DESIGN CRITERIA MEMORANDUM

PROJECT ID 6999-08-09
WISCONSIN RAPIDS EAST ARTERIAL
WOOD COUNTY

PREPARED FOR:

WisDOT North Central Region - Wisconsin Rapids

1681 Second Avenue South

Wisconsin Rapids, WI 54495

CONTACT: Tim Radtke

PHONE: 715.421.8318

EMAIL: tim.radtke@dot.state.wi.us

PREPARED BY:

CH2M HILL, INC.

135 South 84th Street, Suite 325

Milwaukee, WI 53214-1456

CONTACT: Dan Dupies

PHONE: 414.272.2426

EMAIL: Dan.Dupies@ch2m.com

EMCS, INC.

605 South 24th Avenue, Suite 24

Wausau, WI 54401

CONTACT: Stephanie Christensen, PE

PHONE: 715.845.1081

EMAIL: schristensen@emcsinc.com

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Introduction

The North Central Region of the Wisconsin Department of Transportation (WisDOT), in partnership with regional and local agencies, is investigating the need for a new facility (the "East Arterial") on a corridor between the Village of Port Edwards and east side of the City of Wisconsin Rapids. Design criteria presented in this memo has been prepared for the existing route and the proposed East Arterial.

Existing Corridor

Description

The existing corridor begins in the Village of Port Edwards at the intersection of STH 54-73/Letendre Avenue and STH 54-73/Wisconsin Rapids Drive. It then proceeds north along STH 54-73/Wisconsin Rapids Drive/2nd Avenue to the intersection with STH 13-54/Riverview Expressway. It then proceeds east along STH 13-54/Riverview Expressway to the intersection with STH 13-54/8th Street. STH 54/Riverview Expressway proceeds east to the intersection at CTH W, which is the north termini for this study, while STH 13 proceeds south along 8th Street to the intersection with CTH Z/Griffith Avenue. The approximate length of the existing corridor is 6.5 miles and is shown in Exhibit 1.

Year 2035 Design Criteria

WisDOT provided traffic projections for the existing corridor for the year 2006 and 2035. Average Daily Traffic (ADT) projections for the existing route without construction of the East Arterial are shown in Table 1 below. ADT projections for the existing route with construction of the East Arterial are shown in Table 2 below.

Table 1

ADT Projections - Existing Route (No East Arterial)

Existing Route Segment	2006 ADT	2035 ADT
Second Avenue/WI River Drive		
Between Letendre and Verbunker	7,700	10,930
Between Verbunker and Seneca	7,930	11,260
Between Seneca and Gaynor	11,750	14,700
Between Gaynor and Riverview Expressway	13,050	16,850
Riverview Expressway		
2nd Avenue to 1st Street	26,900	36,100
1st Street to 8th Street	21,450	30,800
8th Street to CTH W	16,500	25,400
8th Street		
Riverview Expressway to Pepper	25,050	34,350
Pepper to Airport	26,050	35,550
Airport to 2 Mile	27,300	37,100
2 Mile to Whitrock	29,300	39,100
Whitrock to CTH Z	29,500	39,400

Table 2

ADT Projections - Existing Route (With East Arterial)

Existing Route Segment	2035 ADT
Second Avenue/WI River Drive	
Between Letendre and Verbunker	10,200
Between Verbunker and Seneca	9,600
Between Seneca and Gaynor	9,600
Between Gaynor and Riverview Expressway	11,700
Riverview Expressway	
2nd Avenue to 1st Street	31,750
1st Street to 8th Street	27,300
8th Street to CTH W	18,150
8th Street	
Riverview Expressway to Pepper	24,650
Pepper to Airport	26,450
Airport to 2 Mile	27,700
2 Mile to Whitrock	29,450
Whitrock to CTH Z	29,900

The traffic operations analysis indicates no need to increase the number of through lanes along the existing corridor. Details are in the Wisconsin Rapids East Arterial Corridor Study Traffic Analyses technical memorandum prepared by CH2M HILL.

Exhibit 2A and 2B detail the design criteria for the existing corridor. Typical sections for reconstruction of the existing corridor would meet the criteria in Figures 2 and 3 of the WisDOT Facilities Development Manual (FDM) Procedure 11-20-1.

Traffic operations analysis and crash analysis along the existing route indicates that spot improvements along the existing route in addition to construction of the East Arterial could be considered to improve operational and safety deficiencies. Further detail on the crash data analyzed for the study area can be found in the Wisconsin Rapids East Arterial Study Crash Analysis summary prepared by CH2M HILL.

Spot improvements could include construction of barrier median at select locations along 8th Street to reduce the number of turning conflicts, intersection improvements including addition or lengthening of protected turn lanes on the mainline and side roads, and traffic signal phasing changes. Proposed spot improvement typical sections for addition of barrier median and left turn lanes along 8th Street are shown in Exhibit 3.

An alternative analysis balancing geometrics against cost, real estate impacts, and other factors would be required to determine the preferred intersection improvements at each location.

Proposed East Arterial Corridor

Description

The proposed East Arterial corridor begins at the intersection of STH 54-73/Letendre Avenue and STH 54-73/Wisconsin Rapids Drive. The corridor proceeds east across the Wisconsin River on new alignment and then continues east along the CTH Z corridor. It then crosses STH 13/8th Street and proceeds northeast to approximately Whitrock Avenue. It then turns due north along the 20th Street corridor. The proposed corridor continues north and terminates at the intersection of STH 54 and STH 54/CTH W/Riverview Expressway. The approximate length of the corridor is 4.3 miles and is shown in Exhibit 4.

Year 2035 Design Criteria

WisDOT provided traffic projections for the proposed East Arterial corridor for the year 2035. Average Daily Traffic (ADT) projections for the proposed route are shown in Table 3 below. CH2M HILL completed a traffic operations analysis and anticipated LOS information is shown in Table 3 below. Details of the traffic operations analysis for the corridor are in the Wisconsin Rapids East Arterial Corridor Study Traffic Analyses technical memorandum prepared by CH2M HILL.

Table 3

Design Criteria - Proposed East Arterial

Proposed Route Segment	2035 ADT	Design Speed	Posted Speed	Design LOS Trigger	Anticipated LOS	Proposed Design Class
Second Avenue/WI River Drive to Wisconsin River Bridge Crossing	13,050	30	25	D	B	U2b
New Wisconsin River Bridge Crossing	13,050	40	35	D	B	U2b
New Wisconsin River Bridge Crossing - Rangeline Road	13,050	45	40	D	B	U2b
Rangeline Road to STH 13	14,150	45	40	D	B	U2b
STH 13 to Airport Avenue	23,800	45	40	D	B	U4
Airport Avenue to CTH W	22,350	45	40	D	B	U4

Exhibit 5A and 5B detail the design criteria for the proposed East Arterial. The WisDOT NC Region established design speeds for each of segment of the proposed East Arterial as shown in Table 3 above. The proposed posted and design speeds were coordinated with NC Region Traffic, Maintenance, and Planning sections and provided by Jim Wendels via email dated March 3, 2006. The design speeds are 5 mph over the posted speeds per FDM Procedure 11-10-1. Proposed design speeds are consistent with the existing posted speeds at each terminus (posted 25 mph at Second Avenue/WI River Drive and posted 40 mph at CTH W) and the existing posted speeds along the CTH Z corridor which vary from 35 mph to 45 mph.

From Second Avenue/WI River Drive to STH 13, a two lane rural typical section or urban section could be used to meet traffic needs. Although storm water quality benefits are associated with a rural section with grass ditches, a two lane urban section (Design Class 2b) was selected between Second Avenue/WI River Drive and STH 13 to provide continuity between the existing and proposed urban sections at each terminus. The two lane urban section will also help to minimize impacts between

Sampson Street and STH 13 where development exists close proximity to existing CTH Z and near the airport property since drainage ditches will not need to be accommodated. Although a four lane undivided urban section (Design Class 3) would meet traffic needs between STH 13 and CTH W in the year 2035, a four lane divided section (Design Class U4) is planned between STH 13 and CTH W in order to provide continuity with the section of STH 54 north of CTH W, provide for protected turn lanes at intersections, and to preserve a corridor to meet long-term needs beyond the design year of 2035. The typical sections for the proposed East Arterial are shown in Exhibit 6. These include a multi-use path on one side in order to provide continuity with the existing multi-use trail along STH 54 north of CTH W. The pedestrian and bike accommodation details including any future needs to add a sidewalk or path on the other side of the route will be coordinated with the local agencies prior to setting a final corridor width for analysis in the feasibility study.

Intersection connections and closures required where the East Arterial crosses existing roadways will be considered in further detail as part of the corridor alternative analysis including any intersection improvements required at the intersection of the East Arterial with 2nd Avenue/Wisconsin River Drive, STH 13/8th Street, and Riverview Expressway/CTH W. Required intersection geometry will be based on traffic operations analysis.

EXISTING CORRIDOR LOCATION MAP

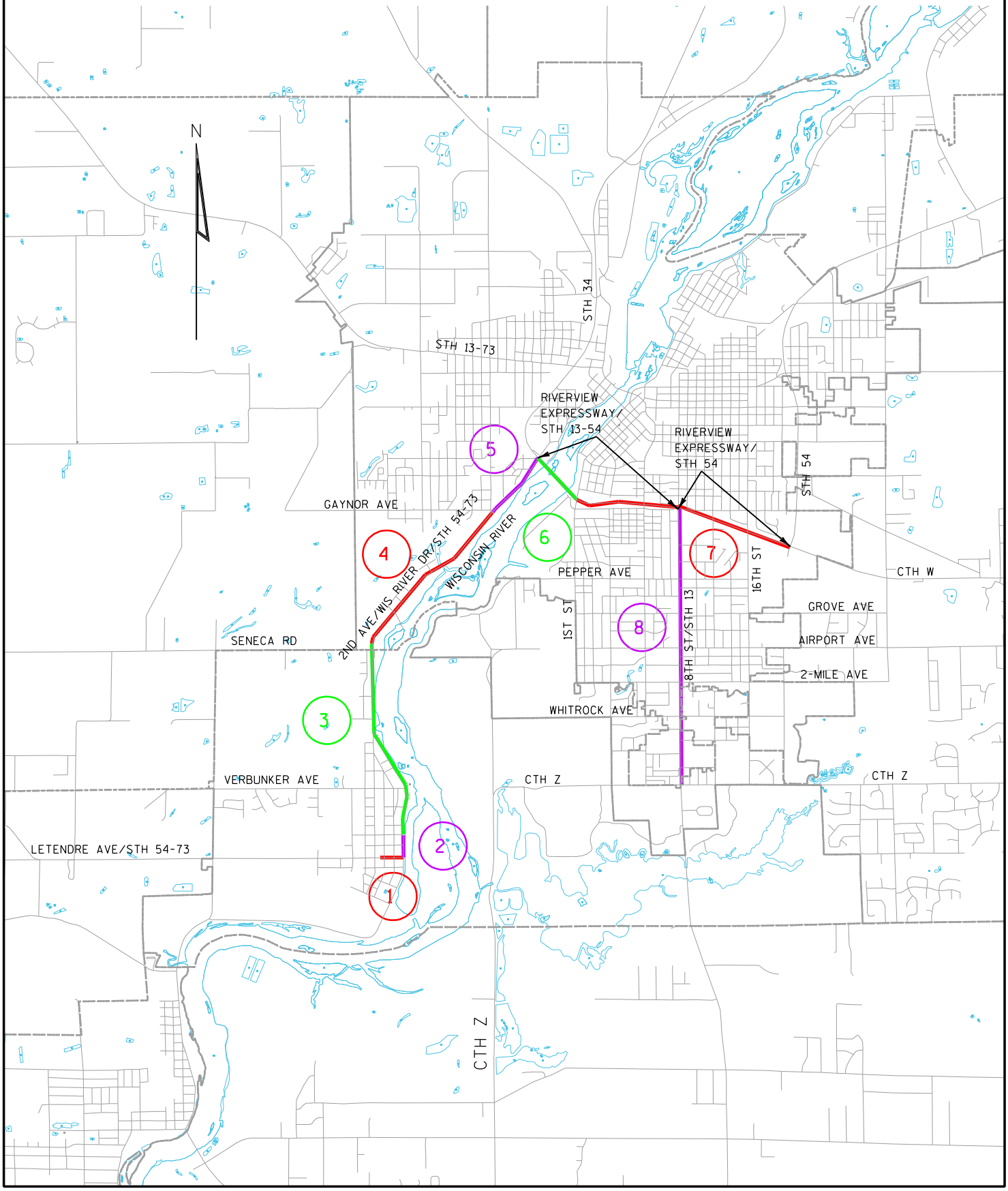


EXHIBIT 1

EXHIBIT 2A
Roadway Design Criteria - Existing Corridor

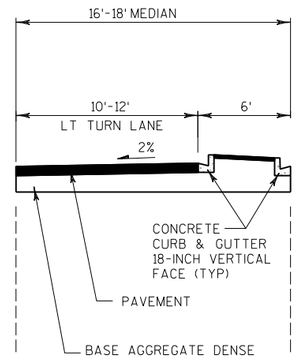
		SEGMENT (See Exhibit 1 for locations)							
		1	2	3	4	5	6	7	8
Item	References	Letendre Ave/ STH 54-73	2nd Ave/ STH 54-73 (Letendre to Lavigne)	2nd Ave/ STH 54-73 (Lavigne to Seneca)	2nd Ave/ STH 54-73 (Seneca to 17th Ave/ Gaynor)	2nd Ave/ STH 54-73 (17th Ave/ Gaynor to Riverview Expressway)	Riverview Expressway/ STH 13-54-73 (2nd Ave - 1st St)	Riverview Expressway/ STH 13-54-73 (1st St - CTH W)	8th Street/ STH 13-73
GENERAL									
Design Year	WisDOT	2035							
Design Life	WisDOT Policy	20 years							
Existing Posted Speed	Field Observation	25	25	40	40	35	40	40	35
Desirable Design Speed - V (mph)	FDM 11-10-1	30	30	45*	45*	40	45*	45*	40
Design Vehicle (For Geometric Design)	WisDOT Policy	WB-62							
Design Level of Service	FDM 11-5-3	D	D	D	D	D	D	D	D
Stopping Sight Distance (FT)	FDM 11-10-5, Figure 1	200	200	360	360	305	360	360	305
Min. Decision Sight Distance (FT)	FDM 11-10-5, Figure 1 (Maneuver E)	620	620	930	930	825	930	930	825
Truck Traffic (%)	WisDOT Traffic Forecasting Section	7.6%	7.6%	7.6%	7.6%	7.6%	8.4%	Unknown	6.6%
Existing AADT (2006)	WisDOT Traffic Forecasting Section	8500	7400	7400-7930	11750	13050	26900	15150 - 21450	19450-29500
Construction Year AADT (2015)	WisDOT Traffic Forecasting Section	9850	8350	8350-8960	12700	14300	29900	17700 - 24350	22450-32950
Design AADT (2035)	WisDOT Traffic Forecasting Section	12200	10550	10550-11260	14700	16850	36100	23300 - 30800	29250-39400
Functional Classification	WisDOT Functional Classification Maps	Urban Principal Arterial**							
Urban Roadway Type	FDM 11-20-1, Table 2	Low Speed Urban Roadway							
FDM Design Class	FDM 11-20-1, Figure 1	U2b	U2b	U2b	U2b	U2b	U3	U4	

*** 45 MPH DESIGN SPEED IS USED FOR DEVELOPMENT OF GEOMETRIC ELEMENTS (HORIZONTAL AND VERTICAL ALIGNMENT, ETC..) AND NOT FOR CROSS SECTION ELEMENTS. CROSS SECTION ELEMENTS INCLUDING THE USE OF BARRIER VS. MOUNTABLE CURB ARE BASED ON POSTED SPEED.**

**** THE FUNCTIONAL CLASS OF THE EXISTING CORRIDOR AT THE SOUTH/WEST TERMINUS AND THE NORTH/EAST TERMINUS IS URBAN PRINCIPAL ARTERIAL. IT IS ANTICIPATED THAT THE EAST ARTERIAL WILL BE CLASSIFIED AS AN URBAN PRINCIPAL ARTERIAL.**

EXHIBIT 2B
Roadway Design Criteria - Existing Corridor

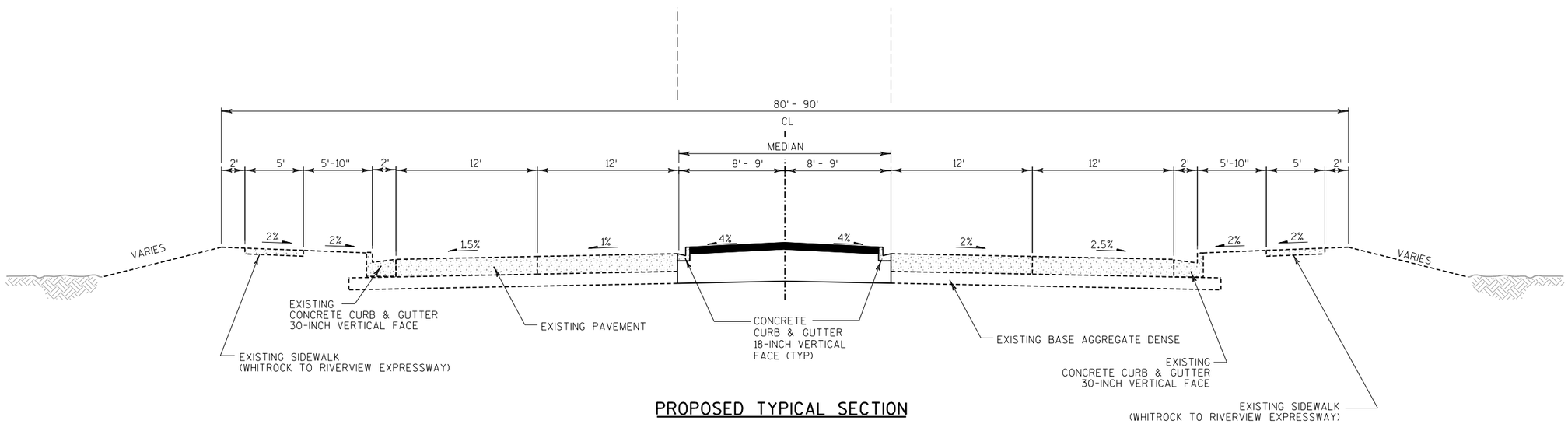
		SEGMENT (See Exhibit 1 for locations)							
		1	2	3	4	5	6	7	8
Item	**References**	**Letendre Ave/ STH 54-73**	**2nd Ave/ STH 54-73 (Letendre to Lavigne)**	**2nd Ave/ STH 54-73 (Lavigne to Seneca)**	**3rd Ave/ STH 54-73 (Seneca to 17th Ave/ Gaynor)**	**2nd Ave/ STH 54-73 (17th Ave/ Gaynor to Riverview Expressway)**	**Riverview Expressway/ STH 13-54-73 (2nd Ave - 1st St)**	**Riverview Expressway/ STH 13-54-73 (1st St - CTH W)**	**8th Street/ STH 13-73**
HORIZONTAL ALIGNMENT									
Max. Superelevation Rate	FDM 11-10-5, Table 6	4%							
Min. Radius of Curvature for design speed (FT Radius)	Low speed urban criteria (based on side friction), FDM 11-10-5, Table 6 , pgs 18-20	230	230	665	665	490	665	665	490
Min. Horizontal Curve for Normal Crown (FT Radius)	Low speed urban criteria (based on side friction), FDM 11-10-5, Table 6 , pgs 18-20	300	300	945	945	675	945	945	675
Max. Deflection Without Curve (Degrees)	FDM 11-10-5, Table 4	2	2	1	1	2	1	1	2
Max. Deflection Through Urban Intersections (Degrees)	FDM 11-10-5, Table 5	8	8	N/A	N/A	3	N/A	N/A	3
Intersection Sight Distance (FT)	FDM 11-10-5, pgs 9-13	Varies based on location							
Design Vehicle for Intersection Sight Distance	FDM 11-10-5, Table 1	WB-62							
VERTICAL ALIGNMENT									
Type of Terrain	GDHS 2001, pg 235	Level							
Max. Grade	GDHS 2001, pg 476	8%	8%	6%	6%	7%	6%	6%	7%
Min. Continuous Grade (Desirable Value / Min. Value)	FDM 11-10-5, pg 22	0.5% (DES.) / 0.3% (MIN.)							
Min. Length for CREST Curves (FT)	FDM 11-10-5, Figure 3	90	90	135	135	120	135	135	120
K Value for CREST Vertical Curves (Des / Min)	FDM 11-10-5, Figure 3	30	30	120 (DES.) / 80 (MIN.)	120 (DES.) / 80 (MIN.)	80 (DES.) / 60 (MIN.)	120 (DES.) / 80 (MIN.)	120 (DES.) / 80 (MIN.)	80 (DES.) / 60 (MIN.)
Max. K for CREST Curves (for drainage)	FDM 11-10-5, pg 21	167							
Min. K Value for SAG Vertical Curves	FDM 11-10-5, Figure 4	37	37	79	79	64	79	79	64
Max. grade change without vertical curve	FDM 11-10-5, Table 8	1%	1%	0.70%	0.70%	0.80%	0.70%	0.70%	0.80%
Max. Sidewalk and Multi-use Path Grade	FDM 11-20-1, pg 12 & ADA	8.33%							
INTERSECTION DESIGN									
Urban Turn Bay Taper	FDM 11-25-1, Figure 2	10:1 (DES.) / 75' (MIN.)							
Left Turn Lane Width	FDM 11-25-5, Table 2	12' (DES.) / 10' (MIN.)							
Median Separating Opposing Traffic - Width at LT Turn Lane (FOC to FOC)	FDM 11-25-5, Table 2	4' - 14'							
Turn Lane Length	FDM 11-25-5, Figure 1	100' (DES.) / 50' (MIN.) / DESIRABLE TO ACCOMMODATE 90% TRAFFIC QUEUES AT SIGNALIZED INTERSECTIONS							



PROPOSED TYPICAL SECTION

8TH STREET

MEDIAN AT LEFT TURN LANE



PROPOSED TYPICAL SECTION

8TH STREET

SPOT IMPROVEMENT

CONVERT TWTL TO BARRIER MEDIAN

PROPOSED EAST ARTERIAL CORRIDOR LOCATION MAP

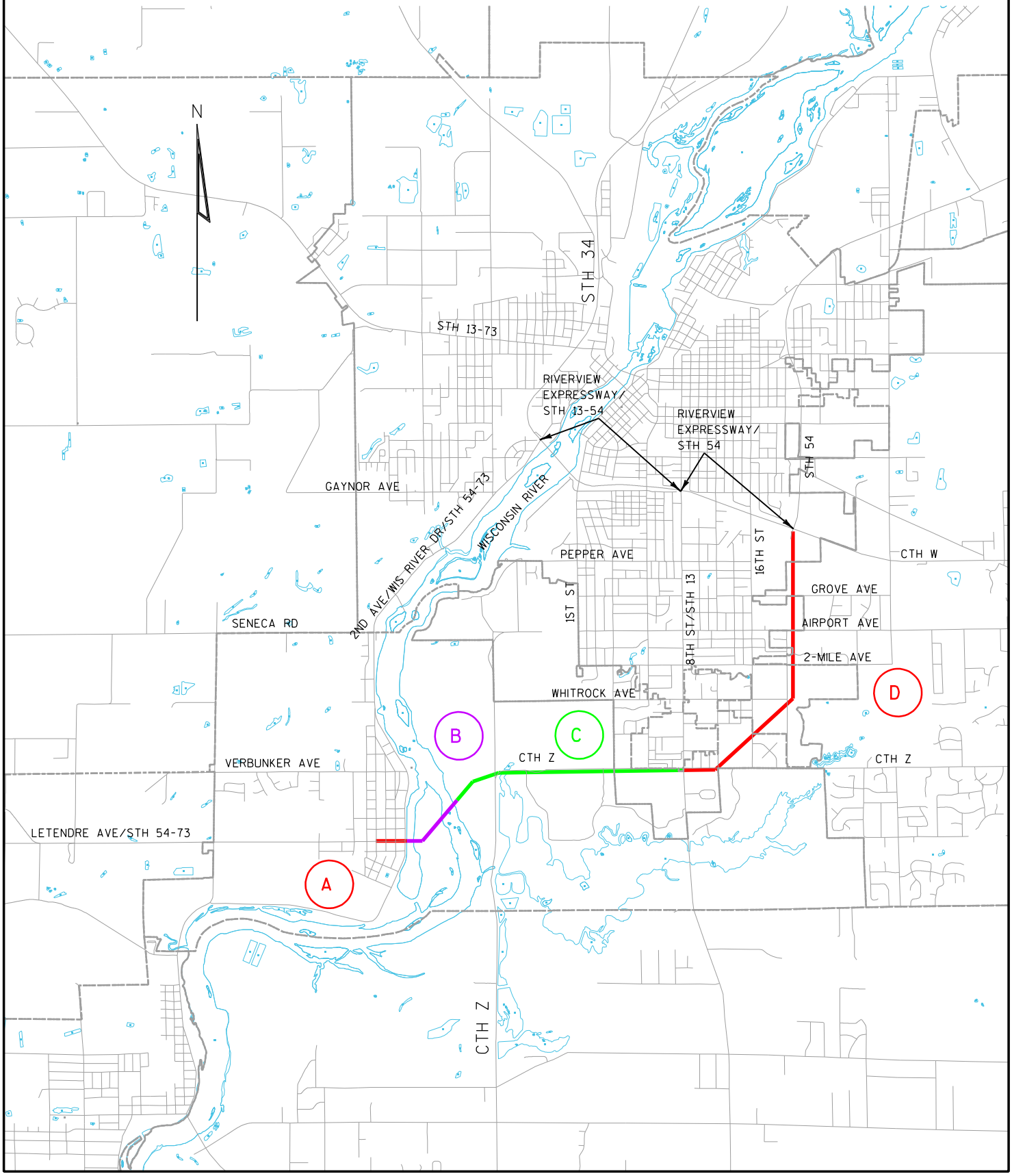


EXHIBIT 4

EXHIBIT 5A
Roadway Design Criteria - Proposed East Arterial Corridor

		SEGMENT (See Exhibit 4 for locations)			
		A	B	C	D
Item	References	South/West Terminus in Port Edwards to Wisconsin River Bridge	Wisconsin River Bridge Crossing	Wisconsin River Bridge - STH 13	STH 13 - North/East Terminus at CTH W
GENERAL					
Design Year	WisDOT	2035			
Design Life	WisDOT Policy	20 years			
Proposed Posted Speed - V (mph)	FDM 11-10-1	25	35	40	
Desirable Design Speed - V (mph)	WisDOT Region (3-3-06 email)	30	40	45 *	
Design Vehicle (For Geometric Design)	WisDOT Policy	WB-62			
Design Level of Service	FDM 11-5-3	D	D	D	D
Stopping Sight Distance (FT)	FDM 11-10-5, Figure 1	200	305	360	
Min. Decision Sight Distance (FT)	FDM 11-10-5, Figure 1 (Maneuver E)	620	825	930	
Truck Traffic (%)	WisDOT Traffic Forecasting Section	5.5%			
Existing AADT (2006)	WisDOT Traffic Forecasting Section	N/A			
Construction Year AADT (2015)	WisDOT Traffic Forecasting Section	10850	10850	10600	17450 - 18600
Design AADT (2035)	WisDOT Traffic Forecasting Section	13050	13050	14150	22350-23800
Functional Classification	WisDOT Functional Classification Maps	Urban Principal Arterial **			
Urban Roadway Type	FDM 11-20-1, Table 2	Low Speed Urban Roadway			
FDM Design Class	FDM 11-20-1, Figure 1	U2b			U4

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EXHIBIT 5B
Roadway Design Criteria - Proposed East Arterial Corridor

		SEGMENT (See Exhibit 4 for locations)			
		A	B	C	D
Item	**References**	**South/West Termini in Port**	**Wisconsin River**	**Wisconsin River**	**STH 13 - North/East Termini at**
HORIZONTAL ALIGNMENT					
Max. Superelevation Rate	FDM 11-10-5, Table 6	4%			
Min. Radius of Curvature for design speed (FT Radius)	Low speed urban criteria (based on side friction), FDM 11-10-5, Table 6 , pgs 18-20	230	490	665	665
Min. Horizontal Curve for Normal Crown (FT Radius)	Low speed urban criteria (based on side friction), FDM 11-10-5, Table 6 , pgs 18-20	300	675	945	945
Max. Horizontal Deflection Without Curve (Degrees) (not at intersections)	FDM 11-10-5, Table 4	2		1	
Max. Deflection Through Urban Intersections (Degrees)	FDM 11-10-5, Table 5	8	3	N/A	
Intersection Sight Distance (FT)	FDM 11-10-5, pgs 9-13	Varies based on location			
Design Vehicle for Intersection Sight Distance	FDM 11-10-5, Table 1	WB-62			
Intersection Spacing (FT)	FDM 11-25-45, pg 2	1300 (DES.)			
Frontage Road Spacing (FT) Distance at intersection (min/des)	FDM 11-25-45, Figure 1	300 (MIN.) / 600 (DES.)			
Frontage Road Spacing (FT) Distance outside intersection (min/des)	FDM 11-25-45, Figure 1	45 / 85			
VERTICAL ALIGNMENT					
Type of Terrain	GDHS 2001, pg 235	Level			
Max. Grade	GDHS 2001, pg 476	8%	7%	6%	
Min. Continuous Grade (Desirable Value / Min. Value)	FDM 11-10-5, pg 22	0.5% (DES.) / 0.3% (MIN.)			
Min. Length for CREST Curves (FT)	FDM 11-10-5, Figure 3	90	120	135	
K Value for CREST Vertical Curves (Des / Min)	FDM 11-10-5, Figure 3	30	80 (DES.) / 60 (MIN.)	120 (DES.) / 80 (MIN.)	
Max. K for CREST Curves (for drainage)	FDM 11-10-5, pg 21	167			
Min. K Value for SAG Vertical Curves	FDM 11-10-5, Figure 4	37	64	79	
Max. grade change without vertical curve	FDM 11-10-5, Table 8	1%	0.80%	0.70%	
Max. Sidewalk and Multi-use Path Grade	FDM 11-20-1, pg 12 & ADA	8.33%			
INTERSECTION DESIGN					
Urban Turn Bay Taper	FDM 11-25-1, Figure 2	10:1 (DES.) / 75' (MIN.)			
Left Turn Lane Width	FDM 11-25-5, Table 2	12' (DES.) / 10' (MIN.)			
Median Separating Opposing Traffic - Width at LT Turn Lane (FOC to FOC)	FDM 11-25-5, Table 2	4' - 14'			
Turn Lane Length	FDM 11-25-5, Figure 1	100' (DES.) / 50' (MIN.) / DESIRABLE TO ACCOMMODATE 90% TRAFFIC QUEUES AT SIGNALIZED INTERSECTIONS			

2

NOTES:

TYPICAL SECTIONS SHOWN WITH PATH ON ONE SIDE. ANY NEED FOR PEDESTRIAN/BIKE ACCOMMODATIONS ON BOTH SIDES OF THE EAST ARTERIAL TO BE DISCUSSED WITH LOCALS.

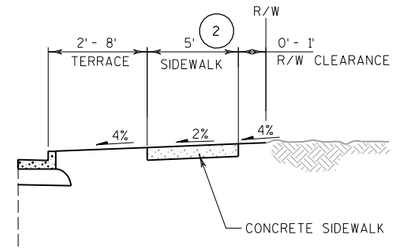
RANGE OF WIDTHS SHOWN ARE BASED ON FDM PROCEDURE 11-20-1

(1) THE TERRACE WIDTH ADJACENT TO MULTI-USE TRAIL BASED ON THE FOLLOWING CRITERIA:

2' MIN TO 4' MAX TO EDGE OF SIGN + 2' SIGN (TYP) + 3' BIKE CLEARANCE = 9'
2' TO EDGE OF SIGN (REQ'D LATERAL CLEARANCE) + 4' SIGN (MAX) + 3' BIKE CLEARANCE = 9'

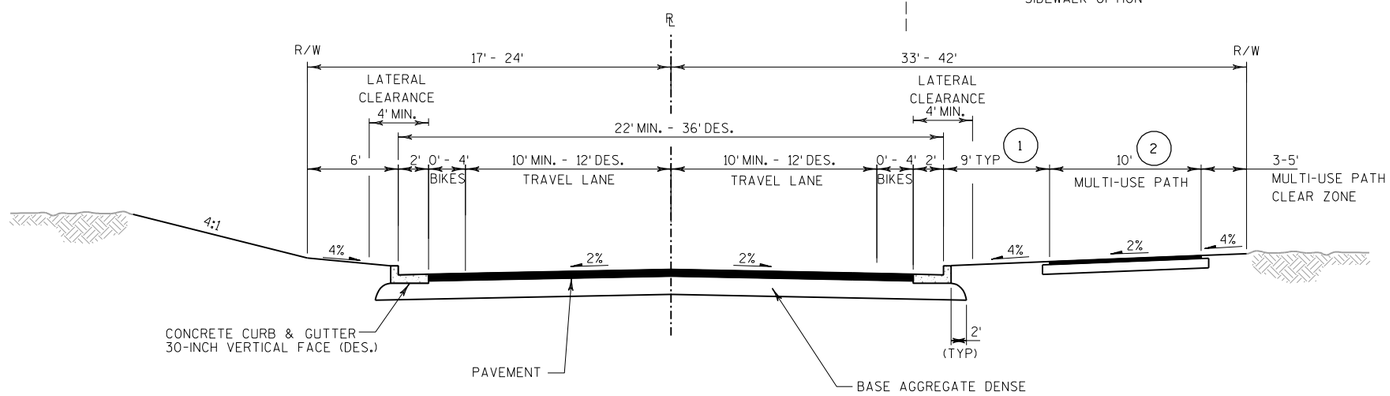
THE EXISTING TERRACE WIDTH NORTH OF CTH W = 10'

(2) SIDEWALK WIDTH ON STRUCTURE = 6' MIN.
MULTI-USE PATH WIDTH ON STRUCTURE = 12' MIN.



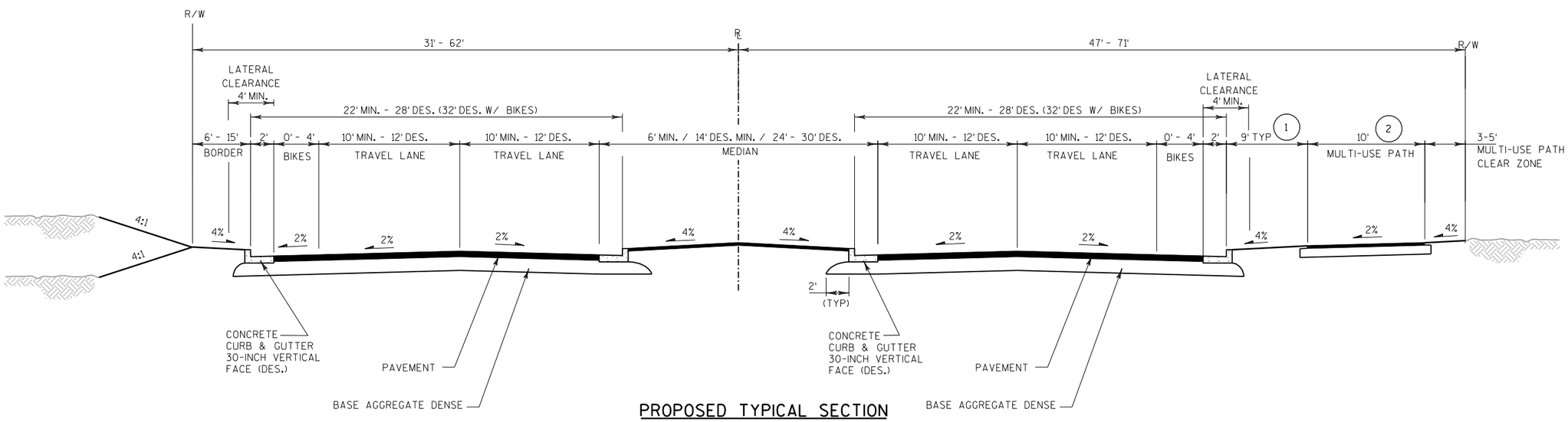
PROPOSED TYPICAL SECTION

SIDEWALK OPTION



PROPOSED TYPICAL SECTION

EAST ARTERIAL
URBAN DESIGN CLASS 2B
SOUTH TERMINI - STH 13



PROPOSED TYPICAL SECTION

EAST ARTERIAL
URBAN DESIGN CLASS 4
STH 13 - CTH W

PROJECT NO:6999-08-09	HWY:EAST ARTERIAL	COUNTY:WOOD	EXHIBIT 6 - TYPICAL SECTIONS FOR PROPOSED EAST ARTERIAL CORRIDOR	SHEET	E