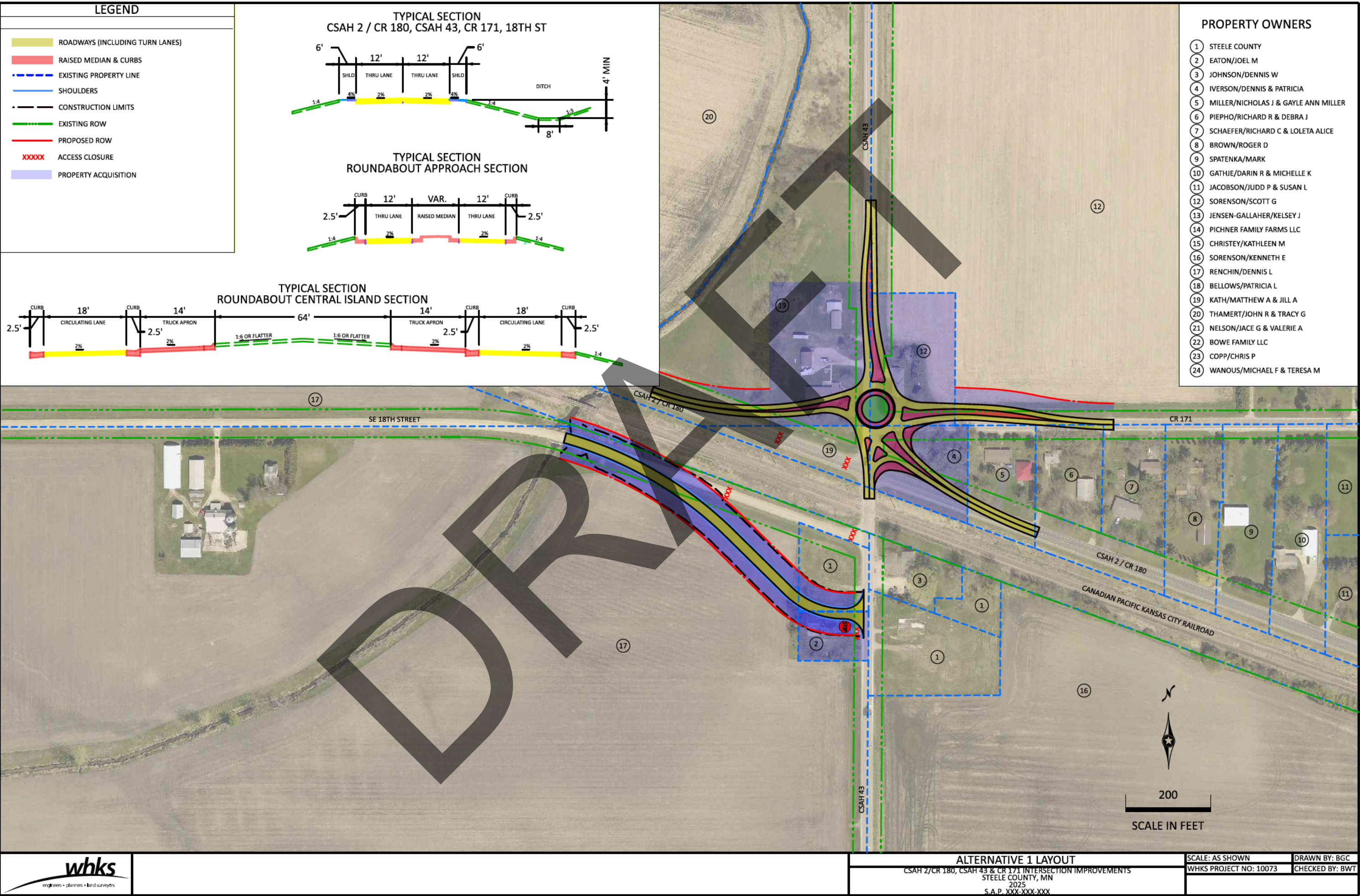


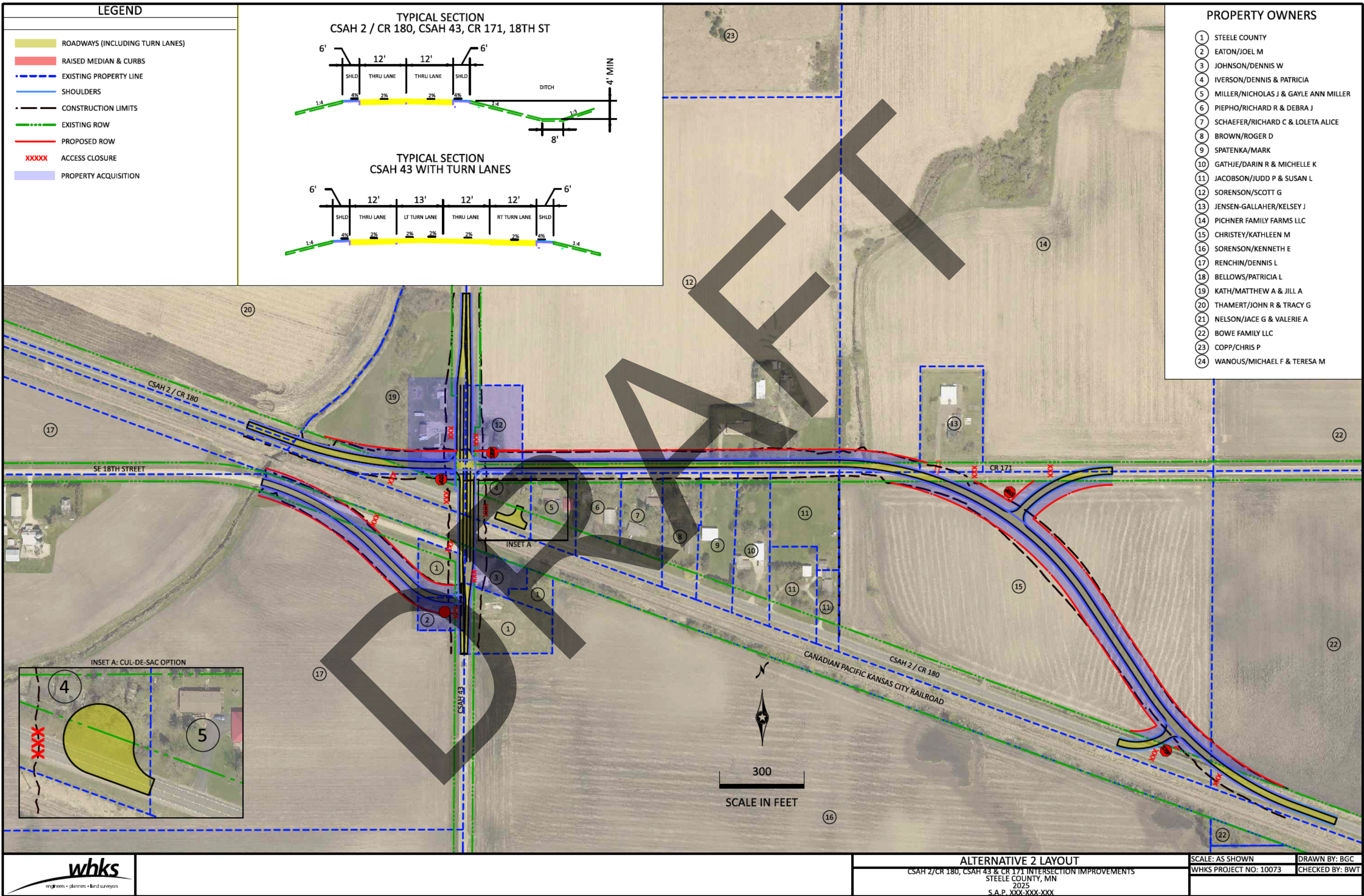
Appendix A: Alternative Layouts

DRAFT

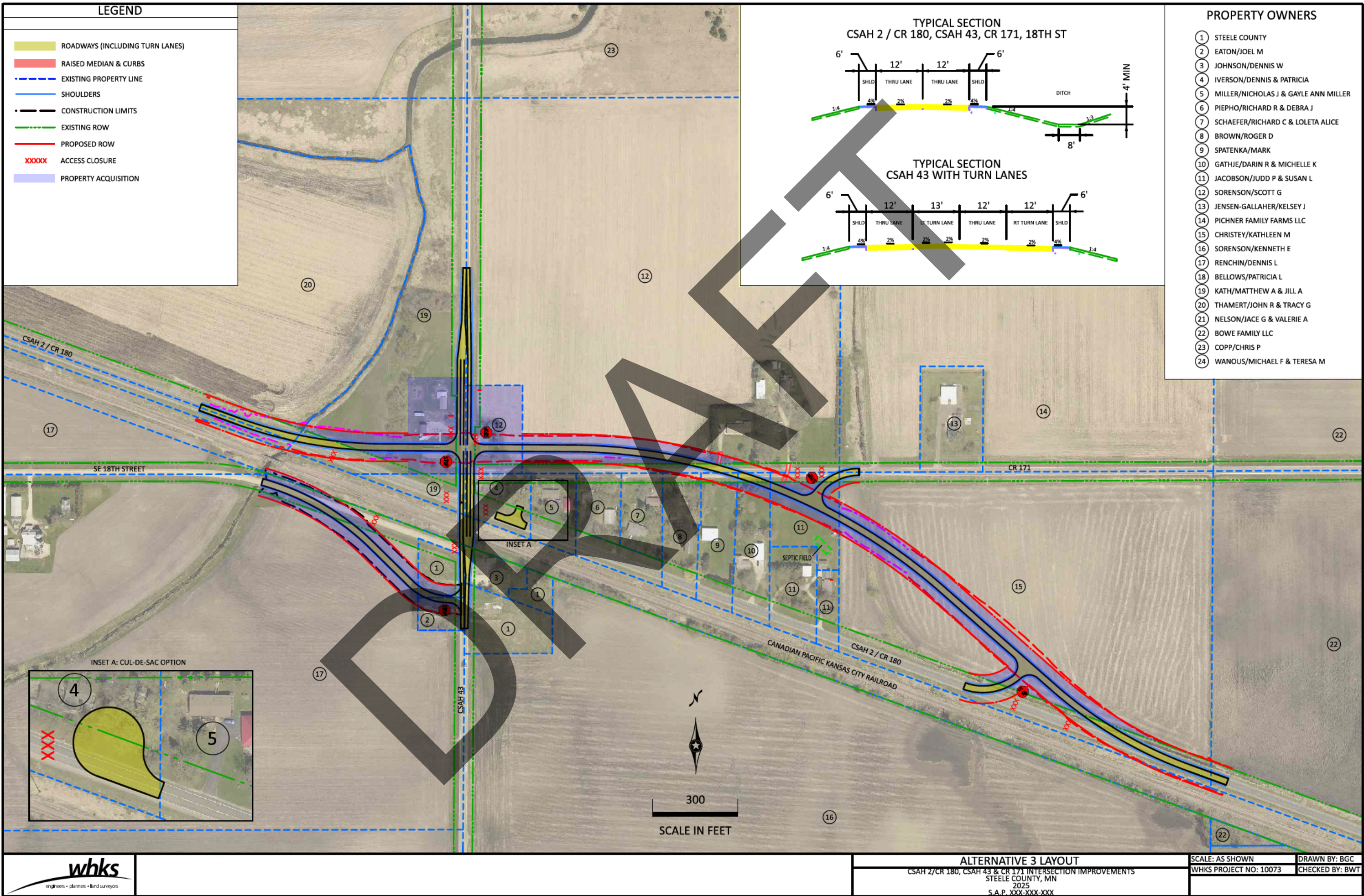
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PLOTTED/REVISED: 1-NOV-2024



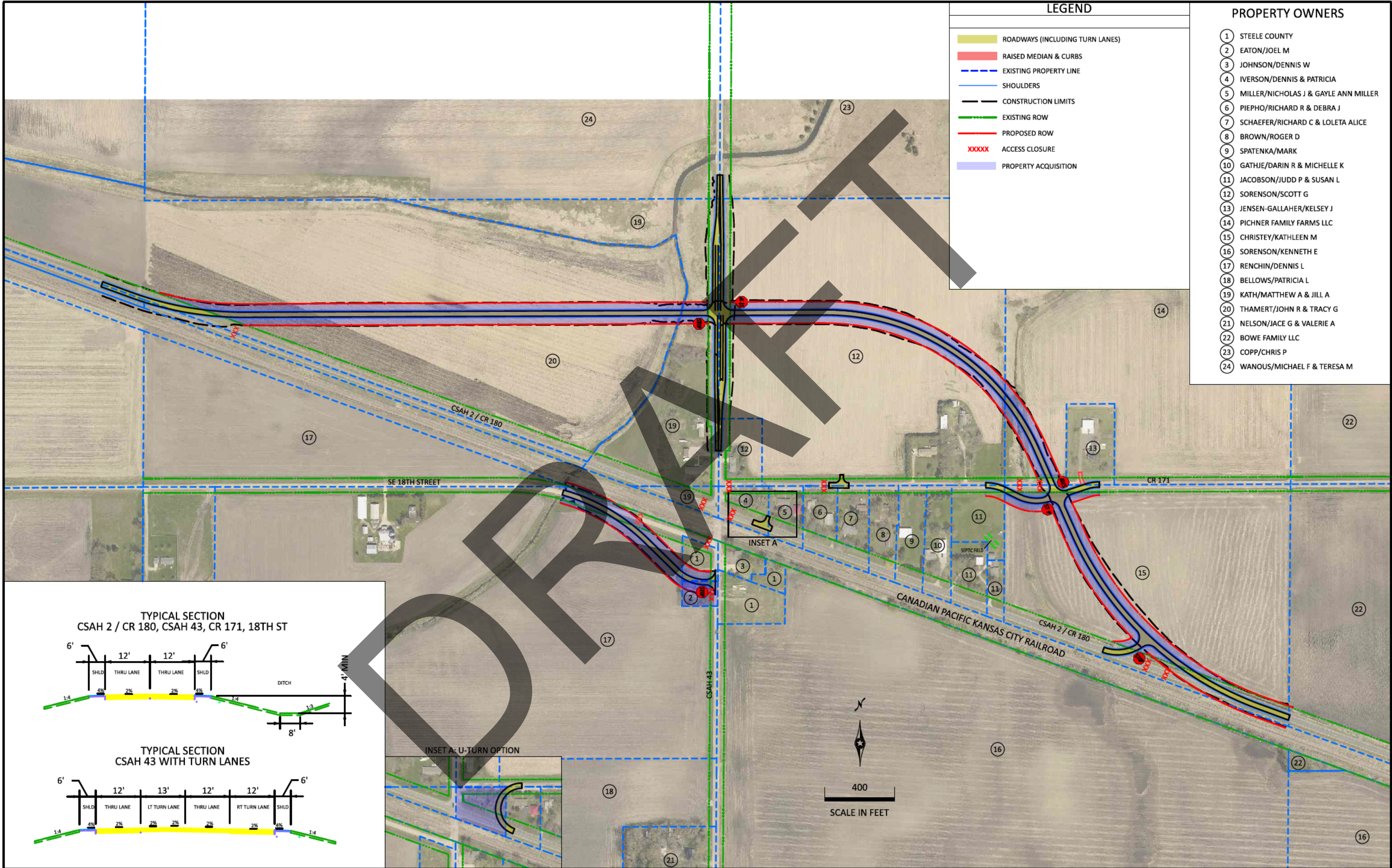
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6-NOV-2024
PLOTTED/REVISED:

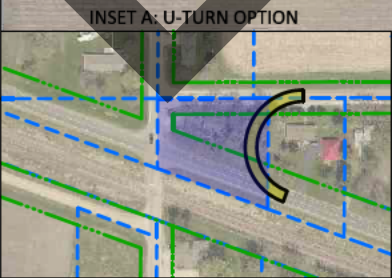
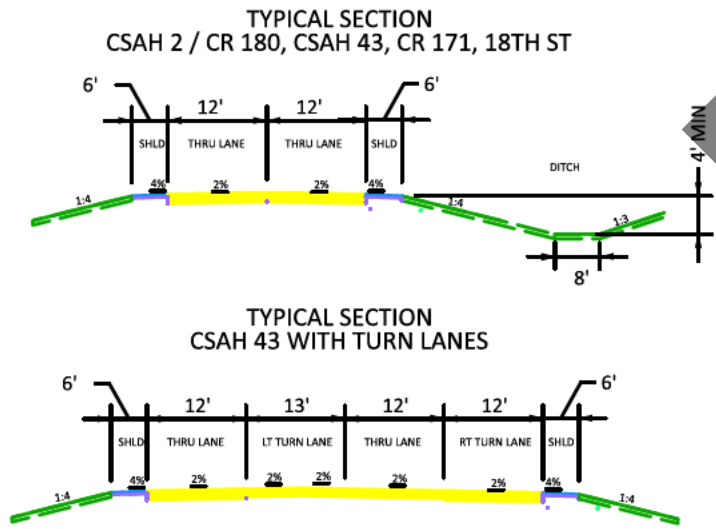


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PLOTTED/REVISED: 16-JAN-2025



LEGEND	
	ROADWAYS (INCLUDING TURN LANES)
	RAISED MEDIAN & CURBS
	EXISTING PROPERTY LINE
	SHOULDERS
	CONSTRUCTION LIMITS
	EXISTING ROW
	PROPOSED ROW
	ACCESS CLOSURE
	PROPERTY ACQUISITION

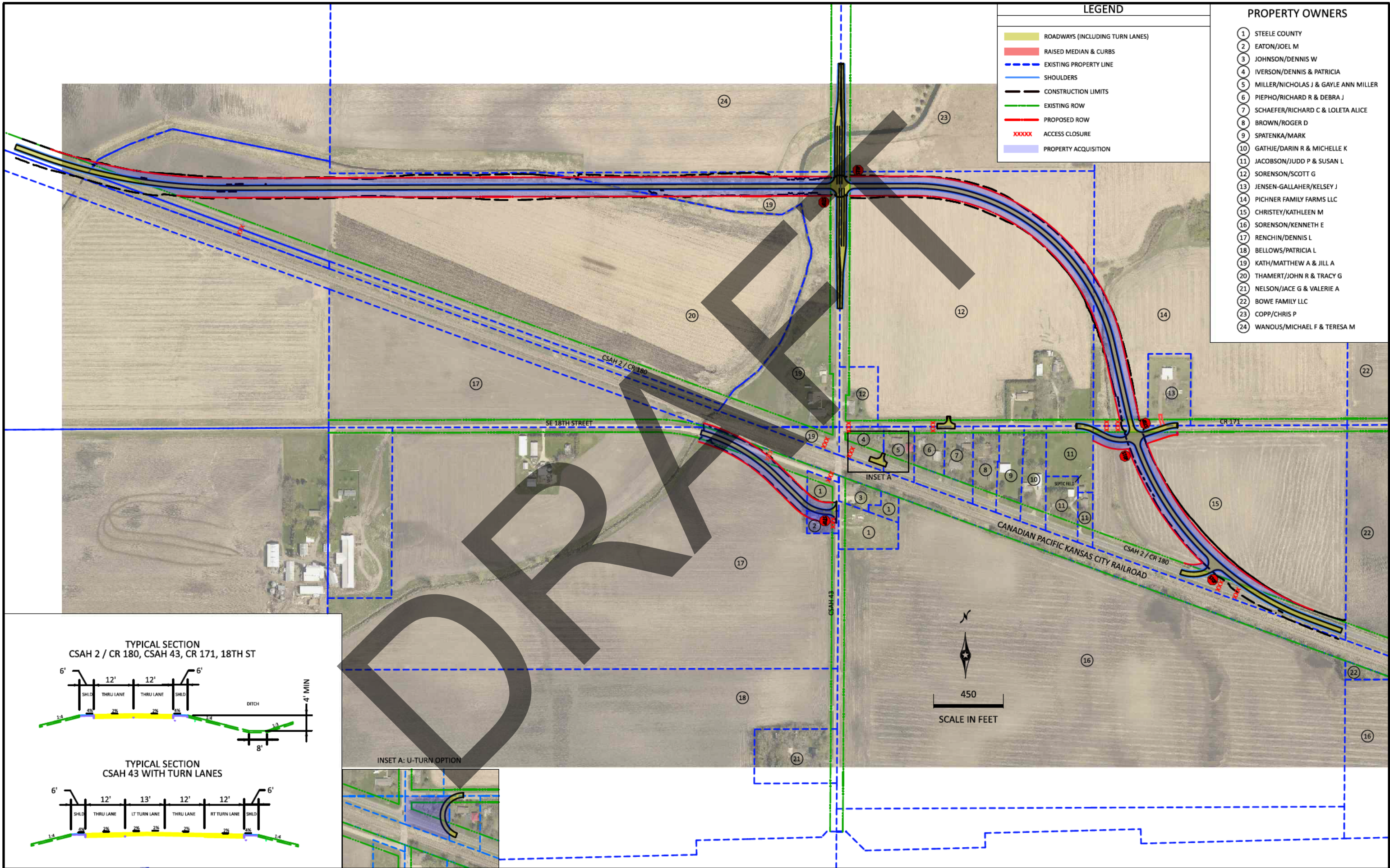
PROPERTY OWNERS	
1	STEELE COUNTY
2	EATON/JOEL M
3	JOHNSON/DENNIS W
4	IVERSON/DENNIS & PATRICIA
5	MILLER/NICHOLAS J & GAYLE ANN MILLER
6	PIEPHO/RICHARD R & DEBRA J
7	SCHAEFER/RICHARD C & LOLETA ALICE
8	BROWN/ROGER D
9	SPATENKA/MARK
10	GATHJE/DARIN R & MICHELLE K
11	JACOBSON/JUDD P & SUSAN L
12	SORENSEN/SCOTT G
13	JENSEN-GALLAHER/KELSEY J
14	PICHNER FAMILY FARMS LLC
15	CHRISTEY/KATHLEEN M
16	SORENSEN/KENNETH E
17	RENCHIN/DENNIS L
18	BELLOWS/PATRICIA L
19	KATH/MATTHEW A & JILL A
20	THAMERT/JOHN R & TRACY G
21	NELSON/JACE G & VALERIE A
22	BOWE FAMILY LLC
23	COPP/CHRIS P
24	WANOUS/MICHAEL F & TERESA M



ALTERNATIVE 4 LAYOUT
CSAH 2/CR 180, CSAH 43 & CR 171 INTERSECTION IMPROVEMENTS
STEELE COUNTY, MN
2025
S.A.P. XXX-XXX-XXX

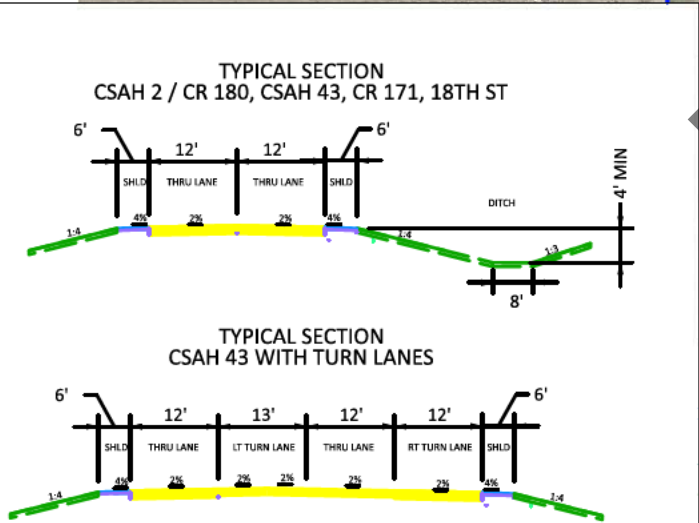
SCALE: AS SHOWN	DRAWN BY: BGC
WHKS PROJECT NO: 10073	CHECKED BY: BWI

DISTRICT #: 6
PLOT NAME: Conceptual Layout5B Exhibit.dgn
PATH & FILENAME: MN\Steele County\10073 Havana\Drawings\CADD\10.12\Design\Conceptual Layout5B Exhibit.dgn



LEGEND	
	ROADWAYS (INCLUDING TURN LANES)
	RAISED MEDIAN & CURBS
	EXISTING PROPERTY LINE
	SHOULDERS
	CONSTRUCTION LIMITS
	EXISTING ROW
	PROPOSED ROW
	ACCESS CLOSURE
	PROPERTY ACQUISITION

PROPERTY OWNERS	
1	STEELE COUNTY
2	EATON/JOEL M
3	JOHNSON/DENNIS W
4	IVERSON/DENNIS & PATRICIA
5	MILLER/NICHOLAS J & GAYLE ANN MILLER
6	PIEPHO/RICHARD R & DEBRA J
7	SCHAEFER/RICHARD C & LOLETA ALICE
8	BROWN/ROGER D
9	SPATENKA/MARK
10	GATHJE/DARIN R & MICHELLE K
11	JACOBSON/JUDD P & SUSAN L
12	SORENSEN/SCOTT G
13	JENSEN-GALLAHER/KELSEY J
14	PICHNER FAMILY FARMS LLC
15	CHRISTEY/KATHLEEN M
16	SORENSEN/KENNETH E
17	RENCHIN/DENNIS L
18	BELLOWS/PATRICIA L
19	KATH/MATTHEW A & JILL A
20	THAMERT/JOHN R & TRACY G
21	NELSON/JACE G & VALERIE A
22	BOWE FAMILY LLC
23	COPP/CHRIS P
24	WANOUS/MICHAEL F & TERESA M



ALTERNATIVE 4B LAYOUT	
CSAH 2/CR 180, CSAH 43 & CR 171 INTERSECTION IMPROVEMENTS	
STEELE COUNTY, MN	
2025	
S.A.P. XXX-XXX-XXX	

SCALE: AS SHOWN	DRAWN BY: BGC
WHKS PROJECT NO: 10073	CHECKED BY: BWI

Appendix B: Cost Estimates

DRAFT

Item No	Description	Unit	Total Quantity	Unit Price	Total Item Cost
Roadway					
Base Roadway Items					
2104.504	REMOVE PAVEMENT	SQ YD	6200	\$10.00	\$62,000.00
2106.507	EXCAVATION - COMMON	CU YD	6663	\$15.00	\$99,945.00
2106.507	SELECT GRANULAR EMBANKMENT (CV)	CU YD	3332	\$25.00	\$83,300.00
2106.507	COMMON EMBANKMENT (CV)	CU YD	4997.25	\$7.00	\$34,980.75
2118.509	AGGREGATE SURFACING CLASS 2	TON	682	\$30.00	\$20,460.00
2211.507	AGGREGATE BASE (CV) CLASS 5	CU YD	1599	\$40.00	\$63,960.00
2360.504	TYPE SP 12.5 NON WEARING COURSE MIXTURE	TON	1125	\$100.00	\$112,500.00
2360.509	TYPE SP 12.5 WEARING COURSE MIXTURE	TON	1125	\$100.00	\$112,500.00
2531.503	CONCRETE CURB & GUTTER DESIGN B612	LF	3340	\$35.00	\$116,900.00
2531.503	CONCRETE CURB & GUTTER DESIGN S524	LF	4790	\$35.00	\$167,650.00
2531.504	CONCRETE MEDIAN	SQ YD	1964	\$85.00	\$166,940.00
	INTAKE	EACH	16	\$5,000.00	\$80,000.00
	15" RCP	LF	600	\$120.00	\$72,000.00
	18" RCP	LF	400	\$120.00	\$48,000.00
	24" RCP CULVERT	LF	234	\$130.00	\$30,420.00
	24" RCP APRON	EACH	4	\$1,700.00	\$6,800.00
	CHANNEL SHAPING	LS	1	\$2,000.00	\$2,000.00
	LIGHTING (5% OF ROADWAY ITEMS)	LS	2		\$64,017.79
Roadway Items Subtotal Cost					
Rounded to nearest \$10,000					\$1,340,000.00
Roadway Contingency Cost					
Estimated at 25% Base Roadway Items Subtotal Cost					\$335,000.00
Roadway Mobilization Cost					
Estimated at 10% Base Roadway Items Subtotal Cost					\$134,000.00
Roadway Traffic Control Cost					
Estimated at 5% Base Roadway Items Subtotal Cost					\$67,000.00
Roadway Engineering and Design Cost					
Estimated at 18% Base Roadway Items Subtotal Cost					\$241,200.00
Roadway Right of Way Cost					
Parcel	all parcel costs based on 2024 est. market value plus 25% increase for relocation expenses				
4					\$210,000.00
19					\$530,000.00
12					\$210,000.00
2					\$210,000.00
Building Structure Demolition		EACH	6	\$ 25,000.00	\$150,000.00
Misc. Acreage		ACRE	1.03	\$ 10,000.00	\$10,300.00
Subtotal					\$1,320,000.00
Total Cost					
Rounded to nearest \$10,000					\$3,440,000.00

Item No	Description	Unit	Total Quantity	Unit Price	Total Item Cost
Roadway					
Base Roadway Items					
2104.504	REMOVE PAVEMENT	SQ YD	6200	\$10.00	\$62,000.00
2106.507	EXCAVATION - COMMON	CU YD	6663	\$15.00	\$99,945.00
2106.507	SELECT GRANULAR EMBANKMENT (CV)	CU YD	3332	\$25.00	\$83,300.00
2106.507	COMMON EMBANKMENT (CV)	CU YD	4997.25	\$7.00	\$34,980.75
2118.509	AGGREGATE SURFACING CLASS 2	TON	682	\$30.00	\$20,460.00
2211.507	AGGREGATE BASE (CV) CLASS 5	CU YD	1599	\$40.00	\$63,960.00
2360.504	TYPE SP 12.5 NON WEARING COURSE MIXTURE	TON	1125	\$100.00	\$112,500.00
2360.509	TYPE SP 12.5 WEARING COURSE MIXTURE	TON	1125	\$100.00	\$112,500.00
2531.503	CONCRETE CURB & GUTTER DESIGN B612	LF	3340	\$35.00	\$116,900.00
2531.503	CONCRETE CURB & GUTTER DESIGN S524	LF	4790	\$35.00	\$167,650.00
2531.504	CONCRETE MEDIAN	SQ YD	1964	\$85.00	\$166,940.00
	INTAKE	EACH	16	\$5,000.00	\$80,000.00
	15" RCP	LF	600	\$120.00	\$72,000.00
	18" RCP	LF	400	\$120.00	\$48,000.00
	24" RCP CULVERT	LF	234	\$130.00	\$30,420.00
	24" RCP APRON	EACH	4	\$1,700.00	\$6,800.00
	CHANNEL SHAPING	LS	1	\$2,000.00	\$2,000.00
	LIGHTING (5% OF ROADWAY ITEMS)	LS	2		\$64,017.79
Roadway Items Subtotal Cost					
Rounded to nearest \$10,000					\$1,340,000.00
Roadway Contingency Cost					
Estimated at 25% Base Roadway Items Subtotal Cost					\$335,000.00
Roadway Mobilization Cost					
Estimated at 10% Base Roadway Items Subtotal Cost					\$134,000.00
Roadway Traffic Control Cost					
Estimated at 5% Base Roadway Items Subtotal Cost					\$67,000.00
Roadway Engineering and Design Cost					
Estimated at 18% Base Roadway Items Subtotal Cost					\$241,200.00
Roadway Right of Way Cost					
Parcel	all parcel costs based on 2024 est. market value plus 25% increase for relocation expenses				
4					\$210,000.00
19					\$530,000.00
12					\$210,000.00
2					\$210,000.00
Building Structure Demolition		EACH	6	\$ 25,000.00	\$150,000.00
Misc. Acreage		ACRE	1.03	\$ 10,000.00	\$10,300.00
Subtotal					\$1,320,000.00
Total Cost					
Rounded to nearest \$10,000					\$3,440,000.00

Item No	Description	Unit	Total Quantity	Unit Price	Total Item Cost
Roadway					
Roadway Items					
2104.504	REMOVE PAVEMENT	SQ YD	13444	\$10.00	\$134,440.00
2106.507	EXCAVATION - COMMON	CU YD	22785	\$15.00	\$341,775.00
2106.507	SELECT GRANULAR EMBANKMENT (CV)	CU YD	12969	\$25.00	\$324,225.00
2106.507	COMMON EMBANKMENT (CV)	CU YD	9,755	\$7.00	\$68,285.00
2118.509	AGGREGATE SURFACING CLASS 2	TON	741	\$30.00	\$22,230.00
2211.507	AGGREGATE BASE (CV) CLASS 5	CU YD	4323	\$40.00	\$172,920.00
2360.504	TYPE SP 12.5 NON WEARING COURSE MIXTURE	TON	3097	\$100.00	\$309,700.00
2360.509	TYPE SP 12.5 WEARING COURSE MIXTURE	TON	4377	\$100.00	\$437,700.00
	8'x8' PRECAST CONCRETE BOX CULVERT	LF	40	\$1,200.00	\$48,000.00
	8'X8' PRECAST CONCRETE BOX CULVERT END SECTION	EACH	4	\$24,000.00	\$96,000.00
	10'X8' PRECAST CONCRETE BOX CULVERT	LF	20	\$1,600.00	\$32,000.00
	10'X8' PRECAST CONCRETE BOX CULVERT END SECTION	EACH	2	\$33,500.00	\$67,000.00
	24" RCP PIPE CULVERT	LF	125	\$130.00	\$16,250.00
	24" RCP APRON	EACH	3	\$1,700.00	\$5,100.00
	30" RCP PIPE CULVERT	LF	233	\$200.00	\$46,600.00
	30" RCP PIPE APRON	EACH	4	\$2,000.00	\$8,000.00
	48" RCP PIPE CULVERT	LF	98	\$375.00	\$36,750.00
	48" RCP PIPE APRON	EACH	2	\$3,800.00	\$7,600.00
	CHANNEL SHAPING	LS	1	\$3,000.00	\$3,000.00
Roadway Items Subtotal Cost					
	Rounded to nearest \$10,000				\$2,180,000.00
Roadway Contingency Cost					
	Estimated at 20% Base Roadway Items Subtotal Cost				\$436,000.00
Roadway Mobilization Cost					
	Estimated at 10% Base Roadway Items Subtotal Cost				\$218,000.00
Roadway Traffic Control Cost					
	Estimated at 5% Base Roadway Items Subtotal Cost				\$109,000.00
Roadway Engineering and Design Cost					
	Estimated at 18% Base Roadway Items Subtotal Cost				\$392,400.00
Wetland Mitigation Impacts Cost					
		ACRE	0.4	\$51,000.00	\$20,400.00
Right of Way Cost					
Parcel	all parcel costs based on 2024 est. market value plus 25% increase for relocation expenses				
19					\$530,000.00
12					\$210,000.00
2					\$210,000.00
	Building Structure Demolition	EACH	5	\$ 25,000.00	\$125,000.00
	Misc. Acreage	ACRE	6.21	\$ 10,000.00	\$62,100.00
	Subtotal				\$1,140,000.00
Total Cost					
	Rounded to nearest \$10,000				\$4,500,000.00

Item No	Description	Unit	Total Quantity	Unit Price	Total Item Cost
Roadway					
Base Roadway Items					
2104.504	REMOVE PAVEMENT	SQ YD	17420	\$10.00	\$174,200.00
2106.507	EXCAVATION - COMMON	CU YD	41044	\$15.00	\$615,660.00
2106.507	SELECT GRANULAR EMBANKMENT (CV)	CU YD	18303	\$25.00	\$457,575.00
2106.507	COMMON EMBANKMENT (CV)	CU YD	16,090	\$7.00	\$112,630.00
2118.509	AGGREGATE SURFACING CLASS 2	TON	713	\$30.00	\$21,390.00
2211.507	AGGREGATE BASE (CV) CLASS 5	CU YD	6101	\$40.00	\$244,040.00
2360.504	TYPE SP 12.5 NON WEARING COURSE MIXTURE	TON	4351	\$100.00	\$435,100.00
2360.509	TYPE SP 12.5 WEARING COURSE MIXTURE	TON	6178	\$100.00	\$617,800.00
	8'x6' PRECAST CONCRETE BOX CULVERT	LF	136	\$1,600.00	\$217,600.00
	8'x6' PRECAST CONCRETE BOX CULVERT END SECTION	EACH	4	\$25,000.00	\$100,000.00
	14'x8' PRECAST CONCRETE BOX CULVERT	LF	68	\$2,000.00	\$136,000.00
	14'x8' PRECAST CONCRETE BOX CULVERT END SECTION	EACH	2	\$35,000.00	\$70,000.00
	24" RCP PIPE CULVERT	LF	206	\$130.00	\$26,780.00
	24" RCP APRON	EACH	4	\$1,700.00	\$6,800.00
	30" RCP PIPE CULVERT	LF	118	\$200.00	\$23,600.00
	30" RCP PIPE APRON	EACH	4	\$2,000.00	\$8,000.00
	48" RCP PIPE CULVERT	LF	280	\$375.00	\$105,000.00
	48" RCP PIPE APRON	EACH	4	\$3,800.00	\$15,200.00
	CHANNEL SHAPING	LS	1	\$4,000.00	\$4,000.00
Roadway Items Subtotal Cost					
	Rounded to nearest \$10,000				\$3,390,000.00
Roadway Contingency Cost					
	Estimated at 20% Base Roadway Items Subtotal Cost				\$678,000.00
Roadway Mobilization Cost					
	Estimated at 10% Base Roadway Items Subtotal Cost				\$339,000.00
Roadway Traffic Control Cost					
	Estimated at 5% Base Roadway Items Subtotal Cost				\$169,500.00
Roadway Engineering and Design Cost					
	Estimated at 18% Base Roadway Items Subtotal Cost				\$610,200.00
Wetland Mitigation Impacts Cost					
		ACRE	1.3	\$51,000.00	\$66,300.00
Right of Way Cost					
Parcel	all parcel costs based on 2024 est. market value plus 25% increase for relocation expenses				
2					\$210,000.00
	Building Structure Demolition	EACH	1	\$ 25,000.00	\$25,000.00
	Misc. Acreage	ACRE	13.41	\$ 10,000.00	\$134,100.00
	Subtotal				\$370,000.00
Total Cost					
	Rounded to nearest \$10,000				\$5,620,000.00

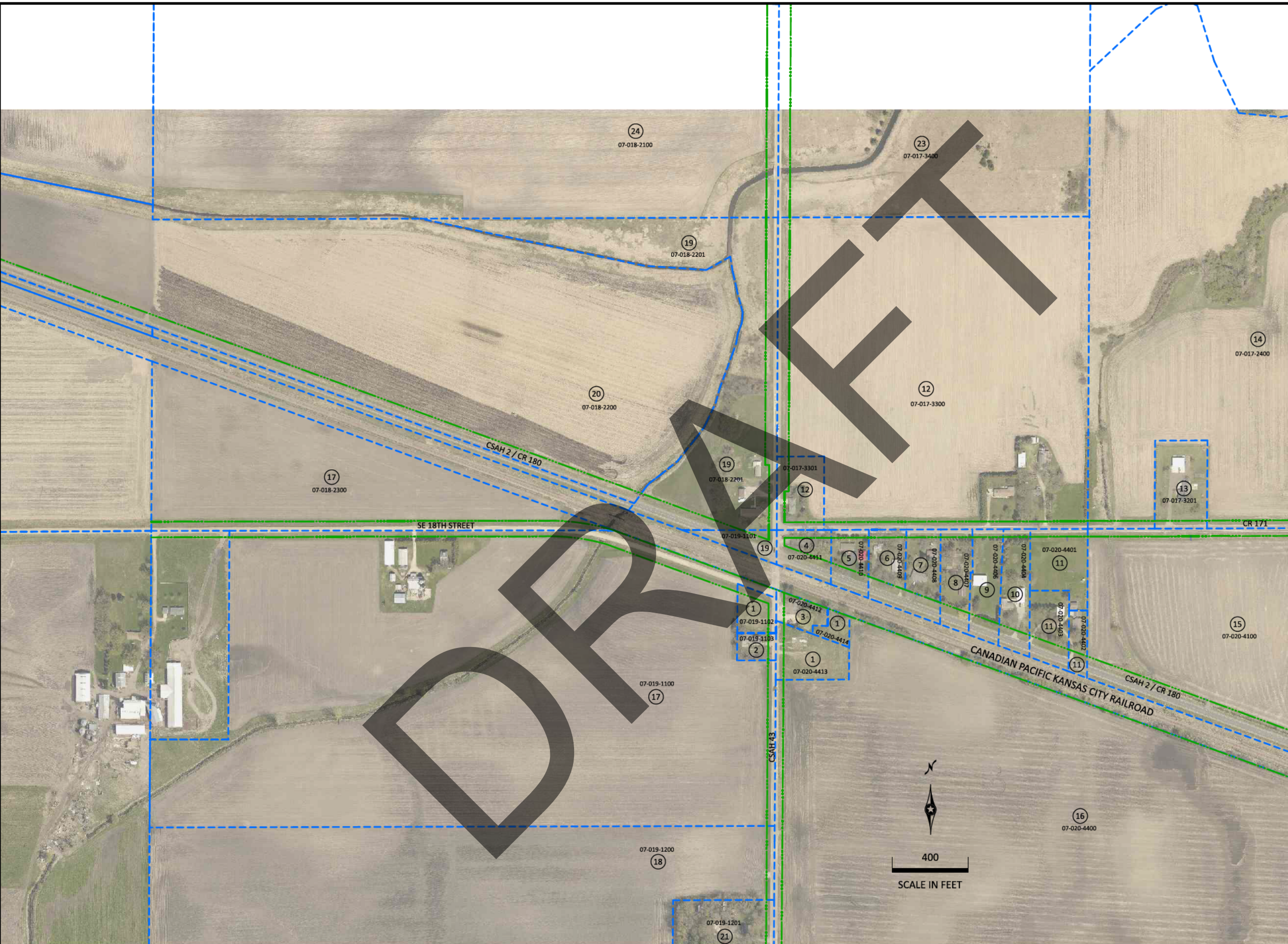
Item No	Description	Unit	Total Quantity	Unit Price	Total Item Cost
Roadway					
Base Roadway Items					
	Based on 25% increase in roadway length over Alt 4				\$4,237,500.00
Roadway Items Subtotal Cost					
	Rounded to nearest \$10,000				\$4,240,000.00
Roadway Contingency Cost					
	Estimated at 20% Base Roadway Items Subtotal Cost				\$848,000.00
Roadway Mobilization Cost					
	Estimated at 10% Base Roadway Items Subtotal Cost				\$424,000.00
Roadway Traffic Control Cost					
	Estimated at 5% Base Roadway Items Subtotal Cost				\$212,000.00
Roadway Engineering and Design Cost					
	Estimated at 18% Base Roadway Items Subtotal Cost				\$763,200.00
Wetland Mitigation Impacts Cost					
		ACRE	1.25	\$51,000.00	\$63,750.00
Right of Way Cost					
Parcel	all parcel costs based on 2024 est. market value plus 25% increase for relocation expenses				
2					\$210,000.00
	Building Structure Demolition	EACH	1	\$ 25,000.00	\$25,000.00
	Misc. Acreage	ACRE	17.98	\$ 10,000.00	\$179,800.00
	Subtotal				\$410,000.00
Total Cost					
	Rounded to nearest \$10,000				\$6,960,000.00

Appendix C: Property Map

DRAFT

PLOTTED/REVISED: 27-FEB-2025

PLOT NAME: Conceptual Layout Exhibit



PROPERTY OWNERS

- 1 STEELE COUNTY
- 2 EATON/JOEL M
- 3 JOHNSON/DENNIS W
- 4 IVERSON/DENNIS & PATRICIA
- 5 MILLER/NICHOLAS J & GAYLE ANN MILLER
- 6 PIEPHO/RICHARD R & DEBRA J
- 7 SCHAEFER/RICHARD C & LOLETA ALICE
- 8 BROWN/ROGER D
- 9 SPATENKA/MARK
- 10 GATHJE/DARIN R & MICHELLE K
- 11 JACOBSON/JUDD P & SUSAN L
- 12 SORENSON/SCOTT G
- 13 JENSEN-GALLAHER/KELSEY J
- 14 PICHNER FAMILY FARMS LLC
- 15 CHRISTEY/KATHLEEN M
- 16 SORENSON/KENNETH E
- 17 RENCHIN/DENNIS L
- 18 BELLOWS/PATRICIA L
- 19 KATH/MATTHEW A & JILL A
- 20 THAMERT/JOHN R & TRACY G
- 21 NELSON/JACE G & VALERIE A
- 22 BOWE FAMILY LLC
- 23 COPP/CHRIS P
- 24 WANOUS/MICHAEL F & TERESA M



PROPERTY MAP

CSAH 2/CR 180, CSAH 43 & CR 171 INTERSECTION IMPROVEMENTS

STEELE COUNTY, MN

2025

S.A.P. XXX-XXX-XXX

SCALE: AS SHOWN

WHKS PROJECT NO: 10073

DRAWN BY: BGC

CHECKED BY: BWI

Appendix D: Public Engagement

D.1: Open House #1 Attendance

DRAFT

STEELE COUNTY CSAH 2/CR 180, CSAH 43 & CR 171 INTERSECTION IMPROVEMENTS

Project No. 10073

October 10, 2024

5:00pm – 7:00pm

SIGN-IN SHEET

NAME	REPRESENTING	PHONE NO.	EMAIL
1. Monte Mowry	self	507-455-0913	mowrys/lazy meadows@gmail
2. Larry Schubert	Havana Town Ship	507-456-6882	
3. John Bowe	HAVANA	507-456-4607	
4. Mark Burnham	HAVANA	507/456-4552	
5. Deb Burnham	"	507/456-4906	
6. Laurie Wolhart	"	507-456-2880	lwolhart@gmail.com
7. Michelle Gauthier	Havana	(507) 475-0837	dmgauthier@gmail.com
8. Dawn Gauthier	Havana	(507) 456-0752	dmgauthier@gmail.com
9. Richard Schaefer	HAVANA	507 676-0970	RVRRR75@outlook.com
10. Lolera Schaefer	HAVANA	507-676-0825	
11. Susan Johnson	self	507-456-7535	susiebauer58@hotmail.com
12.			
13.			
14.			
15.			

STEELE COUNTY CSAH 2/CR 180, CSAH 43 & CR 171 INTERSECTION IMPROVEMENTS

SIGN-IN SHEET

NAME	REPRESENTING	PHONE NO.	EMAIL
16. ALEX EBENHOH	Self	507 475 1100	ALEX.EBENHOH@GMAIL.COM
17. DENNIS IVERSON	Self	507 475-0519	ddiverson52@gmail.com
18. Patricia Herod	Self	507-475-0518	LI
19. Lolita Berner	Self	507-676-0825	mstingcat333@gmail.com
20. Kim H. H. H.	Self	507 456-2161	Kim.H.H.H.@gmail.com
21. Lynn Eaton	Self	507-456-0795	llynneatonfamily11@hotmail.com
22. Glenn Engstrom	ARM of MN	612-247-3068	gengstrom@armofmn.com
23. Nick Miller	Nick Miller	507-390-1774	
24. John Tracy Thorne		507-456-3857	
25. Jeanne Righner		507-456-8786	
26. Melissa Zimmermann		507 696-1960	LyssaLynn13@gmail.com
27. Kent Schmidt	Self	507-456-1523	
28.			
29.			
30.			
31.			
32.			
33.			
34.			
35.			

STEELE COUNTY CSAH 2/CR 180, CSAH 43 & CR 171 INTERSECTION IMPROVEMENTS

Project No. 10073
October 10, 2024
5:00pm – 7:00pm

SIGN-IN SHEET

	NAME	REPRESENTING	PHONE NO.	EMAIL
1.	Scott Sorenson	Scott Sorenson	612 414 7783	SSorenson100@gmail.com
2.	Tom Carowu	Scott Sorenson	607 791.3690	etgourmet@cox.net
3.	Steve Schickling	Scott Sorenson	776-881-1967 cell	Steve.Schickling@gmail.com
4.	Kurt Easters	Scott Sorenson	612 244 3224	98catfan@gmail.com
5.	Miller	Rich Miller	507-390-1774	
6.	Thomas Sorenson	Scott Sorenson	612-670-5120	tommy.sorenson100@gmail.com
7.	Steve Sorenson	Scott Sorenson	507 476 7162	STEVE.SORENSEN23@gmail.com
8.	Rich Sorenson	Scott Sorenson	507 451-3813	dave@greenwood.com
9.	Jill & Matt Kath	Kath	507-456-0504	jill.kath@yahoo.com
10.	BRIAN D. SCHMIDT	SELF	507-451-9614	
11.	Angie Jensen	Self	507-456-3885	jensenangie@gmail.com
12.	Dean Schram	Daughter Jensen	507-456-1102	deanschram@gmail.com
13.	Hebey Jensen-Gallagher	Hebey Jensen-Gallagher	507-213-6469	hamilcawen@gmail.com
14.				
15.				

STEELE COUNTY CSAH 2/CR 180, CSAH 43 & CR 171 INTERSECTION IMPROVEMENTS

SIGN-IN SHEET

	NAME	REPRESENTING	PHONE NO.	EMAIL
16.	Greg Krueger	Steele County	507-456-6601	greg.krueger@co.steele.mn.us
17.	James Brady	Steele County	507-202-0804	Jim.Brady@Livv.com
18.	Brian Doughty	Steele Service	507-456-4969	steeleservicing@gmail.com
19.	Gale Jorgensen	Self	612-214-3723	Watersprite ST@yahoo.com
20.	Jace + Val Nelson	Self	507-390-2596	jvnelson@yahoo.com
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D.2: Open House #2 Attendance

DRAFT

STEELE COUNTY CSAH 2/CR 180, CSAH 43 & CR 171 INTERSECTION IMPROVEMENTS

Project No. 10073
January 30, 2025
5:00pm – 7:00pm

SIGN-IN SHEET

	NAME	REPRESENTING	PHONE NO.	EMAIL
1.	Jim Abbe	Steele County Commission	507-456-0786	
2.	LAURIE Wolhart	Clerk, Havana	507-456-2880	havanaclerk@gmail.com
3.	LARRY Schubert	Havana Township	507-676-6882	
4.	Jake JACOBSON		507-676-7168	STEELDUST RZE@GMAIL.COM
5.	GRANT QUAM		507-455-0138	gquam@gmail.com
6.	JACKSON KNUDSON	STEELE CO.	507-686-0112	jackson.knudson@steelecountymn.gov
7.	John Bowe		456-4607	BoweJohn1@Yahoo.com
8.	Jeanne Pichner		507-456-8786	JeanneP193@gmail.com
9.	Roger Carroll		507-456-5606	None
10.	Kent Schmidt		507-456-1523	
11.	Gale Jorgensen		612-214-3723	watersprite57@yahoo.com
12.	Lynn & Joel Eaton		507-456-0795	eatonfamily11@hotmail.com
13.	Mikelle Mathys	Steele	(507) 475-0831	smgmathys@gmail.com
14.				
15.				

STEELE COUNTY CSAH 2/CR 180, CSAH 43 & CR 171 INTERSECTION IMPROVEMENTS

Project No. 10073

January 30, 2025

5:00pm – 7:00pm

SIGN-IN SHEET

	NAME	REPRESENTING	PHONE NO.	EMAIL
1.	Beth Schaefer	Self + wife	507-676-0970	BURWORD 75 @ Outlook.com
2.	Paul Jochem		507-259-3039	
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STEELE COUNTY CSAH 2/CR 180, CSAH 43 & CR 171 INTERSECTION IMPROVEMENTS

Project No. 10073

January 30, 2025

5:00pm – 7:00pm

SIGN-IN SHEET

NAME	REPRESENTING	PHONE NO.	EMAIL
1. Matt & Jill Kath	Matthew Kath	507-475-8551	
2. Tim Nelson	Tim Nelson	507-213-9614	
3. Tanner Kennedy		507-676-7956	
4. Thomas Sorenson	Scott Sorenson	612-670-5120	
5. Mark Spatenka		507-475-1983	
6. Val Nelson		507-390-2596	
7. Melissa Zimmerman			
8. Dennis Karchin		507-457-1277	
9.			
10.			
11.			
12.			
13.			
14.			
15.			

D.3: CPKC Railroad Correspondence

DRAFT

Brandyn Chezick

From: Brandon Theobald
Sent: Monday, December 2, 2024 4:22 PM
To: Brandyn Chezick
Cc: Eric Tott
Subject: FW: [EXTERNAL] FW: 193376B, Waseca Subdivision MP 83.9

Brandon Theobald, P.E. | Associate
Voice: 507.288.3923 | www.whks.com



Click [here](#) to subscribe to our newsletter.



From: Sponholz, Paul <Paul.Sponholz@SteeleCountyMN.gov>
Sent: Monday, December 2, 2024 3:31 PM
To: Brandon Theobald <BTheobald@Whks.com>
Subject: [EXTERNAL] FW: 193376B, Waseca Subdivision MP 83.9

Brandon,

CPKC prefers Concept 4. I also talked to Brian over the phone before he sent this email. Concepts 2 & 3 aren't desirable to him with the turn lanes over the track and the potential of traffic queues sitting on the track.

Paul Sponholz, P.E. | County Engineer

Steele County | PO Box 890, 3000 Hoffman Dr NW, Owatonna, MN 55060-0890
O: (507) 444-7671 | M: (507) 475-2253 | Paul.Sponholz@SteeleCountyMN.gov

From: Brian Osborne <Brian.Osborne@cpkcr.com>
Sent: Monday, December 2, 2024 3:27 PM
To: Sponholz, Paul <Paul.Sponholz@SteeleCountyMN.gov>
Cc: Larry Lloyd <Larry.Lloyd@cpkcr.com>; Daniel Sabatka (<Daniel_Sabatka@cpr.ca> <Daniel_Sabatka@cpr.ca>
Subject: RE: 193376B, Waseca Subdivision MP 83.9

Paul,
After receiving the plans CPKC would go with option 4 than 3. Option 4 just has better turn lanes for traffic by the tracks. It also has room for an overpass in the future.

Thank You

Brian Osborne
Manager of Public Works
120 South 6th Street Suite 700



NEW EMAIL ADDRESS: Brian.Osborne@cpkcr.com

Canadian Pacific Emergency Number: 1-800-716-9132
Canadian Pacific Call-Before-You-Dig: 1-866-291-0741
Call-Before-You-Dig National Hotline: 811

For Faster Processing, Please Use The FRA Public Data Base to Find Subdivision and Mile Post
<https://safetydata.fra.dot.gov/OfficeofSafety/PublicSite/Crossing/Crossing.aspx>

All Utility Permits and Utility Crossing Permits Must Be Submitted at
https://jllrpg.360works.com/fmi/webd/rpo_web_kcs.fmp12

Permits@kcsouthern.com

From: Sponholz, Paul <Paul.Sponholz@SteeleCountyMN.gov>
Sent: Tuesday, November 26, 2024 10:08 AM
To: Brian Osborne <Brian.Osborne@cpkcr.com>
Cc: Larry Lloyd <Larry.Lloyd@cpkcr.com>; Daniel Sabatka (<Daniel.Sabatka@cpr.ca> <Daniel.Sabatka@cpr.ca>
Subject: 193376B, Waseca Subdivision MP 83.9

This Message Is From an External Sender

This email did not originate from CPKC. Please exercise caution with any links or attachments.

Brian,

We are working on another project near or across the subject rail crossing to make some safety improvements with construction scheduled for 2026. This intersection in the unincorporated village of Havana is one of most hazardous intersections in the county; including a truck vs train crash in 2019. The intersection has seen a significant increase in traffic with the expansion of US 14, closure of several other area rail crossings. It especially takes a lot grain truck traffic headed to the Al Corn Ethanol Plant to the east near Claremont which is serviced by this rail line.

We'll be realigning the intersections of CSAH 2 (Claremont Rd), CSAH 43, CR 180 and CR 171 to combine and spread out the distance between intersections and rail crossing, and remove skews if possible.

Would you provide comments on the 4 concepts attached to help us determine a preferred option, preferably by December 13? If you'd like, we can set up a Teams meeting to discuss.

In summary the concepts are:

Concept 1: Roundabout. Yield line is approximately 150 feet from the center of the track. No change at the crossing. Impacts to residential properties are very high, so we are unlikely to choose this option.

Concept 2: Realign CSAH 2/CR 180 to CR 171, combines intersection and moves it about 200 feet from the center of track. Increases width of crossing to about 70 feet with the skew (includes four 12' lanes (two thru and two turn lanes) with two 6' shoulders). Turn lanes would be over the track, so could introduce occasional queuing of traffic over track.

Concept 3: Realign CSAH 2/CR 180 to about 90 feet north of CR 171, combines intersection and moves it about 290 feet from the center of track. Increases width of crossing to about 70 feet with the skew (includes four 12' lanes (two thru and two turn lanes) with two 6' shoulders). Turn lanes would be over the track, but near their beginning compared to Concept 2. Traffic less likely to queue over track, but still possible.

Concept 4: Realign CSAH 2/CR 180 to CR 171, combines intersection and moves it about 950 feet from the center of track. No changes necessary for the crossing. Turn lanes are north of the track. Significant farmland impacts, but this is looking to be our preferred option for many reasons. And it appears to have the least impact on the railroad.

Currently the crossing is controlled passively by stop signs. The intersection to the north is also controlled by a stop sign, so currently, trucks stopping for CSAH 2/CR 180/Claremont Rd have their trailer over the track when waiting for clearing the road. If the railroad is supportive, we are supportive of seeing if a diagnostic would change this to gates and flashing lights, and then fund the crossing controls with a federal or state crossing improvement program.





Paul Sponholz, P.E. | County Engineer

Steele County | PO Box 890, 3000 Hoffman Dr NW, Owatonna, MN 55060-0890

O: (507) 444-7671 | M: (507) 475-2253 | Paul.Sponholz@SteeleCountyMN.gov

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Appendix E: Decision Matrix

DRAFT

Steele County | CSAH 2/CR 180, CSAH 43 & CR 171 Intersection Improvements

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Roadway	Existing roadway alignment. Roundabout intersection control.	Shift roadway alignment north to CR 171. Two-way stop intersection control.	Shift roadway alignment slightly north of CR 171. Two-way stop intersection control.	Shift roadway alignment farther north of CR 171. Two-way stop intersection control.
Considerations				
Geometrics	Curved approaches to reduce driver speed entering the intersection. Existing intersection skew remains. No increase in storage space between intersection and RR crossing.	Reduce number of intersections near RR crossing. Remove intersection skew. Additional storage space for vehicles between intersection and RR crossing. CSAH 43 turn lanes extend through RR crossing. Room for future improvements to intersection.	Reduce number of intersections near RR crossing. Remove intersection skew. Increased additional storage space for vehicles between intersection and RR crossing. CSAH 43 turn lanes extend through RR crossing. Room for future improvements to intersection.	Reduce number of intersections near RR crossing. Remove intersection skew. Greatest additional storage space for vehicles between intersection and RR crossing. Shift CSAH 43 turn lanes north, avoiding impacts to the RR crossing. Room for future RR overpass and improvements to intersection.
Right of Way Acquisition	Most residential property acquisition. Minimal farmland acquisition.	Moderate residential property acquisition, moderate farmland property acquisition.	Major residential property acquisition, major farmland property acquisition.	Minimal residential properties, most farmland property.
Relocations	Relocation required for four property owners.	Relocation required for four property owners including one multi-resident apartment building.	Relocation required for three property owners.	Relocation required for one property owner. Owner has previously contacted County to discuss sale of property.
Cost	\$3,440,000	\$4,710,000	\$4,500,000	\$5,620,000

Visual Ranking

- Most Feature Improvement/Least Considerations
- Some Feature Improvement/Some Considerations
- Less Improvement/Major Considerations
- Least Feature Improvement/Most Considerations



Appendix F: ICE Report

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**INTERSECTION CONTROL EVALUATION REPORT
FOR
CSAH 2/CR 180, CSAH 43, and CR 171**

HAVANA, MINNESOTA

Prepared for:
Steele County, MN
2025

I hereby certify that this plan, specification or report
was prepared by me or under my direct supervision
and that I am a duly Licensed Professional Engineer
under the laws of the State of Minnesota.



Eric J. Tott, P.E., PTOE

02-24-2025
Date

54543
License. No.

whks

engineers + planners + land surveyors

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Appendix

Appendix A Traffic Count Data

Appendix B Intersection Capacity Analysis Reports

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Appendix E Intersection Capacity Analysis Reports

Appendix F Crash Data

Appendix G Warrants

Appendix H Alternative Exhibits

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Project Description

An intersection control evaluation (ICE) report has been prepared for the intersection of CSAH 2/CR 180, CSAH 43, and CR 171 in Steele County, Minnesota. The report applies the signal justification warrants, as outlined in the *Minnesota Manual on Uniform Traffic Control Devices (MUTCD)* and uses engineering methods outlined in the *Highway Capacity Manual, 6th Edition*. Several alternative layouts for the intersection have been proposed and analyzed in this report, including the findings of different traffic control evaluations.

The purpose of the report is to determine which type of intersection control is the most beneficial for the intersection. Specifically, this report will evaluate whether side-street stop, multi-way stop, traffic signal, or a roundabout is the most beneficial method of traffic control for the intersection.

Intersection Location

The intersections of SE 44th Avenue (CSAH 43) with CR 171, CSAH 2/CR 180, and 18th Street are located in the City of Havana, Minnesota. The study area lies in the east central region of Steele County. Currently, the area surrounding the intersection is mixed agricultural / residential (See Figure 1).



Figure 1 – Location Map

Existing Intersection Characteristics

CSAH 43 / CR 171 Intersection

The CSAH 43 / CR 171 intersection is a three-legged intersection. CSAH 43 is a north-south route. The side street, CR 171 is an east-west route with stop control on CR 171. All approaches to are two-lane roadways with no additional turn lanes. There are several entrances near the intersection for residential properties.

CSAH 43 / CSAH 2/CR 180 Intersection

The CSAH 43 / CSAH 2/CR 180 intersection is a skewed four-legged intersection. CSAH 43 is a north-south route with stop control on CSAH 43. CSAH 2/CR 180 is an east-west route. All approaches to are two-lane roadways with no additional turn lanes. There is a residential entrance in the northeast quadrant of the intersection and a skewed railroad crossing on the south leg of the intersection.

CSAH 43 / 18th Street Intersection

The CSAH 43 / 18th Street intersection is a three-legged intersection. CSAH 43 is a north-south route. The side street, 18th Street is an east-west route with stop control on 18th Street. All approaches to are two-lane roadways with no additional turn lanes. There are several entrances near the intersection for residential properties and a skewed railroad crossing on the north leg of the intersection.

All three intersections and the railroad crossing are closely spaced.

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Proposed Configurations

Four alternative layouts for this intersection are being proposed and analyzed in this report.

Alternative 1:

Alternative 1 consists of a 5-leg roundabout connecting CSAH 43, CSAH 2/CR 180 and CR 171. Alternative 1 includes rerouting SE 18th Street to the south to remove the skew of the intersection (see Figure 2). For a full-size print of the alternative, see Appendix H.

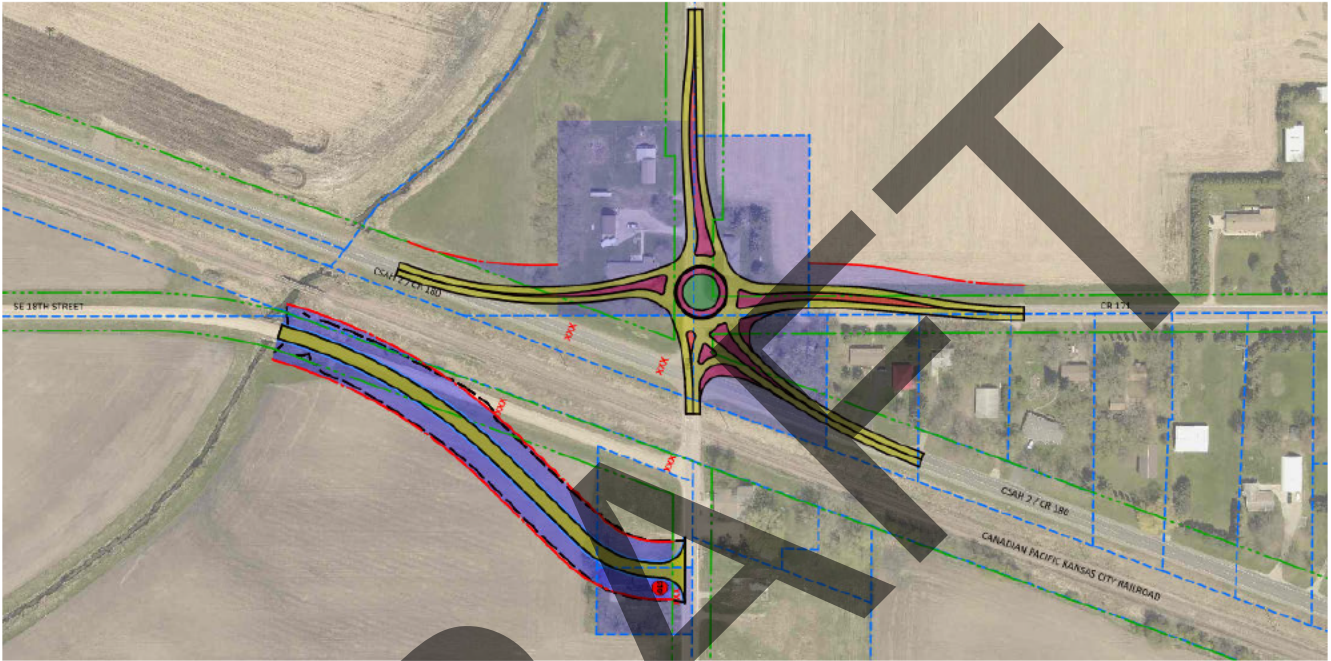


Figure 2 – Alternative 1

Alternative 2:

Alternative 2 consists of a new realigned intersection of CSAH 43, CSAH 2/CR 180 and CR 171 with the stop control switched from CSAH 43 to CSAH 2/CR 180 and CR 171. Alternative 2 includes rerouting SE 18th Street to the south to remove the skew of the intersection (see Figure 3). For a full-size print of the alternative, see Appendix H.



Figure 3 – Alternative 2

Alternative 3:

Alternative 3 consists of a new realigned intersection of CSAH 43, CSAH 2/CR 180 and CR 171 with the stop control switched from CSAH 43 to CSAH 2/CR 180 and CR 171. Alternative 3 includes rerouting SE 18th Street to the south to remove the skew of the intersection (see Figure 4). For a full-size print of the alternative, see Appendix H.

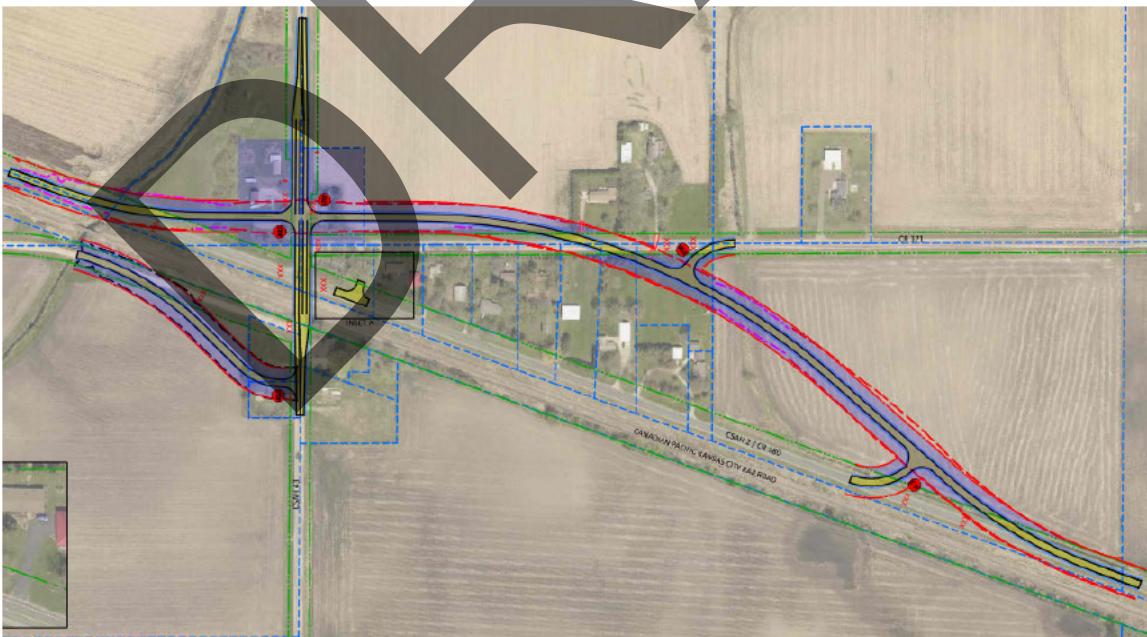


Figure 4 – Alternative 3

Alternative 4:

Alternative 4 consists of a new realigned intersection of CSAH 43, CSAH 2/CR 180 and CR 171 with the stop control switched from CSAH 43 to CSAH 2/CR 180 and CR 171. Alternative 4 includes rerouting SE 18th Street to the south to remove the skew of the intersection (see Figure 5). For a full-size print of the alternative, see Appendix H.

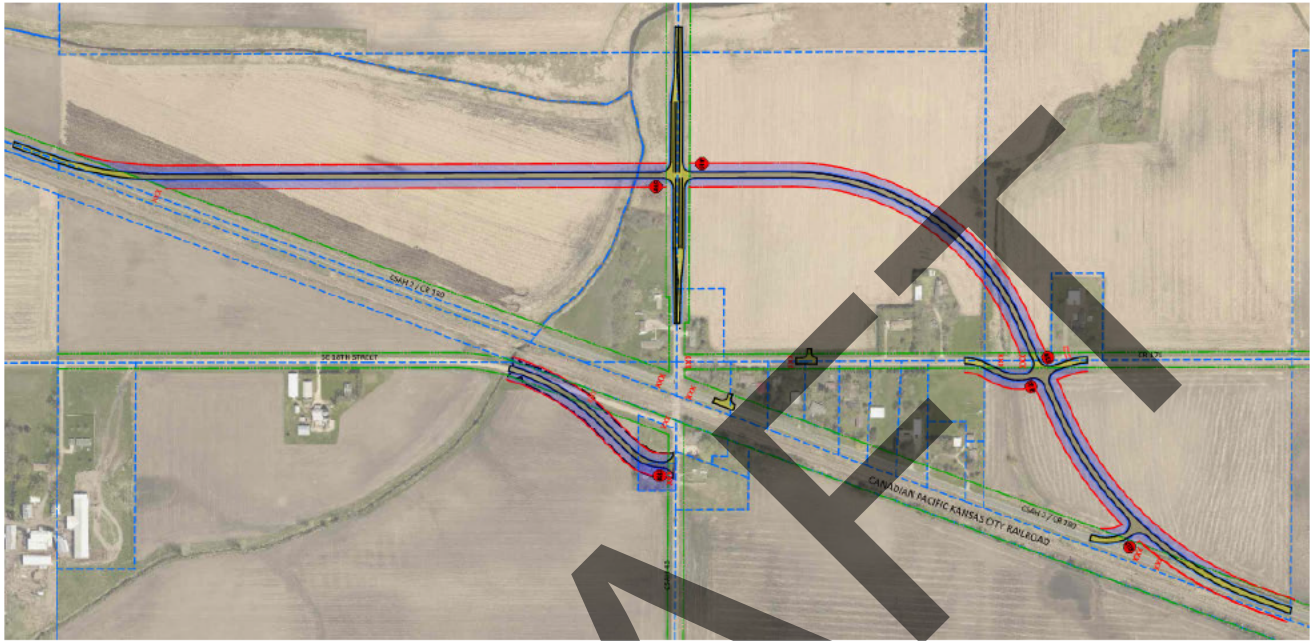
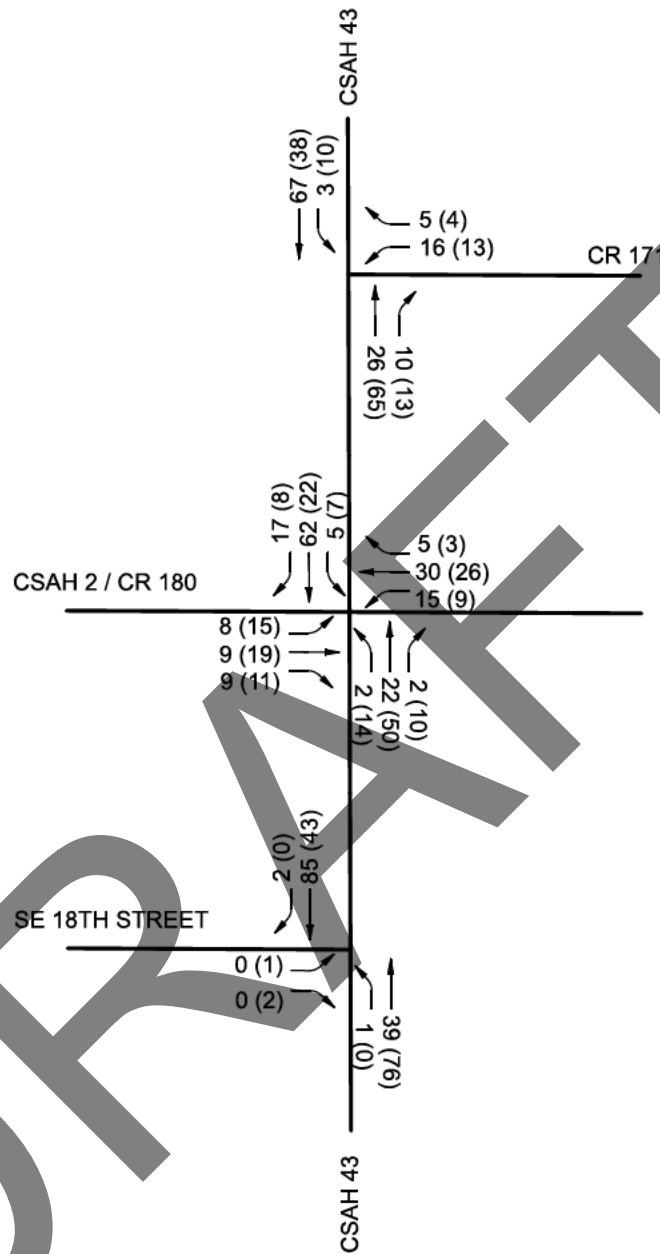


Figure 5 – Alternative 4

Traffic Volumes

Existing Traffic

Directional intersection traffic volumes were obtained from intersection traffic counts performed on Tuesday, May 21, 2024 (see Appendix A for the traffic count data). Traffic counts were performed from 6:00 AM to 7:00 PM. See Figure 6 for the peak hour traffic volumes.



NOT TO SCALE

LEGEND

MOVEMENT DESIGNATION

22 (45) AM (PM) PEAK HOUR TRAFFIC VOLUME

CSAH 2/CR 180, CSAH 43, and CR 171

EXISTING
PEAK HOUR TRAFFIC

STEELE COUNTY, MN

FIGURE 6

whks
engineers + planners + land surveyors

Traffic Changes Due to Planned Roadway Improvements

Previous corridor studies have indicated there will be an increase of traffic on CSAH 43 due to planned residential growth on the east side of the City of Owatonna.

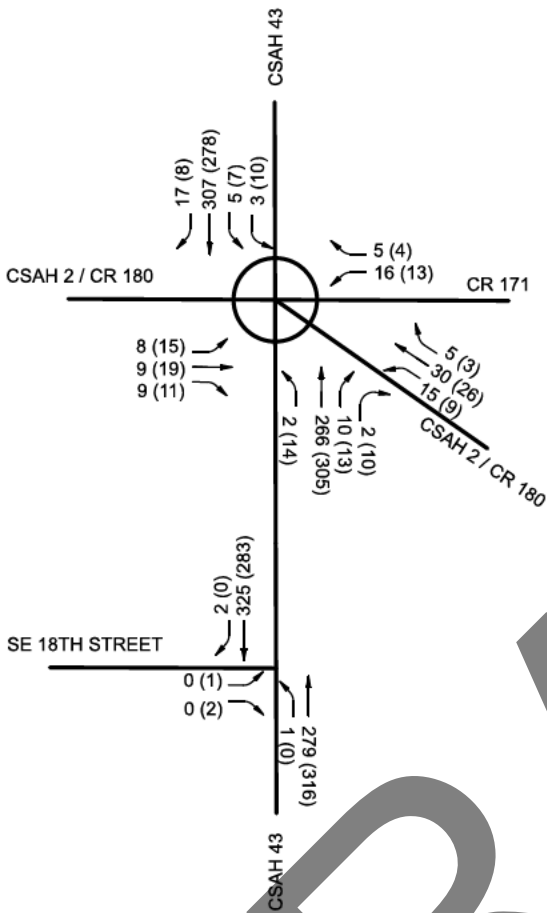
The County is anticipating making improvements to CR 180 at a railroad underpass to the west. Currently the underpass is restricted to a 12-foot vertical clearance. The project will update the road to meet current clearance standards of at least 14' 6" or more. That change would encourage more truck traffic to utilize CR 180/CSAH 2.

It is estimated that in 2030, the average daily traffic (ADT) on CSAH 43 will be 5,500. Based on the traffic counts taken as part of this study, the current ADT on CSAH 43 is 1,500. Using a 1% compound growth factor, the ADT volumes were factored up to obtain design year (2044) volumes. The estimated 2044 ADT for CSAH 43 is approximately 6,300. The additional traffic was converted from ADT to hourly traffic using a K factor of 0.10. The future traffic volumes are shown in Figure 7.

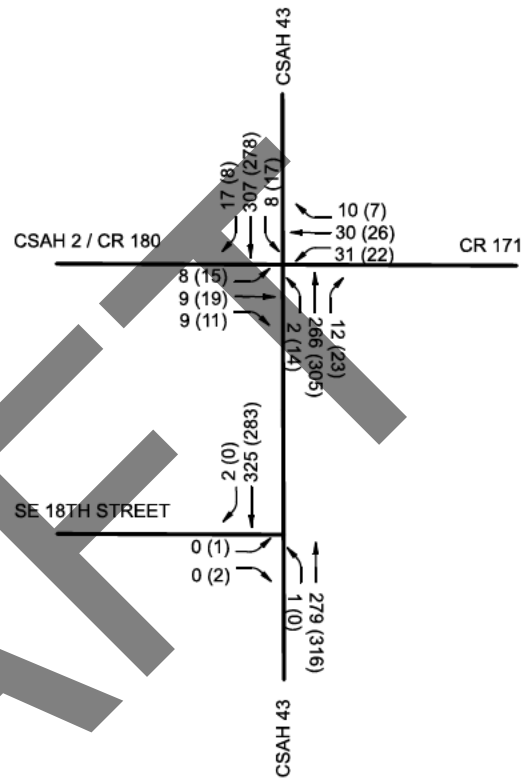
Traffic Redistribution Based on Proposed Alternatives

Based on the proposed alternatives, the traffic was redistributed to analyze each alternative. Alternatives 2 through 4 have the same redistribution (see Figure 8 for the redistributed traffic).

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ALTERNATIVE 1



ALTERNATIVES 2-4



- LEGEND**
- MOVEMENT DESIGNATION
 - 22 (45) AM (PM) PEAK HOUR TRAFFIC VOLUME

CSAH 2/CR 180, CSAH 43, and CR 171

REDISTRIBUTED 2044
PEAK HOUR TRAFFIC

STEELE COUNTY, MN

FIGURE 8



Intersection Analyses

The capacity of the intersections was analyzed using the procedures outlined in the *Highway Capacity Manual, 7th Edition (HCM)*, the intersections were modeled using Synchro Studio 11 with SimTraffic 11 and Sidra Intersection 9.1.

Level of Service (LOS) at intersections is primarily a function of peak hour turning movement volumes, intersection lane configuration, and traffic control. For intersection analysis, the *HCM* defines LOS in terms of the average control delay at the intersection in seconds per vehicle. Level of service is broken down into letter grades, with LOS A representing good operations and LOS F representing poor operations. LOS E is considered to be at capacity. Table 1 shows the level of service correlations to seconds of delay for signalized intersections and stop control (unsignalized) intersections. Currently in the United States, roundabout control is also categorized as unsignalized.

LOS	Signalized Intersection Control Delay (seconds/vehicle)	Unsignalized Intersection Control Delay (seconds/vehicle)
A	≤ 10 sec.	≤ 10 sec.
B	10 - 20 sec.	10 - 15 sec.
C	20 - 35 sec.	15 - 25 sec.
D	35 - 55 sec.	25 - 35 sec.
E	55 - 80 sec.	35 - 50 sec.
F	> 80 sec.	> 50 sec.

Table 1 – Intersection LOS Criteria

Capacity Analysis

The proposed alternatives were analyzed using the Synchro/SimTraffic and Sidra Intersection software programs, which uses the *Highway Capacity Manual (HCM)* methodology. The intersections were analyzed using the 2044 traffic volumes. Alternatives 2 through 4 have the same redistribution and will result in the same capacity.

Alternative 1

For Alternative 1, roundabout control and side-street stop control were analyzed. Based on the analysis, it has been determined that roundabout control connecting CSAH 43, CSAH 2/CR 180, and CR 171 in addition of a side-street stop control for 18th Street/CSAH 43, is acceptable. A summary of the detailed LOS results is shown in Appendix B.

Alternative 1 Level of Service					
		CSAH 2/CR 180, CR 171/CSAH 43, CSAH 43		18th Street/CSAH 43	
		AM	PM	AM	PM
APPROACH	NB	A	A	A	A
	SB	A	A	A	A
	EB	A	B	A	B
	WB	A	A	-	-
	NWB	A	A	-	-
Intersection LOS		A	A	A	A

Table 2 – Alternative 1 LOS Summary

Alternatives 2-4: Side-Street Stop Control

For Alternatives 2-4, side-street stop control was analyzed. Based on the analysis, it has been determined that side-street stop control at the intersection connecting CSAH 43, CSAH 2/CR 180, and CR 171 in addition of a side-street stop control for 18th Street/CSAH 43, is acceptable. A summary of the detailed LOS results is shown in Appendix C.

Alternatives 2-4 Level of Service					
		CSAH 2/CR 180, CR 171/CSAH 43, CSAH 43		18th Street/CSAH 43	
		AM	PM	AM	PM
APPROACH	NB	A	A	A	A
	SB	A	A	A	A
	EB	B	C	A	B
	WB	C	C	-	-
Intersection LOS		-	-	A	A

Table 3 – Alternatives 2-4 LOS Summary

Alternatives 2-4: Multi-Way Stop Control

For Alternatives 2-4, multi-way stop control at the intersection connecting CSAH 43, CSAH 2/CR 180, and CR 171 in addition of a side-street stop control for 18th Street/CSAH 43, is acceptable. A summary of the detailed LOS results is shown in Appendix D.

Alternatives 2-4 Level of Service			
		CSAH 2/CR 180, CR 171/CSAH 43, CSAH 43	
		AM	PM
APPROACH	NB	B	B
	SB	B	B
	EB	A	A
	WB	B	B
Intersection LOS		B	B

Table 4 – Alternatives 2-4 LOS Summary

Alternatives 2-4: Traffic Signal Control

For Alternatives 2-4, traffic signal control at the intersection connecting CSAH 43, CSAH 2/CR 180, and CR 171 in addition of a side-street stop control for 18th Street/CSAH 43, is acceptable. A summary of the detailed LOS results is shown in Appendix E.

Alternatives 2-4 Level of Service			
		CSAH 2/CR 180, CR 171/CSAH 43, CSAH 43	
		AM	PM
APPROACH	NB	B	B
	SB	B	B
	EB	A	A
	WB	A	A
Intersection LOS		B	B

Table 5 – Alternatives 2-4 LOS Summary

Safety Analysis

Crash data was obtained from the Minnesota Department of Transportation (MnDOT) showing fifteen recorded crashes at the three intersections between 2014 and 2024. The majority of crashes were angle (47%), other (27%), and single vehicle run off road (13%). There were four minor injury crashes, four possible injury crashes, and seven property damage crashes. Four crashes were at the CR 171 intersection. Nine crashes were at the CSAH 2/CR 180 intersection. Two crashes were at the 18th Street intersection. See Appendix F for the detailed crash data.

MnDOT provides an online calculator⁽⁴⁾ to determine the intersection crash rate per million vehicles entering the intersection. MnDOT has a crash rate goal of 1.0 crash per million entering vehicles (MEV) for all intersections.

The 2040 Transportation Plan identified the intersection as the top ranked crash location in the County based on 2016-2020 crash data. The current traffic counts and crash data were entered into the MnDOT crash calculator with the following results:

Intersection Crash Rate = 1.81 per million entering vehicles

Based on the crash data provided at this location, there is a need to address safety issues. Angle crashes are severe crash types at high speeds.

Alternative 1

The proposed 5-leg roundabout combines two closely spaced skewed intersections and reduces the number of conflict points.

Studies show that roundabout control improves safety in the following ways:

1. Slower vehicle speeds
2. Decreased number of conflict points
3. Reduction of accident severity

Installing a roundabout is an accepted traffic calming technique which is achieved by controlling geometrics. Speed reduction can be realized at all times of the day and during various traffic volumes. Roundabout control is a flexible type of control that handles varying traffic volumes efficiently. Installing a roundabout may reduce crashes by 44% (p. 30, DRCRF⁽¹⁾) and may reduce property damage only crashes by 42% and injuries by 82% (p. 31, DRCRF⁽¹⁾). Actual crash reductions vary due to site-specific factors.

The rerouting of SE 18th Street to the south to remove the skew of the intersection may also reduce crashes by 9% (p. 33, DRCRF⁽¹⁾).

Alternatives 2-4

The new realigned intersection of CSAH 43, CSAH 2/CR 180, and CR 171 will remove the skew and increase the separation from the railroad crossing. The new realigned intersection combines two closely spaced intersections, reducing the overall number of conflict points. Turn lanes will also be added on CSAH 43 to remove turning traffic from the through movement. Installing right turn lanes on the major road approaches may reduce crashes by 26% (DRCRF⁽¹⁾). Installing left turn lanes on the major road approaches may reduce crashes by 48% (DRCRF⁽¹⁾). Removing the skew of the intersection may also reduce crashes by 9% (p. 33, DRCRF⁽¹⁾). No crash reduction factor was available for combining

whks

intersections; however, it is expected to reduce the number of crashes significantly. Actual crash reductions vary due to site-specific factors.

The rerouting of SE 18th Street to the south to remove the skew of the intersection may also reduce crashes by 9% (p. 33, DRCRF⁽¹⁾).

Warrant Analysis

A warrant analysis was performed in accordance with the *Minnesota Manual on Uniform Traffic Control Devices (MnMUTCD)* utilizing Highway Capacity Software (HCS). There are no warrants for the installation of roundabouts. However, MnDOT's current policy states that roundabouts are considered warranted if traffic volumes meet the criteria for either multi-way stop or traffic signal control warrants. The peak hour traffic was also analyzed using the NCHRP report 825 Exhibit 17⁽³⁾.

Multi-way stop control warrants:

1. Crash Experience
2. Sight Distance
3. Transition to Signal or Roundabout
4. 8-Hour Volume
5. Other

Signal control warrants:

1. 8-Hour Volume
2. 4-Hour Volume
3. Peak Hour
4. Pedestrian Volume
5. School Crossing
6. Coordinated Signal System
7. Crash Experience
8. Roadway Network
9. Intersection Near a Grade Crossing

Multi-way stop warrants 1 through 5 are not met.

Signal control warrants 1 through 8 are not met. There are currently 5 trains a day at the grade crossing. Signal warrant 9 will be met if the future traffic is observed and the existing intersection configuration is not improved. The existing queue distance is approximately 65 feet and meets the requirements for existing traffic. To meet the needs of the future traffic, 130 feet of queue distance will be required. All proposed alternatives will meet the queue requirement.

NCHRP report 825 Exhibit 17 suggests that two-way stop control is appropriate for all proposed alternatives.

A summary of the warrant analysis is shown in Appendix G

Site Review

Right of Way

All four Alternatives will require additional right-of-way (ROW) to be constructed.

Alternative 1 will require the acquisition of approximately 17 acres of property and result in the relocation of four single-family residential houses.

Alternative 2 will require the acquisition of approximately 22 acres of ROW and result in the relocation of three single-family residential houses and one multi-family apartment unit.

Alternative 3 will require the acquisition of approximately 21 acres of ROW and result in the relocation of three single-family residential houses.

Alternative 4 will require the acquisition of approximately 14 acres of ROW and the relocation of one single-family residential house.

Cost Analysis

The estimated construction cost for Alternative 1 is estimated to be \$3,440,000.

The estimated construction cost for Alternative 2 is estimated to be \$4,710,000.

The estimated construction cost for Alternative 3 is estimated to be \$4,500,000.

The estimated construction cost for Alternative 4 is estimated to be \$5,620,000.

Findings and Recommendations

Capacity Analysis

Alternative 1

It has been determined that roundabout control for CSAH 2/CR 180 / CR 171 / CSAH 43, and side-street stop control for 18th Street/CSAH 43 is acceptable.

Alternatives 2-4

It has been determined that side-street stop, multi-way stop, and traffic signal control for CSAH 2/CR 180 / CR 171, and CSAH 43 is acceptable. Side-street stop control for 18th Street/CSAH 43 is acceptable.

Safety Analysis

Based on the crash data provided at this location, there is a need to address safety issues. Angle crashes are severe crash types at high speeds. Using the MNDOT crash calculator, an Intersection Crash Rate of 1.81 was calculated. MnDOT has a crash rate goal of 1.0 crash per million entering vehicles (MEV) for all intersections.

Alternative 1

Roundabouts offer significant safety benefits including an overall reduction in vehicle speed, elimination of dangerous intersection conditions such as stop sign running, and removes serious conflict points including angle, left-turn, and head-on crashes.⁽²⁾

Alternatives 2-4

The new realigned intersection of CSAH 43, CSAH 2/CR 180, and CR 171 will remove the skew and increase the separation from the railroad crossing. The new realigned intersection combines two closely spaced intersections, reducing the overall number of conflict points. Turn lanes will also be added on CSAH 43 to remove turning traffic from the through movement.

Warrant Analysis

Multi-way stop warrants are not met. It is not recommended that multi-way stop be implemented if unwarranted. Multi-way stop control is suitable only at intersections with moderate and relatively balanced volume levels on the intersection approaches. Under other conditions, the use of Multi-way stop control may create unnecessary delays and aggressive driver behavior. Not every two-way stop-controlled intersection should be considered as a candidate for multi-way stop control. This strategy should be used selectively, recognizing patterns and volumes of traffic and potentially adverse reaction by the driving population to being stopped for no apparent reason. If drivers encounter substantial delays, they may become impatient and act irrationally, which can lead to crash patterns of the type that the strategy is intended to correct.⁽⁵⁾

Signal control warrants 1 through 8 are not met. There are currently 5 trains a day at the grade crossing. Signal warrant 9 will be met if the future traffic is observed and the existing intersection configuration is not improved. The existing queue distance between the railroad crossing and the highway is approximately 65 feet and meets the requirements for existing traffic. To meet the needs of the future traffic, 130 feet of queue distance will be required. All proposed alternatives will meet the queue requirement. Based on the signal warrants not being met, it is not recommended that a signal be installed. Unwarranted signals can increase crash rate by 24%⁽¹⁾.

NCHRP report 825 Exhibit 17 suggests that two-way stop control is appropriate for all proposed alternatives.

Summary of Findings

All alternatives presented and types of intersection control will provide an acceptable Level of Service for future traffic. Warrants related to crashes, sight distance, and traffic volumes are not met for multi-way stop or signal control and roundabout control based on signal and multi-way stop findings. Signal warrant 9 related to the railroad crossing will be met if the future traffic is observed and the existing intersection configuration is not improved. The existing queue distance between the railroad crossing and the highway is approximately 65 feet and meets the requirements for existing traffic. To meet the needs of the future traffic, 130 feet of queue distance will be required. All proposed alternatives will meet the queue requirement for existing and future traffic. Based on the signal warrants not being met, it is not recommended that a signal be installed. Unwarranted signals can increase crash rate by 24%⁽¹⁾.

Based on the crash data provided, there are specific safety issues that need to be addressed in the proposed improvements. Roundabout control is an accepted traffic calming technique. Reduced vehicle speed is achieved by controlling geometrics and therefore, speed reduction can be realized at all times of the day and under varying traffic volumes. The redesigned intersections in Alternatives 2-4 that eliminates the skew and tight spaced intersections will also improve safety.

While not recommended as a permanent solution to the intersection based on the analysis performed in this report, multi-way stop could be implemented as a temporary traffic control. It would help reduce the number of right angle crashes at the intersection caused by poor sight distances and skewed geometry, and could be implemented immediately until the improved intersection is reconstructed. Multi-way stop would also provide an opportunity to prepare drivers for the switch in stop control from CSAH 43 to CSAH 2/CR 180 as recommended in this report. Additional pavement markings and advanced warning signs should also be updated at all approaches of the intersection to improve driver awareness to the interim control change. Dynamic changeable message signs should also be used in the short term to draw more attention to the changes.

Alternative 4 was found to require the least amount of additional ROW acquisition and require the least amount of housing relocations. Alternatives 1,2 and 3 all required higher amounts of acquisition and additional housing relocations.

Alternative 1 was found to be the cheapest alternative at \$3,440,000. The remaining alternatives were similar in cost, with Alternative 3 at \$4,500,000, then Alternative 2 at \$4,710,000, and Alternative 4 being the most expensive at \$5,620,000.

Based on these factors and the analyses performed in this study, Alternative 4 is the recommended Alternative. While all four alternatives had adequate safety and capacity requirements, Alternative 4 provides the most separation from the railroad tracks and other intersections for future upgrades to the intersection of CSAH 2/ CR 180 and CSAH 43 for a similar cost compared to the other alternatives. This was the only alternative that also provides enough space for construction of a future railroad overpass. Alternative 4 also requires the least amount of ROW acquisition and relocation of properties to construct. The two-way stop control in Alternatives 4 could be upgraded to multi-way stop or traffic signal in the future if the traffic demand requires it.

References

- (1) Geni Bahar, Maurice Masliah, Rhys Wolff, Peter Park, Desktop Reference for Crash Reduction Factors, Report No. FHWA-SA-08-011 (Washington, D.C.: US Department of Transportation Federal Highway Administration, 2008).
- (2) Christopher W. Jenks et. al, ROUNDABOUTS: An Informational Guide, Second Edition, Report No. 672 (Washington, D.C.: US Department of Transportation Federal Highway Administration, 2010), p.3-33.
- (3) Richard Dowling et. al, Planning and Preliminary Engineering Applications Guide to the Highway Capacity Manual Report No. 825 (Washington, D.C.: US Department of Transportation Federal Highway Administration, 2016), p.31.
- (4) MNDOT, Traffic Engineering https://www.dot.state.mn.us/trafficeng/safety/crash_complex.html
- (5) TIMOTHY R. NEUMAN et. al, Guidance for Implementation of the AASHTO Strategic Highway Safety Plan Volume 5: A Guide for Addressing Unsignalized Intersection Collisions Report No. 500 (Washington, D.C.: US Department of Transportation Federal Highway Administration, 2003), p.V-90.

DRAFT

APPENDIX A

Traffic Count Data

DRAFT

44th Ave & 18th St (north offset) - TMC

Tue May 21, 2024

Full Length (6 AM-7 PM)

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1187532, Location: 44.066268, -93.146422

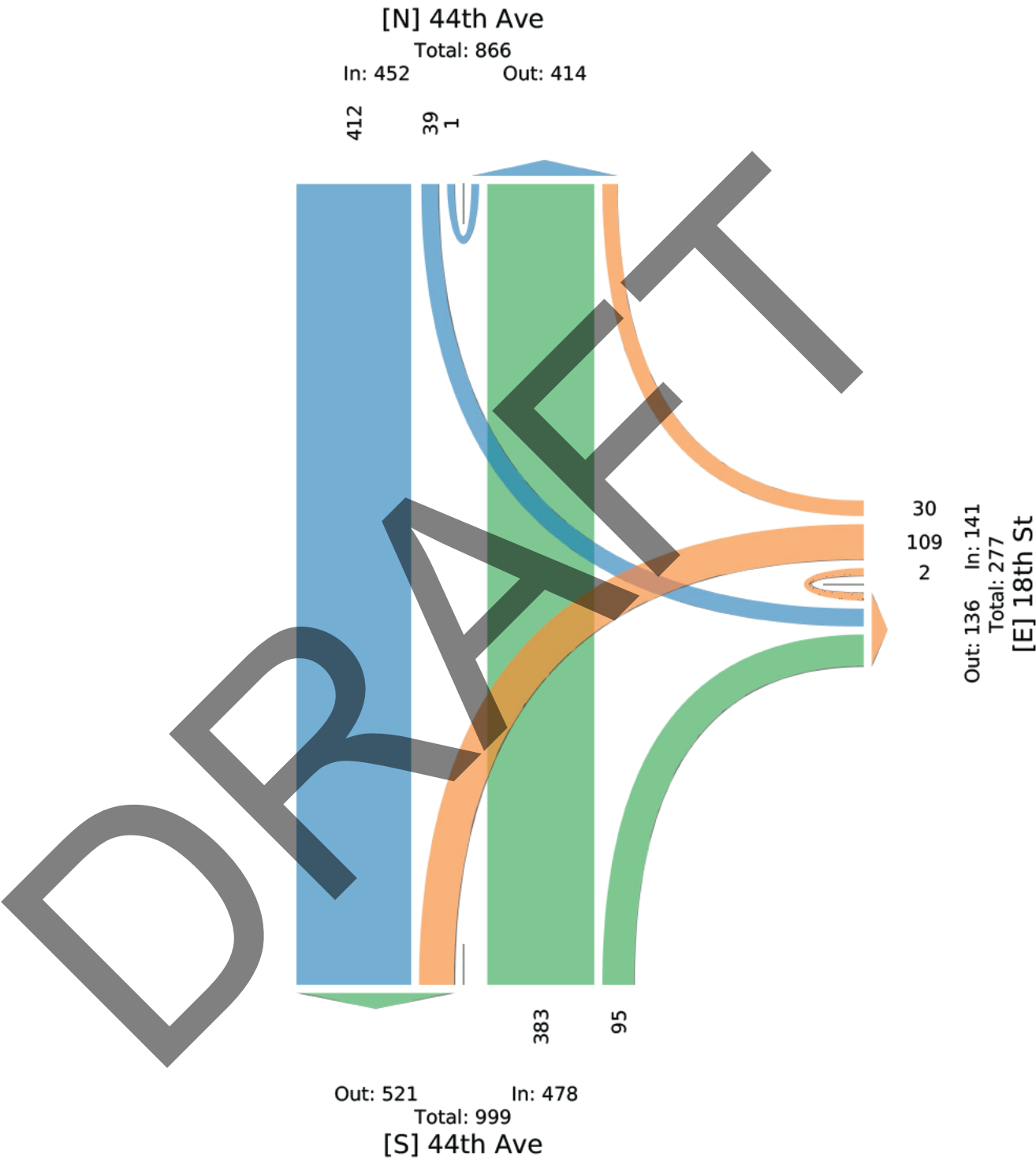


Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	44th Ave Southbound				18th St Westbound				44th Ave Northbound				
Time	T	L	U	App	R	L	U	App	R	T	U	App	Int
2024-05-21 6:00AM	52	1	0	53	1	9	0	10	2	14	0	16	79
7:00AM	70	1	1	72	3	11	0	14	9	24	0	33	119
8:00AM	38	3	0	41	6	10	0	16	3	29	0	32	89
9:00AM	26	2	0	28	1	7	0	8	7	14	0	21	57
10:00AM	19	1	0	20	2	7	0	9	4	17	0	21	50
11:00AM	21	1	0	22	2	8	0	10	5	18	0	23	55
12:00PM	24	4	0	28	1	5	0	6	13	23	0	36	70
1:00PM	30	4	0	34	2	9	0	11	7	27	0	34	79
2:00PM	33	6	0	39	5	11	0	16	9	42	0	51	106
3:00PM	32	6	0	38	3	12	1	16	13	55	0	68	122
4:00PM	27	3	0	30	2	9	1	12	9	61	0	70	112
5:00PM	19	4	0	23	1	6	0	7	9	43	0	52	82
6:00PM	21	3	0	24	1	5	0	6	5	16	0	21	51
Total	412	39	1	452	30	109	2	141	95	383	0	478	1071
% Approach	91.2%	8.6%	0.2%	-	21.3%	77.3%	1.4%	-	19.9%	80.1%	0%	-	-
% Total	38.5%	3.6%	0.1%	42.2%	2.8%	10.2%	0.2%	13.2%	8.9%	35.8%	0%	44.6%	-
Lights and Motorcycles	398	39	1	438	28	101	2	131	91	362	0	453	1022
% Lights and Motorcycles	96.6%	100%	100%	96.9%	93.3%	92.7%	100%	92.9%	95.8%	94.5%	0%	94.8%	95.4%
Heavy	14	0	0	14	2	8	0	10	4	21	0	25	49
% Heavy	3.4%	0%	0%	3.1%	6.7%	7.3%	0%	7.1%	4.2%	5.5%	0%	5.2%	4.6%

*L: Left, R: Right, T: Thru, U: U-Turn

44th Ave & 18th St (north offset) - TMC
Tue May 21, 2024
Full Length (6 AM-7 PM)
All Classes (Lights and Motorcycles, Heavy)
All Movements
ID: 1187532, Location: 44.066268, -93.146422



44th Ave & 18th St (north offset) - TMC
 Tue May 21, 2024
 AM Peak (7:15 AM - 8:15 AM)
 All Classes (Lights and Motorcycles, Heavy)
 All Movements
 ID: 1187532, Location: 44.066268, -93.146422

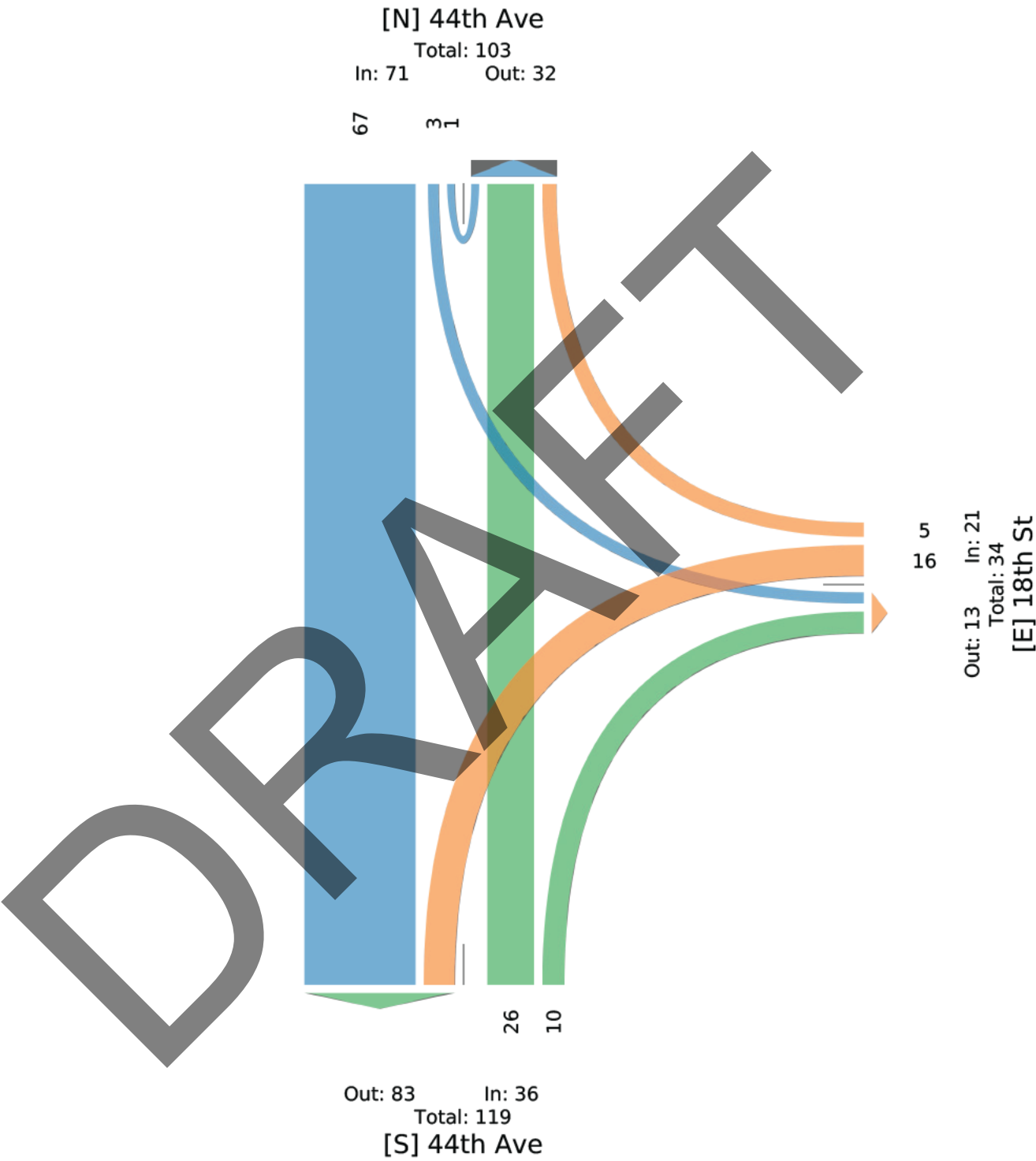


Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	44th Ave Southbound				18th St Westbound				44th Ave Northbound				
Time	T	L	U	App	R	L	U	App	R	T	U	App	Int
2024-05-21 7:15AM	17	0	0	17	2	2	0	4	1	5	0	6	27
7:30AM	19	0	0	19	0	6	0	6	2	8	0	10	35
7:45AM	18	1	1	20	0	3	0	3	5	4	0	9	32
8:00AM	13	2	0	15	3	5	0	8	2	9	0	11	34
Total	67	3	1	71	5	16	0	21	10	26	0	36	128
% Approach	94.4%	4.2%	1.4%	-	23.8%	76.2%	0%	-	27.8%	72.2%	0%	-	-
% Total	52.3%	2.3%	0.8%	55.5%	3.9%	12.5%	0%	16.4%	7.8%	20.3%	0%	28.1%	-
PHF	0.882	0.375	0.250	0.888	0.417	0.667	-	0.656	0.500	0.722	-	0.818	0.914
Lights and Motorcycles	65	3	1	69	3	15	0	18	10	26	0	36	123
% Lights and Motorcycles	97.0%	100%	100%	97.2%	60.0%	93.8%	0%	85.7%	100%	100%	0%	100%	96.1%
Heavy	2	0	0	2	2	1	0	3	0	0	0	0	5
% Heavy	3.0%	0%	0%	2.8%	40.0%	6.3%	0%	14.3%	0%	0%	0%	0%	3.9%

*L: Left, R: Right, T: Thru, U: U-Turn

44th Ave & 18th St (north offset) - TMC
Tue May 21, 2024
AM Peak (7:15 AM - 8:15 AM)
All Classes (Lights and Motorcycles, Heavy)
All Movements
ID: 1187532, Location: 44.066268, -93.146422

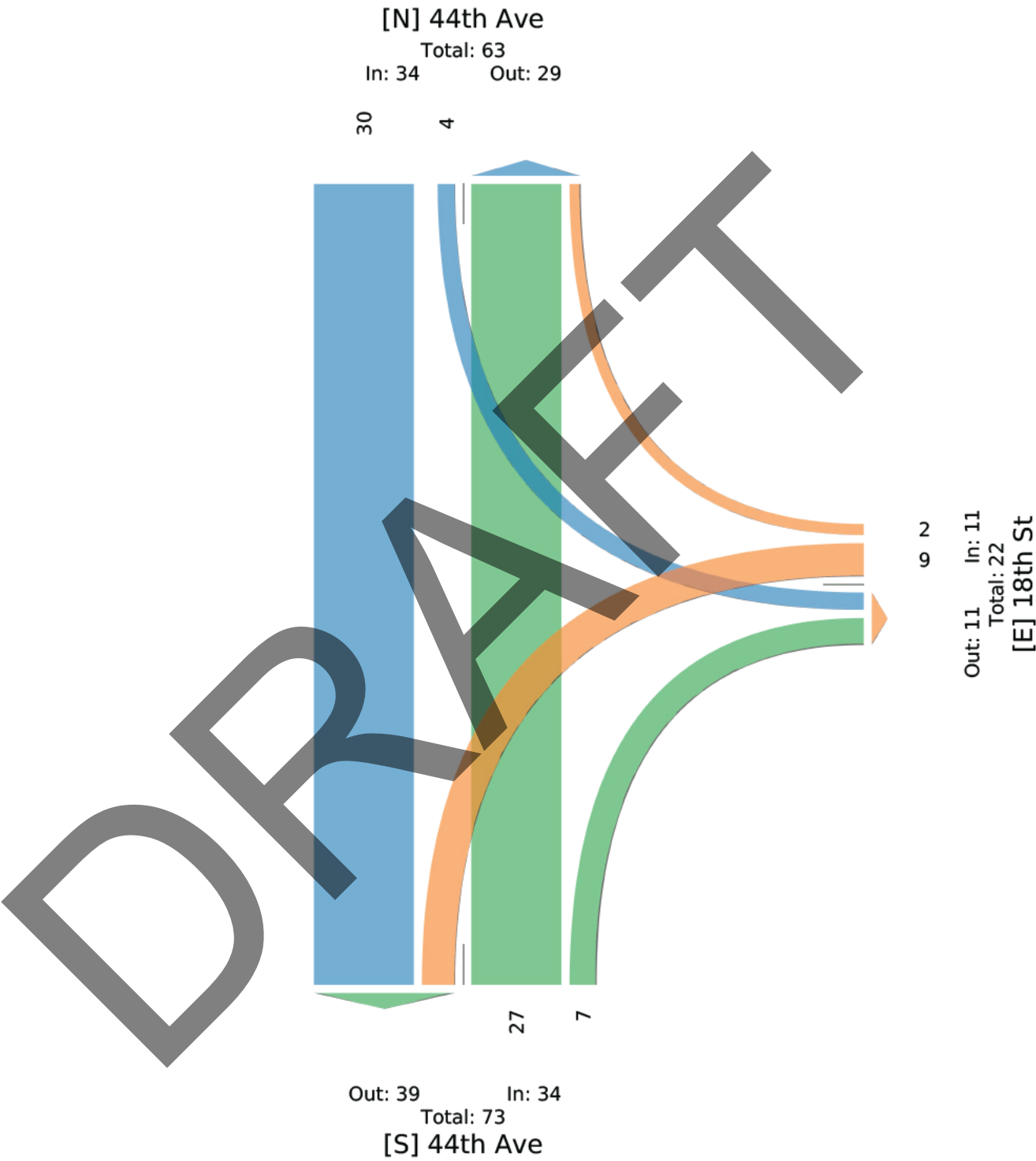


44th Ave & 18th St (north offset) - TMC
 Tue May 21, 2024
 Midday Peak (1 PM - 2 PM)
 All Classes (Lights and Motorcycles, Heavy)
 All Movements
 ID: 1187532, Location: 44.066268, -93.146422

Leg Direction	44th Ave Southbound				18th St Westbound				44th Ave Northbound				
Time	T	L	U	App	R	L	U	App	R	T	U	App	Int
2024-05-21 1:00PM	7	2	0	9	1	3	0	4	3	5	0	8	21
1:15PM	8	1	0	9	0	4	0	4	0	5	0	5	18
1:30PM	10	0	0	10	1	0	0	1	1	7	0	8	19
1:45PM	5	1	0	6	0	2	0	2	3	10	0	13	21
Total	30	4	0	34	2	9	0	11	7	27	0	34	79
% Approach	88.2%	11.8%	0%	-	18.2%	81.8%	0%	-	20.6%	79.4%	0%	-	-
% Total	38.0%	5.1%	0%	43.0%	2.5%	11.4%	0%	13.9%	8.9%	34.2%	0%	43.0%	-
PHF	0.750	0.500	-	0.850	0.500	0.563	-	0.688	0.583	0.675	-	0.654	0.940
Lights and Motorcycles	29	4	0	33	2	8	0	10	6	23	0	29	72
% Lights and Motorcycles	96.7%	100%	0%	97.1%	100%	88.9%	0%	90.9%	85.7%	85.2%	0%	85.3%	91.1%
Heavy	1	0	0	1	0	1	0	1	1	4	0	5	7
% Heavy	3.3%	0%	0%	2.9%	0%	11.1%	0%	9.1%	14.3%	14.8%	0%	14.7%	8.9%

*L: Left, R: Right, T: Thru, U: U-Turn

44th Ave & 18th St (north offset) - TMC
Tue May 21, 2024
Midday Peak (1 PM - 2 PM)
All Classes (Lights and Motorcycles, Heavy)
All Movements
ID: 1187532, Location: 44.066268, -93.146422



44th Ave & 18th St (north offset) - TMC

Tue May 21, 2024

PM Peak (2:30 PM - 3:30 PM) - Overall Peak Hour

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1187532, Location: 44.066268, -93.146422

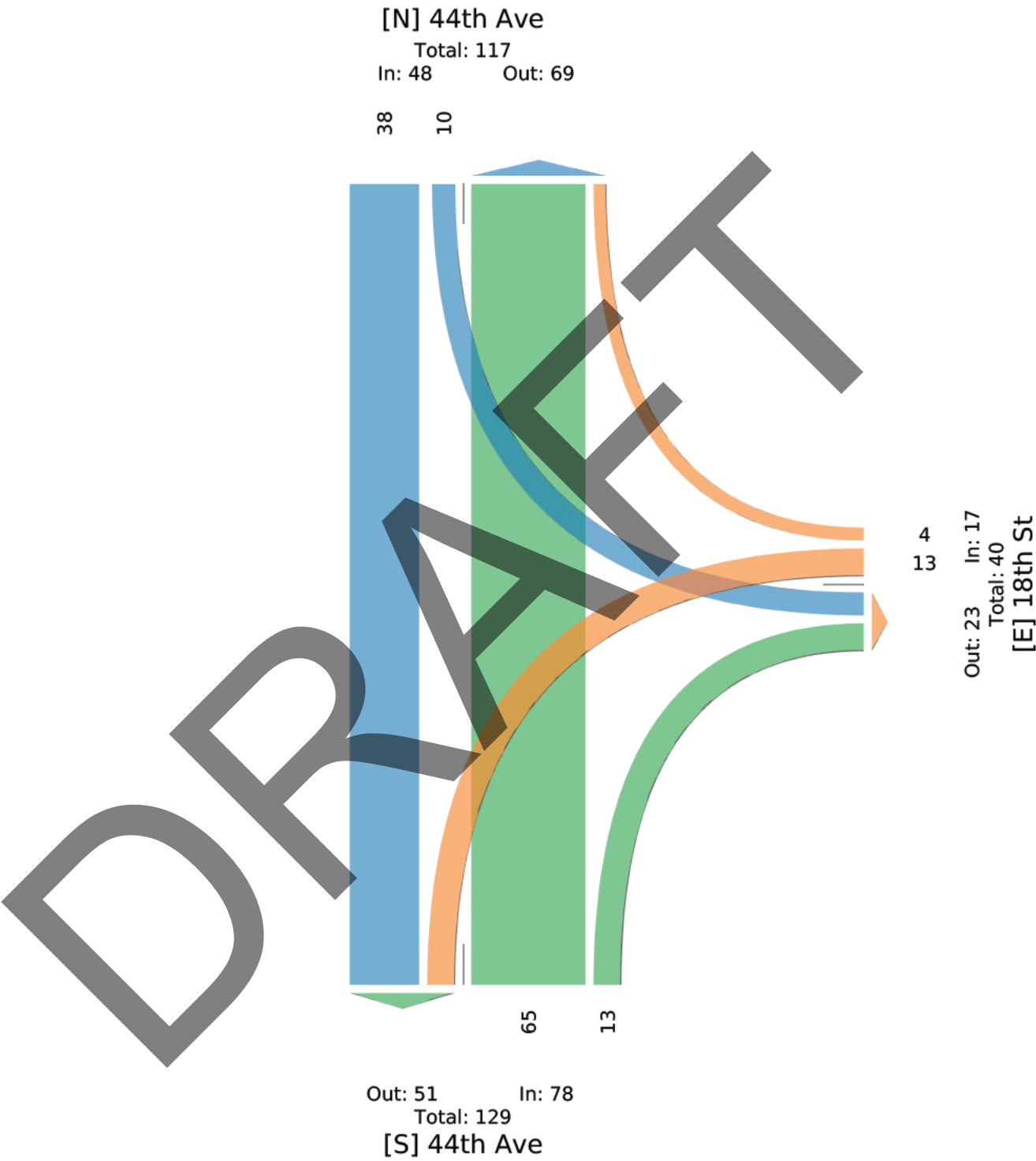


Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	44th Ave Southbound				18th St Westbound				44th Ave Northbound				
Time	T	L	U	App	R	L	U	App	R	T	U	App	Int
2024-05-21 2:30PM	11	1	0	12	1	3	0	4	2	15	0	17	33
2:45PM	9	4	0	13	1	4	0	5	4	14	0	18	36
3:00PM	7	1	0	8	0	4	0	4	4	15	0	19	31
3:15PM	11	4	0	15	2	2	0	4	3	21	0	24	43
Total	38	10	0	48	4	13	0	17	13	65	0	78	143
% Approach	79.2%	20.8%	0%	-	23.5%	76.5%	0%	-	16.7%	83.3%	0%	-	-
% Total	26.6%	7.0%	0%	33.6%	2.8%	9.1%	0%	11.9%	9.1%	45.5%	0%	54.5%	-
PHF	0.864	0.625	-	0.800	0.500	0.813	-	0.850	0.813	0.774	-	0.813	0.831
Lights and Motorcycles	37	10	0	47	4	13	0	17	13	62	0	75	139
% Lights and Motorcycles	97.4%	100%	0%	97.9%	100%	100%	0%	100%	100%	95.4%	0%	96.2%	97.2%
Heavy	1	0	0	1	0	0	0	0	0	3	0	3	4
% Heavy	2.6%	0%	0%	2.1%	0%	0%	0%	0%	0%	4.6%	0%	3.8%	2.8%

*L: Left, R: Right, T: Thru, U: U-Turn

44th Ave & 18th St (north offset) - TMC
Tue May 21, 2024
PM Peak (2:30 PM - 3:30 PM) - Overall Peak Hour
All Classes (Lights and Motorcycles, Heavy)
All Movements
ID: 1187532, Location: 44.066268, -93.146422



44th Ave & Claremont Rd - TMC

Tue May 21, 2024

Full Length (6 AM-7 PM)

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1187533, Location: 44.065991, -93.146408



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	44th Ave Southbound					Claremont Rd Westbound					44th Ave Northbound					Claremont Rd Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2024-05-21 6:00AM	7	51	3	0	61	4	7	9	0	20	2	11	5	0	18	6	14	1	0	21	120
7:00AM	13	64	5	0	82	5	34	11	0	50	1	24	3	0	28	10	10	4	0	24	184
8:00AM	13	34	1	0	48	3	3	9	0	15	2	22	5	0	29	1	8	7	0	16	108
9:00AM	2	29	1	0	32	1	4	11	0	16	3	12	8	0	23	4	9	7	0	20	91
10:00AM	5	18	3	0	26	5	10	9	0	24	11	14	2	0	27	4	6	3	0	13	90
11:00AM	7	22	2	0	31	6	7	9	0	22	3	12	0	0	15	2	7	5	0	14	82
12:00PM	6	21	3	0	30	2	14	11	0	27	11	25	3	0	39	1	10	11	0	22	118
1:00PM	8	30	2	0	40	3	10	7	0	20	8	24	4	0	36	1	5	6	0	12	108
2:00PM	9	29	6	0	44	6	12	14	0	32	7	31	7	0	45	6	13	15	0	34	155
3:00PM	9	25	8	0	42	5	13	4	0	22	3	47	9	0	59	5	18	15	0	38	161
4:00PM	8	22	7	0	37	3	26	9	0	38	10	50	14	0	74	11	19	15	0	45	194
5:00PM	6	14	4	0	24	4	10	8	0	22	6	48	7	0	61	6	10	7	0	23	130
6:00PM	8	17	3	0	28	2	8	0	0	10	3	16	0	0	19	0	9	5	0	14	71
Total	101	376	48	0	525	49	158	111	0	318	70	336	67	0	473	57	138	101	0	296	1612
% Approach	19.2%	71.6%	9.1%	0%	-	15.4%	49.7%	34.9%	0%	-	14.8%	71.0%	14.2%	0%	-	19.3%	46.6%	34.1%	0%	-	-
% Total	6.3%	23.3%	3.0%	0%	32.6%	3.0%	9.8%	6.9%	0%	19.7%	4.3%	20.8%	4.2%	0%	29.3%	3.5%	8.6%	6.3%	0%	18.4%	-
Lights and Motorcycles	101	348	48	0	497	45	149	89	0	283	49	319	62	0	430	54	136	100	0	290	1500
% Lights and Motorcycles	100%	92.6%	100%	0%	94.7%	91.8%	94.3%	80.2%	0%	89.0%	70.0%	94.9%	92.5%	0%	90.9%	94.7%	98.6%	99.0%	0%	98.0%	93.1%
Heavy	0	28	0	0	28	4	9	22	0	35	21	17	5	0	43	3	2	1	0	6	112
% Heavy	0%	7.4%	0%	0%	5.3%	8.2%	5.7%	19.8%	0%	11.0%	30.0%	5.1%	7.5%	0%	9.1%	5.3%	1.4%	1.0%	0%	2.0%	6.9%

*L: Left, R: Right, T: Thru, U: U-Turn

44th Ave & Claremont Rd - TMC

Tue May 21, 2024

Full Length (6 AM-7 PM)

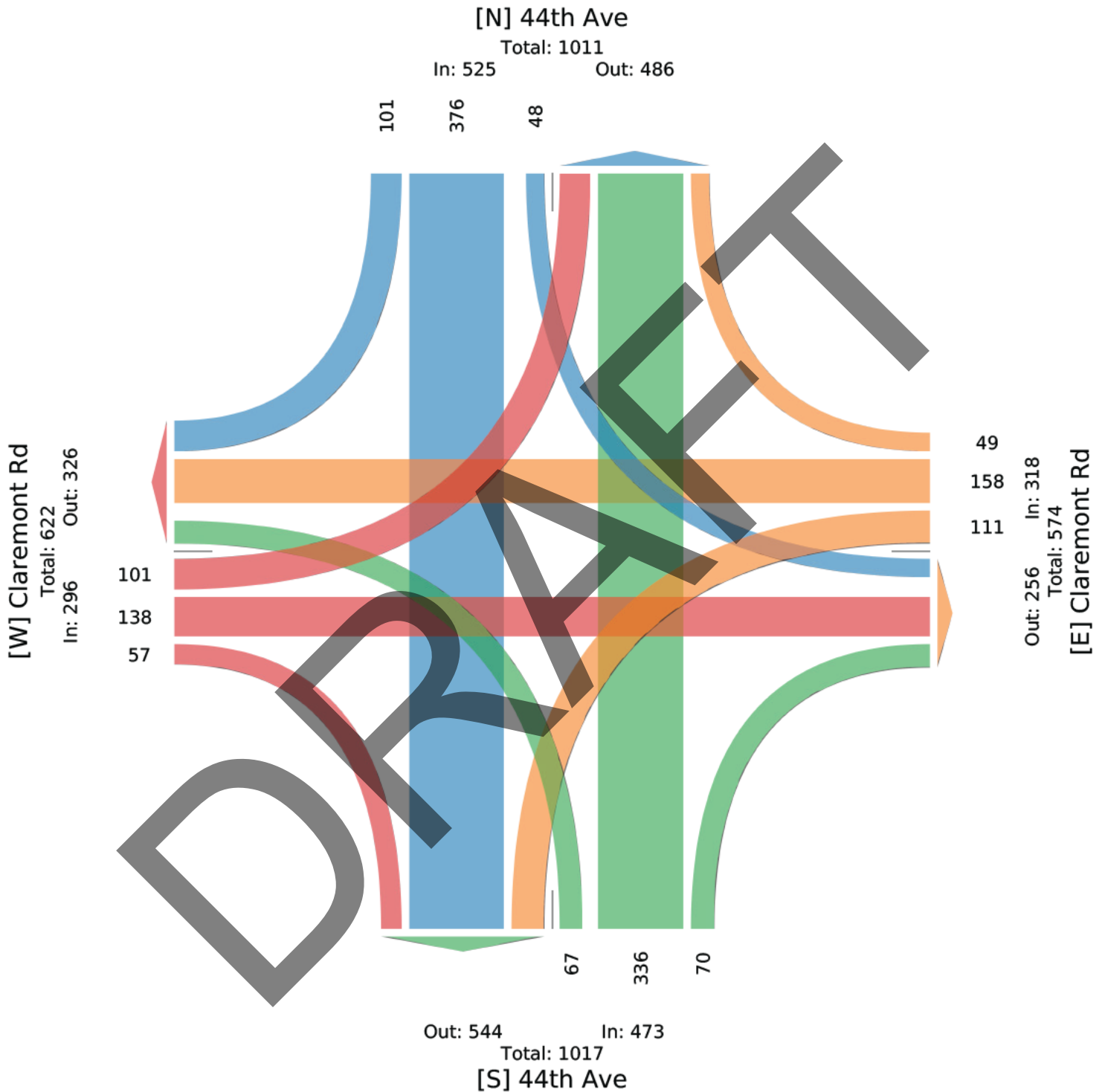
All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1187533, Location: 44.065991, -93.146408



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



44th Ave & Claremont Rd - TMC
 Tue May 21, 2024
 AM Peak (7:15 AM - 8:15 AM)
 All Classes (Lights and Motorcycles, Heavy)
 All Movements
 ID: 1187533, Location: 44.065991, -93.146408



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	44th Ave Southbound					Claremont Rd Westbound					44th Ave Northbound					Claremont Rd Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2024-05-21 7:15AM	2	16	2	0	20	1	11	6	0	18	0	5	0	0	5	7	1	0	0	8	51
7:30AM	5	19	1	0	25	1	8	4	0	13	1	9	1	0	11	1	3	0	0	4	53
7:45AM	6	14	1	0	21	3	10	1	0	14	0	3	1	0	4	1	3	3	0	7	46
8:00AM	4	13	1	0	18	0	1	4	0	5	1	5	0	0	6	0	2	5	0	7	36
Total	17	62	5	0	84	5	30	15	0	50	2	22	2	0	26	9	9	8	0	26	186
% Approach	20.2%	73.8%	6.0%	0%	-	10.0%	60.0%	30.0%	0%	-	7.7%	84.6%	7.7%	0%	-	34.6%	34.6%	30.8%	0%	-	-
% Total	9.1%	33.3%	2.7%	0%	45.2%	2.7%	16.1%	8.1%	0%	26.9%	1.1%	11.8%	1.1%	0%	14.0%	4.8%	4.8%	4.3%	0%	14.0%	-
PHF	0.708	0.816	0.625	-	0.840	0.417	0.682	0.625	-	0.694	0.500	0.611	0.500	-	0.591	0.321	0.750	0.400	-	0.813	0.877
Lights and Motorcycles	17	59	5	0	81	5	29	14	0	48	1	22	2	0	25	8	9	8	0	25	179
% Lights and Motorcycles	100%	95.2%	100%	0%	96.4%	100%	96.7%	93.3%	0%	96.0%	50.0%	100%	100%	0%	96.2%	88.9%	100%	100%	0%	96.2%	96.2%
Heavy	0	3	0	0	3	0	1	1	0	2	1	0	0	0	1	1	0	0	0	1	7
% Heavy	0%	4.8%	0%	0%	3.6%	0%	3.3%	6.7%	0%	4.0%	50.0%	0%	0%	0%	3.8%	11.1%	0%	0%	0%	3.8%	3.8%

*L: Left, R: Right, T: Thru, U: U-Turn

44th Ave & Claremont Rd - TMC

Tue May 21, 2024

AM Peak (7:15 AM - 8:15 AM)

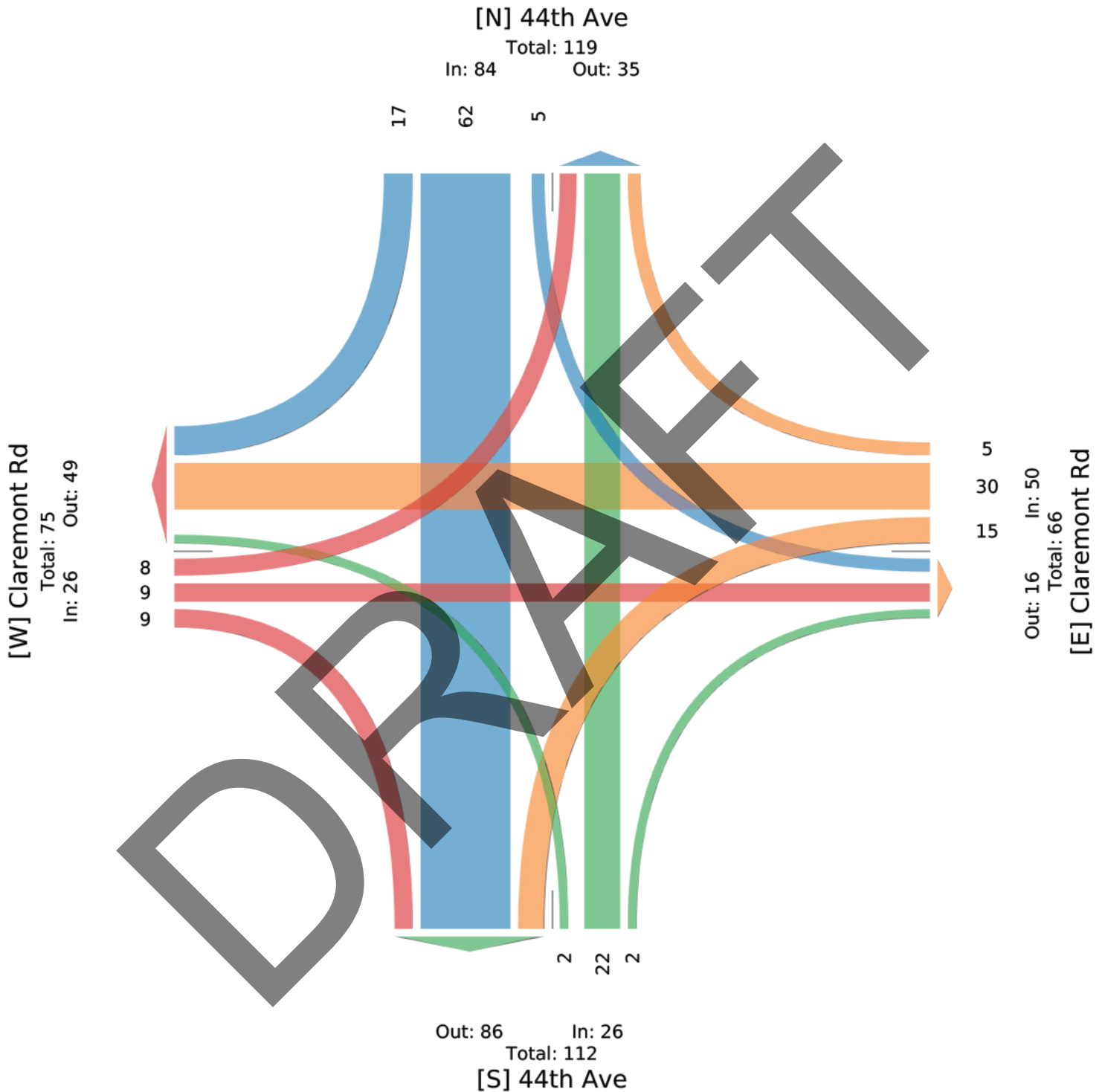
All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1187533, Location: 44.065991, -93.146408



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

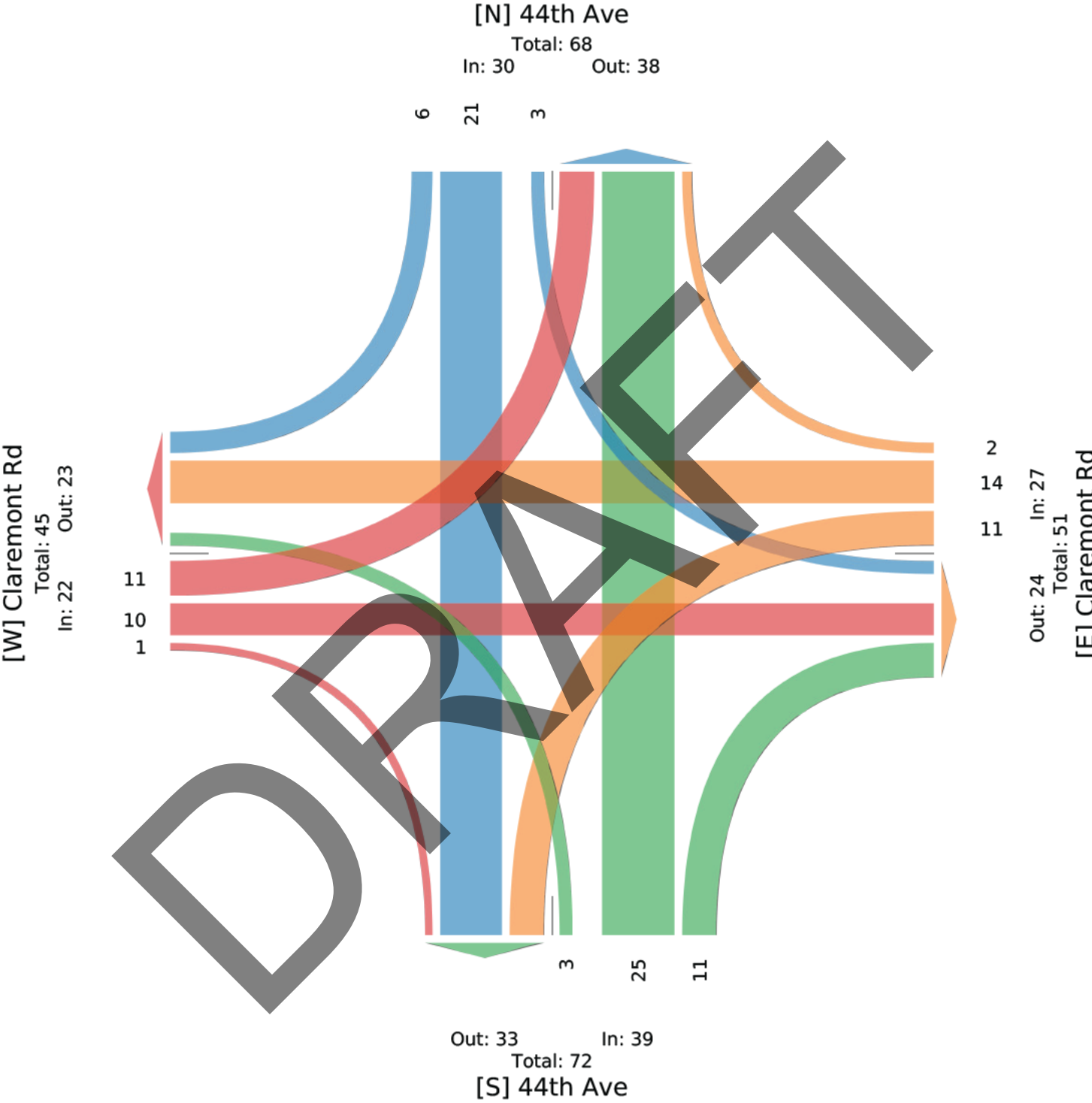


44th Ave & Claremont Rd - TMC
 Tue May 21, 2024
 Midday Peak (12 PM - 1 PM)
 All Classes (Lights and Motorcycles, Heavy)
 All Movements
 ID: 1187533, Location: 44.065991, -93.146408

Leg Direction	44th Ave Southbound					Claremont Rd Westbound					44th Ave Northbound					Claremont Rd Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2024-05-21 12:00PM	1	6	0	0	7	0	4	4	0	8	4	10	1	0	15	1	3	3	0	7	37
12:15PM	4	3	1	0	8	0	3	2	0	5	2	6	0	0	8	0	2	3	0	5	26
12:30PM	1	7	2	0	10	1	4	2	0	7	3	6	1	0	10	0	2	0	0	2	29
12:45PM	0	5	0	0	5	1	3	3	0	7	2	3	1	0	6	0	3	5	0	8	26
Total	6	21	3	0	30	2	14	11	0	27	11	25	3	0	39	1	10	11	0	22	118
% Approach	20.0%	70.0%	10.0%	0%	-	7.4%	51.9%	40.7%	0%	-	28.2%	64.1%	7.7%	0%	-	4.5%	45.5%	50.0%	0%	-	-
% Total	5.1%	17.8%	2.5%	0%	25.4%	1.7%	11.9%	9.3%	0%	22.9%	9.3%	21.2%	2.5%	0%	33.1%	0.8%	8.5%	9.3%	0%	18.6%	-
PHF	0.375	0.750	0.375	-	0.750	0.500	0.875	0.688	-	0.844	0.688	0.625	0.750	-	0.650	0.250	0.833	0.550	-	0.688	0.797
Lights and Motorcycles	6	18	3	0	27	2	13	8	0	23	6	23	2	0	31	1	10	11	0	22	103
% Lights and Motorcycles	100%	85.7%	100%	0%	90.0%	100%	92.9%	72.7%	0%	85.2%	54.5%	92.0%	66.7%	0%	79.5%	100%	100%	100%	0%	100%	87.3%
Heavy	0	3	0	0	3	0	1	3	0	4	5	2	1	0	8	0	0	0	0	0	15
% Heavy	0%	14.3%	0%	0%	10.0%	0%	7.1%	27.3%	0%	14.8%	45.5%	8.0%	33.3%	0%	20.5%	0%	0%	0%	0%	0%	12.7%

*L: Left, R: Right, T: Thru, U: U-Turn

44th Ave & Claremont Rd - TMC
Tue May 21, 2024
Midday Peak (12 PM - 1 PM)
All Classes (Lights and Motorcycles, Heavy)
All Movements
ID: 1187533, Location: 44.065991, -93.146408



44th Ave & Claremont Rd - TMC

Tue May 21, 2024

PM Peak (4 PM - 5 PM) - Overall Peak Hour

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1187533, Location: 44.065991, -93.146408

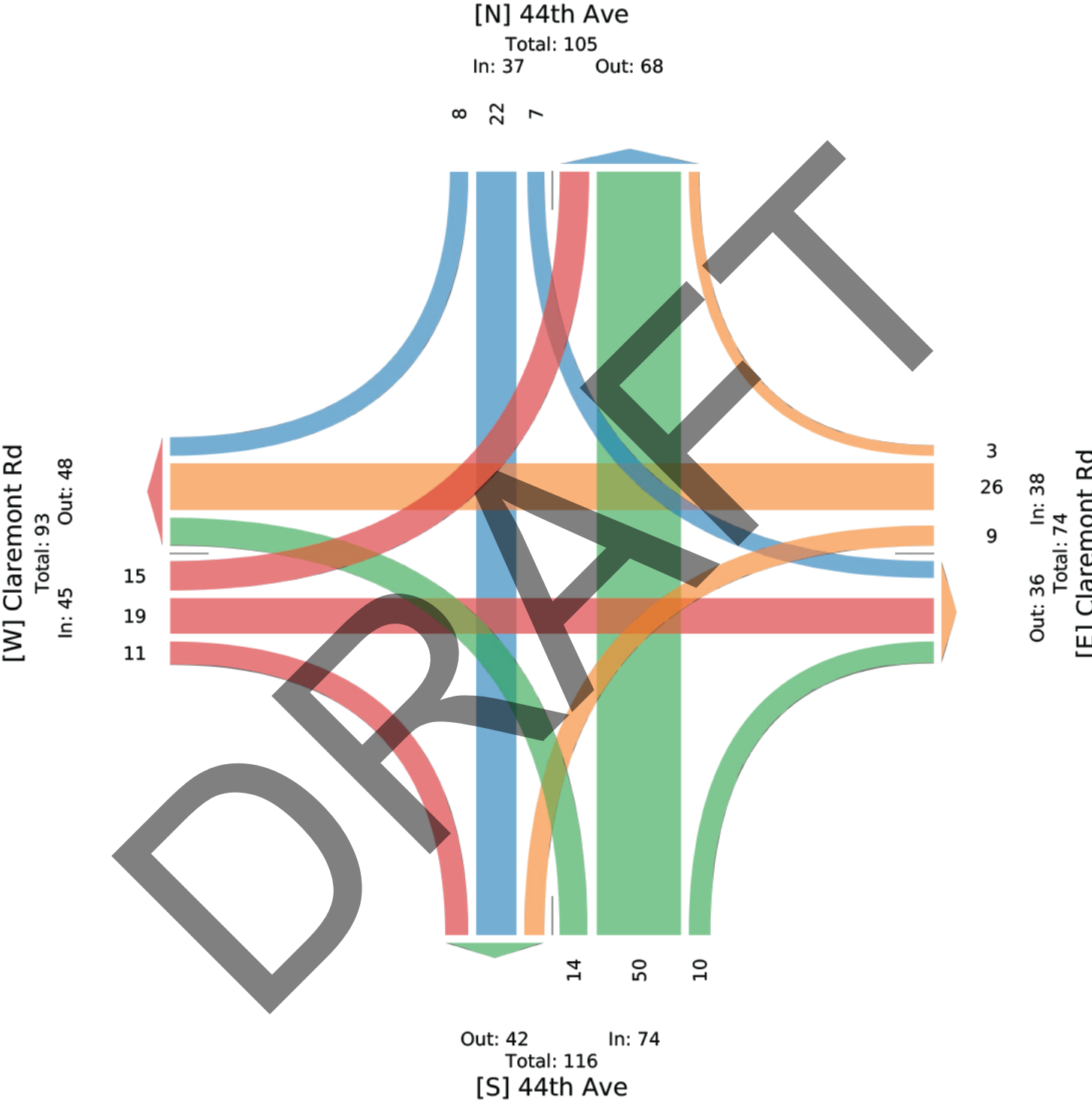


Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	44th Ave Southbound					Claremont Rd Westbound					44th Ave Northbound					Claremont Rd Eastbound					
Time	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	R	T	L	U	App	Int
2024-05-21 4:00PM	4	6	3	0	13	0	7	2	0	9	3	14	2	0	19	2	0	5	0	7	48
4:15PM	1	9	2	0	12	1	7	3	0	11	0	16	7	0	23	5	6	4	0	15	61
4:30PM	2	5	0	0	7	2	5	1	0	8	5	9	2	0	16	1	5	3	0	9	40
4:45PM	1	2	2	0	5	0	7	3	0	10	2	11	3	0	16	3	8	3	0	14	45
Total	8	22	7	0	37	3	26	9	0	38	10	50	14	0	74	11	19	15	0	45	194
% Approach	21.6%	59.5%	18.9%	0%	-	7.9%	68.4%	23.7%	0%	-	13.5%	67.6%	18.9%	0%	-	24.4%	42.2%	33.3%	0%	-	-
% Total	4.1%	11.3%	3.6%	0%	19.1%	1.5%	13.4%	4.6%	0%	19.6%	5.2%	25.8%	7.2%	0%	38.1%	5.7%	9.8%	7.7%	0%	23.2%	-
PHF	0.500	0.611	0.583	-	0.712	0.375	0.929	0.750	-	0.864	0.500	0.781	0.500	-	0.804	0.550	0.594	0.750	-	0.750	0.795
Lights and Motorcycles	8	22	7	0	37	2	24	7	0	33	10	50	14	0	74	11	19	15	0	45	189
% Lights and Motorcycles	100%	100%	100%	0%	100%	66.7%	92.3%	77.8%	0%	86.8%	100%	100%	100%	0%	100%	100%	100%	100%	0%	100%	97.4%
Heavy	0	0	0	0	0	1	2	2	0	5	0	0	0	0	0	0	0	0	0	0	5
% Heavy	0%	0%	0%	0%	0%	33.3%	7.7%	22.2%	0%	13.2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	2.6%

*L: Left, R: Right, T: Thru, U: U-Turn

44th Ave & Claremont Rd - TMC
Tue May 21, 2024
PM Peak (4 PM - 5 PM) - Overall Peak Hour
All Classes (Lights and Motorcycles, Heavy)
All Movements
ID: 1187533, Location: 44.065991, -93.146408



44th Ave & 18th St (south offset) - TMC

Tue May 21, 2024

Full Length (6 AM-7 PM)

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1187534, Location: 44.065548, -93.146426

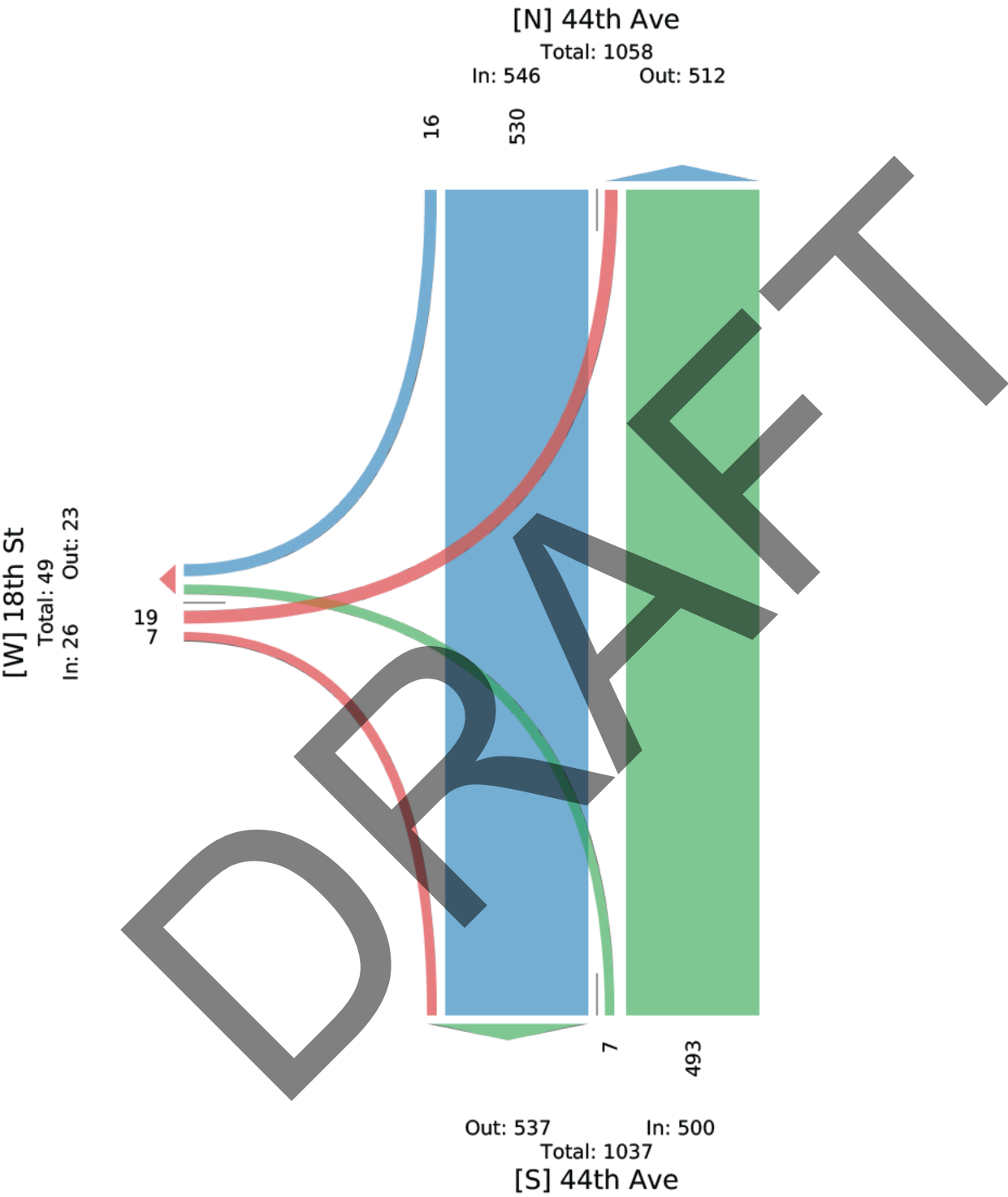


Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	44th Ave Southbound				44th Ave Northbound				18th St Eastbound				
Time	R	T	U	App	T	L	U	App	R	L	U	App	Int
2024-05-21 6:00AM	0	67	0	67	27	1	0	28	0	1	0	1	96
7:00AM	3	79	0	82	36	0	0	36	0	0	0	0	118
8:00AM	1	48	0	49	33	0	0	33	0	1	0	1	83
9:00AM	2	41	0	43	24	1	0	25	2	2	0	4	72
10:00AM	2	29	0	31	28	0	0	28	0	0	0	0	59
11:00AM	1	32	0	33	17	1	0	18	0	0	0	0	51
12:00PM	0	34	0	34	37	0	0	37	0	2	0	2	73
1:00PM	0	38	0	38	33	0	0	33	0	3	0	3	74
2:00PM	1	48	0	49	46	2	0	48	1	0	0	1	98
3:00PM	2	33	0	35	55	1	0	56	0	4	0	4	95
4:00PM	0	43	0	43	76	0	0	76	2	1	0	3	122
5:00PM	2	23	0	25	57	1	0	58	1	5	0	6	89
6:00PM	2	15	0	17	24	0	0	24	1	0	0	1	42
Total	16	530	0	546	493	7	0	500	7	19	0	26	1072
% Approach	2.9%	97.1%	0%	-	98.6%	1.4%	0%	-	26.9%	73.1%	0%	-	-
% Total	1.5%	49.4%	0%	50.9%	46.0%	0.7%	0%	46.6%	0.7%	1.8%	0%	2.4%	-
Lights and Motorcycles	15	475	0	490	432	7	0	439	7	19	0	26	955
% Lights and Motorcycles	93.8%	89.6%	0%	89.7%	87.6%	100%	0%	87.8%	100%	100%	0%	100%	89.1%
Heavy	1	55	0	56	61	0	0	61	0	0	0	0	117
% Heavy	6.3%	10.4%	0%	10.3%	12.4%	0%	0%	12.2%	0%	0%	0%	0%	10.9%

*L: Left, R: Right, T: Thru, U: U-Turn

44th Ave & 18th St (south offset) - TMC
Tue May 21, 2024
Full Length (6 AM-7 PM)
All Classes (Lights and Motorcycles, Heavy)
All Movements
ID: 1187534, Location: 44.065548, -93.146426



44th Ave & 18th St (south offset) - TMC

Tue May 21, 2024

AM Peak (6:45 AM - 7:45 AM) - Overall Peak Hour

All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1187534, Location: 44.065548, -93.146426



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	44th Ave Southbound				44th Ave Northbound				18th St Eastbound				
Time	R	T	U	App	T	L	U	App	R	L	U	App	Int
2024-05-21 6:45AM	0	20	0	20	9	1	0	10	0	0	0	0	30
7:00AM	0	15	0	15	10	0	0	10	0	0	0	0	25
7:15AM	1	26	0	27	6	0	0	6	0	0	0	0	33
7:30AM	1	24	0	25	14	0	0	14	0	0	0	0	39
Total	2	85	0	87	39	1	0	40	0	0	0	0	127
% Approach	2.3%	97.7%	0%	-	97.5%	2.5%	0%	-	0%	0%	0%	-	-
% Total	1.6%	66.9%	0%	68.5%	30.7%	0.8%	0%	31.5%	0%	0%	0%	0%	-
PHF	0.500	0.817	-	0.806	0.696	0.250	-	0.714	-	-	-	-	0.814
Lights and Motorcycles	2	81	0	83	29	1	0	30	0	0	0	0	113
% Lights and Motorcycles	100%	95.3%	0%	95.4%	74.4%	100%	0%	75.0%	0%	0%	0%	-	89.0%
Heavy	0	4	0	4	10	0	0	10	0	0	0	0	14
% Heavy	0%	4.7%	0%	4.6%	25.6%	0%	0%	25.0%	0%	0%	0%	-	11.0%

*L: Left, R: Right, T: Thru, U: U-Turn

44th Ave & 18th St (south offset) - TMC

Tue May 21, 2024

AM Peak (6:45 AM - 7:45 AM) - Overall Peak Hour

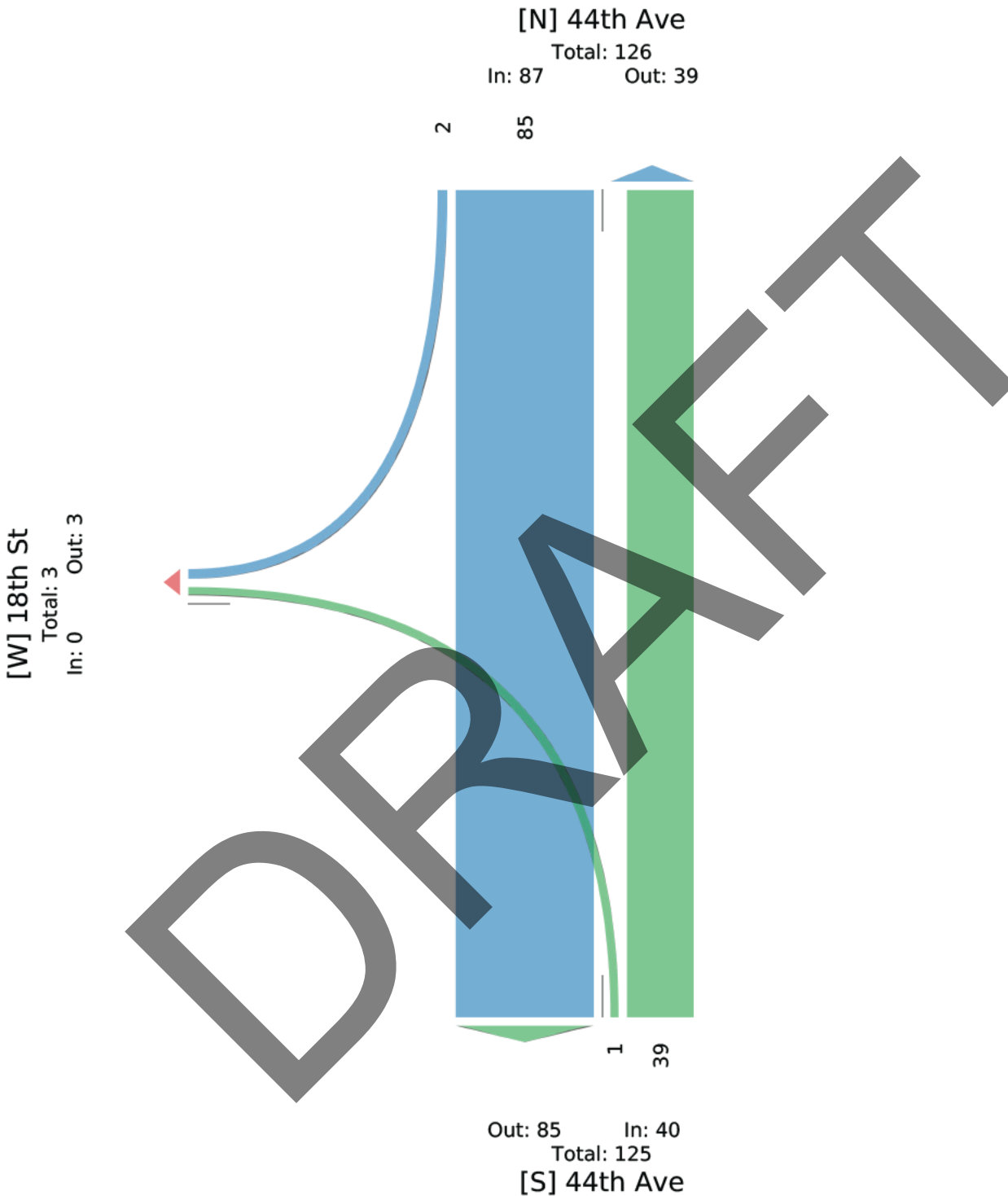
All Classes (Lights and Motorcycles, Heavy)

All Movements

ID: 1187534, Location: 44.065548, -93.146426



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



44th Ave & 18th St (south offset) - TMC
 Tue May 21, 2024
 Midday Peak (1 PM - 2 PM)
 All Classes (Lights and Motorcycles, Heavy)
 All Movements
 ID: 1187534, Location: 44.065548, -93.146426

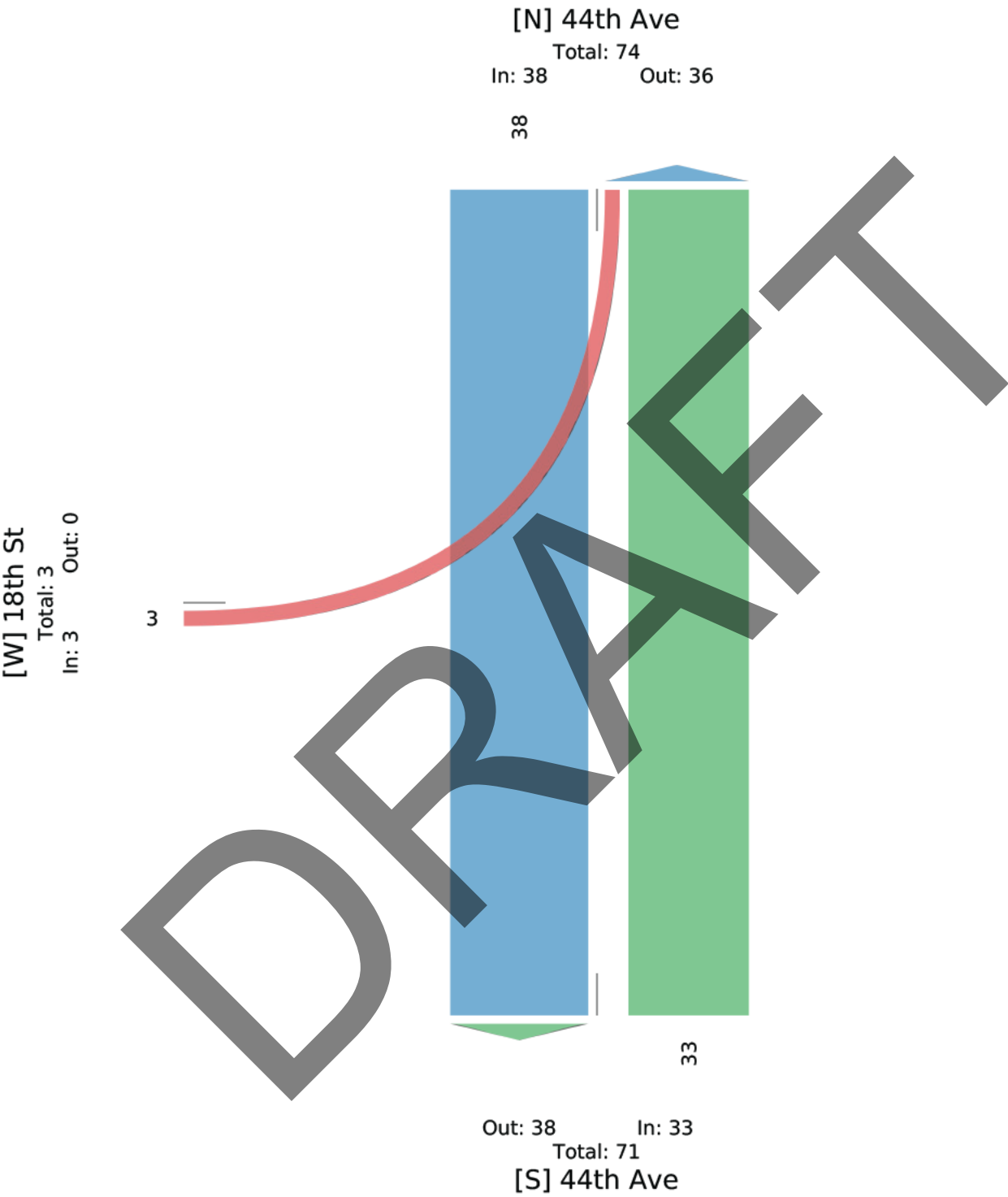
Leg Direction	44th Ave Southbound				44th Ave Northbound				18th St Eastbound				
Time	R	T	U	App	T	L	U	App	R	L	U	App	Int
2024-05-21 1:00PM	0	8	0	8	8	0	0	8	0	1	0	1	17
1:15PM	0	10	0	10	4	0	0	4	0	0	0	0	14
1:30PM	0	11	0	11	8	0	0	8	0	2	0	2	21
1:45PM	0	9	0	9	13	0	0	13	0	0	0	0	22
Total	0	38	0	38	33	0	0	33	0	3	0	3	74
% Approach	0%	100%	0%	-	100%	0%	0%	-	0%	100%	0%	-	-
% Total	0%	51.4%	0%	51.4%	44.6%	0%	0%	44.6%	0%	4.1%	0%	4.1%	-
PHF	-	0.864	-	0.864	0.635	-	-	0.635	-	0.375	-	0.375	0.841
Lights and Motorcycles	0	33	0	33	26	0	0	26	0	3	0	3	62
% Lights and Motorcycles	0%	86.8%	0%	86.8%	78.8%	0%	0%	78.8%	0%	100%	0%	100%	83.8%
Heavy	0	5	0	5	7	0	0	7	0	0	0	0	12
% Heavy	0%	13.2%	0%	13.2%	21.2%	0%	0%	21.2%	0%	0%	0%	0%	16.2%

*L: Left, R: Right, T: Thru, U: U-Turn

44th Ave & 18th St (south offset) - TMC
Tue May 21, 2024
Midday Peak (1 PM - 2 PM)
All Classes (Lights and Motorcycles, Heavy)
All Movements
ID: 1187534, Location: 44.065548, -93.146426



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



44th Ave & 18th St (south offset) - TMC
 Tue May 21, 2024
 PM Peak (4 PM - 5 PM)
 All Classes (Lights and Motorcycles, Heavy)
 All Movements
 ID: 1187534, Location: 44.065548, -93.146426

Leg Direction	44th Ave Southbound				44th Ave Northbound				18th St Eastbound				
Time	R	T	U	App	T	L	U	App	R	L	U	App	Int
2024-05-21 4:00PM	0	11	0	11	20	0	0	20	0	0	0	0	31
4:15PM	0	17	0	17	22	0	0	22	0	0	0	0	39
4:30PM	0	7	0	7	16	0	0	16	0	0	0	0	23
4:45PM	0	8	0	8	18	0	0	18	2	1	0	3	29
Total	0	43	0	43	76	0	0	76	2	1	0	3	122
% Approach	0%	100%	0%	-	100%	0%	0%	-	66.7%	33.3%	0%	-	-
% Total	0%	35.2%	0%	35.2%	62.3%	0%	0%	62.3%	1.6%	0.8%	0%	2.5%	-
PHF	-	0.632	-	0.632	0.864	-	-	0.864	0.250	0.250	-	0.250	0.782
Lights and Motorcycles	0	40	0	40	74	0	0	74	2	1	0	3	117
% Lights and Motorcycles	0%	93.0%	0%	93.0%	97.4%	0%	0%	97.4%	100%	100%	0%	100%	95.9%
Heavy	0	3	0	3	2	0	0	2	0	0	0	0	5
% Heavy	0%	7.0%	0%	7.0%	2.6%	0%	0%	2.6%	0%	0%	0%	0%	4.1%

*L: Left, R: Right, T: Thru, U: U-Turn

44th Ave & 18th St (south offset) - TMC
Tue May 21, 2024
PM Peak (4 PM - 5 PM)
All Classes (Lights and Motorcycles, Heavy)
All Movements
ID: 1187534, Location: 44.065548, -93.146426



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

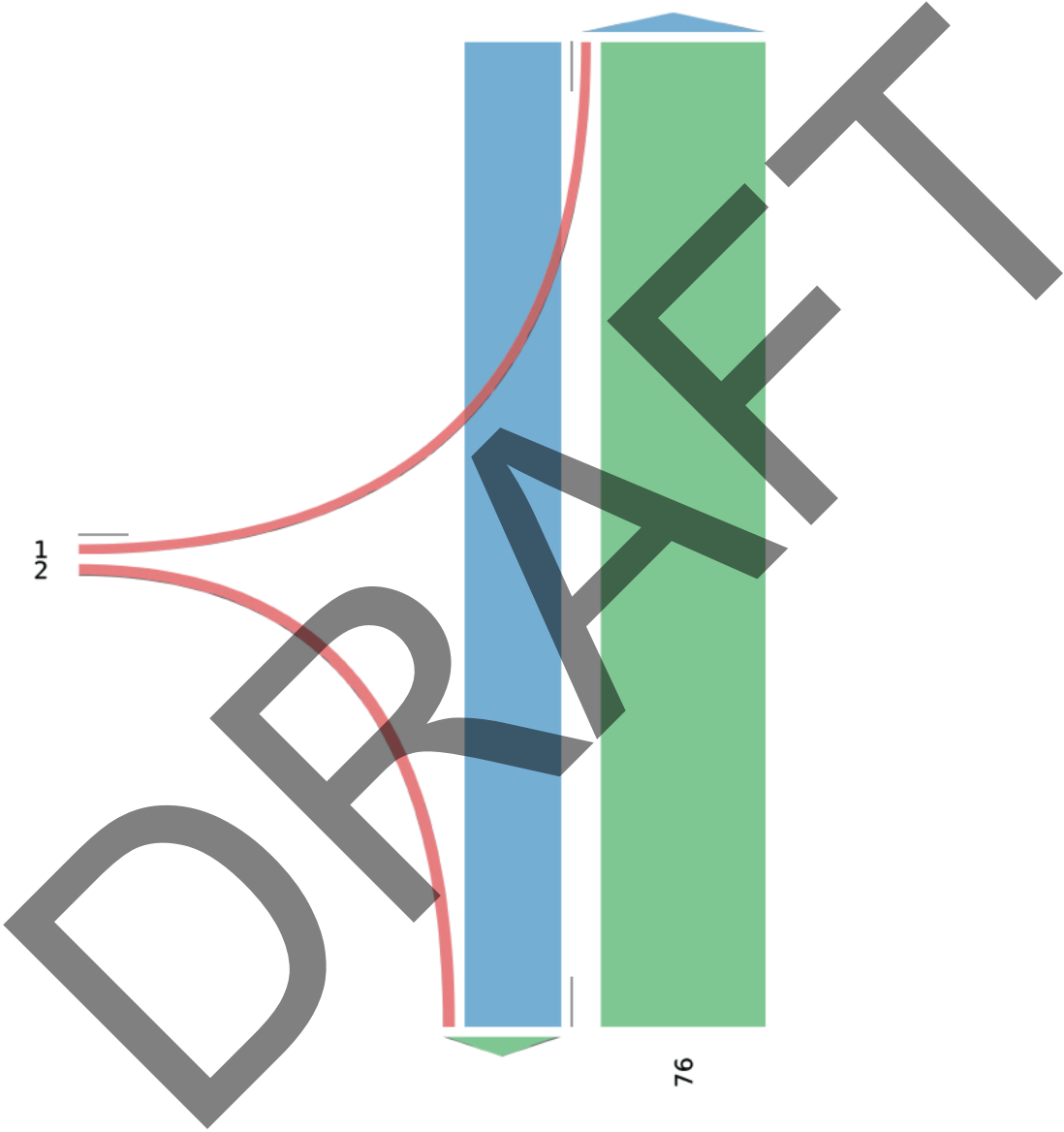
[N] 44th Ave

Total: 120
In: 43 Out: 77

43

[W] 18th St
Total: 3
In: 3 Out: 0

1
2



Out: 45 In: 76
Total: 121
[S] 44th Ave

APPENDIX B

Intersection Capacity Analysis Reports

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MOVEMENT SUMMARY

Site: 1 [AM PEAK - CSAH 2/ CR 180 / CR 171 / CSAH 43 (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site

Site Category: (None)

Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist]				mph
South: RoadName															
3	L2	All MCs	3	3.0	3	3.0	0.245	4.7	LOS A	1.3	33.3	0.16	0.05	0.16	32.9
8	T1	All MCs	296	3.0	296	3.0	0.245	4.7	LOS A	1.3	33.3	0.16	0.05	0.16	33.5
18	R2	All MCs	14	3.0	14	3.0	0.245	4.7	LOS A	1.3	33.3	0.16	0.05	0.16	33.3
18b	R3	All MCs	3	3.0	3	3.0	0.245	4.7	LOS A	1.3	33.3	0.16	0.05	0.16	33.1
Approach			316	3.0	316	3.0	0.245	4.7	LOS A	1.3	33.3	0.16	0.05	0.16	33.5
SouthEast: RoadName															
3bx	L3	All MCs	21	3.0	21	3.0	0.075	4.5	LOS A	0.3	7.7	0.45	0.32	0.45	31.3
3ax	L1	All MCs	40	3.0	40	3.0	0.075	4.5	LOS A	0.3	7.7	0.45	0.32	0.45	31.3
18ax	R1	All MCs	8	3.0	8	3.0	0.075	4.5	LOS A	0.3	7.7	0.45	0.32	0.45	31.9
18bx	R3	All MCs	1	3.0	1	3.0	0.075	4.5	LOS A	0.3	7.7	0.45	0.32	0.45	31.5
Approach			70	3.0	70	3.0	0.075	4.5	LOS A	0.3	7.7	0.45	0.32	0.45	31.4
East: RoadName															
1b	L3	All MCs	1	3.0	1	3.0	0.035	4.4	LOS A	0.1	3.5	0.46	0.32	0.46	31.6
1	L2	All MCs	22	3.0	22	3.0	0.035	4.4	LOS A	0.1	3.5	0.46	0.32	0.46	31.6
6	T1	All MCs	1	3.0	1	3.0	0.035	4.4	LOS A	0.1	3.5	0.46	0.32	0.46	32.1
16	R2	All MCs	8	3.0	8	3.0	0.035	4.4	LOS A	0.1	3.5	0.46	0.32	0.46	31.9
Approach			32	3.0	32	3.0	0.035	4.4	LOS A	0.1	3.5	0.46	0.32	0.46	31.7
North: RoadName															
7	L2	All MCs	4	3.0	4	3.0	0.315	5.7	LOS A	1.8	45.5	0.29	0.12	0.29	32.4
7a	L1	All MCs	8	3.0	8	3.0	0.315	5.7	LOS A	1.8	45.5	0.29	0.12	0.29	32.4
4	T1	All MCs	350	3.0	350	3.0	0.315	5.7	LOS A	1.8	45.5	0.29	0.12	0.29	33.0
14	R2	All MCs	23	3.0	23	3.0	0.315	5.7	LOS A	1.8	45.5	0.29	0.12	0.29	32.7
Approach			385	3.0	385	3.0	0.315	5.7	LOS A	1.8	45.5	0.29	0.12	0.29	33.0
West: RoadName															
5	L2	All MCs	11	3.0	11	3.0	0.041	4.5	LOS A	0.2	4.1	0.47	0.35	0.47	32.4
2	T1	All MCs	12	3.0	12	3.0	0.041	4.5	LOS A	0.2	4.1	0.47	0.35	0.47	33.0
12a	R1	All MCs	1	3.0	1	3.0	0.041	4.5	LOS A	0.2	4.1	0.47	0.35	0.47	33.0
12	R2	All MCs	12	3.0	12	3.0	0.041	4.5	LOS A	0.2	4.1	0.47	0.35	0.47	32.7
Approach			36	3.0	36	3.0	0.041	4.5	LOS A	0.2	4.1	0.47	0.35	0.47	32.7
All Vehicles			838	3.0	838	3.0	0.315	5.1	LOS A	1.8	45.5	0.27	0.13	0.27	33.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Organisation: WHKS & CO. | Licence: PLUS / 1PC | Processed: Monday, September 30, 2024 3:29:07 PM

Project: C:\SP\WHKS & CO\WHKS Projects - Documents\MN\Steele County\10073 Havana\ICE Report\Traffic Models\2044 Alt1 rounabout AM.sip9

DRAFT

MOVEMENT SUMMARY

Site: 1 [PM PEAK - CSAH 2/ CR 180 / CR 171 / CSAH 43 (Site Folder: General)]

Output produced by SIDRA INTERSECTION Version: 9.1.6.228

New Site

Site Category: (None)

Roundabout

Vehicle Movement Performance															
Mov ID	Turn	Mov Class	Demand Flows		Arrival Flows		Deg. Satn	Aver. Delay	Level of Service	95% Back Of Queue		Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed
			[Total HV]	%	[Total HV]	%	v/c	sec		[Veh. veh	Dist]				mph
South: RoadName															
3	L2	All MCs	20	3.0	20	3.0	0.321	5.7	LOS A	1.8	47.2	0.27	0.10	0.27	32.4
8	T1	All MCs	348	3.0	348	3.0	0.321	5.7	LOS A	1.8	47.2	0.27	0.10	0.27	33.0
18	R2	All MCs	17	3.0	17	3.0	0.321	5.7	LOS A	1.8	47.2	0.27	0.10	0.27	32.7
18b	R3	All MCs	14	3.0	14	3.0	0.321	5.7	LOS A	1.8	47.2	0.27	0.10	0.27	32.5
Approach			399	3.0	399	3.0	0.321	5.7	LOS A	1.8	47.2	0.27	0.10	0.27	32.9
SouthEast: RoadName															
3bx	L3	All MCs	12	3.0	12	3.0	0.063	4.9	LOS A	0.2	6.3	0.50	0.39	0.50	31.2
3ax	L1	All MCs	35	3.0	35	3.0	0.063	4.9	LOS A	0.2	6.3	0.50	0.39	0.50	31.2
18ax	R1	All MCs	4	3.0	4	3.0	0.063	4.9	LOS A	0.2	6.3	0.50	0.39	0.50	31.7
18bx	R3	All MCs	1	3.0	1	3.0	0.063	4.9	LOS A	0.2	6.3	0.50	0.39	0.50	31.3
Approach			52	3.0	52	3.0	0.063	4.9	LOS A	0.2	6.3	0.50	0.39	0.50	31.2
East: RoadName															
1b	L3	All MCs	1	3.0	1	3.0	0.030	4.6	LOS A	0.1	2.9	0.49	0.36	0.49	31.4
1	L2	All MCs	17	3.0	17	3.0	0.030	4.6	LOS A	0.1	2.9	0.49	0.36	0.49	31.4
6	T1	All MCs	1	3.0	1	3.0	0.030	4.6	LOS A	0.1	2.9	0.49	0.36	0.49	32.0
16	R2	All MCs	5	3.0	5	3.0	0.030	4.6	LOS A	0.1	2.9	0.49	0.36	0.49	31.8
Approach			25	3.0	25	3.0	0.030	4.6	LOS A	0.1	2.9	0.49	0.36	0.49	31.5
North: RoadName															
7	L2	All MCs	14	3.0	14	3.0	0.283	5.4	LOS A	1.5	39.3	0.28	0.12	0.28	32.5
7a	L1	All MCs	10	3.0	10	3.0	0.283	5.4	LOS A	1.5	39.3	0.28	0.12	0.28	32.5
4	T1	All MCs	312	3.0	312	3.0	0.283	5.4	LOS A	1.5	39.3	0.28	0.12	0.28	33.1
14	R2	All MCs	11	3.0	11	3.0	0.283	5.4	LOS A	1.5	39.3	0.28	0.12	0.28	32.8
Approach			347	3.0	347	3.0	0.283	5.4	LOS A	1.5	39.3	0.28	0.12	0.28	33.0
West: RoadName															
5	L2	All MCs	21	3.0	21	3.0	0.070	4.6	LOS A	0.3	7.1	0.46	0.34	0.46	32.3
2	T1	All MCs	26	3.0	26	3.0	0.070	4.6	LOS A	0.3	7.1	0.46	0.34	0.46	32.9
12a	R1	All MCs	1	3.0	1	3.0	0.070	4.6	LOS A	0.3	7.1	0.46	0.34	0.46	32.9
12	R2	All MCs	15	3.0	15	3.0	0.070	4.6	LOS A	0.3	7.1	0.46	0.34	0.46	32.6
Approach			63	3.0	63	3.0	0.070	4.6	LOS A	0.3	7.1	0.46	0.34	0.46	32.6
All Vehicles			886	3.0	886	3.0	0.321	5.4	LOS A	1.8	47.2	0.30	0.15	0.30	32.8

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if $v/c > 1$ irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stoeline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Sieglach M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

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Project: C:\SP\WHKS & CO\WHKS Projects - Documents\MN\Steele County\10073 Havana\ICE Report\Traffic Models\2044 Alt1 roundabout PM.sip9

DRAFT

SE 18th St / CSAH 43 AM PEAK
3: CSAH 43 & SE 18TH

10/01/2024

Intersection

Int Delay, s/veh 0

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations 

Traffic Vol, veh/h 0 0 1 279 325 2

Future Vol, veh/h 0 0 1 279 325 2

Conflicting Peds, #/hr 0 0 0 0 0 0

Sign Control Stop Stop Free Free Free Free

RT Channelized - None - None - None

Storage Length 0 - - - - -

Veh in Median Storage, # 0 - - 0 0 -

Grade, % 0 - - 0 0 -

Peak Hour Factor 92 92 92 92 92 92

Heavy Vehicles, % 2 2 2 2 2 2

Mvmt Flow 0 0 1 303 353 2

Major/Minor Minor2 Major1 Major2

Conflicting Flow All 659 354 355 0 - 0

Stage 1 354 - - - - -

Stage 2 305 - - - - -

Critical Hdwy 6.42 6.22 4.12 - - -

Critical Hdwy Stg 1 5.42 - - - - -

Critical Hdwy Stg 2 5.42 - - - - -

Follow-up Hdwy 3.518 3.318 2.218 - - -

Pot Cap-1 Maneuver 429 690 1204 - - -

Stage 1 710 - - - - -

Stage 2 748 - - - - -

Platoon blocked, % - - - - -

Mov Cap-1 Maneuver 429 690 1204 - - -

Mov Cap-2 Maneuver 429 - - - - -

Stage 1 709 - - - - -

Stage 2 748 - - - - -

Approach EB NB SB

HCM Control Delay, s 0 0 0

HCM LOS A

Minor Lane/Major Mvmt NBL NBT EBLn1 SBT SBR

Capacity (veh/h) 1204 - - - - -

HCM Lane V/C Ratio 0.001 - - - - -

HCM Control Delay (s) 8 0 0 - - -

HCM Lane LOS A A A - - -

HCM 95th %tile Q(veh) 0 - - - - -

SE 18th St / CSAH 43 PM PEAK
3: CSAH 43 & SE 18TH STREET

10/01/2024

Intersection

Int Delay, s/veh 0.1

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations   0    

Traffic Vol, veh/h 1 2 0 316 283 0

Future Vol, veh/h 1 2 0 316 283 0

Conflicting Peds, #/hr 0 0 0 0 0 0

Sign Control Stop Stop Free Free Free Free

RT Channelized - None - None - None

Storage Length 0 - - - - -

Veh in Median Storage, # 0 - - 0 0 -

Grade, % 0 - - 0 0 -

Peak Hour Factor 92 92 92 92 92 92

Heavy Vehicles, % 2 2 2 2 2 2

Mvmt Flow 1 2 0 343 308 0

Major/Minor Minor2 Major1 Major2

Conflicting Flow All 651 308 308 0 - 0

Stage 1 308 - - - - -

Stage 2 343 - - - - -

Critical Hdwy 6.42 6.22 4.12 - - -

Critical Hdwy Stg 1 5.42 - - - - -

Critical Hdwy Stg 2 5.42 - - - - -

Follow-up Hdwy 3.518 3.318 2.218 - - -

Pot Cap-1 Maneuver 433 732 1253 - - -

Stage 1 745 - - - - -

Stage 2 719 - - - - -

Platoon blocked, % - - - - -

Mov Cap-1 Maneuver 433 732 1253 - - -

Mov Cap-2 Maneuver 433 - - - - -

Stage 1 745 - - - - -

Stage 2 719 - - - - -

Approach EB NB SB

HCM Control Delay, s 11.1 0 0

HCM LOS B

Minor Lane/Major Mvmt NBL NBT EBLn1 SBT SBR

Capacity (veh/h) 1253 - 595 - -

HCM Lane V/C Ratio - - 0.005 - -

HCM Control Delay (s) 0 - 11.1 - -

HCM Lane LOS A - B - -

HCM 95th %tile Q(veh) 0 - 0 - -

APPENDIX C

Intersection Capacity Analysis Reports

DRAFT

AM PEAK CSAH 2/ CR 180 / CR 171 / CSAH 43
3: CSAH 43 & CSAH 2

10/01/2024

Intersection												
Int Delay, s/veh	2.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↙	↕	↗	↙	↕	↗
Traffic Vol, veh/h	10	11	11	39	37	14	3	272	16	11	322	21
Future Vol, veh/h	10	11	11	39	37	14	3	272	16	11	322	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	300	300	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	12	12	42	40	15	3	296	17	12	350	23
Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	712	693	350	700	699	296	373	0	0	313	0	0
Stage 1	374	374	-	302	302	-	-	-	-	-	-	-
Stage 2	338	319	-	398	397	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	347	367	693	354	364	743	1185	-	-	1247	-	-
Stage 1	647	618	-	707	664	-	-	-	-	-	-	-
Stage 2	676	653	-	628	603	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	308	362	693	336	359	743	1185	-	-	1247	-	-
Mov Cap-2 Maneuver	308	362	-	336	359	-	-	-	-	-	-	-
Stage 1	645	612	-	705	662	-	-	-	-	-	-	-
Stage 2	620	651	-	599	597	-	-	-	-	-	-	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	14.7			17.8			0.1			0.2		
HCM LOS	B			C								
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR				
Capacity (veh/h)	1185	-	-	406	378	1247	-	-				
HCM Lane V/C Ratio	0.003	-	-	0.086	0.259	0.01	-	-				
HCM Control Delay (s)	8	-	-	14.7	17.8	7.9	-	-				
HCM Lane LOS	A	-	-	B	C	A	-	-				
HCM 95th %tile Q(veh)	0	-	-	0.3	1	0	-	-				

PM PEAK CSAH 2/ CR 180 / CR 171 / CSAH 43
3: CSAH 43 & CSAH 2

10/01/2024

Intersection												
Int Delay, s/veh	3.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↙	↕	↗	↙	↕	↗
Traffic Vol, veh/h	19	24	14	27	32	9	18	320	29	22	287	10
Future Vol, veh/h	19	24	14	27	32	9	18	320	29	22	287	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	300	-	300	300	-	300
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	21	26	15	29	35	10	20	348	32	24	312	11
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	787	780	312	774	759	348	323	0	0	380	0	0
Stage 1	360	360	-	388	388	-	-	-	-	-	-	-
Stage 2	427	420	-	386	371	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	309	327	728	316	336	695	1237	-	-	1178	-	-
Stage 1	658	626	-	636	609	-	-	-	-	-	-	-
Stage 2	606	589	-	637	620	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	272	315	728	282	324	695	1237	-	-	1178	-	-
Mov Cap-2 Maneuver	272	315	-	282	324	-	-	-	-	-	-	-
Stage 1	647	613	-	626	599	-	-	-	-	-	-	-
Stage 2	554	580	-	585	608	-	-	-	-	-	-	-
Approach	EB		WB		NB		SB					
HCM Control Delay, s	17.7		19.1		0.4		0.6					
HCM LOS	C		C									
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR					
Capacity (veh/h)	1237	-	-	345	328	1178	-	-				
HCM Lane V/C Ratio	0.016	-	-	0.18	0.225	0.02	-	-				
HCM Control Delay (s)	8	-	-	17.7	19.1	8.1	-	-				
HCM Lane LOS	A	-	-	C	C	A	-	-				
HCM 95th %tile Q(veh)	0	-	-	0.6	0.8	0.1	-	-				

SE 18th St / CSAH 43 AM PEAK
3: CSAH 43 & SE 18TH

10/01/2024

Intersection

Int Delay, s/veh 0

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations 

Traffic Vol, veh/h 0 0 1 279 325 2

Future Vol, veh/h 0 0 1 279 325 2

Conflicting Peds, #/hr 0 0 0 0 0 0

Sign Control Stop Stop Free Free Free Free

RT Channelized - None - None - None

Storage Length 0 - - - - -

Veh in Median Storage, # 0 - - 0 0 -

Grade, % 0 - - 0 0 -

Peak Hour Factor 92 92 92 92 92 92

Heavy Vehicles, % 2 2 2 2 2 2

Mvmt Flow 0 0 1 303 353 2

Major/Minor Minor2 Major1 Major2

Conflicting Flow All 659 354 355 0 - 0

Stage 1 354 - - - - -

Stage 2 305 - - - - -

Critical Hdwy 6.42 6.22 4.12 - - -

Critical Hdwy Stg 1 5.42 - - - - -

Critical Hdwy Stg 2 5.42 - - - - -

Follow-up Hdwy 3.518 3.318 2.218 - - -

Pot Cap-1 Maneuver 429 690 1204 - - -

Stage 1 710 - - - - -

Stage 2 748 - - - - -

Platoon blocked, % - - - - -

Mov Cap-1 Maneuver 429 690 1204 - - -

Mov Cap-2 Maneuver 429 - - - - -

Stage 1 709 - - - - -

Stage 2 748 - - - - -

Approach EB NB SB

HCM Control Delay, s 0 0 0

HCM LOS A

Minor Lane/Major Mvmt NBL NBT EBLn1 SBT SBR

Capacity (veh/h) 1204 - - - - -

HCM Lane V/C Ratio 0.001 - - - - -

HCM Control Delay (s) 8 0 0 - - -

HCM Lane LOS A A A - - -

HCM 95th %tile Q(veh) 0 - - - - -

SE 18th St / CSAH 43 PM PEAK
3: CSAH 43 & SE 18TH STREET

10/01/2024

Intersection

Int Delay, s/veh 0.1

Movement EBL EBR NBL NBT SBT SBR

Lane Configurations      

Traffic Vol, veh/h 1 2 0 316 283 0

Future Vol, veh/h 1 2 0 316 283 0

Conflicting Peds, #/hr 0 0 0 0 0 0

Sign Control Stop Stop Free Free Free Free

RT Channelized - None - None - None

Storage Length 0 - - - - -

Veh in Median Storage, # 0 - - 0 0 -

Grade, % 0 - - 0 0 -

Peak Hour Factor 92 92 92 92 92 92

Heavy Vehicles, % 2 2 2 2 2 2

Mvmt Flow 1 2 0 343 308 0

Major/Minor Minor2 Major1 Major2

Conflicting Flow All 651 308 308 0 - 0

Stage 1 308 - - - - -

Stage 2 343 - - - - -

Critical Hdwy 6.42 6.22 4.12 - - -

Critical Hdwy Stg 1 5.42 - - - - -

Critical Hdwy Stg 2 5.42 - - - - -

Follow-up Hdwy 3.518 3.318 2.218 - - -

Pot Cap-1 Maneuver 433 732 1253 - - -

Stage 1 745 - - - - -

Stage 2 719 - - - - -

Platoon blocked, % - - - - -

Mov Cap-1 Maneuver 433 732 1253 - - -

Mov Cap-2 Maneuver 433 - - - - -

Stage 1 745 - - - - -

Stage 2 719 - - - - -

Approach EB NB SB

HCM Control Delay, s 11.1 0 0

HCM LOS B

Minor Lane/Major Mvmt NBL NBT EBLn1 SBT SBR

Capacity (veh/h) 1253 - 595 - -

HCM Lane V/C Ratio - - 0.005 - -

HCM Control Delay (s) 0 - 11.1 - -

HCM Lane LOS A - B - -

HCM 95th %tile Q(veh) 0 - 0 - -

APPENDIX D

Intersection Capacity Analysis Reports

DRAFT

AM PEAK CSAH 2/ CR 180 / CR 171 / CSAH 43
3: CSAH 43 & CSAH 2

10/03/2024

Intersection

Intersection Delay, s/veh 12.1
Intersection LOS B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔	↔	↔	↔	↔
Traffic Vol, veh/h	10	11	11	39	37	14	3	272	16	11	322	21
Future Vol, veh/h	10	11	11	39	37	14	3	272	16	11	322	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	12	12	42	40	15	3	296	17	12	350	23
Number of Lanes	0	1	0	0	1	0	1	1	1	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	1	1
HCM Control Delay	9.5	10.4	11.9	12.9
HCM LOS	A	B	B	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	31%	43%	100%	0%	0%
Vol Thru, %	0%	100%	0%	34%	41%	0%	100%	0%
Vol Right, %	0%	0%	100%	34%	16%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	3	272	16	32	90	11	322	21
LT Vol	3	0	0	10	39	11	0	0
Through Vol	0	272	0	11	37	0	322	0
RT Vol	0	0	16	11	14	0	0	21
Lane Flow Rate	3	296	17	35	98	12	350	23
Geometry Grp	5	5	5	5	5	5	5	5
Degree of Util (X)	0.005	0.436	0.022	0.061	0.174	0.019	0.51	0.029
Departure Headway (Hd)	5.808	5.305	4.6	6.347	6.391	5.745	5.242	4.537
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	611	674	769	567	564	618	683	781
Service Time	3.591	3.087	2.381	4.051	4.092	3.523	3.019	2.313
HCM Lane V/C Ratio	0.005	0.439	0.022	0.062	0.174	0.019	0.512	0.029
HCM Control Delay	8.6	12.2	7.5	9.5	10.4	8.6	13.4	7.5
HCM Lane LOS	A	B	A	A	B	A	B	A
HCM 95th-tile Q	0	2.2	0.1	0.2	0.6	0.1	2.9	0.1

PM PEAK CSAH 2/ CR 180 / CR 171 / CSAH 43
3: CSAH 43 & CSAH 2

10/03/2024

Intersection

Intersection Delay, s/veh 12.2
Intersection LOS B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔		↔	↔	↔	↔	↔	↔
Traffic Vol, veh/h	19	24	14	27	32	9	18	320	29	22	287	10
Future Vol, veh/h	19	24	14	27	32	9	18	320	29	22	287	10
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	21	26	15	29	35	10	20	348	32	24	312	11
Number of Lanes	0	1	0	0	1	0	1	1	1	1	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	3	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	3	3	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	3	1	1
HCM Control Delay	10	10.3	12.9	12.3
HCM LOS	A	B	B	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	WBLn1	SBLn1	SBLn2	SBLn3
Vol Left, %	100%	0%	0%	33%	40%	100%	0%	0%
Vol Thru, %	0%	100%	0%	42%	47%	0%	100%	0%
Vol Right, %	0%	0%	100%	25%	13%	0%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	18	320	29	57	68	22	287	10
LT Vol	18	0	0	19	27	22	0	0
Through Vol	0	320	0	24	32	0	287	0
RT Vol	0	0	29	14	9	0	0	10
Lane Flow Rate	20	348	32	62	74	24	312	11
Geometry Grp	5	5	5	5	5	5	5	5
Degree of Util (X)	0.031	0.511	0.04	0.111	0.134	0.039	0.462	0.014
Departure Headway (Hd)	5.794	5.29	4.585	6.47	6.55	5.841	5.337	4.632
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	612	675	771	557	551	607	668	762
Service Time	3.583	3.079	2.373	4.173	4.252	3.632	3.128	2.422
HCM Lane V/C Ratio	0.033	0.516	0.042	0.111	0.134	0.04	0.467	0.014
HCM Control Delay	8.8	13.6	7.6	10	10.3	8.9	12.7	7.5
HCM Lane LOS	A	B	A	A	B	A	B	A
HCM 95th-tile Q	0.1	2.9	0.1	0.4	0.5	0.1	2.4	0

APPENDIX E

Intersection Capacity Analysis Reports

DRAFT

AM PEAK CSAH 2/ CR 180 / CR 171 / CSAH 43
3: CSAH 43 & CSAH 2

10/03/2024

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations		↕			↕		↕	↑	↕	↕	↑	↕
Traffic Volume (veh/h)	10	11	11	39	37	14	3	272	16	11	322	21
Future Volume (veh/h)	10	11	11	39	37	14	3	272	16	11	322	21
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	11	12	12	42	40	15	3	296	17	12	350	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	257	274	223	350	313	100	424	748	634	466	748	634
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	380	686	556	588	782	251	1009	1870	1585	1067	1870	1585
Grp Volume(v), veh/h	35	0	0	97	0	0	3	296	17	12	350	23
Grp Sat Flow(s),veh/h/ln	1623	0	0	1621	0	0	1009	1870	1585	1067	1870	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.1	5.1	0.3	0.4	6.2	0.4
Cycle Q Clear(g_c), s	0.5	0.0	0.0	1.5	0.0	0.0	6.3	5.1	0.3	5.4	6.2	0.4
Prop In Lane	0.31		0.34	0.43		0.15	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	754	0	0	763	0	0	424	748	634	466	748	634
V/C Ratio(X)	0.05	0.00	0.00	0.13	0.00	0.00	0.01	0.40	0.03	0.03	0.47	0.04
Avail Cap(c_a), veh/h	754	0	0	763	0	0	424	748	634	466	748	634
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	8.3	0.0	0.0	8.6	0.0	0.0	12.3	9.6	8.2	11.6	10.0	8.2
Incr Delay (d2), s/veh	0.1	0.0	0.0	0.3	0.0	0.0	0.0	1.6	0.1	0.1	2.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.0	0.5	0.0	0.0	0.0	1.9	0.1	0.1	2.4	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.4	0.0	0.0	8.9	0.0	0.0	12.3	11.2	8.3	11.7	12.1	8.3
LnGrp LOS	A	A	A	A	A	A	B	B	A	B	B	A
Approach Vol, veh/h		35			97			316			385	
Approach Delay, s/veh		8.4			8.9			11.0			11.8	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		8.3		2.5		8.2		3.5				
Green Ext Time (p_c), s		1.2		0.1		1.5		0.3				
Intersection Summary												
HCM 6th Ctrl Delay				11.0								
HCM 6th LOS				B								

PM PEAK CSAH 2/ CR 180 / CR 171 / CSAH 43
3: CSAH 43 & CSAH 2

10/03/2024

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement												
Lane Configurations		↕			↕		↗	↖	↗	↖	↖	↗
Traffic Volume (veh/h)	19	24	14	27	32	9	18	320	29	22	287	10
Future Volume (veh/h)	19	24	14	27	32	9	18	320	29	22	287	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	21	26	15	29	35	10	20	348	32	24	312	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	278	326	159	319	359	89	456	748	634	424	748	634
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Sat Flow, veh/h	427	816	397	520	897	221	1057	1870	1585	1003	1870	1585
Grp Volume(v), veh/h	62	0	0	74	0	0	20	348	32	24	312	11
Grp Sat Flow(s),veh/h/ln	1639	0	0	1638	0	0	1057	1870	1585	1003	1870	1585
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.6	6.2	0.6	0.8	5.4	0.2
Cycle Q Clear(g_c), s	1.0	0.0	0.0	1.1	0.0	0.0	6.0	6.2	0.6	7.0	5.4	0.2
Prop In Lane	0.34		0.24	0.39		0.14	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	763	0	0	767	0	0	456	748	634	424	748	634
V/C Ratio(X)	0.08	0.00	0.00	0.10	0.00	0.00	0.04	0.47	0.05	0.06	0.42	0.02
Avail Cap(c_a), veh/h	763	0	0	767	0	0	456	748	634	424	748	634
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	8.4	0.0	0.0	8.4	0.0	0.0	11.9	10.0	8.3	12.5	9.7	8.2
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.3	0.0	0.0	0.2	2.1	0.2	0.3	1.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	0.0	0.4	0.0	0.0	0.1	2.4	0.2	0.2	2.1	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.6	0.0	0.0	8.7	0.0	0.0	12.1	12.0	8.4	12.8	11.4	8.2
LnGrp LOS	A	A	A	A	A	A	B	B	A	B	B	A
Approach Vol, veh/h		62			74			400			347	
Approach Delay, s/veh		8.6			8.7			11.7			11.4	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.5		22.5		22.5		22.5				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		18.0		18.0		18.0		18.0				
Max Q Clear Time (g_c+I1), s		8.2		3.0		9.0		3.1				
Green Ext Time (p_c), s		1.6		0.2		1.3		0.2				
Intersection Summary												
HCM 6th Ctrl Delay				11.1								
HCM 6th LOS				B								

APPENDIX F

Crash Data

DRAFT



Crash Summary

Crash Severity/Crash Year												
Crash Severity	Total	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
K - Fatal	0	0	0	0	0	0	0	0	0	0	0	0
A - Serious Injury	0	0	0	0	0	0	0	0	0	0	0	0
B - Minor Injury	1	0	0	0	0	0	0	0	1	0	0	0
C - Possible Injury	1	0	0	0	0	0	0	0	1	0	0	0
N - Prop Dmg Only	2	0	0	1	0	0	0	0	0	0	1	0
Total	4	0	0	1	0	0	0	0	2	0	1	0

Crash Severity/Number of Vehicles					
Crash Severity	Total	0	1	2	3+
K - Fatal	0	0	0	0	0
A - Serious Injury	0	0	0	0	0
B - Minor Injury	1	0	0	1	0
C - Possible Injury	1	0	0	1	0
N - Prop Dmg Only	2	0	1	1	0
Total	4	0	1	3	0

Basic Type Summary			Total	%
Pedestrian			0	0.0
Bike			0	0.0
Single Vehicle Run Off Road			1	25.0
Single Vehicle Other			0	0.0
Sideswipe Same Direction			0	0.0
Sideswipe Opposing			0	0.0
Rear End			0	0.0
Head On			0	0.0
Left Turn			0	0.0
Angle			3	75.0
Other			0	0.0
Total			4	100.0

First Harmful Event Summary			Total	%
Pedestrian			0	0.0
Bicyclist			0	0.0
Motor Vehicle In Transport			3	75.0
Parked Motor Vehicle			0	0.0
Train			0	0.0
Deer/Animal			0	0.0
Other - Non Fixed Object			0	0.0
Collision Fixed Object			1	25.0
Non-Collision Harmful Events			0	0.0
Other/Unknown			0	0.0
Total			4	100.0

Relationship to Intersection Summary			Total	%
Not at Intersection/Interchange			0	0.0
Four-Way Intersection			3	75.0
T or Y Intersection			1	25.0
Five-Way Intersection or More			0	0.0
Roundabout			0	0.0
Intersection Related			0	0.0
Driveway Access Related			0	0.0
At School Crossing			0	0.0
Railway Grade Crossing			0	0.0
Shared Use Path or Trail			0	0.0
Interchange on Ramp			0	0.0
Interchange off Ramp			0	0.0
Interchange Other Areas			0	0.0
Crossover Related			0	0.0
Acceleration/Deceleration Lane			0	0.0
Other/Unknown			0	0.0
Total			4	100.0

Weather 1 Summary			Total	%
Clear			3	75.0
Cloudy			1	25.0
Rain			0	0.0
Snow			0	0.0
Sleet, Hail (Freezing Rain/Drizzle)			0	0.0
Fog/Smog/Smoke			0	0.0
Blowing Sand/Soil/Dirt/Snow			0	0.0
Severe Crosswinds			0	0.0
Other/Unknown			0	0.0
Total			4	100.0

Light Condition Summary			Total	%
Daylight			4	100.0
Sunrise			0	0.0
Sunset			0	0.0
Dark (Str Lights On)			0	0.0
Dark (Str Lights Off)			0	0.0
Dark (No Str Lights)			0	0.0
Dark (Unknown Light)			0	0.0
Other/Unknown			0	0.0
Total			4	100.0



Crash Summary

Time of Day/Day of Week

From To	00:00 01:59	02:00 03:59	04:00 05:59	06:00 07:59	08:00 09:59	10:00 11:59	12:00 13:59	14:00 15:59	16:00 17:59	18:00 19:59	20:00 21:59	22:00 23:59	Total	%
SUN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
MON	0	0	0	0	0	1	0	0	0	0	0	0	1	25.0
TUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
WED	0	0	0	0	0	0	1	0	1	0	0	0	2	50.0
THU	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
FRI	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
SAT	0	0	0	0	0	0	0	1	0	0	0	0	1	25.0
Total	0	0	0	0	0	1	1	1	1	0	0	0	4	100.0
%	0.0	0.0	0.0	0.0	0.0	25.0	25.0	25.0	25.0	0.0	0.0	0.0	100.0	100.0

Driver & Non-Motorist Age/Gender Summary

Age	M	F	NR	No Value	Total	%
<14	0	0	0	0	0	0.0
14	0	0	0	0	0	0.0
15	0	0	0	0	0	0.0
16	0	1	0	0	1	14.3
17	0	0	0	0	0	0.0
18	0	0	0	0	0	0.0
19	0	0	0	0	0	0.0
20	0	0	0	0	0	0.0
21-24	0	0	0	0	0	0.0
25-29	1	0	0	0	1	14.3
30-34	2	0	0	0	2	28.6
35-39	0	0	0	0	0	0.0
40-44	0	0	0	0	0	0.0
45-49	1	1	0	0	2	28.6
50-54	0	0	0	0	0	0.0
55-59	0	0	0	0	0	0.0
60-64	1	0	0	0	1	14.3
65-69	0	0	0	0	0	0.0
70-74	0	0	0	0	0	0.0
75-79	0	0	0	0	0	0.0
80-84	0	0	0	0	0	0.0
85-89	0	0	0	0	0	0.0
90-94	0	0	0	0	0	0.0
95+	0	0	0	0	0	0.0
Unknown or Blank	0	0	0	0	0	0.0
Total	5	2	0	0	7	100.0
%	71.4	28.6	0.0	0.0	100.0	100.0

Month Summary

	Total	%
January	1	25.0
February	0	0.0
March	0	0.0
April	0	0.0
May	1	25.0
June	0	0.0
July	0	0.0
August	1	25.0
September	0	0.0
October	1	25.0
November	0	0.0
December	0	0.0
Total	4	100.0

Physical Condition Summary

	Total	%
Apparently Normal (Including No Drugs/Alcohol)	6	37.5
Physical Disability (Short Term or Long Term)	0	0.0
Medical Issue (Ill, Sick or Fainted)	0	0.0
Emotional (Depression, Angry, Disturbed, etc.)	0	0.0
Asleep or Fatigued	0	0.0
Has Been Drinking Alcohol	1	6.2
Has Been Taking Illicit Drugs	0	0.0
Has Been Taking Medications	0	0.0
Other/Unknown	9	56.2
Not Applicable	0	0.0
Total	16	100.0

Selection Filter:

WORK AREA: State - SPATIAL FILTER APPLIED

Analyst:

Eric Tott

Notes:



Crash Summary

Crash Severity/Crash Year												
Crash Severity	Total	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
K - Fatal	0	0	0	0	0	0	0	0	0	0	0	0
A - Serious Injury	0	0	0	0	0	0	0	0	0	0	0	0
B - Minor Injury	3	0	0	1	0	1	0	0	0	0	1	0
C - Possible Injury	3	0	0	1	1	0	0	0	0	0	1	0
N - Prop Dmg Only	3	1	0	1	0	0	0	0	0	0	0	1
Total	9	1	0	3	1	1	0	0	0	0	2	1

Crash Severity/Number of Vehicles					
Crash Severity	Total	0	1	2	3+
K - Fatal	0	0	0	0	0
A - Serious Injury	0	0	0	0	0
B - Minor Injury	3	0	0	2	1
C - Possible Injury	3	0	1	2	0
N - Prop Dmg Only	3	0	0	3	0
Total	9	0	1	7	1

Basic Type Summary		Total	%
Pedestrian		0	0.0
Bike		0	0.0
Single Vehicle Run Off Road		1	11.1
Single Vehicle Other		0	0.0
Sideswipe Same Direction		0	0.0
Sideswipe Opposing		0	0.0
Rear End		1	11.1
Head On		0	0.0
Left Turn		0	0.0
Angle		4	44.4
Other		3	33.3
Total		9	100.0

First Harmful Event Summary		Total	%
Pedestrian		0	0.0
Bicyclist		0	0.0
Motor Vehicle In Transport		8	88.9
Parked Motor Vehicle		0	0.0
Train		0	0.0
Deer/Animal		0	0.0
Other - Non Fixed Object		0	0.0
Collision Fixed Object		1	11.1
Non-Collision Harmful Events		0	0.0
Other/Unknown		0	0.0
Total		9	100.0

Relationship to Intersection Summary		Total	%
Not at Intersection/Interchange		0	0.0
Four-Way Intersection		5	55.6
T or Y Intersection		1	11.1
Five-Way Intersection or More		0	0.0
Roundabout		0	0.0
Intersection Related		3	33.3
Driveway Access Related		0	0.0
At School Crossing		0	0.0
Railway Grade Crossing		0	0.0
Shared Use Path or Trail		0	0.0
Interchange on Ramp		0	0.0
Interchange off Ramp		0	0.0
Interchange Other Areas		0	0.0
Crossover Related		0	0.0
Acceleration/Deceleration Lane		0	0.0
Other/Unknown		0	0.0
Total		9	100.0

Weather 1 Summary		Total	%
Clear		5	55.6
Cloudy		3	33.3
Rain		0	0.0
Snow		0	0.0
Sleet, Hail (Freezing Rain/Drizzle)		0	0.0
Fog/Smog/Smoke		1	11.1
Blowing Sand/Soil/Dirt/Snow		0	0.0
Severe Crosswinds		0	0.0
Other/Unknown		0	0.0
Total		9	100.0

Light Condition Summary		Total	%
Daylight		6	66.7
Sunrise		0	0.0
Sunset		1	11.1
Dark (Str Lights On)		1	11.1
Dark (Str Lights Off)		0	0.0
Dark (No Str Lights)		1	11.1
Dark (Unknown Light)		0	0.0
Other/Unknown		0	0.0
Total		9	100.0



Crash Summary

Time of Day/Day of Week

From To	00:00 01:59	02:00 03:59	04:00 05:59	06:00 07:59	08:00 09:59	10:00 11:59	12:00 13:59	14:00 15:59	16:00 17:59	18:00 19:59	20:00 21:59	22:00 23:59	Total	%
SUN	0	0	0	0	0	0	0	0	1	0	0	0	1	11.1
MON	0	0	0	0	0	0	1	0	0	0	0	0	1	11.1
TUE	0	0	0	0	0	0	0	0	1	0	0	0	1	11.1
WED	0	0	0	0	0	0	0	0	2	0	0	0	2	22.2
THU	0	0	0	0	0	0	1	0	0	0	0	0	1	11.1
FRI	0	0	0	0	0	0	1	0	1	0	0	0	2	22.2
SAT	1	0	0	0	0	0	0	0	0	0	0	0	1	11.1
Total	1	0	0	0	0	0	3	0	5	0	0	0	9	100.0
%	11.1	0.0	0.0	0.0	0.0	0.0	33.3	0.0	55.6	0.0	0.0	0.0	100.0	100.0

Driver & Non-Motorist Age/Gender Summary

Age	M	F	NR	No Value	Total	%
<14	0	0	0	0	0	0.0
14	0	0	0	0	0	0.0
15	0	0	0	0	0	0.0
16	0	0	0	0	0	0.0
17	1	0	0	0	1	5.6
18	2	0	0	0	2	11.1
19	0	0	0	0	0	0.0
20	0	0	0	0	0	0.0
21-24	0	0	0	0	0	0.0
25-29	2	0	0	0	2	11.1
30-34	1	2	0	0	3	16.7
35-39	1	2	0	0	3	16.7
40-44	2	0	0	0	2	11.1
45-49	1	0	0	0	1	5.6
50-54	0	0	0	0	0	0.0
55-59	0	1	0	0	1	5.6
60-64	2	0	0	0	2	11.1
65-69	0	0	0	0	0	0.0
70-74	0	0	0	0	0	0.0
75-79	0	0	0	0	0	0.0
80-84	0	0	0	0	0	0.0
85-89	0	0	0	0	0	0.0
90-94	0	0	0	0	0	0.0
95+	0	0	0	0	0	0.0
Unknown or Blank	0	0	0	1	1	5.6
Total	12	5	0	1	18	100.0
%	66.7	27.8	0.0	5.6	100.0	100.0

Month Summary

	Total	%
January	0	0.0
February	1	11.1
March	1	11.1
April	1	11.1
May	0	0.0
June	2	22.2
July	0	0.0
August	0	0.0
September	1	11.1
October	1	11.1
November	2	22.2
December	0	0.0
Total	9	100.0

Physical Condition Summary

	Total	%
Apparently Normal (Including No Drugs/Alcohol)	15	41.7
Physical Disability (Short Term or Long Term)	0	0.0
Medical Issue (Ill, Sick or Fainted)	0	0.0
Emotional (Depression, Angry, Disturbed, etc.)	0	0.0
Asleep or Fatigued	0	0.0
Has Been Drinking Alcohol	1	2.8
Has Been Taking Illicit Drugs	0	0.0
Has Been Taking Medications	0	0.0
Other/Unknown	19	52.8
Not Applicable	1	2.8
Total	36	100.0

Selection Filter:

WORK AREA: State - SPATIAL FILTER APPLIED

Analyst:

Eric Tott

Notes:



Crash Summary

Crash Severity/Crash Year												
Crash Severity	Total	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
K - Fatal	0	0	0	0	0	0	0	0	0	0	0	0
A - Serious Injury	0	0	0	0	0	0	0	0	0	0	0	0
B - Minor Injury	0	0	0	0	0	0	0	0	0	0	0	0
C - Possible Injury	0	0	0	0	0	0	0	0	0	0	0	0
N - Prop Dmg Only	2	0	0	0	0	0	1	1	0	0	0	0
Total	2	0	0	0	0	0	1	1	0	0	0	0

Crash Severity/Number of Vehicles					
Crash Severity	Total	0	1	2	3+
K - Fatal	0	0	0	0	0
A - Serious Injury	0	0	0	0	0
B - Minor Injury	0	0	0	0	0
C - Possible Injury	0	0	0	0	0
N - Prop Dmg Only	2	0	1	1	0
Total	2	0	1	1	0

Basic Type Summary			Total	%
Pedestrian			0	0.0
Bike			0	0.0
Single Vehicle Run Off Road			0	0.0
Single Vehicle Other			1	50.0
Sideswipe Same Direction			0	0.0
Sideswipe Opposing			0	0.0
Rear End			0	0.0
Head On			0	0.0
Left Turn			0	0.0
Angle			0	0.0
Other			1	50.0
Total			2	100.0

First Harmful Event Summary			Total	%
Pedestrian			0	0.0
Bicyclist			0	0.0
Motor Vehicle In Transport			1	50.0
Parked Motor Vehicle			0	0.0
Train			1	50.0
Deer/Animal			0	0.0
Other - Non Fixed Object			0	0.0
Collision Fixed Object			0	0.0
Non-Collision Harmful Events			0	0.0
Other/Unknown			0	0.0
Total			2	100.0

Relationship to Intersection Summary			Total	%
Not at Intersection/Interchange			1	50.0
Four-Way Intersection			0	0.0
T or Y Intersection			0	0.0
Five-Way Intersection or More			0	0.0
Roundabout			0	0.0
Intersection Related			0	0.0
Driveway Access Related			0	0.0
At School Crossing			0	0.0
Railway Grade Crossing			1	50.0
Shared Use Path or Trail			0	0.0
Interchange on Ramp			0	0.0
Interchange off Ramp			0	0.0
Interchange Other Areas			0	0.0
Crossover Related			0	0.0
Acceleration/Deceleration Lane			0	0.0
Other/Unknown			0	0.0
Total			2	100.0

Weather 1 Summary			Total	%
Clear			1	50.0
Cloudy			1	50.0
Rain			0	0.0
Snow			0	0.0
Sleet, Hail (Freezing Rain/Drizzle)			0	0.0
Fog/Smog/Smoke			0	0.0
Blowing Sand/Soil/Dirt/Snow			0	0.0
Severe Crosswinds			0	0.0
Other/Unknown			0	0.0
Total			2	100.0

Light Condition Summary			Total	%
Daylight			2	100.0
Sunrise			0	0.0
Sunset			0	0.0
Dark (Str Lights On)			0	0.0
Dark (Str Lights Off)			0	0.0
Dark (No Str Lights)			0	0.0
Dark (Unknown Light)			0	0.0
Other/Unknown			0	0.0
Total			2	100.0



Crash Summary

Time of Day/Day of Week														
From To	00:00 01:59	02:00 03:59	04:00 05:59	06:00 07:59	08:00 09:59	10:00 11:59	12:00 13:59	14:00 15:59	16:00 17:59	18:00 19:59	20:00 21:59	22:00 23:59	Total	%
SUN	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
MON	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
TUE	0	0	0	0	1	0	0	0	0	0	0	0	1	50.0
WED	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
THU	0	0	0	0	0	0	0	0	1	0	0	0	1	50.0
FRI	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
SAT	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Total	0	0	0	0	1	0	0	0	1	0	0	0	2	100.0
%	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	100.0	100.0

Driver & Non-Motorist Age/Gender Summary							
Age	M	F	NR	No Value	Total	%	
<14	0	0	0	0	0	0.0	
14	0	0	0	0	0	0.0	
15	0	0	0	0	0	0.0	
16	0	0	0	0	0	0.0	
17	0	0	0	0	0	0.0	
18	0	0	0	0	0	0.0	
19	0	0	0	0	0	0.0	
20	0	0	0	0	0	0.0	
21-24	0	0	0	0	0	0.0	
25-29	0	1	0	0	1	33.3	
30-34	0	0	0	0	0	0.0	
35-39	1	0	0	0	1	33.3	
40-44	1	0	0	0	1	33.3	
45-49	0	0	0	0	0	0.0	
50-54	0	0	0	0	0	0.0	
55-59	0	0	0	0	0	0.0	
60-64	0	0	0	0	0	0.0	
65-69	0	0	0	0	0	0.0	
70-74	0	0	0	0	0	0.0	
75-79	0	0	0	0	0	0.0	
80-84	0	0	0	0	0	0.0	
85-89	0	0	0	0	0	0.0	
90-94	0	0	0	0	0	0.0	
95+	0	0	0	0	0	0.0	
Unknown or Blank	0	0	0	0	0	0.0	
Total	2	1	0	0	3	100.0	
%	66.7	33.3	0.0	0.0	100.0	100.0	

Month Summary		Total	%
January		1	50.0
February		0	0.0
March		0	0.0
April		0	0.0
May		0	0.0
June		0	0.0
July		0	0.0
August		0	0.0
September		0	0.0
October		1	50.0
November		0	0.0
December		0	0.0
Total		2	100.0

Physical Condition Summary		Total	%
Apparently Normal (Including No Drugs/Alcohol)		3	37.5
Physical Disability (Short Term or Long Term)		0	0.0
Medical Issue (Ill, Sick or Fainted)		0	0.0
Emotional (Depression, Angry, Disturbed, etc.)		0	0.0
Asleep or Fatigued		0	0.0
Has Been Drinking Alcohol		0	0.0
Has Been Taking Illicit Drugs		0	0.0
Has Been Taking Medications		0	0.0
Other/Unknown		5	62.5
Not Applicable		0	0.0
Total		8	100.0

Selection Filter:

WORK AREA: State - SPATIAL FILTER APPLIED

Analyst:

Eric Tott

Notes:

Individual Crash reports have been redacted from this feasibility study report as they contain information the county is not authorized to share with non-traffic safety professionals. The following crash report numbers were reviewed for the study.

01183419

00781786

00751935

01143092

00384354

00503322

00584210

00325062

00969038

01096842

00375801

00874958

00340832

01115744

11012301

To see specific crash reports, contact the Minnesota Department of Public Safety at:
<https://dps.mn.gov/contact-us/public-record-requests>

Traffic Engineering

[Traffic Engineering Home](#) [Publications](#) [Training](#) [Organizations](#) [Contacts](#)

Basic intersection crash performance

Input Analysis Period (in years)	10
Input # of Fatal Crashes at Intersection (Not # of Persons Killed)	0
Input # of 'A' Severity Crashes at Intersection	0
Input # of 'B' Severity Crashes at Intersection	4
Input # of 'C' Severity Crashes at Intersection	4
Input # of Property Damage Crashes at Intersection	7
Input Average # of Vehicles Entering Intersection Daily *	2270

**Average number of vehicles entering intersection can be calculated by adding ADTs for all of the intersection legs, and then dividing that by 2. This assumes that directional split of the roadway for the average day is 50/50.*

Intersection Crash Rate = per million entering vehicles

Intersection Severity Rate =

Intersection Crash Density = crashes per year

APPENDIX G

Warrants

DRAFT





HCS Warrants Report

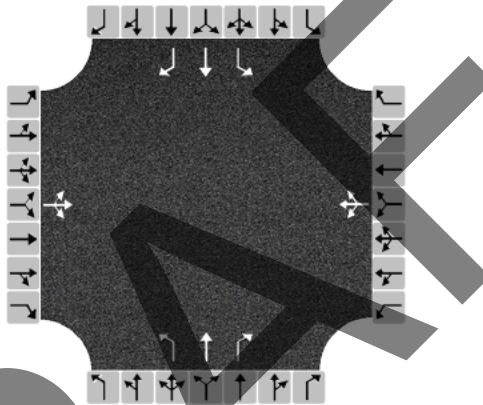
Project Information

Analyst	WHKS	Date	10/1/2024
Agency	WHKS	Analysis Year	2024
Jurisdiction		Time Period Analyzed	2044 AM
Project Description			

General

Major Street Direction	North-South	Population < 10,000	No
Starting Time Interval	7	Coordinated Signal System	No
Median Type	Undivided	Crashes (crashes/year)	0
Major Street Speed (mi/h)	0	Adequate Trials of Crash Exp. Alt.	No
Nearest Signal (ft)	0		

Geometry and Traffic



Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Number of Lanes, N	0	1	0	0	1	0	1	1	1	1	1	1
Lane Usage	LTR			LTR			L	T	R	L	T	R
Vehicle Volumes Averages (veh/h)	0	0	0	3	3	1	0	22	1	0	26	1
Pedestrian Averages (peds/h)	0			0			0			0		
Gap Averages (gaps/h)	0			0			0			0		
Delay (s/veh)	0.0			0.0			0.0			0.0		
Delay (veh-hrs)	0.0			0.0			0.0			0.0		

School Crossing and Roadway Network

Number of Students in Highest Hour	0	Two or More Major Routes	No
Number of Adequate Gaps in Period	0	Weekend Counts	No
Number of Minutes in Period	0	5-year Growth Factor (%)	0

Railroad Crossing

Grade Crossing Approach	None	Rail Traffic (trains/day)	4
Highest Volume Hour with Trains	Unknown	High Occupancy Buses (%)	0
Distance to Stop Line (ft)	-	Tractor-Trailer Trucks (%)	10

Volume Summary														
Hour	Major Volume	Minor Volume	Total Volume	Peds/h	Gaps/h	1A (100%)	1A (80%)	1B (100%)	1B (80%)	2 (100%)	3A (100%)	3B (80%)	4A (100%)	4B (80%)
07 - 08	0	0	0	0	0	No	No	No	No	No	No	No	No	No
08 - 09	0	0	0	0	0	No	No	No	No	No	No	No	No	No
09 - 10	645	90	767	0	0	No	No	No	No	No	No	No	No	No
10 - 11	0	0	0	0	0	No	No	No	No	No	No	No	No	No
11 - 12	0	0	0	0	0	No	No	No	No	No	No	No	No	No
12 - 13	0	0	0	0	0	No	No	No	No	No	No	No	No	No
13 - 14	0	0	0	0	0	No	No	No	No	No	No	No	No	No
14 - 15	0	0	0	0	0	No	No	No	No	No	No	No	No	No
15 - 16	0	0	0	0	0	No	No	No	No	No	No	No	No	No
16 - 17	0	0	0	0	0	No	No	No	No	No	No	No	No	No
17 - 18	0	0	0	0	0	No	No	No	No	No	No	No	No	No
18 - 19	0	0	0	0	0	No	No	No	No	No	No	No	No	No
Total	645	90	767	0	0	0	0	0	0	0	0	0	0	0

Warrants	
Warrant 1: Eight-Hour Vehicular Volume	
A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--	
B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--	
80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)	
Warrant 2: Four-Hour Vehicular Volume	
Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach)	
Warrant 3: Peak Hour	
A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or--	
B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)	
Warrant 4: Pedestrian Volume	
A. Four Hour Volumes --or--	
B. One-Hour Volumes	
Warrant 5: School Crossing	
Gaps Same Period --and--	
Student Volumes	
Nearest Traffic Control Signal (optional)	
Warrant 6: Coordinated Signal System	
Degree of Platooning (Predominant direction or both directions)	
Warrant 7: Crash Experience	
A. Adequate trials of alternatives, observance and enforcement failed --and--	
B. Reported crashes susceptible to correction by signal (12-month period) --and--	
C. 80% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied	
Warrant 8: Roadway Network	
A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or--	
B. Weekend Volume (Five hours total)	
Warrant 9: Grade Crossing	
A. Grade Crossing within 140 ft --and--	
B. Peak-Hour Vehicular Volumes	

HCS Warrants Report

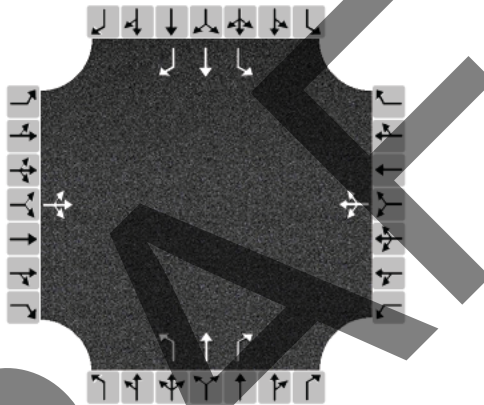
Project Information

Analyst	WHKS	Date	10/1/2024
Agency	WHKS	Analysis Year	2024
Jurisdiction		Time Period Analyzed	2044 PM
Project Description			

General

Major Street Direction	North-South	Population < 10,000	No
Starting Time Interval	7	Coordinated Signal System	No
Median Type	Undivided	Crashes (crashes/year)	0
Major Street Speed (mi/h)	0	Adequate Trials of Crash Exp. Alt.	No
Nearest Signal (ft)	0		

Geometry and Traffic



Approach	Eastbound			Westbound			Northbound			Southbound		
Movement	L	T	R	L	T	R	L	T	R	L	T	R
Number of Lanes, N	0	1	0	0	1	0	1	1	1	1	1	1
Lane Usage	LTR			LTR			L	T	R	L	T	R
Vehicle Volumes Averages (veh/h)	1	2	1	2	2	0	1	26	2	1	23	0
Pedestrian Averages (peds/h)	0			0			0			0		
Gap Averages (gaps/h)	0			0			0			0		
Delay (s/veh)	0.0			0.0			0.0			0.0		
Delay (veh-hrs)	0.0			0.0			0.0			0.0		

School Crossing and Roadway Network

Number of Students in Highest Hour	0	Two or More Major Routes	No
Number of Adequate Gaps in Period	0	Weekend Counts	No
Number of Minutes in Period	0	5-year Growth Factor (%)	0

Railroad Crossing

Grade Crossing Approach	None	Rail Traffic (trains/day)	4
Highest Volume Hour with Trains	Unknown	High Occupancy Buses (%)	0
Distance to Stop Line (ft)	-	Tractor-Trailer Trucks (%)	10

Volume Summary

Hour	Major Volume	Minor Volume	Total Volume	Peds/h	Gaps/h	1A (100%)	1A (80%)	1B (100%)	1B (80%)	2 (100%)	3A (100%)	3B (80%)	4A (100%)	4B (80%)
07 - 08	0	0	0	0	0	No	No	No	No	No	No	No	No	No
08 - 09	0	0	0	0	0	No	No	No	No	No	No	No	No	No
09 - 10	0	0	0	0	0	No	No	No	No	No	No	No	No	No
10 - 11	0	0	0	0	0	No	No	No	No	No	No	No	No	No
11 - 12	0	0	0	0	0	No	No	No	No	No	No	No	No	No
12 - 13	0	0	0	0	0	No	No	No	No	No	No	No	No	No
13 - 14	0	0	0	0	0	No	No	No	No	No	No	No	No	No
14 - 15	0	0	0	0	0	No	No	No	No	No	No	No	No	No
15 - 16	686	68	811	0	0	No	No	No	No	No	No	No	No	No
16 - 17	0	0	0	0	0	No	No	No	No	No	No	No	No	No
17 - 18	0	0	0	0	0	No	No	No	No	No	No	No	No	No
18 - 19	0	0	0	0	0	No	No	No	No	No	No	No	No	No
Total	686	68	811	0	0	0	0	0	0	0	0	0	0	0

Warrants**Warrant 1: Eight-Hour Vehicular Volume**

- A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--
- B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--
- 80% Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)

Warrant 2: Four-Hour Vehicular Volume

- Four-Hour Vehicular Volume (Both major approaches --and-- higher minor approach)

Warrant 3: Peak Hour

- A. Peak-Hour Conditions (Minor delay -- and-- minor volume --and-- total volume) --or--
- B. Peak-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)

Warrant 4: Pedestrian Volume

- A. Four Hour Volumes --or--
- B. One-Hour Volumes

Warrant 5: School Crossing

- Gaps Same Period --and--
- Student Volumes
- Nearest Traffic Control Signal (optional)

Warrant 6: Coordinated Signal System

- Degree of Platooning (Predominant direction or both directions)

Warrant 7: Crash Experience

- A. Adequate trials of alternatives, observance and enforcement failed --and--
- B. Reported crashes susceptible to correction by signal (12-month period) --and--
- C. 80% Volumes for Warrants 1A, 1B, --or-- 4 are satisfied

Warrant 8: Roadway Network

- A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2, or 3) --or--
- B. Weekend Volume (Five hours total)

Warrant 9: Grade Crossing

- A. Grade Crossing within 140 ft --and--
- B. Peak-Hour Vehicular Volumes

CSAH 2/CR 180, CR 171/CSAH 43
2044 Traffic Volumes
Multi-Way Stop Warrants

Warrants:

		Met	Not Met	Comments
A. Crash Experience				
	A. For a four-leg intersection, there are five or more reported crashes in a 12-month period or six or more reported crashes in a 36-month period that were of a type susceptible to correction by the installation of multi-way stop control. B. For a three-leg intersection, there are four or more reported crashes in a 12-month period or five or more reported crashes in a 36-month period that were of a type susceptible to correction by the installation of multi-way stop control.		✓	Average 1.5 crash per year
B. Sight Distance				
	All-way stop control may be installed at an intersection where an engineering study indicates that sight distance on the minor-road approaches controlled by a STOP sign is not adequate for a vehicle to turn onto or cross the major (uncontrolled) road.		✓	The existing intersection configuration meets sight distance requirements. The proposed configurations will also meet the requirements.
C. Transition to Signal or Roundabout				
	All-way stop control may be installed at locations where all-way stop control is an interim measure that can be installed to control traffic while arrangements are being made for the installation of a traffic control signal at the intersection or for the installation of yield control at a circular intersection.		✓	Signal warrants are not met. The warrant may be met for the existing configuration in the future. See the signal warrant section for additional discussion.
D. 8-Hour Volume				
	Major street approaches total averages at least <u>300</u> vehicles per hour for any 8 hours of an average day; and Minor street approaches total averages at least <u>200</u> units per hour for the same 8 hours		✓	The minor street peak hour is 100 vph, therefore the 200 units per hour will not be met.
E. Other Factors				
	All-way stop control may be installed at an intersection where an engineering study indicates that all-way stop control is needed due to other factors not addressed in the other all-way stop control warrants. Such other factors may include, but are not limited to, the following: A. The need to control left-turn conflicts, B. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where all-way stop control would improve traffic operational characteristics of the intersection, or C. Where pedestrian and/or bicyclist movements support the installation of all-way stop control.			Local residents have expressed interest in reverting back to multi-way stop. However, based on the warrant analysis, this has not been determined as a necessary solution.

Warrants:

1	Eight-Hour Vehicular Volume These major-street and minor-street volumes shall be for the same 8 hours for each condition; however, the 8 hours that are selected for the Condition A analysis shall not be required to be the same 8 hours that are selected for the Condition B analysis. Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume Condition A—Minimum Vehicular Volume <table><tr><th colspan="2">Number of lanes for moving traffic on each approach</th><th colspan="4">Vehicles per hour on major street (total of both approaches)</th><th colspan="4">Vehicles per hour on more critical minor-street approach (one direction only)</th></tr><tr><th>Major Street</th><th>Minor Street</th><th>100%^a</th><th>80%^b</th><th>70%^c</th><th>56%^d</th><th>100%^a</th><th>80%^b</th><th>70%^c</th><th>56%^d</th></tr><tr><td>1</td><td>1</td><td>500</td><td>400</td><td>350</td><td>280</td><td>150</td><td>120</td><td>105</td><td>84</td></tr><tr><td>2 or more</td><td>1</td><td>600</td><td>480</td><td>420</td><td>336</td><td>150</td><td>120</td><td>105</td><td>84</td></tr><tr><td>2 or more</td><td>2 or more</td><td>600</td><td>480</td><td>420</td><td>336</td><td>200</td><td>160</td><td>140</td><td>112</td></tr><tr><td>1</td><td>2 or more</td><td>500</td><td>400</td><td>350</td><td>280</td><td>200</td><td>160</td><td>140</td><td>112</td></tr></table> <table><tr><th colspan="2">Number of lanes for moving traffic on each approach</th><th colspan="4">Vehicles per hour on major street (total of both approaches)</th><th colspan="4">Vehicles per hour on more critical minor-street approach (one direction only)</th></tr><tr><th>Major Street</th><th>Minor Street</th><th>100%^a</th><th>80%^b</th><th>70%^c</th><th>56%^d</th><th>100%^a</th><th>80%^b</th><th>70%^c</th><th>56%^d</th></tr><tr><td>1</td><td>1</td><td>750</td><td>600</td><td>525</td><td>420</td><td>75</td><td>60</td><td>53</td><td>42</td></tr><tr><td>2 or more</td><td>1</td><td>900</td><td>720</td><td>630</td><td>504</td><td>75</td><td>60</td><td>53</td><td>42</td></tr><tr><td>2 or more</td><td>2 or more</td><td>900</td><td>720</td><td>630</td><td>504</td><td>100</td><td>80</td><td>70</td><td>56</td></tr><tr><td>1</td><td>2 or more</td><td>750</td><td>600</td><td>525</td><td>420</td><td>100</td><td>80</td><td>70</td><td>56</td></tr></table> ^a Basic minimum hourly volume ^b Used for combination of Conditions A and B after adequate trial of other remedial measures ^c May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000 ^d May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000	Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on more critical minor-street approach (one direction only)				Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d	1	1	500	400	350	280	150	120	105	84	2 or more	1	600	480	420	336	150	120	105	84	2 or more	2 or more	600	480	420	336	200	160	140	112	1	2 or more	500	400	350	280	200	160	140	112	Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on more critical minor-street approach (one direction only)				Major Street	Minor Street	100% ^a	80% ^b	70% ^c	56% ^d	100% ^a	80% ^b	70% ^c	56% ^d	1	1	750	600	525	420	75	60	53	42	2 or more	1	900	720	630	504	75	60	53	42	2 or more	2 or more	900	720	630	504	100	80	70	56	1	2 or more	750	600	525	420	100	80	70	56	Met	Not Met	Comments ✓ 8 hour data is not available due for future conditions. Peak hour traffic appears to be in the range of these values, but the peak hour traffic is not expected to extend for 8 hours per day.
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on more critical minor-street approach (one direction only)																																																																																																																						
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2	Four-Hour Vehicular Volume The Four-Hour Vehicular Volume signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal. If the posted or statutory speed limit or the 85th-percentile speed on the major street exceeds 40 mph, or if the intersection lies within the built-up area of an isolated community having a population of less than 10,000, Figure 4C-2 may be used in place of Figure 4C-1. Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume Figure 4C-2. Warrant 2, Four-Hour Vehicular Volume (70% Factor) (COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)	Met	Not Met	Comments ✓ 4 hour data is not available due for future conditions. Peak hour traffic appears to be in the range of these values, but the peak hour traffic is not expected to extend for 4 hours per day.																																																																																																																								
3	Peak Hour A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day: 1. The total stopped-time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach, and 2. The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes, and 3. The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches. B. The plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the more critical minor-street approach (one direction only) for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4C-3 for the existing combination of approach lanes.	Met	Not Met	Comments ✓ 745 vehicles entering the intersection in the peak hour																																																																																																																								

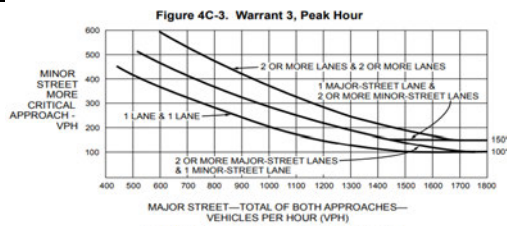


Figure 4C-4. Warrant 3, Peak Hour (70% Factor)
(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



4 Pedestrian Volume

5 School Crossing

6 Coordinated Signal System

7 Crash Experience

Table 4C-2. Minimum Number of Reported Crashes in a One-Year Period

Number of through lanes on each approach		Total of angle and pedestrian crashes (all severities)*		Total of fatal-and-injury angle and pedestrian crashes*	
Major Street	Minor Street	Four Legs	Three Legs	Four Legs	Three Legs
1	1	5	4	3	3
2 or more	1	5	4	3	3
2 or more	2 or more	5	4	3	3
1	2 or more	5	4	3	3

* Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street

Table 4C-3. Minimum Number of Reported Crashes in a Three-Year Period

Number of through lanes on each approach		Total of angle and pedestrian crashes (all severities)*		Total of fatal-and-injury angle and pedestrian crashes*	
Major Street	Minor Street	Four Legs	Three Legs	Four Legs	Three Legs
1	1	8	5	4	4
2 or more	1	6	5	4	4
2 or more	2 or more	6	5	4	4
1	2 or more	6	5	4	4

* Angle crashes include all crashes that occur at an angle and involve one or more vehicles on the major street and one or more vehicles on the minor street

8 Roadway Network

The need for a traffic control signal should be considered if an engineering study finds that the common intersection of two or more major routes meets one or both of the following criteria:

A. The intersection has a total existing, or immediately projected, entering volume of at least 1,000 vehicles per hour during the peak hour of a typical weekday and has 5-year projected traffic volumes, based on an engineering study, that meet one or more of Warrants 1, 2, and 3 during an average weekday; or

B. The intersection has a total existing or immediately projected entering volume of at least 1,000 vehicles per hour for each of any 5 hours of a non-normal business day (Saturday or Sunday).

A major route as used in this signal warrant should have at least one of the following characteristics:

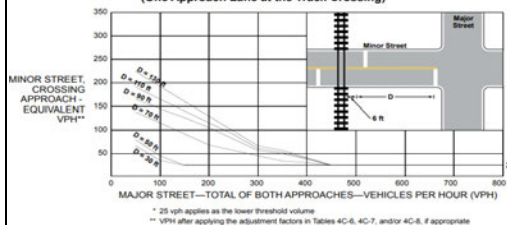
A. It is part of the street or highway system that serves as the principal roadway network for through traffic flow;

B. It includes rural or suburban highways outside, entering, or traversing a city; or

C. It appears as a major route on an official plan, such as a major street plan in an urban area traffic and transportation study

9 Intersection Near a Grade Crossing

Figure 4C-9. Warrant 9, Intersection Near a Grade Crossing
(One Approach Lane at the Track Crossing)



✓

645 major / 100 minor

N/A

N/A

N/A

✓

CR171 intersection had 2 crashes (2021)
CSAH2/CR180 intersection had 3 crashes (2016) (2 injury)
18th St intersection had 1 crash (2020)

✓

CR171 intersection had 3 crashes (2021-2023)
CSAH2/CR180 intersection had 5 crashes (2016-2018) (2 angle injury)
18th St intersection had 2 crashes (2019-2021)

✓

Entering peak hour volumes are 745. Warrants 1-3 are not met.

Ex Traffic / Ex Configuration - 83 veh major/74 veh minor (not met)
Future Traffic / Ex Configuration - 100 veh major/645 veh minor (met)
Proposed Alternatives - 130' queue distance required.