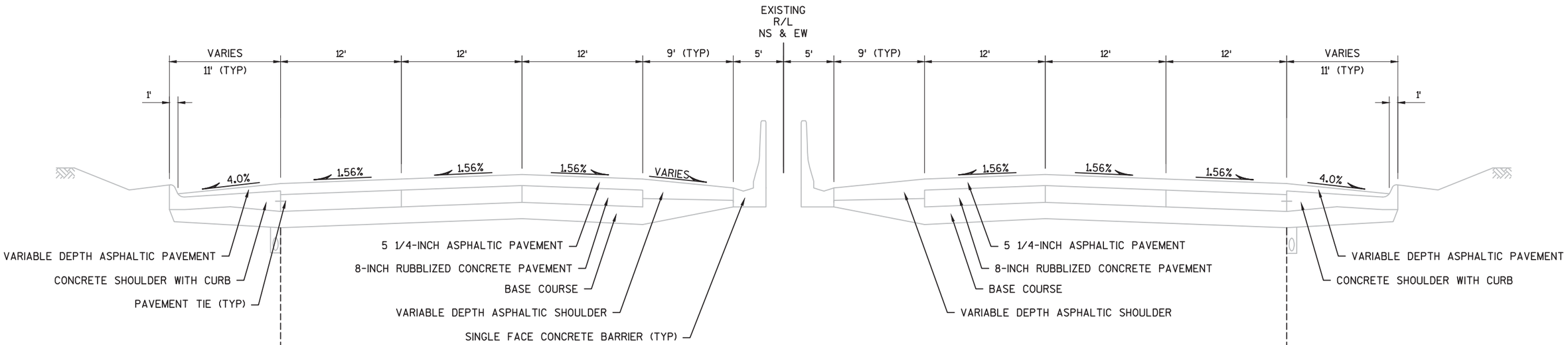


STA. 75EW+50.00 TO STA. 80EW+51.00
STA. 98NS+11.00 TO STA. 107NS+33.00
STA. 128NS+90.00 TO STA. 137NS+12.00
STA. 157NS+16.00 TO STA. 161NS+48.03

STA. 80EW+51.00 TO STA. 81EW+70.00

STA. 75EW+50.00 TO STA. 80EW+20.00
STA. 82EW+74.00 TO STA. 86EW+00.00
STA. 100NS+51.00 TO STA. 109NS+10.00
STA. 121NS+23.00 TO STA. 134NS+19.00

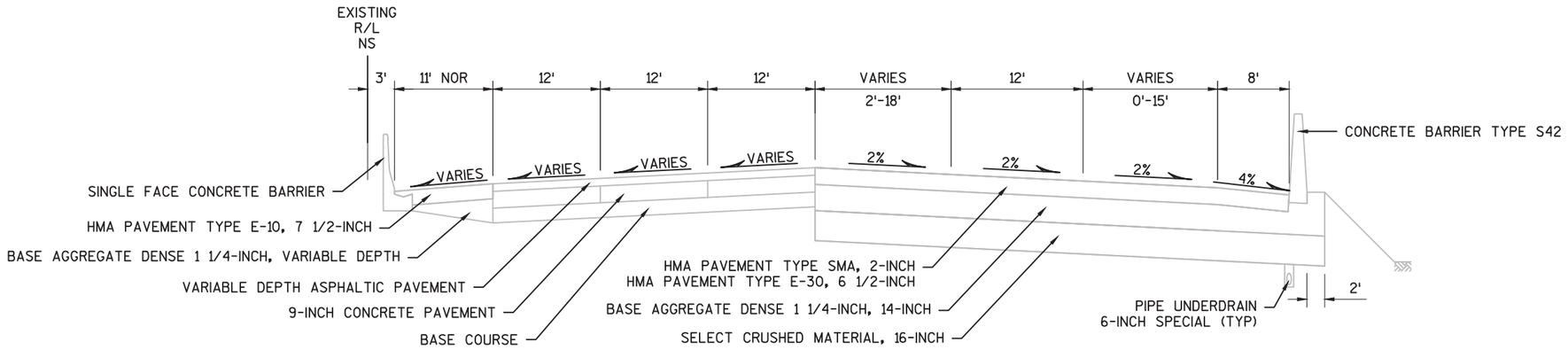
STA. 80EW+20.00 TO STA. 82EW+74.00
STA. 120NS+00.00 TO STA. 121NS+23.00

TYPICAL EXISTING SECTION
IH 894/IH 43/USH 45

STA. 68EW+10.60 TO STA. 81EW+54.60
STA. 70NS+19.30 TO 90NS+15.71 EB
STA. 74NS+03.88 TO STA. 90NS+15.71 WB
STA. 97NS+84.25 TO STA. 104NS+21.88
STA. 109NS+02.74 TO STA. 136NS+76.73
STA. 146NS+97.51 TO STA. 151NS+88.94
STA. 157NS+15.61 TO STA. 161NS+48.03 EB
STA. 186NS+24.46 TO 187NS+48.19 WB

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

PRE_7



TYPICAL EXISTING SECTION

IH 894 WB/USH 45 NB

STA. 155NS+70.76 TO STA 160NS+66.98

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

PRE_8

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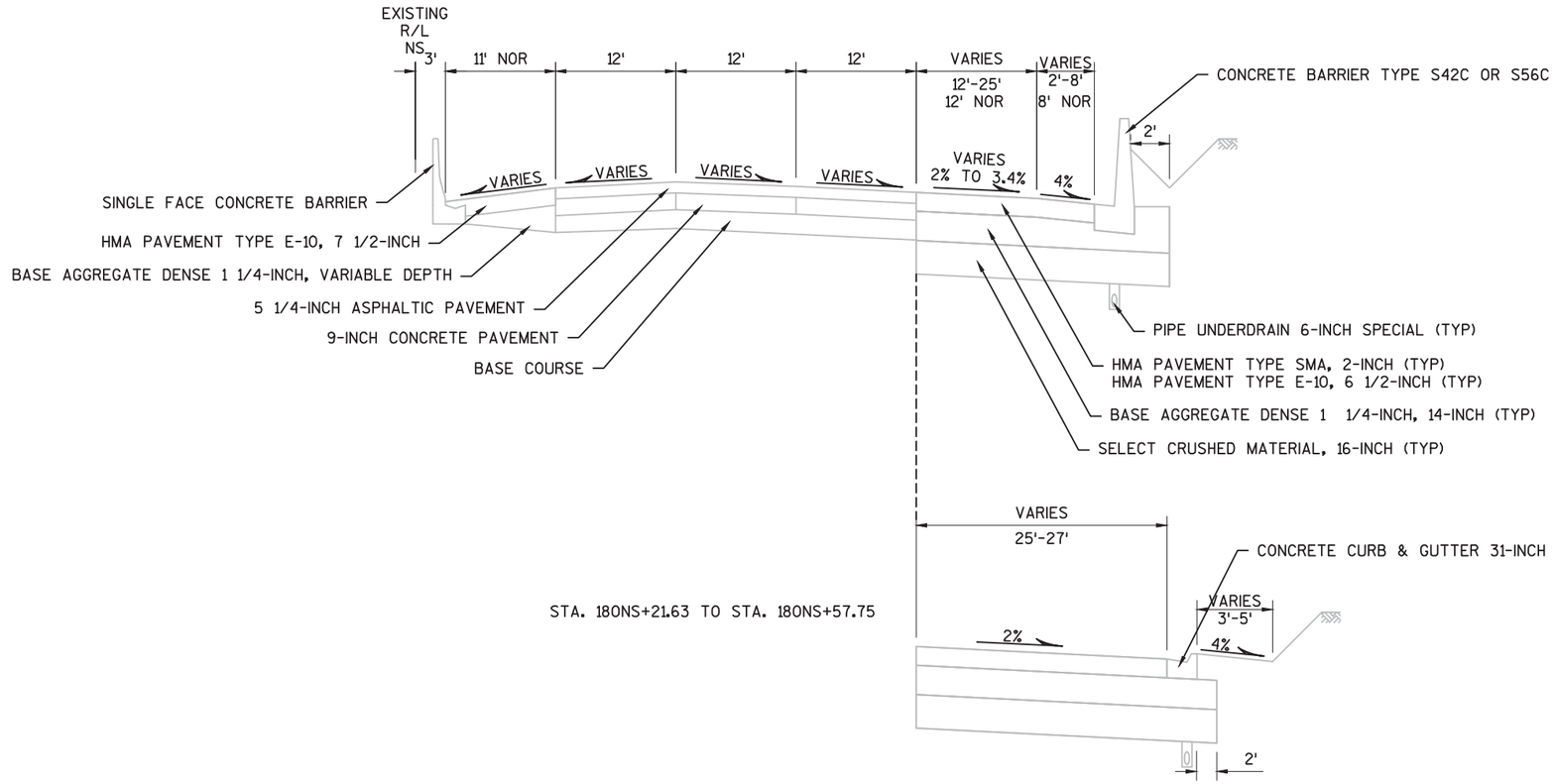

TYPICAL EXISTING SECTION
IH 894 WB/USH 45 NB
STA. 160NS+66.98 TO STA. 180NS+57.75

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

PRE_9

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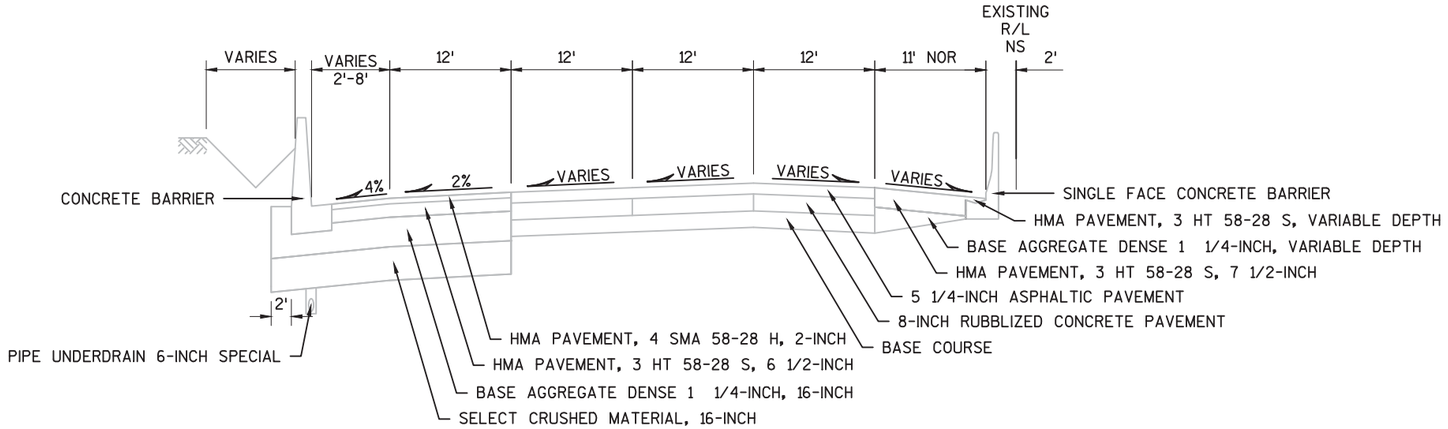

TYPICAL EXISTING SECTION

IH 894 EB/USH 45 SB

STA. 161NS+48.03 TO STA. 187NS+48.19

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

PRE_10

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020301_TS.DWG
PROJECTSHEETDATA - 020305_TS

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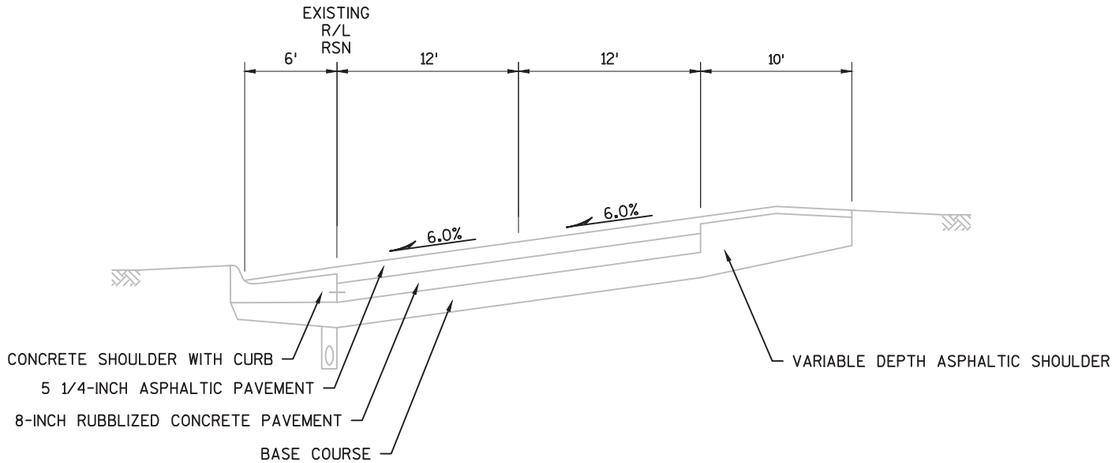

TYPICAL EXISTING SECTION

RAMP SN

STA 210RSN+46.44 TO STA 217RSN+63.20

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

PRE_11

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020301_TS.DWG
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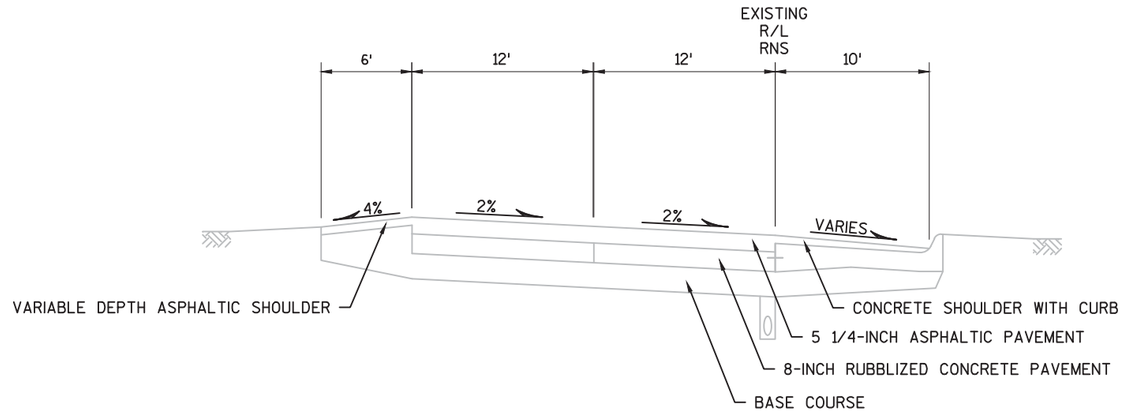
WISDOT/CADDS SHEET 42



TYPICAL EXISTING SECTION

RAMP NS

STA 34RNS+29.07 TO STA 45RNS+27.36

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

PRE_12

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020301_TS.DWG
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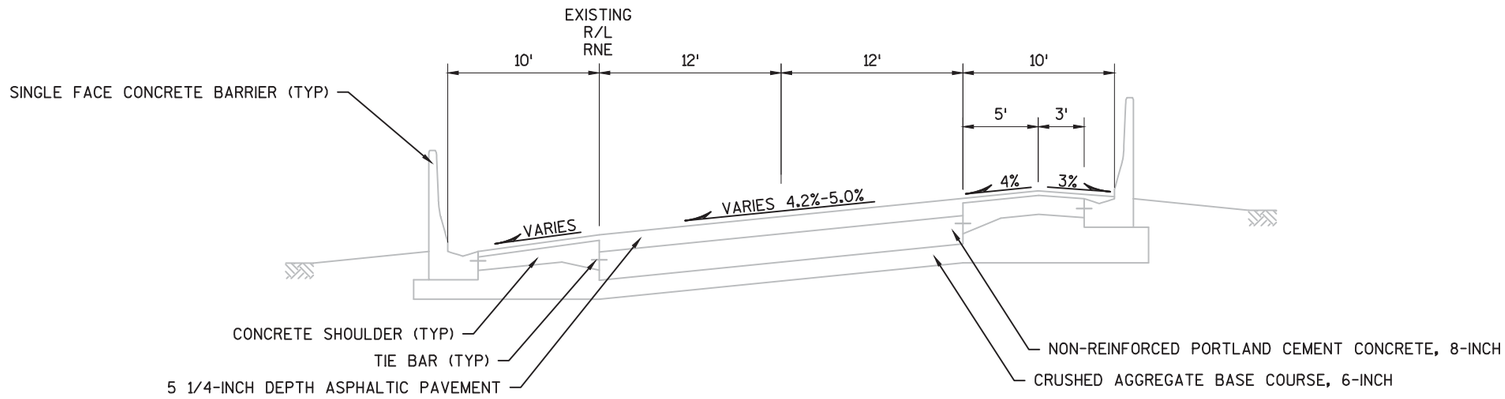
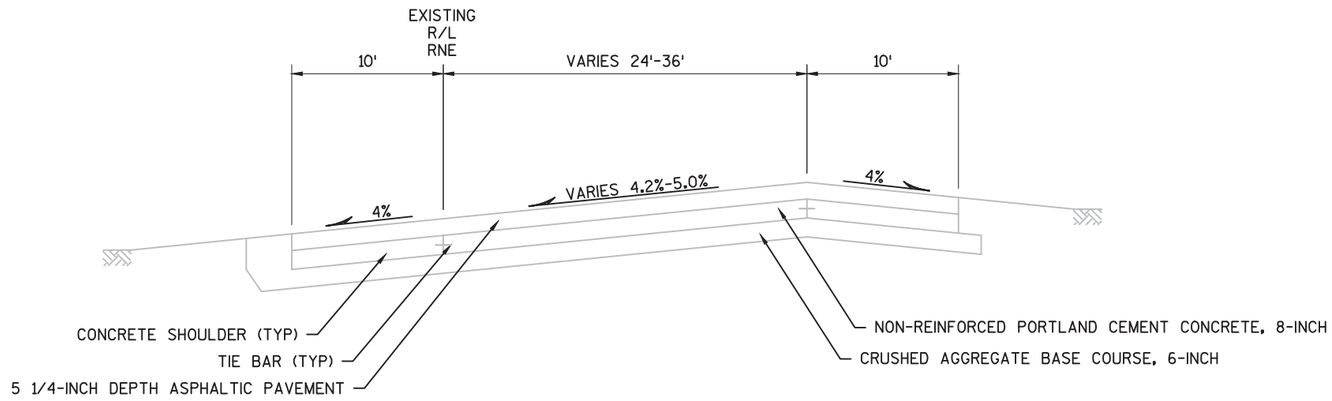


TYPICAL EXISTING SECTION
RAMP NE
STA. 29RNE+84.05 TO STA. 40RNE+05.41



TYPICAL EXISTING SECTION
RAMP NE
STA. 46RNE+76.73 TO STA. 67RNE+71.61

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

PRE_13

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020301_TS.DWG
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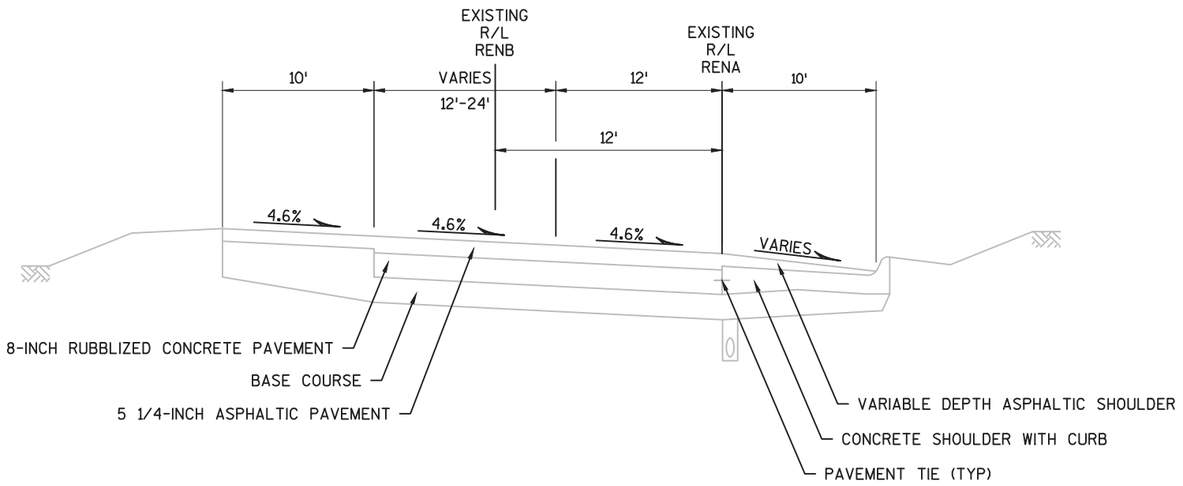

TYPICAL EXISTING SECTION
RAMP EN
STA. 25REN+98.87 TO STA. 62REN+81.27

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020301_TS.DWG
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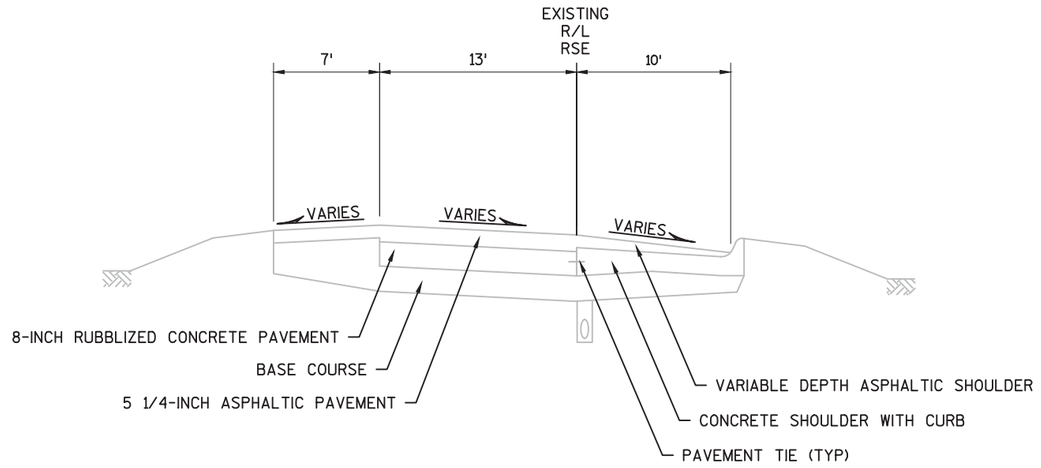

TYPICAL EXISTING SECTION
RAMP SE
STA. 211RSE+49.06 TO STA. 212RSE+31.72

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020301_TS.DWG
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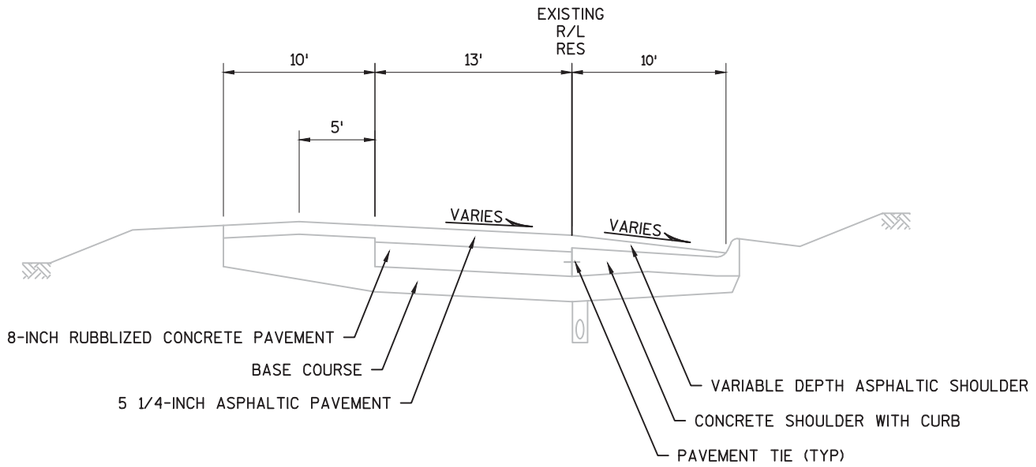
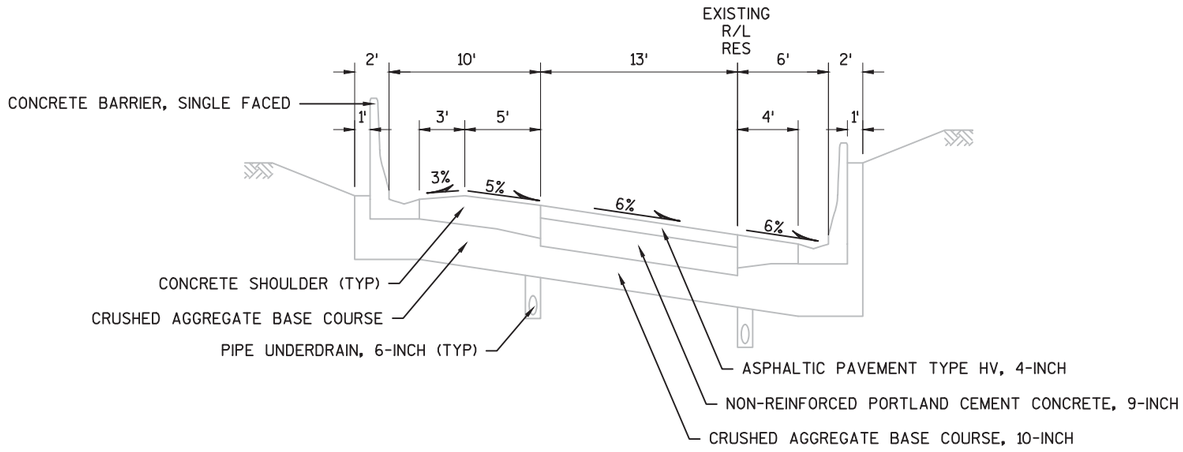


TYPICAL EXISTING SECTION
RAMP ES
STA. 200RES+04.00 TO STA. 200RES+56.33



TYPICAL EXISTING SECTION
RAMP ES
STA. 213RES+09.71 TO STA. 213RES+26.03

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

PRE_16

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020301_TS.DWG
PROJECTSHEETDATA - 020311_TS

PLOT DATE : 4/29/2017 1:31 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT

ATTACHMENT 3

Traffic Forecast Report

I-41/894 Resurfacing Project

DSR - Traffic Forecast Report

Corridor Peak Hour Volumes

Direction	Segment/Ramp	AM Peak Hour Vol (veh)			PM Peak Hour Vol (veh)		
		Existing (2009)	No Build (2028)	Build (2028)	Existing (2009)	No Build (2028)	Build (2028)
I-41 SB/ I-894 EB	Zoo Int W-S Sys Ramp	1220	1429	1591	1840	2054	2263
	Zoo Int N-S Sys Ramp	2440	2857	3183	3100	3454	3808
	Zoo Int E-S Sys Ramp	740	867	964	1200	1338	1476
	Greenfield Ave Exit Ramp (from NB)	450	211	235	490	179	198
	Greenfield Ave Exit Ramp (from EB/WB)		317	352		367	404
	Greenfield Ave - Zoo Int Sys Ramps	-	2646	2948	-	3275	3610
	Zoo Sys Ramps - Greenfield Ave	-	4625	5151	-	6300	6945
	Greenfield Ave Entr Ramp	490	575	640	680	754	833
	Greenfield Ave - Lincoln Ave	4440	5200	5791	6330	7054	7778
	Lincoln Ave Exit Ramp	540	633	704	470	523	576
	Lincoln Ave - National Ave	3900	4567	5087	5860	6531	7202
	National Ave Exit Ramp	250	294	326	460	517	569
	National Ave Entr Ramp	460	539	601	700	778	858
	National Ave - Oklahoma Ave	4110	4812	5362	6100	6792	7491
	Oklahoma Ave Exit Ramp	830	972	1082	820	912	1005
	Oklahoma Ave - Beloit Rd	3280	3840	4280	5280	5880	6486
	Beloit Rd Exit Ramp	200	233	261	480	534	588
	Beloit Rd Entr Ramp	450	525	585	480	535	589
	Beloit Rd - Hale Int	3530	4132	4604	5280	5881	6487
	Hale Int N-W Sys Ramp	1100	1289	1437	1830	2038	2250
	Hale Int N-E Sys Ramp	2430	2843	3167	3450	3843	4237
I-41 NB/ I-894 WB	Zoo Int S-E Sys Ramp	1340	1585	1775	1070	1198	1323
	Zoo Int S-W Sys Ramp	1380	1617	1803	1560	1748	1927
	Zoo Int S-N Sys Ramp	3250	3817	4250	2670	2994	3300
	Zoo Int - Greenfield Ave	-	3208	3572	-	2792	3078
	Greenfield Ave Entr Ramp (to NB)	670	609	678	480	202	222
	Greenfield Ave Entr Ramp (to EB/WB)		176	196		333	367
	Greenfield Ave - Zoo Int Sys Ramps	-	6234	6954	-	5405	5961
	Greenfield Ave Exit Ramp	420	494	548	610	685	756
	Lincoln Ave - Greenfield Ave	5720	6728	7502	5430	6090	6717
	Lincoln Ave Entr Ramp	620	725	808	700	779	860
	National Ave - Lincoln Ave	5100	6003	6694	4730	5311	5857
	National Ave Entr Ramp	470	550	613	390	434	479
	National Ave Exit Ramp	270	289	322	490	504	556
	Oklahoma Ave - National Ave	4900	5742	6403	4830	5381	5934
	Oklahoma Ave Entr Ramp	600	702	784	560	623	688
	Beloit Rd - Oklahoma Ave	4300	5040	5619	4270	4758	5246
	Beloit Rd Entr Ramp	430	504	561	250	278	307
	Beloit Rd Exit Ramp	340	398	443	370	412	454
	Hale Int - Beloit Rd	4210	4934	5501	4390	4892	5393
	Hale Int W-N Sys Ramp	1550	1816	2023	1370	1527	1683
	Hale Int E-N Sys Ramp	2660	3118	3478	3020	3365	3710
I-43 NB/ I-894 EB	124th St - WIS 100	2350	2751	3064	2010	2239	2468
	WIS 100 Entr Ramp	1000	1172	1306	840	937	1033
	WIS 100 - Hale Int	3350	3923	4370	2850	3176	3501
	Hale Int W-E Sys Ramp	1800	2107	2347	1480	1649	1818
	Hale Int - 84th St	4230	4950	5514	4930	5492	6055
	84th St Exit Ramp	400	468	521	770	856	945
	84th St - Forest Home Ave	3830	4482	4993	4160	4636	5110
	Forest Home Ave Entr Ramp	460	539	600	190	212	233
	76th St Entr Ramp	510	597	665	520	579	639
	76th St - 60th St	4800	5618	6258	4870	5427	5982
I-43 SB/ I-894 WB	WIS 100 - 124th St	1620	2018	2249	2260	2519	2777
	WIS 100 Exit Ramp to NB	90	109	122	100	110	124
	WIS 100 Exit Ramp to SB	810	969	1080	1250	1392	1536
	Hale Int - WIS 100	2520	3096	3451	3610	4021	4437
	Hale Int E-W Sys Ramp	1420	1807	2014	1780	1983	2187
	84th St - Hale Int	4080	4925	5492	4800	5348	5897
	84th St Entr Ramp	480	563	631	560	625	689
	Forest Home Ave - 84th St	3600	4362	4861	4240	4723	5208
	Forest Home Ave Exit Ramp	150	193	215	250	279	307
	76th St - Forest Home Ave	3750	4555	5076	4490	5002	5515
	76th St Exit Ramp	400	515	574	640	713	786
	60th St - 76th St	4150	5070	5650	5130	5715	6301

ATTACHMENT 4

Highway Capacity Analysis

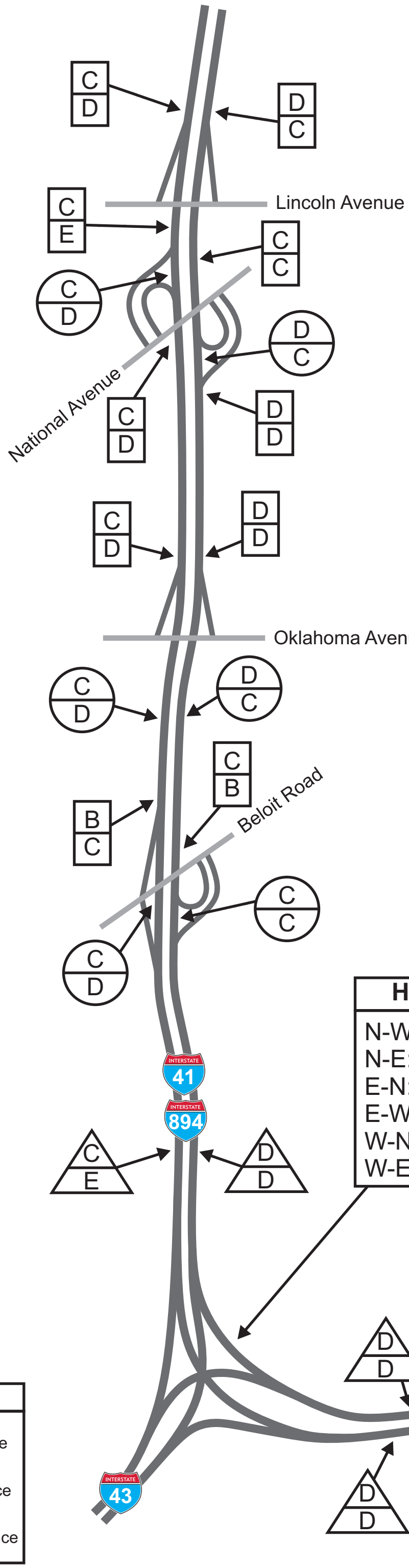
I-894/I-41 Resurfacing Project

Existing Peak Hour Conditions (2009)

HCS 2010 Results

N

Not to Scale



Hale Interchange LOS	
N-W: AM = C	PM = E
N-E: AM = C	PM = D
E-N: AM = C	PM = D
E-W: AM = D	PM = D
W-N: AM = B/D*	PM = B/D*
W-E: AM = E	PM = D

*2 lane segment/1 lane segment

Legend

AM / PM - Basic Segment Level of Service

AM / PM - Ramp Segment Level of Service

AM / PM - Weave Segment Level of Service

DRAFT v3 12/20/2016

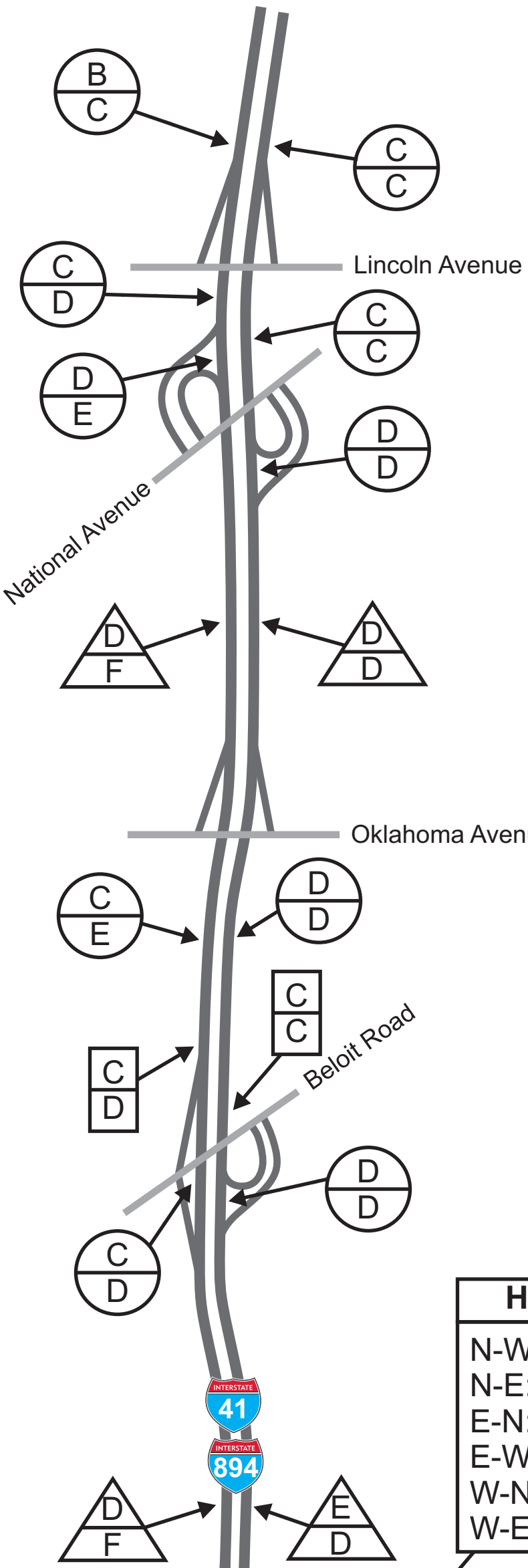
I-894/I-41 Resurfacing Project

Future (2028) No Build Peak Hour Conditions

HCS 2010 Results

N

Not to Scale



Hale Interchange LOS	
N-W: AM = C	PM = E
N-E: AM = D	PM = E
E-N: AM = D	PM = D
E-W: AM = E	PM = E
W-N: AM = B/E*	PM = B/D*
W-E: AM = F	PM = D

*2 lane segment/1 lane segment

Analysis assumes rebuilt Zoo Interchange to National Avenue and auxiliary lanes between National Avenue and Oklahoma Avenue (built for Zoo Int mitigation)

Legend

AM / PM - Basic Segment Level of Service

AM / PM - Ramp Segment Level of Service

AM / PM - Weave Segment Level of Service

DRAFT v3 12/20/2016

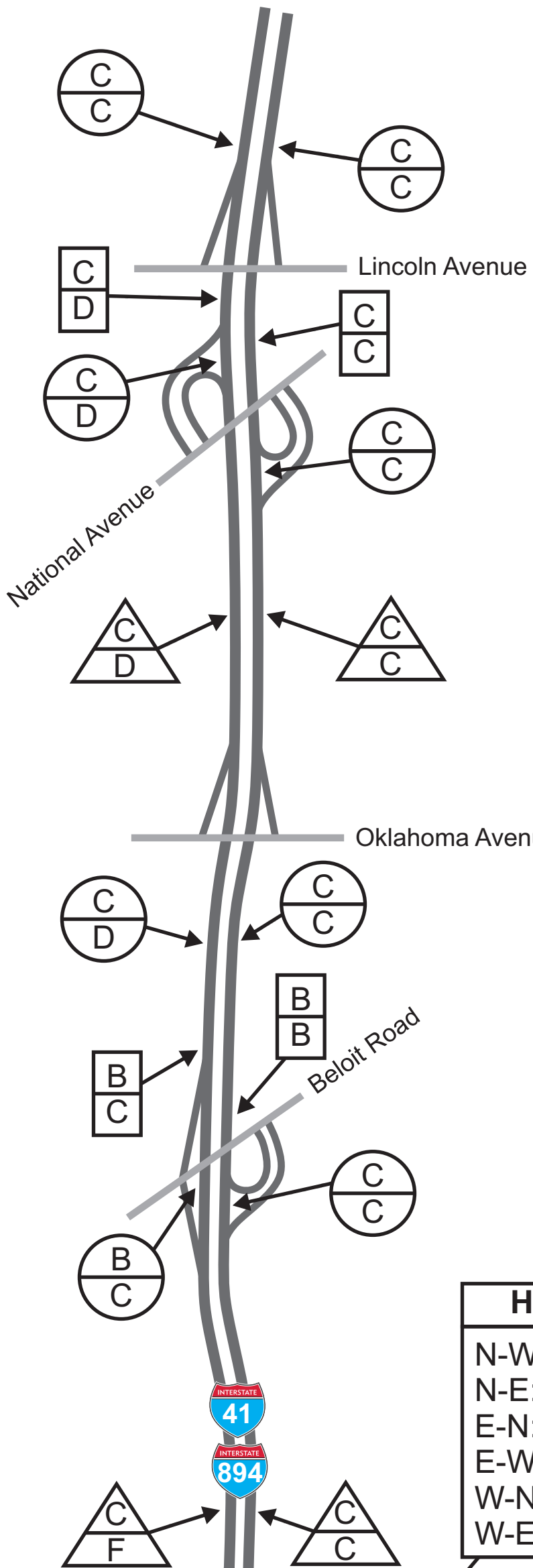
I-894/I-41 Resurfacing Project

Future (2028) Build Peak Hour Conditions

HCS 2010 Results

N

Not to Scale



Hale Interchange LOS	
N-W: AM = D	PM = F
N-E: AM = B	PM = C
E-N: AM = C	PM = C
E-W: AM = E	PM = F
W-N: AM = C/E*	PM = B/D*
W-E: AM = F	PM = E

*2 lane segment/1 lane segment

Analysis assumes rebuilt Zoo Interchange to National Avenue and eight (8) lanes between National Avenue and Hale Interchange, as well as the Hale Interchange to 84th Street (via three [3] lanes on both the N-E and E-N system ramps)

Legend

AM/PM - Basic Segment Level of Service

AM/PM - Ramp Segment Level of Service

AM/PM - Weave Segment Level of Service

DRAFT v4 1/9/2017

ATTACHMENT 5

Preliminary Plan Sheets

2

2

W. COLD SPRING ROAD

NG FULL SPAN SIGN STRUCTURE
S-40-805

S. 101ST STREET

IH 894 EB/USH 45 SB

IH 894 WB/USH 45 NB

84+00NS MATCHLINE

WETLAND BOUNDARY

NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET E

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050201_PN_NS.DWG
LAYOUT NAME - 050201_PN

PLOT DATE : 5/1/2017 3:25 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

2

2

S. 101ST STREET

IH 894 EB/USH 45 SB

IH 894 WB/USH 45 NB

S-40-3004

NEW BUTTERFLY SIGN STRUCTURE S-40-3004

84+00NS MATCHLINE

99+00NS MATCHLINE

86NS

88NS

90NS

92NS

94NS

96NS

98NS

W. HOWARD AVE

WETLAND BOUNDARY

N

NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET E

PRE_425

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050201_PN_NS.DWG
LAYOUT NAME - 050202_PN

PLOT DATE : 5/1/2017 3:25 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

2

2

IH 894 EB/USH 45 SB

IH 894 WB/USH 45 NB

99+00NS MATCHLINE

114+00NS MATCHLINE

101NS 102NS 104NS 106NS 108NS 110NS 112NS

N

WETLAND BOUNDARY

NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET E

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050201_PN_NS.DWG
LAYOUT NAME - 050203_PN

PLOT DATE : 5/1/2017 3:26 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

2

2

IH 894 EB/USH 45 SB

IH 894 WB/USH 45 NB

W. BELOIT ROAD (CTH T)

WETLAND BOUNDARY

114+00NS MATCHLINE

129+00NS MATCHLINE

116NS

118NS

120NS

122NS

124NS

126NS

128NS

NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET	E

PRE_427

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050201_PN_NS.DWG
LAYOUT NAME - 050204_PN

PLOT DATE : 5/1/2017 3:27 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

2

2

N

IH 894 EB/USH 45 SB

IH 894 WB/USH 45 NB

129+00NS MATCHLINE

144+00NS MATCHLINE

130NS

132NS

134NS

136NS

138NS

140NS

142NS

S-40-3005

NEW BUTTERFLY SIGN STRUCTURE

S-40-3005

WETLAND BOUNDARY

WETLAND BOUNDARY

NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET E

PRE_428

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050201_PN_NS.DWG
LAYOUT NAME - 050205_PN

PLOT DATE : 5/1/2017 3:28 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

2

2

S. 101ST STREET

IH 894 EB/USH 45 SB

IH 894 WB/USH 45 NB

159+00NS MATCHLINE

174+00NS MATCHLINE

160NS 162NS 164NS 166NS 168NS 170NS 172NS

S-40-3006

S-40-359

NEW DMS SIGN STRUCTURE S-40-459

NEW BUTTERFLY SIGN STRUCTURE S-40-3006

NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET E

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050201_PN_NS.DWG
LAYOUT NAME - 050207_PN

PLOT DATE : 5/1/2017 3:29 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

2

2

WETLAND BOUNDARY

IH 894 EB/USH 45 SB

144+00NS MATCHLINE

146NS

148NS

150NS

152NS

154NS

156NS

158NS

159+00NS MATCHLINE

IH 894 WB/USH 45 NB

WETLAND BOUNDARY

W. OKLAHOMA AVENUE

NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET	E

PRE_430

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050201_PN_NS.DWG
LAYOUT NAME - 050206_PN

PLOT DATE : 5/1/2017 3:29 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

2

2

W. CLEVELAND AVENUE

S. 101ST STREET

W. NATIONAL AVENUE (CTH ES)

IH 894 EB/USH 45 SB

IH 894 WB/USH 45 NB

174+00 NS MATCHLINE

189+00 NS MATCHLINE

176NS

178NS

180NS

182NS

184NS

186NS

188NS

NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET E

PRE_431

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050201_PN_NS.DWG
LAYOUT NAME - 050208_PN

PLOT DATE : 5/1/2017 3:30 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

2

2

EXISTING FULL SPAN SIGN S-40-810

S. 92ND STREET

IH 894 WB/IH 43 SB

IH 894 EB/IH 43 NB

S-40-810

S-40-3007

S-40-3008

NEW BUTTERFLY SIGN STRUCTURE S-40-3007

NEW CANTILEVER SIGN STRUCTURE S-40-3008

WETLAND BOUNDARY

WETLAND BOUNDARY

70EW

72EW

74EW

76EW

78EW

80EW

82+00EW MATCHLINE

VANE DRAIN

RIPRAP

SIGN

FLAG

N

NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET	E

PRE_432

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050211_PN_EW.DWG
LAYOUT NAME - 050211_PN

PLOT DATE : 5/1/2017 3:31 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

2

2

IH 894 WB/IH 43 SB

IH 894 EB/IH 43 NB

S. 84TH STREET

82+00EW MATCHLINE

97+00EW MATCHLINE

84EW

86EW

88EW

90EW

92EW

94EW

96EW

VANE DRAIN

WETLAND BOUNDARY

WETLAND BOUNDARY

NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

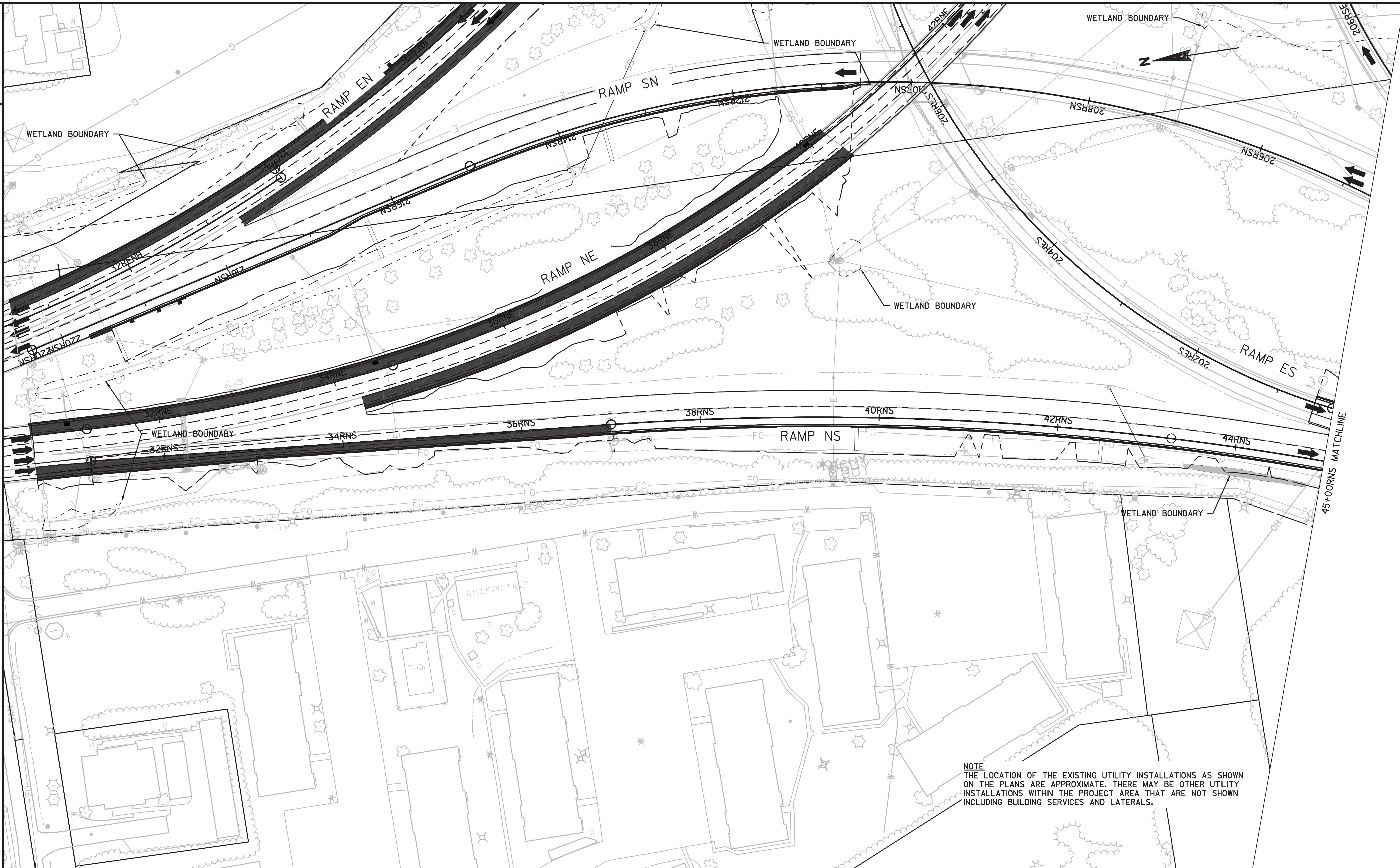
PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET E

PRE_433

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050211_PN_EW.DWG
LAYOUT NAME - 050212_PN

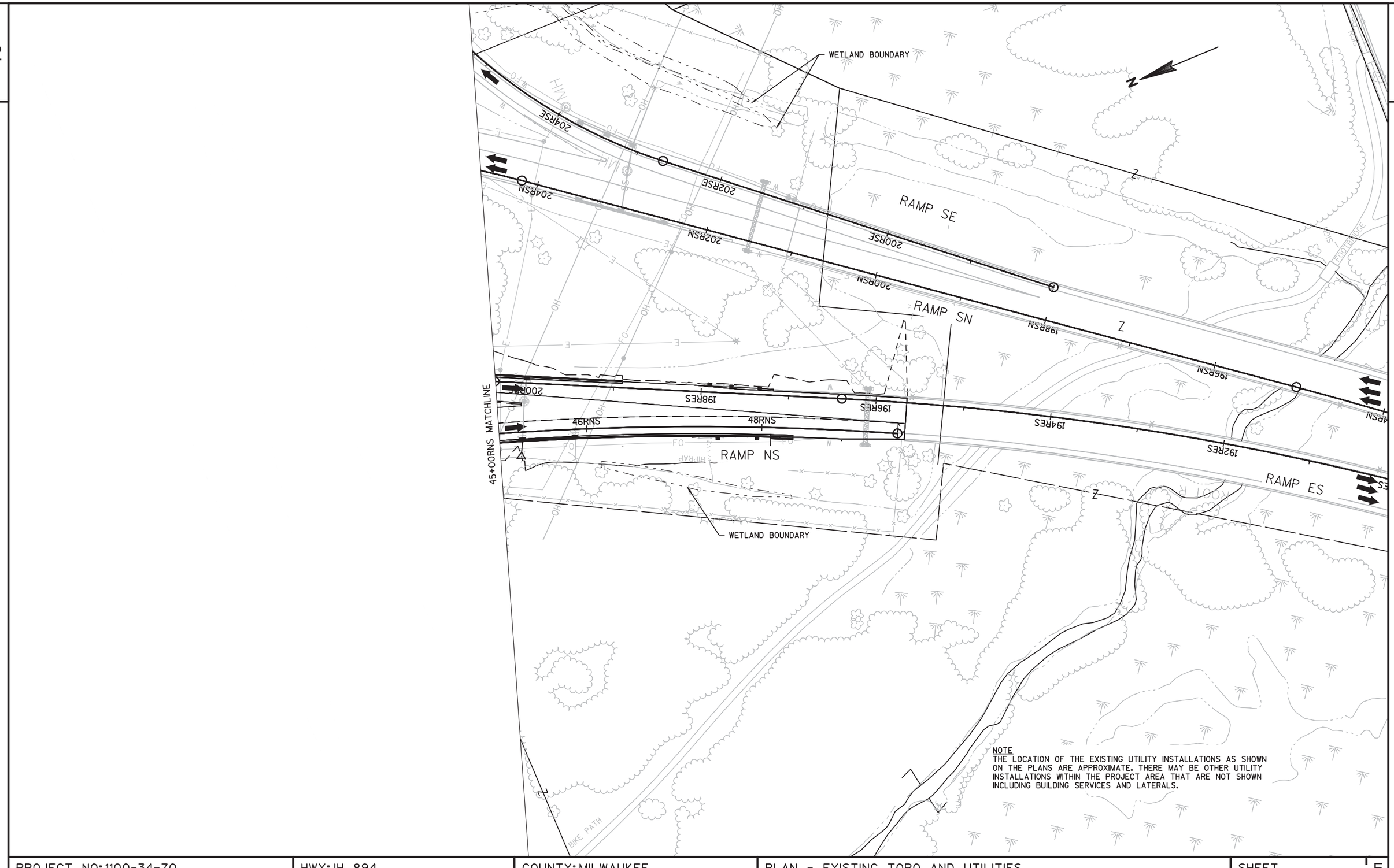
PLOT DATE : 5/1/2017 3:32 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

2



NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

PROJECT NO:1100-34-70	HWY:IH 894	COUNTY:MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET PRE_434	E



PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET E

PRE_435

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050213_PN_NS_RMP.DWG
LAYOUT NAME - 050214_PN

PLOT DATE : 5/1/2017 3:34 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

2

2

WETLAND BOUNDARY

RAMP EN

RAMP SN

RAMP ES

RAMP NE

RAMP NS

WETLAND BOUNDARY

WETLAND BOUNDARY

WETLAND BOUNDARY

44+00EW MATCHLINE

NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET E

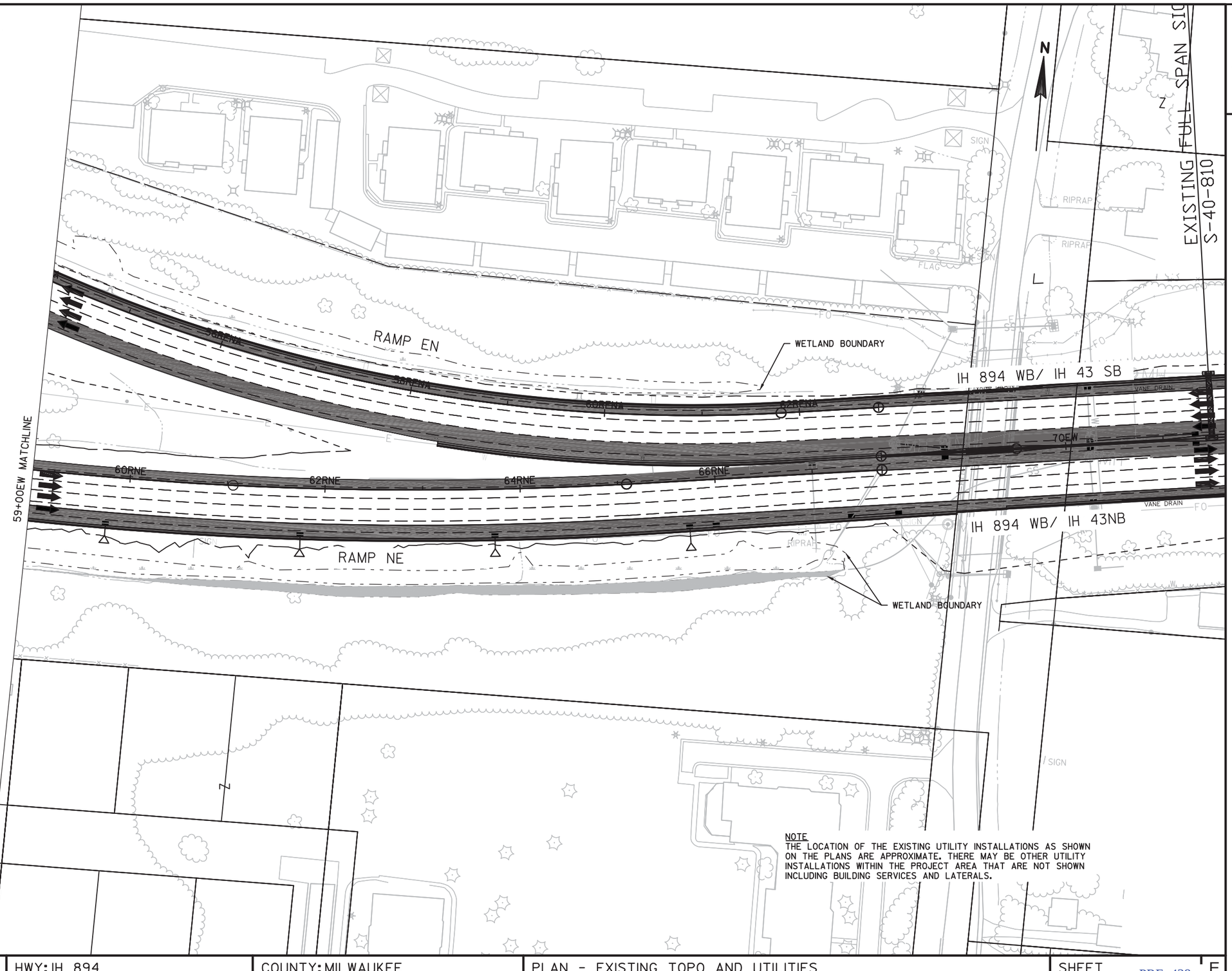
PRE_436

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050215_PN_NE_RMP.DWG
LAYOUT NAME - 050215_PN

PLOT DATE : 5/1/2017 3:34 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET E

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050215_PN_NE_RMP.DWG
LAYOUT NAME - 050216_PN
PLOT DATE : 5/1/2017 3:35 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT



NOTE
THE LOCATION OF THE EXISTING UTILITY INSTALLATIONS AS SHOWN ON THE PLANS ARE APPROXIMATE. THERE MAY BE OTHER UTILITY INSTALLATIONS WITHIN THE PROJECT AREA THAT ARE NOT SHOWN INCLUDING BUILDING SERVICES AND LATERALS.

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN - EXISTING TOPO AND UTILITIES	SHEET E

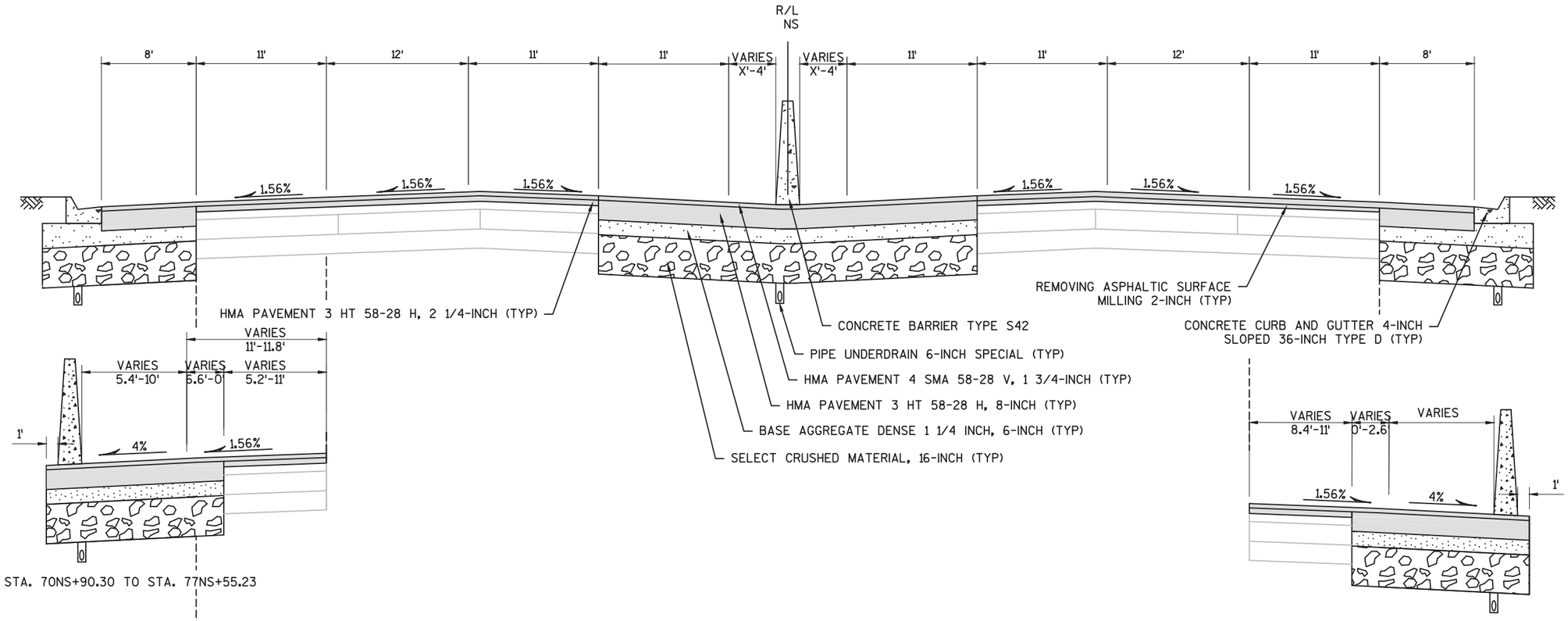
PRE_438

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\050215_PN_NE_RMP.DWG
LAYOUT NAME - 050217_PN

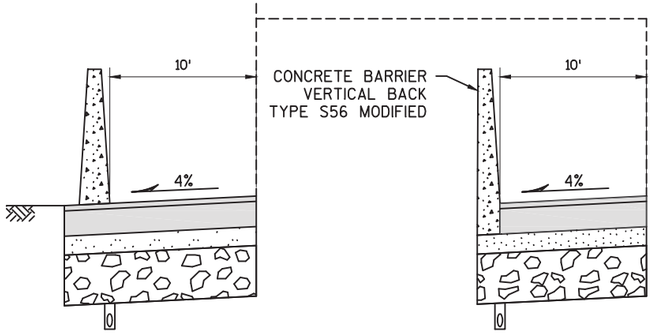
PLOT DATE : 5/1/2017 3:36 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:100 FT

ATTACHMENT 6

Finished Proposed Typical Sections



STA. 70NS+90.30 TO STA. 77NS+55.23



STA. 77NS+55.23 TO STA. 90NS+15.71
STA. 97NS+84.25 TO STA. 98NS+70.16
STA. 120NS+19.55 TO STA. 121NS+57.20
STA. 148NS+49.69 TO STA. 148NS+62.97

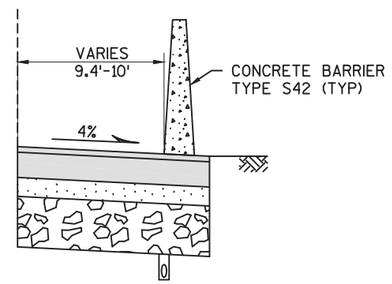
STA. 118NS+84.08 TO STA. 120NS+19.55

TYPICAL FINISHED SECTION

IH 894/IH 43/USH 45

STA. 70NS+90.30 TO 90NS+15.71 SB
STA. 74NS+03.88 TO STA. 90NS+15.71 WB
STA. 97NS+84.25 TO STA. 104NS+21.88
STA. 109NS+02.74 TO STA. 136NS+76.73
STA. 146NS+97.51 TO STA. 148NS+62.97
STA. 186NS+24.46 TO 187NS+48.19 WB

STA. 74NS+03.88 TO STA. 75NS+38.17

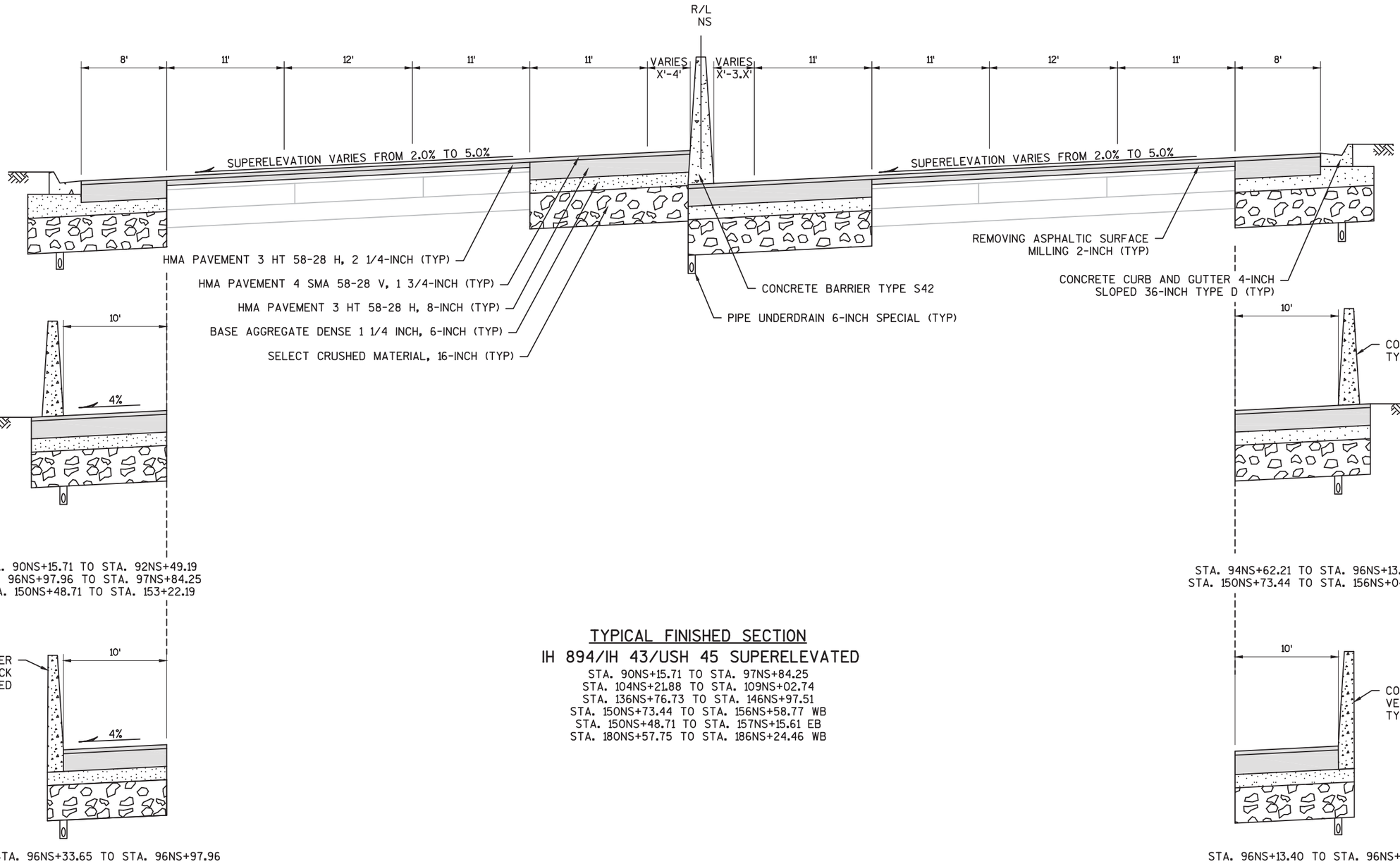


STA. 75NS+38.17 TO STA. 77NS+39.54
STA. 147NS+53.48 TO STA. 148NS+87.78
STA. 155NS+70.76 TO STA. 155NS+92.55

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

PRE_17

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020401_TS.DWG
PROJECTSHEETDATA - 020401_TS
PLOT DATE : 4/29/2017 1:27 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT



STA. 90NS+15.71 TO STA. 92NS+49.19
STA. 96NS+97.96 TO STA. 97NS+84.25
STA. 150NS+48.71 TO STA. 153+22.19

STA. 96NS+33.65 TO STA. 96NS+97.96

STA. 94NS+62.21 TO STA. 96NS+13.40
STA. 150NS+73.44 TO STA. 156NS+04.99

STA. 96NS+13.40 TO STA. 96NS+75.08

TYPICAL FINISHED SECTION

IH 894/IH 43/USH 45 SUPERELEVATED

STA. 90NS+15.71 TO STA. 97NS+84.25
STA. 104NS+21.88 TO STA. 109NS+02.74
STA. 136NS+76.73 TO STA. 146NS+97.51
STA. 150NS+73.44 TO STA. 156NS+58.77 WB
STA. 150NS+48.71 TO STA. 157NS+15.61 EB
STA. 180NS+57.75 TO STA. 186NS+24.46 WB

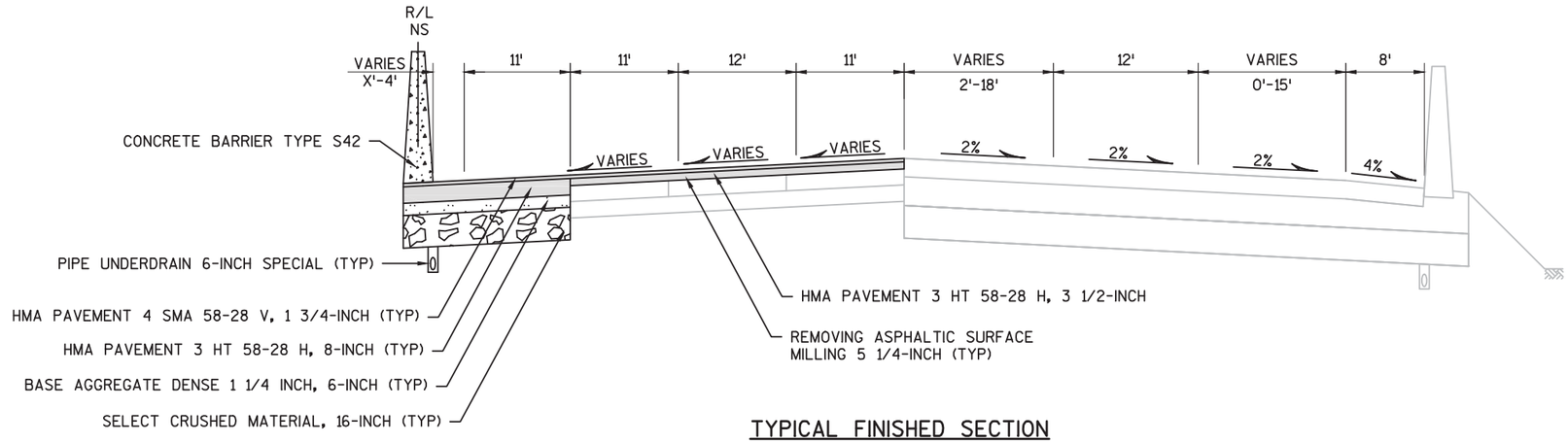
PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

PRE_18

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020401_TS.DWG
PROJECTSHEETDATA - 020402_TS

PLOT DATE : 4/29/2017 1:27 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT

WISDOT/CADDS SHEET 42



TYPICAL FINISHED SECTION

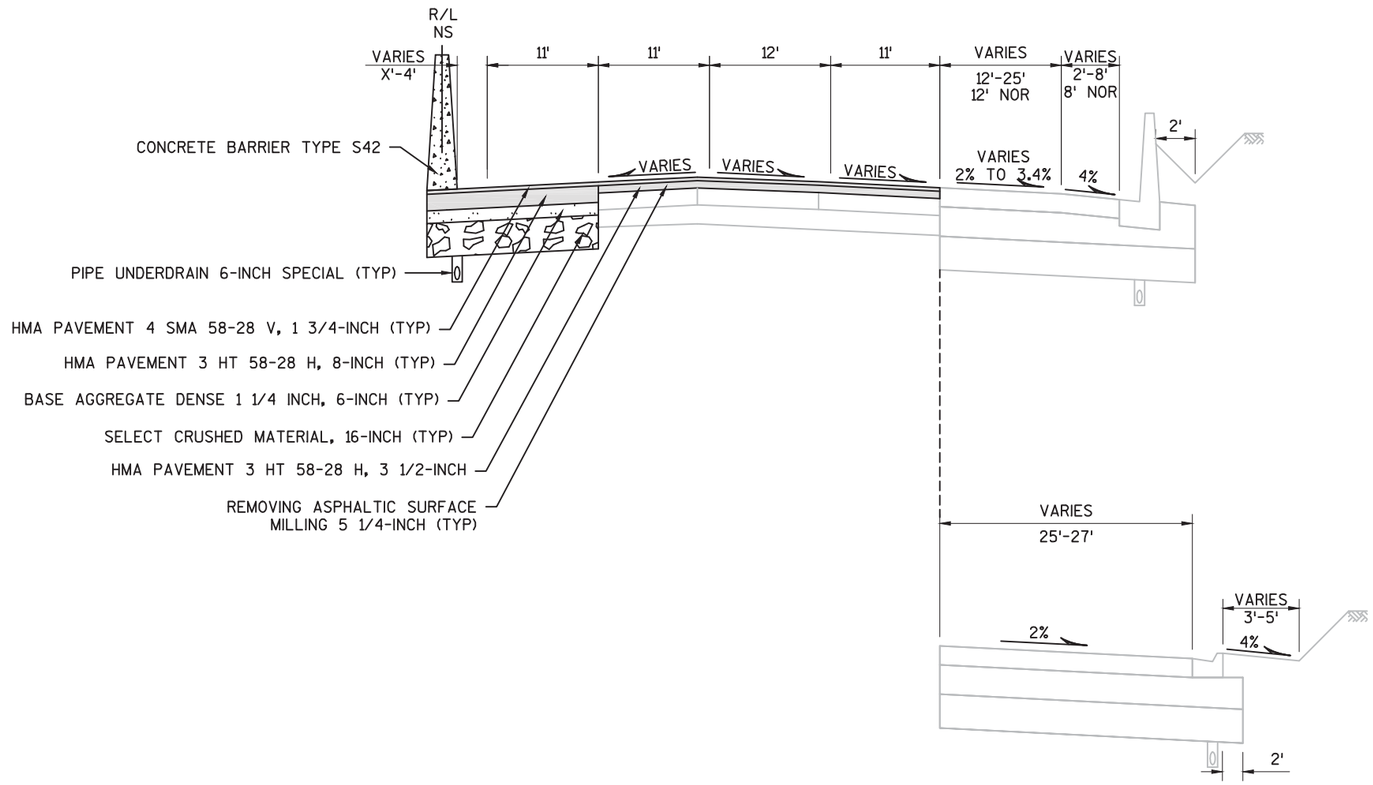
IH 894 WB/USH 45 NB

STA. 156NS+58.77 TO STA 160NS+66.98

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020401_TS.DWG
PROJECTSHEETDATA - 020403_TS

PLOT DATE : 4/29/2017 1:27 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT



STA. 180NS+21.63 TO STA. 180NS+57.75

TYPICAL FINISHED SECTION

IH 894 WB/USH 45 NB

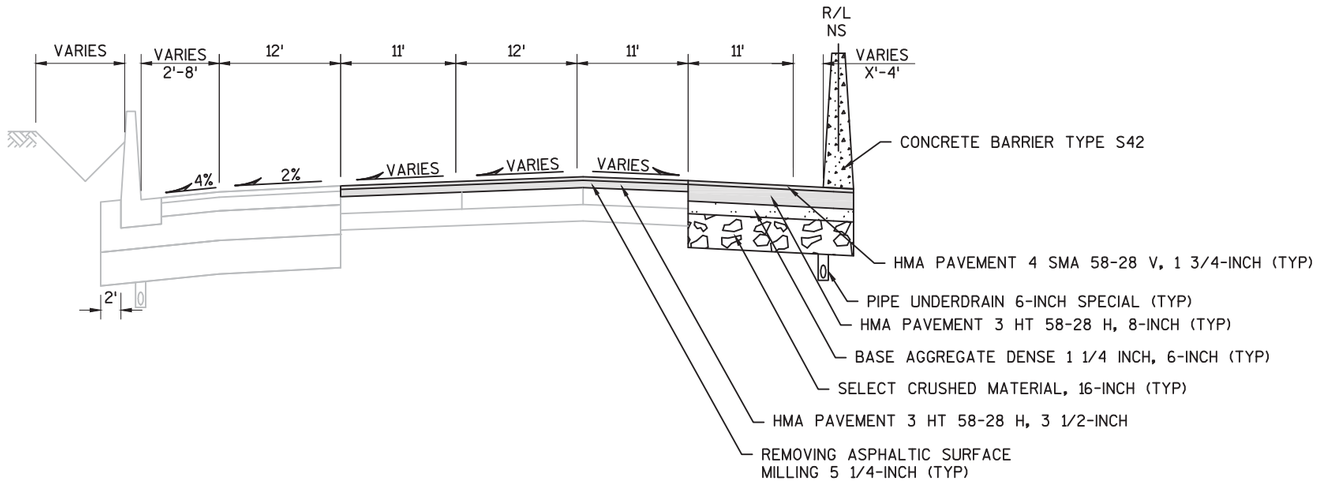
STA. 160NS+66.98 TO STA. 180NS+57.75

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

PRE_20

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020401_TS.DWG
PROJECTSHEETDATA - 020404_TS

PLOT DATE : 4/29/2017 1:28 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT



TYPICAL FINISHED SECTION

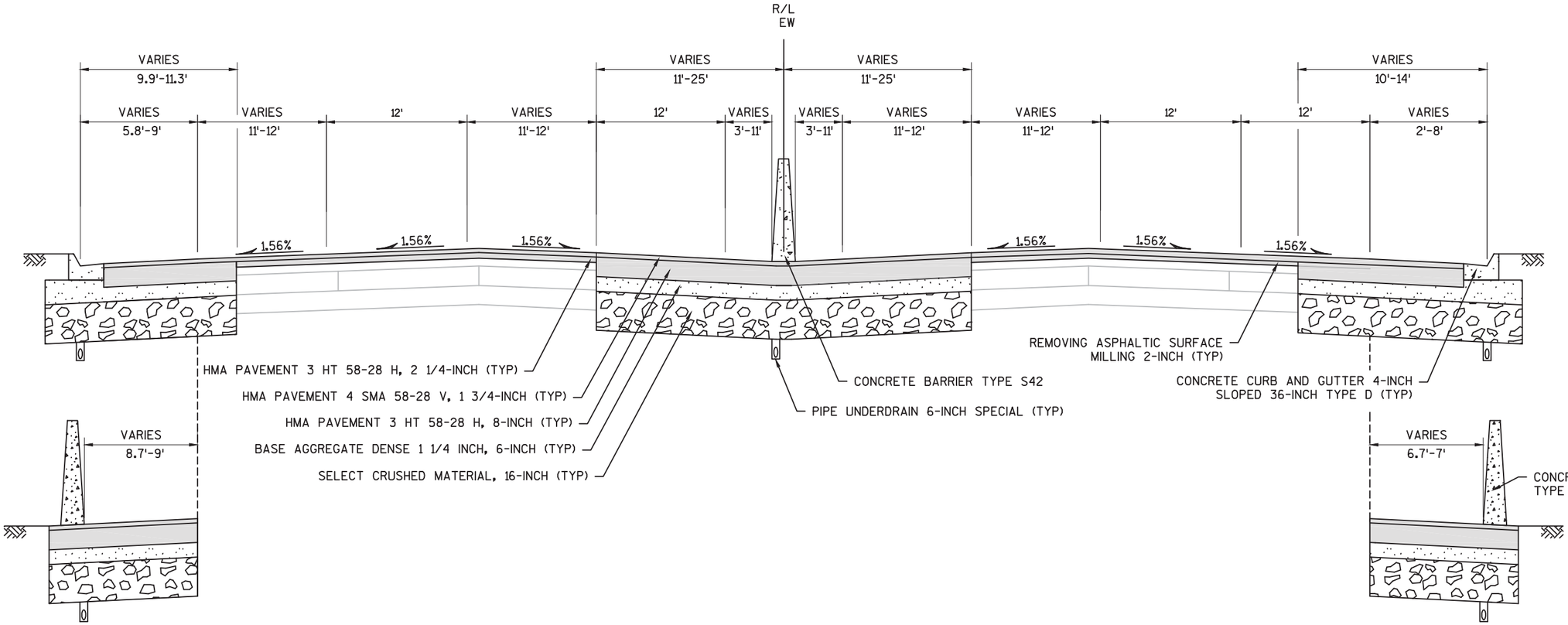
IH 894 EB/USH 45 SB

STA. 161NS+48.03 TO STA. 187NS+48.19

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

PRE_21

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020401_TS.DWG
PROJECTSHEETDATA - 020405_TS
PLOT DATE : 4/29/2017 1:28 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT
WISDOT/CADDS SHEET 42



STA. 69EW+54.62 TO STA. 72EW+60.64

STA. 68EW+10.60 TO STA. 69EW+35.94

TYPICAL FINISHED SECTION

IH 894/IH 43/USH 45

STA. 68EW+10.60 TO STA. 81EW+99.04

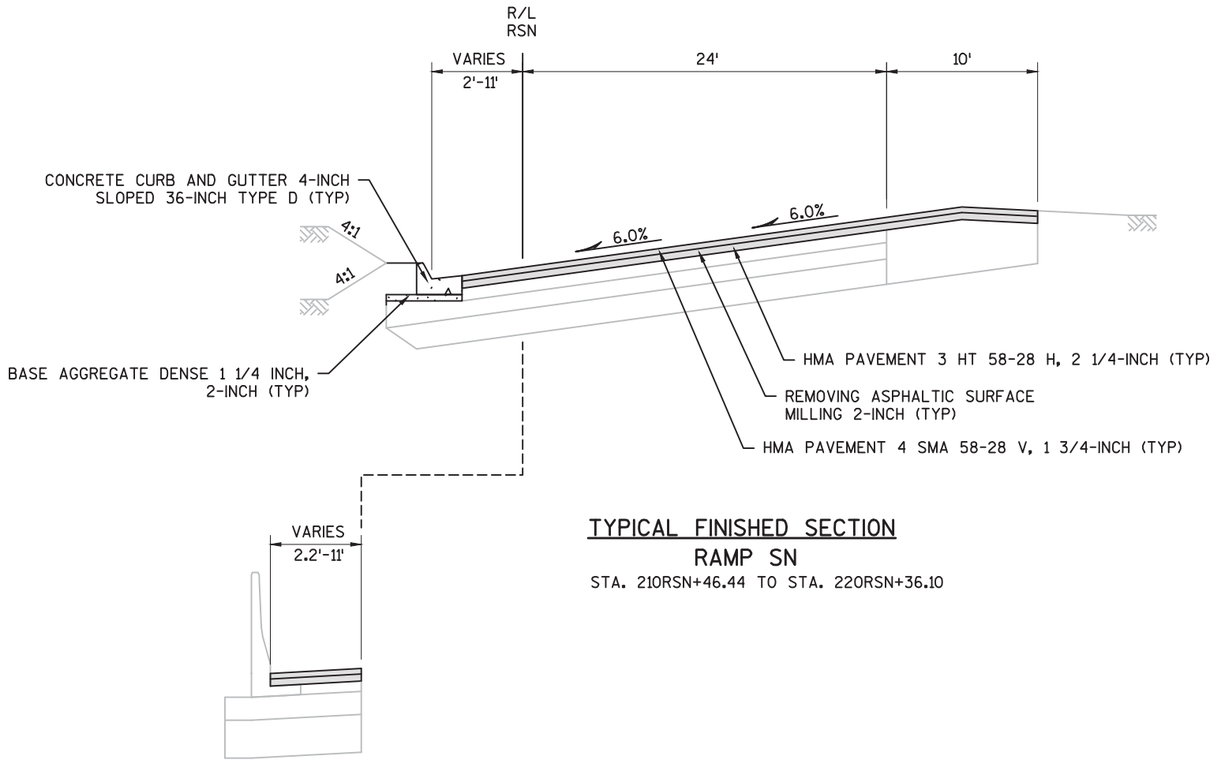
PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

PRE_22

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020401_TS.DWG
PROJECTSHEETDATA - 020406_TS

PLOT DATE : 4/29/2017 1:28 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT

WISDOT/CADDS SHEET 42



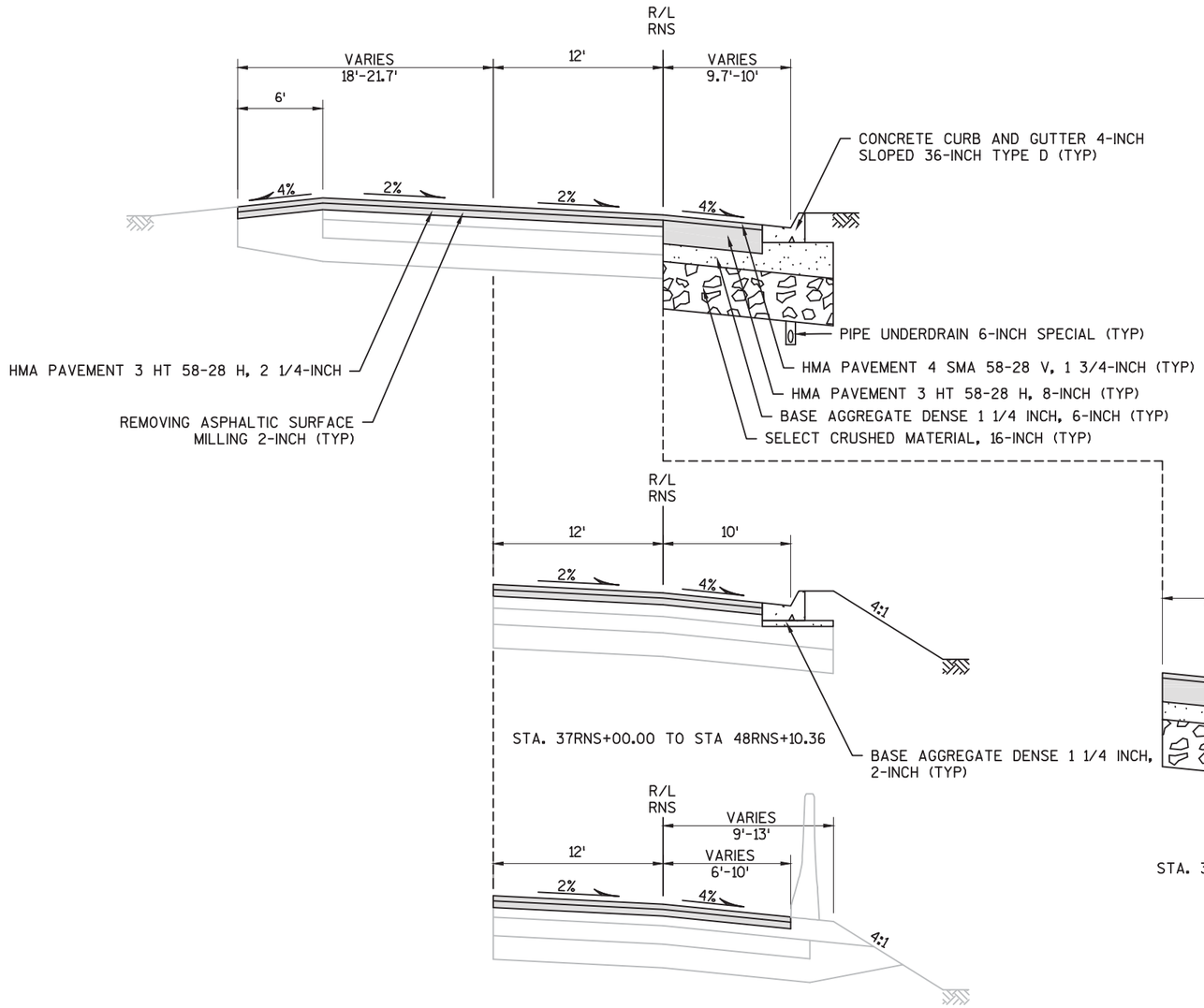
TYPICAL FINISHED SECTION
RAMP SN

STA. 210RSN+46.44 TO STA. 220RSN+36.10

STA. 210RSN+46.44 TO STA. 210RSN+56.18
STA. 219RSN+45.25 TO STA. 220RSN+36.10

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020401_TS.DWG
PROJECTSHEETDATA - 020410_TS
PLOT DATE : 4/29/2017 1:28 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT

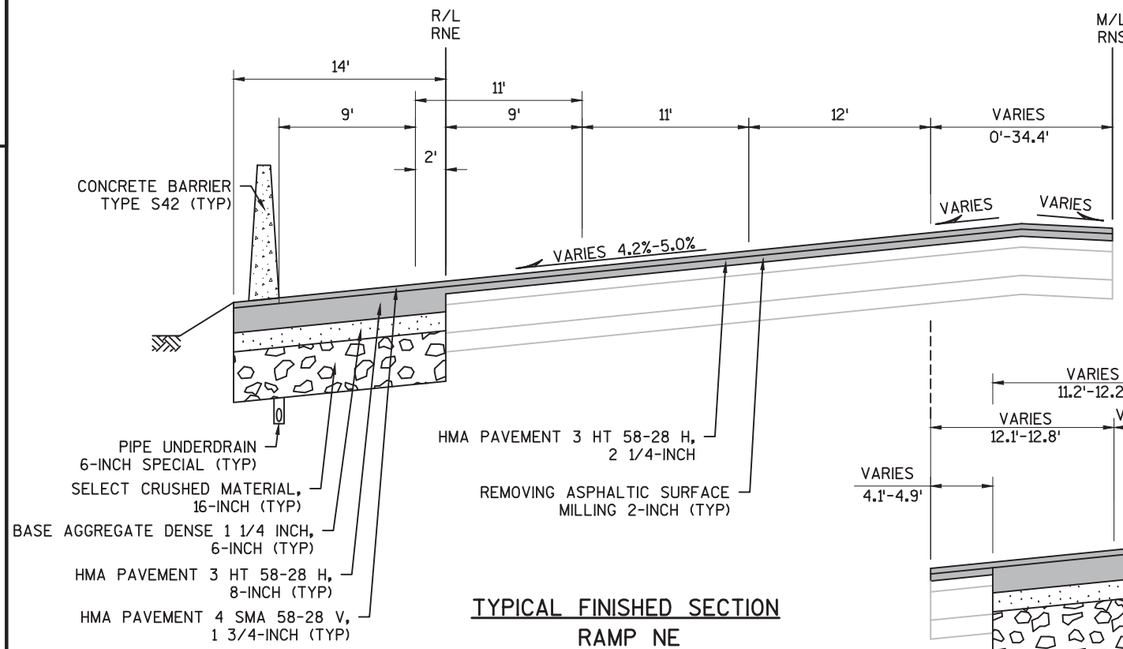


TYPICAL FINISHED SECTION

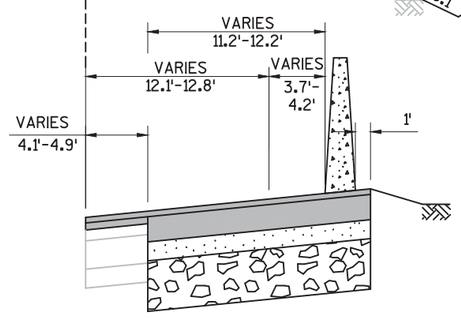
RAMP NS

STA. 31RNS+18.13 TO STA 49RNS+55.14

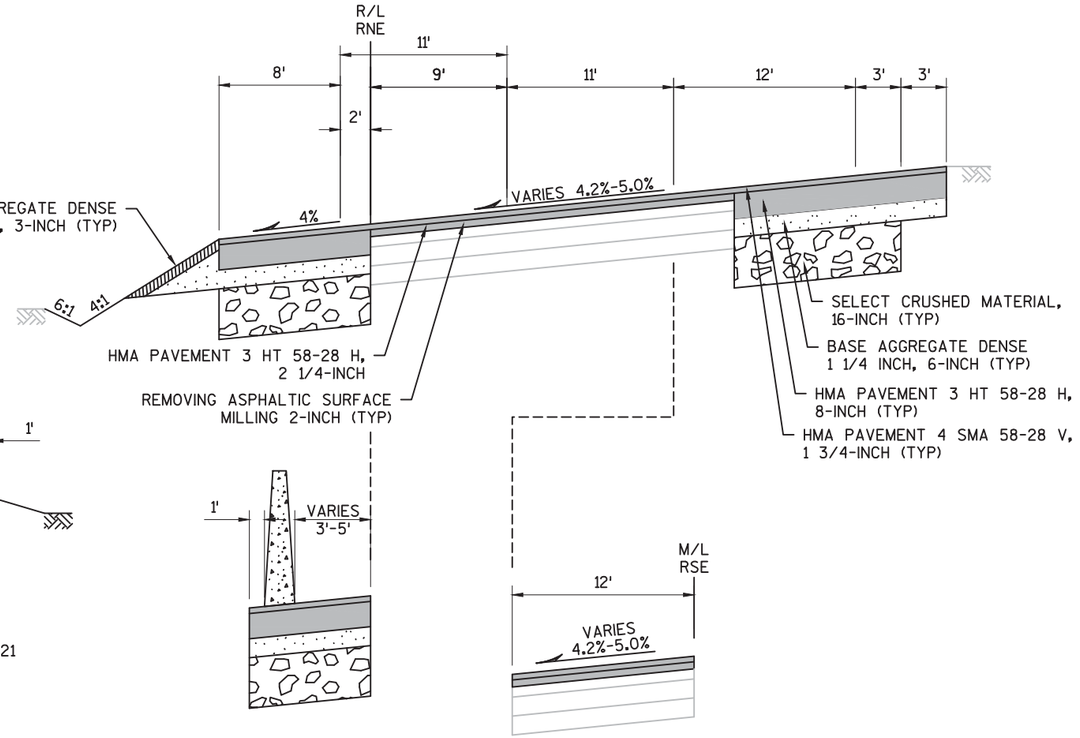
PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET PRE_24 E



TYPICAL FINISHED SECTION
RAMP NE
STA. 30RNE+54.87 TO STA. 34RNE+25.33

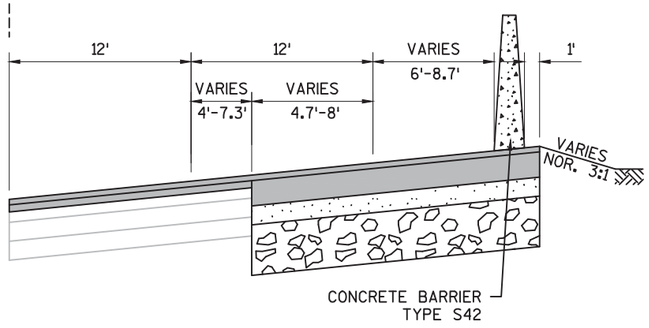


STA. 30RNE+54.87 TO STA. 31RNE+19.21

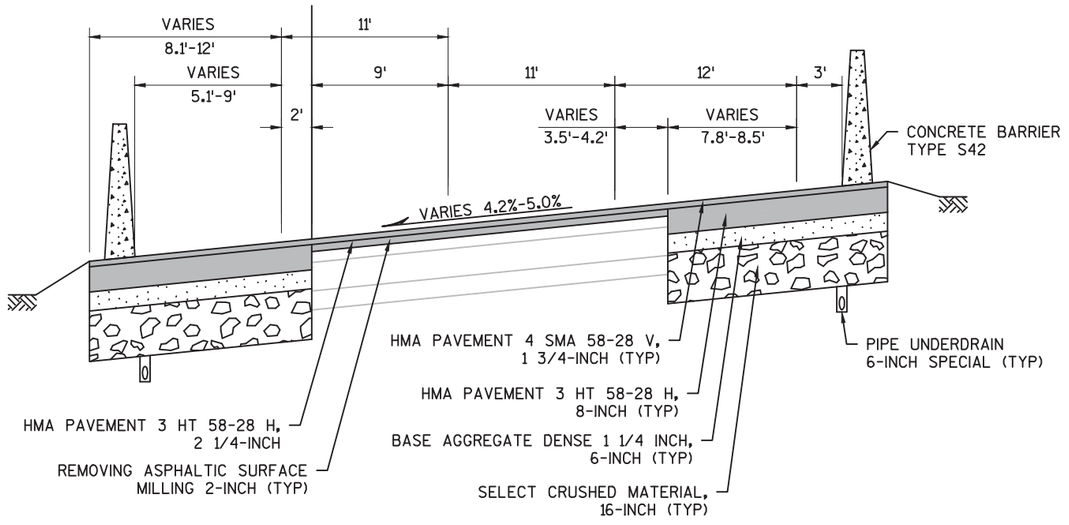


STA. 46RNE+67.48 TO STA. 49RNE+00.00

STA. 49RNE+43.29 TO STA. 53RNE+63.66



STA. 53RNE+63.66 TO STA. 66RNE+94.44

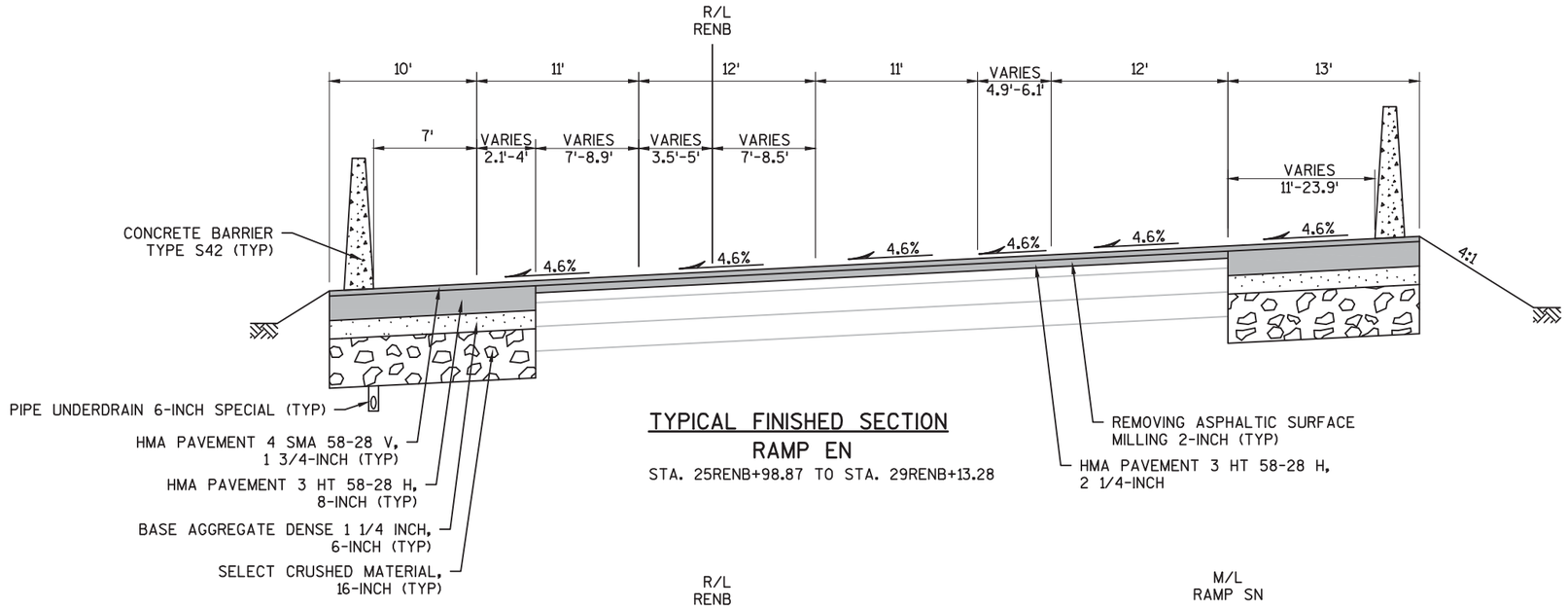


NOTE: RESIN BINDER HIGH FRICTION SURFACE TREATEMENT STATIONS
STA. 30RNE+54.87 TO STA. 40RNE+20.26
STA. 46RNE+65.71 TO STA. 65RNE+09.33

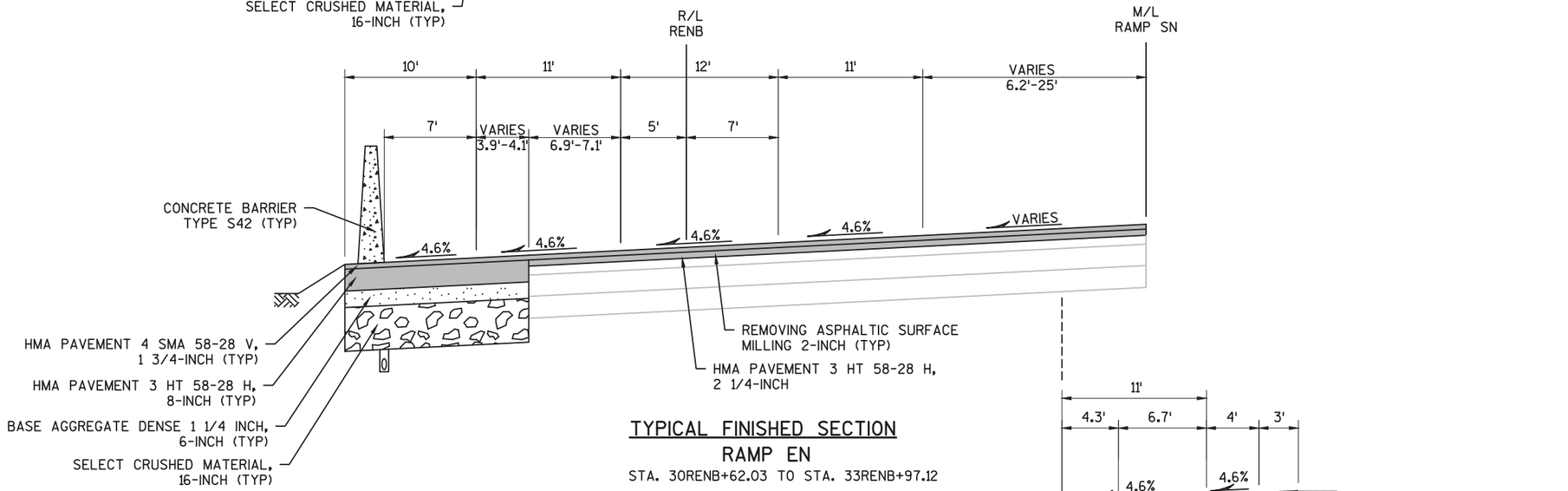
TYPICAL FINISHED SECTION
RAMP NE
STA. 34RNE+25.33 TO STA. 40RNE+18.33

TYPICAL FINISHED SECTION
RAMP NE
STA. 46RNE+67.48 TO STA. 67RNE+71.61

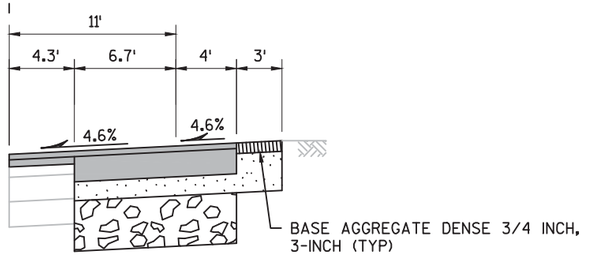
PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET PRE_25 E



TYPICAL FINISHED SECTION
RAMP EN
STA. 25RENB+98.87 TO STA. 29RENB+13.28



TYPICAL FINISHED SECTION
RAMP EN
STA. 30RENB+62.03 TO STA. 33RENB+97.12

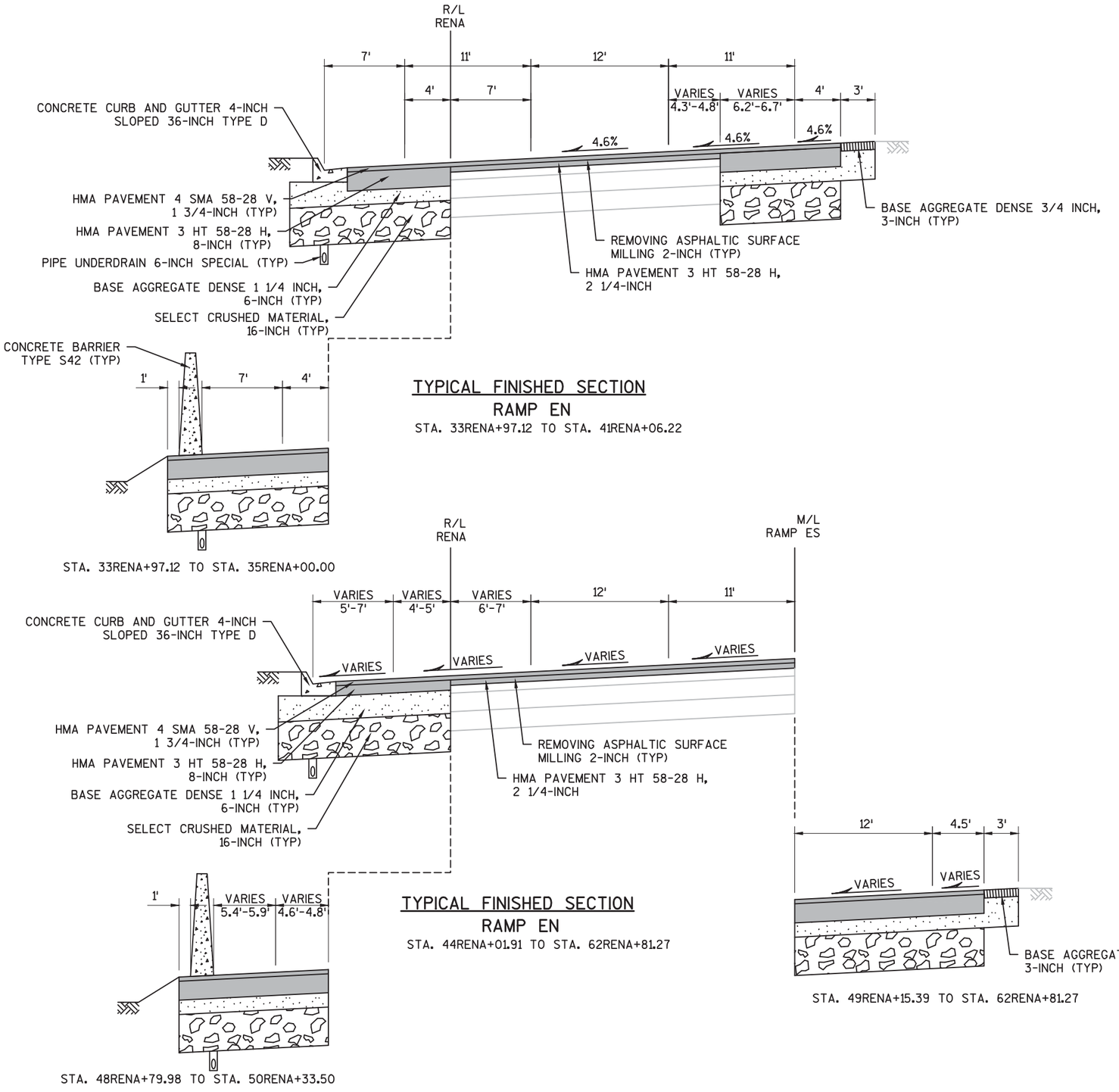


STA. 33RENB+34.06 TO STA. 33RENB+97.12

NOTE: RESIN BINDER HIGH FRICTION
SURFACE TREATEMENT STATIONS
STA. 25RENA+98.87 TO STA. 29RENA+09.51
STA. 30RENA+55.77 TO STA. 33RENA+97.12
STA. 33RENB+97.12 TO STA. 41RENB+06.17
STA. 44RENB+01.97 TO STA. 45RENB+12.60

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

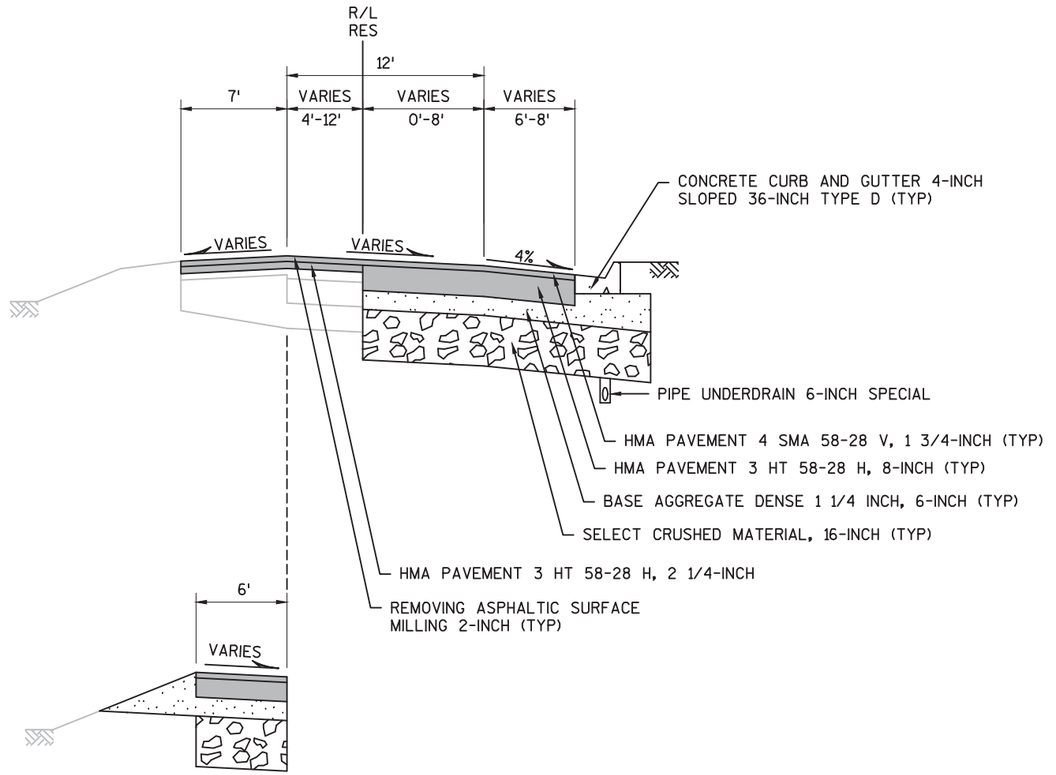
FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020401_TS.DWG
PROJECTSHEETDATA - 020413_TS
PLOT DATE : 4/29/2017 1:28 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT



PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020401_TS.DWG
PROJECTSHEETDATA - 020414_TS

PLOT DATE : 4/29/2017 1:28 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT



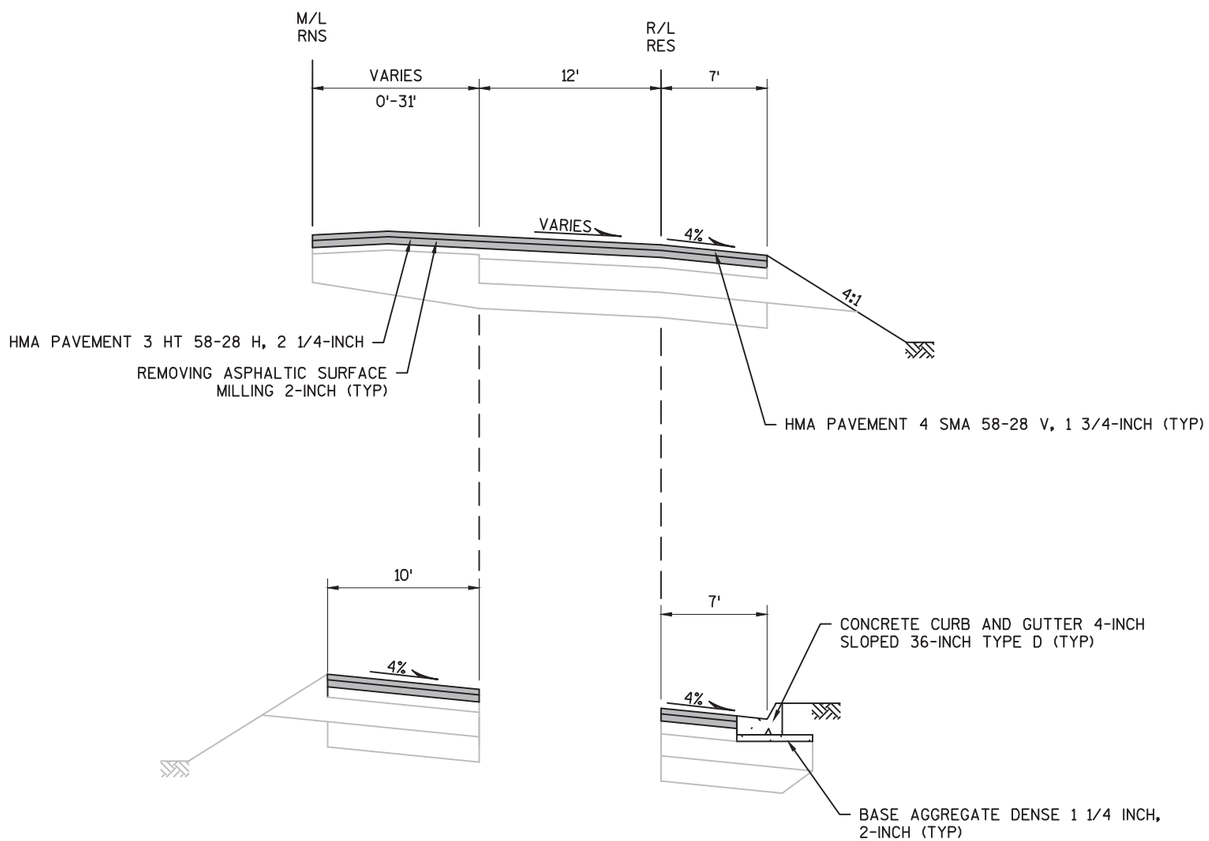
STA. 211RSE+49.05 TO STA. 212RSE+31.41

TYPICAL FINISHED SECTION

RAMP SE

STA. 211RSE+49.05 TO STA. 216RSE+59.22

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET PRE_28 E



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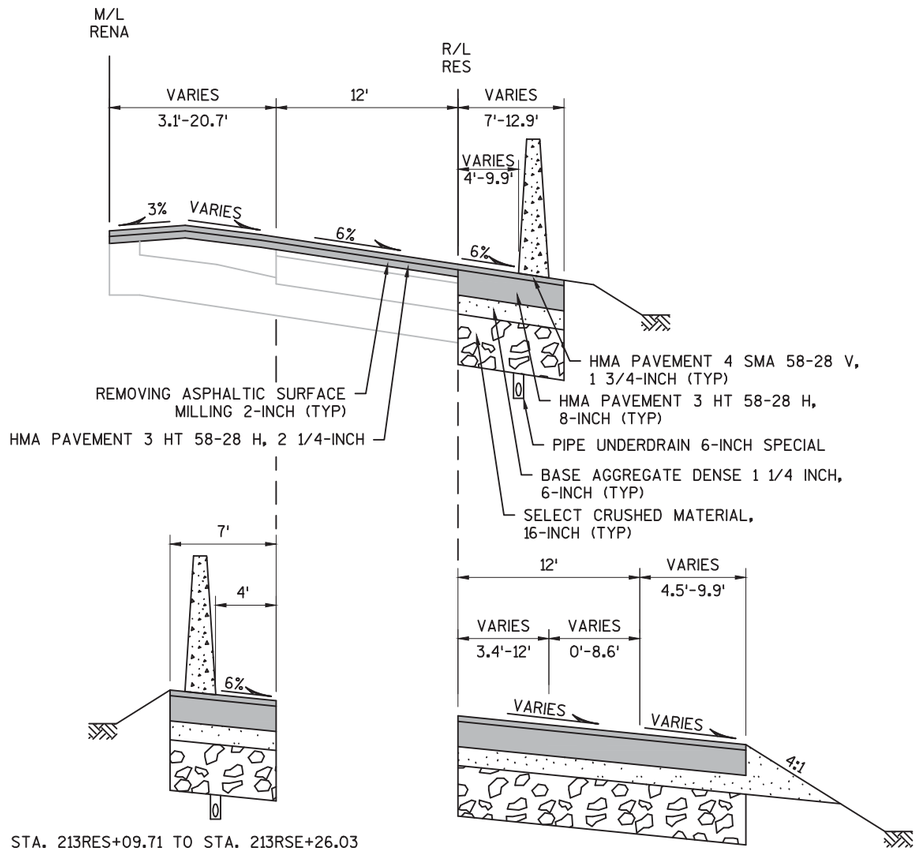
RAMP ES
STA. 195RES+64.94 TO STA. 200RES+56.33



STA. 213RES+09.71 TO STA. 213RSE+26.03

STA. 215RES+024.13 TO STA. 218RES+15.05

TYPICAL FINISHED SECTION
RAMP ES
STA. 213RES+09.71 TO STA. 218RES+15.05

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET E

PRE_29

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PLOT DATE : 4/29/2017 1:28 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT

ATTACHMENT 7

Transportation Management Plan Documentation and Request for Approval Form

WisDOT TMP Documentation and Request for Approval

TMP ID: 3037
Version: Approved (60%)

This is a request for approval of the Transportation Management Plan (TMP) for the project detailed below. Impacts resulting from project activities meet the current work zone policies of the Wisconsin Department of Transportation.

1A. Project Information:

TMP Type: Type 3
Region: SE
Local Program: No
Created Comment: Created from Scratch. User comment:

Design ID: 1100-34-00
Project Title: IH 894 84TH ST TO LINCOLN AVE
County: MILWAUKEE
Highway: I-894

Construction ID: 1100-34-70
Project Type: RECONDITIONING / BRIDGE REHABILITATION
Project Limits: 84TH ST TO LINCOLN AVE
Project Length: 3.38 Mile(s)
Project Duration: 300 Day(s)
Engineer's Estimate: more than $10M
PS&E Date: 08/01/2017
LET Date: 12/12/2017
NHS Route: Yes
AADT: 131300
AADT Year: 2013
Federal Oversight: No

1B. Project Impacts:

Anticipated Begin: 02/2018
Anticipated End: 12/2018
Delay: Moderate
OSOW Route: Yes

1C. Location:

Highway

Begin County: MILWAUKEE
End County: MILWAUKEE
Highway: I-894 WB
Begin Landmark: ON RAMP FROM S 84TH ST | I-41 NB/I-43 SB/I-894 WB/US 41 NB

	| MILWAUKEE
Direction From:	E
Distance From:	0.0 Mile(s)
End Landmark:	ON RAMP FROM W LINCOLN AVE | I-41 NB/I-894 WB/US 41 NB/US 45 NB | MILWAUKEE
Direction From:	N
Distance From:	0.05 Mile(s)
Begin County:	MILWAUKEE
End County:	MILWAUKEE
Highway:	I-894 EB
Begin Landmark:	OFF RAMP TO W LINCOLN AVE | I-41 SB/I-894 EB/US 41 SB/US 45 SB | MILWAUKEE
Direction From:	N
Distance From:	0.00 Mile(s)
End Landmark:	OFF RAMP TO 76-84TH ST | I-41 SB/I-43 NB/I-894 EB/US 41 SB | MILWAUKEE
Direction From:	E
Distance From:	0.00 Mile(s)

2. Brief description of work activities.

This is a resurfacing project along IH 894 from 84th St to National Ave. The outside shoulders, median and inside shoulders will be rehabilitated and the deteriorating drainage system in the median will be improved. The existing driving lanes will be resurfaced and the roadway will be restriped to 4-lanes in each directions. All work will be completed within the existing roadway footprint. The outside shoulders will remain the same width as existing, approximately 10-ft, and the inside shoulder width will be reduced to approximately 4-ft. The work will also consist of rehabilitating the IH 894 bridges over Coldspring Rd, Oklahoma Ave and National Ave, along with three structures in the Hale Interchange (E-N Ramp, N-E Ramp & S-N Ramp).

3. Briefly describe the staging planned for maintaining traffic.

During the first stage of construction, the outside shoulders will be resurfaced to handle traffic that will travel on the shoulders during stage 2. Stage 1 will be constructed using lane closures during off-peak and nighttime hours. During the second stage of construction, traffic will be shifted to the outside to reconstruct the median, inside shoulder and inside lane (lane 1), along with improving the median storm sewer. During the third stage, traffic will be shifted to the inside to reconstruct the outside shoulder. During construction several service interchange ramps will be closed when the outside shoulders are being reconstructed, although no two consecutive service ramps will be closed at the same time. During stage 4, the existing driving lanes will be resurfaced using lane closures during nighttime hours. Three lanes of traffic will be maintained in the northbound direction and southbound direction along IH 894 during peak hours with the exception of stage 2. During stage 2, three lanes of traffic will be

maintained in the northbound direction and two lanes of traffic will be maintained in the southbound direction from Oklahoma to the Hale Interchange. During stage 2 the Hale Interchange ES Ramp will be closed for a short period to reconstruct the gore and shoulders at the system ramp. The Zoo Interchange ES Ramp will remain closed until stage 3 is completed. The Zoo Interchange WS Ramp will have one lane closed (one lane will remain open) until stage 3 is completed.

Lane and shoulder widths will be reduced during construction. The number of mainline driving lanes will often be reduced during off-peak and nighttime hours. Temporary barrier will be used to protect the work zone along with drums and signage.

The PPC Overlays on the IH 894 NB and SB bridges over Oklahoma, Beloit and National will be poured in halves by reducing the number of driving lanes during off-peak and nighttime hours. The PPC Overlays on the Hale Interchange System Ramps (EN Ramp, NE Ramp and SN Ramp) will be completed during nighttime lane closures. Barricades, drums and signage will be used for traffic control.

The bridge painting will be completed during stages 2, 3 and 4.

4. Will there be restrictions on pedestrian/bicycle access?

☑ Yes ☐ No

If Yes:

a) Will sidewalk/multiuse path be closed?

☑ Yes ☐ No

b) Describe how pedestrian and bicyclists will be accommodated

Sidewalk could potentially be closed along National Avenue under IH 894 while the bridge girders are being painted. Sidewalk exists on each side of National Avenue and the sidewalk will only be closed on one side of National Avenue at a time so pedestrians will be accommodated at all times.

c) Will crosswalks be provided? What is the spacing of crosswalks?

Crosswalks currently exist at 102nd Street and 99th Street. A crosswalk is located 600ft east of the National Ave bridge at 99th Street and 1000ft west of the National Avenue bridge at 102nd Street. The existing crosswalks will not be impacted.

d) Are the strategies in compliance with ADA?

Yes, the strategies are in compliance with ADA. The sidewalk will remain open along one side of National Avenue at all times and the existing crosswalks will not be impacted.

5. Briefly describe how access to traffic generators, businesses, school buses, garbage trucks, postal services, and transit impacts will be mitigated (alternate routes, etc.).

a) Are the strategies in compliance with ADA?

During construction detour signage will be placed to detour traffic along signed routes. Various methods of public outreach will also be utilized such as signage, web updates, informing businesses of the

closures and alternate routes, etc.

Access to bus stops will not be impacted, Milwaukee County Transit System (MCTS) will be contacted and invited to the 60% Plan review meeting to start coordinating and to determine transit impacts.

b) Is access to bus stops affected?

☐ Yes ☑ No

6. Will the project have lane closures?

☑ Yes ☐ No

If Yes:

a) Are there restrictions on when lane closures are allowed?

☑ Yes ☐ No

b) What hours/days are lane closures permitted?

Freeway Lane Closure Hours

Weekday Peak Hours

5:30 AM - 7:00 PM Monday, Tuesday, Wednesday, Thursday, and Friday

Weekend Peak Hours

10:00 AM - 7:00 PM Saturday, Sunday

Weekday Off-Peak Hours

7:00 PM - 10:00 PM Monday, Tuesday, Wednesday, Thursday

7:00 PM - 11:00 PM Friday

Weekend Off-Peak Hours

8:00 AM - 10:00 AM Saturday, Sunday

7:00 PM - 11:00 PM Saturday

7:00 PM - 9:30 PM Sunday

Night Time Hours

10:00 PM - 5:30 AM (Sunday PM to Monday AM, Monday PM to Tuesday AM, Tuesday PM to Wednesday AM, Wednesday PM to Thursday AM, Thursday PM to Friday AM)

11:00 PM - 8:00 AM (Friday PM to Saturday AM, Saturday PM to Sunday AM)

Full Freeway Closure Hours

11:00 PM - 4:30 AM (Sunday PM to Monday AM, Monday PM to Tuesday AM, Tuesday PM to Wednesday AM, Wednesday PM to Thursday AM, Thursday PM to Friday AM)

11:00 PM - 6:00 AM (Friday PM to Saturday AM, Saturday PM to Sunday AM)

Provide a minimum of three lanes in each direction of freeway (minimum of 2 lanes in southbound direction during Stage 2) and ensure that the freeways are entirely clear for traffic during Weekday Peak Hours and Weekend Peak Hours. Provide a minimum of two lanes in each direction of the freeway and ensure that the freeway is entirely clear for traffic during Weekday Off-Peak Hours and Weekend Off-Peak Hours. Provide a minimum of one lane in each direction of the freeway and ensure that the freeways are entirely clear for traffic during Night Time Hours except as allowed during full closure.

Provide signed detour routes, as shown in the plans that are fully open and free of construction during all full freeway closures. Full closure and detouring of freeway will be restricted to Full Freeway Closure Hours, unless Extended Hours are approved by the Department. The contract specifications will require the contractor to give the Department 14 days of advance notification of each closure. This will allow the notification of the public through radio, television and newspaper advertisements and articles and will allow coordination with special events, local municipalities, emergency responders, and OSOW route permit coordinators. Additional signing, detour routes and alternate routes will be required for these closures.

c) How were traffic counts used in determining permitted lane closure times?(For multi-lane roadways, indicate peak hour volume per direction of travel. For two-lane, two-way roadways indicate AADT)?

Existing 24-hour traffic volumes along IH-894 were compared to the 1,550 vphpl work zone capacity to determine motorist delays. The approximate 1,550 vphpl capacity threshold is derived from the capacity calculation shown in FDM 11-50-30. Beginning with 1,750 pcphpl for long term construction, factors are applied for intensity and proximity of the construction, lane and shoulder widths, and heavy truck volumes.

Peak hour volumes (Site 400007, May '13) are as follows:

- Northbound: 4,050 vph (AM Peak); 5,745 vph (PM Peak)

- Southbound: 4,600 vph (AM Peak); 4,455 vph (PM Peak)

7. Please provide the following.

a) Minimum lane width to be maintained.

11-ft minimum lane width will be maintained along IH 894.

b) Minimum lane width plus shoulder width to accommodate OSOW.

11-ft minimum lane width will be maintained along IH 894 during the project plus a minimum of 1-ft shoulder between the edge of lane to face of temporary barrier for a total minimum width of 12-ft.

c) Minimum height (if less than typically available)

Existing vertical clearance will remain unchanged.

8. Will the project be detoured?

☑ Yes ☐ No

a) Explain length of detour, travel times, improvements required for signal timing, surface and shoulder conditions, capacity, etc

WB IH 894 Exit Ramp to Beloit Rd:

From IH 894 WB/IH 43 SB: The primary singed detour is to exit onto 76th St, south to Layton Ave, west to STH 100, and north to Beloit Rd. The primary detour is approximately 1 mile longer and will take about 5 minutes longer than the normal route.

From IH 43 NB: The primary signed detour is to exit onto Layton Ave, east to STH 100, and north to Beloit Rd. The primary detour is approximately 0.3 miles shorter and will take about 3 minutes longer than the normal route.

The secondary signed detour route for both the above primary detour routes is to exit onto National Ave, west to STH 100, and south to Beloit Rd. The secondary detour is approximately 2.5 miles longer and will take about 5 minutes longer than the normal route.

Beloit Rd Entrance Ramp to WB IH 894:

The primary signed detour route is to travel west to STH 100, north to National Ave, and east to WB IH 894 entrance ramp. The primary detour is approximately 1 mile longer and will take about 3 minutes longer than the normal route.

National Ave Entrance Ramp to WB IH 894:

The primary signed detour route is to travel east to Lincoln Ave then west to WB IH 894 entrance ramp. The primary detour is approximately 0.5 mile longer and will take about 1.5 minutes longer than the normal route.

EB IH 894 Exit Ramp to National Ave:

The primary signed detour route is to exit onto Lincoln Ave, west to STH 100, and south to National Ave. The primary detour is approximately 0.5 miles longer and will take about 1 minute longer than the normal route.

EB IH 894 Exit Ramp to Beloit Rd:

The primary signed detour route is to exit onto Oklahoma Ave, west to STH 100, and south to Beloit Rd. The primary detour is approximately 1 mile longer and will take about 3 minute longer than the normal route.

Beloit Rd Entrance Ramp to EB IH 894:

To IH 894 EB/IH 43 NB: The primary signed detour route is to travel west to STH 100 then south to IH 894 EB/IH 43 NB entrance ramp. The primary detour is approximately 1.5 miles longer and will take about 4 minute longer than the normal route.

To IH 43 SB: The primary signed detour route is to travel west to STH 100, south to Layton Ave, and west to IH 43 SB entrance ramp. The primary detour is approximately 0.4 miles shorter and will take about 3 minute longer than the normal route.

Hale Interchange E-S Ramp Closure (Short term):

The primary signed detour is to exit onto 76th St, south to Layton Ave, and west to IH 43 SB. The primary detour is approximately 0.1 miles shorter and will take about 5 minutes longer than the normal route.

The secondary signed detour route for both the above primary detour routes is to exit onto Beloit Rd, west to STH 100, south to Layton Ave, and west to IH 43 SB. The secondary detour is approximately 1.9 miles longer and will take about 6 minutes longer than the normal route.

Further analysis is required determining any changes to signal timing for the above detour routes

b) Are there width and height restrictions on the detour?

☐ Yes ☑ No

9. List major special events and holidays, and how traffic disruptions will be minimized.

Holiday:

From noon Friday, May 25, 2018 to 6:00 AM Tuesday, May 29, 2018 for Memorial Day;

From noon Tuesday, July 3, 2018 to 6:00 AM Thursday, July 5, 2018 for Independence Day;

From noon Friday, August 31, 2018 to 6:00 AM Tuesday, September 4, 2018 for Labor Day;

From noon Wednesday, November 21, 2018 to 6:00 AM Monday, November 26, 2018 for Thanksgiving;

From noon Friday, December 21, 2018 to 6:00 AM Thursday, December 27, 2018 for Christmas;

From noon Monday, December 31, 2018 to 6:00 AM Wednesday, January 2, 2019 for New Years'.

Special Events:

During Summer Fest, scheduled for June 27-July 8, 2018, keep open the roadways until one hour after the event closes each night;

During Wisconsin State Fair, scheduled for August 2-12, 2018, keep open the roadways until one hour after the event closes each night;

On days with a Milwaukee Brewer home game at Miller Park, maintain two outbound lanes on eastbound IH 894 from Miller Park up until four hours after the start of the game. IH 894 restrictions during other special events at Miller Park will be determined on an as needed basis.

10. Describe the method(s) (LCAT, Quadro, FDM 11-50-30, etc.) used to estimate motorist delays or queue length (Applicable only for freeways, expressways, and signalized corridors).

Synchro 9 was used to analyze AM and PM peak hour delays and operations at key intersections

on the adjacent local road network and service interchange ramp terminals. Quadro and the procedure outlined in the Facilities Development Manual (FDM) 11-50-30 were used to estimate vehicle delays and queuing on the Interstate 41/894 (I-41/894) freeway corridor.

Freeway and local road operations were modeled and analyzed for the "worst-case" construction stage, as determined by the project team. The "worst-case" construction stage corresponds to Stage 2 in the 60% plans, which was detailed previously. Stage 2 includes the closures of the Hale Interchange East-to-South (E-S) system ramp, Zoo Interchange E-S system ramp, a single lane on the Zoo Interchange West-to-South (W-S) system ramp (one lane open to traffic), National Avenue southbound (SB) entrance ramp, and a single lane on I-41 SB/894 Eastbound (EB) between Oklahoma Avenue and the Hale Interchange (two lanes open to traffic). It should be noted that the Hale Interchange E-S system ramp would not be closed for the duration of Stage 2. As such, the analysis of Stage 2 was performed both with (Scenario A) and without (Scenario B) this closure.

The project team utilized AM and PM peak hour "Rapid Analysis of Diversion in Urban Situations" (RADIUS) construction diversion forecasts for each Stage 2 scenario provided by the Wisconsin Department of Transportation (WisDOT) to estimate peak hour freeway and local road volumes during both Stage 2 scenarios. The RADIUS forecasts assumed the various impacts/closures associated with Stage 2 for each scenario as well as concurrent system ramp closures within the Marquette Interchange as part of a resurfacing project planned to occur around the same time as this project.

Base year AM and PM peak hour intersection traffic count and freeway volume data was compiled for the I-41/894 corridor, key local intersections, and service interchange ramp terminals. The base year data was adjusted to correspond to the construction year (2018) and the RADIUS Stage 2 peak hour forecasts were applied to estimate peak hour construction volumes for analysis.

Based on the RADIUS peak hour forecasts, roughly 960 (AM) to 1,415 (PM) vehicles are expected to divert away from the I-41 SB/894 EB corridor due to the single lane closure between Oklahoma Avenue and the Hale Interchange, as well as the closure of the National Avenue SB entrance ramp, during either Stage 2 scenario. Of these, about 300 (AM) to 720 (PM) vehicles would utilize SB 108th Street (Wisconsin State Highway [WIS] 100) as an alternate route as it is a major parallel six-lane signalized roadway located within a half mile west of the I-41/894 freeway corridor. I-41 Northbound (NB)/894 Westbound (WB) is expected to carry slightly more traffic (270 to 310 more vehicles) due to the concurrent closures within the Marquette Interchange.

The closure of the Hale Interchange E-S system ramp is expected to divert between 1,465 (AM) and 1,850 (PM) vehicles based on the RADIUS Stage 2 scenario A peak hour forecasts. Some of this traffic diverts regionally through the Zoo Interchange or locally to either Beloit Road, Layton Avenue, or Forest Home Avenue. Traffic diverting to Beloit Road (205 to 275 vehicles) exits NB from I-41/894 and travels west on Beloit Road to either the 124th Street service interchange to access I-43 or points west. Traffic diverting to Layton Avenue (360 to 420 vehicles) exits I-43 SB/894 WB at either 76th Street or Forest Home Avenue and continues west to the 124th Street service interchange with I-43. Traffic diverting to Forest Home Avenue (220 to 365 vehicles) exits I-43 SB/894 WB and continues southwest to WIS 100. These three local roadways are utilized far less when the Hale Interchange E-S system ramp is open under Stage 2 scenario B.

11. What is the anticipated travel delay during peak travel periods (also indicate frequency, e.g. daily and duration)? Please compare the peak hour volumes per lane with the work zone capacity criteria in FDM 11-50-30. If it exceeds the estimated capacity, a delay calculation is required. If the delay is more than 15 minutes, the TMP will be a type 3 and if less than 15 minutes, it generally will be a type 2. The Regional Work Zone Engineer can assist you in determining your delay.

Quadro was used to estimate the delay per vehicle and queue lengths on each direction of I-41/894 through the work zone for both scenarios of Stage 2 (with and without Hale Interchange E-S system ramp closure). The "Maximum Queue Delay" method was used within Quadro with an assumed maximum delay of 15 minutes. The "Maximum Queue Delay" method assumes that traffic will divert away from the work zone once the selected delay tolerance is reached. This method is typically utilized for analysis of urban scenarios with multiple alternate routes. An assumed work zone capacity of 1,650 vehicles per hour per lane (VPHPL) was utilized for the analysis, which is consistent with other Southeast Region projects. Hourly traffic volumes were estimated for 2018 conditions and include forecasted diversion from the RADIUS construction diversion forecasts for each scenario of Stage 2. "Attachment 1" includes Quadro output summaries for reference.

Based on the Quadro analysis of Stage 2 (scenario A), I-41 NB/894 WB is expected to average less than 5 minutes of delay and 0.4 miles of queue upstream of the Hale Interchange during the work week (Monday-Friday) peak hours, primarily the AM peak hour. There is no expected delay or queuing on the weekends. In Stage 2 (scenario B), I-41 NB/894 WB delays (Monday-Friday) are expected to average less than 3 minutes with queues of less than 0.4 miles as more traffic is expected to divert from the corridor based on the RADIUS construction diversion forecast. In Stage 2 (scenario A), I-41 SB/894 EB is expected to average 11 to 17 minutes of delay and 1.5 miles of queue upstream of the Oklahoma Avenue interchange during the work week extended PM peak period (about 2PM to 7PM). An additional 30% of traffic is expected to divert from I-41 SB/894 EB during the most congested portion of this period due to the additional delay. During the weekend, mid-day delays (noon to 5PM) on I-41 SB/894 EB are expected to reach 10-15 minutes of delay with similar queues. In Stage 2 (scenario B), I-41 SB/894 EB delays and queue lengths are expected to stay the same, but the duration of congestion is reduced to 3PM to 6PM as the RADIUS construction diversion forecast indicates more traffic diverting from the corridor. The duration of weekend delays and queuing is also reduced in Stage 2 (scenario B) to 2PM to 5PM.

The anticipated travel delay per vehicle along WIS 100 and Layton Avenue, as well as the service ramp terminals along I-41/894 and I-43/894, during Stage 2 (scenario A) is approximately 1.9 minutes during the AM peak hour and 2.1 minutes during the PM peak hour. This represents an increase of 46% (AM) to 31% (PM) relative to the existing peak hours. Anticipated travel delay per vehicle decreases slightly during Stage 2 (scenario B) to 1.4 (AM) and 2.0 (PM) minutes, which is an increase of 8% (AM) to 25% (PM) relative to the existing peak hours. "Attachment 2" shows a comparison of key intersection and service ramp terminal overall levels of service (LOS) during the peak hours for each scenario.

In general, key locations operate at LOS D or better during the existing peak hours except for WIS 100 & Greenfield Avenue (LOS E [AM] and LOS F [PM]). This intersection is over capacity during the peak hours, which results in longer delays and queues. There are no major changes in operations under either Stage 2 scenario except for WIS 100 & Lincoln Avenue which degrades to LOS E in the PM peak hour due to the additional SB diversion on WIS 100. It should be noted that there are a few

locations with specific turning movements that degrade more significantly (in terms of LOS and/or queuing) from existing conditions due to construction diversion, mainly in scenario A. These locations include:

- WIS 100 & Beloit Road (Scenarios A and B)

*AM: EBT - LOS E (390 feet [95th% queue]), SBL - LOS F (272 feet)

*PM: WBT - LOS F (497 feet), SBL - LOS C (246 feet)

- WIS 100 & Layton Avenue (Scenario A)

*AM: WBT - LOS F (324 feet), WBR - LOS E (272 feet), NBL - LOS E (259 feet)

*PM: WBL - LOS F (358 feet), WBT - LOS E (344 feet), NBL - LOS E (338 feet), SBL - LOS E

- Layton Avenue & 84th Street (Scenario A)

*AM/PM: WBT - increased queues (330-425 feet)

Operations at the WIS 100 & Beloit Road intersection degrade along EB/WB Beloit Road due to the additional diversion forecasted to utilize that roadway as an alternate route to the Hale Interchange E-S system ramp closure in conjunction with additional SB WIS 100 traffic due to the I-41 SB/894 EB lane closure. Similarly, additional traffic on WIS 100 (SB lane closure) and Layton Avenue (Hale Interchange E-S closure) degrades operations on the WB approach and turning movements. WB queue lengths increase at the Layton Avenue & 84th Street intersection due to the additional volume on Layton Avenue.

Service interchange ramp terminals generally operate at LOS C or better during the existing peak hours except for 124th Street (intersection with Layton Avenue), which operates at LOS F during the AM peak hour. This ramp terminal is a four-way stop where the west leg of the intersection form the I-43 entrance/exit ramps. This location continues to operate at LOS F under Stage 2 (scenario A) during the AM peak hour and degrades to LOS E during the PM peak hour with increased EB and WB delay/queues due to diversion from the closure of the Hale Interchange E-S system ramp. In addition, the Beloit Road NB exit ramp at the east service ramp terminal (I-41 NB/894 WB ramps) is expected to have heavy delays (46.4-62.9 seconds [LOS D/E]) and long queues (400-450 feet) in both peak hours for Stage 2 (scenario A) due to the diversion from the Hale Intersection E-S system ramp closure, as noted in the previous section.

Proposed mitigation for the key local intersections and service interchange ramp terminals previously detailed include the following:

- WIS 100 & Beloit Road (Scenario A and B): adjust signal phase splits (keep cycle length for coordination) to provide additional time to the EB/WB approaches and SBL turn; optimize offset

- WIS 100 & Layton Avenue (Scenario A): adjust signal phase splits (keep cycle length for coordination) to provide additional time to the WB approach and NBL/SBL turns; optimize offset

- Layton Avenue & 84th Street (Scenario A): adjust signal phase splits (keep cycle length for coordination) to provide additional time to the WB approach; optimize offset

- 124th Street & Layton Avenue/I-43 Ramps (Scenario A): coordinate with local law enforcement to have a police officer direct traffic at this location during the peak hours, which would help to reduce EB/WB queues

- Beloit Road & I-41/894 Ramps (Scenario A): adjust signal phase splits (keep cycle length for coordination) to provide additional time to the NB exit ramp and WBL turn at the west ramp terminal; adjust offsets to optimize coordination between ramp terminals

In addition, the project team suggests that the signal timings at the Oklahoma Avenue service interchange be modified to provide more time to the SB exit ramp phase. Analysis of the service ramps does not indicate any significant operational issues for Stage 2 considering a lack of significant diversion in the RADIUS construction diversion forecasts. However, it is possible that the SB exit ramp could receive more traffic than forecasted due to variation in I-41 SB/894 EB day to day operations (accidents, weather, etc.) during the lane closure.

The calculated work zone capacity based on the methodology outlined in FDM 11-50-30 changes slightly by direction in each peak hour due to different peak hour truck percentages. During the AM peak hour, the calculated work zone capacity is 3,182 vehicles per hour (VPH) along I-41 SB/894 EB (two lanes) and 4,773 VPH along I-41 NB/894 WB (three lanes). During the PM peak hour, the calculated work zone capacity is 3,107 VPH and 4,705 VPH, for I-41 SB/894 EB and I-41 NB/894 WB respectively. "Attachment 3" shows the existing delay, calculated work zone delay, and anticipated additional delay due to construction on I-41/894. The work zone delay calculation utilized estimated 2018 peak hour volumes which included changes in peak hour volumes from the RADIUS construction diversion forecasts. The greatest anticipated additional delay due to construction is 13 (PM) to 15 (AM) minutes on I-41 SB/894 EB due to the single lane closure between Oklahoma Avenue and the Hale Interchange.

12. Identify alternate routes anticipated, and any alternate route improvements or signing planned.

Alternate routes to utilize W Layton Ave (CTH Y) and S 108th St (STH 100).

13. Are any intersection traffic control changes proposed such as temporary signals, temporary changes to an all way stop, etc?

Signal timing revisions are expected. Further analysis is required.

14. Are there anticipated traffic impacts from the proposed project on other roads/routes in the region/corridor? Identify other projects in the corridor (only if delay anticipated on this project).

An increase in traffic volume is expected along IH 94 from the Mitchell Interchange to the Zoo Interchange. An increase in traffic volume is also expected along Layton Ave from STH 100 to 84th St and along STH 100 from Layton Ave to Bluemound Rd.

The Zoo Interchange Phase 2, Project IDs 1060-33-81 & 1060-43-81 will going on at the same time as the IH 894 project. The design team has been coordinating with the construction team and will

continue to work with them.

15. Does the project affect other regions/states?

☐ Yes ☑ No

16. Check mitigation strategies planned

STRATEGY	COMMENTS
☑ Public information campaigns	See Section #17 for specific Public Information campaigns planned.
☑ Off-peak lane closures	Off-peak lane closures. Permitted closure times listed in (NAME OF SECTION NUMBER OR ATTACHMENT HERE).
☐ Temporary widening to maintain traffic lanes	
☑ Changeable message signs (PCMS)	PCMS signs are anticipated to be used on IH 894 Northbound and Southbound to alert traffic of planned full freeway closures.
☑ Ramp closures	Service ramps will be closed, although no 2 consecutive service ramps will be closed. Service Ramps will be closed during nighttime hours.
☑ Temporary signals/timing revisions	
☑ Coordination with adjacent projects	Zoo Interchange Phase 2, Project ID's: 1060-33-81 and 1060-43-81.
☑ Innovative contracting, (lane rental, A+B, etc)	Lane rental fee charged if lanes are not open to traffic by the peak hour times listed in (NAME OF SECTION NUMBER OR ATTACHMENT HERE).
☐ Temporary Emergency Pullouts	
☐ Motorist service patrols	
☑ Nighttime Work	Nighttime lane closures and full freeway closures. Permitted closure times listed in (NAME OF SECTION NUMBER OR ATTACHMENT HERE).

☑ Enhanced Traffic control devices (Wet reflective pavement marking, temp concrete barrier, etc)

☑ Reduced regulatory speed limit (requires declaration approved by Regional Traffic Engineer, & by BTO if 65-mph hwy or higher speed facility.)

Speed Limit Reduction to 50mph during construction will be consistent with the Speed Limit Reduction for the Zoo Interchange Construction Project in 2018.

17. Describe public information strategies planned (coordinate this activity with your Regional Communications Manager).

Press release, newspaper, 511 internet website, and weekly construction meetings.

18. Describe incident management strategies planned.

The pre construction meeting will discuss incident management strategies with local officials, county sheriff, and state patrol. Weekly construction meetings will be held during the project and all parties will be invited. Notification of upcoming changes to staging and traffic control will be communicated during construction. Emergency responders will be called for any incident during active work on the project.

19. Describe how transit impacts will be mitigated.

Milwaukee County Transit System (MCTS) will be contacted and invited to the 60% Plan review meeting to start coordinating and to determine transit impacts.

Attachments:

Attachments for TMP ID 3037 are listed below.

- [f] 1100-34-00 PIOP Checklist.docx
- [F] Section_11
  - [f] Attachment 1_Quadro Output Results_DRAFT_v2_170308.pdf
  - [f] Attachment 2_Synchro Intersection Analysis_DRAFT_v1_170309.pdf
  - [f] Attachment 3_FDM 11-50-30 Delay Calc_DRAFT_v1_170309.pdf
- [f] Traffic Control Overviews.pdf

*** [F] represents folder and [f] represents file.**

Approvals:

60% Approval

Signature Role	Signature Status	Signatory	Signed On
Project Manager (PM)	Signed	Ashley Kiepczynski	02/10/2017 07:32 AM
Regional Traffic (RT)	Signed	Rebecca Klein	04/13/2017 06:50 AM
Regional Project Development Chief (RPDC)	Signed	Bunmi Olapo	04/13/2017 11:16 AM
Bureau of Project Development (BPD)	Signed	William Anderson	04/17/2017 10:17 AM

ATTACHMENT 8

Environmental Commitments Basic Sheet

BASIC SHEET 8 – ENVIRONMENTAL COMMITMENTS

Attach a copy of this page to the design study report and the PS&E submittal package.

Factor Sheet	**Commitment** (If none, include "No special or supplemental commitments required.")
A-1 General Economics	Access to local businesses and residents would be maintained during construction.
A-2 Business	Access to local businesses would be maintained during construction.
A-3 Agriculture	No special or supplemental commitments required
B-1 Community or Residential	Access to local residences and community facilities would be maintained during construction.
B-2 Indirect Effects	No special or supplemental commitments required. See **Appendix A** for more information.
B-3 Cumulative Effects	No special or supplemental commitments required. See **Appendix A** for more information.
B-4 Environmental Justice	No special or supplemental commitments required
B-5 Historic Resources	No special or supplemental commitments required
B-6 Archaeological/Burial Sites	No special or supplemental commitments required
B-7 Tribal Coordination/Consultation	No special or supplemental commitments required
B-8 Section 4(f) and 6(f) or Other Unique Areas	No special or supplemental commitments required
B-9 Aesthetics	No special or supplemental commitments required
C-1 Wetlands	Wetland impacts will be avoided and minimized. Proper control measures will be used to prevent material from falling into wetlands from bridge work. Temporary access permits will be obtained from the DNR for minor work during construction. The temporary access permit will be obtained during final design, prior to construction. Any further commitments will be determined during final design phases.
C-2 Rivers, Streams and Floodplains	No special or supplemental commitments required
C-3 Lakes or other Open Water	No special or supplemental commitments required
C-4 Groundwater, Wells and Springs	No special or supplemental commitments required
C-5 Upland Wildlife and Habitat	No special or supplemental commitments required
C-6 Coastal Zones	No special or supplemental commitments required
C-7 Threatened and Endangered Species	No special or supplemental commitments required
D-1 Air Quality	No special or supplemental commitments required
D-2 Construction Stage Sound Quality	WisDOT Standard Specification 107.8(6) and 108.7.1 would apply

ATTACHMENT 9

Complete Streets

1100-34-00
84th Street to National Avenue
IH 894
Milwaukee County

Description:

The proposed project is located in the Cities of Greenfield, Milwaukee, and West Allis in Milwaukee County. Proposed improvements include rehabilitating the median, inside shoulders and outside shoulders, and resurfacing the driving lanes along IH 894 from 84th St to National Ave. The project/construction limits do not extend down the ramps and will not affect bike/pedestrian facilities at the ramp termini. Rehabilitation of the IH 894 bridges over Coldspring Rd, Oklahoma Ave and National Ave along with three structures in the Hale Interchange (E-N Ramp, N-E Ramp & S-N Ramp) will also be included with the proposed project. Each of the structures included with the project are located along IH 894 and will not impact any bike/pedestrian facilities.

Both pedestrian and bicycle accommodations are not being included in the projects because the proposed improvement is classified as freeway, which pedestrians and bicycles are prohibited from using.

2

2

N

IH 894/USH 45

W. COLD SPRING ROAD

CITY OF GREENFIELD

STRUCTURE B-40-187
PPC OVERLAY

STRUCTURE B-40-186
PPC OVERLAY

STRUCTURE B-40-189
PPC OVERLAY

STRUCTURE B-40-324
PPC OVERLAY

STRUCTURE B-40-188
PPC OVERLAY AND BRIDGE PAINTING

S-40-3010

S-40-3009

S-40-810

S-40-3007

S-40-3008

S-40-3011

BEGIN PROJECT
STA 88EW+99.10

IH 894/IH 43

ROOT RIVER

IH 43

S. 92ND STREET

S. 84TH STREET

W. LAYTON AVENUE/CTH Y

W. LAYTON AVENUE/CTH Y

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PROJECT OVERVIEW	SHEET	E

2

2

ROOT RIVER

CITY OF GREENFIELD

STRUCTURE B-40-186
PPC OVERLAY

STRUCTURE B-40-187
PPC OVERLAY

IH 894/USH 45

220NS

230NS

240NS

80NS

90NS

100NS

S-40-3004

110NS

120NS

130NS

140NS

S-40-3005

W. COLD SPRING ROAD

W. HOWARD AVENUE

W. BELOIT ROAD/CTH T

CITY OF MILWAUKEE

N

CITY OF WEST ALLIS

STRUCTURE B-40-119
PPC OVERLAY

STRUCTURE B-40-120
PPC OVERLAY

IH 894/USH 45

140NS

150NS

160NS

S-40-3005

170NS

S-40-3006

180NS

S-40-459

STRUCTURE B-40-124
PPC OVERLAY AND BRIDGE PAINTING

STRUCTURE B-40-123
PPC OVERLAY AND BRIDGE PAINTING

END PROJECT
STA 189NS+74.66

190NS

200NS

210NS

IH 894/USH 45

W. OKLAHOMA AVENUE

W. CLEVELAND AVENUE

W. NATIONAL AVENUE/CTH ES

W. LINCOLN AVENUE

N

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PROJECT OVERVIEW	SHEET	E

FILE NAME : X:\PDS\C3D\11003400\SHEETSPLAN\020201_PO.DWG
LAYOUT NAME - 020202_PO

PLOT DATE : 2/22/2017 11:58 AM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:500 FT

ATTACHMENT 10

Exceptions to Standards Report

CORRESPONDENCE/MEMORANDUM _____ **State of Wisconsin**

Date: May 4, 2017

To: David Stertz
Roadway Standards and Methods Section Chief
Bureau of Project Development

ATTN: Will Anderson, PE
Project Services Engineer for SE Region
Bureau of Project Development

Dave Platz
Field Operations Engineer
FHWA Wisconsin Division

From: Roberto Gutierrez
Project Development Chief
SE Region

Subject: **EXCEPTION TO STANDARDS REPORT**
Project I.D. 1100-34-00
IH 894
84TH St to Lincoln Ave
Milwaukee County

Report Prepared By: WisDOT SE Region

Your approval is requested for exception to standards as shown in the attached report for the subject project.

_____ 5/4/17
Project Development Chief — Date
SE Region

Approve:
_____ 5/4/17
Roadway Standards and Methods Section Chief — Date
Bureau of Project Development

Approve:
_____ 5/17/2017
~~Field Operations Engineer~~ Prog. & Proj. Del. Dir. — Date
FHWA Wisconsin Division

EXCEPTION TO STANDARDS REPORT

Project I.D. 1100-34-00
IH 894
84th Street to Lincoln Ave
Milwaukee County

I. Existing Highway Conditions and Proposed Improvement

Introduction

This report covers work to be performed in 2018 on IH 894/IH 41/IH 43/USH 45 from 84th St. to National Avenue, which includes the North-East and East-North through movements along IH 894/IH 41 in the Hale Interchange.

Existing Conditions

The project is located in the Cities of Greenfield, Milwaukee and West Allis in Milwaukee County. Interstate 894 (IH 894), Interstate 41 (IH 41), Interstate 43 (IH 43) and United States Highway 45 (USH 45) make up various segments of this project corridor and are part of the National Highway System. The pavement condition is poor with extensive amounts of transverse, longitudinal, reflective and alligator cracking. The drainage structures in the median are deteriorating and are in need of replacement. The last rehabilitation project was completed in 2003, about 15 years ago.

Traffic Data

Existing (2009) Average Weekday Daily Traffic (AWDT) volumes range from 128,200 vehicles per day (vpd) on I-894/I-43 between the Hale Interchange and 84th Street to 148,400 vpd on I-894/I-41/USH 45 between National Avenue and Oklahoma Avenue. Future (2028) AWDTs are expected to range from 140,000 vpd between Oklahoma Avenue and Beloit Road to 156,000 vpd near Lincoln Avenue, which represents an overall growth rate between 4% and 10% based on Southeastern Wisconsin Regional Planning Commission (SEWRPC) daily volume forecasts for the project corridor. The daily average truck percentage along I-894/I-41/I-43/USH 45 is about 11%.

Existing Conditions

The existing conditions traffic analysis is based on 2009 peak hour traffic volumes provided by the Wisconsin Department of Transportation (WisDOT) and modelled with the 2010 Highway Capacity Manual (2010 HCM) analysis methodology using Highway Capacity Software 2010 (HCS 2010). 2009 was selected as the existing year for analysis as there were minimal construction impacts on the southeast Wisconsin freeway system that would have effected traffic patterns. The AM peak hour is considered to be from 7:00 to 8:00AM and the PM peak hour is considered to be from 4:00 to 5:00PM for analysis purposes.

During the AM peak hour, the I-894/I-41/I-43/USH 45 corridor operates between level of service (LOS) C and D for both directions of travel. Operations during the PM peak hour ranges from LOS C to LOS E along the I-894/I-41/I-43/USH 45 corridor. I-894 eastbound (EB)/I-41 southbound (SB) at the National Avenue exit ramp, and between Beloit Road and the Hale Interchange operate at LOS E. In general, I-894/I-41/I-43/USH 45 westbound (WB)/northbound (NB) operated worse during the AM peak hour and I-894/I-43 EB/I-41/USH 45 SB operate worse during the PM peak hour due to the directional distribution of volumes during the peak hours.

Existing Configuration with 2028 Traffic Volumes ("No Build")

The No Build alternative assumes existing capacity on I-894/I-41/I-43/USH 45 south/east of National Avenue with a reconstructed Zoo Interchange, including auxiliary lanes between National Avenue and Oklahoma Avenue that were constructed in 2016. HCS 2010 analysis of the No Build AM and PM peak hours utilized future 2028 peak hour forecasted volumes, which were developed using a combination of the SEWRPC No Build forecast and historical growth rates for the corridor.

AM and PM peak hour operations north of National Avenue are expected to generally improve under the No Build scenario due to the design modifications and improved capacity added to I-894/I-41/USH 45 from the Zoo Interchange reconstruction project. South of National Avenue peak hour operations generally degrade at least one LOS from existing conditions due to increased future traffic volumes and the temporary transition that will exist between the Zoo Interchange reconstruction improvements and the existing I-894/I-41/USH 45/I-43 roadway sections until further future roadway reconstruction improvements can be completed. Several locations degrade to LOS F in the No Build scenario, including I-894 EB/I-41/USH 45 SB between National Avenue and Oklahoma Avenue (PM), I-894 EB/I-41/USH 45 SB between Beloit Road and the Hale Interchange (PM), and I-

894/I-41 EB and I-43/USH 45 SB between the Hale Interchange and 84th Street (AM/PM). Several other locations along I-894/I-41 WB, I-43/USH 45 NB, I-894/I-41 EB and I-41/USH 45 SB degrade to LOS E in both peak hours as well.

Proposed Configuration with 2028 Traffic Volumes ("Build")
The proposed (Build) alternative would provide an additional driving/auxiliary lane on I-894/I-41/I-43/USH 45 from 84th Street to National Avenue through the Hale Interchange. HCS 2010 analysis of the Build AM and PM peak hours utilized future 2028 peak hour forecasted volumes, which were developed using the SEWRPC Build forecast peak hour growth rates for the corridor.

In general, I-894/I-41/I-43/USH 45 is expected to improve under the Build alternative in comparison to the No Build alternative. There are a couple locations that would remain unchanged in terms of LOS in comparison to the No Build scenario. These locations include I-894/I-41 EB and /USH 45 SB between Beloit Road and the Hale Interchange (LOS F – PM peak) and I-894 EB/I-43 SB between the Hale Interchange and 84th Street (LOS F – AM/PM peaks). These segments remain at LOS F in the Build scenario because roadway is under capacity in the design year. All other segments operate at LOS D or better during the AM and PM peak hours.

See Attachment 2 for traffic volumes used for analysis of the corridor.

See Attachment 3 for the LOS summary of HCS 2010 analysis of the corridor.

Proposed Improvements

This project work consists of rehabilitating the median, inside and outside shoulders; improving the drainage system both structurally and flow capacity; resurfacing the existing driving lanes and restriping them to provide 4 lanes in each direction from 84th Street to National Avenue. Bridge rehabilitation work along IH 894/IH 41/IH 43/USH 45 between National Ave and 84th St is also included with the project.

At the southern/eastern project limits, the taper style entrance ramp at 84th Street will be converted to a thru lane along IH 894/IH 41/USH 45 NB/WB, creating a 4th lane. In the IH 894/IH 41/IH 43 SB/EB direction the 4th thru lane will end into the 84th Street exit ramp. At the northern limits the 4th lane will continue southbound, south of National Ave, instead of becoming an exit ramp to National Avenue as it is configured today. These improvements will:

- Increase the transition length southbound from the Zoo Interchange reconstruction into existing IH 894/IH 41/USH 41/IH 43 roadway cross section and the ramps within the Hale Interchange. The system ramp traffic in the Zoo Interchange has been reconfigured to right side ramp access as part of its design modernization so the additional transition length will allow a greater distance for drivers to move over and maneuver into the existing IH 894/IH 41/IH 43/USH 45 roadway cross section to continue southbound and eastbound.
- Allow for more gaps in traffic along northbound IH 894/IH 41/USH 45 approaching the reconstructed Zoo Interchange lane configurations. By adding a median lane, traffic wanting to travel east/west on IH 94 at the newly reconfigured system ramps on the right will have more gaps to move between travel lanes and into and out of ramps.
- Increase safety by allowing more time for drivers to make decisions and to lessen congestion and increase gaps between vehicles when maneuvering between mainline travel lanes and ramp lanes.
- Reduce the total amount of delay and improve reliability for drivers traveling within the corridor.
- Provide additional lanes available to drivers to negotiate around disabled and emergency vehicles during traffic incidents.
- Allow the corridor to handle additional traffic volumes when used as a mitigation route for detoured traffic during future planned highway construction along STH 100, I 94, I 43, etc.
- Temporarily improve traffic conditions along this corridor until a future reconstruction project can be scheduled and then provide for the roadway platform in which to stage traffic lanes during the corridors reconstruction.

II. Substandard Features (See Attachments 4 and 5)

Substandard Feature #1:
A 50mph design speed is requested along the mainline roadways of IH 894/IH 41 passing through the Hale Interchange described as Ramp EN (Sta 25REN+98.87 to Sta 45REN+18.08) and Ramp NE (Sta 29RNE+84.05 to Sta 55RNE+00.00).

Standard for Which Exception is requested:
Since the IH 894/IH 41 east-north and north-east roadways within the Hale Interchange are continuous mainline movements the design speed for these roadways should be 60mph the same as the mainline roadway sections north and east of the Hale Interchange as per 4R Interstate Standards.

Reason for Requesting Exception:
To provide standard 60 mph design speed curvature along these roadways would require bridges B-40-189 and B-40-324 to be fully reconstructed in conjunction with the entire Hale Interchange. The reconstruction of this interchange would need to be significantly reconfigured for a significant distance along each leg of the interchange including the reconstruction of the interchanges within each of these legs. This interchange reconstruction would require a major environmental document action to be completed along with major design and construction funding to be procured. Neither the time schedule nor funding is available at this time to proceed with such an action.

Safety mitigation specific to these substandard design speed segments will consist of high surface friction treatment on the roadway surface and the installation of new pavement marking and signing to give advance notice to drivers as to the curve conditions ahead and to adjust their speed appropriately. Where shoulder widths on bridges are being substantially narrowed, parapets will evaluated for crashworthiness and if the existing does not meet crash standards, the parapet will be replaced. An Intelligent Transportation System, DMS, will be implemented to help mitigate safety concerns. Further information on these strategies are described in more detail later in this report under section **V. Safety Enhancements**

Substandard Feature #2:
11-ft minimum lane widths are requested for 3 of the 4 proposed restriped lanes along IH 894/IH 41/IH 43/USH 45 throughout the project. Three 11-ft lanes and one 12-ft lane will be provided in each direction with lane #3 being a 12-ft lane in each direction. Typical sections showing these requested dimensions are shown in the Attachment 5 (Exhibit 1).

Standard for Which Exception is requested:
Lane widths for National Highway System Interstate routes are 12-ft minimum for 4R Interstate projects.

Reason for Requesting Exception:
In order to provide standard lane widths for all the driving lanes and make the proposed traffic operation improvements on IH 894/IH 41/IH 43/USH 45, the highway would need to be fully reconstructed/widened or the shoulder widths would need to be reduced even further from what is requested and shown in the Attachment 5 (Exhibit 1). As described below in Substandard Feature #3, both the inside and some of the outside shoulder widths are requested to be below standards, however it is proposed for the outside shoulder widths to be wide enough in most locations to accommodate the safe refuge of disabled and emergency vehicles throughout most of the project limits. The 3 out of 4 narrow, 11-ft lanes are required to keep the outside shoulder widths as wide as possible. In addition to the narrow lane and shoulder width exceptions, a single concrete safety barrier is proposed to be constructed within the median rather than the normal double concrete safety barrier installation. This is proposed to maximize the use of the existing median width to provide as wide of lane and shoulder widths as possible.

Narrow lane and shoulder widths could likely increase the rate of normal sideswipe crashes, however improved operations from restriping to one additional lane in each direction along IH 894 from 84th Street to National Ave will likely reduce congestion related sideswipe and rear-end crashes by a much larger amount then the amount the normal side-swipe crashes will increase thus reducing the overall rate of crashes. There is no other practical improvement between the proposed rehabilitation/restriping project with its

exception for lane widths alternative and a full reconstruction/widening project with standard lane widths that can be completed at this time.

Safety mitigation specific to these substandard lane widths will consist of high surface friction treatment on the roadway surface along horizontal curves and the installation of new pavement marking and signing to guide drivers to stay in their lanes. An Intelligent Transportation System, DMS, will be implemented to help mitigate safety concerns. Further information on these strategies are described in more detail later in this report under section **V. Safety Enhancements**

Substandard Feature #3:

2-4ft minimum median/inside shoulder widths are requested to be provided along IH 894/IH 41/IH 43/USH 45 throughout the project. See Typical Sections in the Attachment 5 (Exhibit 1 through 13) for exact locations and widths within the requested exception range of 2-4ft shoulder widths.

1.92-ft median/inside shoulder widths are requested to be provided at sign structures S-40-3004, S-40-3005, S-40-3006, S-40-3007 and S-40-018 (existing).

3-9.38-ft outside shoulder widths are requested to be provided along IH 894/IH 41/IH 43 from the north end of the Hale Interchange to 84th Street. 10ft outside shoulder widths will be provided along IH 894/IH 41/USH 45 from W. National Avenue to the north end of the Hale Interchange. See Typical Sections in the Attachment 5 (Exhibit 1 through 13) for exact locations and widths within the requested exception range of 3-9.8ft widths.

2-ft outside shoulder width is provided at Beloit Road NB on ramp. 2-ft shoulder width is an existing shoulder width which is being maintained as is.

Standard for Which Exception is requested:

4R Interstate design standards for this project require 10-ft minimum median/inside and outside shoulder widths on IH 894/IH 41/IH 43/USH 45 having 6 or more travel lanes.

Reason for Requesting Exception:

To provide minimum standard median/inside and outside shoulder widths and at the same time add additional travel/auxiliary lanes to improve traffic operations on IH 894, the highway would need to be fully reconstructed and widened or the outside shoulder widths would need to be reduced even further below standards from what is discussed here and shown in Attachment 5 (Exhibit 1 through 13).

Although some locations of outside shoulder widths are substantially below standards, most of the outside shoulder widths along IH 894/IH 41/USH 45 are close to or meet the 10-ft standard and have mountable curb allowing disabled and emergency vehicles to park partially off the outside edge of the shoulder to distance themselves from moving traffic. In those locations in which the shoulder widths are substantially below standards, highway sections with shoulder widths that are at or close to the 10ft standard are located not very far in which disabled and emergency vehicles can be fairly easily moved to these wider shoulder locations. In addition to the narrow lane and shoulder width exceptions, a single concrete safety barrier is proposed to be constructed within the median rather than the normal double concrete safety barrier installation. This is proposed to maximize the use of the existing median width to provide as wide of lane and shoulder widths as possible.

There are no practical incremental improvement alternatives between the requested non-standard shoulder width alternative proposed and a standard shoulder width alternative short of reconstruction and widening that is practicable to propose. Though these requested narrow lane and shoulder width exceptions may likely increase the rate of normal sideswipe crashes, the improved operations from the restriping to add an additional travel/auxiliary lane will reduce congestion related side-swipe and rear-end crashes by a greater number significantly reducing the overall crash rate along IH 894/IH 41/IH 43/USH 45 from 84th Street to National Ave.

Safety mitigation specific to these substandard shoulder widths will consist of high surface friction treatment on the roadway surface along horizontal curves at Ramp NE and Ramp EN, the installation of new pavement

marking and signing to help guide drivers to stay in their lanes. An Intelligent Transportation System, DMS, will be implemented to help mitigate safety concerns. Further information on these strategies are described in more detail later in this report under section **V. Safety Enhancements**

Substandard Feature #4:

The combination of concrete median safety barrier and/or bridge parapets in locations with existing substandard vertical curves create reduced sight obstructions along some of the horizontal curves sections within the project (See Attachment 5, Exhibits 14-18).

The standards for stopping sight distance are defined in FDM 11-10-5. The following locations in the project area do not meet the minimum stopping sight distance for their respective design speeds **(See Exhibits 14 through 18)**

Substandard Feature #4	*Stopping Sight Distance Obstruction	Location (Stationing)	Design Speed (mph)	SSD** Required (ft)	SSD** Provided (ft)	Estimated Speed Rating for SSD** Provided (mph)	Exhibit Number
SSD Below Minimum at Horizontal Curve Locations with Combined Vertical Curvature and/or Median Concrete Safety Barrier/Bridge Parapets	IH 894 NB Substandard Crest Curve	STA 105NS+20 – 108NS+75	60	570	455	52	14
	IH 894 NB Substandard Crest Curve	STA 145NS+75 – 148NS+25	60	570	465	53	15
	IH 894 NB Inside Lane Barrier Obstruction	STA 149NS+75 – 153NS+25	60	570	477	54	15
	IH 894 SB Substandard Crest Curve	STA 88NS+70 – 92NS+20	60	570	460	52	16
	IH 894 SB Inside Lane Barrier Obstruction	STA 107NS+20 – 111NS+70	60	570	389	47	14
	IH 894 SB Substandard Crest Curve	STA 110NS+90 – 113NS+90	60	570	469	53	14
	IH 894 SB Substandard Crest Curve	STA 151NS+70 – 155NS+90	60	570	458	52	15
	Ramp EN Barrier Obstruction	STA 30REN+50 – 37REN+00	50	425	362	45	17
	Ramp NE Barrier Obstruction	STA 33RNE+80 – 43RNE+85	50	425	238	34	18

*Controlling Criteria **SSD = Stopping Sight Distance

Standard for Which Exception is requested:

The minimum stopping sight distance standards for respective design speed locations are listed in the table above. The requested stopping sight distance exceptions with their estimated speed ratings are also listed in the table above.

Reason for Requesting Exception:

To meet minimum stopping sight distances throughout the project, the whole highway would need to be reconstructed with improved horizontal and vertical curvature meeting standards and/or along with the wider inside shoulder widths where concrete safety barrier is present. To maximize the widths of the shoulders, a single concrete safety barrier is proposed to be constructed within the median rather than the normal double

concrete safety barrier installation. This is proposed to maximize the use of the existing median width to provide as wide of lane and shoulder widths as possible.

Current crash reports indicate that significant crash patterns exist in the NB and SB directions between the Beloit Road exit and entrance ramps when highway congestion is present. The Curve from Sta. 105NS+20 to 113NS+90 is located within this location with crash patterns in the area which may be an indication that substandard stopping sight distance may be a contributor. For the Curve located between Sta. 145NS+75 to 155NS+90 the crash reports don't indicate the presence of significant crash patterns due to substandard stopping sight distance, however the overall Crash Rate within this segment is significantly higher than the Statewide Crash Rate. In addition, crash rates along the curves of Ramp EN and NE in the Hale Interchange are lower than the Statewide Crash Rate. It is very difficult in these locations to determine to what extent the substandard stopping sight distances are contributing to crashes versus congestion and the lane changing and merging/diverging of traffic between the mainline and ramps within these areas. Generally highway improvements that reduce the effects of congestion and improve lane changing and merging/diverging of traffic between mainline and interchange ramps will reduce the amount of hazards in which substandard sight distance could be a contributor in a crash and reduce the overall numbers of crashes.

As safety mitigation measures to reduce the impact of substandard sight distance on crashes, new LED lighting will be installed throughout the project improving the overall visibility for drivers at all points along the highway during all times of the day and high friction surface treatment will be placed at Ramp NE and EN at these substandard SSD locations to maximize vehicle stopping and steering performance as listed in the above table.

Substandard Feature #5:

Super-elevation rates vary from 2% to 7.5% throughout the project and are not consistent with 4R Interstate standards with respect to horizontal curvature present. The following curves have radii and/or super-elevations that result in speed ratings less than the required design speeds.

* Horizontal Feature (Curve, P.I. Deflection, etc.)	Location (Stationing)	Radius	Design Speed	* Super-Elevation (S.E.)	Existing Number of Lanes	Speed Rating (Estimation Using Existing Values & Design Standard Super Tables for a 6-lane Divided Highway)	Proposed Number of Lanes	Required Super-elevation Based on Existing Radius and Design Speed for the Proposed Restriped 8-lane Divided Highway)
IH 894 Curve NS1	94+02.30NS	2864.78'	60mph	3.1%	6	45mph	8	4.5%
IH 894 Curve NS2	106+63.59NS	1909.86'	60mph	4.2%	6	45mph	8	5.5%
IH 894 Curve NS3	141+88.47NS	5731.11'	60mph	2.0%	6	50mph	8	2.7%
IH 894 Curve NS4	154+53.03NS	2847.37'	60mph	3.0%	6	45mph	8	4.5%
IH 894 Curve NS5	182+90.96NS	5729.58'	60mph	2.0%	6	50mph	8	2.7%
IH 894 Curve EW1	85+28.96EW	2864.79'	60mph	3.1%	6	45mph	8	4.5%
IH 894 Curve RSN3	210+02.19RSN	1206.23'	60mph	6.0%	1	55mph	1	6.0% Min. Radius of 1,330'
IH 894 Curve RES3	207+92.07RES	763.94'	50mph	6.1%	1	35mph (using Green Book and 8% super)	1	6.0% Min. Radius of 833'
IH 894 Curve RENA1	39+75.76RENA	1762.94'	50mph	4.5%	2	45mph	3	4.7%
IH 894 Curve RENA2	56+87.27RENA	1637.03	50mph	7.5%	2	60mph (using Green Book	3	4.9%

						and 8% super)		
IH 894 Curve RENB1	30+06.10RENB	1637.01'	50mph	4.6%	2	45mph	3	4.9%
IH 894 Curve RNE1	32+93.62RNE	1909.86'	50mph	4.2%	2	45mph	3	4.5%
IH 894 Curve RNE2	43+31.64RNE	1432.40'	50mph	4.2%	2	40mph	3	5.2%
IH 894 Curve RNE4	61+07.30RNE	3819.75'	50mph	2.5%	2	45mph	3	2.8%
IH 894 Curve RNS1	43+35.55RNS	3274.04'	60mph	3.4%	1	50mph	1	4.1%

Standard for Which Exception is requested:
According to WisDOT FDM 4R Interstate Standards FHWA's requirement for super-elevation is to "Improve as closely as practical to the appropriate rate for new construction".

Reason for Requesting Exception:
Wedging the asphalt overlays to improve the super-elevation rates is not possible through this segment of IH 894/IH 41/IH 43/USH 45 without major modifications to the roadway profile, roadway alignment and/or median concrete safety barrier modification or some combination of each. To incorporate these modifications and make the proposed traffic operation improvements on IH 894/IH 41/IH 43/USH 45 the roadway and system ramps would need to be fully reconstructed/widened.

Improving the substandard super-elevations on the bridge structures is also not possible without major bridge work to the deck and/or super-structure or installing a wedged overlay on the bridge decks adversely impacting the structural load ratings.

There is no practical incremental improvement possible to incorporate between the proposed re-striping alternative with the requested substandard super-elevation exceptions and a reconstruction/widening alternative to meet standard super-elevation rates on this project.

Safety mitigation specific to these substandard super-elevations will consist of high surface friction treatment on the roadway surface along these substandard super-elevated horizontal curves and the installation of new pavement marking and signing to guide drivers to stay in their lanes. Drainage improvements will help to keep the pavement dryer during rainy and snow melt conditions maximizing roadway surface friction. An Intelligent Transportation System, DMS, will be implemented to help mitigate safety concerns. Further information on these strategies are described in more detail later in this report under section **V. Safety Enhancements**

Substandard Feature #6:
Existing 15.84'/Proposed15.84' vertical clearance at SN Ramp bridge (B-40-189) under NE Ramp bridge (B-40-188).

Standard for Which Exception is requested:
According to FDM 11-35-1.5 Attachment 1.9 - Minimum Vertical Clearance for Bridges to Remain

- The minimum vertical clearance for an existing bridge over a freeway or expressway is 16'-0''

The existing vertical clearance is 15.84' and the proposed vertical clearance after the proposed PPC maintenance overlay is placed on B-40-189 will remain 15.84' which is less than 16'-0".

Reason for Requesting Exception:
To correct the vertical clearance under the proposed rehabilitation/re-striping, the highway and its interchanges would need to be fully reconstructed/widened with a combination of mainline, ramp and side road profile adjustments. Since this substandard bridge vertical clearance involves bridges on ramps within the multi-level Hale Interchange, adjustments cannot be made to this bridge without impacting the mainline

and ramp profiles and clearances within the entire interchange. There is no practical incremental improvement alternative between the proposed rehabilitation/restriping project with the requested vertical clearance exception and clearance full reconstruction project.

Coordination with Bridge maintenance revealed that if a structure is hit then an additional inspection is required and a damage inspection needs to be documented on the Bridge HSI site. There is no information listed on the Bridge HSI site that any additional inspections of the structure had been completed. Thus there is no evidence available suggesting that substandard vertical clearance has contributed to any crashes within the corridor. The only information about any crashes near any of the structures amounted to 4 crashes from 2010-2014 that consisted of 2 sideswipe involving vehicle merging and 2 rear-end crashes that occurred when congestion was present in the area. According to the police reports there have been no crashes related to the concrete safety barrier or bridge parapets at any of the bridge structures.

III. Crash Information

Roadway	Crash Rate [1] (2007-2009, 2011-2012)	Statewide Crash Rate [1] (2008-2012)	Number & Severity of Crashes			
			Fatal	Injury	Property Damage	Total No. Crashes
I-894 EB/I-41 SB from Lincoln Ave to Oklahoma Ave	178.9	73.0	0	62	164	226
I-894 EB/I-41 SB from Oklahoma Ave to Hale Int	87.4	73.0	0	41	120	161
I-894 EB thru Hale Int (N-E System Ramp)	51.0	73.0	0	5	9	14
I-894 EB/I-43 NB from Hale Int to 84th St	55.9	73.0	0	14	29	43
I-894 WB/I-43 SB from 84th St to Hale Int	50.1	73.0	0	14	24	38
I-894 WB thru Hale Int (E-N System Ramp)	31.3	73.0	0	2	4	6
I-894 WB/I-41 NB from Hale Int to Oklahoma Ave	135.2	73.0	0	65	209	274
I-894 WB/I-41 NB from Oklahoma Ave to Lincoln Ave	208.2	73.0	0	72	189	261

[1] Crash rate based on 100 million vehicles miles traveled (100 MVMT)

Comments:

- The larger roadway segment crash rates shown above were calculated based on the weighted averages of individual, smaller roadway segment crash rates
- Crash data from 2010 was excluded from the crash analysis due to the Zoo Interchange Emergency Bridge Repair project that took place which significantly influenced traffic demand and travel patterns on I-894/I-41/I-43/USH 45 that were inconsistent with the preceding and subsequent years

Significant Crash Locations or Patterns

Location	Years	Number & Severity of Crashes				Crash Rate[(2)]	Possible Factors Contributing to Crashes
		Fatal	Injury	Property Damage	Total		
I-894 EB/I-41 SB from Lincoln Ave to National Ave Exit Ramp	2007-2009, 2011-2012	0	25	68	93	264.7	A, B
I-894 EB/I-41 SB btwn National Ave Exit and Entr Ramps		0	28	73	101	367.3	A, B, C, D
I-894 EB/I-41 SB btwn Beloit Rd Exit and Entr Ramps		0	16	46	62	181.5	A, B, D
I-894 WB/I-41 NB btwn Beloit Rd Exit and Entr Ramps		0	30	83	113	487.5	A, B, D
I-894 WB/I-41 NB btwn National Ave Exit and Entr Ramps		0	21	73	94	313.8	A, B, D
I-894 WB/I-41 NB from National Ave Entr Ramp to Lincoln Ave		0	37	79	116	196.2	A, B, C

[(2)] Crashes per million entering vehicles (MEV)

Comments:

A – Peak hour traffic congestion (rear-end crashes prevalent)

B – Merge/diverge and/or weaving operational issues (mainly sideswipe and angle crashes prevalent)

C – High service ramp entering or exiting volumes (mainly sideswipe and angle crashes prevalent)

D – Horizontal and/or vertical geometric issues (all crash types including single vehicle crashes prevalent)

IV. Cost Data

As mentioned in previous sections of the ESR, outside of the rehabilitation/restriping project alternative as proposed and/or some variations in lane and shoulder width trade-off dimensions still requiring exceptions to standards which were substantially discussed between WisDOT SE Region Sections and Central Office Bureaus and FHWA when scoping the project, reconstruction of the mainline and interchanges in the corridor is the only real next viable option.

Magnitude cost to reconstruct the entire IH 894/IH 41/IH 43/USH 45 corridor from W. National Avenue to 84th Street with interchange reconstructions would be approximately $650 million which would result in significant adverse impacts, including right of way acquisitions, potential property relocations, and various social and environmental impacts.

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Magnitude cost of just reconstructing the Hale Interchange, including earthwork and excavations, pavement and structure replacement, potential local road access modifications, as well as reconstruction of the HWY 100 Interchange and 92nd Street bridge would be approximately $350 million - $400 million which would result in various adverse impacts, including right of way acquisitions, potential property relocations, and various social and environmental impacts.

Reconstruction in the magnitude of either of these above options will require completing a major Environmental Document Process Actions, such as an Environmental Impact Statement (EIS) or Environmental Assessment (EA), which could take up to 3 – 5 years to complete. Funding availability for these alternatives is likely not going to be available for some time beyond the 3- 5 years as other project studies that are underway or scheduled before this project could occur have not secured their funding. These timeframes in themselves require an interim project to be completed to preserve this roadway prior to when reconstruction can be completed and a good portion of the proposed rehabilitation cost is reusable for traffic control and staging that would be needed to be completed in advance of beginning any reconstruction work.

V. Safety Enhancements

WisDOT, BTO and FHWA are working together on the installation of an additional DMS, active chevron signs and solid pavement markings through substandard curves to mitigate safety concerns based on recommendations from the managed lanes feasibility study.

A DMS currently exists along IH 894 SB towards the norther project limits that was installed in 2016. A DMS will be included with the current project along IH 894 NB towards the northern project limits. At each of these locations the DMS will provide advanced information to drivers about upcoming incidents, out of the normal traffic operations and special weather conditions.

A DMS is proposed along IH 894 SB prior to the Hale Interchange based on recommendations from the Potential Managed Lanes Strategies Memo (See Attachment 6). The DMS prior to the Hale Interchange will serve the same purposes as the two DMS signs at the northern project limits but will include additional measures to address the substandard geometrics, stopping sight distance and design speed, along the north to east movement/curve through the Hale Interchange. The DMS will have the ability to display information such as too fast for curve and backups ahead. The addition of blinking chevron signs and solid pavement marking lines will also help mitigate safety concerns.

The following is the list of features included in the proposed design that will help to achieve significantly improved safety and traffic operations beyond doing nothing:

- Reduce congestion and improve traffic weaving operations between the Zoo Interchange Reconstruction Improvements and the existing IH 894/IH 41/IH 43/USH 45 roadway section including improvements to the existing interchange ramp/auxiliary lane configurations along the corridor.
- Provide new storm sewer structures to improve drainage and stabilize the median pavement structure by replacing the deteriorating storm sewer pipes.
- Improved interchange lighting will increase driver sight lines in general and mitigate for the reduced stopping sight distance exceptions by allowing drivers to see beyond vehicle taillights of disabled and emergency/maintenance vehicles stopped along the roadway for the entire vehicle roofline profiles above the concrete safety barrier during evening hours.
- High friction surface treatment to improve vehicle tire friction performance for crash avoidance maneuvers during all weather conditions, but especially during wet or icy conditions.

Attachments
Attachment 1 – Project Location Overview Map
Attachment 2 – Traffic Forecast
Attachment 3 – Highway Capacity Analysis
Attachment 4 – Design Exception Locations Overview
Attachment 5 – Design Exception Exhibits
Attachment 6 – Potential Managed Lanes Strategies Memo

ATTACHMENT 1

Attachment 1

2

2

N

IH 894/USH 45

W. COLD SPRING ROAD

CITY OF GREENFIELD

STRUCTURE B-40-187
PPC OVERLAY

STRUCTURE B-40-186
PPC OVERLAY

STRUCTURE B-40-189
PPC OVERLAY

STRUCTURE B-40-324
PPC OVERLAY

STRUCTURE B-40-188
PPC OVERLAY AND BRIDGE PAINTING

BEGIN PROJECT
STA 88EW+99.10

IH 894/IH 43

IH 43

S. 92ND STREET

S. 84TH STREET

W. LAYTON AVENUE/CTH Y

W. LAYTON AVENUE/CTH Y

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PROJECT OVERVIEW	SHEET	E

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LAYOUT NAME - 020201_PO

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Attachment 1

2

2

CITY OF GREENFIELD

IH 894/USH 45

STRUCTURE B-40-186
PPC OVERLAY

STRUCTURE B-40-187
PPC OVERLAY

220NS

230NS

240NS

80NS

90NS

100NS

110NS

120NS

130NS

140NS

W. COLD SPRING ROAD

W. HOWARD AVENUE

W. BELOIT ROAD/CTH T

CITY OF MILWAUKEE

IH 894/USH 45

N

CITY OF WEST ALLIS

STRUCTURE B-40-119
PPC OVERLAY

STRUCTURE B-40-120
PPC OVERLAY

140NS

150NS

160NS

170NS

180NS

STRUCTURE B-40-124
PPC OVERLAY AND BRIDGE PAINTING

STRUCTURE B-40-123
PPC OVERLAY AND BRIDGE PAINTING

END PROJECT
STA 189NS+74.66

190NS

200NS

210NS

IH 894/USH 45

W. OKLAHOMA AVENUE

W. CLEVELAND AVENUE

W. NATIONAL AVENUE/CTH ES

W. LINCOLN AVENUE

N

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PROJECT OVERVIEW	SHEET	E

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ATTACHMENT 2

Attachment 2

I-41/894 Resurfacing Project

DSR - Traffic Forecast Report

Corridor Peak Hour Volumes

Direction	Segment/Ramp	AM Peak Hour Vol (veh)			PM Peak Hour Vol (veh)		
		Existing (2009)	No Build (2028)	Build (2028)	Existing (2009)	No Build (2028)	Build (2028)
I-41 SB/ I-894 EB	Zoo Int W-S Sys Ramp	1220	1429	1591	1840	2054	2263
	Zoo Int N-S Sys Ramp	2440	2857	3183	3100	3454	3808
	Zoo Int E-S Sys Ramp	740	867	964	1200	1338	1476
	Greenfield Ave Exit Ramp (from NB)	450	211	235	490	179	198
	Greenfield Ave Exit Ramp (from EB/WB)		317	352		367	404
	Greenfield Ave - Zoo Int Sys Ramps	-	2646	2948	-	3275	3610
	Zoo Sys Ramps - Greenfield Ave	-	4625	5151	-	6300	6945
	Greenfield Ave Entr Ramp	490	575	640	680	754	833
	Greenfield Ave - Lincoln Ave	4440	5200	5791	6330	7054	7778
	Lincoln Ave Exit Ramp	540	633	704	470	523	576
	Lincoln Ave - National Ave	3900	4567	5087	5860	6531	7202
	National Ave Exit Ramp	250	294	326	460	517	569
	National Ave Entr Ramp	460	539	601	700	778	858
	National Ave - Oklahoma Ave	4110	4812	5362	6100	6792	7491
	Oklahoma Ave Exit Ramp	830	972	1082	820	912	1005
	Oklahoma Ave - Beloit Rd	3280	3840	4280	5280	5880	6486
	Beloit Rd Exit Ramp	200	233	261	480	534	588
	Beloit Rd Entr Ramp	450	525	585	480	535	589
	Beloit Rd - Hale Int	3530	4132	4604	5280	5881	6487
	Hale Int N-W Sys Ramp	1100	1289	1437	1830	2038	2250
	Hale Int N-E Sys Ramp	2430	2843	3167	3450	3843	4237
I-41 NB/ I-894 WB	Zoo Int S-E Sys Ramp	1340	1585	1775	1070	1198	1323
	Zoo Int S-W Sys Ramp	1380	1617	1803	1560	1748	1927
	Zoo Int S-N Sys Ramp	3250	3817	4250	2670	2994	3300
	Zoo Int - Greenfield Ave	-	3208	3572	-	2792	3078
	Greenfield Ave Entr Ramp (to NB)	670	609	678	480	202	222
	Greenfield Ave Entr Ramp (to EB/WB)		176	196		333	367
	Greenfield Ave - Zoo Int Sys Ramps	-	6234	6954	-	5405	5961
	Greenfield Ave Exit Ramp	420	494	548	610	685	756
	Lincoln Ave - Greenfield Ave	5720	6728	7502	5430	6090	6717
	Lincoln Ave Entr Ramp	620	725	808	700	779	860
	National Ave - Lincoln Ave	5100	6003	6694	4730	5311	5857
	National Ave Entr Ramp	470	550	613	390	434	479
	National Ave Exit Ramp	270	289	322	490	504	556
	Oklahoma Ave - National Ave	4900	5742	6403	4830	5381	5934
	Oklahoma Ave Entr Ramp	600	702	784	560	623	688
	Beloit Rd - Oklahoma Ave	4300	5040	5619	4270	4758	5246
	Beloit Rd Entr Ramp	430	504	561	250	278	307
	Beloit Rd Exit Ramp	340	398	443	370	412	454
	Hale Int - Beloit Rd	4210	4934	5501	4390	4892	5393
	Hale Int W-N Sys Ramp	1550	1816	2023	1370	1527	1683
	Hale Int E-N Sys Ramp	2660	3118	3478	3020	3365	3710
I-43 NB/ I-894 EB	124th St - WIS 100	2350	2751	3064	2010	2239	2468
	WIS 100 Entr Ramp	1000	1172	1306	840	937	1033
	WIS 100 - Hale Int	3350	3923	4370	2850	3176	3501
	Hale Int W-E Sys Ramp	1800	2107	2347	1480	1649	1818
	Hale Int - 84th St	4230	4950	5514	4930	5492	6055
	84th St Exit Ramp	400	468	521	770	856	945
	84th St - Forest Home Ave	3830	4482	4993	4160	4636	5110
	Forest Home Ave Entr Ramp	460	539	600	190	212	233
	76th St Entr Ramp	510	597	665	520	579	639
	76th St - 60th St	4800	5618	6258	4870	5427	5982
I-43 SB/ I-894 WB	WIS 100 - 124th St	1620	2018	2249	2260	2519	2777
	WIS 100 Exit Ramp to NB	90	109	122	100	110	124
	WIS 100 Exit Ramp to SB	810	969	1080	1250	1392	1536
	Hale Int - WIS 100	2520	3096	3451	3610	4021	4437
	Hale Int E-W Sys Ramp	1420	1807	2014	1780	1983	2187
	84th St - Hale Int	4080	4925	5492	4800	5348	5897
	84th St Entr Ramp	480	563	631	560	625	689
	Forest Home Ave - 84th St	3600	4362	4861	4240	4723	5208
	Forest Home Ave Exit Ramp	150	193	215	250	279	307
	76th St - Forest Home Ave	3750	4555	5076	4490	5002	5515
	76th St Exit Ramp	400	515	574	640	713	786
	60th St - 76th St	4150	5070	5650	5130	5715	6301

ATTACHMENT 3

I-894/I-41 Resurfacing Project

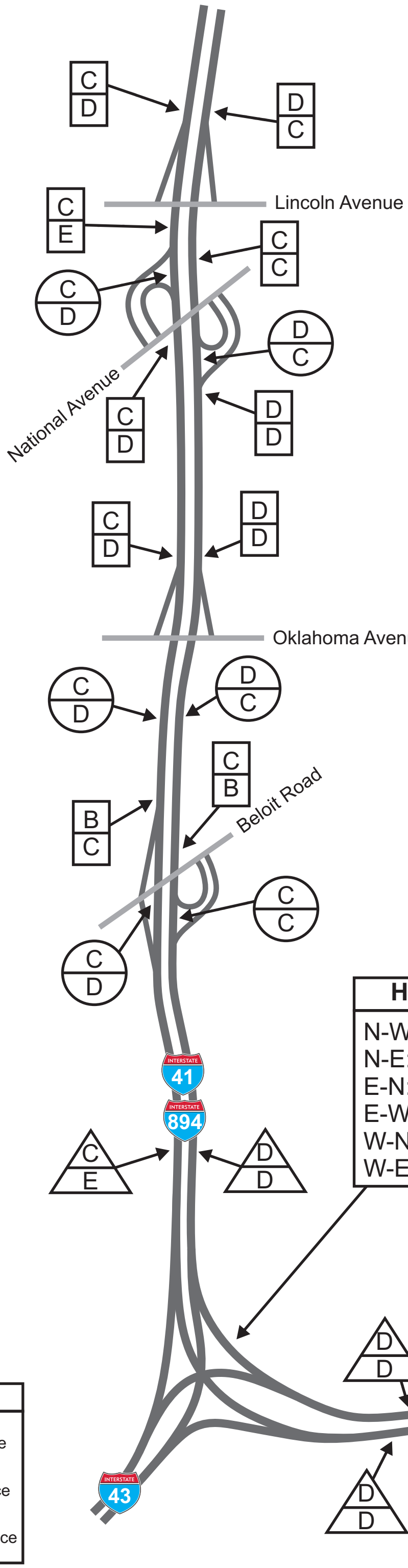
Existing Peak Hour Conditions (2009)

HCS 2010 Results

Attachment 3

N

Not to Scale



Hale Interchange LOS	
N-W: AM = C	PM = E
N-E: AM = C	PM = D
E-N: AM = C	PM = D
E-W: AM = D	PM = D
W-N: AM = B/D*	PM = B/D*
W-E: AM = E	PM = D

*2 lane segment/1 lane segment

Legend

AM / PM - Basic Segment Level of Service

AM / PM - Ramp Segment Level of Service

AM / PM - Weave Segment Level of Service

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I-894/I-41 Resurfacing Project

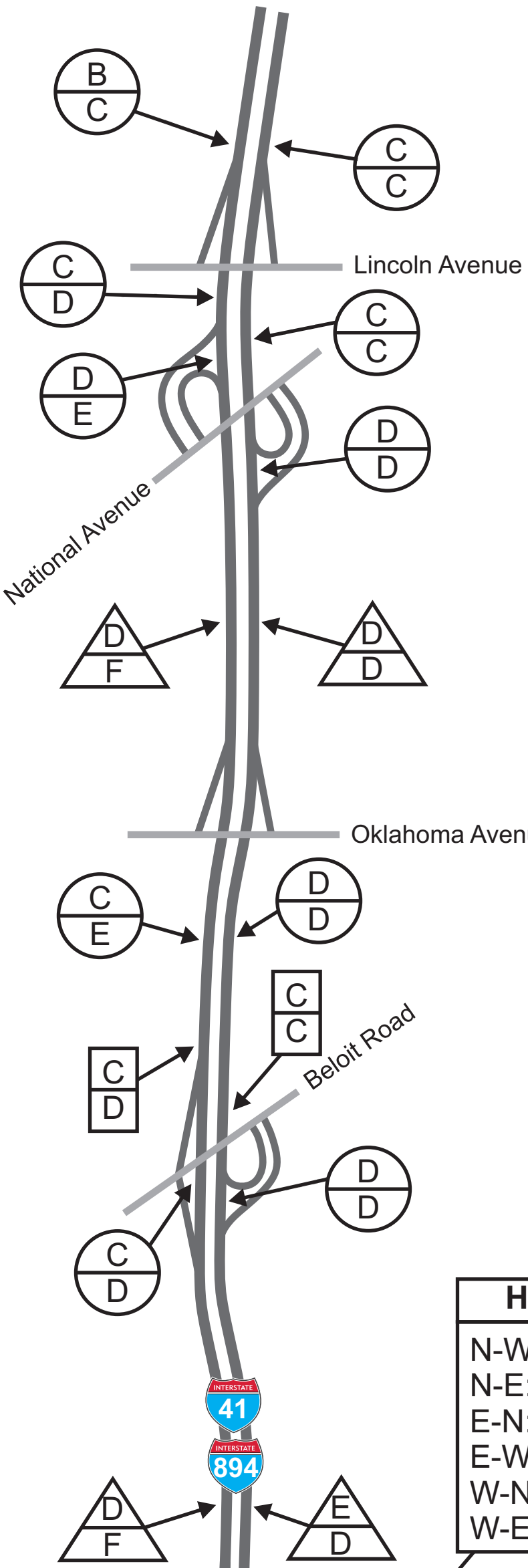
Future (2028) No Build Peak Hour Conditions

HCS 2010 Results

Attachment 3

N

Not to Scale



Hale Interchange LOS	
N-W: AM = C	PM = E
N-E: AM = D	PM = E
E-N: AM = D	PM = D
E-W: AM = E	PM = E
W-N: AM = B/E*	PM = B/D*
W-E: AM = F	PM = D

*2 lane segment/1 lane segment

Analysis assumes rebuilt Zoo Interchange to National Avenue and auxiliary lanes between National Avenue and Oklahoma Avenue (built for Zoo Int mitigation)

Legend

AM / PM - Basic Segment Level of Service

AM / PM - Ramp Segment Level of Service

AM / PM - Weave Segment Level of Service

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I-894/I-41 Resurfacing Project

Future (2028) Build Peak Hour Conditions

HCS 2010 Results

Attachment 3

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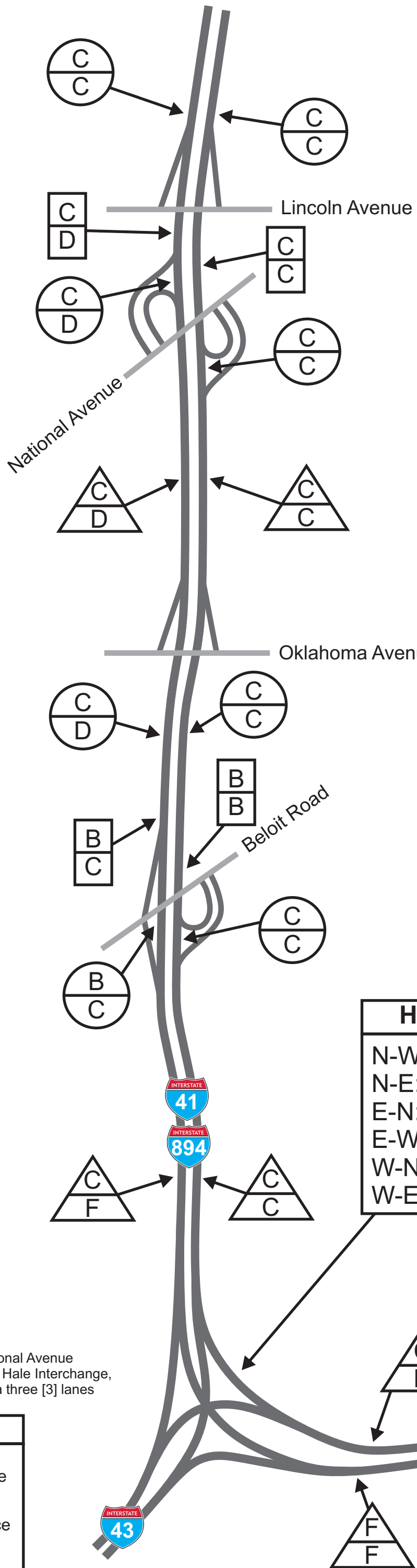

Hale Interchange LOS	
N-W: AM = D	PM = F
N-E: AM = B	PM = C
E-N: AM = C	PM = C
E-W: AM = E	PM = F
W-N: AM = C/E*	PM = B/D*
W-E: AM = F	PM = E

*2 lane segment/1 lane segment

Analysis assumes rebuilt Zoo Interchange to National Avenue and eight (8) lanes between National Avenue and Hale Interchange, as well as the Hale Interchange to 84th Street (via three [3] lanes on both the N-E and E-N system ramps)

Legend

AM / PM - Basic Segment Level of Service

AM / PM - Ramp Segment Level of Service

AM / PM - Weave Segment Level of Service

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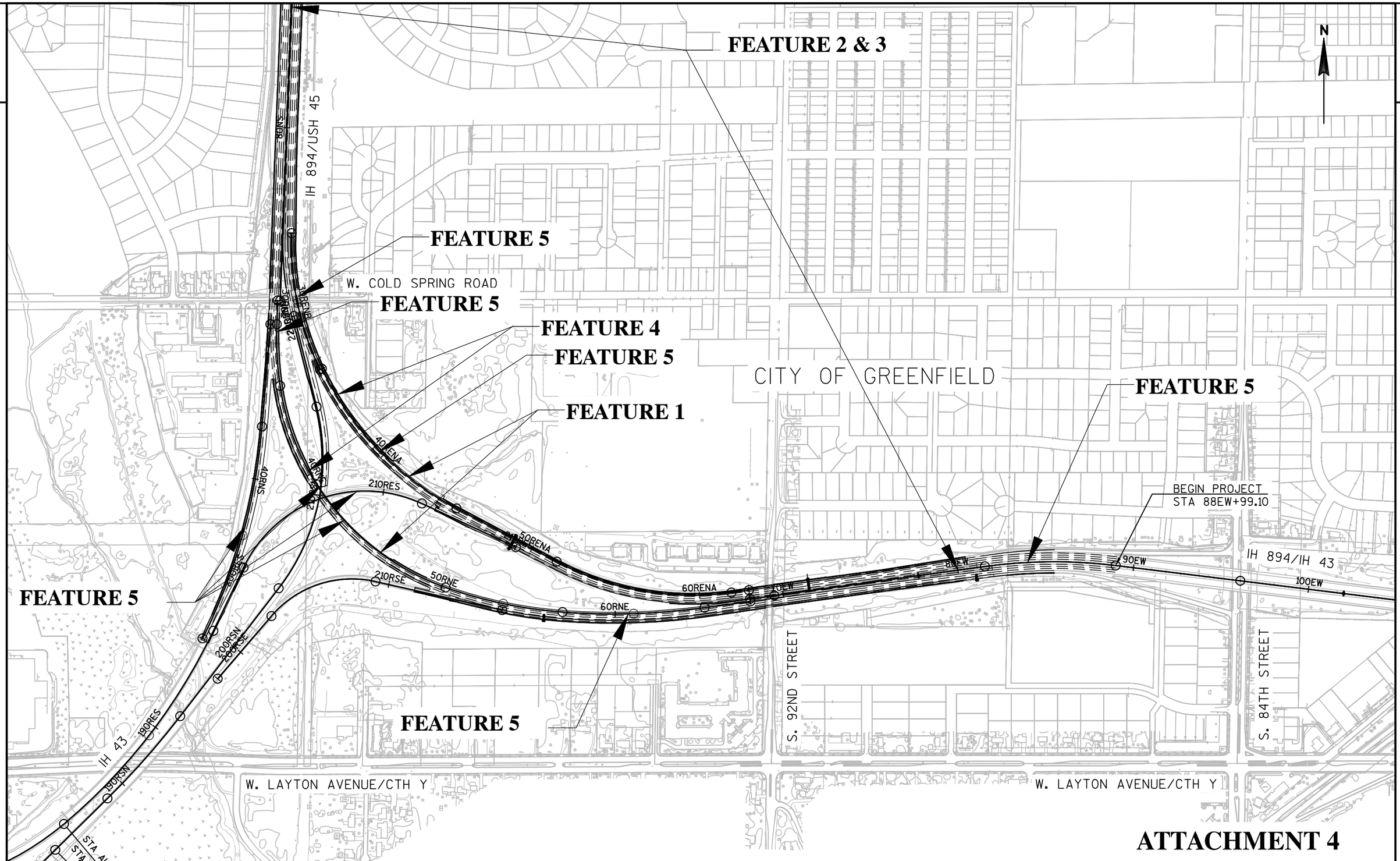
ATTACHMENT 4



ATTACHMENT 4

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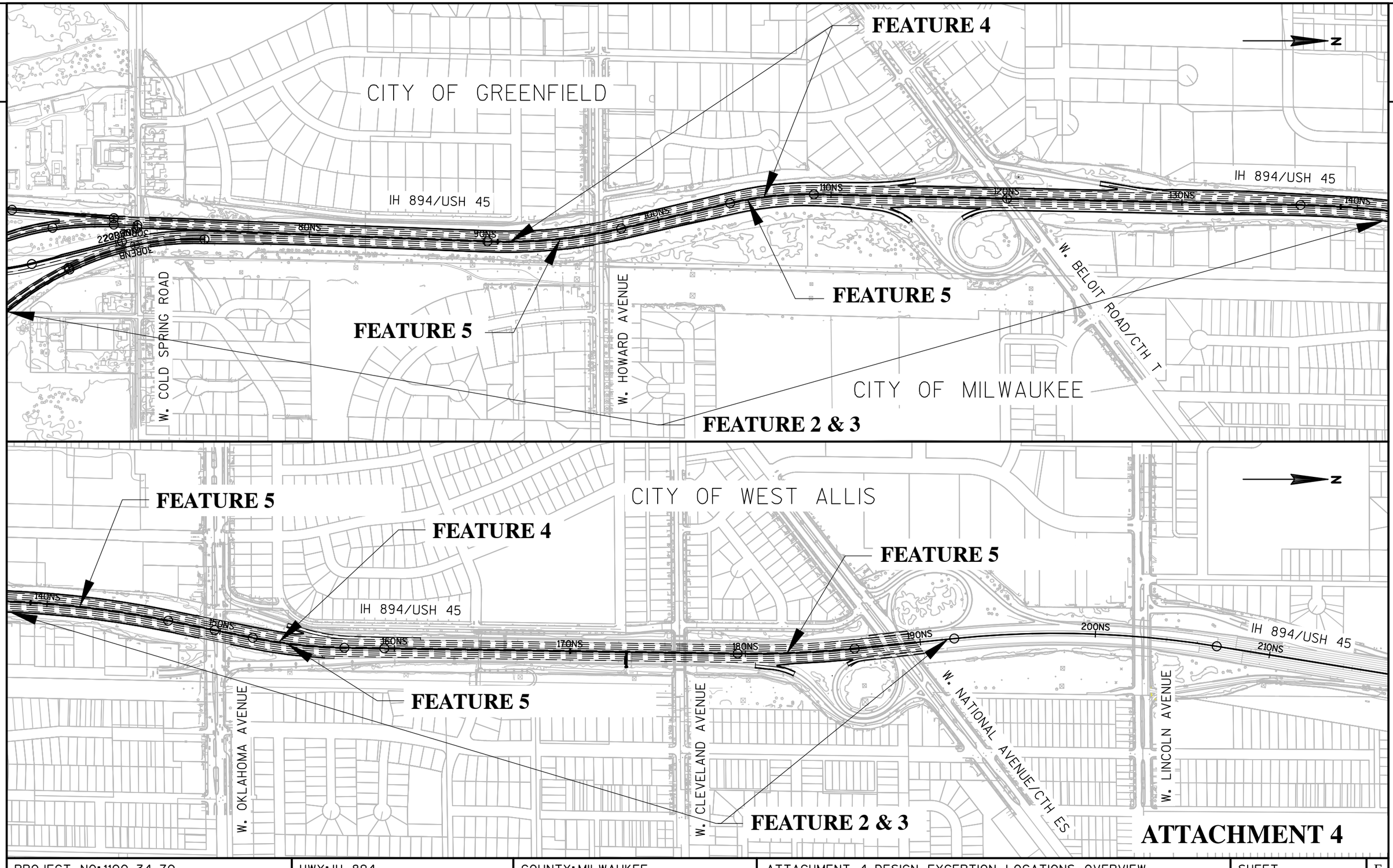

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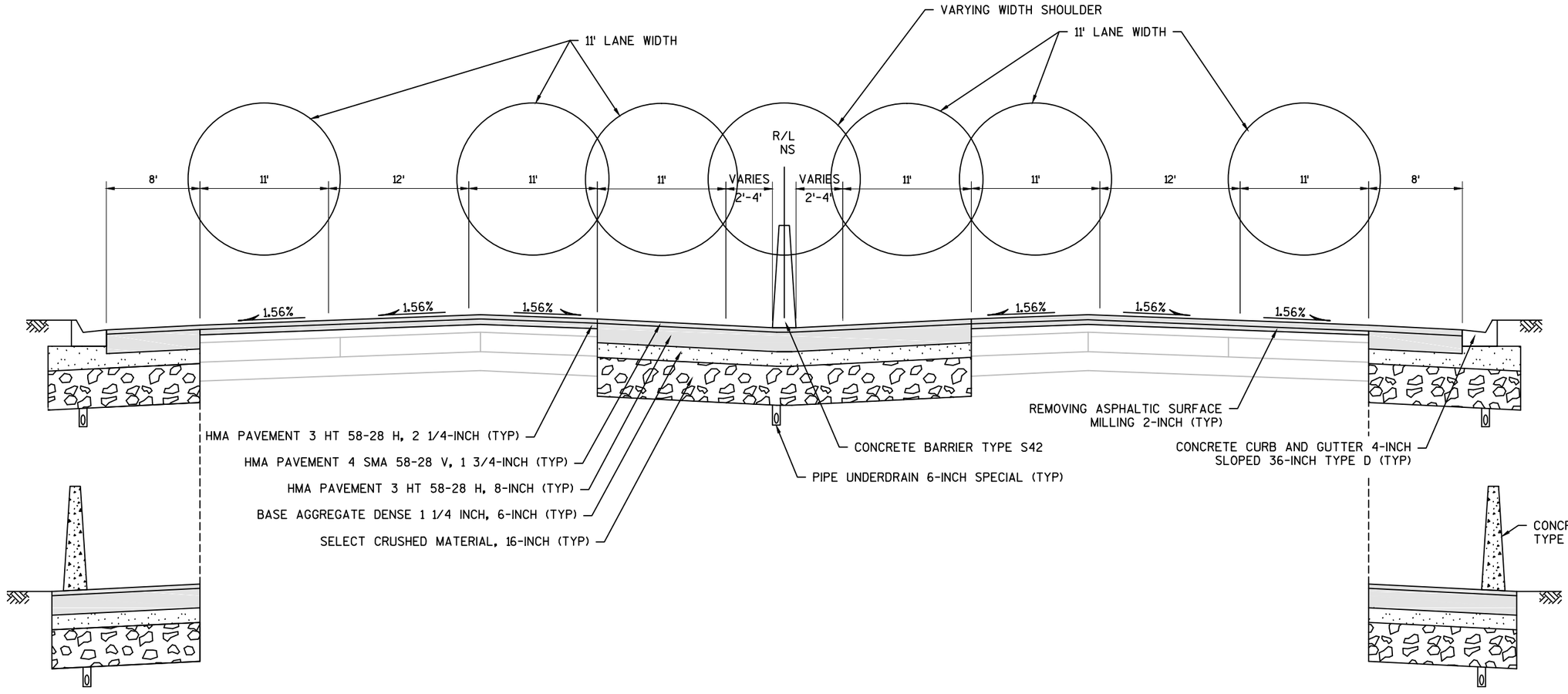
ATTACHMENT 5



STA. 70NS+87.35 TO STA. 90NS+15.71
STA. 97NS+84.25 TO STA. 98NS+55.35
STA. 120NS+19.55 TO STA. 121NS+57.20

STA. 74NS+03.88 TO STA. 77NS+33.58
STA. 147NS+53.48 TO STA. 148NS+87.78
STA. 155NS+70.76 TO STA. 155NS+92.55

TYPICAL FINISHED SECTION

IH 894/IH 43/USH 45

STA. 70NS+90.30 TO 90NS+15.71 EB
STA. 74NS+03.88 TO STA. 90NS+15.71 WB
STA. 97NS+84.25 TO STA. 104NS+21.88
STA. 109NS+02.74 TO STA. 136NS+76.73
STA. 146NS+97.51 TO STA. 148NS+87.78
STA. 186NS+24.46 TO 187NS+48.19 WB

EXHIBIT 1

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

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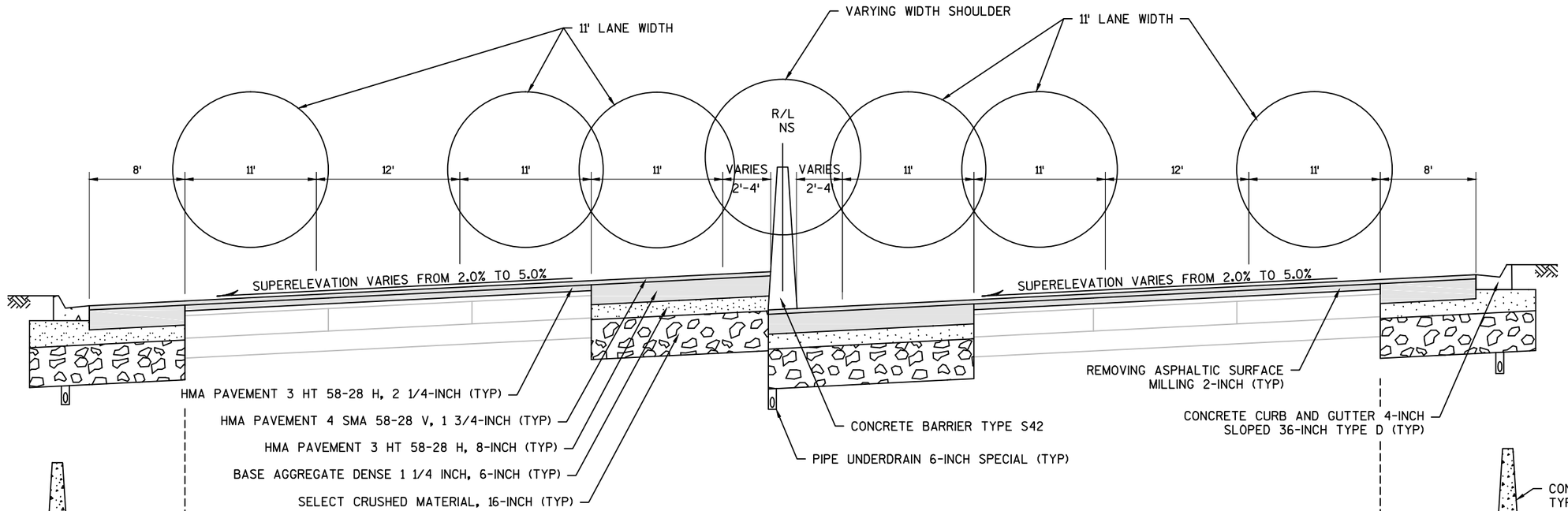
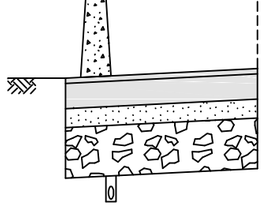
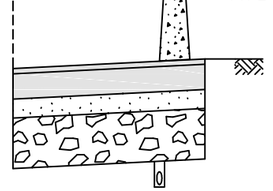




STA. 90NS+15.71 TO STA. 92NS+49.19
STA. 96NS+97.96 TO STA. 97NS+84.25
STA. 150NS+48.71 TO STA. 153+22.19



STA. 94NS+62.21 TO STA. 96NS+13.40
STA. 150NS+73.44 TO STA. 156NS+04.99

TYPICAL FINISHED SECTION

IH 894/IH 43/USH 45 SUPERELEVATED

STA. 90NS+15.71 TO STA. 97NS+84.25
STA. 104NS+21.88 TO STA. 109NS+02.74
STA. 136NS+76.73 TO STA. 146NS+97.51
STA. 150NS+73.44 TO STA. 156NS+58.77 WB
STA. 150NS+48.71 TO STA. 157NS+15.61 EB
STA. 180NS+57.75 TO STA. 186NS+24.46 WB

EXHIBIT 2

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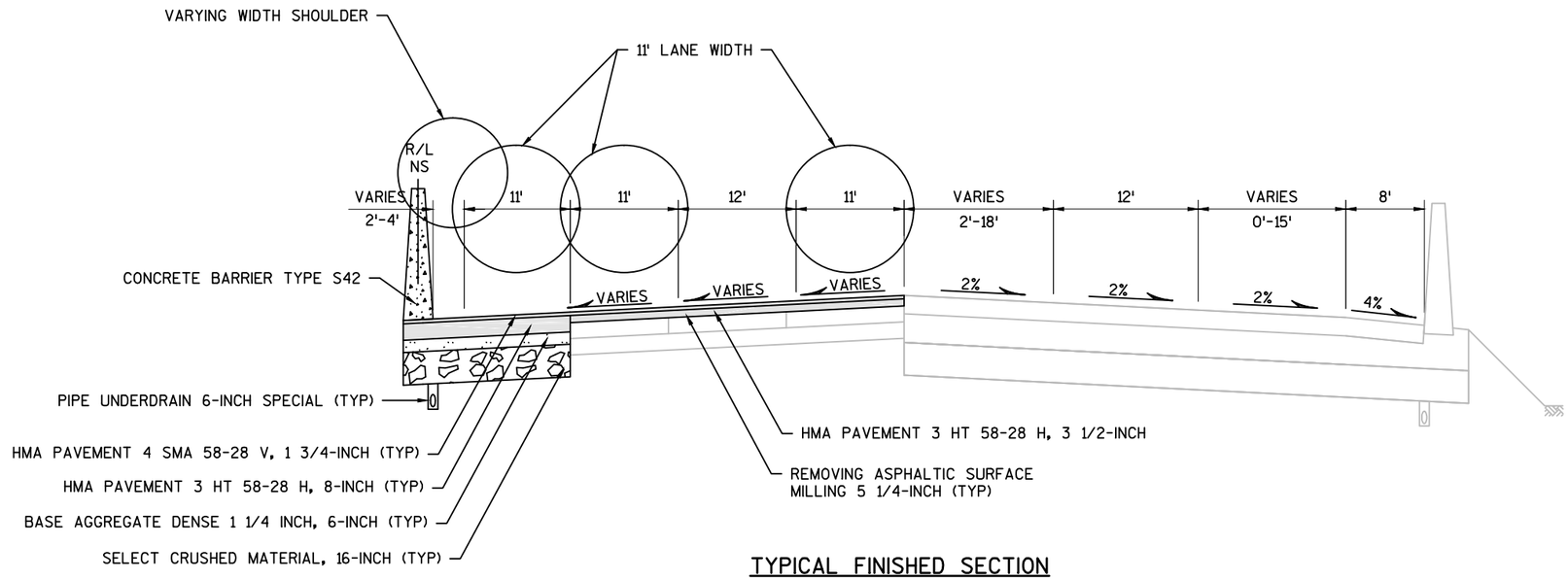


TYPICAL FINISHED SECTION

IH 894 WB/USH 45 NB

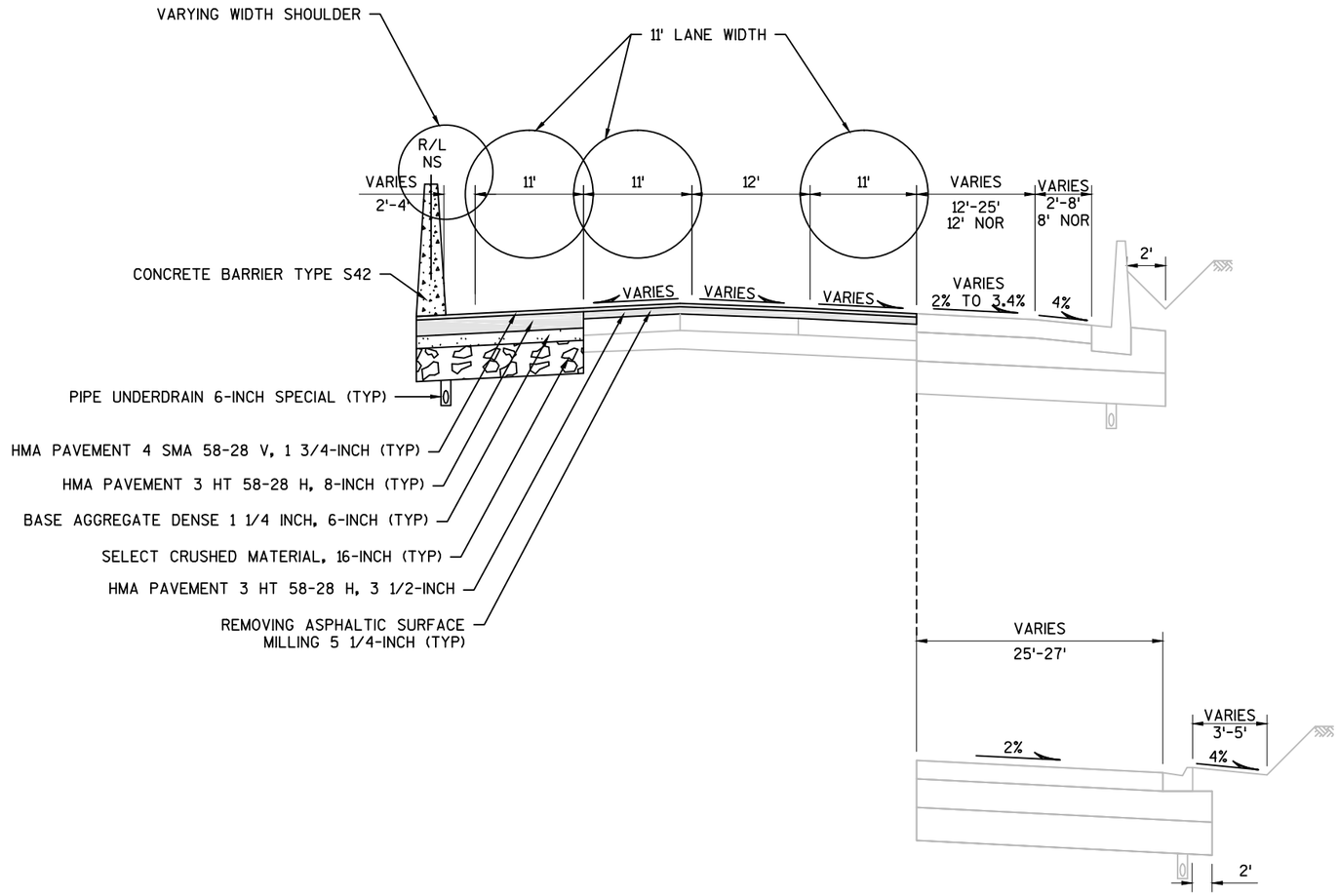
STA. 156NS+58.77 TO STA 160NS+66.98

EXHIBIT 3

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

FILE NAME : X:\1100-34-00 IH894 HALE TO LINCOLN\DESIGN ENG. REPORTS\EXCEPTION TO STDS. REPORT (ESR)\ATTACHMENTS\EXHIBITS_TS.DWG PLOT DATE : 2/14/2017 2:14 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT
PROJECTSHEETDATA - 020403_TS

WISDOT/CADDS SHEET 42



STA. 180NS+21.63 TO STA. 180NS+57.75

TYPICAL FINISHED SECTION

IH 894 WB/USH 45 NB

STA. 160NS+66.98 TO STA. 180NS+57.75

EXHIBIT 4

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

FILE NAME : X:\1100-34-00 IH894 HALE TO LINCOLN\DESIGN ENG. REPORTS\EXCEPTION TO STDS. REPORT (ESR)\ATTACHMENTS\EXHIBITS_TS.DWG
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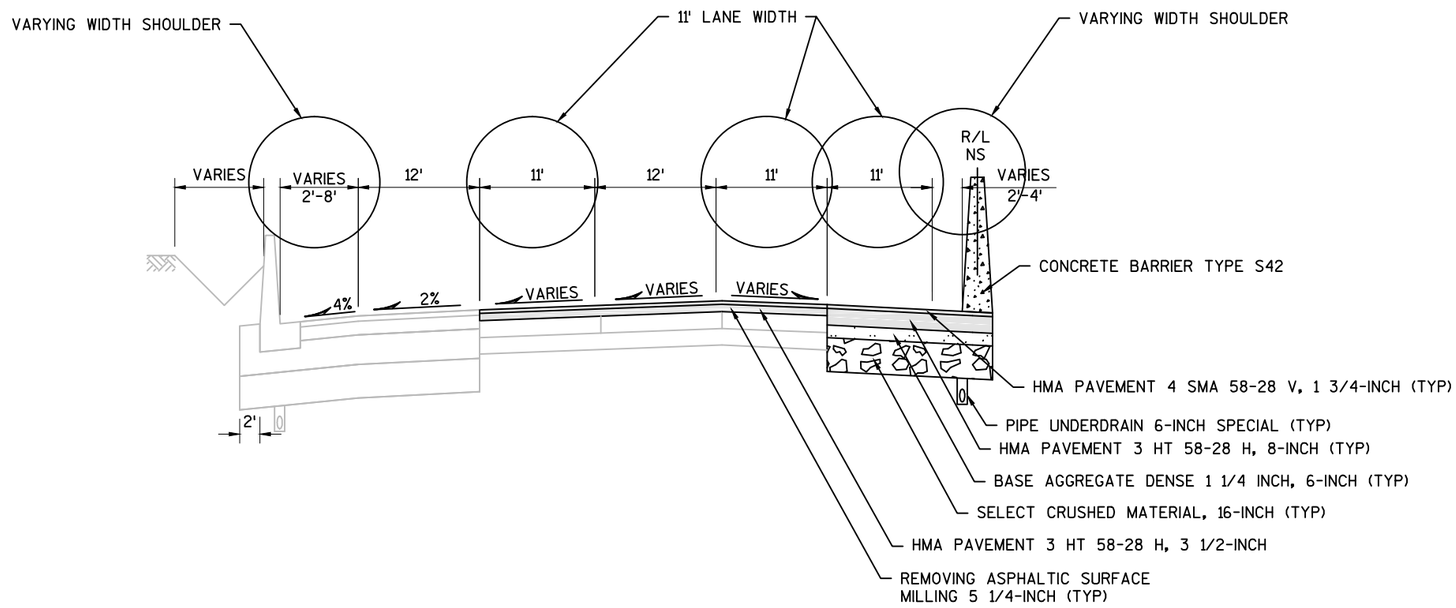
WISDOT/CADDS SHEET 42



TYPICAL FINISHED SECTION

IH 894 EB/USH 45 SB

STA. 161NS+48.03 TO STA. 187NS+48.19

EXHIBIT 5

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

FILE NAME : X:\1100-34-00 IH894 HALE TO LINCOLN\DESIGN ENG. REPORTS\EXCEPTION TO STDS. REPORT (ESR)\ATTACHMENTS\EXHIBITS_TS.DWG PLOT DATE : 2/14/2017 2:15 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT
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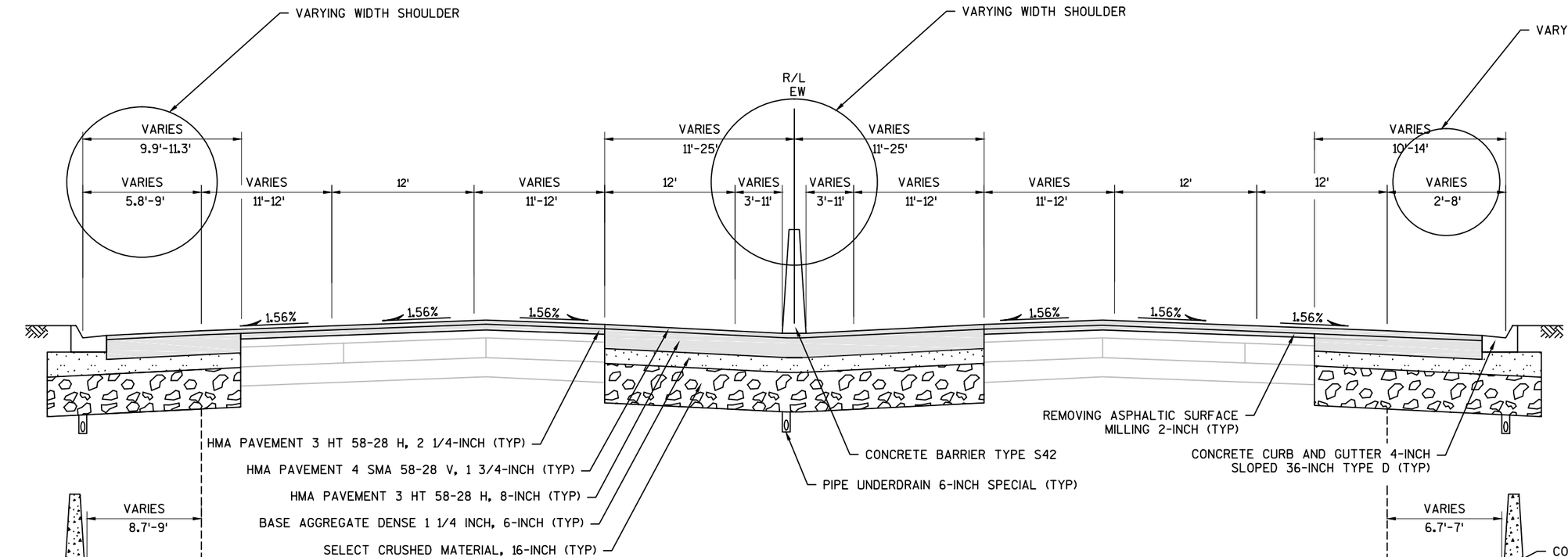

STA. 69EW+54.62 TO STA. 72EW+60.64

STA. 68EW+10.60 TO STA. 69EW+35.94

TYPICAL FINISHED SECTION

IH 894/IH 43/USH 45

STA. 68EW+10.60 TO STA. 81EW+99.04

EXHIBIT 6

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

FILE NAME : X:\1100-34-00 IH894 HALE TO LINCOLN\DESIGN ENG. REPORTS\EXCEPTION TO STDS. REPORT (ESR)\ATTACHMENTS\EXHIBITS_TS.DWG PLOT DATE : 2/14/2017 2:15 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT
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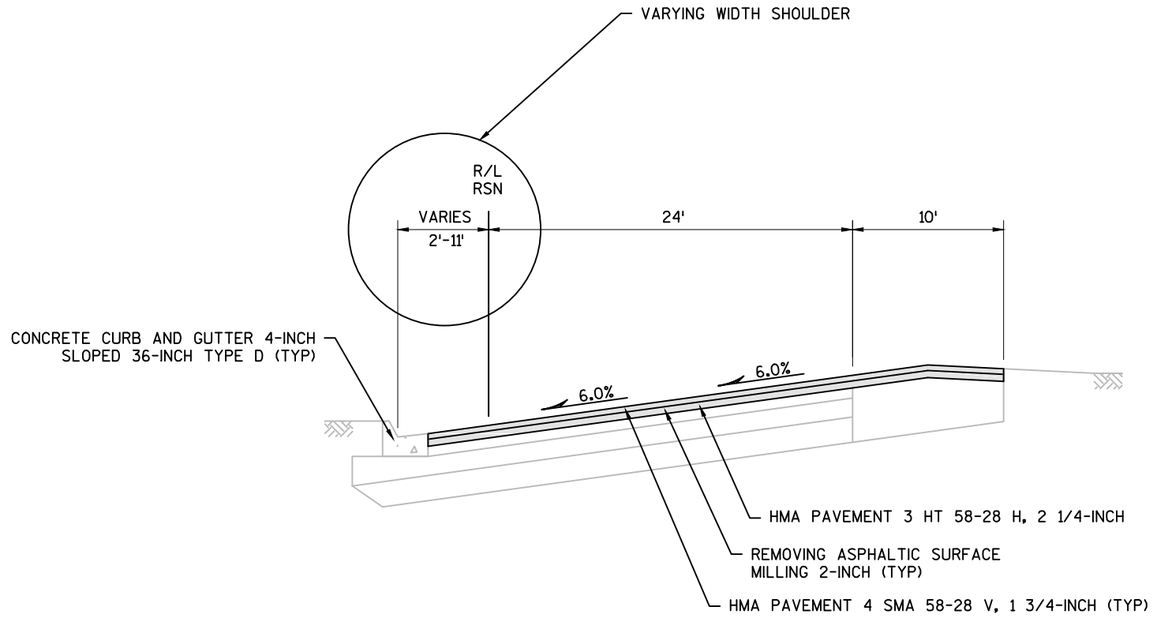


TYPICAL FINISHED SECTION

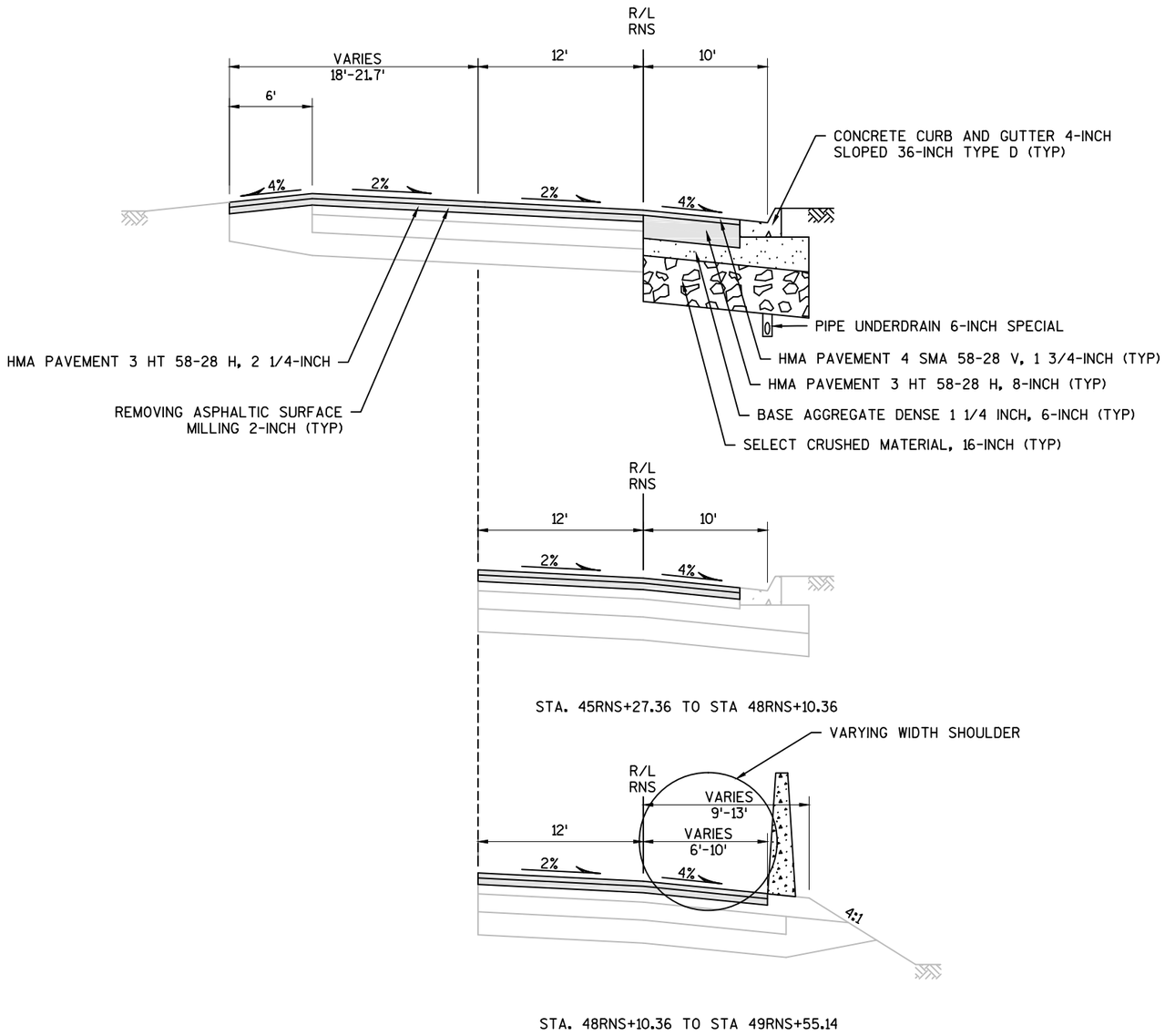
RAMP SN

STA. 210RSN+46.44 TO STA. 217RSN+63.13

EXHIBIT 7

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

FILE NAME : X:\1100-34-00 IH894 HALE TO LINCOLN\DESIGN ENG. REPORTS\EXCEPTION TO STDS. REPORT (ESR)\ATTACHMENTS\EXHIBITS_TS.DWG PLOT DATE : 2/14/2017 2:16 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT
PROJECTSHEETDATA - 020410_TS



TYPICAL FINISHED SECTION

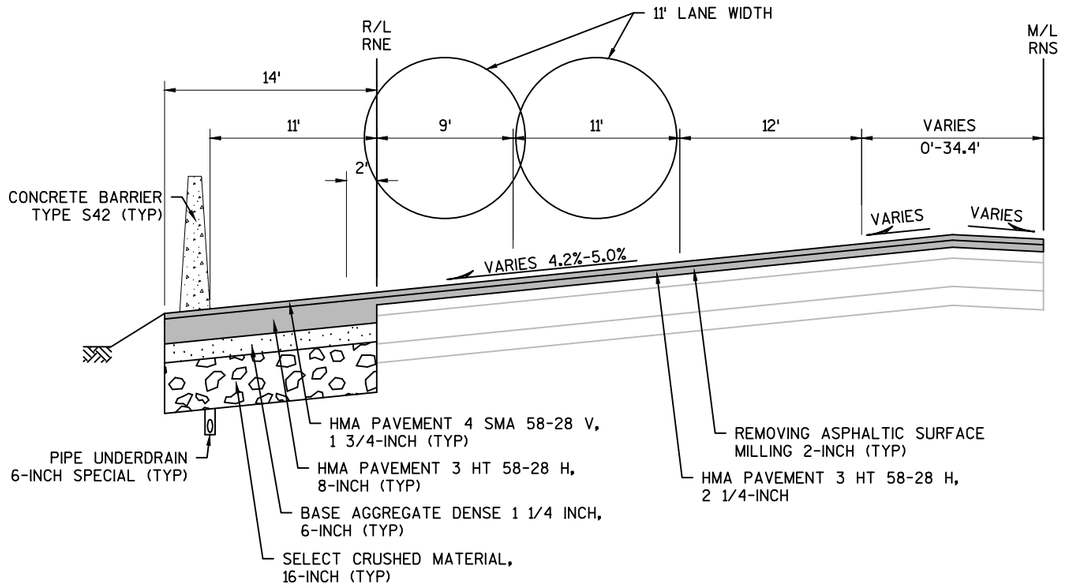
RAMP NS

STA. 34RNS+29.40 TO STA 49RNS+55.14

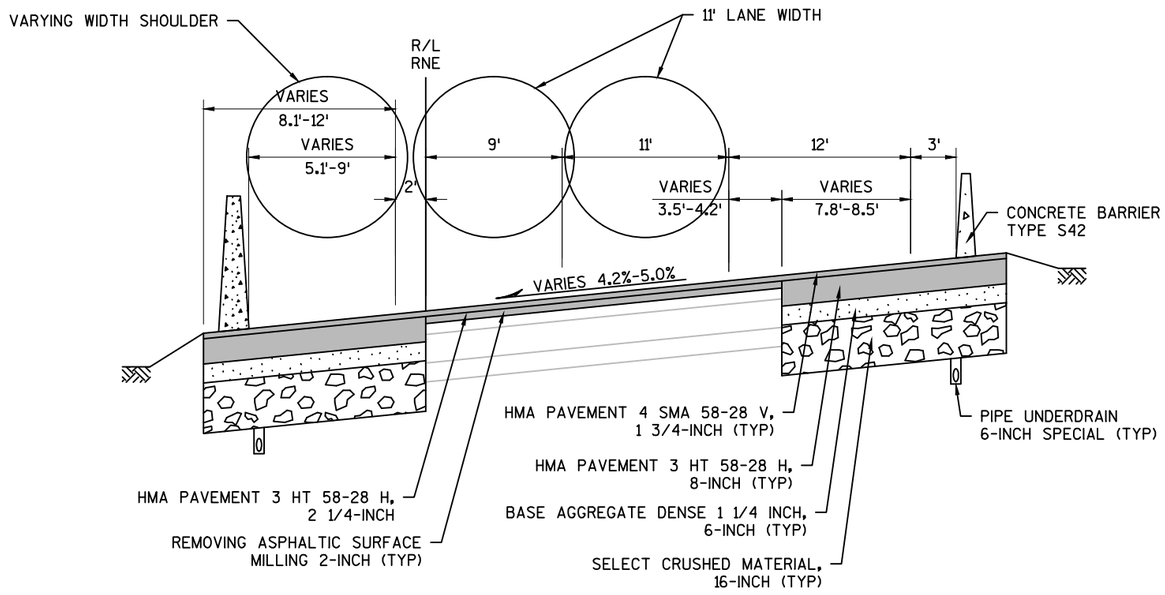
EXHIBIT 8

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

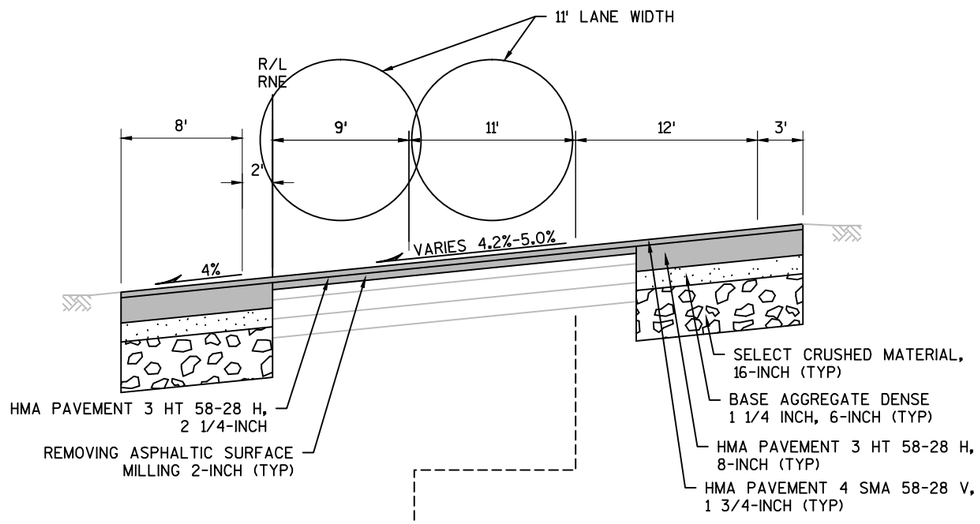
FILE NAME : X:\1100-34-00 IH894 HALE TO LINCOLN\DESIGN ENG. REPORTS\EXCEPTION TO STDS. REPORT (ESR)\ATTACHMENTS\EXHIBITS_TS.DWG PLOT DATE : 2/14/2017 2:17 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT
PROJECTSHEETDATA - 020411_TS

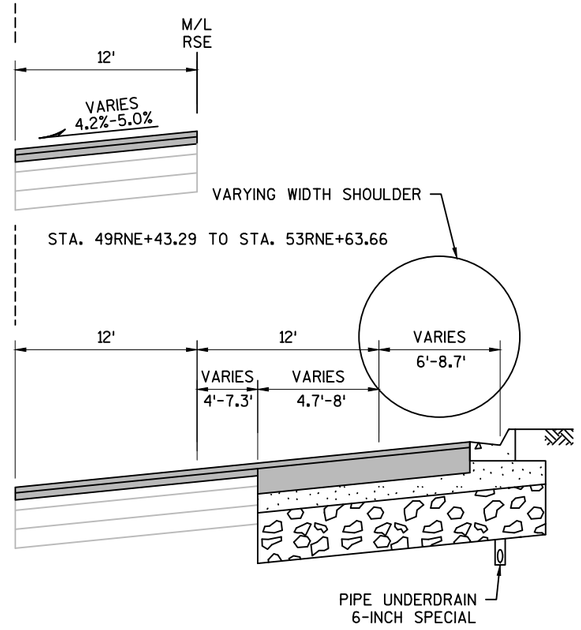


TYPICAL FINISHED SECTION
RAMP NE
STA. 30RNE+58.12 TO STA. 34RNE+25.21



TYPICAL FINISHED SECTION
RAMP NE
STA. 34RNE+25.21 TO STA. 40RNE+18.33





STA. 53RNE+63.66 TO STA. 66RNE+94.44

TYPICAL FINISHED SECTION
RAMP NE
STA. 46RNE+67.48 TO STA. 67RNE+71.61

EXHIBIT 9

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

FILE NAME : X:\1100-34-00 IH894 HALE TO LINCOLN\DESIGN ENG. REPORTS\EXCEPTION TO STDS. REPORT (ESR)\ATTACHMENTS\EXHIBITS_TS.DWG PLOT DATE : 2/14/2017 2:17 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT
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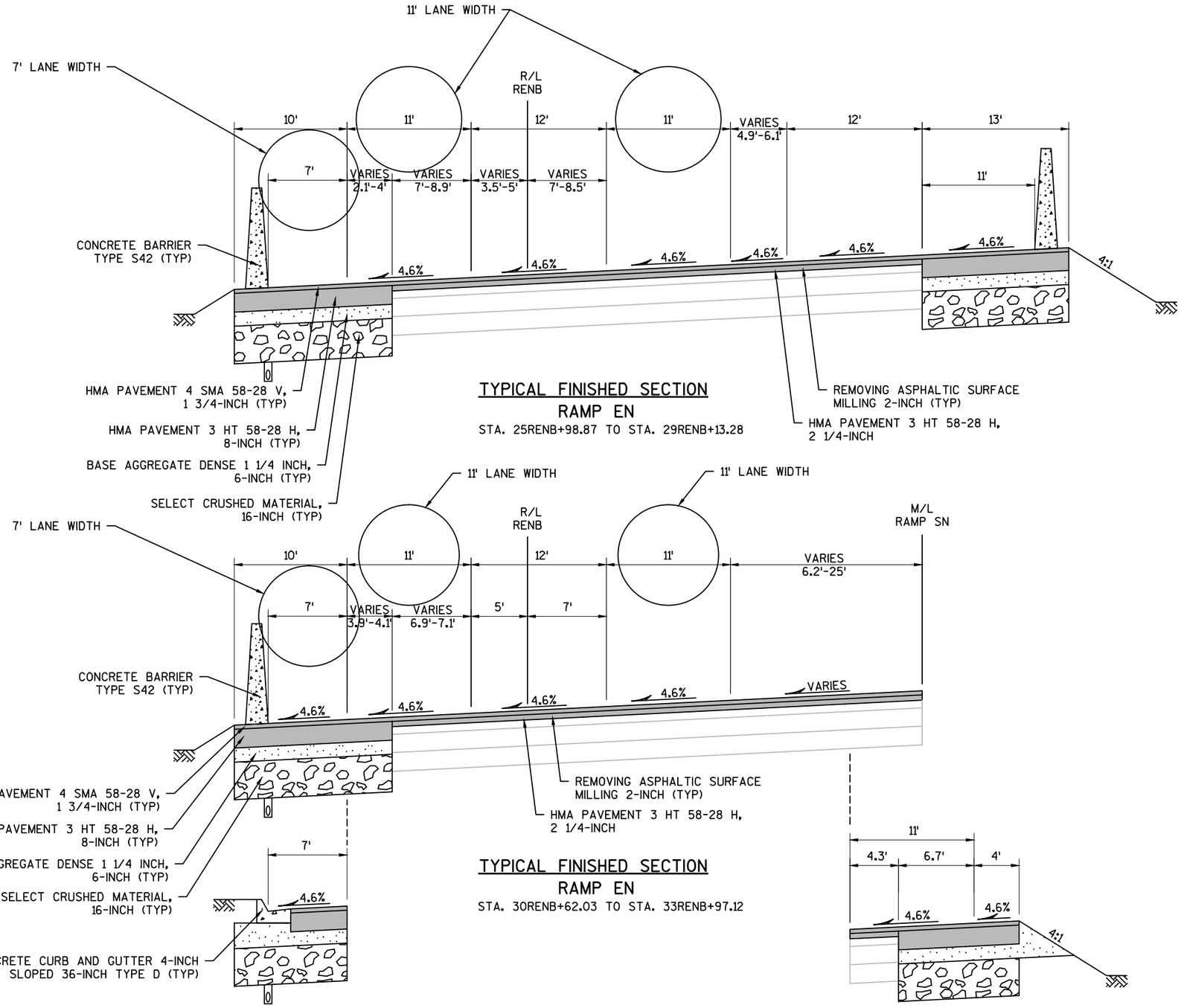


TYPICAL FINISHED SECTION
RAMP EN
STA. 25RENB+98.87 TO STA. 29RENB+13.28

TYPICAL FINISHED SECTION
RAMP EN
STA. 30RENB+62.03 TO STA. 33RENB+97.12

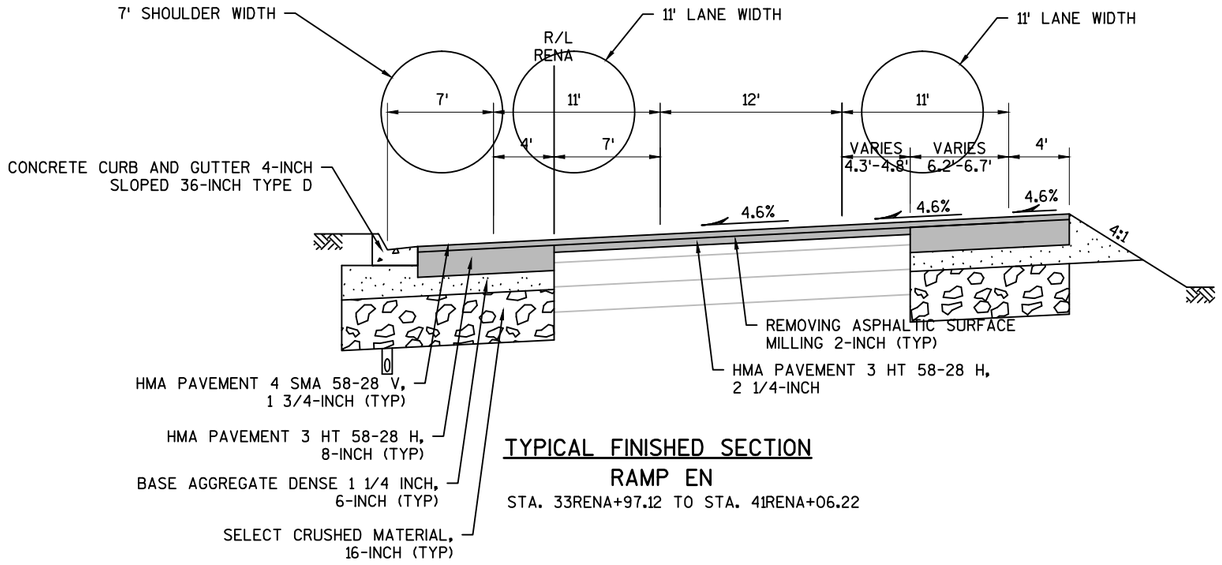
STA. 31RENB+62.85 TO STA. 33RENB+97.12

STA. 33RENB+34.06 TO STA. 33RENB+97.12

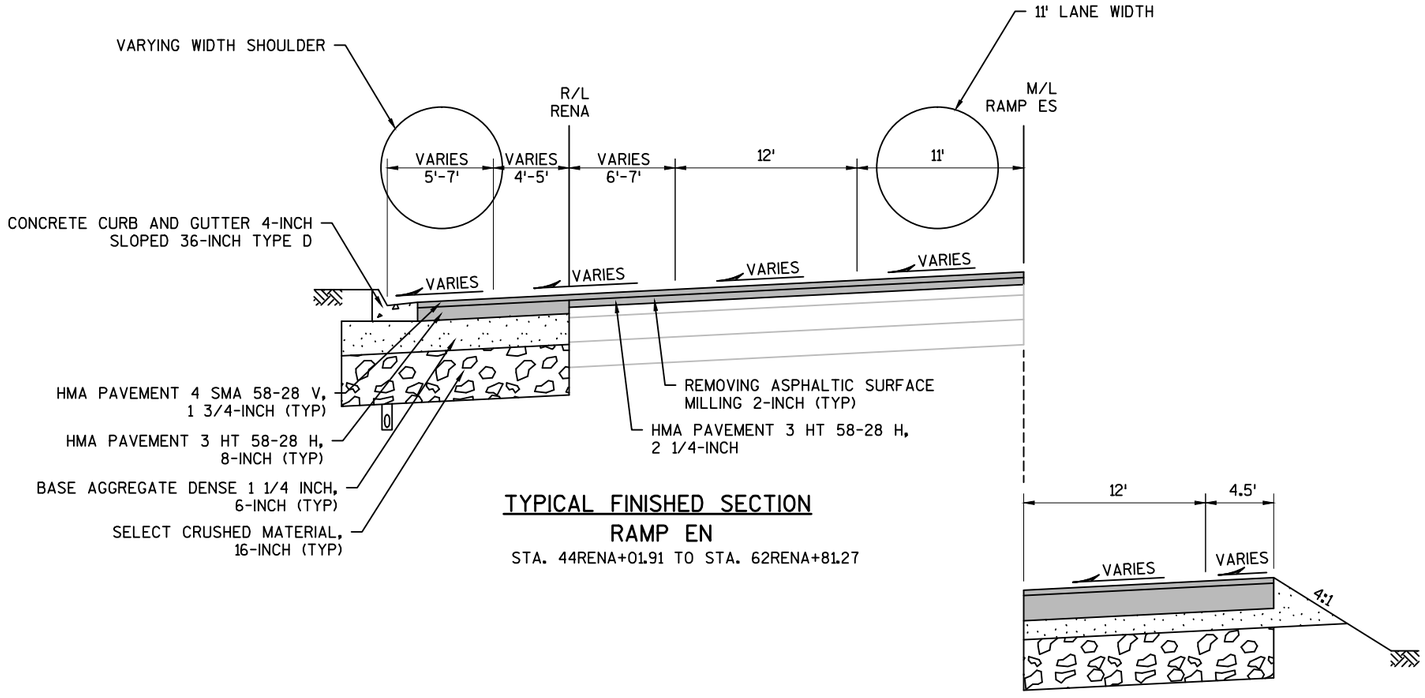
EXHIBIT 10

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

FILE NAME : X:\1100-34-00 IH894 HALE TO LINCOLN\DESIGN ENG. REPORTS\EXCEPTION TO STDS. REPORT (ESR)\ATTACHMENTS\EXHIBITS_TS.DWG PLOT DATE : 2/14/2017 2:17 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT
PROJECTSHEETDATA - 020413_TS



TYPICAL FINISHED SECTION
RAMP EN
STA. 33RENA+97.12 TO STA. 41RENA+06.22



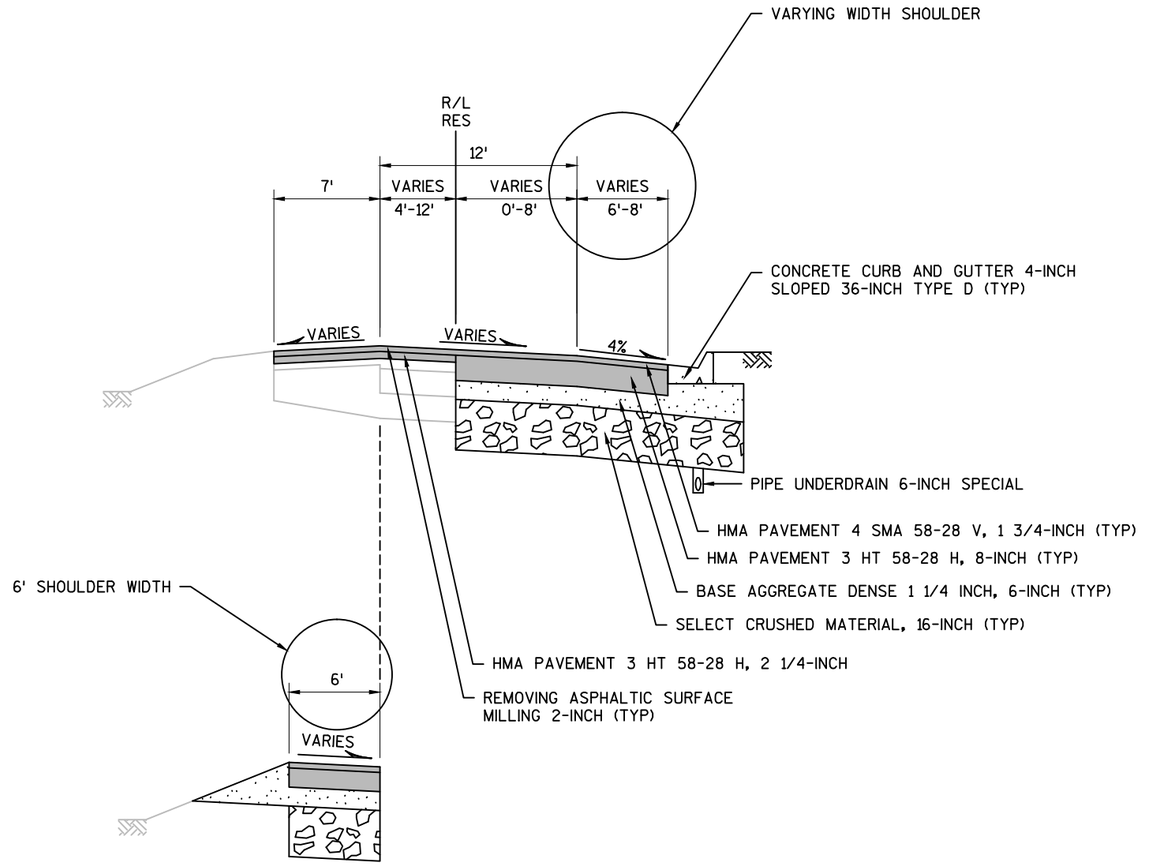
TYPICAL FINISHED SECTION
RAMP EN
STA. 44RENA+01.91 TO STA. 62RENA+81.27

STA. 49RENA+15.39 TO STA. 62RENA+81.27

EXHIBIT 11

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

FILE NAME : X:\1100-34-00 IH894 HALE TO LINCOLN\DESIGN ENG. REPORTS\EXCEPTION TO STDS. REPORT (ESR)\ATTACHMENTS\EXHIBITS_TS.DWG PLOT DATE : 2/14/2017 2:18 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT
PROJECTSHEETDATA - 020414_TS



STA. 211RSE+49.05 TO STA. 212RSE+31.41

TYPICAL FINISHED SECTION

RAMP SE

STA. 211RSE+49.05 TO STA. 216RSE+59.22

EXHIBIT 12

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

FILE NAME : X:\1100-34-00 IH894 HALE TO LINCOLN\DESIGN ENG. REPORTS\EXCEPTION TO STDS. REPORT (ESR)\ATTACHMENTS\EXHIBITS_TS.DWG PLOT DATE : 2/14/2017 2:18 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT
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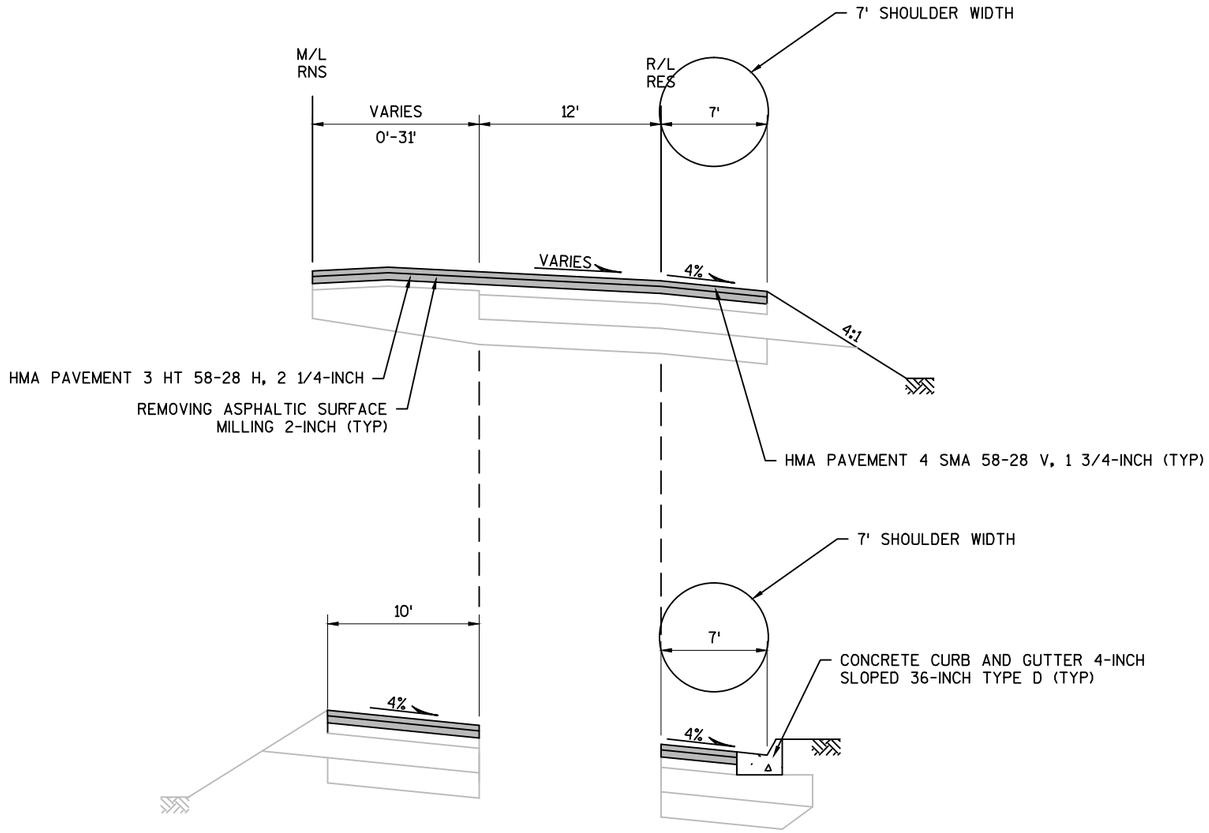
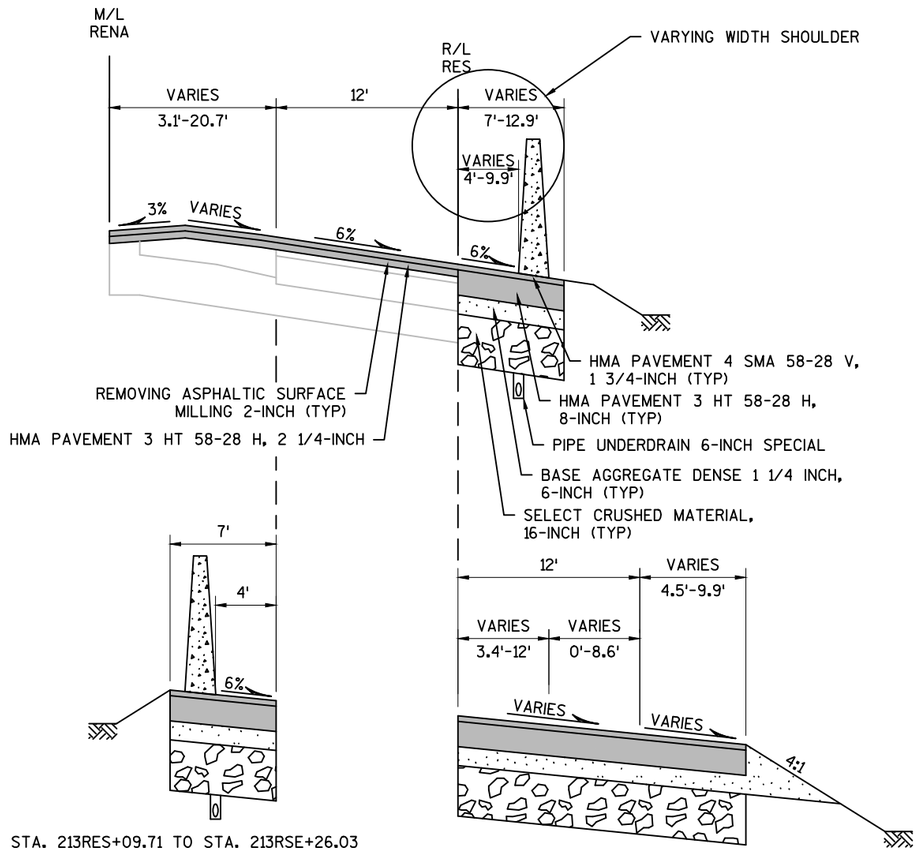


STA. 198RES+90.53 TO STA. 200RES+56.33

TYPICAL FINISHED SECTION
RAMP ES
STA. 195RES+64.94 TO STA. 200RES+56.33



STA. 213RES+09.71 TO STA. 213RSE+26.03

STA. 215RES+024.13 TO STA. 218RES+15.05

TYPICAL FINISHED SECTION
RAMP ES
STA. 213RES+09.71 TO STA. 218RES+15.05

EXHIBIT 13

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	PLAN: TYPICAL SECTIONS	SHEET	E

FILE NAME : X:\1100-34-00 IH894 HALE TO LINCOLN\DESIGN ENG. REPORTS\EXCEPTION TO STDS. REPORT (ESR)\ATTACHMENTS\EXHIBITS_TS.DWG PLOT DATE : 2/14/2017 2:19 PM PLOT BY : POBRIC, SILVANA PLOT NAME : PLOT SCALE : 1 IN:10 FT
PROJECTSHEETDATA - 020416_TS

EXHIBIT 14

N

DESIGN SPEED = 60 MPH
REQUIRED STOPPING SIGHT DISTANCE = 570'
PROVIDED STOPPING SIGHT DISTANCE = 389'
ACTUAL DESIGN SPEED = 47 MPH

IH 894 SB STA 107NS+20 - 111NS+70
INSIDE LANE 42" BARRIER OBSTRUCTION

SIGHT LINES (TYP)

IH 894 SB STA 110NS+90 - 113NS+90
SUBSTANDARD CREST CURVE

DESIGN SPEED = 60 MPH
REQUIRED STOPPING SIGHT DISTANCE = 570'
PROVIDED STOPPING SIGHT DISTANCE = 469'
ACTUAL DESIGN SPEED = 53 MPH

BELOIT RD SB ON RAMP

IH 894 EB/USH 45 SB

102NS
104NS
106NS
108NS
110NS
112NS
114NS
116NS

IH 894 WB/USH 45 NB

BELOIT RD NB OFF RAMP

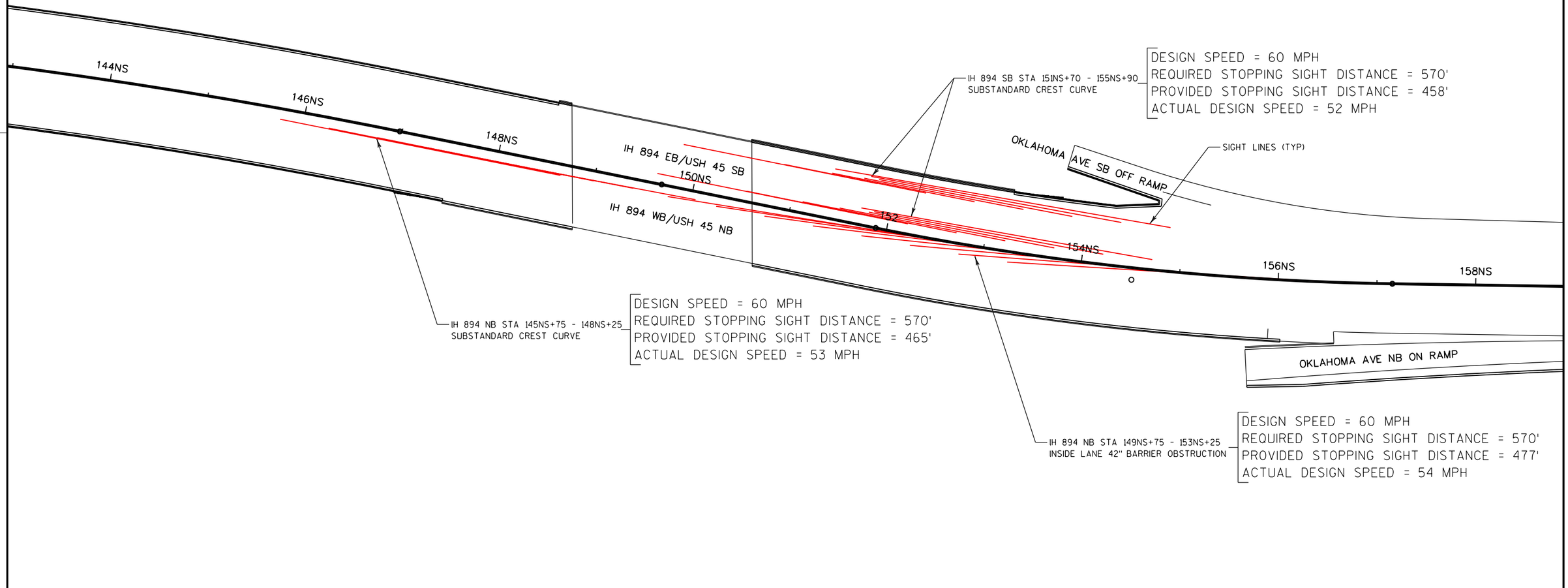
IH 894 NB STA 105NS+20 - 108NS+75
SUBSTANDARD CREST CURVE

DESIGN SPEED = 60 MPH
REQUIRED STOPPING SIGHT DISTANCE = 570'
PROVIDED STOPPING SIGHT DISTANCE = 455'
ACTUAL DESIGN SPEED = 52 MPH

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	EXHIBIT 14	SHEET	E

FILE NAME : C:\IH 894 SSD\Exhibit 14.dgn PLOT DATE : 2/14/2017 PLOT BY : cjl PLOT NAME : PLOT SCALE : 1:100

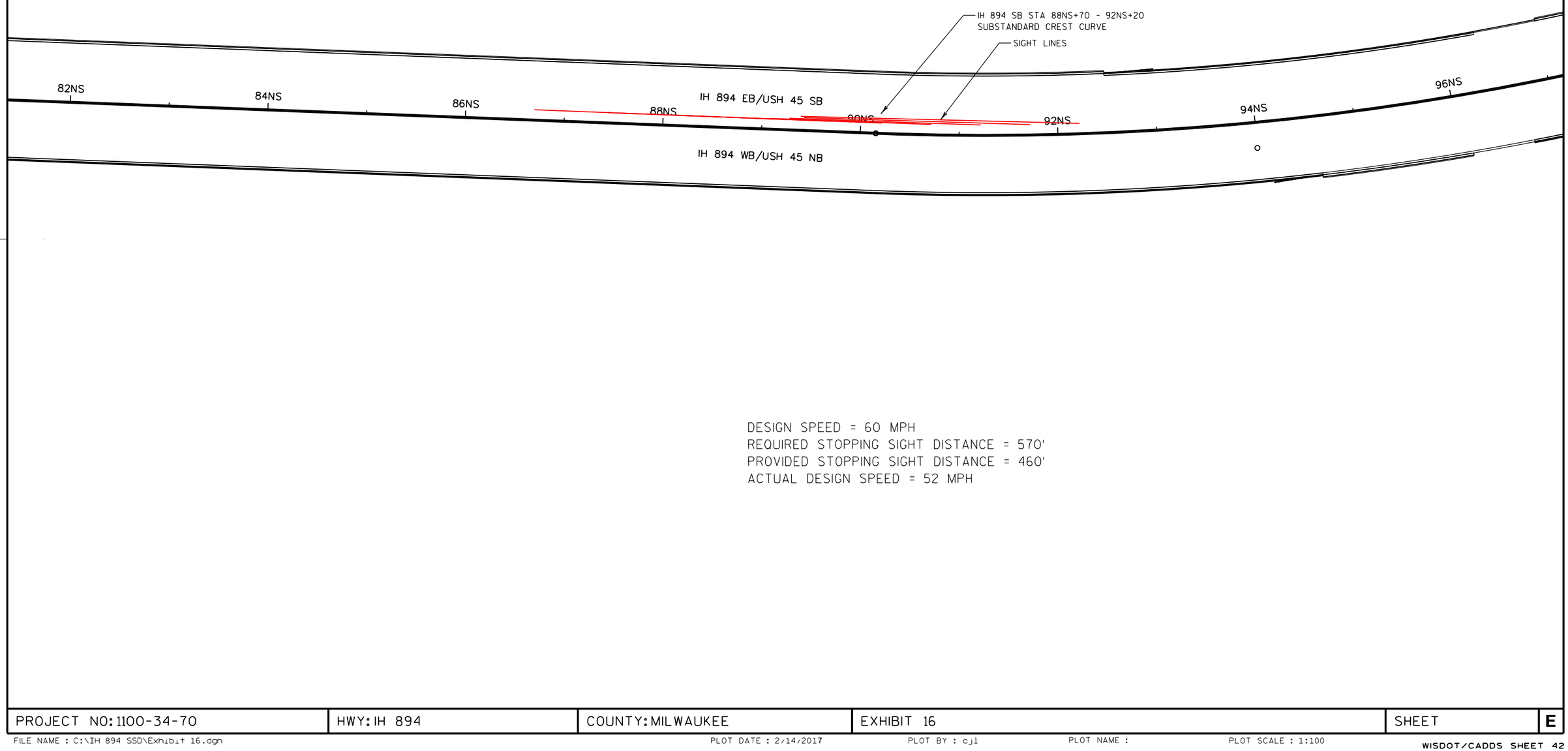
EXHIBIT 15



PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	EXHIBIT 15	SHEET	E

FILE NAME : C:\IH 894 SSD\Exhibit 15.dgn PLOT DATE : 2/14/2017 PLOT BY : cjl PLOT NAME : PLOT SCALE : 1:100

EXHIBIT 16

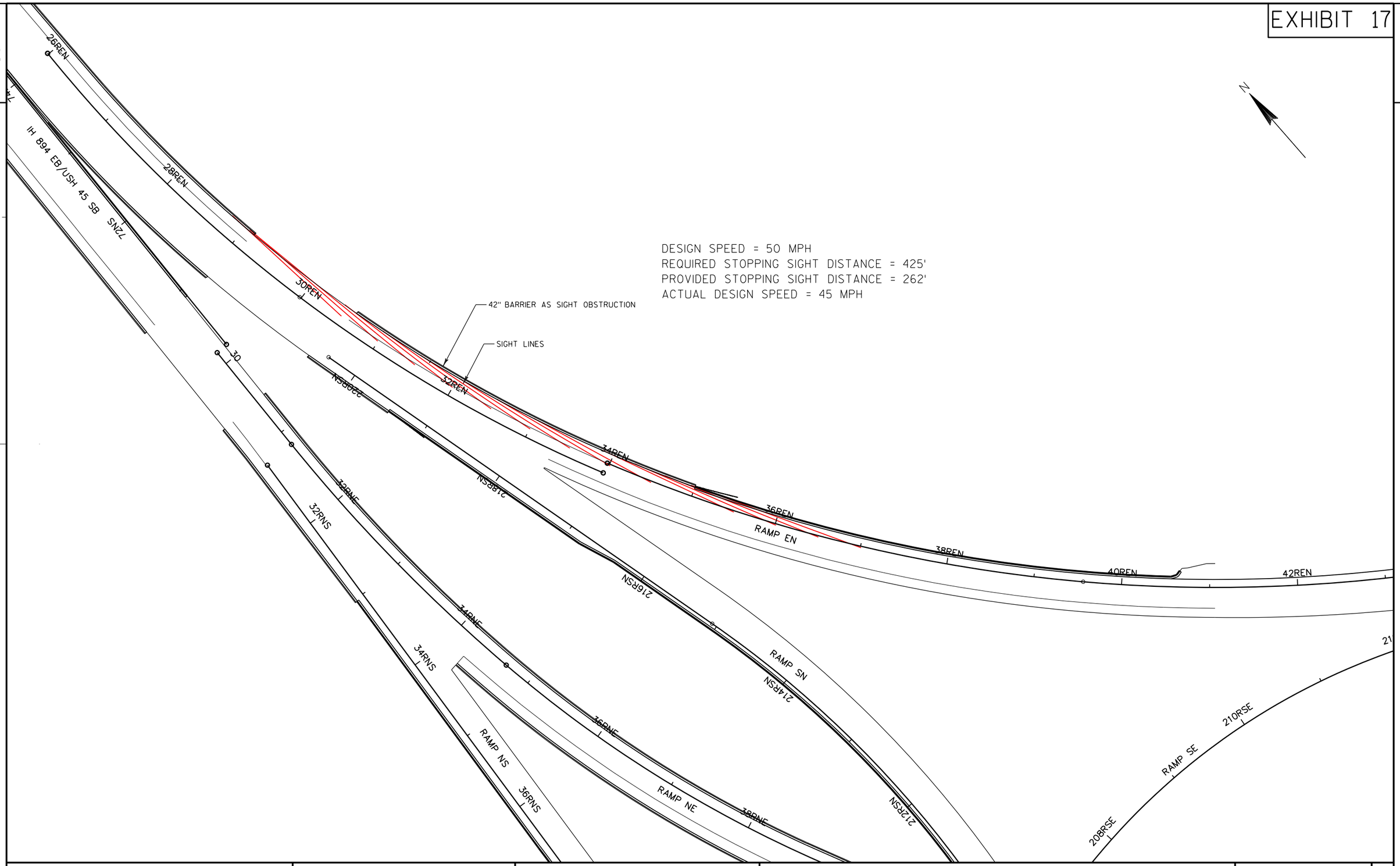


DESIGN SPEED = 60 MPH
REQUIRED STOPPING SIGHT DISTANCE = 570'
PROVIDED STOPPING SIGHT DISTANCE = 460'
ACTUAL DESIGN SPEED = 52 MPH

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	EXHIBIT 16	SHEET	E

FILE NAME : C:\IH 894 SSD\Exhibit 16.dgn PLOT DATE : 2/14/2017 PLOT BY : cjl PLOT NAME : PLOT SCALE : 1:100
WISDOT/CADDS SHEET 42

EXHIBIT 17



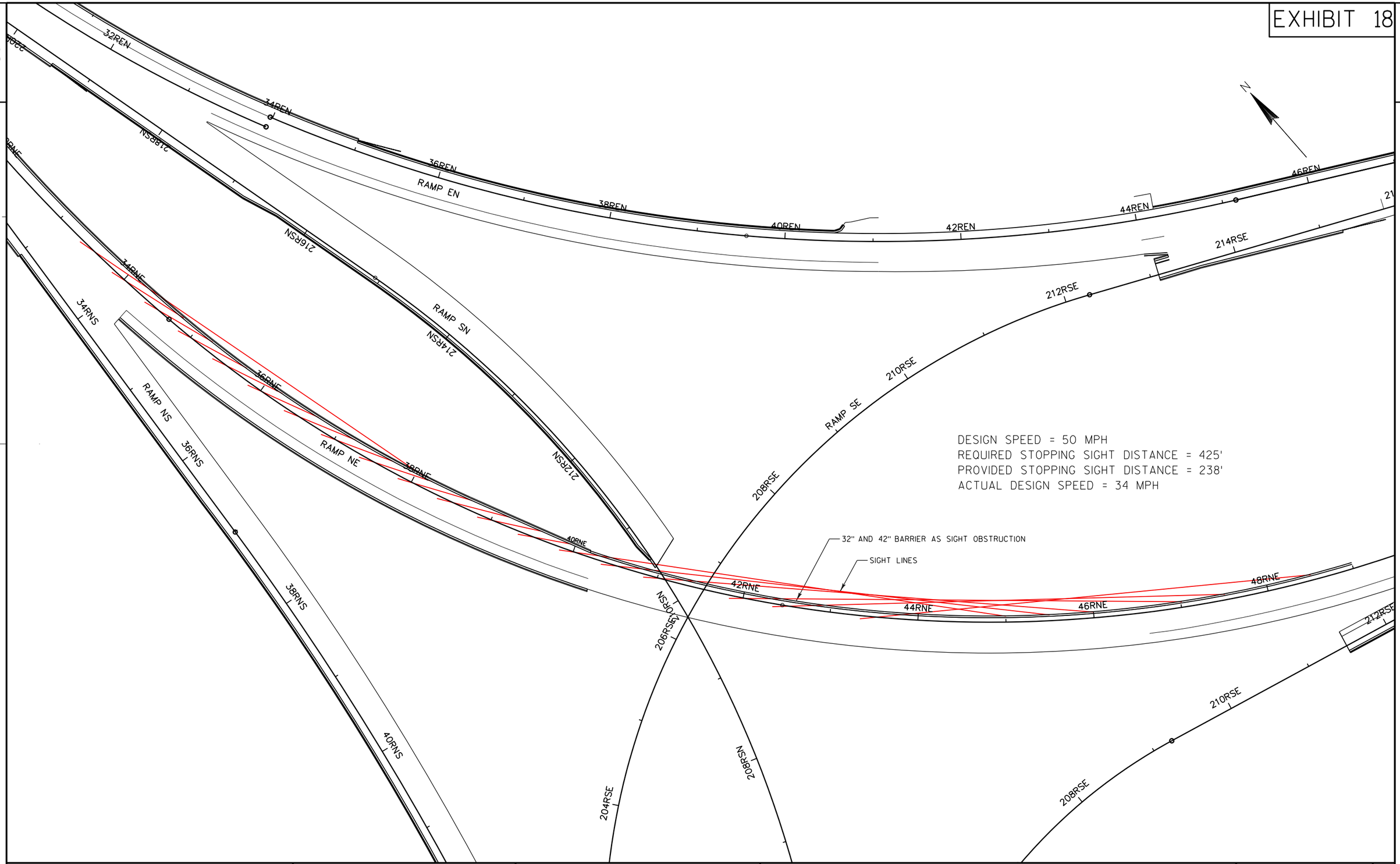
DESIGN SPEED = 50 MPH
REQUIRED STOPPING SIGHT DISTANCE = 425'
PROVIDED STOPPING SIGHT DISTANCE = 262'
ACTUAL DESIGN SPEED = 45 MPH

PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	EXHIBIT 17	SHEET	E

FILE NAME : C:\IH 894 SSD\Exhibit 17.dgn PLOT DATE : 2/14/2017 PLOT BY : cjl PLOT NAME : PLOT SCALE : 1:100

WISDOT/CADDS SHEET 42

EXHIBIT 18



PROJECT NO: 1100-34-70	HWY: IH 894	COUNTY: MILWAUKEE	EXHIBIT 18	SHEET	E

FILE NAME : C:\IH 894 SSD\Exhibit 18.dgn PLOT DATE : 2/14/2017 PLOT BY : cjl PLOT NAME : PLOT SCALE : 1:100

ATTACHMENT 6

MEMORANDUM

To:	Chris Hager, P.E. Wisconsin Department of Transportation
From:	Emily Moser, P.E., PTOE Jeffery Dale, P.E. Kimley-Horn and Associates, Inc.
Date:	April 21, 2017
Subject:	*Potential Managed Lane Strategies to Mitigate Exception to Standards on I-894 from 84th Street to Lincoln Avenue*

The Exception to Standards Report for Project I.D. 1100-34-00 identified some specific challenges that exist along the I-894 corridor. Each of these challenges presents certain safety concerns that prompt the request for the exceptions to design standards. The identified substandard features and safety concerns include:

1. Design Speed – 60MPH design speed along the mainline cannot be supported through the Hale interchange with current horizontal and vertical curvature.

2. Lane Widths – Standard minimum lane widths would not allow for four general purposes lanes in each direction. Ability to reduce lane widths would provide additional capacity to alleviate existing congestion and operational concerns.

3. Shoulder Widths – Standard minimum shoulder widths would not allow for four general purposes lanes in each direction. Ability to reduce shoulder widths would provide additional capacity to alleviate existing congestion and operational concerns.

4. Stopping Sight Distance – Concrete median safety barrier and bridge parapets near substandard vertical curves do not meet minimum stopping sight distance requirements.

5. Super-Elevation Rates – Curves with substandard super-elevation and radii do not meet minimum requirements.

6. Vertical Bridge Clearance – Existing substandard vertical clearance for bridge within Hale interchange will be maintained.

The Exception to Standards report has identified several safety mitigation measures for these substandard features including a high surface friction treatment, new LED lighting, new pavement marking and signing, and improved drainage. In addition, managed lane strategies can be integrated with the resurfacing project to help mitigate these safety concerns. Incident management is an integral strategy that can be applied to mitigate across all of the identified issues. The ability to quickly and efficiently clear and manage incidents would help reduce the potential for secondary crashes and improve safety with respect to the reduction in lane and shoulder widths and the substandard super-elevation rates within this corridor. Emergency pull-outs along the roadway would provide areas to clear the mainline and allow first responders to conduct crash investigations. A dedicated Freeway Service Team would also support better incident response and clearance.

This memo is focused on mitigation strategies that can more specifically address two of the identified safety concerns—design speed and stopping sight distance. Strategies to mitigate these two safety issues are presented in Table 1. The strategies listed start at the very basic deployment using static signs and build upon the foundation to integrate more advanced technology including detection and monitoring of conditions on the roadway to provide real-time information to drivers approaching potential hazards.

Table 1. Managed Lane Strategies to Mitigate Exceptions to Standards

Strategies	Design Speeds	Stopping Sight Distance
Static Signs	Static signs to caution drivers to slow down as they approach the Hale interchange. Can include advisory speed limits in the vicinity of the curve with or without flashers.	Static signs to caution drivers to slow down as they approach specific curves in the roadway. Can include advisory message of slower or stopped traffic likely during peak periods.
Detection and Signing - Speed Feedback Sign - Variable Speed Limit (VSL) - Small Dynamic Message Sign (DMS) or Hybrid Sign	Excessive Speed Warning System / Dynamic Speed Feedback Sign – A number of different configurations can be used to detect excessive vehicle speeds and warn drivers to slow down. These systems would use additional detection installed approaching the Hale interchange. One example of a system is the installation on I-43 near North Avenue. When unsafe speeds are detected with respect to specific vehicle classification, a warning message "TOO FAST FOR CURVE" is displayed on a small dynamic message sign. Additional overhead signing options would include advisory speed curve warning signs with dynamic flashers accompanied by a small DMS with a message indicating excess speeds. Other options would include shoulder-mounted signs that can be used to display the vehicle's detected speed with the posted advisory speed.	Back of Queue Warning System – Use of additional detection installed at locations with limited sight distance. When slower or stopped traffic is detected, advisories can be communicated either through shoulder-mounted signs with flashers, variable advisory speed limit signs, or small DMS used to display a message for approaching traffic such as "SLOW OR STOPPED TRAFFIC."
Freeway Service Teams	Use of freeway service teams would increase incident management in the vicinity of the Hale Interchange. Quicker incident clearance will reduce the likelihood of secondary crashes due to unsafe travel speeds.	Use of freeway service teams would increase incident management along the corridor. Quicker incident clearance will reduce the likelihood of secondary crashes due to limited sight distance.
Enhanced Emergency Pull-outs	Accident investigation sites or emergency pull-outs would promote quicker clearance if incidents from general purpose lanes. Quicker incident clearance will reduce the likelihood of secondary crashes due to unsafe travel speeds.	Accident investigation sites or emergency pull-outs would promote quicker clearance if incidents from general purpose lanes. Quicker incident clearance will reduce the likelihood of secondary crashes due to limited sight distance.

Strategies	Design Speeds	Stopping Sight Distance
Lane Control System (LCS)	Dynamic Junction Control - Installation of a Lane Control System (LCS) in the vicinity of the Hale Interchange would allow more efficient use of lanes through advisory speeds and lane-by-lane traffic management strategies. Small DMS also would support supplemental messages such as "TOO FAST FOR CURVE."	Installation of a Lane Control System (LCS) would include full gantries with lane control signals over each lane and supplemental DMS. The system would allow for posting of advisory speeds over each lane (through speed harmonization) or merge and lane closed indications as appropriate based on confirmed crash or hazard in the roadway. More granular lane-by-lane traffic management would help mitigate limited sight distances. Redundant CCTV camera coverage and detection would supplement the ability to monitor the roadway conditions.
Redundant CCTV Camera Coverage		Installation of redundant CCTV cameras would ensure continuous and uninterrupted surveillance of the corridor and support more effective traffic management in areas with limited sight distance.
Video Analytics		Video analytics are able to provide another level of incident detection for debris on the roadway or slow/stopped vehicles. Quicker incident detection will increase safety in the vicinity of areas with limited sight distance.

Table 2 presents planning level costs for each strategy. Both capital and operations and maintenance costs are provided to demonstrate the necessary investment in each strategy. The costs are provided in ranges and are based on similar deployments in other states. The total planning level cost is then calculated as follows:

Capital Cost + Annual O&M (for 5 years) + 20% Contingency

Table 2. Planning Level Costs per Strategy

Strategy	Quantity Assumption	Capital Costs	Annual O&M	Total Planning Level Cost
Static Signs				Minimal
Detection and Signing	Per site per direction	Feedback Sign - $50K - $60K VSL - $75K - $90K DMS - $350K - $400K	Feedback Sign - $1.5K - $2K VSL - $1.5K - $2K DMS - $3.5K - $5K	Feedback Sign - $70K - $85K VSL - $80K - $120K DMS - $440K - $510K
Freeway Service Teams	Per corridor	$450K - $500K	$450K - $500K	$3.2M - $3.6M
Enhanced Emergency Pull-outs	3 sites	$800K - $1M	$8K – $10K	$1M - $1.3M
Lane Control System (LCS)	Per mile	$900K - $1.2M	$10K – $15K	$1.1M - $1.5M
Redundant CCTV Camera Coverage	3 additional cameras	$50K - $75K	$750 - $1.2K	$65K - $100K
Video Analytics	5 cameras with encoders	$100K - $125K	$1.5K - $2.5K	$125K - $165K

The costs above are provided for planning purposes and should not be used for bidding. More detailed cost estimates should be developed as part of the design process for implementation of the above strategies.

ATTACHMENT 11

Roadside Hazard Analysis form template

Roadside Hazard Analysis

Project I.D. 1100-34-00

Entered by: Dean Filtz
Checked by:

Speed (MPH) = Posted 55 mph
AADT = 119,900
Alignment = See attached project overview

Hazard ID	Station or Stations	Offset (ft)	L/R	Total length of hazard FT	Description	Action	Discussion
1	45RENA+30	20’	L	20’	Riprap	Remove hazard	Riprap located at flume outfall
2	48RENA+60	20’	L	5’	Sign bridge footing	Install beam guard/concrete barrier	Remove crash barrels and install beam guard EAT with the addition of concrete barrier to shield hazard
3	48RENA+60	60’	R	5’	Sign bridge footing	Install beam guard/concrete barrier	Remove crash barrels and install beam guard EAT with the addition of concrete barrier to shield hazard
4	44RENA+50 WB	15’	L	15’	Riprap	Remove hazard	Riprap located in front of beam guard EAT
5	115NS+50 to 118NS+80	70’	L	330’	Side slopes 2:1-3:1	Out of scope	Improvement of the side slopes are beyond the scope of this project. A higher level 3R project or reconstruction should correct the slopes
6	48RNE+00	10’	L	30’	Riprap	Remove hazard	Riprap located adjacent to shoulder within clear zone
7	200RES+00 to 203RES+00	25’	L	300’	Side slopes 2:1-3:1	Out of scope	Improvement of the side slopes are beyond the scope of this project. A higher level 3R project or reconstruction should correct the slopes
8	200RES+00 to 203RES+00	10’	R	300’	Side slopes 2:1-3:1	Out of scope	Improvement of the side slopes are beyond the scope of this project. A higher level 3R project or reconstruction should correct the slopes

Hazard ID	Station or Stations	Offset (ft)	L/R	Total length of hazard FT	Description	Action	Discussion
9	201RSN+70 to 207RSN+20	5’	L	550’	Side slopes 2:1-3:1	Out of scope	Improvement of the side slopes are beyond the scope of this project. A higher level 3R project or reconstruction should correct the slopes
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