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# Wahoo East Study

US-77; 2+2 EXPANSION

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## Wahoo East 2+2 Study; US-77

RP 95.05 – RP 111.48

### Location

This study is located on 16.43 miles of US-77 within Saunders County, starting just east of the junction of N-109 with US-77, east of Wahoo at reference post (RP) 95.05, and extending east for 5.08 miles to RP 100.13, the junction of N-92 with US-77. The study limits extend north 11.35 miles to RP 111.48, 0.12 miles south of the Platte River bridge at the Saunders and Dodge County line.

### Description

This study was conducted using a 2+2 design which involves using the existing two lanes of the US-77 highway and adding two new lanes adjacent to the existing lanes, resulting in a four-lane divided highway. Where feasible, the existing two lanes will be resurfaced and remain on alignment. Existing bridges will be assessed and either used in place, rehabilitated, or replaced as necessary. New structures will be constructed on the additional two lanes. New Right-of-Way (ROW), extensive grading and culvert work will be required for expansion to a 4-lane facility.

### Analysis

The corridor analysis study area consisted of 150 feet either side from the existing travel lanes centerline. Within this study area, a right of existing and left of existing alternative was reviewed for impacts to resources, including but not limited to, wetlands, streams and channels, historic sites, utilities, and private property acquisition, damages, and relocations. The corridor level analysis prioritized wetland impacts and an adjacent cemetery in determining which side may be least impacted by this expansion.

### Assumptions

- The 4-lanes would be separated by a 54 foot-wide median
- The study did account for the need for a wider median due to a difference in elevation between the new and existing lanes. Locations have been identified where existing profile does not meet 70mph
- The new lanes profile would not be a lower elevation than the existing lanes
- No hydraulic analysis was conducted for the roadway or bridges. For purposes of this study:
  - District 1 stated that there are no existing flooding or overtopping issues for the existing lanes
  - Existing lanes culverts were extended to accommodate grading
  - New lanes culverts locations were determined and sized to match existing lanes
  - Bridge division provided a recommendation, but further hydraulic analysis would be required for final determination
- The new lanes would remain entirely on the right or left of the existing lanes and creating crossovers and/or switching new lanes to opposite sides was not evaluated with this 2+2 design.

**Conclusion: The proposed new lanes may be least impactful to existing resources if constructed south (right) of the existing lanes from Wahoo to Mead and east (right) of the existing lanes from Mead to Fremont.**

## Wahoo East 2+2 Study; US-77

RP 95.05 – RP 111.48

### Cost

<b>PE (10%)</b>	<b>\$9,401,414</b>
<b>CE (5%)</b>	<b>\$4,700,707</b>
<b>ROW</b>	<b>\$7,500,000</b>
<b>Utilities (2.9%)</b>	<b>\$1,410,212</b>
<b>Construction</b>	<b>\$94,014,139</b>
<b>TOTAL</b>	<b><u>\$117,026,472</u></b>

### Improvements

#### Existing Lanes:

- Mainline (*M&R determination from Wahoo East, CN 13394*)
  - Make Concrete Repairs as necessary. Joint and Crack Seal.
  - Mill 4" of existing asphalt surface by Cold Milling Class 4. Place 4" of Asphaltic Concrete Type SPR. There will be no grade raise at centerline.
  - Some locations vary:
    - Mill 4" of existing asphalt surface by Cold Milling Class 4. Trench 3' wide to a depth of 4" of existing asphalt shoulder at exposed PCC edge (11' from centerline) by Trench Widen. Fill Trench with Asphaltic Concrete Type SPR. Place 4" of Asphaltic Concrete Type SPR. There will be no grade raise at centerline.
- Surfaced Shoulders
  - Mill 2" of existing asphalt by Cold Milling Class 3. Place 2" of Asphaltic Concrete Type SPS. There will be no grade raise.

#### New Lanes:

- **Wahoo to Mead (RP 95.05 – RP 100.13)** - South (right) of existing
- **Mead to Fremont (RP 100.13 – RP 111.48)** - East (right) of existing
- Mainline, Turn Lanes, and Inside Shoulder
  - Build 10" Doweled Concrete Pavement on 4" Foundation Course on Stabilized Subgrade, Type Fly Ash.
- Outside Surfaced Shoulders
  - Build 10" tapered to 8" Concrete Pavement on 4" Foundation Course on Stabilized Subgrade, Type Fly Ash

Wahoo East 2+2 Study; US-77

RP 95.05 – RP 111.48

**Improvements (Continued)**

Existing Bridges:

Structure S077	Type of Structure	Length	Clear Roadway Width	Proposed Treatment*
9791	Steel Girder Simple	52'	32'	Partial Depth Deck Repairs 3" Asphalt Overlay with Hot Liquid Membrane End of Paving to End of Paving 4" Curb Angle Remodel Buttress to 35" 3" Grade Raise
9993	Twin 66.9' Concrete Box Culvert Barrel #1 – 10' x 5' Barrel #2 – 12' x 6'			Extend as determined by Roadway Design
10726	Prestressed Concrete Girder	122'	44'	Partial Depth Deck Repairs 3" Asphalt Overlay with Hot Liquid Membrane End of Paving to End of Paving 4" Curb Angle Remodel Buttress to 35" 3" Grade Raise
11144	Concrete Slab	31'	38.3'	Replace with Triple 7' x 14' x 145' Concrete Box Culvert on CN 13394

\*The existing bridges would require additional analysis for preservation or replacement

New Bridges:

Structure S077	Length*	Clear Roadway Width	Proposed Treatment
9791R	60'	44'	New Bridge
9993R	NA	NA	Twin 12' x 6' x 150' Concrete Box Culvert
10726R	140'	44'	New Bridge
11144R	NA	NA	Triple 7' x 14' x 150' Concrete Box Culvert

\* New bridges would require additional evaluation for final type and span length

## Wahoo East 2+2 Study; US-77

RP 95.05 – RP 111.48

### Deficiencies

The corridor was reviewed for potential deficiencies. Additional analysis will be required; however, locations of deficient vertical curves were identified. The table (below) lists the vertical curve locations with sight distance less than 70 mph.

Reference Post	Existing Station	Curve Length (ft)	Crest or Sag	Speed (MPH)
98.50	168+75.00	400	Crest	68
130.33	171+50.00	600	Crest	67
106.00	309+50.00	600	Crest	67
106.20	318+75.00	800	Sag	61
106.60	346+50.00	600	Sag	49
106.80	353+75.00	600	Crest	62
108.00	415+00.00	650	Crest	61
108.50	441+00.00	1100	Crest	69
108.70	460+00.00	850	Sag	59
110.50	547+75.00	600	Sag	58

### Traffic Recommendations

- Wahoo Airport, N-109 and US-77 West
  - Existing crashes are being reviewed due to fatality and other complaints
  - Potential need for signal in the future, not much for changes with geometrics unless we started to look at other alternatives (Roundabout, RCUT, etc. that maybe done separate from this 4-lane project)
- Co Rd 13
  - Eastbound offset right-turn lane
  - Westbound left-turn lane may be slightly longer due to truck traffic than a traditional county road intersection.
- N-92 intersection, N-109 and US-77 East
  - For this study, design estimated offset right-turn lanes, left-turn lanes and removal of existing ramps.
  - Traffic comments
    - Potential need for interchange or realigning US-77 and moving N-92.
    - Additional analysis required and dependent on future 4-lanes on east approach of N-92.
- N-64 intersection to Valley
  - Northbound offset right-turn lane and add short raised median on east approach of highway.
- Intersection to Leshara (Co Rd "T")
  - Traffic did not recommendations at this location based on past volumes, complaints, crashes, etc.
- Co Rd "W"
  - Southbound offset right-turn lane
  - Lake community to the east may also request offset northbound right-turn lane
- N-109 intersection, South of Inglewood
  - Traffic analysis has identified an existing problem
  - Southbound offset right-turn lane required (or keep ramp if feasible).

## Wahoo East 2+2 Study; US-77

RP 95.05 – RP 111.48

### ROW

- Additional property rights will be required for this expansion. The preliminary study determined that approximately 100' to 125' from the existing ROW line would be required. Expansion of the new 2-lanes will impact and require compensation for damages to private property, including but not limited to, residences, buildings, and pivots.
  - 11 potential relocations areas
  - 14 potential sites for pivot impacts
- ROW has been acquired to build an alternative
  - North of CR S (Mead North Stretch RP 106.00 – RP 111.40)
    - 240 to 370 ft width of new ROW approximately 800 ft east of existing lanes
    - Align shifts back to west near N-109 and US-77 intersection
- ROW Cost Assumptions
  - New ROW would extend 125 ft from existing ROW for the project limits
  - \$10,000 per acre
  - \$300,000 for relocations
  - 30% contingency for incidentals

### Environmental

The corridor analysis study area consisted of 150 feet either side from the existing travel lanes centerline. Within this study area, a right of existing and left of existing alternative was reviewed for impacts to resources, including but not limited to, wetlands, streams and channels, historic sites. The known historic sites consist of old farmsteads. The corridor level analysis prioritized wetland impacts and an adjacent cemetery in determining which side would be least impacted by this expansion.

Wahoo – Mead:

Wetland impacts were the least on the right (south) from Wahoo – Mead which controlled the determination for the new lanes.

Mead – Platte River:

Wetland impacts were the least on the west (left) from Mead to N-64; however, fewer wetlands were impacted on the east (right) from N-64 to the Platte River. The controlling factor was a cemetery on the west (left) at RP 107.90, just south of County Road U.

Wahoo East 2+2 Study; US-77

RP 95.05 – RP 111.48

**Environmental (Continued)**

The table (below) describes the impacts to resources 150 feet left and right of the existing lanes center line.

Location	Wetland Impacts (acres)		Channels (Lin. Ft.)		Historic Properties	
	Lt.	Rt. (south)	Lt.	Rt. (south)	Lt.	Rt. (south)
Wahoo-Mead						
US-16-Co. Rd. 15	0.030	0.009				
Co. Rd. 15-14	0.597	0.076				
Co. Rd. 14-13	0.068	0.064	144	156		
Co. Rd. 13-12	0.040			123	1	
Co. Rd. 12-11	0.095	0.361	103	121		
<b>Subtotal</b>	<b>0.830</b>	<b>0.510</b>	<b>247</b>	<b>400</b>	<b>1</b>	
Mead-US-64		(east)		(east)		(east)
US-77-Co. Rd. N	0.733	2.165	1677			
Co. Rd. N-Co. Rd. O		0.127				
Co. Rd. O-Co. Rd. P						
Co. Rd. P-Co. Rd. Q		0.056				
Co. Rd. Q-Co. Rd. R	0.155	0.135	136	695		
<b>Subtotal</b>	<b>0.888</b>	<b>2.483</b>	<b>1813</b>	<b>695</b>		
US-64-Fremont		(east)		(east)		(east)
Co. Rd. R-Co. Rd. S	0.483	0.013				
Co. Rd. S-Co. Rd. T	0.331	0.197	174	150		
Co. Rd. T-Co. Rd. U		0.036	174	162	<b>Cemetery</b>	1
Co. Rd. U-Co. Rd. V	0.103	0.082	175	167	1	
Co. Rd. V-Co. Rd. W	3.851	2.114	234	680		
Co. Rd. W-Co. Rd. X	1.120	0.945	137	304.6		
Co. Rd. X-Fremont	0.277	2.928	309	379		
<b>Subtotal</b>	<b>6.165</b>	<b>6.315</b>	<b>1203</b>	<b>1842</b>	<b>1</b>	<b>1</b>
<b>Total</b>	<b>7.883</b>	<b>9.308</b>	<b>3263</b>	<b>2937</b>		

Wahoo East 2+2 Study; US-77

RP 95.05 – RP 111.48

**Utilities**

The table (below) describes the impacts to utilities 150 feet left and right of the existing lanes center line

Location	Utilities	
	Lt.	Rt.
Wahoo-Mead		
US-16-Co. Rd. 15		<b>OP</b>
Co. Rd. 15-14	Telephone	<b>OP</b>
Co. Rd. 14-13		<b>OP</b>
Co. Rd. 13-12		<b>OP</b>
Co. Rd. 12-11		<b>OP</b>
Mead-US-64		
US-77-Co. Rd. N	OP	
Co. Rd. N-Co. Rd. O	OP, Gas	<b>Gas</b>
Co. Rd. O-Co. Rd. P	OP	<b>Telephone</b>
Co. Rd. P-Co. Rd. Q	OP	<b>Telephone</b>
Co. Rd. Q-Co. Rd. R	OP	
US-64-Fremont		
Co. Rd. R-Co. Rd. S	OP, Gas	<b>Gas</b>
Co. Rd. S-Co. Rd. T	Telephone	<b>OP</b>
Co. Rd. T-Co. Rd. U	Telephone	<b>OP</b>
Co. Rd. U-Co. Rd. V	Telephone	<b>OP</b>
Co. Rd. V-Co. Rd. W	Telephone	<b>OP</b>
Co. Rd. W-Co. Rd. X	Telephone	<b>OP</b>
Co. Rd. X-Platte River	Telephone	<b>OP</b>



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RP 95.05 – RP 111.48

### Construction packages

Wahoo – Mead:

- RP 95.05 – RP 100.13
- Short of Intersection
- 5.08 Miles
- New lanes - South (right)
- 1 Bridge location
- 1 Bridge-sized box location
- 2 year construction schedule
- Construction Cost \$24 M

Mead North

- RP 100.13 - RP 105.50
- US-77 – N-92 Intersection
- Extend north of N-64
- 5.37 Miles
- New lanes - South (right)
- 2 year construction schedule
- Construction Cost \$33 M

Fremont South

- RP 105.50 – RP 111.48
- North of N-64
- 6 Miles
- New lanes - east (right)
- 1 Bridge location
- 1 Bridge-sized box location
- 2 year construction schedule
- Construction Cost \$38 M

**Cost Summary**

<b>Group</b>	<b>Cost</b>
Grading	\$ 10,931,340
Concrete Pavement	\$ 56,000,000
Culverts	\$ 1,011,213
Seeding	\$ 2,300,000
Bridges	\$ 2,916,375
Guardrail	\$ 678,187
Bituminous	\$ 4,331,124
Miscellaneous	\$ 6,745,900
General	\$ 9,100,000
<b>Total Construction Costs</b>	\$ 94,014,139
PE (10%)	\$ 9,401,414
CE (5%)	\$ 4,700,707
Utilities (2.9%)	\$ 1,410,212
ROW	\$ 7,500,000
<b><u>Total Project Cost</u></b>	<b><u>\$ 117,026,472</u></b>

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