Project and Analyst Information:

Project ID:	6180-30-00
Project Type:	State Highway Rehabilitation Program
Location:	STH 21 and Sand Pit Road Town of Omro Winnebago NE Region
Analyst:	Camie Ferrier
Agency:	Westwood Infrastructure, Inc.
Date:	March 31, 2021

Background Information:

Project Need:	Safety
Project Objective(s):	The project objective is to improve the safety at the intersection of STH 21 and Sand Pit Road.
Additional Information:	The intersection of STH 21 and Sand Pit Road is included in a resurfacing project of STH 21, which begins south of Structure B-70-0051 within the City of Omro and continues to approximately Leonard Point Road. The existing form of traffic control is a minor road stop on Sand Pit Road while STH 21 has free flow traffic. The intersection geometry involves EB and WB both having a designated right turn lane while the left turn and through movements share a lane. NB and SB both have a single lane approach. The speed limit is 55 mph on STH 21 and 45 mph on Sand Pit Road.

Existing Crash Information:

Observed Crash History:

Years: 2015 – 2019

Crash Type	Fatal	Injury A	Injury B	Injury C	KABC	PDO	Total
Sideswipe				1	1	1	2
STH 21 Left Turn				1	1		1
Run off Road			1		1		1
STH 21 Rear End while turning left			4	3	7	2	9
Total	0	0	5	5	10	3	13

Injury A – Suspected Serious Injury
Injury B – Suspected Minor Injury
Injury C – Possible Injury
KABC – Fatal (K) and Injury A, B and C
PDO – Property Damage Only

Crash Trends:

Left turning vehicles on STH 21 appear to be a factor in 13 of the 15 crashes. STH 21 through traffic rear ends traffic that is planning to turn left and left turning traffic from STH 21 fails to yield to oncoming traffic.

Contributing Factors:

Currently, left turn lanes do not exist on STH 21. Another factor may be difficulty selecting adequate gaps when crossing or turning left.

Additional Modes of Transportation:

Mode	Need? Yes/No	Nearby Generators and Existing Facilities	Volume	
			#	Unit
PED/BIKE	Yes	None	N/A	
OSOW	Yes	None		vph

(add more rows as needed)

Other Information: STH 21 in the area of this project is recommended to be part of the Oshkosh MPO Regional Bicycle & Pedestrian Network as shown in the Appleton (Fox Cities) Transportation Management Area & Oshkosh Metropolitan Planning Organization Bicycle and Pedestrian Plan – 2014.

STH 21 is an OSOW truck route and High Clearance Route. Minimum 20 foot vertical clearance required for new vertical elements such as sign structures, sign bridges, signals and lighting.

Summary Tables:

Descriptions:

Alt.	Traffic Control	Description of Alternative
1	Minor Road Stop Control with Slotted Left turns on Major Road	Maintain two-way stop control, with Sand Pit Road being stop controlled. Install dedicated left turn lanes on STH 21.
2	Roundabout	Install a roundabout at the intersection of STH 21 and Sand Pit Road.

Costs and Impacts:

Alt.	Traffic Control	Construction Cost	Real Estate Impacts			Environmental Impacts	
			# Build	# Acres	Cost	Impact Type	# Acres
1	Minor Road Stop Control with Slotted Left turns on Major Road	$1,630,000	N/A	0.07	$1,400	Wetland	0
2	Roundabout	$2,000,000	N/A	0.731	$34,000	Wetland	0

Safety Performance:

Alt.	Traffic Control	Analysis Period	KABC	PDO	Total
-	Existing Conditions	2014 -2019	11	4	15
-	Future No-Build	2027-2036	4.918	11.153	16.071
1	Minor Road Stop Control with Slotted Left turns on Major Road	2027-2036	2.557	5.800	8.357
2	Roundabout	2027-2036	2.965	18.645	21.610

Safety performance results are from the Safety Certification Document, dated 8-6-2020, signed 9-14-2020. Analysis method: Interactive Highway Safety Design Model

Recommendation:

Alternative:

Influencing Factors:

Existing & Future No-Build Conditions:

Practical Feasibility:

Public Opinion:	Concerns with safety have been expressed by local officials. A public involvement meeting is scheduled to occur in 2021.
Business Impacts:	None
ROW Impacts:	None
Utility Impacts:	None
Cost Estimate:	$0
Additional Info:	None

Safety Analysis:

Crash Trend(s) and Contributing Factors:	Left turning vehicles on STH 21 appear to be a factor in 13 of the 15 crashes. STH 21 through traffic rear ends traffic that is planning to turn left and left turning traffic from STH 21 fails to yield to oncoming traffic. Currently, left turn lanes do not exist on STH 21. Another factor may be difficulty selecting adequate gaps when crossing or turning left.
Conflict Points:	EB and WB left turns conflicting with opposing through traffic. NB and SB left turns conflicting with EB and WB traffic.
Vulnerable Users:	N/A
Additional Info:	N/A

Safety Performance Measures:

	Analysis Period	KABC	PDO	Total
Existing Conditions	2014 -2019	11	4	15
Future No-Build	2027-2036	4.918	11.153	16.071

Operational Analysis:

Warrant Analysis:	Utilizing traffic counts from October 21, 2019, traffic signal warrants were evaluated for the intersection of STH 21 and Sand pit Road. The signal warrant analysis showed that traffic signals were not warranted at the intersection, therefore a traffic signal alternative was eliminated from consideration.
Queue Impacts:	There are field entrances located on the north leg of Sand Pit Road at approximately 170’ north of the intersection. The southbound queue of 165’ in 2047 approaches the first field entrance. There is a commercial driveway on the south leg of Sand Pit Road at approximately 185’ south of the intersection. The northbound queue does not impact this driveway.
Additional Capacity:	None
Railroad Impacts:	None
Additional Info:	In 2047, the southbound leg experiences a LOS of F in the am and pm peak hours and the northbound leg experiences a LOS of E in the pm peak hour.

Operational Performance Measures:

Year: 2027

Existing Conditions

AM Peak	EB			WB			NB			SB		
	L/T	-	R	L/T	-	R	-	All	-	-	All	-
# Lanes	1		1	1		1		1			1	
LOS	A			A				C			E	
Delay (s)	7.9			8.8				20.2			37.8	
v/c	0.00			0.01				0.10			0.60	
Queue (ft.)	0			0				7.5			87.5	
Storage (ft.)												

PM Peak	EB			WB			NB			SB		
	L/T	-	R	L/T	-	R	-	All	-	-	All	-
# Lanes	1		1	1		1		1			1	
LOS	A			A				D			E	
Delay (s)	9.0			8.4				29.5			37.1	
v/c	0.02			0.01				0.28			0.36	
Queue (ft.)	2.5			0				27.5			37.5	
Storage (ft.)												
Additional Information												

Year: 2047

Future No-Build Conditions (Design Year)

AM Peak	EB			WB			NB			SB		
	L/T	-	R	L/T	-	R	-	All	-	-	All	-
# Lanes	1		1	1		1		1			1	
LOS	A			A				C			F	
Delay (s)	7.9			8.9				22.9			69.0	
v/c	0.00			0.01				0.14			0.84	
Queue (ft.)	0			0				12.5			165	
Storage (ft.)												

PM Peak	EB			WB			NB			SB		
	L/T	-	R	L/T	-	R	-	All	-	-	All	-
# Lanes	1		1	1		1		1			1	
LOS	A			A				E			F	
Delay (s)	9.2			8.5				40.8			56.9	
v/c	0.03			0.01				0.44			0.56	
Queue (ft.)	2.5			0				50			70	
Storage (ft.)												
Additional Information												

Alt. 1: Minor Road Stop Control with Slotted Left turns on Major Road:

Practical Feasibility:

Public Opinion:	A public involvement meeting is scheduled in 2021.
Business Impacts:	None
ROW Impacts:	0.07 Acres ($1,400)
Utility Impacts:	Unknown
Cost Estimate:	$1,630,000
Additional Info:	None

Safety Analysis:

Crash Trend(s) being Improved with Alt.:	The addition of slotted left turn lanes on STH 21 would address crashes related to left turning vehicles and rear end crashes.
Geometric Concerns:	Due to the addition of left turn lanes, sideroad cross traffic will have additional travel length to cross STH 21 or turn left onto STH 21.
Additional Info:	None

Safety Performance Measures:

	Analysis Period	KABC	PDO	Total
Existing Conditions	2014 -2019	11	4	15
Future No-Build	2027-2036	4.918	11.153	16.071
Alt. 1: Minor Road Stop Control with Slotted Left turns on Major Road:	2027-2036	2.557	5.800	8.357

Operational Analysis:

Warrant Analysis:	N/A
Queue Impacts:	There are field entrances located on the north leg of Sand Pit Road at approximately 170’ north of the intersection. The southbound queue of 165’ in 2047 approaches the first field entrance. There is a commercial driveway on the south leg of Sand Pit Road at approximately 185’ south of the intersection. The northbound queue does not impact this driveway.
Additional Capacity:	None
Railroad Impacts:	None
Additional Info:	In 2047, the southbound leg experiences a LOS of F in the am and pm peak hours and the northbound leg experiences a LOS of E in the pm peak hour.

Operational Performance Measures:

Year: 2027	**Alt. 1: Minor Road Stop Control with Slotted Left turns on Major Road**											
AM Peak	EB			WB			NB			SB		
	L	T	R	L	T	R	-	All	-	-	All	-
# Lanes	1	1	1	1	1	1		1			1	
LOS	A			A				C			E	
Delay (s)	7.9			8.8				20.1			37.6	
v/c	0.00			0.01				0.10			0.60	
Queue (ft.)	0			0				7.5			87.5	
Storage (ft.)	300			300								
PM Peak	EB			WB			NB			SB		
	L	T	R	L	T	R	-	All	-	-	All	-
# Lanes	1	1	1	1	1	1		1			1	
LOS	A			A				D			E	
Delay (s)	9.0			8.4				29.1			36.6	
v/c	0.02			0.01				0.28			0.36	
Queue (ft.)	2.5			0.0				27.5			37.5	
Storage (ft.)	300			300								
Additional Information												

Year: 2047	**Alt. 1: Minor Road Stop Control with Slotted Left turns on Major Road**											
AM Peak	EB			WB			NB			SB		
	L	T	R	L	T	R	-	All	-	-	All	-
# Lanes	1	1	1	1	1	1		1			1	
LOS	A			A				C			F	
Delay (s)	7.9			8.9				22.8			68.3	
v/c	0.00			0.01				0.14			0.84	
Queue (ft.)	0			0				12.5			165	
Storage (ft.)	300			300								
PM Peak	EB			WB			NB			SB		
	L	T	R	L	T	R	-	All	-	-	All	-
# Lanes	1	1	1	1	1	1		1			1	
LOS	A			A				E			F	
Delay (s)	9.2			8.5				39.8			55.2	
v/c	0.03			0.01				0.43			0.55	
Queue (ft.)	2.5			0				50			67.5	
Storage (ft.)	300			300								
Additional Information												

Alt. 2: Roundabout:

Practical Feasibility:

Public Opinion:	A public involvement meeting is scheduled in 2021.
Business Impacts:	Roundabout is designed to accommodate OSOW vehicles. There are no impacts to businesses.
ROW Impacts:	0.731 Acres, $34,000
Utility Impacts:	Unknown
Cost Estimate:	$2,000,000
Additional Info:	None

Safety Analysis:

Crash Trend(s) being Improved with Alt.:	The installation of a roundabout at the intersection of STH 21 and Sand Pit Road would address right-angle crashes and left turning crashes at the intersection.
Geometric Concerns:	None
Additional Info:	None

Safety Performance Measures:

	Analysis Period	KABC	PDO	Total
Existing Conditions	2014 -2019	11	4	15
Future No-Build	2027-2036	4.918	11.153	16.071
Alt. 2: Roundabout:	2027-2036	2.965	18.645	21.610

Operational Analysis:

Warrant Analysis:	N/A
Queue Impacts:	There are field entrances located on the north leg of Sand Pit Road at approximately 170' north of the intersection. There is a commercial driveway on the south leg of Sand Pit Road at approximately 185' south of the intersection. The southbound and northbound queues do not impact these driveways.
Additional Capacity:	All legs operate at a LOS of A in 2047 for the AM and PM peak hours. This alternative has additional capacity compared to alternative 1.
Railroad Impacts:	None
Additional Info:	All legs operate at a LOS of A in 2047 for the AM and PM peak hours.

Operational Performance Measures:

Year: 2027

Alt. 2: Roundabout

AM Peak	EB			WB			NB			SB		
	-	All	-	-	All	-	-	All	-	-	All	-
# Lanes		1			1			1			1	
LOS		A			A			A			A	
Delay (s)		9.3			4.7			5.7			5.0	
v/c		0.536			0.231			0.038			0.153	
Queue (ft.)		93.1			28.6			3.5			16.1	
Storage (ft.)												

PM Peak	EB			WB			NB			SB		
	-	All	-	-	All	-	-	All	-	-	All	-
# Lanes		1			1			1			1	
LOS		A			A			A			A	
Delay (s)		6.7			8.8			5.2			5.6	
v/c		0.399			0.536			0.071			0.083	
Queue (ft.)		60.2			101.0			6.8			7.9	
Storage (ft.)												
Additional Information												

Year: 2047

Alt. 2: Roundabout

AM Peak	EB			WB			NB			SB		
	-	All	-	-	All	-	-	All	-	-	All	-
# Lanes		1			1			1			1	
LOS		B			A			A			A	
Delay (s)		10.6			4.9			6.1			5.6	
v/c		0.587			0.248			0.050			0.201	
Queue (ft.)		105.7			31.2			4.5			21.9	
Storage (ft.)												

PM Peak	EB			WB			NB			SB		
	-	All	-	-	All	-	-	All	-	-	All	-
# Lanes		1			1			1			1	
LOS		A			A			A			A	
Delay (s)		7.3			9.8			5.6			6.0	
v/c		0.432			0.585			0.098			0.111	
Queue (ft.)		67.4			117.8			9.3			10.5	
Storage (ft.)												
Additional Information												

Attachments:

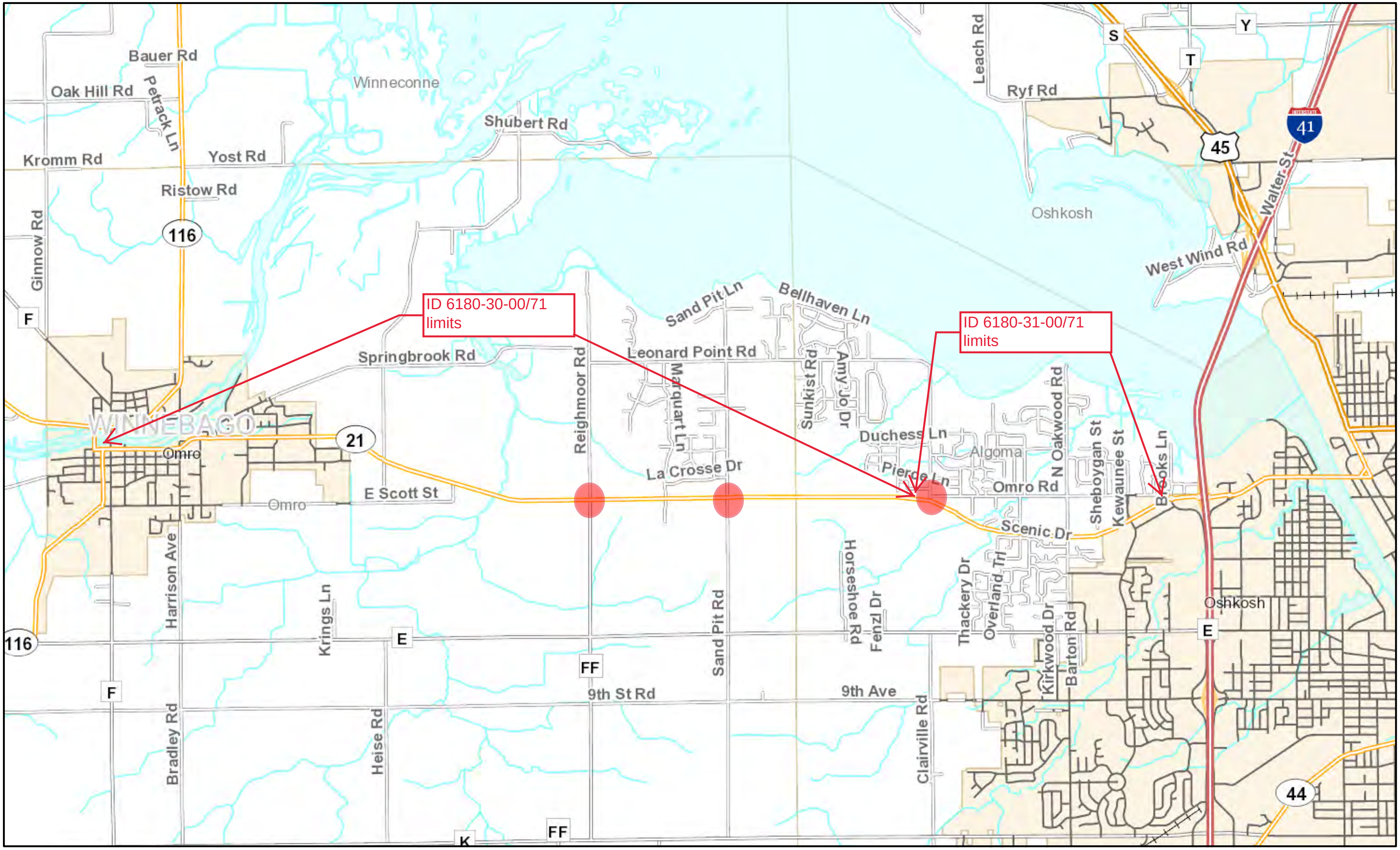
(Provide attachments outline in FDM 11-25-3 Attachment 3.7 as appropriate)

1. Project Location Map
2. Aerial Photo
3. Traffic Data
4. Crash Diagram
5. Exhibits
    a. Existing
    b. Alternative 1 - Left Turn Lane
    c. Alternative 2 - Roundabout
6. Safety Certification Document
7. Signal Warrants
8. Capacity Analysis
    a. HCS
    b. SIDRA 9

January 22, 2020
exported from dotview
WisDOT

DOTView Map

0 0.4 0.8 1.6 mi
0 0.5 1 2 km



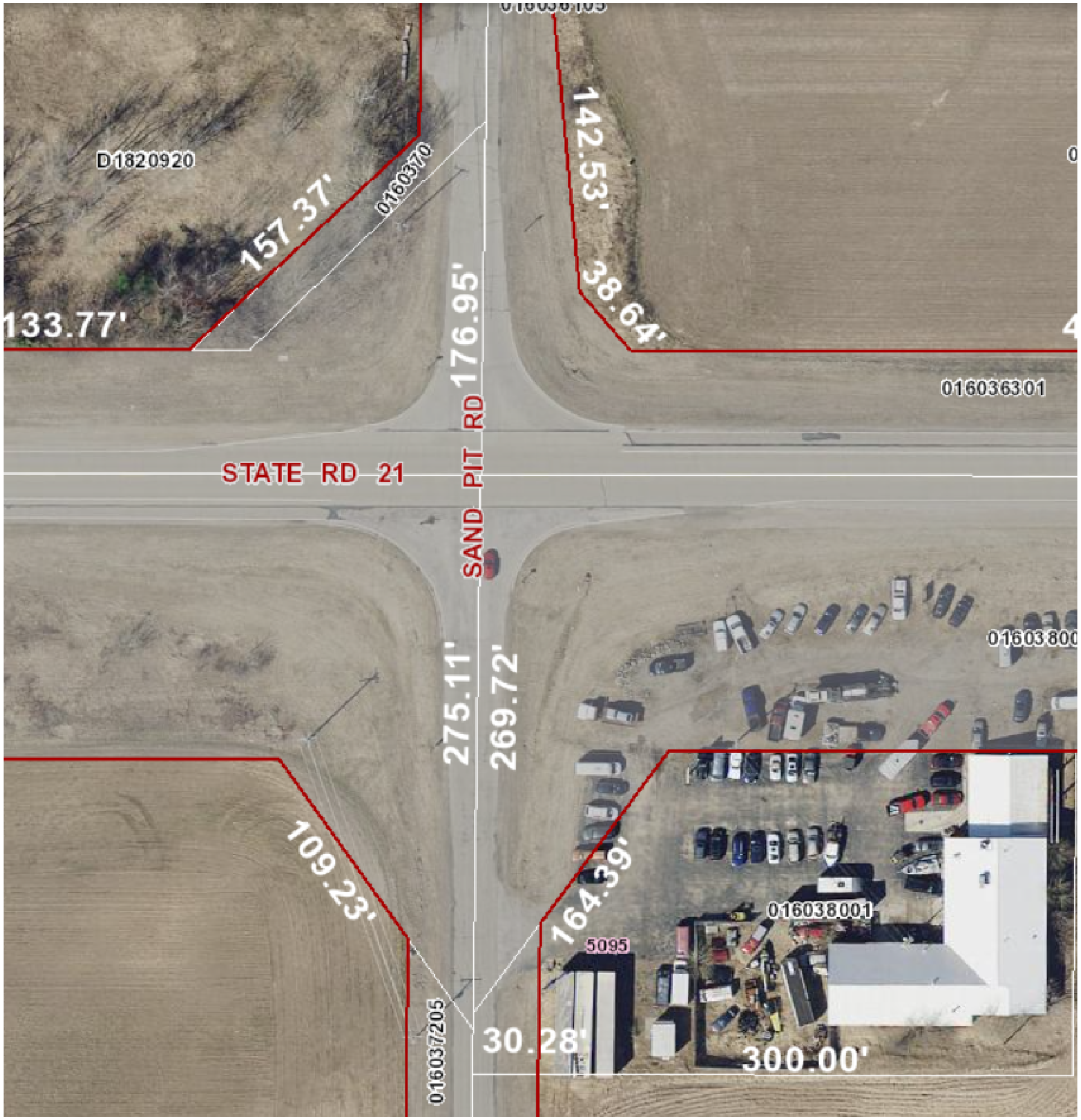
- Railroads
- Interstate Highways
- US Highways
- State Highways
- Off-Mainline Routes
- Urban Streets
- County Trunks
- Rural Roads
- ● Potential Intersection Improvement

Project 6180-30-00/71
Omro - Oshkosh
WIS 116 - Leonard Point Rd
WIS 21
Winnebago County

Project 6180-31-00/71
Omro - Oshkosh
Leonard Point Rd - Washburn St
WIS 21
Winnebago County

6180-30-00
STH 21
STH 116 - Leonard Point Rd
Winnebago County

Intersection STH 21 & Sand Pit Rd



WisDOT TRAFFIC FORECAST REPORT

PROJECT ID(S): 6180-30-00
ROUTE(S): STH 21
Region/COUNTY(IES): NE/Winnebago
LOCATION: STH 116 - Leonard Point Rd
COMPLETED: 10/26/2020

Developed By Thor Jeppson
Phone: (608) 266-2328

E-Mail: Thor.Jeppson@dot.wi.gov

NOTES ON THE FORECAST:

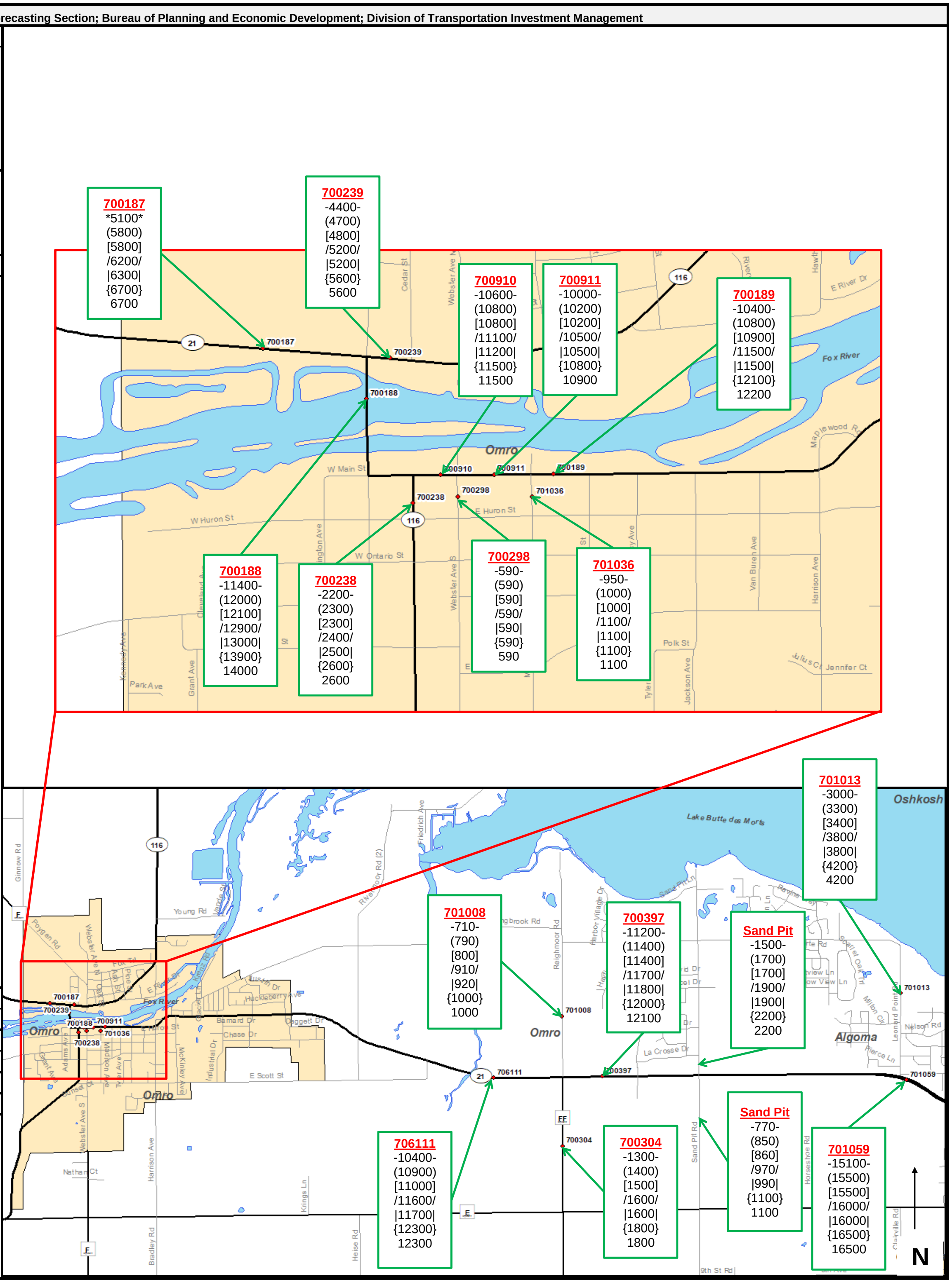
1. This projection assumes that no major new traffic generators will be added to the development already included in the 2010/2045 Northeast Regional Travel Demand Model.

2. Vehicle classification data and design values (K factors, directional splits, and percent trucks in design hours) are available here: http://wisconsindot.gov/Pages/projects/data-plan/traf-fore/default.aspx

3. West of Leonard Point Rd., STH 21 is a Factor Group IV (Rural-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). It is functionally classified as a Rural Principle Arterial (2) for count purposes. East of Leonard Point Rd., STH 21 is a Factor Group II (Urban-Other) roadway (indicating low to moderate fluctuation in traffic from a seasonal perspective). It is functionally classified as an Urban Principal Arterial (14) for count purposes.

4. The 2010/2045 Northeast Regional Travel Demand Model was used to complete this forecast. The Traffic Analysis Forecasting Information System output was used as a comparison tool to check against the model output. Adjustments were made as needed.

5. Roadway improvements coded within the existing plus committed (E+C) network of the 2010/2045 Northeast Regional Travel Demand Model were assumed to be in place for the purposes of developing this forecast.



Site(s)	701059		
Routes(s)	STH 21		
Volume(s)	16530		
Site Growth %	0.33%		

SITE ID = Colored, **bolded**, and underlined

Symbol	Count	Symbol	Forecast
-000-	2019 Count	(000)	2026 AADT
000	2012 Count	[000]	2027 AADT
		/000/	2036 AADT
		|000|	2037 AADT
		{000}	2046 AADT
		000	2047 AADT

WisDOT Bureau of Planning & Economic Development
Traffic Forecasting Section
Forecast by: Thor Jeppson
Phone: (608) 266-2328
Email: Thor.Jeppson@dot.wi.gov

Projected AM Design Hour Traffic Volumes

Indicates roundabout

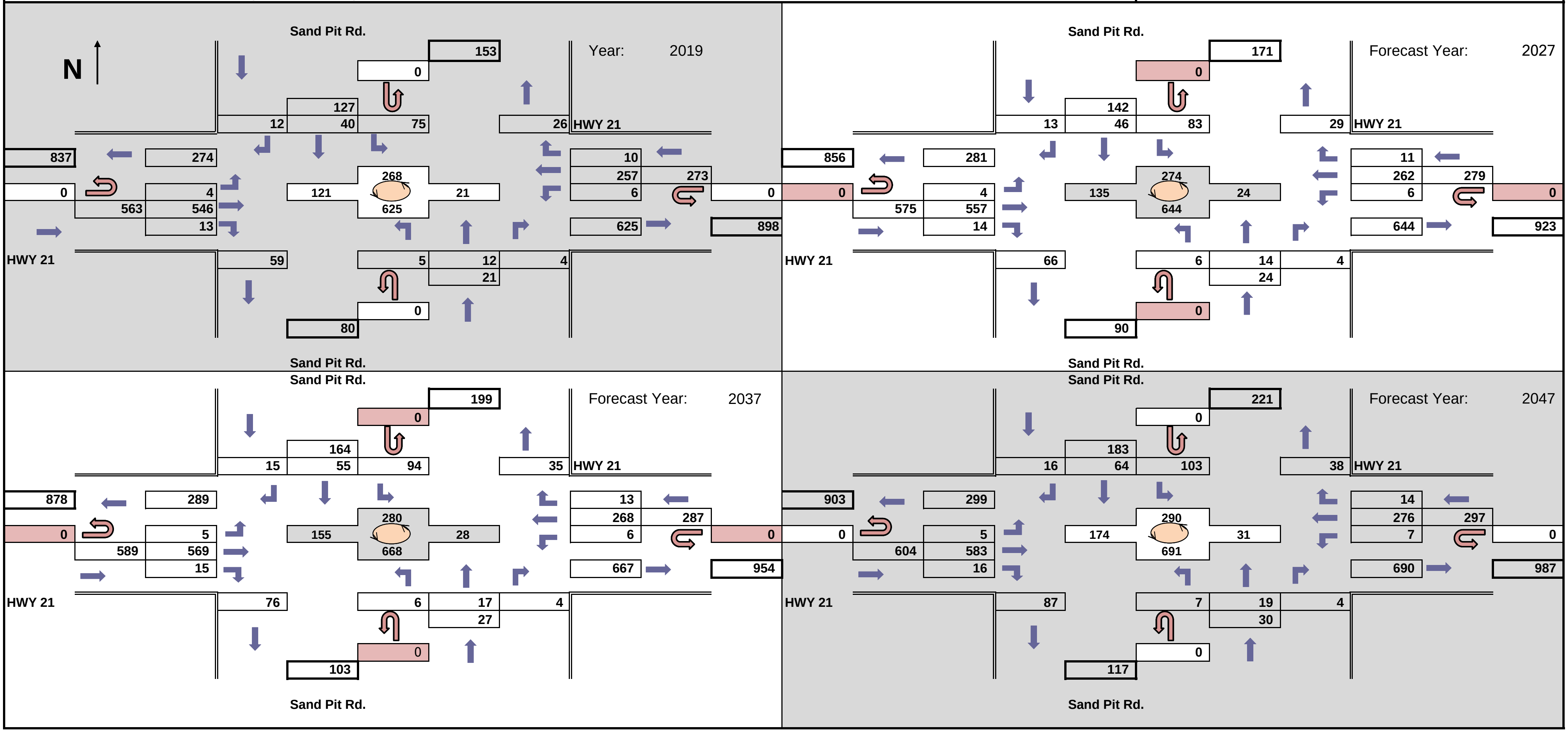
Design Hour: 7:00-8:00am

Forecast Completed: 10/26/2020

Project Description

Project ID(s): 6180-30-00
Route(s): STH 21
Region/COUNTY(IES): NE/Winnebago
Location: @ Sand Pit Rd

Design Hour Turning Movement Data



WisDOT Bureau of Planning & Economic Development
Traffic Forecasting Section
Forecast by: Thor Jeppson
Phone: (608) 266-2328
Email: Thor.Jeppson@dot.wi.gov

Projected PM Design Hour Traffic Volumes

⬭ Indicates roundabout

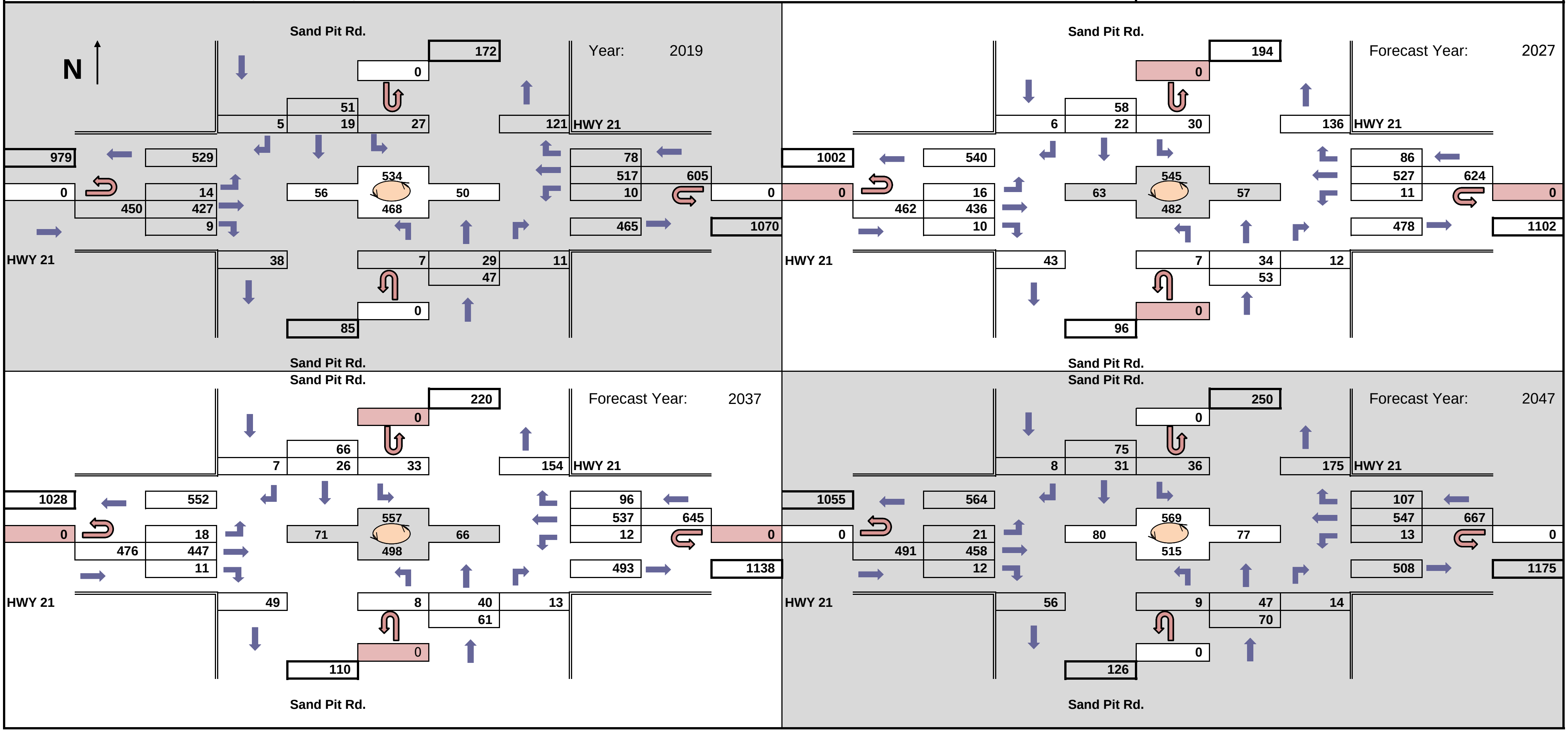
Design Hour: 3:30-4:30pm

Forecast Completed: 10/26/2020

Project Description

Project ID(s): 6180-30-00
Route(s): STH 21
Region/COUNTY(IES): NE/Winnebago
Location: @ Sand Pit Rd

Design Hour Turning Movement Data



STH 21 & Sand Pit Road
2015- 2019

3/25/18, 6am, B

6/14/15, 5pm
11/23/15, 5pm
5/2/16, 7am, B
5/31/16, 11am, C
8/25/17, 10am, B

10/31/19, 10AM, Wet

12/18/17, 5pm, B
5/25/19, 4pm, C
5/28/19, 3pm, B
10/3/19, 4pm, C

12/19/15, 9am, C

4/27/15, 6pm, C

2

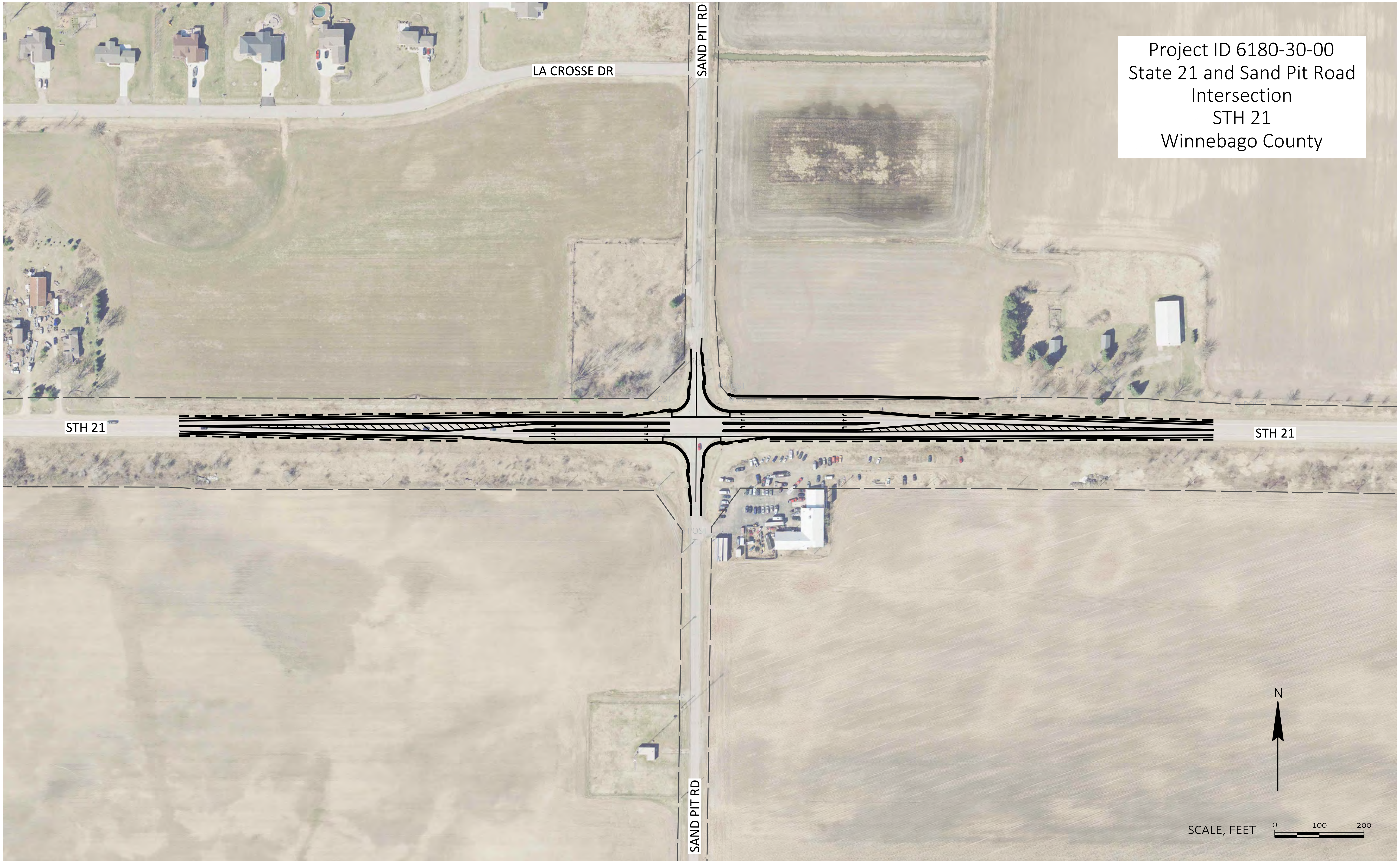
2

Project ID 6180-30-00
State 21 and Sand Pit Road
Intersection
STH 21
Winnebago County

PROJECT NO: 6180-30-71	HWY: STH 21	COUNTY: WINNEBAGO	STH 21 & SAND PIT RD - EXISTING CONDITIONS	SHEET	E

FILE NAME : N:\3001091.00\REPORTS\ICE\DRAWINGS\ICE-61803000-STH 21.DWG
LAYOUT NAME - 2- ICE-618030-STH 21 EXISTING - SAND PIT
PLOT DATE : 2/24/2021 3:36 PM
PLOT BY : CRAIG KNUTH
PLOT NAME :
PLOT SCALE : 1 IN:200 FT

2



Project ID 6180-30-00
State 21 and Sand Pit Road
Intersection
STH 21
Winnebago County

2

PROJECT NO: 6180-30-71	HWY: STH 21	COUNTY: WINNEBAGO	STH 21 & SAND PIT RD - LEFT-TURN LANES OPTION	SHEET	E

FILE NAME : N:\3001091.00\REPORTS\ICE\DRAWINGS\ICE-61803000-STH 21.DWG
LAYOUT NAME - 6 - ICE-618030-STH 21 LEFT- SAND PIT
PLOT DATE : 2/24/2021 3:36 PM
PLOT BY : CRAIG KNUTH
PLOT NAME :
PLOT SCALE : 1 IN:200 FT
WISDOT/CADDS SHEET 42

2

2

Project ID 6180-30-00
State 21 and Sand Pit Road
Intersection
STH 21
Winnebago County

PROJECT NO: 6180-30-71	HWY: STH 21	COUNTY: WINNEBAGO	STH 21 & SAND PIT RD - ROUNDABOUT OPTION	SHEET **E**

FILE NAME : N:\3001091.00\REPORTS\ICE\DRAWINGS\ICE-61803000-STH 21.DWG
LAYOUT NAME - 4 - ICE-618030-STH 21 RA - SAND PIT
PLOT DATE : 2/24/2021 3:36 PM
PLOT BY : CRAIG KNUTH
PLOT NAME :
PLOT SCALE : 1 IN:200 FT
WISDOT/CADDS SHEET 42

CORRESPONDENCE/MEMORANDUM **State of Wisconsin**

Date: August 6, 2020

To: WisDOT NE Region Planning Chief: Brian Brock
Bureau of Traffic Operations – Traffic Engineering and Safety Section (BTOSafetyEngineering@dot.wi.gov)

From: Scott Nelson
WisDOT NE Region

Subject: SAFETY CERTIFICATION DOCUMENT
Project I.D. (design) 6180-30-00
STH 21 from STH 116 – Leonard Point Road
Winnebago County

Having considered the safety performance of the existing corridor and any proposed improvements, we believe this document reflects the intent of the policy and guidelines described in section 11-38 of the Wisconsin Facilities Development Manual.

Concurrence:

Kevin M. Scopoline 8/26/2020

Bureau of Traffic Operations Date
Traffic Engineering and Safety Section

Approval:

Brian S. Brock 9/14/2020

Region Planning Chief Date

SAFETY CERTIFICATION DOCUMENT

Analyst:	Scott A. Nelson	**Design ID:**	6180-30-00
Agency:	WisDOT DTSD NE Region	**Highway:**	STH 21
Date:	August 6, 2020	**Project Title:**	Omro – Oshkosh, STH 116 – Leonard Pt Rd
		Improvement Concept Code:	RSRF10

1. **Did the project have Sites of Promise from the system screening?** Yes ☒ No ☐

Comments:

PDP ID 4284 – STH 116 to Webster - Crash Rate Flag 2.11, KAB Crash Rate Flag 2.09
PDP ID 4289 – CTH FF to Sand Pit Road - KAB Crash Rate Flag 1.46
PDP ID 4290 – Sand Pit Road to Leonard Point Road - Crash Rate Flag 1.18, KAB Crash Rate Flag 1.79
IX_70_02975 – STH 21 & STH 116 - Total Crash LOSS 4, PSI 3.97, KABC LOSS 4, PSI 0.84
IX_70_02977 – STH 21 & Madison Ave - Total Crash LOSS 4, PSI 2.39
IX_70_02978 – STH 21 & Monroe St - KABC LOSS 4, PSI 0.45
IX_70_02980 – STH 21 & Quincy - KABC LOSS 4, PSI 1.16
IX_70_03026 – STH 21 & McKinley Ave - KABC LOSS 4, PSI 0.45
IX_70_03024 – STH 21 Beckwith Ave - KABC LOSS 4, PSI 0.45
IX_70_03034 – STH 21 & Alder Ave & Goldenrod Dr - Total Crash LOSS 4, PSI 4.27, KABC LOSS 4, PSI 1.43
IX_70_02902 – STH 21 & Rivermoor Rd - Total Crash LOSS 4, PSI 2.84
IX_70_02649 – STH 21 & CTH FF/Reighmoor Rd - Total Crash LOSS 4, PSI 3.21, KABC LOSS 4, PSI 3.76
IX_70_02660 – STH 21 & Sand Pit Rd - Total Crash LOSS 4, PSI 9.04, KABC LOSS 4, PSI 4.10

2. **Did relevant crashes remain after the initial Crash Vetting Process?** Yes ☒ No ☐

Comments:
PDP ID 4284 – STH 116 to Webster (Segment Identified) – Of the ten crashes in this segment, five crashes remained after vetting. Four WB rear end crashes at the Jefferson St intersection and one at a driveway. A TWLTL was evaluated for feasibility by PDS preliminary engineering and it was determined to not be a feasible alternative.

PDP ID 4289 – CTH FF to Sand Pit Road (Segment Identified) – Of the twenty-two crashes in this segment, twelve crashes remain after vetting. Only one segment crash occurred near Potratz Hill, but no safety mitigation strategies are recommended base on this one isolated crash. The remaining crashes will be addressed in the intersection safety flag for the CTH FF/Reighmoor intersection.

PDP ID 4290 – Sand Pit Road to Leonard Point Road (Segment Identified) – Of the thirty-seven crashes in this segment, fourteen remaining after vetting. Nine of these crashes occurred at the Sand Pit Road intersection and will be addressed in the intersection safety flag below. The remaining five crashes involve drifting left of center along this segment. The improvement project will include centerline rumble stripes which should help address this crash trend.

IX_70_02975 – STH 21 & STH 116 (Intersection Identified) – Of the eight crashes at this intersection, five remain after vetting. Four WB rear end crashes at the Jefferson St intersection and one at a driveway. A TWLTL was evaluated for feasibility by PDS preliminary engineering and it was determined to not be a feasible alternative.

IX_70_02977 – STH 21 & Madison Ave (Intersection Identified) – One of the seven crashes remain after vetting. The crash involved a WB vehicle yielded to a pedestrian crossing North to South on the East side of the intersection. Another WB tried bypassing WB on right and struck the pedestrian. The crash could be classified as driver error by bypassing the yielding vehicle in front. No safety mitigation strategies are recommended based on this one crash.

IX_70_02978 – STH 21 & Monroe St (Intersection Identified) - Of the four crashes at this intersection three remained after vetting. Two WB rear ends of left turns onto Monroe and one WB rear end turning into Kwik Trip. A TWLTL was evaluated for feasibility by PDS preliminary engineering and it was determined to not be a feasible alternative. No other safety mitigation strategies are recommended.

IX_70_02980 – STH 21 & Quincy (Intersection Identified) – Of the three crashes at this intersection, one remained after vetting and it occurred at a driveway near the Quincy St. intersection. A WB rear end of left turning traffic into a driveway near Quincy Ave. No safety mitigation strategies are recommended based on this one crash.

IX_70_03026 – STH 21 & McKinley Ave (Intersection Identified) – Of the four crashes at this intersection, three remain after vetting. Three WB rear end crashes have occurred with left turns onto McKinley Ave. A TWLTL was evaluated for feasibility by PDS preliminary engineering and it was determined to not be a feasible alternative. No other safety mitigation strategies are recommended.

IX_70_03024 – STH 21 Beckwith Ave (Intersection Identified) – Of the four crashes at this intersection, no crashes remain after vetting. No safety mitigation strategies are recommended.

IX_70_03034 – STH 21 & Alder Ave & Goldenrod Dr (Intersection Identified) – Of the ten crashes at this intersection, three remained after vetting. Two EB rear end crashes while turning onto Goldenrod and on WB rear end crash while turning onto Alder Ave. A TWLTL was evaluated for feasibility by PDS preliminary engineering and it was determined to not be a feasible alternative. No other safety mitigation strategies are recommended.

IX_70_02902 – STH 21 & Rivermoor Rd (Intersection Identified) - Of the four crashes at this intersection, no crashes remain after vetting. No safety mitigation strategies are recommended.

IX_70_02649 – STH 21 & CTH FF/Reighmoor Rd (Intersection Identified) – Of the eleven crashes at this intersection, nine crashes remain after vetting. Six of the nine crashes involved left turning crashes from Hwy 21. One NB left failed to yield to a SB motorist. One SB failed to yield to WB. The remaining crash was not intersection related but the driver drifted off the roadway to the right. Two safety mitigation strategies are recommended to move forward with the CGA process. The first alternative is to add install positive offset left turn lanes on STH 21. The second alternative is to install a roundabout at the intersection.

IX_70_02660 – STH 21 & Sand Pit Rd (Intersection Identified) – Of the eleven crashes at this intersection, eleven crashes remain after vetting. Ten of the eleven crashes involve a left turning vehicle from Highway 21. The specific crash types with the left turns are identified on the collision diagram in Appendix A. The remaining crash was a NB failure to yield to an EB. Two safety mitigation strategies are recommended to move forward with the CGA process. The first alternative is to add install positive offset left turn lanes on STH 21. The second alternative is to install a roundabout at the intersection.

3. **Were possible safety mitigation alternatives identified in the CGA Process?** Yes ☒ No ☐

Comments:

IX_70_02649 – STH 21 & CTH FF/Reighmoor Rd - Two safety mitigation strategies are recommended to move forward with the CGA process. The first alternative is to add install positive offset left turn lanes on STH 21. The second alternative is to install a roundabout at the intersection. Each alternative will target the six mainline left turn crashes that have occurred. Additionally, the two right-angle crashes can be targeted by the roundabout alternative.

IX_70_02660 – STH 21 & Sand Pit Rd - Two safety mitigation strategies are recommended to move forward with the CGA process. The first alternative is to add install positive offset left turn lanes on STH 21. The second alternative is to install a roundabout at the intersection. Each alternative will target the ten mainline left turning crashes that have occurred. Additionally, the right-angle crash will be targeted by the roundabout alternative.

4. **Were safety mitigation alternatives analyzed in this project?** Yes ☒ No ☐

4.1. **Provide narrative of existing geometric conditions and describe any geometric features that contributed to the type or severity of the crashes.**

IX_70_02649 – STH 21 & CTH FF/Reighmoor Rd – The current lane configuration at this intersection consists of a right turn lane and a shared through/left turn lane on STH 21. The absence of the left turn lane has contributed to one fatal crash, two suspect minor injury crashes, two possible injury crashes, and one property damage only crash. Based on mainline and sideroad volumes, picking an adequate gap is also challenging on the sideroad which has contributed to some of the other crashes. The remaining crashes resulted in two suspected minor injuries, and one possible injury crash.

IX_70_02660 – STH 21 & Sand Pit Rd - The current lane configuration at this intersection consists of a right turn lane and a shared through/left turn lane on STH 21. The absence of the left turn lane has contributed to five suspected minor injuries, three possible injuries, and two property damage only crashes. The remaining right-angle crash resulted in property damage only.

4.2. Provide narrative of crash history, crash trends, and contributing factors that were targeted in the safety mitigation alternatives.

IX_70_02649 – STH 21 & CTH FF/Reighmoor Rd – Of the eleven crashes at this intersection, nine crashes remain after vetting. Six of the nine crashes involved left turning crashes from Hwy 21. One NB left failed to yield to a SB motorist. One SB failed to yield to WB. The remaining crash was not intersection related but the driver drifted off the roadway to the right. The current lane configuration at this intersection consists of a right turn lane and a shared through/left turn lane on STH 21. The absence of the left turn lane has contributed to one fatal crash, two suspect minor injury crashes, two possible injury crashes, and one property damage only crash. The remaining crashes resulted in two suspected minor injuries and one property damage only crash. The left turn lane alternative will target the left turn crashes. The roundabout alternative will target the left turn crashes and right-angle crashes.

IX_70_02660 – STH 21 & Sand Pit Rd - Of the eleven crashes at this intersection, eleven crashes remain after vetting. Ten of the eleven crashes involve a left turning vehicle from Highway 21. One NB motorist failed to yield to a EB motorist. The current lane configuration at this intersection consists of a right turn lane and a shared through/left turn lane on STH 21. The absence of the left turn lane has contributed to five suspected minor injuries, three possible injuries, and two property damage only crashes. The remaining right-angle crash resulted in property damage only. The left turn lane alternative will target the left turn crashes. The roundabout alternative will target the left turn crashes and right-angle crashes.

4.3. Provide narrative and the name for each safety mitigation alternative analyzed in SMCP

STH 21 & CTH FF/Reighmoor Rd

Concrete Repair & Overlay – Base case with no geometric improvements.

STH 21 Left Turn Lanes – Add EB and WB left turn lanes on STH 21. Final geometry for EB and WB approaches will consist of a left turn lane, a through lane, and a right turn lane.

Single lane roundabout – Construct a single lane roundabout at the CTH FF/Reighmoor Rd intersection.

STH 21 & Sand Pit Road

Concrete Repair & Overlay – Base case with no geometric improvements.

STH 21 Left Turn Lanes - Add EB and WB left turn lanes on STH 21. Final geometry for EB and WB approaches will consist of a left turn lane, a through lane, and a right turn lane.

Single lane roundabout - Construct a single lane roundabout at the Sand Pit Rd intersection.

4.4. **Analysis Results**

Analysis Location: STH 21 & CTH FF/Reighmoor Rd
Analysis Method: 2a

	Base	Alt. A	Alt. B	Add/Remove columns
Alternative Name	Concrete Repair & Overlay	STH 21 Left Turn Lanes	Roundabout	
Fatal & Injury	5.806	3.019	2.360	
Property Damage	13.169	6.848	15.651	
Total	18.975	9.867	18.011	
Benefits	-	$1,653,033.89	$2,744,853.97	
Net Cost	$0	$660,000	$780,000	
B/C		**2.5046**	**3.5190**	

Comments:
Both the left turn lane and roundabout alternative have B/C greater than 1.0 using IHSDM with Wisconsin calibration, crash distribution, model, and economic analysis model data sets. No external CMF's were applied.

Analysis Location: STH 21 & Sand Pit Road
Analysis Method: 2a

	Base	Alt. A	Alt. B	Add/Remove columns
Alternative Name	Concrete Repair & Overlay	STH 21 Left Turn Lanes	Roundabout	
Fatal & Injury	4.918	2.557	2.965	
Property Damage	11.153	5.800	18.645	
Total	16.071	8.357	21.610	
Benefits	-	$1,400,196.68	$2,108,056.68	
Net Cost	$0	$550,000	$730,000	
B/C		**2.5458**	**2.8878**	

Comments:
Both the left turn lane and roundabout alternative have B/C greater than 1.0 using IHSDM with Wisconsin calibration, crash distribution, model, and economic analysis model data sets. No external CMF's were applied.

4.5. **Provide narrative of reasonable and acceptable safety mitigation alternatives for consideration in the project improvement process**

STH 21 & CTH FF/Reighmoor Rd

Alt. A - STH 21 Left Turn Lanes – The addition of left turn lanes on STH 21 approaching CTH FF/Reighmoor Road should be considered as a feasible alternative for consideration through the NEPA process.

Alt. B - Single lane roundabout – A single lane roundabout at the intersection of STH 21 & CTH FF/Reighmoor Rd should be considered as a feasible alternative for consideration through the NEPA process.

STH 21 & Sand Pit Road

Alt. A - STH 21 Left Turn Lanes - The addition of left turn lanes on STH 21 approaching Sand Pit Road should be considered as a feasible alternative for consideration through the NEPA process.

Alt. B - Single Lane Roundabout - A single lane roundabout at the intersection of STH 21 & Sand Pit Rd should be considered as a feasible alternative for consideration through the NEPA process.

ATTACHMENTS

Include all attachments in the final SCD and submit as a PDF

A. Project Information
    a. Project Location/Overview Map
    b. Crash Diagram(s)
B. Sites of Promise Documentation
    a. Meta-Manager spreadsheet
    b. Intersection Network Screening spreadsheet
C. Crash Vetting Documentation
    a. WisTransPortal crash data spreadsheet with vetting comments
D. Contributing Geometric Analysis Documentation
    a. Safety Certification Worksheet
E. Safety Mitigation Certification Documentation
    a. Layout/Schematic for each alternative
    b. Cost estimate for each alternative
    c. IHSDM Crash Prediction Evaluation Report for each alternative
    d. IHSDM Economic Analysis Report
    e. Highway Safety Benefit Cost Analysis Tool results

ATTACHMENT A

Project Information

Project Location/Overview Map

Safety Certification Mapping (SCM) Tool

Design ID 6180-30-00	Construction ID(s)
Project Title OMRO - OSHKOSH	Project Description STH 116 - LEONARD POINT ROAD

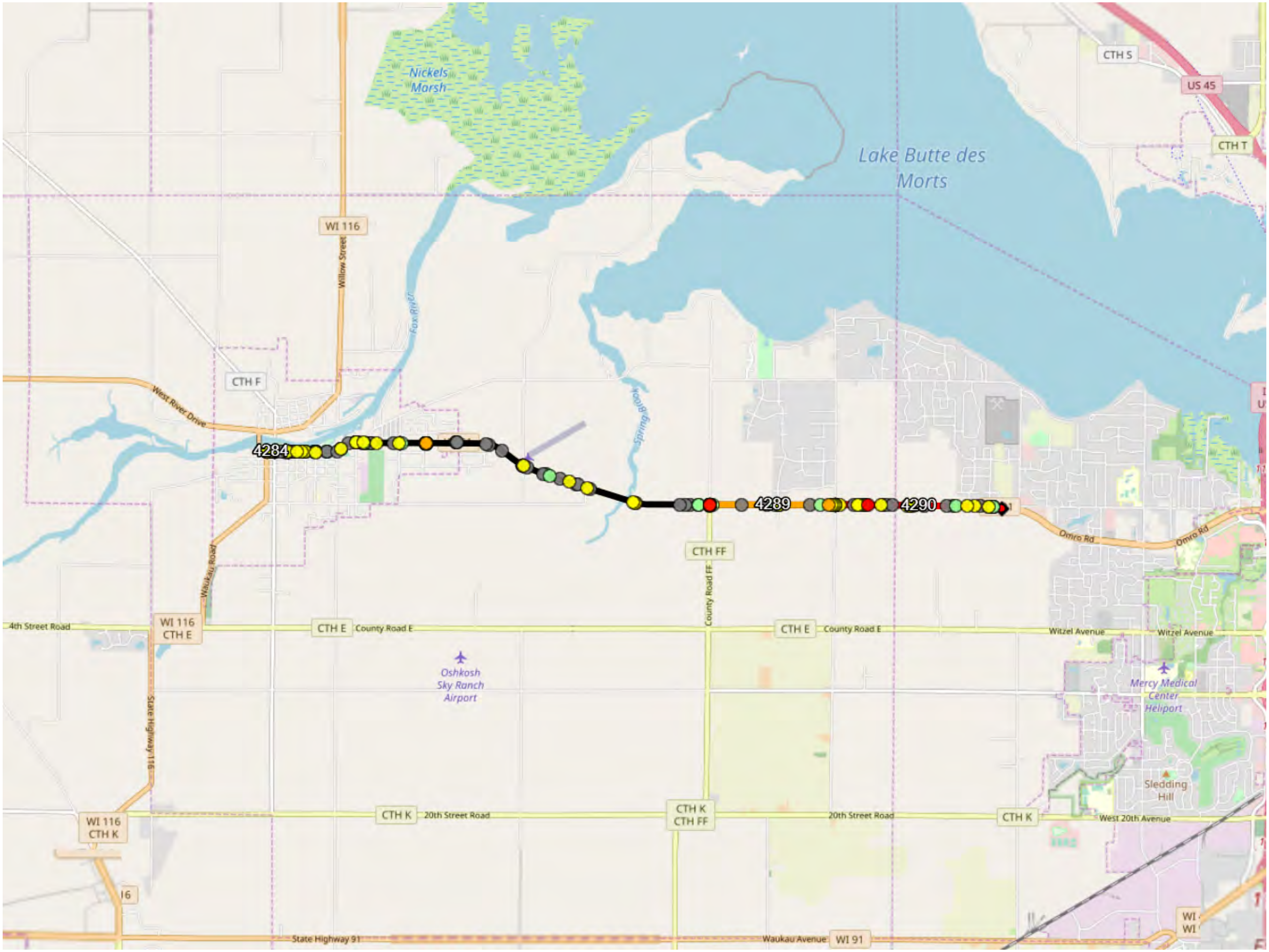
SCM Comment

Meta Manager Version: 2019-10
Meta Manager Crash Years: 2014-2018
SCM Crash Years: 2014-2018

Sites of Promise

Corridor #	Highway	Start County	End County	Start RP	End RP
1	WIS 21 EB	WINNEBAGO	WINNEBAGO	021E162T000	021E170K000

4284: KAB, Crash Rate
4289: KAB
4290: KAB, Crash Rate


Nickels Marsh
Lake Butte des Morts
CTH S
US 45
CTH T
WI 116
Willow Street
Fox River
CTH F
West River Drive
Spring Brook
4284
4289
4290
CTH FF
County Road FF
Omro Rd
Waukau Road
4th Street Road
WI 116
CTH E
CTH E
County Road E
CTH E
County Road E
Witzel Avenue
Witzel Avenue
Oshkosh Sky Ranch Airport
Mercy Medical Center Heliport
State Highway 116
Sledding Hill
WI 116
CTH K
CTH K
20th Street Road
CTH K
CTH FF
20th Street Road
CTH K
West 20th Avenue
State Highway 91
Waukau Avenue
WI 91

Corridor # 1: WIS 21 EB - 021E162T000 - 021E170K000

Meta Manager Version: 2019-10 Crash Years: 2014-2018					SCM Crash Years: 2014-2018					
PDP ID	Crash	KAB	Int Crash	Int KAB	K	A	B	C	O	TOTAL
4284	2.1088	2.0873					2	1	7	10
4285									5	5
4286							9	5	22	36
4287						1	3	2	12	18
4288							6	3	13	22
4289		1.4584			1	1	7	7	6	22
4290	1.1763	1.7913			1		13	6	17	37
TOTAL					2	2	40	24	82	

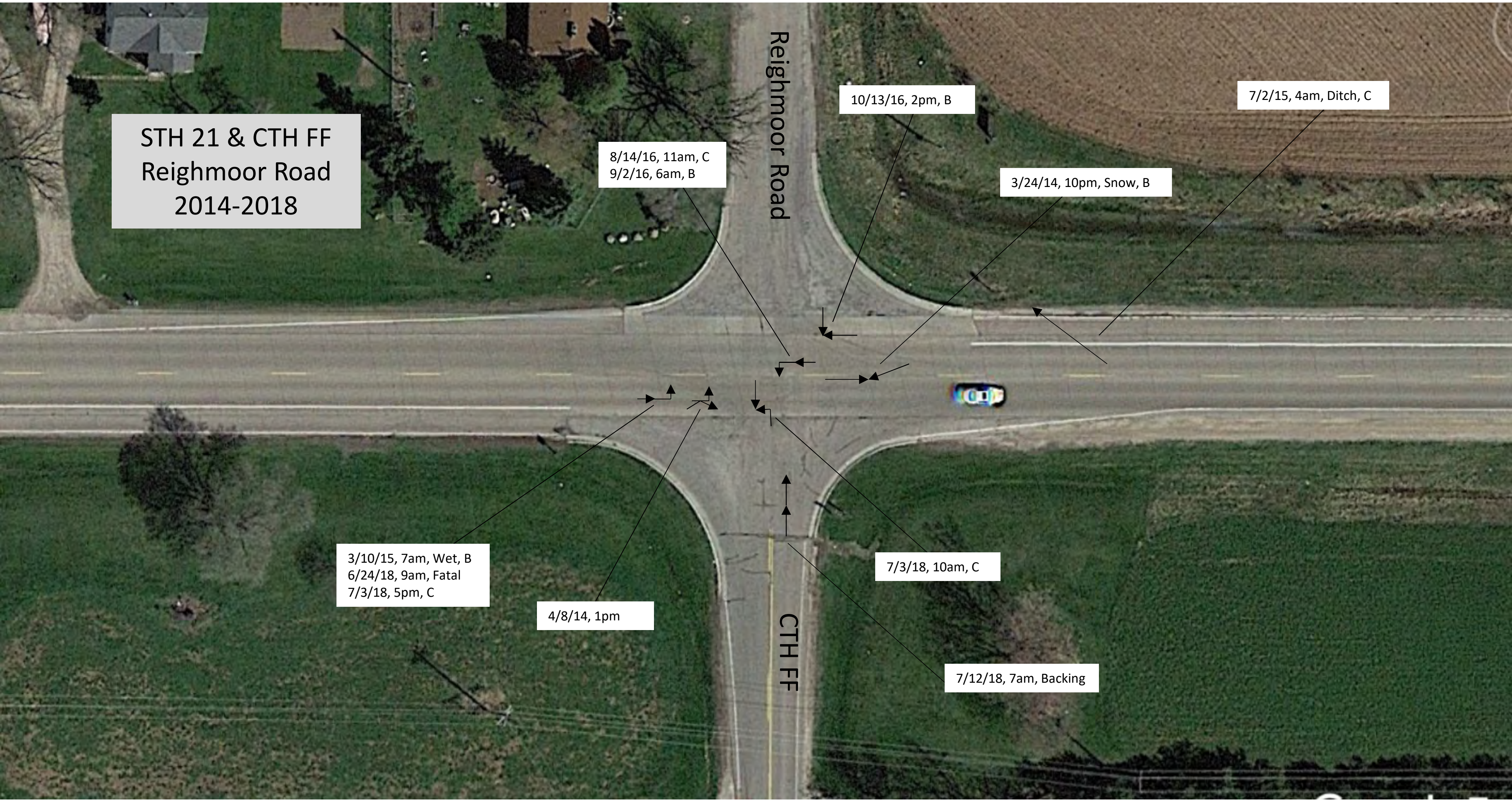
Manner of Collision

PDP ID	NO COLLISION	REAR END	SS OPP	SS SAME	OTHER	TOTAL
4284		9			1	10
4285	1	2		1	1	5
4286	9	20	1		6	36
4287	3	7	1		7	18
4288	12	7		1	2	22
4289	8	8			6	22
4290	10	17	2	1	7	37

ATTACHMENT A

Project Information

Crash Diagram(s)



STH 21 & CTH FF
Reighmoor Road
2014-2018

8/14/16, 11am, C
9/2/16, 6am, B

10/13/16, 2pm, B

7/2/15, 4am, Ditch, C

3/24/14, 10pm, Snow, B

3/10/15, 7am, Wet, B
6/24/18, 9am, Fatal
7/3/18, 5pm, C

4/8/14, 1pm

7/3/18, 10am, C

7/12/18, 7am, Backing

STH 21 & Sand Pit Road
2015- 2019

6/14/15, 5pm
11/23/15, 5pm
5/2/16, 7am, B
5/31/16, 11am, C
8/25/17, 10am, B

10/31/19, 10AM, Wet

12/18/17, 5pm, B
5/25/19, 4pm, C
5/28/19, 3pm, B
10/3/19, 4pm, C

12/19/15, 9am, C

4/27/15, 6pm, C

ATTACHMENT B

Sites of Promise Documentation

Meta-Manager Spreadsheet

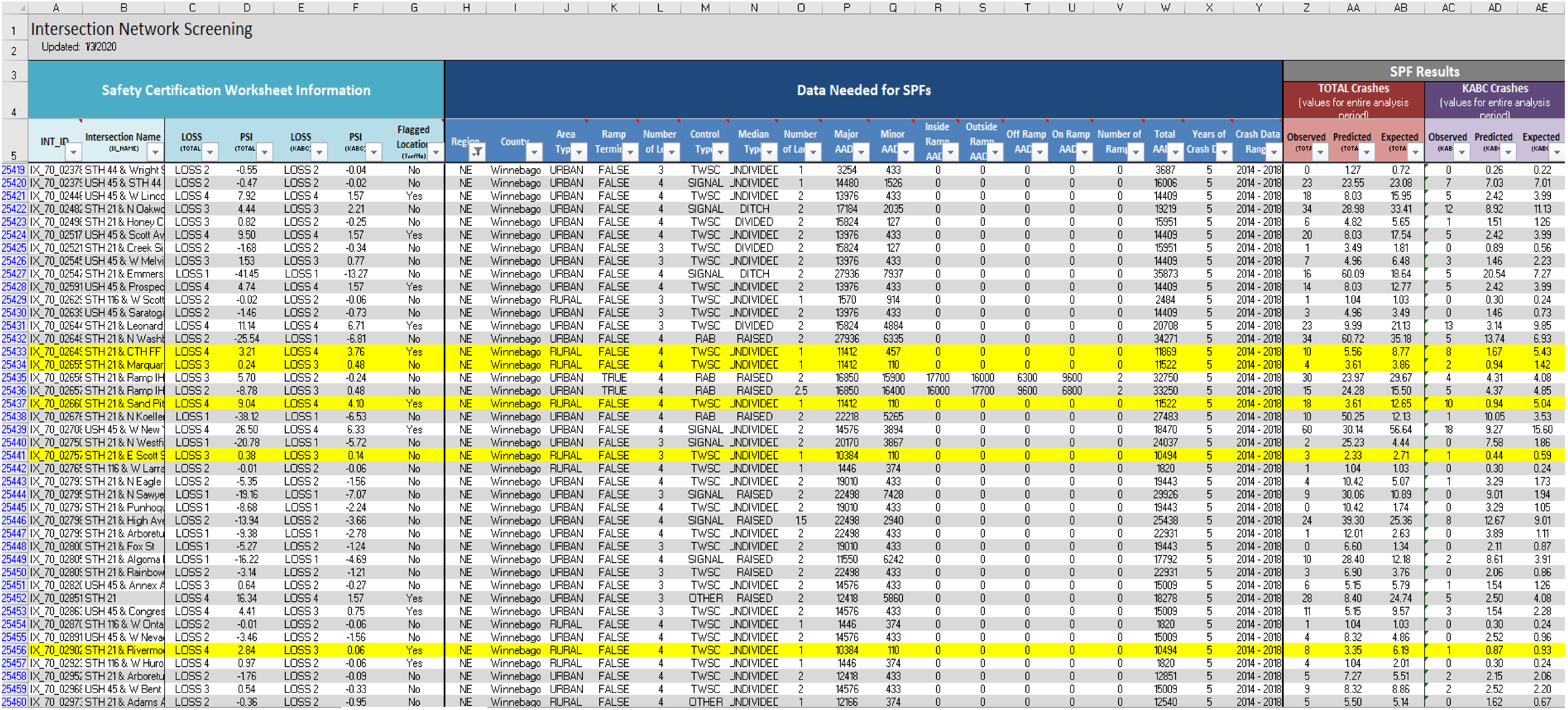
PDP_ID	ISEQNO	TRAF_SEG_ID	RECKEY	FOS_PROJ_ID	PDP_FRM	PDP_TO	PDP_MILE	ACSI_INTS_NM	DIVUND	HWY&DIR	PPROJ_GRP_DESC	RATE	RATEFLAG	CRASHES	CRASHYR5	CRASHYR4	CRASHYR3	CRASHYR2	CRASHYR1	CPM	AKNO	AKPROP	AKFLAG	RORPROP	RORFLAG	INTPROP	INTFLAG
4311	24840	6417	100988	61803071	021E162T000	021E162T006	0.06	STH 116 WB	U	021E	STH 116 - LEONARDS POINT ROAD	992.654	2.10	2.0	2	2	2	2	2	33.3	0.0	0.0%	0.00	0.0%	0.00	70.0%	1.01
4312	24840	9150	100988	61803071	021E162T006	021E162T017	0.11	WEBSTER AVE	U	021E	STH 116 - LEONARDS POINT ROAD	268.680	0.00	1.0	1	1	2	0	1	9.1	0.0	0.0%	0.00	40.0%	0.00	40.0%	0.00
4313	24840	8337	100988	61803071	021E162T017	021E162T110	0.93	MADISON AVE	U	021E	STH 116 - LEONARDS POINT ROAD	197.493	0.00	7.2	4	6	5	12	9	7.7	0.0	0.0%	0.00	5.6%	0.00	61.1%	0.00
4314	24850	8337	100988	61803071	021E162T110	021E166 000	1.06	INDUSTRIAL DR	U	021E	STH 116 - LEONARDS POINT ROAD	86.636	0.00	3.6	2	2	2	6	6	3.4	0.2	5.6%	0.00	16.7%	0.00	66.7%	1.24
4315	24860	8337	100988	61803071	021E166 000	021E168 000	1.57	RIVERMOOR RD	U	021E	STH 116 - LEONARDS POINT ROAD	71.492	0.00	4.4	5	2	5	4	6	2.8	0.0	0.0%	0.00	40.9%	0.00	22.7%	0.00
4316	24870	6712	100988	61803071	021E168 000	021E169 000	1.02	CTH FF	U	021E	STH 116 - LEONARDS POINT ROAD	106.568	0.00	4.4	7	0	6	5	4	4.3	0.4	9.1%	0.00	36.4%	0.00	54.5%	1.04
4317	24880	6712	100988	61803071	021E169 000	021E170K000	1.35	SAND PIT RD	U	021E	STH 116 - LEONARDS POINT ROAD	135.417	1.18	7.4	5	9	7	9	7	5.5	0.2	2.7%	0.00	43.2%	1.09	24.3%	0.00

PDP_ID	CRSHSPOT	SEVINDX	SIREDUC	LOP	IMPFLAG	SFTY_TRVL_CLS_CD	HSTL_AADT_5_YR	MMGR_WTHR_CRSH_TOT	MMGR_FATAL_CRSH_TOT	MMGR_INCAP_INJ_CRSH_TOT	MMGR_NONINCAP_INJ_CRSH_TOT	MMGR_PSBL_INJ_CRSH_TOT	MMGR_PD_ONLY_CRSH_TOT	MMGR_BIKE_CRSH_TOT	MMGR_PED_CRSH_TOT	WI_CNTY_NM	YRS_OTT	MMGR_HMVMT	MMGR_FATL_INJY_OCCP_TOT	MMGR_INCAP_INJY_OCCP_TOT	MMGR_NONINCAP_INJY_OCCP_TOT	MMGR_PSBL_INJY_OCCP_TOT	MMGR_KAB_INJY_RT	MMGR_KAB_INJY_RT_FL	MMGR_KAB_CRSH_RT	MMGR_KAB_CRSH_RT_FL	MMGR_DRV_FL	UCL_CRSH_RT	UCL_KAB_INJY_RT	UCL_KAB_CRSH_RT	ECON_RCD_OVER_RSRF
4311	1	15	9	18	YES	440	9200	3	0	0	2	1	7	0	0	WINNEBAGO	5	0.0101	0	0	2	1	198.531	1.78	198.531	2.08	0	472.631	111.316	95.274	$0
4312	0	3				440	9270	1	0	0	0	0	5	0	0	WINNEBAGO	5	0.0186	0	0	0	0	0.000	0.00	0.000	0.00	0	427.027	93.714	79.538	$4,570
4313	0	64				440	10740	8	0	0	9	5	22	2	1	WINNEBAGO	5	0.1823	0	0	9	8	49.373	0.00	49.373	0.00	0	340.621	60.362	49.724	$0
4314	1	33	30	11	YES	430	10740	3	0	1	3	2	12	0	0	WINNEBAGO	5	0.2078	0	1	8	3	43.318	1.07	19.252	0.00	0	117.706	40.545	29.869	$14,010
4315	0	40				430	10740	8	0	0	6	3	13	0	0	WINNEBAGO	5	0.3077	0	0	7	8	22.747	0.00	19.498	0.00	0	113.869	38.447	28.118	$0
4316	1	63	47	11	YES	430	11090	5	1	1	7	7	6	0	0	WINNEBAGO	5	0.2064	1	6	11	17	87.192	2.15	43.596	1.46	0	117.775	40.583	29.901	$715,536
4317	1	85	33	20	YES	430	11090	7	1	0	13	6	17	0	0	WINNEBAGO	5	0.2732	1	0	20	11	76.858	1.97	51.239	1.79	0	114.952	39.039	28.612	$404,004

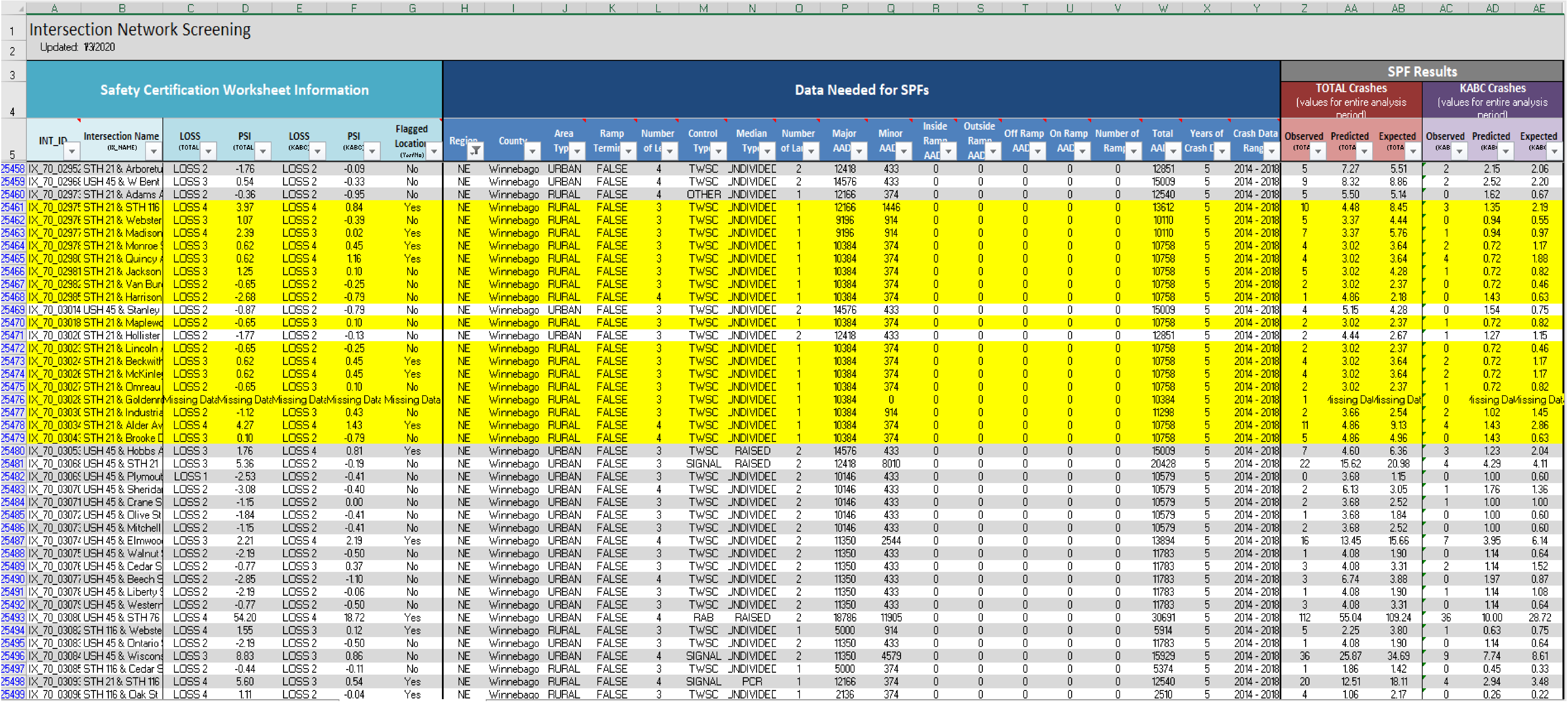
ATTACHMENT B

Sites of
Promise
Documentation

Intersection Network Screening Spreadsheet



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE
1	Intersection Network Screening																														
2	Updated: 1/3/2020																														
3	Safety Certification Worksheet Information							Data Needed for SPFs																		SPF Results					
4																										TOTAL Crashes (values for entire analysis period)			KABC Crashes (values for entire analysis period)		
5	INT_ID	Intersection Name (IX_NAME)	LOSS (TOTAL	PSI (TOTAL	LOSS (KABC)	PSI (KABC)	Flagged Location (Yes/No)	Region	County	Area Typ	Ramp Termi	Number of Le	Control Typ	Median Typ	Number of La	Major AAD	Minor AAD	Inside Ramp AAD	Outside Ramp AAD	Off Ramp AAD	On Ramp AAD	Number of Ramp	Total AAD	Years of Crash D	Crash Data Rang	Observed (TOTA	Predicted (TOTA	Expected (TOTA	Observed (KAB	Predicted (KAB	Expected (KABC
25419	IX_70_0237	STH 44 & Wright	LOSS 2	-0.55	LOSS 2	-0.04	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	1	3254	433	0	0	0	0	0	3687	5	2014 - 2018	0	1.27	0.72	0	0.26	0.22
25420	IX_70_0237	USH 45 & STH 44	LOSS 2	-0.47	LOSS 2	-0.02	No	NE	Winnebago	URBAN	FALSE	4	SIGNAL	UNDIVIDED	1	14480	1526	0	0	0	0	0	16006	5	2014 - 2018	23	23.55	23.08	7	7.03	7.01
25421	IX_70_0244	USH 45 & W Linco	LOSS 4	7.92	LOSS 4	1.57	Yes	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	13976	433	0	0	0	0	0	14409	5	2014 - 2018	18	8.03	15.95	5	2.42	3.99
25422	IX_70_0248	STH 21 & N Oakwo	LOSS 3	4.44	LOSS 3	2.21	No	NE	Winnebago	URBAN	FALSE	4	SIGNAL	DITCH	2	17184	2035	0	0	0	0	0	19219	5	2014 - 2018	34	28.98	33.41	12	8.92	11.13
25423	IX_70_0249	STH 21 & Honey C	LOSS 3	0.82	LOSS 2	-0.25	No	NE	Winnebago	URBAN	FALSE	4	TWSC	DIVIDED	2	15824	127	0	0	0	0	0	15951	5	2014 - 2018	6	4.82	5.65	1	1.51	1.26
25424	IX_70_02517	USH 45 & Scott Av	LOSS 4	9.50	LOSS 4	1.57	Yes	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	13976	433	0	0	0	0	0	14409	5	2014 - 2018	20	8.03	17.54	5	2.42	3.99
25425	IX_70_02521	STH 21 & Creek Si	LOSS 2	-1.68	LOSS 2	-0.34	No	NE	Winnebago	URBAN	FALSE	3	TWSC	DIVIDED	2	15824	127	0	0	0	0	0	15951	5	2014 - 2018	1	3.49	1.81	0	0.89	0.56
25426	IX_70_0254	USH 45 & W Melvi	LOSS 3	1.53	LOSS 3	0.77	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	13976	433	0	0	0	0	0	14409	5	2014 - 2018	7	4.96	6.48	3	1.46	2.23
25427	IX_70_0254	STH 21 & Emmers	LOSS 1	-41.45	LOSS 1	-13.27	No	NE	Winnebago	URBAN	FALSE	4	SIGNAL	DITCH	2	27936	7937	0	0	0	0	0	35873	5	2014 - 2018	16	60.09	18.64	5	20.54	7.27
25428	IX_70_02591	USH 45 & Prospec	LOSS 4	4.74	LOSS 4	1.57	Yes	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	13976	433	0	0	0	0	0	14409	5	2014 - 2018	14	8.03	12.77	5	2.42	3.99
25429	IX_70_0262	STH 116 & W Scott	LOSS 2	-0.02	LOSS 2	-0.06	No	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	1570	914	0	0	0	0	0	2484	5	2014 - 2018	1	1.04	1.03	0	0.30	0.24
25430	IX_70_0263	USH 45 & Saratog	LOSS 2	-1.46	LOSS 2	-0.73	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	13976	433	0	0	0	0	0	14409	5	2014 - 2018	3	4.96	3.49	0	1.46	0.73
25431	IX_70_0264	STH 21 & Leonard	LOSS 4	11.14	LOSS 4	6.71	Yes	NE	Winnebago	URBAN	FALSE	3	TWSC	DIVIDED	2	15824	4884	0	0	0	0	0	20708	5	2014 - 2018	23	9.99	21.13	13	3.14	9.85
25432	IX_70_0264	STH 21 & N Wash	LOSS 2	-25.54	LOSS 1	-6.81	No	NE	Winnebago	URBAN	FALSE	4	RAB	RAISED	2	27936	6335	0	0	0	0	0	34271	5	2014 - 2018	34	60.72	35.18	5	13.74	6.93
25433	IX_70_0264	STH 21 & CTH FF	LOSS 4	3.21	LOSS 4	3.76	Yes	NE	Winnebago	RURAL	FALSE	4	TWSC	UNDIVIDED	1	11412	457	0	0	0	0	0	11869	5	2014 - 2018	10	5.56	8.77	8	1.67	5.43
25434	IX_70_0265	STH 21 & Marquar	LOSS 3	0.24	LOSS 3	0.48	No	NE	Winnebago	RURAL	FALSE	4	TWSC	UNDIVIDED	1	11412	110	0	0	0	0	0	11522	5	2014 - 2018	4	3.61	3.86	2	0.94	1.42
25435	IX_70_0265	STH 21 & Ramp IH	LOSS 3	5.70	LOSS 2	-0.24	No	NE	Winnebago	URBAN	TRUE	4	RAB	RAISED	2	16850	15900	17700	16000	6300	9600	2	32750	5	2014 - 2018	30	23.97	29.67	4	4.31	4.08
25436	IX_70_0265	STH 21 & Ramp IH	LOSS 2	-8.78	LOSS 3	0.48	No	NE	Winnebago	URBAN	TRUE	4	RAB	RAISED	2.5	16850	16400	16000	17700	9600	6800	2	33250	5	2014 - 2018	15	24.28	15.50	5	4.37	4.85
25437	IX_70_0266	STH 21 & Sand Pit	LOSS 4	9.04	LOSS 4	4.10	Yes	NE	Winnebago	RURAL	FALSE	4	TWSC	UNDIVIDED	1	11412	110	0	0	0	0	0	11522	5	2014 - 2018	18	3.61	12.65	10	0.94	5.04
25438	IX_70_0267	STH 21 & N Koelle	LOSS 1	-38.12	LOSS 1	-6.53	No	NE	Winnebago	URBAN	FALSE	4	RAB	RAISED	2	22218	5265	0	0	0	0	0	27483	5	2014 - 2018	10	50.25	12.13	1	10.05	3.53
25439	IX_70_0270	USH 45 & W New	LOSS 4	26.50	LOSS 4	6.33	Yes	NE	Winnebago	URBAN	FALSE	4	SIGNAL	UNDIVIDED	2	14576	3894	0	0	0	0	0	18470	5	2014 - 2018	60	30.14	56.64	18	9.27	15.60
25440	IX_70_0275	STH 21 & N Westfi	LOSS 1	-20.78	LOSS 1	-5.72	No	NE	Winnebago	URBAN	FALSE	3	SIGNAL	UNDIVIDED	2	20170	3867	0	0	0	0	0	24037	5	2014 - 2018	2	25.23	4.44	0	7.58	1.86
25441	IX_70_0275	STH 21 & E Scott	LOSS 3	0.38	LOSS 3	0.14	No	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	10384	110	0	0	0	0	0	10494	5	2014 - 2018	3	2.33	2.71	1	0.44	0.59
25442	IX_70_0276	STH 116 & W Larra	LOSS 2	-0.01	LOSS 2	-0.06	No	NE	Winnebago	RURAL	FALSE	4	TWSC	UNDIVIDED	1	1446	374	0	0	0	0	0	1820	5	2014 - 2018	1	1.04	1.03	0	0.30	0.24
25443	IX_70_0279	STH 21 & N Eagle	LOSS 2	-5.35	LOSS 2	-1.56	No	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	19010	433	0	0	0	0	0	19443	5	2014 - 2018	4	10.42	5.07	1	3.29	1.73
25444	IX_70_0279	STH 21 & N Sawye	LOSS 1	-19.16	LOSS 1	-7.07	No	NE	Winnebago	URBAN	FALSE	3	SIGNAL	RAISED	2	22498	7428	0	0	0	0	0	29926	5	2014 - 2018	9	30.06	10.89	0	9.01	1.94
25445	IX_70_0279	STH 21 & Punhoqu	LOSS 1	-8.68	LOSS 1	-2.24	No	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	19010	433	0	0	0	0	0	19443	5	2014 - 2018	0	10.42	1.74	0	3.29	1.05
25446	IX_70_0279	STH 21 & High Ave	LOSS 2	-13.94	LOSS 2	-3.66	No	NE	Winnebago	URBAN	FALSE	4	SIGNAL	RAISED	1.5	22498	2940	0	0	0	0	0	25438	5	2014 - 2018	24	39.30	25.36	8	12.67	9.01
25447	IX_70_0279	STH 21 & Arboretu	LOSS 1	-9.38	LOSS 1	-2.78	No	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	22498	433	0	0	0	0	0	22931	5	2014 - 2018	1	12.01	2.63	0	3.89	1.11
25448	IX_70_0280	STH 21 & Fox St	LOSS 1	-5.27	LOSS 2	-1.24	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	19010	433	0	0	0	0	0	19443	5	2014 - 2018	0	6.60	1.34	0	2.11	0.87
25449	IX_70_0280	STH 21 & Algoma	LOSS 1	-16.22	LOSS 1	-4.69	No	NE	Winnebago	URBAN	FALSE	4	SIGNAL	RAISED	2	11550	6242	0	0	0	0	0	17792	5	2014 - 2018	10	28.40	12.18	2	8.61	3.91
25450	IX_70_0280	STH 21 & Rainbow	LOSS 2	-3.14	LOSS 2	-1.21	No	NE	Winnebago	URBAN	FALSE	3	TWSC	RAISED	2	22498	433	0	0	0	0	0	22931	5	2014 - 2018	3	6.90	3.76	0	2.06	0.86
25451	IX_70_0282	USH 45 & Annex	LOSS 3	0.64	LOSS 2	-0.27	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	14576	433	0	0	0	0	0	15009	5	2014 - 2018	6	5.15	5.79	1	1.54	1.26
25452	IX_70_02851	STH 21	LOSS 4	16.34	LOSS 4	1.57	Yes	NE	Winnebago	URBAN	FALSE	3	OTHER	RAISED	2	12418	5860	0	0	0	0	0	18278	5	2014 - 2018	28	8.40	24.74	5	2.50	4.08
25453	IX_70_0286	USH 45 & Congres	LOSS 4	4.41	LOSS 3	0.75	Yes	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	14576	433	0	0	0	0	0	15009	5	2014 - 2018	11	5.15	9.57	3	1.54	2.28
25454	IX_70_0287	STH 116 & W Onta	LOSS 2	-0.01	LOSS 2	-0.06	No	NE	Winnebago	RURAL	FALSE	4	TWSC	UNDIVIDED	1	1446	374	0	0	0	0	0	1820	5	2014 - 2018	1	1.04	1.03	0	0.30	0.24
25455	IX_70_02891	USH 45 & W Neva	LOSS 2	-3.46	LOSS 2	-1.56	No	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	14576	433	0	0	0	0	0	15009	5	2014 - 2018	4	8.32	4.86	0	2.52	0.96
25456	IX_70_0290	STH 21 & Rivermo	LOSS 4	2.84	LOSS 3	0.06	Yes	NE	Winnebago	RURAL	FALSE	4	TWSC	UNDIVIDED	1	10384	110	0	0	0	0	0	10494	5	2014 - 2018	8	3.35	6.19	1	0.87	0.93
25457	IX_70_0292	STH 116 & W Huro	LOSS 4	0.97	LOSS 2	-0.06	Yes	NE	Winnebago	RURAL	FALSE	4	TWSC	UNDIVIDED	1	1446	374	0	0	0	0	0	1820	5	2014 - 2018	4	1.04	2.01	0	0.30	0.24
25458	IX_70_0295	STH 21 & Arboretu	LOSS 2	-1.76	LOSS 2	-0.09	No	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	12418	433	0	0	0	0	0	12851	5	2014 - 2018	5	7.27	5.51	2	2.15	2.06
25459	IX_70_0296	USH 45 & W Bent	LOSS 3	0.54	LOSS 2	-0.33	No	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	14576	433	0	0	0	0	0	15009	5	2014 - 2018	9	8.32	8.86	2	2.52	2.20
25460	IX_70_0297	STH 21 & Adams	LOSS 2	-0.36	LOSS 2	-0.95	No	NE	Winnebago	RURAL	FALSE	4	OTHER	UNDIVIDED	1	12166	374	0	0	0	0	0	12540	5	2014 - 2018	5	5.50	5.14	0	1.62	0.67



Intersection Network Screening

Updated: 1/3/2020

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE
3	Safety Certification Worksheet Information							Data Needed for SPFs																		SPF Results					
4																										TOTAL Crashes (values for entire analysis period)			KABC Crashes (values for entire analysis period)		
5	INT_ID	Intersection Name (IX_NAME)	LOSS (TOTAL	PSI (TOTAL	LOSS (KABC)	PSI (KABC)	Flagged Locatio (Yes/No)	Region	County	Area Typ	Ramp Termi	Number of Le	Control Typ	Median Typ	Number of La	Major AAD	Minor AAD	Inside Ramp AAD	Outside Ramp AAD	Off Ramp AAD	On Ramp AAD	Number of Ramp	Total AA	Years of Crash D	Crash Data Rang	Observed (TOTA	Predicted (TOTA	Expected (TOTA	Observed (KAB	Predicted (KAB	Expected (KABC
25458	IX_70_02952	STH 21 & Arboretu	LOSS 2	-1.76	LOSS 2	-0.09	No	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	12418	433	0	0	0	0	0	12851	5	2014 - 2018	5	7.27	5.51	2	2.15	2.06
25459	IX_70_02968	USH 45 & W Bent	LOSS 3	0.54	LOSS 2	-0.33	No	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	14576	433	0	0	0	0	0	15009	5	2014 - 2018	9	8.32	8.86	2	2.52	2.20
25460	IX_70_02973	STH 21 & Adams A	LOSS 2	-0.36	LOSS 2	-0.95	No	NE	Winnebago	RURAL	FALSE	4	OTHER	UNDIVIDED	1	12166	374	0	0	0	0	0	12540	5	2014 - 2018	5	5.50	5.14	0	1.62	0.67
25461	IX_70_02975	STH 21 & STH 116	LOSS 4	3.97	LOSS 4	0.84	Yes	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	12166	1446	0	0	0	0	0	13612	5	2014 - 2018	10	4.48	8.45	3	1.35	2.19
25462	IX_70_02976	STH 21 & Webster	LOSS 3	1.07	LOSS 2	-0.39	No	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	9196	914	0	0	0	0	0	10110	5	2014 - 2018	5	3.37	4.44	0	0.94	0.55
25463	IX_70_02977	STH 21 & Madison	LOSS 4	2.39	LOSS 3	0.02	Yes	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	9196	914	0	0	0	0	0	10110	5	2014 - 2018	7	3.37	5.76	1	0.94	0.97
25464	IX_70_02978	STH 21 & Monroe S	LOSS 3	0.62	LOSS 4	0.45	Yes	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	10384	374	0	0	0	0	0	10758	5	2014 - 2018	4	3.02	3.64	2	0.72	1.17
25465	IX_70_02980	STH 21 & Quincy A	LOSS 3	0.62	LOSS 4	1.16	Yes	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	10384	374	0	0	0	0	0	10758	5	2014 - 2018	4	3.02	3.64	4	0.72	1.88
25466	IX_70_02981	STH 21 & Jackson	LOSS 3	1.25	LOSS 3	0.10	No	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	10384	374	0	0	0	0	0	10758	5	2014 - 2018	5	3.02	4.28	1	0.72	0.82
25467	IX_70_02982	STH 21 & Van Bur	LOSS 2	-0.65	LOSS 2	-0.25	No	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	10384	374	0	0	0	0	0	10758	5	2014 - 2018	2	3.02	2.37	0	0.72	0.46
25468	IX_70_02985	STH 21 & Harrison	LOSS 2	-2.68	LOSS 2	-0.79	No	NE	Winnebago	RURAL	FALSE	4	TWSC	UNDIVIDED	1	10384	374	0	0	0	0	0	10758	5	2014 - 2018	1	4.86	2.18	0	1.43	0.63
25469	IX_70_03014	USH 45 & Stanley	LOSS 2	-0.87	LOSS 2	-0.79	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	14576	433	0	0	0	0	0	15009	5	2014 - 2018	4	5.15	4.28	0	1.54	0.75
25470	IX_70_03018	STH 21 & Maplewo	LOSS 2	-0.65	LOSS 3	0.10	No	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	10384	374	0	0	0	0	0	10758	5	2014 - 2018	2	3.02	2.37	1	0.72	0.82
25471	IX_70_03020	STH 21 & Hollister	LOSS 2	-1.77	LOSS 2	-0.13	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	12418	433	0	0	0	0	0	12851	5	2014 - 2018	2	4.44	2.67	1	1.27	1.15
25472	IX_70_03023	STH 21 & Lincoln A	LOSS 2	-0.65	LOSS 2	-0.25	No	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	10384	374	0	0	0	0	0	10758	5	2014 - 2018	2	3.02	2.37	0	0.72	0.46
25473	IX_70_03024	STH 21 & Beckwith	LOSS 3	0.62	LOSS 4	0.45	Yes	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	10384	374	0	0	0	0	0	10758	5	2014 - 2018	4	3.02	3.64	2	0.72	1.17
25474	IX_70_03026	STH 21 & McKinley	LOSS 3	0.62	LOSS 4	0.45	Yes	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	10384	374	0	0	0	0	0	10758	5	2014 - 2018	4	3.02	3.64	2	0.72	1.17
25475	IX_70_03027	STH 21 & Omreau	LOSS 2	-0.65	LOSS 3	0.10	No	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	10384	374	0	0	0	0	0	10758	5	2014 - 2018	2	3.02	2.37	1	0.72	0.82
25476	IX_70_03028	STH 21 & Goldenr	Missing Data	Missing Data	Missing Data	Missing Data	Missing Data	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	10384	0	0	0	0	0	0	10384	5	2014 - 2018	1	Missing Da	Missing Dat	0	Missing Da	Missing Dat
25477	IX_70_03030	STH 21 & Industria	LOSS 2	-1.12	LOSS 3	0.43	No	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	10384	914	0	0	0	0	0	11298	5	2014 - 2018	2	3.66	2.54	2	1.02	1.45
25478	IX_70_03034	STH 21 & Alder Av	LOSS 4	4.27	LOSS 4	1.43	Yes	NE	Winnebago	RURAL	FALSE	4	TWSC	UNDIVIDED	1	10384	374	0	0	0	0	0	10758	5	2014 - 2018	11	4.86	9.13	4	1.43	2.86
25479	IX_70_03043	STH 21 & Brooke D	LOSS 3	0.10	LOSS 2	-0.79	No	NE	Winnebago	RURAL	FALSE	4	TWSC	UNDIVIDED	1	10384	374	0	0	0	0	0	10758	5	2014 - 2018	5	4.86	4.96	0	1.43	0.63
25480	IX_70_03053	USH 45 & Hobbs A	LOSS 3	1.76	LOSS 4	0.81	Yes	NE	Winnebago	URBAN	FALSE	3	TWSC	RAISED	2	14576	433	0	0	0	0	0	15009	5	2014 - 2018	7	4.60	6.36	3	1.23	2.04
25481	IX_70_03068	USH 45 & STH 21	LOSS 3	5.36	LOSS 2	-0.19	No	NE	Winnebago	URBAN	FALSE	3	SIGNAL	RAISED	2	12418	8010	0	0	0	0	0	20428	5	2014 - 2018	22	15.62	20.98	4	4.29	4.11
25482	IX_70_03069	USH 45 & Plymout	LOSS 1	-2.53	LOSS 2	-0.41	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	10146	433	0	0	0	0	0	10579	5	2014 - 2018	0	3.68	1.15	0	1.00	0.60
25483	IX_70_03070	USH 45 & Sheridan	LOSS 2	-3.08	LOSS 2	-0.40	No	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	10146	433	0	0	0	0	0	10579	5	2014 - 2018	2	6.13	3.05	1	1.76	1.36
25484	IX_70_03071	USH 45 & Crane S	LOSS 2	-1.15	LOSS 2	0.00	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	10146	433	0	0	0	0	0	10579	5	2014 - 2018	2	3.68	2.52	1	1.00	1.00
25485	IX_70_03072	USH 45 & Olive St	LOSS 2	-1.84	LOSS 2	-0.41	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	10146	433	0	0	0	0	0	10579	5	2014 - 2018	1	3.68	1.84	0	1.00	0.60
25486	IX_70_03073	USH 45 & Mitchell	LOSS 2	-1.15	LOSS 2	-0.41	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	10146	433	0	0	0	0	0	10579	5	2014 - 2018	2	3.68	2.52	0	1.00	0.60
25487	IX_70_03074	USH 45 & Elmwoo	LOSS 3	2.21	LOSS 4	2.19	Yes	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	11350	2544	0	0	0	0	0	13894	5	2014 - 2018	16	13.45	15.66	7	3.95	6.14
25488	IX_70_03075	USH 45 & Walnut S	LOSS 2	-2.19	LOSS 2	-0.50	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	11350	433	0	0	0	0	0	11783	5	2014 - 2018	1	4.08	1.90	0	1.14	0.64
25489	IX_70_03076	USH 45 & Cedar S	LOSS 2	-0.77	LOSS 3	0.37	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	11350	433	0	0	0	0	0	11783	5	2014 - 2018	3	4.08	3.31	2	1.14	1.52
25490	IX_70_03077	USH 45 & Beech S	LOSS 2	-2.85	LOSS 2	-1.10	No	NE	Winnebago	URBAN	FALSE	4	TWSC	UNDIVIDED	2	11350	433	0	0	0	0	0	11783	5	2014 - 2018	3	6.74	3.88	0	1.97	0.87
25491	IX_70_03078	USH 45 & Liberty S	LOSS 2	-2.19	LOSS 2	-0.06	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	11350	433	0	0	0	0	0	11783	5	2014 - 2018	1	4.08	1.90	1	1.14	1.08
25492	IX_70_03079	USH 45 & Western	LOSS 2	-0.77	LOSS 2	-0.50	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	11350	433	0	0	0	0	0	11783	5	2014 - 2018	3	4.08	3.31	0	1.14	0.64
25493	IX_70_03080	USH 45 & STH 76	LOSS 4	54.20	LOSS 4	18.72	Yes	NE	Winnebago	URBAN	FALSE	4	RAB	RAISED	2	18786	11905	0	0	0	0	0	30691	5	2014 - 2018	112	55.04	109.24	36	10.00	28.72
25494	IX_70_03082	STH 116 & Webste	LOSS 4	1.55	LOSS 3	0.12	Yes	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	5000	914	0	0	0	0	0	5914	5	2014 - 2018	5	2.25	3.80	1	0.63	0.75
25495	IX_70_03083	USH 45 & Ontario S	LOSS 2	-2.19	LOSS 2	-0.50	No	NE	Winnebago	URBAN	FALSE	3	TWSC	UNDIVIDED	2	11350	433	0	0	0	0	0	11783	5	2014 - 2018	1	4.08	1.90	0	1.14	0.64
25496	IX_70_03084	USH 45 & Wiscons	LOSS 3	8.83	LOSS 3	0.86	No	NE	Winnebago	URBAN	FALSE	4	SIGNAL	UNDIVIDED	2	11350	4579	0	0	0	0	0	15929	5	2014 - 2018	36	25.87	34.69	9	7.74	8.61
25497	IX_70_03085	STH 116 & Cedar S	LOSS 2	-0.44	LOSS 2	-0.11	No	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	5000	374	0	0	0	0	0	5374	5	2014 - 2018	1	1.86	1.42	0	0.45	0.33
25498	IX_70_03093	STH 21 & STH 116	LOSS 4	5.60	LOSS 3	0.54	Yes	NE	Winnebago	RURAL	FALSE	4	SIGNAL	PCR	1	12166	374	0	0	0	0	0	12540	5	2014 - 2018	20	12.51	18.11	4	2.94	3.48
25499	IX_70_03096	STH 116 & Oak St	LOSS 4	1.11	LOSS 2	-0.04	Yes	NE	Winnebago	RURAL	FALSE	3	TWSC	UNDIVIDED	1	2136	374	0	0	0	0	0	2510	5	2014 - 2018	4	1.06	2.17	0	0.26	0.22

ATTACHMENT C

Crash Vetting Documentation

WisTransPortal crash data spreadsheet with vetting comments

CORRIDORID	CUMULMILE	PDPID	SEGLIST	DOCTNMBR	ACCDDATE	DAYNMBR	NTFYHOUR	
1	112.35	4284		CH5P4W8	8/24/2016	WED	15	WB left turn rear end
1	112.35	4284		2PL0QJJ8WV	4/1/2017	SAT	18	WB left turn rear end
1	112.35	4284		CH56BF3	6/28/2014	SAT	16	WB left turn rear end, dropped cell phone
1	112.35	4284		2NL01PTJN8	11/9/2018	FRI	13	NB fail to yield to WB
1	112.35	4284		CH5PW43	10/7/2016	FRI	21	WB yield to pedestrian rear ended
1	112.38	4284		CH56BFD	6/13/2015	SAT	14	WB slowing for stopped vehicles rear ended
1	112.38	4284		2NL01S9LVX	6/11/2017	SUN	17	Crash not at W Main & Jefferson
1	112.38	4284		2NL01VRP3X	2/24/2018	SAT	12	WB rear end of left turn into driveway
1	112.4	4284		CH5PW34	5/6/2015	WED	14	WB yield to pedestrian rear ended
1	112.4	4284		CH5L5ZQ	6/20/2014	FRI	7	WB yield to bikes in crosswalk rear ended
1	112.41	4285		2NL01S9LWL	5/23/2018	WED	7	
1	112.42	4285		CH5MNDT	9/19/2016	MON	7	
1	112.43	4285		CH5LX7F	6/25/2016	SAT	10	
1	112.47	4285		2NL01VRP3M	8/16/2017	WED	21	Pulled out of driveway causing M/C to lose control
1	112.49	4285		CH5L604	9/25/2014	THU	18	Hit & Run while parked left scene
1	112.52	4286		CH5LX62	3/16/2014	SUN	17	Ped hit by bypassing WB vehicle
1	112.52	4286		CH5LX7N	12/4/2016	SUN	12	NB fail to yield to EB, snowy/slushy roads
1	112.52	4286		2NL01VRP46	8/1/2018	WED	13	NB fail to yield to WB, causeing WB Side swipe of parked vehicle
1	112.55	4286		2NL01TJN03	5/5/2017	FRI	22	EB rear end mid-block
1	112.55	4286		CH5P4VG	7/4/2015	SAT	19	WB rear end mid-block
1	112.57	4286		2NL01S9LWF	3/27/2018	TUE	0	WB rear end turning left into Kwik Trip
1	112.6	4286		CH5LX63	3/18/2014	TUE	17	WB rear end turning left onto Monroe
1	112.6	4286		CH5PW3B	7/16/2015	THU	11	WB driver drifted north and struck parked vehicle
1	112.63	4286		CH56BFN	12/23/2016	FRI	15	WB rear end turning left onto Monroe during snowy pavement
1	112.63	4286		2NL00ZLVNK	11/2/2017	THU	18	WB rear end turning into driveway
1	112.65	4286		CH5PW3D	7/23/2015	THU	17	WB rear end to WB vehicle yielding to pedestrian in 300 block, ped not in crosswalk
1	112.66	4286		CH5MNDS	7/16/2015	THU	11	WB left turn into driveway failed to yield R/W to EB through
1	112.66	4286		2NL00ZLVND	6/1/2017	THU	17	WB left turn onto Quincy failed to yield R/W to EB Bike
1	112.74	4286		2NL00ZLVNB	5/27/2017	SAT	15	
1	112.75	4286		2NL01VRP3H	5/31/2017	WED	16	WB bike on sidewalk failed to yield to NB right turn on Jackson Ave.
1	112.75	4286		CH5PW2Z	2/27/2015	FRI	12	
1	112.75	4286		CH5LX7P	12/11/2016	SUN	6	
1	112.75	4286		CH5P4VM	10/10/2015	SAT	15	
1	112.84	4286		CH5P4VC	4/14/2015	TUE	14	
1	112.84	4286		CH5LX6H	11/5/2014	WED	11	
1	112.92	4286		CH54V12	2/6/2014	THU	10	
1	112.97	4286		CH54V10	1/10/2014	FRI	22	
1	112.97	4286		CH56BF5	8/30/2014	SAT	16	
1	113.04	4286		CH5LX7C	6/5/2016	SUN	16	
1	113.1	4286		2NL01VRP3S	11/25/2017	SAT	16	EB driver fell asleep and drifted south hitting vehicle at McKinley
1	113.1	4286		CH54V15	3/11/2014	TUE	10	WB rear end of left turn onto McKinley
1	113.1	4286		CH5LX6R	5/23/2015	SAT	9	WB rear end of left turn onto McKinley
1	113.11	4286		CJF1W3T	7/16/2016	SAT	20	WB rear end of left turn onto McKinley
1	113.16	4286		CH5L5ZR	6/28/2014	SAT	21	Imparied driver hit pedestrian crossing sign
1	113.17	4286		2NL01PTJN9	12/18/2018	TUE	16	WB rear end of vehicle yielding for pedestrian crossing
1	113.17	4286		2NL01TJN0C	6/6/2018	WED	18	WB rear end of vehicle yielding for pedestrian crossing
1	113.18	4286		CH5L5ZW	8/8/2014	FRI	14	WB rear end of vehicle yielding for pedestrian crossing
1	113.22	4286		CH5PW2S	1/27/2015	TUE	9	
1	113.22	4286		CH5LX71	11/26/2015	THU	4	
1	113.27	4286		CH56BFF	7/1/2015	WED	15	
1	113.41	4286		CH56BFG	10/9/2015	FRI	16	
1	113.45	4287		CH56BF1	3/28/2014	FRI	17	
1	113.47	4287		CH5PW3P	11/11/2015	WED	13	
1	113.67	4287		2NL01VRP3Z	2/24/2018	SAT	13	EB rear end of left turning vehicle onto Goldenrod
1	113.68	4287		CH56BF2	5/22/2014	THU	15	NB fail to yield to EB
1	113.68	4287		CH5L5ZM	6/7/2014	SAT	9	NB fail to yield to WB
1	113.68	4287		CH5P4V7	12/29/2014	MON	14	NB fail to yield to EB
1	113.68	4287		CH56BF9	2/24/2015	TUE	5	SB fail to yield to EB, foot slipped off brake, Neither driver valid driver license
1	113.68	4287		CH5PW3H	8/15/2015	SAT	17	EB rear end of left turning vehicle onto Goldenrod
1	113.68	4287		CH5P4VZ	12/23/2015	WED	23	WB rear end of left turning vehicle onto Alder Ave
1	113.68	4287		2NL01VRP3L	7/2/2017	SUN	14	NB fail to yield to EB
1	113.68	4287		2NL01TJN08	12/30/2017	SAT	14	NB left fail to yield to SB through
1	113.68	4287		2NL01TJN0R	12/31/2018	MON	13	Rear end backing
1	113.93	4287		CH5L600	9/14/2014	SUN	11	
1	113.93	4287		CH5PW3C	7/20/2015	MON	11	
1	113.94	4287		CJ37SXV	3/28/2014	FRI	17	
1	114.17	4287		CH5PW3S	3/1/2016	TUE	7	
1	114.19	4287		CJCQMCZ	6/23/2015	TUE	15	
1	114.31	4287		CJFCHZS	6/17/2016	FRI	16	
1	114.51	4288		CJF43QV	11/27/2015	FRI	17	NB fail to yield to WB
1	114.51	4288		CJ2WG0F	2/16/2014	SUN	19	SB left turn fail to yield and EB took evasive action and went in ditch
1	114.51	4288		2PL0TKW13J	9/19/2018	WED	15	SB fail to yield to WB
1	114.55	4288		2PL0RC7178	12/11/2017	MON	16	EB mechanical issue lost control
1	114.69	4288		CJFF0HQ	12/17/2016	SAT	10	
1	114.71	4288		CJDG3ST	3/10/2015	TUE	18	
1	114.74	4288		CJF5L6G	1/8/2016	FRI	15	
1	114.83	4288		CH54V11	1/25/2014	SAT	11	
1	114.91	4288		CJ3MNFC	5/4/2014	SUN	18	
1	114.97	4288		CJD01JX	1/12/2015	MON	11	
1	114.98	4288		CJD01J8	10/13/2014	MON	21	
1	115.06	4288		2PL0QJJ91P	5/31/2018	THU	16	
1	115.09	4288		2PL0RMV8W0	1/30/2017	MON	16	
1	115.45	4288		2PL0SZCGFL	9/17/2018	MON	11	
1	115.47	4288		2NL01PTJN7	11/7/2018	WED	7	
1	115.48	4288		CJFCHZH	5/15/2016	SUN	7	
1	115.84	4288		CJCXK61	10/24/2015	SAT	19	
1	115.88	4288		CJ3JPJN	1/24/2014	FRI	18	
1	115.92	4288		2PL0RZQKSP	6/19/2018	TUE	15	
1	115.99	4288		CJFCJ0G	8/8/2016	MON	16	
1	115.99	4288		CJDQ8CD	12/20/2016	TUE	10	
1	116.07	4288		CJ37SZ0	4/8/2014	TUE	13	EB rear end turning left onto Reighmoor
1	116.08	4289		2PL0QJJ928	7/3/2018	TUE	17	EB rear end turning left onto Reighmoor
1	116.08	4289		CJ3NDMN	3/24/2014	MON	22	WB lost control on snowy pavement and hit EB
1	116.08	4289		CJDLK2P	3/10/2015	TUE	7	EB side swipe left turning vehicle onto Reighmoor
1	116.08	4289		2PL0RXHJS6	7/3/2018	TUE	10	NB left fail to yield to SB through
1	116.08	4289		2PL0QH97V2	6/24/2018	SUN	9	EB left fail to yield to WB
1	116.08	4289		CJDT75Q	9/2/2016	FRI	6	EB rear end turning left onto Reighmoor
1	116.08	4289		CJDBDND	8/14/2016	SUN	11	WB left fail to yield to EB
1	116.08	4289		CJFFQPH	10/13/2016	THU	14	SB fail to yield to WB
1	116.08	4289		2PL0RFP3KB	7/12/2018	THU	7	NB backing hit vehicle behind them
1	116.1	4289		CJCXK5C	7/2/2015	THU	4	WB fell asleep and drifted right just east of intersection
1	116.34	4289		2PL0RC718M	4/17/2018	TUE	13	EB ice fell off and hit WB
1	116.54	4289		KRL0DRXHLP	2/28/2018	WED	12	WB rear end of left turn into driveway
1	116.61	4289		CJFCJ03	7/11/2016	MON	10	EB rear end of right turn into driveway, dropped lunch and was picking it up
1	116.63	4289		CJ36BHC	1/16/2014	THU	9	EB lost control on snowy pavement
1	116.64	4289		CJDG3WV	1/7/2016	THU	14	EB lost control on wet pavement
1	116.64	4289		CJDRQNG	8/12/2015	WED	10	WB rear end turning left onto Potratz Hill Road
1	116.9	4289		CJ30DX5	3/24/2014	MON	23	EB lost control on icy pavement
1	116.98	4289		CJDR0G5	2/26/2016	FRI	18	EB swerved left to miss object in roadway and lost control
1	117.05	4289		CJD01LG	9/20/2015	SUN	6	WB drifted left over centerline and EB
1	117.08	4289		2PL0QWMM0L	3/25/2018	SUN	6	WB swerved to miss a dog and lost control
1	117.09	4289		CJCQM9V	11/18/2014	TUE	16	WB left fail to yield to EB
1	117.09	4289		CJDRQPP	12/19/2015	SAT	9	EB left overtaken on the left
1	117.1	4290		CJCW2P6	4/27/2015	MON	18	EB left fail to yield to WB
1	117.1	4290		CJD3QN1	6/14/2015	SUN	17	WB left rear end by WB
1	117.1	4290		CJDT74P	5/2/2016	MON	7	WB left rear end by WB
1	117.1	4290		CJDN1KS	11/23/2015	MON	17	WB left rear end by WB
1	117.1	4290		2PL0QH97S7	8/25/2017	FRI	10	WB left rear end by WB
1	117.1	4290		2PL0S9LVP3	12/18/2017	MON	17	EB left rear end by EB
1	117.1	4290		C3XC543	7/29/2014	TUE	13	NB fail to yield to EB
1	117.1	4290		CJ37SZN	7/20/2014	SUN	15	WB left rear end by WB
1	117.1	4290		CJF99B0	5/31/2016	TUE	11	WB left rear end by WB
1	117.12	4290		2PL0RLM7VM	4/18/2018	WED	7	EB rear end stopping for school bus ahead reaching for wallet
1	117.14	4290		CJDT760	9/24/2016	SAT	10	EB driver passed out and lost control
1	117.26	4290		CJCZ9BJ	1/26/2015	MON	20	EB lost control on ice
1	117.29	4290		CJD01KC	2/23/2015	MON	11	EB rear end slowing for traffic
1	117.31	4290		CJDR0FP	12/14/2015	MON	16	EB left into driveway rear ended
1	117.33	4290		2PL0RC718W	4/29/2018	SUN	15	WB lost control mechanical failure
1	117.35	4290		CJ3PW3G	9/7/2014	SUN	8	WB fell asleep and drifted left across centerline
1	117.36	4290		2PL0S3FP4F	10/14/2017	SAT	10	EB drifted left of center and hit WB
1	117.37	4290		2PL0QH97RC	1/4/2017	WED	11	WB drifted left of center and hit EB
1	117.49	4290		CJFFQNZ	8/12/2016	FRI	14	EB hit object in road
1	117.5	4290		CJCVBDS	10/16/2014	THU	13	WB rear end slowing for traffic
1	117.52	4290		2PL0RC713L	1/11/2017	WED	18	EB left turn into driveway overtaken on left
1	117.56	4290		2PL0RB000P	8/16/2017	WED	11	EB hit object in road
1	117.69	4290		2PL0RFP3JC	4/4/2018	WED	8	WB lost control passing with snowy pavement
1	117.73	4290		CJCPW6L	9/9/2015	WED	16	EB lost control overtaking right turning vehcile
1	117.73	4290		2PL0RXHJNX	10/10/2017	TUE	12	EB rear end adjusting radio
1	117.85	4290		CJF1W2X	3/1/2016	TUE	4	WB lost control on snowy pavement
1	118.01	4290		2PL0RMV8ZW	5/7/2018	MON	23	EB lost control swerving for racoon
1	118.08	4290		2PL0QCL4H3	10/23/2017	MON	15	WB rear ended waiting to turn left into driveway
1	118.09	4290		CJ399DJ	5/1/2014	THU	5	EB hit object in road
1	118.21	4290		CJDT75D	6/22/2016	WED	10	WB turning left into driveway rear ended
1	118.27	4290		CJDSGV9	6/14/2015	SUN	12	EB turning left into driveway rear ended
1	118.32	4290		CJD4GV8	10/29/2014	WED	17	EB rear end of slowing traffic ahead
1	118.36	4290		2PL0RFP3J9	3/26/2018	MON	12	WB turning left into driveway rear ended
1	118.38	4290		2PL0QDT5LD	8/13/2017	SUN	17	EB drifted left of center and hit WB
1	118.39	4290		CJ30DX6	3/25/2014	TUE	1	WB lost control on icy pavement
1	118.39	4290		CJCVBFZ	1/13/2015	TUE	11	WB in EB lanes and hit EB vehicle
1	118.42	4290		CJFH72P	6/24/2016	FRI	16	WB side swipe in same direction

🟥 Segment KAB Crash Rate Flag
🟧 Segment KAB & Total Crash Rate Flag
🟩 Intersection Total Crash Rate Flag
🟫 Intersection KAB Crash Rate Flag
🟨 Intersection KAB & Total Crash Rate Flag
⬜ Bike Flag
🟦 Pedestrian Flag

- XX - No Engineering Countermeasure

ATTACHMENT D

Contributing Geometric Analysis Documentation

Safety Certification Worksheet

Safety Certification Worksheet

Analyst: Nelson, Scott A
Agency: WisDOT DTSD NE Region
Date of Analysis: 2020-04-08
Meta Manager Version: 2019-10
Meta Manager Crash Years: 2014-2018

Design ID: 6180-30-00
Highway: WIS 21 EB
Project Title: OMRO - OSHKOSH
Project Description: STH 116 - LEONARD POINT ROAD
Worksheet ID: 2716

System Screening - Sites of Promise							Crash Vetting - Sites of Promise	Contributing Geometric Analysis	
See FDM 11-38-10.2 for guidance							See FDM 11-38-10.3 for guidance	See FDM 11-38-10.4 for guidance	
Segments: Meta-Manager									
PDP ID	**From RP**	**RP Description**	**To RP**	**Length** (PDP_Mile)	**Crash Rate Flag** (RATEFLAG) (Insert value if ≥ 1.0)	**KAB Crash Rate Flag** (MMGR_KAB_CRSH_RT) (Insert value if ≥ 1.00)	**Summarize the contributing factors for ALL crashes in the flagged segment.**	**Which geometric features contribute to the type and severity of the crashes?**	**Possible Countermeasures for Safety Mitigation Process**
4284	021E162T000	STH 116 WB	021E162T006	0.06	2.1088	2.0873	5 of 10 crashes remain after vetting. All five crashes are intersection specific. Four WB rear ends of left turning traffic. No left turn lane exists. One NB fail to yield to WB with visibility obstructed by a parked vehicle at the Jefferson intersection.	WB rear end crashes were impacted by having no left turn lane to turn south on STH 116/Jefferson St. or driveways. These four crashes resulted in one type B suspected minor injury, one type C possible injury and two property damage only crashes. The right angle failure to yield crash had no geometric features influencing the crash. The crash resulted in a property damage only crash.	Developing a left turn lane on STH 21 WB at Jefferson or TWLTL could help address the two rear end crashes. This was determined to not be a feasible alternative.
4285	021E162T006	WEBSTER AVE	021E162T017	0.11					
4286	021E162T017	MADISON AVE	021E162T110	0.93					
4287	021E162T110	INDUSTRIAL DR	021E166 000	1.06					
4288	021E166 000	RIVERMOOR RD	021E168 000	1.57					
4289	021E168 000	CTH FF	021E169 000	1.02		1.4584	12 of the 22 crashes remain after vetting. Eight of the 12 crashes remaining crashes occurred at CTH FF intersection and are described in the intersections section below. Of the four remaining crashes in this segment, one occurred at Potratz Hill where WB vehicle was rear ended, one drifted left of centerline, and the remaining two were at Sand Pit Road.	For the ten crashes at CTH FF and Sand Pit Road, see the intersections section below. Of the two remaining crashes one drifted left of center and one was a WB rear end crash at Potratz Hill. These two crashes resulted in one type A suspected serious injury and one type B suspected minor injury.	Recommendations at CTH FF & Sand Pit are listed in the inersections section below. Given only one crash at Potratz Hill, no safety mitigation recommended at this intersection. The project is expected to include centerline rumble strips to address the crash that drifted left of center.
4290	021E169 000	SAND PIT RD	021E170K000	1.35	1.1763	1.7913	14 of 37 crashes remain after vetting. Nine of the remaining crashes occurred at the inersection of Sand Pit Road and the details are discussed in the intersections section below. The five remaining crashes all involve vehicles that drifted left of centerline.	For the nine crashes at Sand Pit Road, see the intersections section below. For the five drifting left of center crashes, no geometric features seem to influence these crashes other than no centerline rumble strips are present. These five crashes resulted in one fatal crash, one suspected minor injury, and three property damage only crashes.	Recommendations at CTH FF & Sand Pit are listed in the inersections section below. Centerline rumble stripes are expected to be included in the project to address these left of center crashes.

Intersections: Intersection Network Screening								
INT_ID	**Intersection Name** (IX_NAME)	**LOSS** (TOTAL)	**PSI** (TOTAL)	**LOSS** (KABC)	**PSI** (KABC)	**Summarize the contributing factors for ALL crashes in the flagged intersection.**	**Which geometric features contribute to the type and severity of the crashes?**	**Possible Countermeasures for Safety Mitigation Process**

IX_70_02975	STH 21 & STH 116	LOSS 4	3.97	LOSS 4	0.84	5 of 8 crashes remain after vetting. Four WB rear ends of left turning traffic. No left turn lane exists. One NB fail to yield to WB with visibility obstructed by a parked vehicle.	WB rear end crashes were impacted by having no left turn lane to turn south on STH 116/Jefferson St. or driveways. These four crashes resulted in one type B suspected minor injury, one type C possible injury and two property damage only crashes. The right angle failure to yield crash had no geometric features influencing the crash. The crash resulted in a property damage only crash.	Developing a left turn lane on STH 21 WB at Jefferson or TWLTL could help address the two rear end crashes. This was determined to not be a feasible alternative.
IX_70_02976	STH 21 & Webster Ave S	LOSS 3	1.07	LOSS 2	-0.39			
IX_70_02977	STH 21 & Madison Ave	LOSS 4	2.39	LOSS 3	0.02	1 of 7 crashes remain after vetting. A WB vehicle yielded to a pedestrian crossing North to South on the East side of the inersection. Another WB tried bypassing WB on right and struck the pedestrian.	Mainly a driver error by passing vehicle resulting in type B suspected minor injury. The width of the crossing is long with two travel lanes and two parking lanes.	Narrowing the STH 21 or creating bump-outs at the Madison Street intersection may have reduced the likehood of this collision. This was determined to not be a feasible alternative.
IX_70_02978	STH 21 & Monroe St	LOSS 3	0.62	LOSS 4	0.45	3 of 4 crashes remain after vetting. Two WB rear ends of left turns onto Monroe and one WB rear end turing into Kwik Trip.	WB rear end crashes were impacted by having no left turn lane to turn south on STH 116 to Monroe St. or driveways. These three crashes resulted in one type B suspected minor injury, and two property damage only crashes.	Developing a left turn lane on STH 21 WB at Monroe or TWLTL could help address the two rear end crashes. This was determined to not be a feasible alternative.
IX_70_02980	STH 21 & Quincy Ave	LOSS 3	0.62	LOSS 4	1.16	1 of 3 crashes remain after vetting. A WB rear end of left turning traffic into a driveway near Quincy Ave.	WB rear end crash was impacted by having no left turn lane. The crash resulted in a type C possible injury.	Developing a left turn lane on STH 21 WB at Quincy Ave. or TWLTL could help address the two rear end crashes. This was determined to not be a feasible alternative.
IX_70_02981	STH 21 & Jackson Ave	LOSS 3	1.25	LOSS 3	0.10			
IX_70_02982	STH 21 & Van Buren Ave	LOSS 2	-0.65	LOSS 2	-0.25			
IX_70_02985	STH 21 & Harrison Ave & Maplewood Rd	LOSS 2	-2.68	LOSS 2	-0.79			
IX_70_03018	STH 21 & Maplewood Rd	LOSS 2	-0.65	LOSS 3	0.10			
IX_70_03027	STH 21 & Omreau Ave	LOSS 2	-0.65	LOSS 3	0.10			
IX_70_03026	STH 21 & McKinley Ave	LOSS 3	0.62	LOSS 4	0.45	3 of 4 crashes remain after vetting. Three WB rear end crashes with left turns onto McKinley Ave.	The three WB rear end crashes were impacted by having no left turn lanes. The three crashes resulted in on type C possible injury and two property damage only crashes.	Developing a left turn lane on STH 21 at McKinley Ave. or TWLTL could help address the three rear end crashes. This was determined to not be a feasible alternative.
IX_70_03024	STH 21 & Beckwith Ave	LOSS 3	0.62	LOSS 4	0.45	0 of 4 crashes remain after vetting.	None	None
IX_70_03023	STH 21 & Lincoln Ave	LOSS 2	-0.65	LOSS 2	-0.25			
IX_70_03028	STH 21 & Goldenrod Ave	LOSS 2	-1.43	LOSS 2	-0.31			
IX_70_03030	STH 21 & Industrial Dr	LOSS 2	-1.12	LOSS 3	0.43			
IX_70_03034	STH 21 & Alder Ave & Goldenrod Dr	LOSS 4	4.27	LOSS 4	1.43	3 of ten crashes remain after vetting. Two EB rear end crashes while turning onto Goldenrod and on WB rear end crash while turning onto Alder Ave.	The three rear end crashes of left turning vehicles were impacted by having no left turn lanes. The three crashes resulted in property damage only.	Developing a left turn lane on STH 21 EB & WB at Alder/Goldenrod or TWLTL could help address the three rear end crashes. This was determined to not be a feasible alternative.
IX_70_03043	STH 21 & Brooke Dr & Schwab Ave	LOSS 3	0.10	LOSS 2	-0.79			
IX_70_02902	STH 21 & Rivermoor Rd (2)	LOSS 4	2.84	LOSS 3	0.06	0 of 4 crashes remain after vetting.	None	None
IX_70_02757	STH 21 & E Scott St	LOSS 3	0.38	LOSS 3	0.14			
IX_70_02649	STH 21 & CTH FF & Reighmoor Rd	LOSS 4	3.21	LOSS 4	3.76	9 of the 11 crashes remain after vetting. Six of the 9 involved left turning crashes from Hwy 21. One NB left failed to yield to a SB motorist. One SB failed to yield to WB. The remaining crash was not intersection related but the driver drifted off the roadway to the right.	The mainline left turning crashes are impacted by having no left turn lanes. NB failing to yield ot SB due to looking at crossing traffic. SB and WB crash due to picking an inadequate gap. The drift to the right due to inattentive driving. The nine crases resulted in one fatality, three type B suspected minor injuries, four type C possible injuries, and one property damage only.	Safety mitigation for these crashes could inlcude a roundabout, left turn lanes on STH 21 EB & WB, and longitudinal shoulder rumble strips.
IX_70_02655	STH 21 & Marquart Ln & Potratz Hill Rd	LOSS 3	0.24	LOSS 3	0.48			
IX_70_02660	STH 21 & Sand Pit Rd	LOSS 4	9.04	LOSS 4	4.10	11 of 11 crashes remain after vetting. Ten of the 11 crashes involve a left turning vehicle from Highway 21. The remaining crash was a NB failure to yield to an EB.	The mainline left turning crashes are impacted by having no left turn lanes. NB failing to yield to EB due to picking an inadequate gap. These crashes resulted in five type B suspected minor injuries, three type C possible injuries, and three property damage only crashes.	Safety mitigation for these crashes could inlcude a roundabout, left turn lanes on STH 21 EB & WB, and longitudinal shoulder rumble strips.

ATTACHMENT E

Safety Mitigation Certification Documentation

Layout/Schematic for each alternative
and Cost Estimate for each alternative

Created by: Mason Simmons

6/24/2020

STH 21 – STH 116 – Industrial Drive

Project ID: 6180-30-00	**Route** : STH 021
Title : Omro - Oshkosh	**Sub Title:** STH 116 – Leonard Point
Region : NORTHEAST	**County** : Winnebago

Improvement Type proposed RSRF10

MetaManager 9/2019

Year 1 ADT varies 10,590

Year 20 ADT varies 10,590

HMA – would be 4MT58-28S based on FDM: 14-10 Attachment 10.3 WisDOT HMA Mixture Selection Process.

Existing roadway conditions:

- 25 MPH roadway
- 12-ft thru lanes with 9-ft parking lanes or 6-ft urban shoulders

Proposed TWLTL conditions:

- 25 MPH roadway
- 12-ft through lanes
- 16-ft TWLTL
- 6-ft Bike Lanes

The options presented were to compare an overlay of STH 21 to adding a TWLTL, however a TWLTL will not fit in the current roadway area. Widening the road to accommodate this option would require a massive real estate acquisition of downtown Omro. As such, no alternative will be presented for this section of roadway.

Project ID: 6180-30-00
STH 21
Omro – Oshkosh
STH 116 - Leonard Point Rd
Winnebago County

Created by: Mason Simmons
Created: 6/2/2020

STH 21 & CTH FF/Reighmoor Rd Intersection

The intersection of STH 21 and CTH FF has an intersection safety flag. Two alternatives have been suggested to mitigate the crashes occurring they are slotted left turn lanes on STH 21 and a single lane roundabout. A construction cost estimate including estimated real estate costs have been created for the two alternatives and a do-nothing alternative cost estimate.

Existing roadway conditions and assumptions for project:

- STH 21 is on the community's plan for wider shoulders for bike accommodations
- 1 ¼-Inch Base Aggregate Dense unit weight = 2 Tons/ CY
- ¾-Inch Base Aggregate Dense unit weight = 2.1 Tons/CY
- Fill expansion factor: 1.33
- STH 21 is a concrete roadway with no HMA overlay
    - As-built 6184-03-71
- Traffic forecasting:
    - Year 1 AADT: 11,090
    - Year 20 AADT: 11,090
- The proposed Improvement Type is RSRF10

*NOTE – if this Do nothing alternative. is selected for the preferred alternative the CTH FF work would most likely stop at the radius and not extend down the road. Due to the nature of IHSDM and this process all alternatives need to have the same limits. All design assumptions need to be revisited in final design.

Do Nothing Alternative (Option 1):

No Geometric modifications.

Limits on STH 21: 0+75 – STA 19+90. Mainline length 1915-ft.

Assumptions:

- 10% of the concrete will need to be repaired or replaced.
- 2-inch HMA of 4LT58-28S based on FDM: 14-10 Attachment 10.3 WisDOT HMA Mixture Selection Process**.**
- 5-ft shoulders (widen from 3-ft due to bike comp plan)
- No new BAD is needed for shoulders due to HMA widening. Using Shaping Shoulders to shape gravel section of shoulder. – Anticipated to be used project wide – therefore higher quantity for pices.

Limits on CTH FF: CTH FF from STA 22+58 – 32+44. Sideroad lengths: 1020-ft

Assumptions:

- 2-inch HMA of 4LT58-28S based on FDM: 14-10 Attachment 10.3 WisDOT HMA Mixture Selection Process**.**
- Mill 2-inches –It is assumed this would be the only milling on the project.
- No new BAD for shoulders

Estimated cost:

Item Number	Item Name	Unit	Quantity	Unit Price	Item Cost
305.0500	Shaping Shoulders	STA	18.8	$50.00	$940
416.1710	Concrete Pavement Repair	SY	315	$80.00	$25,200
416.1720	Concrete Pavement Replacement	SY	315	$90.00	$28,350
455.0605	Tack Coat	Gal	510	$5.00	$2,550
204.0120	Removing Asphaltic Surface Milling	SY	2,500	$6.00	$15,000
460.5224	HMA Pavement 4LT 58-28S	Tons	1,125	$70.00	$78,750
646.1020	Marking Line Epoxy 4-Inch	LF	2,775	$1.00	$2,775
646.1040	Marking Line Grooved Epoxy 4-inch	LF	3,750	$2.00	$7,500
				Total	$161,665
				Rounded	$170,000

Items that are not included in the estimate:

- Traffic control items
- Mobilization
- Field office
- Incentive Items

These items are not included because they are depended on the entire project. To speculate the percentage of these items for this specific location would be very challenging and most-likely not accurate.

Option 2 – Slotted Left Turn Lane

This option will add a slotted left turn lane with a 6-ft positive offset along STH 21. Based off traffic forecast, the left turn lane will be 300-ft. it will be assumed that the final pavement design along STH 21 will be 2inches of HMA over 9-inches of concrete over 6 inches of base aggregate with 5-ft shoulders. Outside of the intersection reconstruction limits, a 2-inch mill and overlay will be applied to CTH FF road between 22+58 – 32+44. It is assumed that all the concrete will be hand work on this project.

Limits on STH 21: 0+75 – STA 19+90. Mainline length 1915-ft.

Assumptions:

- 6-ft positive offset of left turn lanes
- 300-ft left turn lanes
- Pavement Structure: 2-inches HMA over 9-inches concrete over 6-inches of 1 ¼-Inch BAD
    - 2-inch HMA of 4LT58-28S based on FDM: 14-10 Attachment 10.3 WisDOT HMA Mixture Selection Process.
- 5-ft shoulders (widen from 3-ft due to bike comp plan) with 5-ft gravel shoulders

Limits on CTH FF: CTH FF from STA 22+58 – 32+44. Sideroad lengths: 1020-ft

Assumptions:

- 5-inch HMA of 4LT58-28S based on FDM: 14-10 Attachment 10.3 WisDOT HMA Mixture Selection Process.
- Mill 2-inches
- No new BAD for shoulders

Estimated cost:

Item Number	Item Name	Unit	Quantity	Unit Price	Item Cost
204.0100	Removing Pavement	SY	6,300	$20.00	$126,000
205.0100	Excavation Common	CY	5,000	$12.00	$120,000

208.0100	Borrow	CY	1200	$12.00	$14,400
305.0110	Base Aggregate Dense ¾-Inch	Tons	400	$22.00	$8,800
305.0120	Base Aggregate Dense 1 ¼ -Inch	Tons	3,125	$18.00	$56,250
415.0090	Concrete Pavement 9-Inch	SY	6,300	$55.00	$346,500
455.0605	Tack Coat	Gal	70	$5.00	$350
460.5224	HMA Pavement 4MT 48-28S	Ton	1,125	$70.00	$78,750
522.1018	Apron Endwalls for Culvert Pipe Reinforced Concrete 18-Inch	Each	2	$600	$1,200
601.0411	Concrete Curb & Gutter 30-Inch Type D	LF	800	$30.00	$24,000
602.0410	Concrete Sidewalk 5-Inch	SF	2,400	$10.00	$24,000
608.0318	Storm Sewer Culvert Pipe Reinforced Concrete Class III 18-Inch	LF	60	$100	$6,000
611.1004	Catch Basin 4-ft Diameter	Each	2	$2,000	$4,000
625.0500	Salvaged Topsoil	SY	400	$4.00	$1,600
628.2004	Erosion Mat Class I Type B	SY	400	$1.50	$600
629.0210	Fertilizer Type B	CWT	.1	$250.00	$25
630.0120	Seeding Mixture No. 20	LBS	10	$25.00	$250
646.1020	Marking Line Epoxy 4-Inch	LF	2,775	$1.00	$2,775
646.1040	Marking Line Grooved Epoxy 4-inch	LF	3,750	$2.00	$11,250
	FEE R/W (1 parcel)	Acres	.2	$50,000	$10,000
	TLE R/W (1 parcel)	Acres	.05	$10,000	$500
				Total	$823,000
				Rounded	$830,000

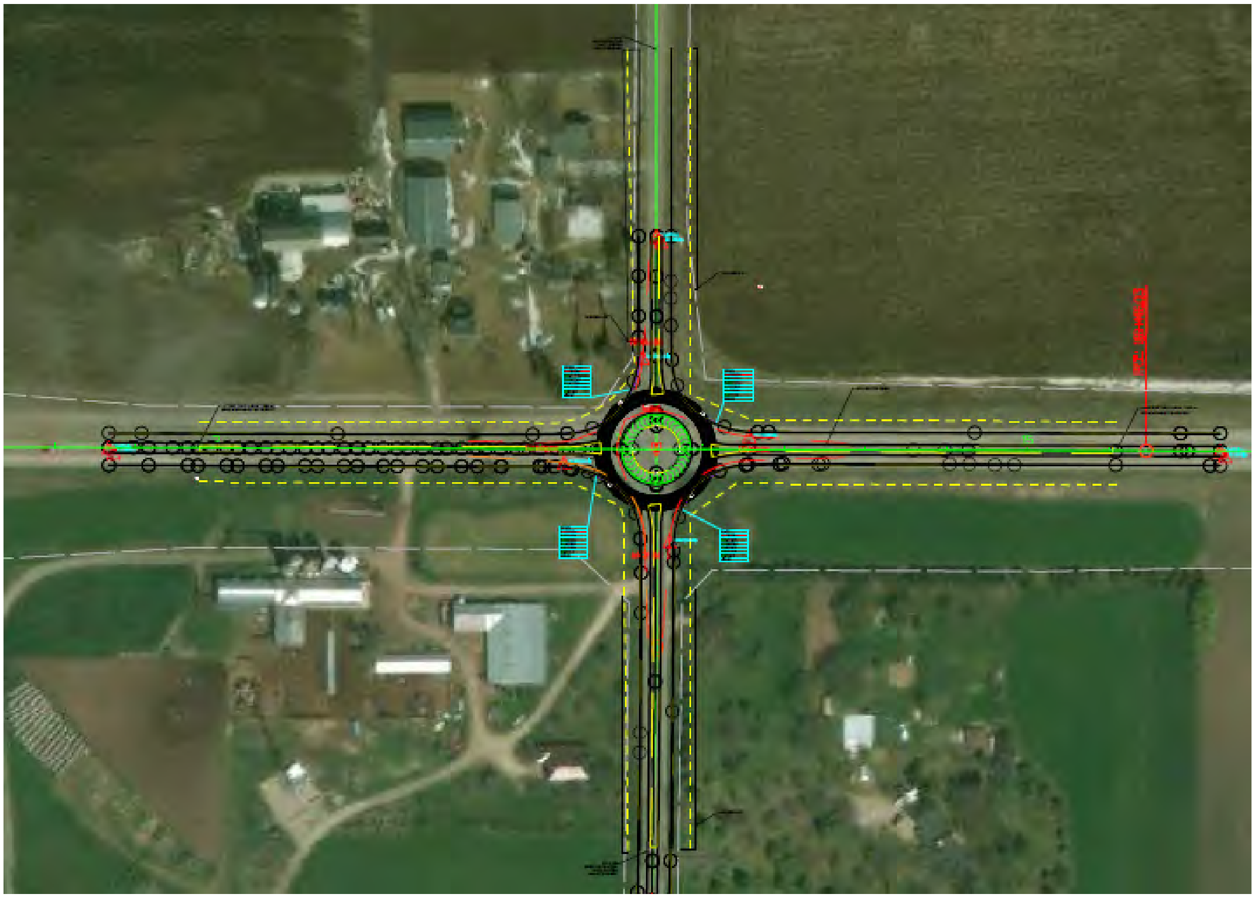
Items that are not included in the estimate:

- Traffic control items
- Mobilization
- Field office
- Incentive Items

These items are not included because they are depended on the entire project. To speculate the percentage of these items for this specific location would be very challenging and most-likely not accurate.

Option 3 – Single Lane Roundabout

This option will reconstruct the intersection to a single lane roundabout. In final design the exact configuration will be completed.



Limits on STH 21: 0+75 – STA 19+90. Mainline length 1915-ft.

Assumptions:

- STA 4+77 – 16+09 will be reconstructed
- STA 0+75 – STA 19+90 -2-inch HMA of 4LT58-28S based on FDM: 14-10 Attachment 10.3 WisDOT HMA Mixture Selection Process**.**
- 5-ft paved shoulders, 5 -ft Gravel at full thickness
- Did not provide grading for Multi-use path
- Lighting lump sum was created by: poles, arms, pull box, Transformer Base, Luminaire LED lights, and Lighting Control Cabinet

Limits on CTH FF: CTH FF from STA 22+58 – 32+44. Sideroad lengths: 1020-ft

Assumptions:

- STA 22+58 – 32+44 be reconstructed
- Depth of HMA, 4LT58-28S based off recent As-built

- 3-ft gravel Shoulders

Estimated Costs: See above for some comments. – How come HMA was brought down to 65, less quantity than project above – I would suggest staying at 70?

Item Number	Item Name	Unit	Quantity	Unit Price	Item Cost
205.0100	Excavation Common	CY	10,000	$12.00	$120,000
305.0110	Base Aggregate Dense ¾-Inch	Tons	400	$22.00	$8,800
305.0120	Base Aggregate Dense 1 ¼ -Inch	Tons	3,700	$18.00	$66,600
415.0090	Concrete Pavement 9-Inch	SY	4,500	$55.00	$247,500
416.0512	Concrete Truck Apron 12-Inch	SY	457	$60.00	27,420
460.5244	HMA Pavement 4LT 58-28S	Tons	750	$70.00	$52,500
522.1018	Apron Endwalls for Culvert Pipe Reinforced Concrete 18-Inch	Each	8	$600	$4,800
608.0318	Storm Sewer Culvert Pipe Reinforced Concrete Class III 18-Inch	LF	120	$100	$12,000
601.0411	Concrete Curb & Gutter 30-Inch Type D	LF	4,562	$30.00	$136,860
602.0410	Concrete Sidewalk 5-Inch (at splitter island crossings)	SF	11,721	$10.00	$117,210
611.1004	Catch Basin 4-ft Diameter	Each	8	$2,000	$16,000
625.0500	Salvaged Topsoil	SY	5,000	$4.00	$20,000
628.2004	Erosion Mat Class I Type B	SY	5,000	$1.50	$7,500
629.0210	Fertilizer Type B	CWT	.5	$250.00	$125
630.0120	Seeding Mixture No. 20	LBS	200	$25.00	$5,000
646.1020	Marking Line Epoxy 4-Inch	LF	2,775	$1.00	$2,775
646.1040	Marking Line Grooved Epoxy 4-inch	LF	3,750	$2.00	$7,500
SPV.0120.01	Lighting Slump Sum	LS	1	$65,000	$65,000
	FEE R/W (5 Parcels)	Acres	.5	$50,000	$25,000
				Total	$942,590
				Rounded	$950,000

Items that are not included in the estimate:

- Traffic control items
- Mobilization
- Field office
- Incentive Items

These items are not included because they are depended on the entire project. To speculate the percentage of these items for this specific location would be very challenging and most-likely not accurate.

Project ID: 6180-30-00
STH 21
Omro – Oshkosh
STH 116 - Leonard Point Rd
Winnebago County

Created by: Mason Simmons
Created: 5/20/2020

STH 21 & Sand Pit Rd Intersection

The intersection of STH 21 and Sand Pit Rd has an intersection safety flag. Two alternatives have been suggested to mitigate the crashes occurring they are slotted left turn lanes on STH 21 and a single lane roundabout. A construction cost estimate including estimated real estate costs have been created for the two alternatives and a do-nothing alternative cost estimate.

Existing roadway conditions and assumptions for project:

- STH 21 is on the community's plan for wider shoulders for bike accommodations
- 1 ¼-Inch Base Aggregate Dense unit weight = 2 Tons/ CY
- ¾-Inch Base Aggregate Dense unit weight = 2.1 Tons/CY
- Fill expansion factor: 1.33
- STH 21 is a concrete roadway with no HMA overlay
    - As-built 6184-03-71
- Traffic forecasting:
    - Year 1 AADT: 11,090
    - Year 20 AADT: 11,090
- The proposed Improvement Type is RSRF10

*NOTE – if this Do nothing alternative. is selected for the preferred alternative the CTH FF work would most likely stop at the radius and not extend down the road. Due to the nature of IHSDM and this process all alternatives need to have the same limits. All design assumptions need to be revisited in final design.

Do Nothing Alternative (Option 1):

No Geometric modifications.

Limits on STH 21: 54+32 – STA 73+11. Mainline length 1879-ft.

Assumptions:

- 10% of the concrete will need to be repaired or replaced.
- 2-inch HMA of 4LT58-28S based on FDM: 14-10 Attachment 10.3 WisDOT HMA Mixture Selection Process.
- 5-ft shoulders (widen from 3-ft due to bike comp plan)
- No new BAD is needed for shoulders due to HMA widening. Using Shaping Shoulders to shape gravel section of shoulder.

Limits on CTH FF: STA 0+00 – 10+20. Sideroad lengths: 1020-ft

Assumptions:

- 2-inch HMA of 4LT58-28S based on FDM: 14-10 Attachment 10.3 WisDOT HMA Mixture Selection Process.
- Mill 2-inches
- No new BAD for shoulders

Estimated cost:

Item Number	Item Name	Unit	Quantity	Unit Price	Item Cost
305.0500	Shaping Shoulders	STA	18.8	$50.00	$940
416.1710	Concrete Pavement Repair	SY	315	$80.00	$25,200
416.1720	Concrete Pavement Replacement	SY	315	$90.00	$28,350
455.0605	Tack Coat	Gal	510	$5.00	$2,550
204.0120	Removing Asphaltic Surface Milling	SY	2500	$6.00	$15,000
460.5224	HMA Pavement 4LT 58-28S	Tons	1,125	$70.00	$78,750
646.1020	Marking Line Epoxy 4-Inch	LF	2,775	$1.00	$2,775
646.1040	Marking Line Grooved Epoxy 4-inch	LF	3,750	$2.00	$7,500
				Total	$161,065
				Rounded	$170,000

Items that are not included in the estimate:

- Traffic control items
- Mobilization
- Field office
- Incentive Items

These items are not included because they are depended on the entire project. To speculate the percentage of these items for this specific location would be very challenging and most-likely not accurate.

Option 2 – Slotted Left Turn Lane

This option will add a slotted left turn lane with a 6-ft positive offset along STH 21. Based off traffic forecast, the left turn lane will be 300-ft. it will be assumed that the final pavement design along STH 21 will be 2inches of HMA over 9-inches of concrete over 6 inches of base aggregate with 5-ft shoulders. Outside of the intersection reconstruction limits, a 2-inch mill and overlay will be applied to CTH FF road between 0+00 – 10+20. It is assumed that all the concrete will be hand work on this project.

Limits on STH 21: 54+32 – STA 73+11. Mainline length 1879-ft.

Assumptions:

- 6-ft positive offset of left turn lanes
- 300-ft left turn lanes
- Pavement Structure: 2-inches HMA over 9-inches concrete over 6-inches of 1 ¼-Inch BAD
  - 2-inch HMA of 4LT58-28S based on FDM: 14-10 Attachment 10.3 WisDOT HMA Mixture Selection Process**.**
- 5-ft shoulders (widen from 3-ft due to bike comp plan) with 5-ft Gravel shoulders
- Limits on CTH FF: STA 0+00 – 10+20. Sideroad lengths: 1020-ft

Assumptions:

- 5-inch HMA of 4LT58-28S based on FDM: 14-10 Attachment 10.3 WisDOT HMA Mixture Selection Process**.**
- 2-inch over lay limits
- Mill 2-inches
- No new BAD for shoulders

Estimated cost:

Item Number	Item Name	Unit	Quantity	Unit Price	Item Cost
204.0100	Removing Pavement	SY	6,300	$20.00	$126,000
205.0100	Excavation Common	CY	500	$12.00	$6,000
208.0100	Borrow	CY	1200	$12.00	$14,400
305.0120	Base Aggregate Dense 1 ¼ -Inch	Tons	3,125	$18.00	$56,250
415.0090	Concrete Pavement 9-Inch	SY	6,300	$55.00	$346,500
455.0605	Tack Coat	Gal	70	$5.00	$350
460.5224	HMA Pavement 4MT 48-28S	Ton	1,125	$70.00	$78,750
522.1018	Apron Endwalls for Culvert Pipe Reinforced Concrete 18-Inch	Each	2	$600	$1,200
601.0411	Concrete Curb & Gutter 30-Inch Type D	LF	800	$30.00	$24,000
602.0410	Concrete Sidewalk 5-Inch (at splitter island crossings)	SF	2,400	$10.00	$24,000
608.0318	Storm Sewer Culvert Pipe Reinforced Concrete Class III 18-Inch	LF	60	$100	$6,000
611.1004	Catch Basin 4-ft Diameter	Each	2	$2,000	$4,000
625.0500	Salvaged Topsoil	SY	400	$4.00	$1,600
628.2004	Erosion Mat Class I Type B	SY	400	$1.50	$600
629.0210	Fertilizer Type B	CWT	.1	$250.00	$25
630.0120	Seeding Mixture No. 20	LBS	10	$25.00	$250
646.1020	Marking Line Epoxy 4-Inch	LF	2,775	$1.00	$2,775
646.1040	Marking Line Grooved Epoxy 4-inch	LF	3,750	$2.00	$7,500
	FEE R/W	Acres	.2	$50,000	$10,000
	TLE R/W	Acres	.05	$10,000	$500
				Total	$710,700
				Rounded	$720,000

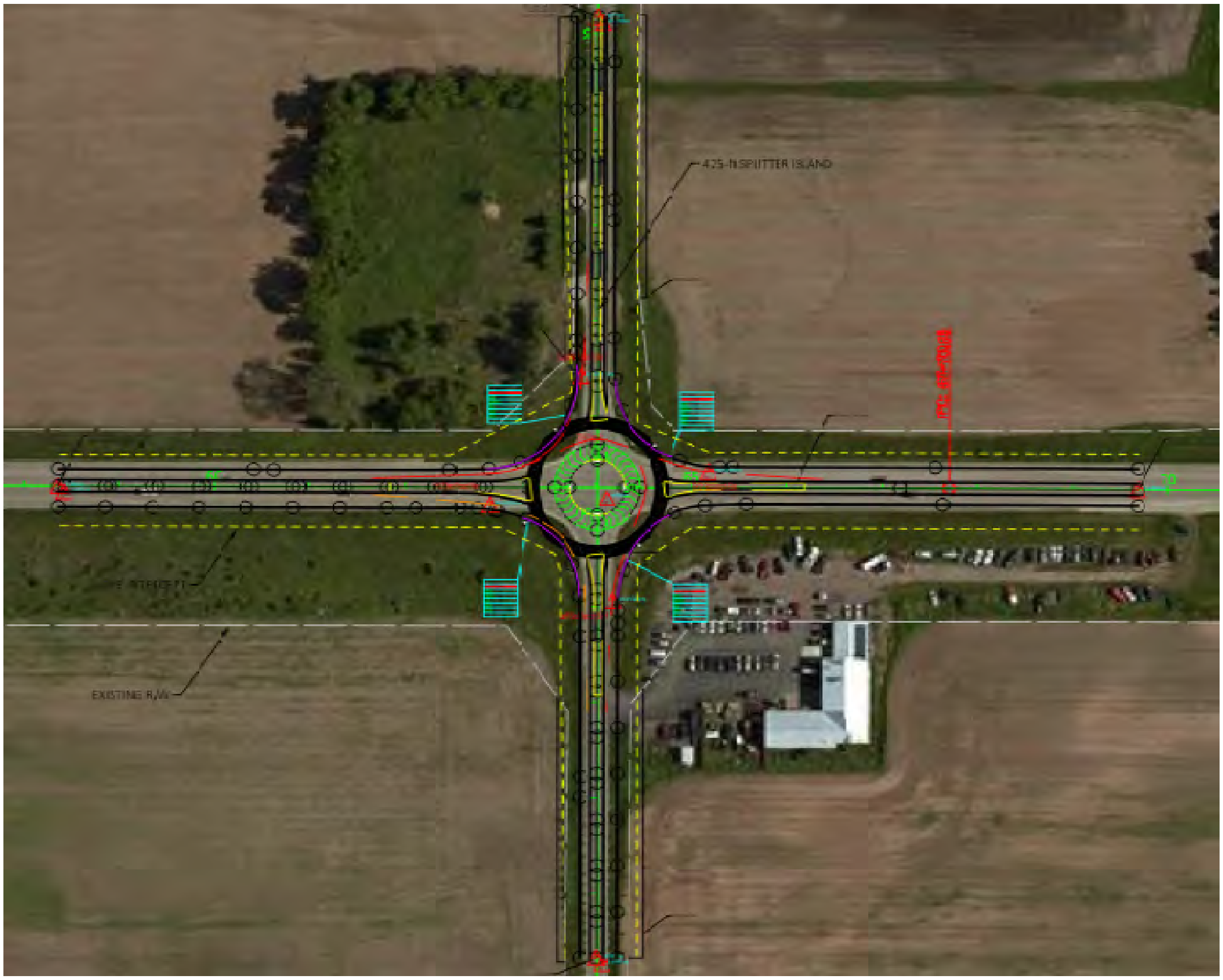
Items that are not included in the estimate:

- Traffic control items
- Mobilization
- Field office
- Incentive Items

These items are not included because they are depended on the entire project. To speculate the percentage of these items for this specific location would be very challenging and most-likely not accurate.

Option 3 – Single Lane Roundabout

This option will reconstruct the intersection to a single lane roundabout. In final design the exact configuration will be completed.



Limits on STH 21: 54+32 – STA 73+11. Mainline length 1879-ft. Assumptions:

- STA 58+32 – 69+68. will be reconstructed – based off previous As-built depths
- STA 54+32 – STA 73+11 -2-inch HMA of 4LT58-28S based on FDM: 14-10 Attachment 10.3 WisDOT HMA Mixture Selection Process.
- 5-ft paved shoulders, 5 -ft Gravel at full thickness
- Did not provide grading for Multi-use path
- Lighting lump sum was created by: poles, arms, pull box, Transformer Base, Luminaire LED lights, and Lighting Control Cabinet

Limits on CTH FF: STA 0+00 – 10+20. Sideroad lengths: 1020-ft Assumptions:

- STA 22+58 – 32+44 be reconstructed
- Depth of HMA, 4LT58-28S based on previous as-built
- 3-ft gravel shoulders

Item Number	Item Name	Unit	Quantity	Unit Price	Item Cost
205.0100	Excavation Common	CY	6,200	$12.00	$74,400
305.0110	Base Aggregate Dense ¾-Inch	Tons	400	$22.00	$8,800
305.0120	Base Aggregate Dense 1 ¼ -Inch	Tons	3,700	$18.00	$66,600
415.0090	Concrete Pavement 9-Inch	SY	4,500	$55.00	$247,500
416.0512	Concrete Truck Apron 12-Inch	SY	457	$60.00	27,420
460.5244	HMA Pavement 4LT 58-28S	Tons	750	$70.00	$52,500
522.1018	Apron Endwalls for Culvert Pipe Reinforced Concrete 18-Inch	Each	8	$600	$4,800
608.0318	Storm Sewer Culvert Pipe Reinforced Concrete Class III 18-Inch	LF	120	$100	$12,000
601.0411	Concrete Curb & Gutter 30-Inch Type D	LF	4,562	$30.00	$136,860
602.0410	Concrete Sidewalk 5-Inch	SF	11,721	$10.00	$117,210
611.1004	Catch Basin 4-ft Diameter	Each	8	$2,000	$16,000
625.0500	Salvaged Topsoil	SY	5,000	$4.00	$20,000
628.2004	Erosion Mat Class I Type B	SY	5,000	$1.50	$7,500
629.0210	Fertilizer Type B	CWT	.5	$250.00	$125
630.0120	Seeding Mixture No. 20	LBS	200	$25.00	$5,000
SPV.0120.01	Lighting Slump Sum	LS	1	$65,000	$65,000
	FEE R/W	Acres	.5	$50,000	$25,000
				Total	$886,715
				Rounded	$900,000

Items that are not included in the estimate:

- Traffic control items
- Mobilization
- Field office
- Incentive Items

These items are not included because they are depended on the entire project. To speculate the percentage of these items for this specific location would be very challenging and most-likely not accurate.

ATTACHMENT E

Safety Mitigation Certification Documentation

IHSDM Crash Prediction Evaluation Report
for each alternative

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

STH 21 & CTH FF
Overlay & Concrete Repair
Base Case

August 6, 2020

Disclaimer

The Interactive Highway Design Model (IHSDM) software is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its content or use thereof. This document does not constitute a standard, specification, or regulation.

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List of Tables

Report Overview

Report Generated: Aug 6, 2020 9:10 AM
Report Template: System: Multi-Page, 508 Compliant [System] (sscpm4, Jan 20, 2020 2:20 PM)

Evaluation Date: Thu Aug 06 09:00:20 CDT 2020
IHSDM Version: v15.0.0 (Oct 31, 2019)
Site Set Crash Prediction Module: v|ModuleInfo.moduleVersion| (|ModuleInfo.moduleDate|)

User Name: Scott Nelson
Organization Name: WisDOT NE Region
Phone: 920.366.2109
E-Mail: scott.nelson@dot.wi.gov

Project Title: 6180-30-00, STH 21 from STH 116 to Leonard Point
Project Comment: Created Wed Jul 01 13:40:49 CDT 2020
Project Unit System: U.S. Customary

Site Set: CTH FF Intersection Overlay & Concrete Repair
Site Set Comment: Created Wed Jul 01 13:41:29 CDT 2020
Site Set Version: v3

Evaluation Title: CTH FF Predicted Crashes Overlay & Concrete Repair
Evaluation Comment: Created Thu Aug 06 08:59:07 CDT 2020
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: WisDOT Calibration_v15-0
Crash Distribution: WisDOT Distributions_v15-0
Model/CMF: WisDOT Models_v15-0
Note: A Model Data Set other than the HSM (Highway Safety Manual) Configuration was selected for this Evaluation. If Crash Modification Factors (CMFs) were modified, then the results will not be in accordance with the HSM (see HSM Appendix to Part C, section A.1.3).
First Year of Analysis: 2027
Last Year of Analysis: 2036
Empirical-Bayes Analysis: None

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

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- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

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Section Types

Rural Two Lane Site Set CPM Evaluation

Site Type

Type: 4ST

Calibration Factor: 1

Table 1. Evaluation and Crash Data (CSD) (if applicable) Intersection Sites

Site No.	Type	Highway	Site Description	Major AADT	Minor AADT	Number of Approaches with Left-Turn Lanes	Number of Approaches with Right-Turn Lanes	Skew Angle 1 (deg)	Skew Angle 2 (deg)	Presence of Lighting
1	4ST	STH 21 & CTH FF	Overlay & Concrete Repair	2027-2036: 11090	2027: 2118; 2028: 2133; 2029: 2148; 2030: 2162; 2031: 2177; 2032: 2192; 2033: 2207; 2034: 2222; 2035: 2237; 2036: 2251	0	2	0.0000	0.0000	no

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Highway	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	4ST	STH 21 & CTH FF	Overlay & Concrete Repair	18.976	1.8975	0.5806	1.3169	0.39	1.8975
		Total	Total	18.976	1.8975	0.5806	1.3169	0.39	1.8975

Table 3. Predicted Crash Frequencies by Year (4ST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2027	1.86	0.57	30.600	1.29	69.400
2028	1.87	0.57	30.600	1.30	69.400
2029	1.88	0.57	30.600	1.30	69.400
2030	1.89	0.58	30.600	1.31	69.400
2031	1.89	0.58	30.600	1.31	69.400
2032	1.90	0.58	30.600	1.32	69.400
2033	1.91	0.58	30.600	1.32	69.400
2034	1.92	0.59	30.600	1.33	69.400
2035	1.93	0.59	30.600	1.34	69.400
2036	1.93	0.59	30.600	1.34	69.400
Total	18.98	5.81	30.600	13.17	69.400
Average	1.90	0.58	30.600	1.32	69.400

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted 4ST Crash Type Distribution

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.06	0.3	3.35	17.6	3.41	18.0
Intersection	Collision with Bicycle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Single-vehicle Collision	1.19	6.2	2.84	15.0	4.03	21.2
Intersection	Overturned	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Run Off Road	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Single Vehicle Crashes	1.25	6.6	6.19	32.6	7.44	39.2
Intersection	Angle Collision	2.66	14.0	2.83	14.9	5.48	28.9
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multiple-vehicle Collision	0.22	1.1	0.28	1.5	0.49	2.6
Intersection	Rear-end Collision	1.25	6.6	2.28	12.0	3.53	18.6
Intersection	Sideswipe	0.44	2.3	1.59	8.4	2.03	10.7
Intersection	Total Multiple Vehicle Crashes	4.56	24.0	6.98	36.8	11.54	60.8
Intersection	Total Intersection Crashes	5.80	30.6	13.16	69.4	18.98	100.0
	Total Crashes	5.80	30.6	13.16	69.4	18.98	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

STH 21 & CTH FF
Mainline Left Turn Lanes

August 6, 2020

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Report Overview

Report Generated: Aug 6, 2020 9:13 AM
Report Template: System: Multi-Page, 508 Compliant [System] (sscpm4, Jan 20, 2020 2:20 PM)

Evaluation Date: Thu Aug 06 09:01:13 CDT 2020
IHSDM Version: v15.0.0 (Oct 31, 2019)
Site Set Crash Prediction Module: v|ModuleInfo.moduleVersion| (|ModuleInfo.moduleDate|)

User Name: Scott Nelson
Organization Name: WisDOT NE Region
Phone: 920.366.2109
E-Mail: scott.nelson@dot.wi.gov

Project Title: 6180-30-00, STH 21 from STH 116 to Leonard Point
Project Comment: Created Wed Jul 01 13:40:49 CDT 2020
Project Unit System: U.S. Customary

Site Set: CTH FF Intersection with STH 21 Left Turn Lanes
Site Set Comment: Copied from CTH FF Intersection Overlay & Concrete Repair (v3)
Site Set Version: v4

Evaluation Title: CTH FF Predicted Crashes Left Turn Lanes
Evaluation Comment: Created Thu Aug 06 09:00:49 CDT 2020
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: WisDOT Calibration_v15-0
Crash Distribution: WisDOT Distributions_v15-0
Model/CMF: WisDOT Models_v15-0
Note: A Model Data Set other than the HSM (Highway Safety Manual) Configuration was selected for this Evaluation. If Crash Modification Factors (CMFs) were modified, then the results will not be in accordance with the HSM (see HSM Appendix to Part C, section A.1.3).
First Year of Analysis: 2027
Last Year of Analysis: 2036
Empirical-Bayes Analysis: None

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Section Types

Rural Two Lane Site Set CPM Evaluation

Site Type

Type: 4ST
Calibration Factor: 1

Table 1. Evaluation and Crash Data (CSD) (if applicable) Intersection Sites

Site No.	Type	Highway	Site Description	Major AADT	Minor AADT	Number of Approaches with Left-Turn Lanes	Number of Approaches with Right-Turn Lanes	Skew Angle 1 (deg)	Skew Angle 2 (deg)	Presence of Lighting
1	4ST	STH 21 & CTH FF	Overlay & Concrete Repair	2027-2036: 11090	2027: 2118; 2028: 2133; 2029: 2148; 2030: 2162; 2031: 2177; 2032: 2192; 2033: 2207; 2034: 2222; 2035: 2237; 2036: 2251	2	2	0.0000	0.0000	no

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Highway	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	4ST	STH 21 & CTH FF	Overlay & Concrete Repair	9.867	0.9867	0.3019	0.6848	0.20	0.9867
		Total	Total	9.867	0.9867	0.3019	0.6848	0.20	0.9867

Table 3. Predicted Crash Frequencies by Year (4ST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2027	0.97	0.30	30.600	0.67	69.400
2028	0.97	0.30	30.600	0.68	69.400
2029	0.98	0.30	30.600	0.68	69.400
2030	0.98	0.30	30.600	0.68	69.400
2031	0.98	0.30	30.600	0.68	69.400
2032	0.99	0.30	30.600	0.69	69.400
2033	0.99	0.30	30.600	0.69	69.400
2034	1.00	0.30	30.600	0.69	69.400
2035	1.00	0.31	30.600	0.69	69.400
2036	1.00	0.31	30.600	0.70	69.400
Total	9.87	3.02	30.600	6.85	69.400
Average	0.99	0.30	30.600	0.69	69.400

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted 4ST Crash Type Distribution

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.03	0.3	1.74	17.6	1.77	18.0
Intersection	Collision with Bicycle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Single-vehicle Collision	0.62	6.2	1.48	15.0	2.10	21.2
Intersection	Overturned	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Run Off Road	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Single Vehicle Crashes	0.65	6.6	3.22	32.6	3.87	39.2
Intersection	Angle Collision	1.38	14.0	1.47	14.9	2.85	28.9
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multiple-vehicle Collision	0.11	1.1	0.14	1.5	0.26	2.6
Intersection	Rear-end Collision	0.65	6.6	1.19	12.0	1.83	18.6
Intersection	Sideswipe	0.23	2.3	0.83	8.4	1.06	10.7
Intersection	Total Multiple Vehicle Crashes	2.37	24.0	3.63	36.8	6.00	60.8
Intersection	Total Intersection Crashes	3.02	30.6	6.85	69.4	9.87	100.0
	Total Crashes	3.02	30.6	6.85	69.4	9.87	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

STH 21 & CTH FF
Roundabout Alternative

August 6, 2020

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Evaluation Date: Thu Aug 06 09:01:52 CDT 2020
IHSDM Version: v15.0.0 (Oct 31, 2019)
Site Set Crash Prediction Module: v|ModuleInfo.moduleVersion| (|ModuleInfo.moduleDate|)

User Name: Scott Nelson
Organization Name: WisDOT NE Region
Phone: 920.366.2109
E-Mail: scott.nelson@dot.wi.gov

Project Title: 6180-30-00, STH 21 from STH 116 to Leonard Point
Project Comment: Created Wed Jul 01 13:40:49 CDT 2020
Project Unit System: U.S. Customary

Site Set: CTH FF Intersection Single Lane Roundabout
Site Set Comment: Created Wed Jul 01 14:00:43 CDT 2020
Site Set Version: v2

Evaluation Title: CTH FF Crash Prediction Roundabout
Evaluation Comment: Created Thu Aug 06 09:01:29 CDT 2020
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: WisDOT Calibration_v15-0
Crash Distribution: WisDOT Distributions_v15-0
Model/CMF: WisDOT Models_v15-0
Note: A Model Data Set other than the HSM (Highway Safety Manual) Configuration was selected for this Evaluation. If Crash Modification Factors (CMFs) were modified, then the results will not be in accordance with the HSM (see HSM Appendix to Part C, section A.1.3).
First Year of Analysis: 2027
Last Year of Analysis: 2036
Empirical-Bayes Analysis: None

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Section Types

Roundabout Site Set CPM Evaluation

Site Type

Type: Roundabout RTL 41R

Calibration Factor: RTL 41R = 1.0

Table 1. Evaluation and Crash Data (CSD) (if applicable) Roundabout - Homogeneous Sites

Site No.	Type	Roundabout	Area Type	Entering AADT
1	41R - Roundabout with 4 legs and a single circulating lane	STH 21 & CTH FF	Rural	Leg 1:2027: 364; 2028: 366; 2029: 368; 2030: 370; 2031: 372; 2032: 374; 2033: 375; 2034: 377; 2035: 379; 2036: 381; Leg 2:2027-2036: 5545; Leg 3:2027: 694; 2028: 700; 2029: 705; 2030: 711; 2031: 716; 2032: 722; 2033: 727; 2034: 733; 2035: 738; 2036: 744; Leg 4:2027-2036: 5545

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Roundabout	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	41R - Roundabout with 4 legs and a single circulating lane	STH 21 & CTH FF		18.011	1.8011	0.2360	1.5651	0.81	1.8011
		Total	Total	18.011	1.8011	0.2360	1.5651	0.81	1.8011

Table 3. Predicted Crash Frequencies by Year (Roundabout RTL 41R)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2027	1.80	0.23	13.097	1.56	86.903
2028	1.80	0.24	13.098	1.56	86.901
2029	1.80	0.24	13.100	1.56	86.900
2030	1.80	0.24	13.101	1.56	86.898
2031	1.80	0.24	13.103	1.56	86.897
2032	1.80	0.24	13.104	1.56	86.895
2033	1.80	0.24	13.106	1.57	86.894
2034	1.80	0.24	13.107	1.57	86.893
2035	1.80	0.24	13.109	1.57	86.891
2036	1.80	0.24	13.110	1.57	86.890
Total	18.01	2.36	13.104	15.65	86.896
Average	1.80	0.24	13.104	1.56	86.896

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Roundabout RTL 41R Crash Severity

Site No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0178	0.1766	1.1362	1.0295	15.6510
Total	0.0178	0.1766	1.1362	1.0295	15.6510

Table 5. Predicted Roundabout RTL 41R Crash Type Distribution

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.22	1.2	0.22	1.2
Intersection	Collision with Fixed Object	0.51	2.8	4.08	22.7	4.59	25.5
Intersection	Collision with Other Object	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Single-vehicle Collision	0.49	2.7	1.82	10.1	2.31	12.8
Intersection	Collision with Parked Vehicle	0.01	0.0	0.05	0.3	0.05	0.3
Intersection	Total Single Vehicle Crashes	1.01	5.6	6.17	34.2	7.17	39.8
Intersection	Angle Collision	0.27	1.5	2.33	12.9	2.60	14.4
Intersection	Head-on Collision	0.03	0.1	0.06	0.3	0.09	0.5
Intersection	Other Multiple-vehicle Collision	0.17	0.9	1.10	6.1	1.26	7.0
Intersection	Rear-end Collision	0.70	3.9	3.88	21.5	4.58	25.4
Intersection	Sideswipe	0.18	1.0	2.13	11.8	2.31	12.8
Intersection	Total Multiple Vehicle Crashes	1.35	7.5	9.50	52.7	10.85	60.2
Intersection	Total Intersection Crashes	2.36	13.1	15.67	86.9	18.03	100.0
	Total Crashes	2.36	13.1	15.67	86.9	18.03	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

STH 21 & Sand Pit Road
Overlay & Concrete Repair
Base Case

August 6, 2020

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Report Overview

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Report Template: System: Multi-Page, 508 Compliant [System] (sscpm4, Jan 20, 2020 2:20 PM)

Evaluation Date: Thu Aug 06 09:02:36 CDT 2020
IHSDM Version: v15.0.0 (Oct 31, 2019)
Site Set Crash Prediction Module: v|ModuleInfo.moduleVersion| (|ModuleInfo.moduleDate|)

User Name: Scott Nelson
Organization Name: WisDOT NE Region
Phone: 920.366.2109
E-Mail: scott.nelson@dot.wi.gov

Project Title: 6180-30-00, STH 21 from STH 116 to Leonard Point
Project Comment: Created Wed Jul 01 13:40:49 CDT 2020
Project Unit System: U.S. Customary

Site Set: Sand Pit Road Intersection Overlay & Concrete Repair
Site Set Comment: Created Wed Jul 01 15:29:11 CDT 2020
Site Set Version: v2

Evaluation Title: Sand Pit Predicted Crashes Overlay and Concrete Repair
Evaluation Comment: Created Thu Aug 06 09:02:06 CDT 2020
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: WisDOT Calibration_v15-0
Crash Distribution: WisDOT Distributions_v15-0
Model/CMF: WisDOT Models_v15-0
Note: A Model Data Set other than the HSM (Highway Safety Manual) Configuration was selected for this Evaluation. If Crash Modification Factors (CMFs) were modified, then the results will not be in accordance with the HSM (see HSM Appendix to Part C, section A.1.3).
First Year of Analysis: 2027
Last Year of Analysis: 2036
Empirical-Bayes Analysis: None

Disclaimer Regarding Crash Prediction Method

IMPORTANT NOTICE ABOUT COMPARING RESULTS FROM HIGHWAY SAFETY MANUAL FIRST EDITION (2010) MODELS TO RESULTS FROM NEW MODELS DEVELOPED UNDER NCHRP PROJECTS 17-70 AND 17-58

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Highway and Transportation Officials (AASHTO), multiple research efforts have been undertaken through the National Cooperative Highway Research Program (NCHRP) to develop safety performance models for road segment and intersection facility types that were not initially reflected in the HSM-1, in order to expand the breadth and depth of the HSM in the future.

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- Roundabouts: completed in 2018 under NCHRP Project 17-70, the new methods will provide improved outcomes for the safety analysis of roundabouts.
- 6+ lane and one-way urban/suburban arterials (including models for segments and intersections): completed under NCHRP Project 17-58.

However, in the absence of local calibration factors (see HSM-1 Part C, Appendix A for guidance on calibration of the predictive models), it is neither appropriate nor advisable to directly compare the results from new models (from NCHRP Projects 17-58 and 17-70) to results from HSM-1 models, as the models were not calibrated to the same base state data sets, and consequently can produce unexpected results. If local calibration factors are available and applied to both new models and HSM-1 models, then it may be appropriate to directly compare the results.*[Note: Work being performed under NCHRP Project 17-72 (Update of Crash Modification Factors for the Highway Safety Manual) is expected to re-calibrate many of the old (HSM-1) and new (e.g., NCHRP 17-70) models to data from a single (or small number of) states, that would allow results from all models to be directly compared.]*

The models produced for NCHRP Project 17-70 have independent value in terms of informing the design of a roundabout and assessing the effects of different design characteristics on the expected safety performance of a roundabout.

The HSM-1 interim method previously included in IHSDM for evaluating roundabouts on urban/suburban arterials (i.e., evaluating an existing intersection and then applying a Crash Modification Factor for replacing the existing intersection with a roundabout) has been deactivated in IHSDM, to minimize any confusion with the new roundabout methodology.

Section Types

Rural Two Lane Site Set CPM Evaluation

Site Type

Type: 4ST

Calibration Factor: 1

Table 1. Evaluation and Crash Data (CSD) (if applicable) Intersection Sites

Site No.	Type	Highway	Site Description	Major AADT	Minor AADT	Number of Approaches with Left-Turn Lanes	Number of Approaches with Right-Turn Lanes	Skew Angle 1 (deg)	Skew Angle 2 (deg)	Presence of Lighting
1	4ST	Sand Pit Road		2027-2036: 14340	2027: 1259; 2028: 1266; 2029: 1274; 2030: 1281; 2031: 1288; 2032: 1296; 2033: 1303; 2034: 1311; 2035: 1318; 2036: 1325	0	2	0.0000	0.0000	no

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Highway	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	4ST	Sand Pit Road		16.070	1.6071	0.4918	1.1153	0.28	1.6071
		Total	Total	16.070	1.6071	0.4918	1.1153	0.28	1.6071

Table 3. Predicted Crash Frequencies by Year (4ST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2027	1.58	0.48	30.600	1.10	69.400
2028	1.59	0.49	30.600	1.10	69.400
2029	1.59	0.49	30.600	1.11	69.400
2030	1.60	0.49	30.600	1.11	69.400
2031	1.60	0.49	30.600	1.11	69.400
2032	1.61	0.49	30.600	1.12	69.400
2033	1.61	0.49	30.600	1.12	69.400
2034	1.62	0.50	30.600	1.12	69.400
2035	1.63	0.50	30.600	1.13	69.400
2036	1.63	0.50	30.600	1.13	69.400
Total	16.07	4.92	30.600	11.15	69.400
Average	1.61	0.49	30.600	1.11	69.400

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted 4ST Crash Type Distribution

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.05	0.3	2.83	17.6	2.89	18.0
Intersection	Collision with Bicycle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Single-vehicle Collision	1.00	6.2	2.41	15.0	3.41	21.2
Intersection	Overturned	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Run Off Road	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Single Vehicle Crashes	1.06	6.6	5.24	32.6	6.30	39.2
Intersection	Angle Collision	2.25	14.0	2.39	14.9	4.64	28.9
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multiple-vehicle Collision	0.18	1.1	0.23	1.5	0.42	2.6
Intersection	Rear-end Collision	1.06	6.6	1.93	12.0	2.99	18.6
Intersection	Sideswipe	0.37	2.3	1.35	8.4	1.72	10.7
Intersection	Total Multiple Vehicle Crashes	3.86	24.0	5.91	36.8	9.77	60.8
Intersection	Total Intersection Crashes	4.92	30.6	11.15	69.4	16.07	100.0
	Total Crashes	4.92	30.6	11.15	69.4	16.07	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

STH 21 & Sand Pit Road
Mainline Left Turns Alternative

August 6, 2020

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Report Template: System: Multi-Page, 508 Compliant [System] (sscpm4, Jan 20, 2020 2:20 PM)

Evaluation Date: Thu Aug 06 09:03:12 CDT 2020
IHSDM Version: v15.0.0 (Oct 31, 2019)
Site Set Crash Prediction Module: v|ModuleInfo.moduleVersion| (|ModuleInfo.moduleDate|)

User Name: Scott Nelson
Organization Name: WisDOT NE Region
Phone: 920.366.2109
E-Mail: scott.nelson@dot.wi.gov

Project Title: 6180-30-00, STH 21 from STH 116 to Leonard Point
Project Comment: Created Wed Jul 01 13:40:49 CDT 2020
Project Unit System: U.S. Customary

Site Set: Sand Pit Road Intersection STH 21 Left Turn Lanes
Site Set Comment: Copied from Sand Pit Road Intersection Overlay & Concrete Repair (v2)
Site Set Version: v2

Evaluation Title: Sand Pit Predicted Crashes Left Turn Lanes
Evaluation Comment: Created Thu Aug 06 09:02:51 CDT 2020
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: WisDOT Calibration_v15-0
Crash Distribution: WisDOT Distributions_v15-0
Model/CMF: WisDOT Models_v15-0
Note: A Model Data Set other than the HSM (Highway Safety Manual) Configuration was selected for this Evaluation. If Crash Modification Factors (CMFs) were modified, then the results will not be in accordance with the HSM (see HSM Appendix to Part C, section A.1.3).
First Year of Analysis: 2027
Last Year of Analysis: 2036
Empirical-Bayes Analysis: None

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Section Types

Rural Two Lane Site Set CPM Evaluation

Site Type

Type: 4ST
Calibration Factor: 1

Table 1. Evaluation and Crash Data (CSD) (if applicable) Intersection Sites

Site No.	Type	Highway	Site Description	Major AADT	Minor AADT	Number of Approaches with Left-Turn Lanes	Number of Approaches with Right-Turn Lanes	Skew Angle 1 (deg)	Skew Angle 2 (deg)	Presence of Lighting
1	4ST	Sand Pit Road		2027-2036: 14340	2027: 1259; 2028: 1266; 2029: 1274; 2030: 1281; 2031: 1288; 2032: 1296; 2033: 1303; 2034: 1311; 2035: 1318; 2036: 1325	2	2	0.0000	0.0000	no

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Highway	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	4ST	Sand Pit Road		8.357	0.8357	0.2557	0.5800	0.15	0.8357
		Total	Total	8.357	0.8357	0.2557	0.5800	0.15	0.8357

Table 3. Predicted Crash Frequencies by Year (4ST)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2027	0.82	0.25	30.600	0.57	69.400
2028	0.82	0.25	30.600	0.57	69.400
2029	0.83	0.25	30.600	0.57	69.400
2030	0.83	0.25	30.600	0.58	69.400
2031	0.83	0.26	30.600	0.58	69.400
2032	0.84	0.26	30.600	0.58	69.400
2033	0.84	0.26	30.600	0.58	69.400
2034	0.84	0.26	30.600	0.58	69.400
2035	0.85	0.26	30.600	0.59	69.400
2036	0.85	0.26	30.600	0.59	69.400
Total	8.36	2.56	30.600	5.80	69.400
Average	0.84	0.26	30.600	0.58	69.400

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted 4ST Crash Type Distribution

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.03	0.3	1.47	17.6	1.50	18.0
Intersection	Collision with Bicycle	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Single-vehicle Collision	0.52	6.2	1.25	15.0	1.77	21.2
Intersection	Overturned	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Collision with Pedestrian	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Run Off Road	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Total Single Vehicle Crashes	0.55	6.6	2.73	32.6	3.28	39.2
Intersection	Angle Collision	1.17	14.0	1.24	14.9	2.41	28.9
Intersection	Head-on Collision	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Multiple-vehicle Collision	0.10	1.1	0.12	1.5	0.22	2.6
Intersection	Rear-end Collision	0.55	6.6	1.00	12.0	1.55	18.6
Intersection	Sideswipe	0.19	2.3	0.70	8.4	0.89	10.7
Intersection	Total Multiple Vehicle Crashes	2.01	24.0	3.07	36.8	5.08	60.8
Intersection	Total Intersection Crashes	2.56	30.6	5.80	69.4	8.36	100.0
	Total Crashes	2.56	30.6	5.80	69.4	8.36	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Interactive Highway Safety Design Model

Crash Prediction Evaluation Report

STH 21 & Sand Pit Road
Roundabout Alternative

August 6, 2020

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Report Overview

Report Generated: Aug 6, 2020 9:18 AM
Report Template: System: Multi-Page, 508 Compliant [System] (sscpm4, Jan 20, 2020 2:20 PM)

Evaluation Date: Thu Aug 06 09:03:53 CDT 2020
IHSDM Version: v15.0.0 (Oct 31, 2019)
Site Set Crash Prediction Module: v|ModuleInfo.moduleVersion| (|ModuleInfo.moduleDate|)

User Name: Scott Nelson
Organization Name: WisDOT NE Region
Phone: 920.366.2109
E-Mail: scott.nelson@dot.wi.gov

Project Title: 6180-30-00, STH 21 from STH 116 to Leonard Point
Project Comment: Created Wed Jul 01 13:40:49 CDT 2020
Project Unit System: U.S. Customary

Site Set: Sand Pit Road Intersection Roundabout
Site Set Comment: Copied from Sand Pit Road Intersection STH 21 Left Turn Lanes (v2)
Site Set Version: v4

Evaluation Title: Sand Pit Predicted Crashes Roundabout
Evaluation Comment: Created Thu Aug 06 09:03:27 CDT 2020
Policy for Superelevation: AASHTO 2011 U.S. Customary
Calibration: WisDOT Calibration_v15-0
Crash Distribution: WisDOT Distributions_v15-0
Model/CMF: WisDOT Models_v15-0
Note: A Model Data Set other than the HSM (Highway Safety Manual) Configuration was selected for this Evaluation. If Crash Modification Factors (CMFs) were modified, then the results will not be in accordance with the HSM (see HSM Appendix to Part C, section A.1.3).
First Year of Analysis: 2027
Last Year of Analysis: 2036
Empirical-Bayes Analysis: None

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Section Types

Roundabout Site Set CPM Evaluation

Site Type

Type: Roundabout RTL 41R

Calibration Factor: RTL 41R = 1.0

Table 1. Evaluation and Crash Data (CSD) (if applicable) Roundabout - Homogeneous Sites

Site No.	Type	Roundabout	Area Type	Entering AADT
1	41R - Roundabout with 4 legs and a single circulating lane	Sand Pit Road	Rural	Leg 1:2027: 629; 2028: 633; 2029: 637; 2030: 640; 2031: 644; 2032: 648; 2033: 651; 2034: 655; 2035: 659; 2036: 662; Leg 2:2027-2036: 7170; Leg 3:2027: 629; 2028: 633; 2029: 637; 2030: 640; 2031: 644; 2032: 648; 2033: 651; 2034: 655; 2035: 659; 2036: 662; Leg 4:2027-2036: 7170

Table 2. Predicted Crash Frequencies and Rates by Site

Site No.	Type	Roundabout	Site Description	Total Predicted Crashes for Evaluation Period	Predicted Total Crash Frequency (crashes/yr)	Predicted FI Crash Frequency (crashes/yr)	Predicted PDO Crash Frequency (crashes/yr)	Predicted Intersection Travel Crash Rate (crashes/million veh)	Intersection Crash Rate (crashes/yr)
1	41R - Roundabout with 4 legs and a single circulating lane	Sand Pit Road		21.610	2.1610	0.2965	1.8645	0.76	2.1610
		Total	Total	21.610	2.1610	0.2965	1.8645	0.76	2.1610

Table 3. Predicted Crash Frequencies by Year (Roundabout RTL 41R)

Year	Total Crashes	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)
2027	2.16	0.30	13.715	1.86	86.285
2028	2.16	0.30	13.716	1.86	86.284
2029	2.16	0.30	13.717	1.86	86.282
2030	2.16	0.30	13.718	1.86	86.282
2031	2.16	0.30	13.720	1.86	86.280
2032	2.16	0.30	13.721	1.86	86.279
2033	2.16	0.30	13.722	1.86	86.278
2034	2.16	0.30	13.723	1.87	86.277
2035	2.16	0.30	13.725	1.87	86.275
2036	2.16	0.30	13.726	1.87	86.275
Total	21.61	2.96	13.720	18.64	86.280
Average	2.16	0.30	13.720	1.86	86.280

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

Table 4. Predicted Roundabout RTL 41R Crash Severity

Site No.	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)
1	0.0191	0.1898	1.2209	1.5353	18.6452
Total	0.0191	0.1898	1.2209	1.5353	18.6452

Table 5. Predicted Roundabout RTL 41R Crash Type Distribution

Element Type	Crash Type	FI Crashes	Percent FI (%)	PDO Crashes	Percent PDO (%)	Total Crashes	Percent Total (%)
Intersection	Collision with Animal	0.00	0.0	0.26	1.2	0.26	1.2
Intersection	Collision with Fixed Object	0.64	3.0	4.87	22.5	5.51	25.5
Intersection	Collision with Other Object	0.00	0.0	0.00	0.0	0.00	0.0
Intersection	Other Single-vehicle Collision	0.62	2.9	2.16	10.0	2.78	12.9
Intersection	Collision with Parked Vehicle	0.01	0.0	0.06	0.3	0.06	0.3
Intersection	Total Single Vehicle Crashes	1.27	5.9	7.35	34.0	8.61	39.8
Intersection	Angle Collision	0.34	1.6	2.78	12.8	3.12	14.4
Intersection	Head-on Collision	0.03	0.2	0.07	0.3	0.11	0.5
Intersection	Other Multiple-vehicle Collision	0.21	1.0	1.30	6.0	1.52	7.0
Intersection	Rear-end Collision	0.88	4.1	4.62	21.4	5.51	25.5
Intersection	Sideswipe	0.23	1.1	2.54	11.7	2.77	12.8
Intersection	Total Multiple Vehicle Crashes	1.70	7.9	11.32	52.3	13.02	60.2
Intersection	Total Intersection Crashes	2.96	13.7	18.66	86.3	21.63	100.0
	Total Crashes	2.96	13.7	18.66	86.3	21.63	100.0

Note: *Fatal and Injury Crashes* and *Property Damage Only Crashes* do not necessarily sum up to *Total Crashes* because the distribution of these three crashes had been derived independently.

ATTACHMENT E

Safety Mitigation Certification Documentation

IHSDM Economic Analysis Report

Interactive Highway Safety Design Model

Economic Analysis Report

STH 21 & CTH FF

August 6, 2020

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Economic Analysis Report

Economic Analysis Report Overview

Report Generated: Aug 6, 2020 9:19 AM
Report Template: System: Multi-Page [System] (eam2, Jan 20, 2020 2:20 PM)

Evaluation Title: EAAnalysis Updated 8/6/2020
Evaluation Comment: Created Thu Aug 06 09:06:21 CDT 2020
Evaluation Date: Thu Aug 06 09:06:46 CDT 2020

User Name: Scott Nelson
Organization Name: WisDOT NE Region
Phone: 920.366.2109
E-Mail: scott.nelson@dot.wi.gov

Project Title: 6180-30-00, STH 21 & CTH FF Evaluation
Project Comment: Created Wed Jul 01 14:29:10 CDT 2020

Configuration Summary

Crash Cost Configuration: WisDOT Economics_v15-0

Configuration Comment: WisDOT Crash Costs

Table 1. Economic Analysis Configuration

Configuration Data	
Crash Unit Cost Zero Year	**2016**
Crash Cost Index	**0.00**
Discount Rate	**0.03**
KABCO Unit Costs	
K Cost ($/Crash)	**10,897,580.00**
A Cost ($/Crash)	**613,781.00**
B Cost ($/Crash)	**194,022.00**
C Cost ($/Crash)	**110,830.00**
O Cost ($/Crash)	**10,173.00**

Table 2. RTL Segment FI Proportion Data

Segment Type	Fatal Crash (K) Proportion of FI (%)	Incapacitating Injury Crash (A) Proportion of FI (%)	Non-incapacitating Injury Crash (B) Proportion of FI (%)	Possible Injury Crash (C) Proportion of FI (%)
Two-Lane Undivided	3.502	12.638	43.370	40.490

Table 3. RTL Intersection FI Proportion Data

Intersection Type	Fatal Crash (K) Proportion of FI (%)	Incapacitating Injury Crash (A) Proportion of FI (%)	Non-incapacitating Injury Crash (B) Proportion of FI (%)	Possible Injury Crash (C) Proportion of FI (%)
Three-Legged w/STOP control	3.070	15.070	42.380	39.480
Four-Legged w/STOP control	3.980	15.280	42.860	37.880
Four-Legged Signalized	2.960	11.750	35.290	50.000

Table 4. RML Segment FI Proportion Data

Segment Type	Fatal Crash (K) Proportion of FI (%)	Incapacitating Injury Crash (A) Proportion of FI (%)	Non-incapacitating Injury Crash (B) Proportion of FI (%)	Possible Injury Crash (C) Proportion of FI (%)
Four-Lane Undivided	3.502	12.638	43.370	40.490
Four-Lane Divided	3.502	12.638	43.370	40.490

Table 5. RML Intersection FI Proportion Data

Intersection Type	Fatal Crash (K) Proportion of FI (%)	Incapacitating Injury Crash (A) Proportion of FI (%)	Non-incapacitating Injury Crash (B) Proportion of FI (%)	Possible Injury Crash (C) Proportion of FI (%)
Three-Legged w/STOP control	4.090	14.090	40.630	41.190
Four-Legged w/STOP control	4.710	15.910	41.990	37.390
Four-Legged Signalized	0.600	10.010	37.180	52.210

Table 6. USA Segment FI Proportion Data

Segment Type	Fatal Crash (K) Proportion of FI (%)	Incapacitating Injury Crash (A) Proportion of FI (%)	Non-incapacitating Injury Crash (B) Proportion of FI (%)	Possible Injury Crash (C) Proportion of FI (%)
Two-Lane Undivided	1.012	5.785	33.011	60.192
Three-Lane w/Center TWLTL	1.012	5.785	33.011	60.192
Four-Lane Undivided	1.012	5.785	33.011	60.192
Four-Lane Divided	1.012	5.785	33.011	60.192
Five-Lane w/Center TWLTL	1.012	5.785	33.011	60.192

Table 7. USA Intersection FI Proportion Data

Intersection Type	Fatal Crash (K) Proportion of FI (%)	Incapacitating Injury Crash (A) Proportion of FI (%)	Non-incapacitating Injury Crash (B) Proportion of FI (%)	Possible Injury Crash (C) Proportion of FI (%)
Three-Legged w/STOP control	0.744	6.558	36.725	55.973
Three-Legged Signalized	0.451	4.957	32.024	62.568
Four-Legged w/STOP control	0.864	6.637	38.161	54.338
Four-Legged Signalized	0.715	5.263	32.359	61.663

Analysis Output Summary

Analysis Type: Benefit/Cost

Table 8. Case Cost Summary

Is Base Case	Title	Present Value of Crash Cost ($)	Present Value of Other Cost ($)	Net Present Value of Benefits (B) ($)	Net Present Value of Costs (C) ($)	Present Value of Net Benefit (B-C) ($)	Benefit Cost Ratio (B/C)
Yes	Overlay and Concrete Repairs	3,443,820.60	170,000.00				
	STH 21 Left Turn Lanes Added	1,790,786.71	830,000.00	1,653,033.89	660,000.00	993,033.89	2.5046
	STH 21 & CTH FF Roundabout	698,966.63	950,000.00	2,744,853.97	780,000.00	1,964,853.97	3.5190

Table 9. Case Crash Summary

Is Base Case	Title	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
Yes	Overlay and Concrete Repairs	0.2311	0.8872	2.4887	2.1995	13.1690	18.9755
	STH 21 Left Turn Lanes Added	0.1202	0.4614	1.2941	1.1437	6.8479	9.8672
	STH 21 & CTH FF Roundabout	0.0178	0.1766	1.1362	1.0295	15.6510	18.0111

Crash Cost Data

Overlay and Concrete Repairs Data

Case Title: Overlay and Concrete Repairs
Is Base Case: true
Present Value of Crash Cost: 3,443,820.60
Present Value of Other Cost: 170,000.00

Table 10. Overlay and Concrete Repairs Evaluation Cost

Project or Interchange	Selected Facility	Selected Evaluation	Present Value of Crash Cost ($)
6180-30-00, STH 21 from STH 116 to Leonard Point	CTH FF Intersection Overlay & Concrete Repair	CTH FF Predicted Crashes Overlay & Concrete Repair	3,443,820.60
Total			3,443,820.60

Table 11. Overlay and Concrete Repairs Evaluation Crashes

Project or Interchange	Selected Facility	Selected Evaluation	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
6180-30-00, STH 21 from STH 116 to Leonard Point	CTH FF Intersection Overlay & Concrete Repair	CTH FF Predicted Crashes Overlay & Concrete Repair	0.2311	0.8872	2.4887	2.1995	13.1690	18.9755
Total			0.2311	0.8872	2.4887	2.1995	13.1690	18.9755

Table 12. CTH FF Intersection Overlay & Concrete Repair Facility Type Crashes

Facility Type	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
Rural Two-Lane Intersection	0.2311	0.8872	2.4887	2.1995	13.1690	18.9755
Total	0.2311	0.8872	2.4887	2.1995	13.1690	18.9755

STH 21 Left Turn Lanes Added Data

Case Title: STH 21 Left Turn Lanes Added

Is Base Case: false

Present Value of Crash Cost: 1,790,786.71

Present Value of Other Cost: 830,000.00

Table 13. STH 21 Left Turn Lanes Added Evaluation Cost

Project or Interchange	Selected Facility	Selected Evaluation	Present Value of Crash Cost ($)
6180-30-00, STH 21 from STH 116 to Leonard Point	CTH FF Intersection with STH 21 Left Turn Lanes	CTH FF Predicted Crashes Left Turn Lanes	1,790,786.71
Total			1,790,786.71

Table 14. STH 21 Left Turn Lanes Added Evaluation Crashes

Project or Interchange	Selected Facility	Selected Evaluation	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
6180-30-00, STH 21 from STH 116 to Leonard Point	CTH FF Intersection with STH 21 Left Turn Lanes	CTH FF Predicted Crashes Left Turn Lanes	0.1202	0.4614	1.2941	1.1437	6.8479	9.8672
Total			0.1202	0.4614	1.2941	1.1437	6.8479	9.8672

Table 15. CTH FF Intersection with STH 21 Left Turn Lanes Facility Type Crashes

Facility Type	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
Rural Two-Lane Intersection	0.1202	0.4614	1.2941	1.1437	6.8479	9.8672
Total	0.1202	0.4614	1.2941	1.1437	6.8479	9.8672

STH 21 & CTH FF Roundabout Data

Case Title: STH 21 & CTH FF Roundabout
Is Base Case: false
Present Value of Crash Cost: 698,966.63
Present Value of Other Cost: 950,000.00

Table 16. STH 21 & CTH FF Roundabout Evaluation Cost

Project or Interchange	Selected Facility	Selected Evaluation	Present Value of Crash Cost ($)
6180-30-00, STH 21 from STH 116 to Leonard Point	CTH FF Intersection Single Lane Roundabout	CTH FF Crash Prediction Roundabout	698,966.63
Total			698,966.63

Table 17. STH 21 & CTH FF Roundabout Evaluation Crashes

Project or Interchange	Selected Facility	Selected Evaluation	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
6180-30-00, STH 21 from STH 116 to Leonard Point	CTH FF Intersection Single Lane Roundabout	CTH FF Crash Prediction Roundabout	0.0178	0.1766	1.1362	1.0295	15.6510	18.0111
Total			0.0178	0.1766	1.1362	1.0295	15.6510	18.0111

Table 18. CTH FF Intersection Single Lane Roundabout Facility Type Crashes

Facility Type	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
Roundabout	0.0178	0.1766	1.1362	1.0295	15.6510	18.0111
Total	0.0178	0.1766	1.1362	1.0295	15.6510	18.0111

Evaluation Message

Interactive Highway Safety Design Model

Economic Analysis Report

STH 21 & Sand Pit Road

August 6, 2020

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Economic Analysis Report

Economic Analysis Report Overview

Report Generated: Aug 6, 2020 10:05 AM
Report Template: System: Multi-Page [System] (eam2, Jan 20, 2020 2:20 PM)

Evaluation Title: EAAnalysis 4 Updated 8/6/2020
Evaluation Comment: Created Thu Aug 06 10:04:25 CDT 2020
Evaluation Date: Thu Aug 06 10:04:44 CDT 2020

User Name: Scott Nelson
Organization Name: WisDOT NE Region
Phone: 920.366.2109
E-Mail: scott.nelson@dot.wi.gov

Project Title: 6180-30-00, STH 21 & Sand Pit Road Evaluation
Project Comment: Created Wed Jul 01 16:09:50 CDT 2020

Configuration Summary

Crash Cost Configuration: WisDOT Economics_v15-0

Configuration Comment: WisDOT Crash Costs

Table 1. Economic Analysis Configuration

Configuration Data	
Crash Unit Cost Zero Year	**2016**
Crash Cost Index	**0.00**
Discount Rate	**0.03**
KABCO Unit Costs	
K Cost ($/Crash)	**10,897,580.00**
A Cost ($/Crash)	**613,781.00**
B Cost ($/Crash)	**194,022.00**
C Cost ($/Crash)	**110,830.00**
O Cost ($/Crash)	**10,173.00**

Table 2. RTL Segment FI Proportion Data

Segment Type	Fatal Crash (K) Proportion of FI (%)	Incapacitating Injury Crash (A) Proportion of FI (%)	Non-incapacitating Injury Crash (B) Proportion of FI (%)	Possible Injury Crash (C) Proportion of FI (%)
Two-Lane Undivided	3.502	12.638	43.370	40.490

Table 3. RTL Intersection FI Proportion Data

Intersection Type	Fatal Crash (K) Proportion of FI (%)	Incapacitating Injury Crash (A) Proportion of FI (%)	Non-incapacitating Injury Crash (B) Proportion of FI (%)	Possible Injury Crash (C) Proportion of FI (%)
Three-Legged w/STOP control	3.070	15.070	42.380	39.480
Four-Legged w/STOP control	3.980	15.280	42.860	37.880
Four-Legged Signalized	2.960	11.750	35.290	50.000

Table 4. RML Segment FI Proportion Data

Segment Type	Fatal Crash (K) Proportion of FI (%)	Incapacitating Injury Crash (A) Proportion of FI (%)	Non-incapacitating Injury Crash (B) Proportion of FI (%)	Possible Injury Crash (C) Proportion of FI (%)
Four-Lane Undivided	3.502	12.638	43.370	40.490
Four-Lane Divided	3.502	12.638	43.370	40.490

Table 5. RML Intersection FI Proportion Data

Intersection Type	Fatal Crash (K) Proportion of FI (%)	Incapacitating Injury Crash (A) Proportion of FI (%)	Non-incapacitating Injury Crash (B) Proportion of FI (%)	Possible Injury Crash (C) Proportion of FI (%)
Three-Legged w/STOP control	4.090	14.090	40.630	41.190
Four-Legged w/STOP control	4.710	15.910	41.990	37.390
Four-Legged Signalized	0.600	10.010	37.180	52.210

Table 6. USA Segment FI Proportion Data

Segment Type	Fatal Crash (K) Proportion of FI (%)	Incapacitating Injury Crash (A) Proportion of FI (%)	Non-incapacitating Injury Crash (B) Proportion of FI (%)	Possible Injury Crash (C) Proportion of FI (%)
Two-Lane Undivided	1.012	5.785	33.011	60.192
Three-Lane w/Center TWLTL	1.012	5.785	33.011	60.192
Four-Lane Undivided	1.012	5.785	33.011	60.192
Four-Lane Divided	1.012	5.785	33.011	60.192
Five-Lane w/Center TWLTL	1.012	5.785	33.011	60.192

Table 7. USA Intersection FI Proportion Data

Intersection Type	Fatal Crash (K) Proportion of FI (%)	Incapacitating Injury Crash (A) Proportion of FI (%)	Non-incapacitating Injury Crash (B) Proportion of FI (%)	Possible Injury Crash (C) Proportion of FI (%)
Three-Legged w/STOP control	0.744	6.558	36.725	55.973
Three-Legged Signalized	0.451	4.957	32.024	62.568
Four-Legged w/STOP control	0.864	6.637	38.161	54.338
Four-Legged Signalized	0.715	5.263	32.359	61.663

Analysis Output Summary

Analysis Type: Benefit/Cost

Table 8. Case Cost Summary

Is Base Case	Title	Present Value of Crash Cost ($)	Present Value of Other Cost ($)	Net Present Value of Benefits (B) ($)	Net Present Value of Costs (C) ($)	Present Value of Net Benefit (B-C) ($)	Benefit Cost Ratio (B/C)
Yes	Sand Pit Overylay & Concrete Repair	2,917,076.43	170,000.00				
	Sand Pit STH 21 Left Turn Lanes	1,516,879.75	720,000.00	1,400,196.68	550,000.00	850,196.68	2.5458
	Sand Pit Road Roundabout	809,019.74	900,000.00	2,108,056.68	730,000.00	1,378,056.68	2.8878

Table 9. Case Crash Summary

Is Base Case	Title	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
Yes	Sand Pit Overylay & Concrete Repair	0.1957	0.7514	2.1077	1.8628	11.1530	16.0705
	Sand Pit STH 21 Left Turn Lanes	0.1018	0.3907	1.0960	0.9686	5.7995	8.3567
	Sand Pit Road Roundabout	0.0191	0.1897	1.2204	1.5359	18.6452	21.6102

Crash Cost Data

Sand Pit Overylay & Concrete Repair Data

Case Title: Sand Pit Overylay & Concrete Repair
Is Base Case: true
Present Value of Crash Cost: 2,917,076.43
Present Value of Other Cost: 170,000.00

Table 10. Sand Pit Overylay & Concrete Repair Evaluation Cost

Project or Interchange	**Selected Facility**	**Selected Evaluation**	**Present Value of Crash Cost ($)**
6180-30-00, STH 21 from STH 116 to Leonard Point	Sand Pit Road Intersection Overlay & Concrete Repair	Sand Pit Predicted Crashes Overlay and Concrete Repair	2,917,076.43
Total			2,917,076.43

Table 11. Sand Pit Overylay & Concrete Repair Evaluation Crashes

Project or Interchange	Selected Facility	Selected Evaluation	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
6180-30-00, STH 21 from STH 116 to Leonard Point	Sand Pit Road Intersection Overlay & Concrete Repair	Sand Pit Predicted Crashes Overlay and Concrete Repair	0.1957	0.7514	2.1077	1.8628	11.1530	16.0705
Total			0.1957	0.7514	2.1077	1.8628	11.1530	16.0705

Table 12. Sand Pit Road Intersection Overlay & Concrete Repair Facility Type Crashes

Facility Type	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
Rural Two-Lane Intersection	0.1957	0.7514	2.1077	1.8628	11.1530	16.0705
Total	0.1957	0.7514	2.1077	1.8628	11.1530	16.0705

Sand Pit STH 21 Left Turn Lanes Data

Case Title: Sand Pit STH 21 Left Turn Lanes
Is Base Case: false
Present Value of Crash Cost: 1,516,879.75
Present Value of Other Cost: 720,000.00

Table 13. Sand Pit STH 21 Left Turn Lanes Evaluation Cost

Project or Interchange	Selected Facility	Selected Evaluation	Present Value of Crash Cost ($)
6180-30-00, STH 21 from STH 116 to Leonard Point	Sand Pit Road Intersection STH 21 Left Turn Lanes	Sand Pit Predicted Crashes Left Turn Lanes	1,516,879.75
Total			1,516,879.75

Table 14. Sand Pit STH 21 Left Turn Lanes Evaluation Crashes

Project or Interchange	Selected Facility	Selected Evaluation	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
6180-30-00, STH 21 from STH 116 to Leonard Point	Sand Pit Road Intersection STH 21 Left Turn Lanes	Sand Pit Predicted Crashes Left Turn Lanes	0.1018	0.3907	1.0960	0.9686	5.7995	8.3567
Total			0.1018	0.3907	1.0960	0.9686	5.7995	8.3567

Table 15. Sand Pit Road Intersection STH 21 Left Turn Lanes Facility Type Crashes

Facility Type	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
Rural Two-Lane Intersection	0.1018	0.3907	1.0960	0.9686	5.7995	8.3567
Total	0.1018	0.3907	1.0960	0.9686	5.7995	8.3567

Sand Pit Road Roundabout Data

Case Title: Sand Pit Road Roundabout

Is Base Case: false

Present Value of Crash Cost: 809,019.74

Present Value of Other Cost: 900,000.00

Table 16. Sand Pit Road Roundabout Evaluation Cost

Project or Interchange	Selected Facility	Selected Evaluation	Present Value of Crash Cost ($)
6180-30-00, STH 21 from STH 116 to Leonard Point	Sand Pit Road Intersection Roundabout	Sand Pit Predicted Crashes Roundabout	809,019.74
Total			809,019.74

Table 17. Sand Pit Road Roundabout Evaluation Crashes

Project or Interchange	Selected Facility	Selected Evaluation	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
6180-30-00, STH 21 from STH 116 to Leonard Point	Sand Pit Road Intersection Roundabout	Sand Pit Predicted Crashes Roundabout	0.0191	0.1897	1.2204	1.5359	18.6452	21.6102
Total			0.0191	0.1897	1.2204	1.5359	18.6452	21.6102

Table 18. Sand Pit Road Intersection Roundabout Facility Type Crashes

Facility Type	Fatal (K) Crashes (crashes)	Incapacitating Injury (A) Crashes (crashes)	Non-Incapacitating Injury (B) Crashes (crashes)	Possible Injury (C) Crashes (crashes)	No Injury (O) Crashes (crashes)	Total Crashes (crashes)
Roundabout	0.0191	0.1897	1.2204	1.5359	18.6452	21.6102
Total	0.0191	0.1897	1.2204	1.5359	18.6452	21.6102

Evaluation Message

Wisconsin Department of Transportation Traffic Signal Warrant Summary Worksheet

70%

The Worksheet(s) attached are provided as an attachment to the Engineering Investigation Study for:

Intersection: WIS 21 & Sand Pit Road
County: Winnebago
Select one:

Major Street: WIS 21
Critical Approach Speed: 55 mph
Lanes: 1 lane

Minor Street: Sand Pit Road
Critical Approach Speed: 55 mph
Lanes: 1 lane

% Right Turns Included
From North (SB) 100%
From East (WB) 0%
From South (NB) 100%
From West (EB) 0%

In built-up area of isolated community of < 10,000 population? Yes
Total number of approaches at intersection? 4 or more
If it is a "T" intersection, inflate minor threshold to 150%? No
Manually set volume level? No

Analysis based on EXISTING volume data.

Date	Day of the Week	Time (HH:MM)			
		From	AM / PM	To	AM / PM
10/26/2019	Tuesday	6:00	AM	6:00	PM

Warrant Evaluation Summary	Warrant Met:
Warrant 1: Eight - Hour Vehicular Volume	**No**
Condition A: Minimum Vehicular Volume	No
Condition B: Interruption of Continuous Traffic	No
Condition C: Combination: 80% of A and B	No
Warrant 2: Four-Hour Volume	**No**
Warrant 3: Peak Hour Volume	**N/A**
Warrant 4: Pedestrian Volume	**N/A**
Criterion A: Four-Hour	
Criterion B: Peak-Hour	
Warrant 5: School Crossing	**N/A**
Warrant 6: Coordinated Signal System	**N/A**
Warrant 7: Crash Experience	**Yes**
Warrant 8: Roadway Network	**N/A**
Warrant 9: Intersection Near a Grade Crossing	**N/A**

Warrant Analysis Conducted By:

Name: Randy Asman
Agency: WisDOT

Date: 1/23/2020

Warrant 1: Eight - Hour Vehicular Volume 70%

Warrant Evaluated? Yes **Warrant Satisfied?** No **Manually Set To:**

Condition A :		
Min. Veh. Volume		
Volume Level	70%	56%
Major Rd. Req	350	280
Minor Rd. Req	105	84
Number of Hours	1	1

Satisfied? No

Condition B:		
Interruption of Continuous Traffic		
Volume Level	70%	56%
Major Rd. Req	525	420
Minor Rd. Req	53	42
Number of Hours	4	8

Satisfied? No

Condition C:
Combination of A & B at 56%

Satisfied? No

6:00 AM	Enter Start Time (Military Time) (HH:MM)				
Time Period	**From**	**To**	**Major Road: Both App. (VPH)**	**Minor Road: High App. (VPH)**	**Total**
1	6:00	7:00	557	75	632
2	7:00	8:00	813	127	940
3	8:00	9:00	538	55	593
4	9:00	10:00	530	35	565
5	10:00	11:00	517	43	560
6	11:00	12:00	592	36	628
7	12:00	13:00	652	38	690
8	13:00	14:00	652	34	686
9	14:00	15:00	774	43	817
10	15:00	16:00	959	54	1013
11	16:00	17:00	980	48	1028
12	17:00	18:00	825	47	872
13	18:00	19:00	0	0	0
14	19:00	20:00	0	0	0
15	20:00	21:00	0	0	0
16	21:00	22:00	0	0	0

Warrant 2: Four-Hour Volume 70%

Warrant Evaluated? Yes
Warrant Satisfied? No
Manually Set To:

Hour Start	7:00	15:00	16:00	17:00
Major Road Vol.	813	959	980	825
Minor Road Vol.	127	54	48	47

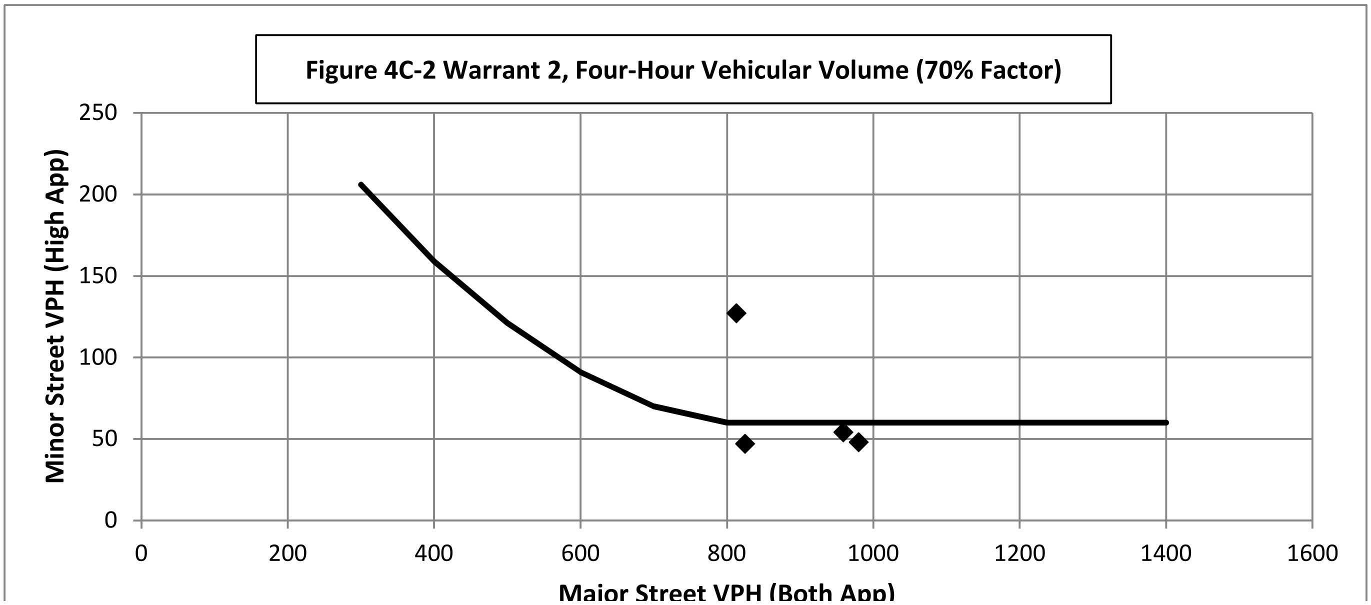


Figure 4C-2 Warrant 2, Four-Hour Vehicular Volume (70% Factor)

Major Street VPH (Both App)

Warrant 3: Peak Hour Volume 70%

Warrant Evaluated?

Warrant Satisfied? N/A

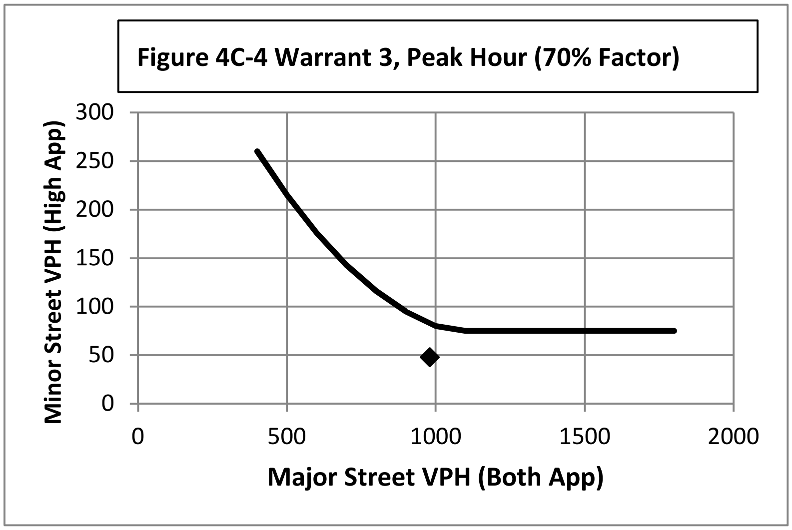
Manually Set To:

Condition justifying use of warrant:

Criteria		Met?
Delay on Minor Approach	4	
Volume on Minor Approach	100	
Total Entering Volume (veh/h)	800	

Manually Set Peak Hour?

Peak Hour	Major Road Vol. (Both App.)	Minor Road Vol. (High App.)
16:00	980	48



Warrant 4: Pedestrian Volume 70%

Warrant Evaluated?

Warrant Satisfied? N/A

Manually Set To:

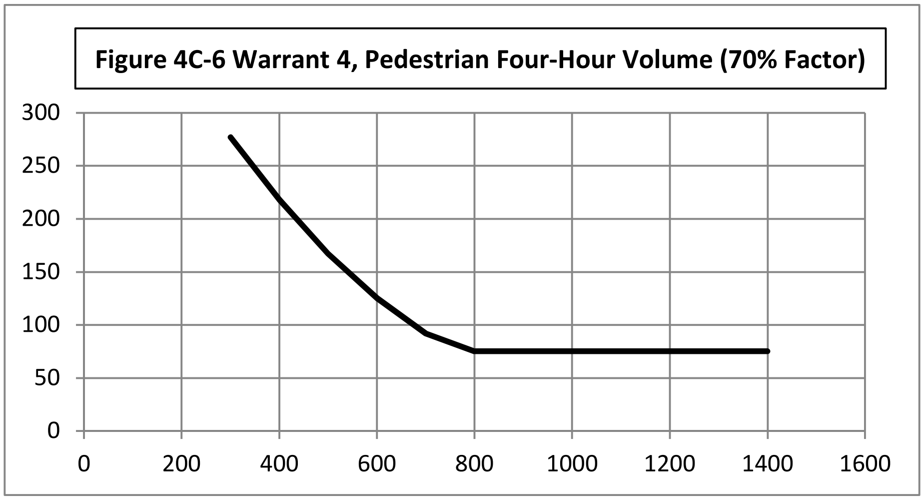
Criterion A: Four Hour

Hour (Start)	Pedestrian Volume	Major Road Vol.
		0
		0
		0
		0

Manually Set Major Rd Vol?

Avg. walk speed less than 3.5 ft/s?

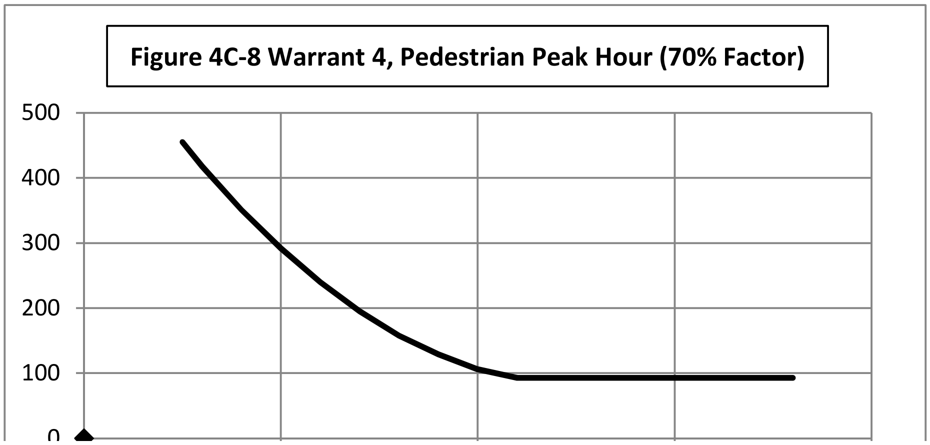
Criterion A Satisfied?

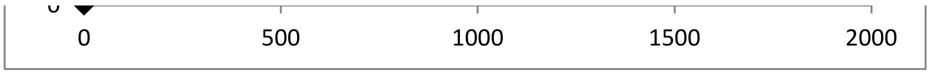


Criterion B: Peak Hour

Peak Hour	Pedestrian Vol.	Major Road Vol.
0:00	0	0

Criterion B Satisfied?




0
500
1000
1500
2000

Warrant 5: School Crossing

70%

Warrant Evaluated? **Warrant Satisfied?** **N/A** **Manually Set To:**

Criteria		Fulfilled?
1	There are a MINIMUM of 20 school children during the highest crossing hour.	
2	There are fewer adequate gaps in the major road traffic stream during the period when the school children are using the crossing than the number of minutes in the same period.	
3	The nearest traffic signal along the major road is located more than 300 ft away. Or, the nearest traffic signal is within 300 ft but the proposed traffic signal will not restrict the progressive movement of traffic.	

Warrant 6: Coordinated Signal System

70%

Warrant Evaluated? **Warrant Satisfied?** **N/A** **Manually Set To:**

Criteria		Fulfilled?
1	Signal spacing > 1000 ft	
2	On a one-way road or a road that has traffic predominantly in one direction, the adjacent signals are so far apart that they do not provide the necessary degree of vehicle platooning.	
3	On a two-way road, adjacent signals do not provide the necessary degree of platooning and the proposed and the adjacent signals will collectively provide a progressive operation.	

Warrant 7: Crash Experience

70%

Warrant Evaluated? **Yes** **Warrant Satisfied?** **Yes** **Manually Set To:**

Criteria			Met?	Fulfilled?
1	Adequate trial of other remedial measures has failed to reduce crash frequency.			Yes
	Measures Tried:	Added Turn Lanes		
2	Five or more reported crashes, of types susceptible to correction by signal, have occurred within a 12 month period.	# of crashes per 12 months		Yes
		5		
3	Warrant 1, Condition A (80%)		No	Yes
	Warrant 1, Condition B (80%)		Yes	
	Warrant 4, Criterion A (80%)		No	
	Warrant 4, Criterion B (80%)		No	

Warrant 8: Roadway Network

70%

Warrant Evaluated? **Warrant Satisfied?** **N/A** **Manually Set To:**

Criteria							Met?	Fulfilled?
1	Total entering volume of at least 1,000 veh/h during typical weekday peak hour					1028	Yes	No
	Five-year projected volumes that satisfy one or more of Warrants 1, 2, or 3.						No	
2	Total entering vol. of at least 1,000 veh/h for each of any 5 hrs of non-normal business day (Sat. or Sun.)							
		Hour						
		Volume						

Characteristics of Major Routes - Select yes if all intersecting routes have characteristic		Fulfilled?
1	Part of the road or highway system that serves as the principal roadway network for through traffic flow	

2	Rural or suburban highway outside of, entering, or traversing a city	
3	Appears as a major route on an official plan	

Warrant 9: Intersection Near a Grade Crossing **70%**

Warrant Evaluated? **Warrant Satisfied?** **N/A** **Manually Set To:**

Adjustment Factors			**Manually Set Peak Hour?**				
Rail Traffic per Day	% High Occupancy Buses on Minor Road	% Tractor-Trailer Trucks on Minor Road	D	Peak Hour	Major Road Vol.	Minor Road Vol.	Adjusted Minor Vol.
1	0	0% to 2.5%	660	16:00	980	48	16.08

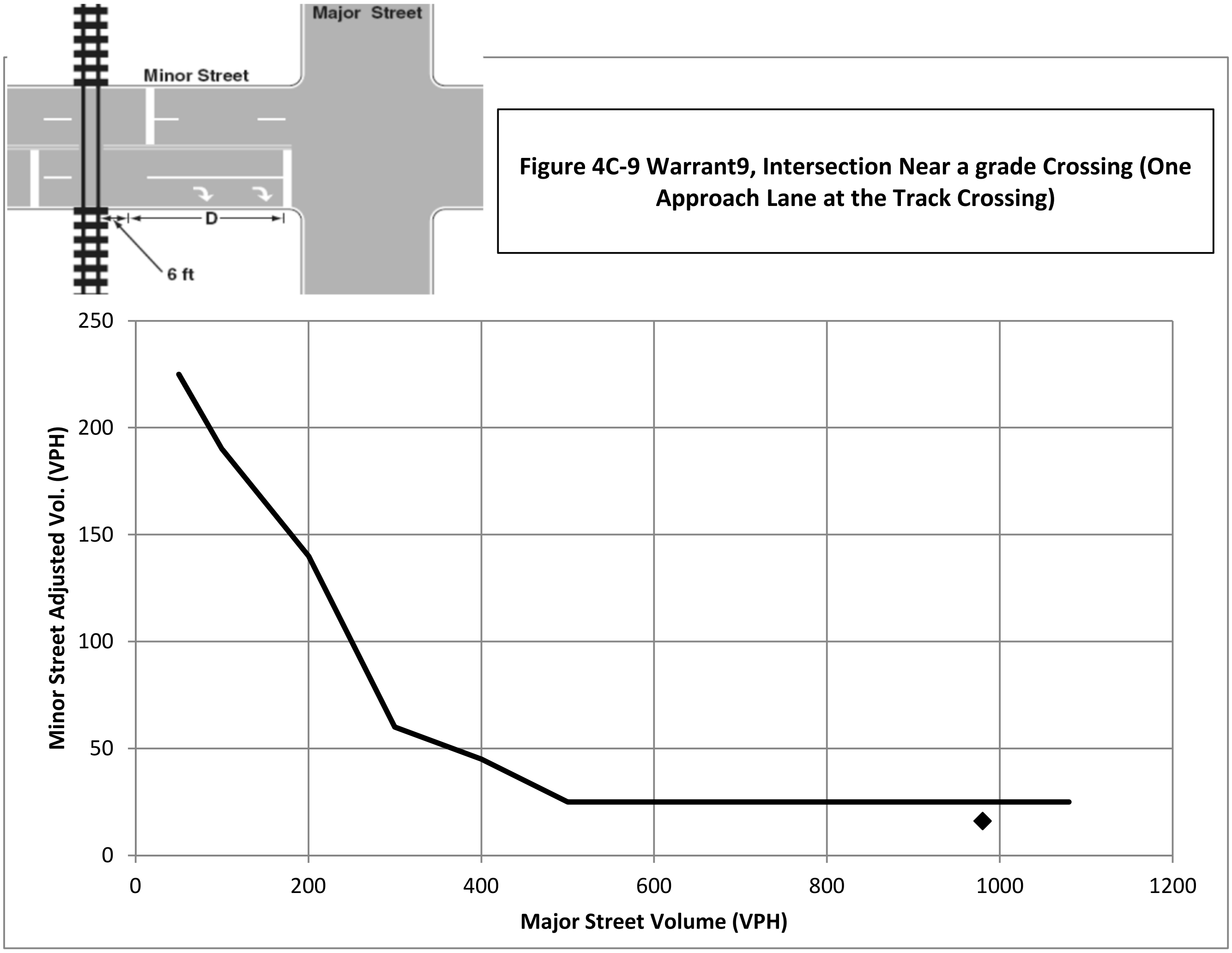


Figure 4C-9 Warrant9, Intersection Near a grade Crossing (One Approach Lane at the Track Crossing)

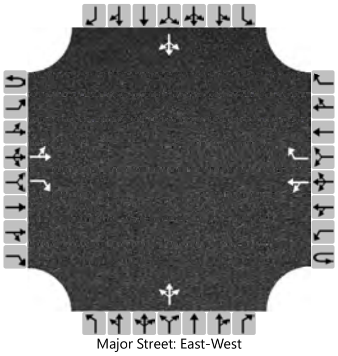
Conclusions/Comments:

HCS7 Two-Way Stop-Control Report

General Information / Site Information

General Information		Site Information	
Analyst	CRF	Intersection	STH 21 and Sand Pit Rd
Agency/Co.	Westwood	Jurisdiction	WisDOT NE
Date Performed	1/21/2021	East/West Street	STH 21
Analysis Year	2027	North/South Street	Sand Pit Road
Time Analyzed	AM Peak Existing Geometry	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	STH 21, Omro - Oshkosh		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	0	1	1		0	1	0		0	1	0
Configuration		LT		R		LT		R			LTR				LTR	
Volume (veh/h)		4	557	14		6	262	11		6	14	4		83	46	13
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No											
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

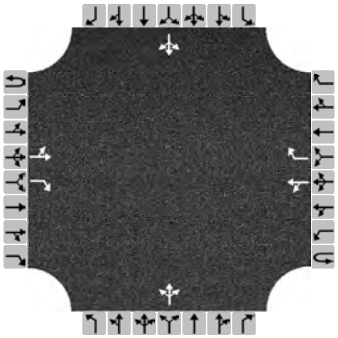
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				7					26				154	
Capacity, c (veh/h)		1259				955					263				258	
v/c Ratio		0.00				0.01					0.10				0.60	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.3				3.5	
Control Delay (s/veh)		7.9				8.8					20.2				37.8	
Level of Service (LOS)		A				A					C				E	
Approach Delay (s/veh)	0.1				0.3				20.2				37.8			
Approach LOS									C				E			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CRF	Intersection	STH 21 and Sand Pit Rd
Agency/Co.	Westwood	Jurisdiction	WisDOT NE
Date Performed	1/21/2021	East/West Street	STH 21
Analysis Year	2027	North/South Street	Sand Pit Road
Time Analyzed	PM Peak Existing Geometry	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	STH 21, Omro - Oshkosh		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	0	1	1		0	1	0		0	1	0
Configuration		LT		R		LT		R			LTR				LTR	
Volume (veh/h)		16	436	10		11	527	86		7	34	12		30	22	6
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No											
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		17				12					58				63	
Capacity, c (veh/h)		918				1073					204				174	
v/c Ratio		0.02				0.01					0.28				0.36	
95% Queue Length, Q_{95} (veh)		0.1				0.0					1.1				1.5	
Control Delay (s/veh)		9.0				8.4					29.5				37.1	
Level of Service (LOS)		A				A					D				E	
Approach Delay (s/veh)	0.5				0.3				29.5				37.1			
Approach LOS									D				E			

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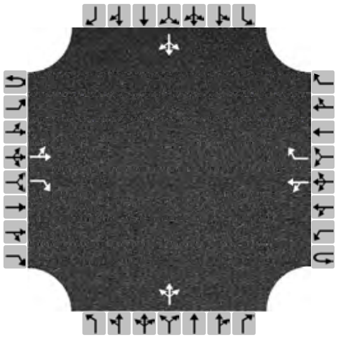
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CRF	Intersection	STH 21 and Sand Pit Rd
Agency/Co.	Westwood	Jurisdiction	WisDOT NE
Date Performed	1/21/2021	East/West Street	STH 21
Analysis Year	2047	North/South Street	Sand Pit Road
Time Analyzed	AM Peak Existing Geometry	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	STH 21, Omro - Oshkosh		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	0	1	1		0	1	0		0	1	0
Configuration		LT		R		LT		R			LTR				LTR	
Volume (veh/h)		5	583	16		7	276	14		7	19	4		103	64	16
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No											
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

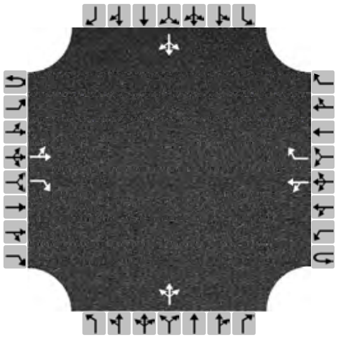
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		5				8					33				199	
Capacity, c (veh/h)		1239				931					234				236	
v/c Ratio		0.00				0.01					0.14				0.84	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.5				6.6	
Control Delay (s/veh)		7.9				8.9					22.9				69.0	
Level of Service (LOS)		A				A					C				F	
Approach Delay (s/veh)	0.1				0.3				22.9				69.0			
Approach LOS									C				F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CRF	Intersection	STH 21 and Sand Pit Rd
Agency/Co.	Westwood	Jurisdiction	WisDOT NE
Date Performed	1/21/2021	East/West Street	STH 21
Analysis Year	2047	North/South Street	Sand Pit Road
Time Analyzed	PM Peak Existing Geometry	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	STH 21, Omro - Oshkosh		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	1	0	0	1	1		0	1	0		0	1	0
Configuration		LT		R		LT		R			LTR				LTR	
Volume (veh/h)		21	458	12		13	547	107		9	47	14		36	31	8
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No											
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

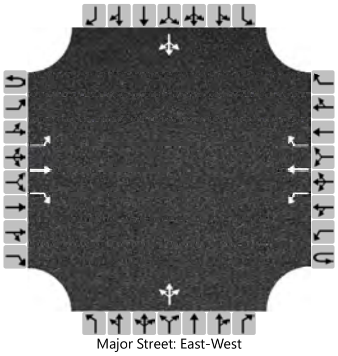
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		23				14					76				82	
Capacity, c (veh/h)		884				1049					174				146	
v/c Ratio		0.03				0.01					0.44				0.56	
95% Queue Length, Q_{95} (veh)		0.1				0.0					2.0				2.8	
Control Delay (s/veh)		9.2				8.5					40.8				56.9	
Level of Service (LOS)		A				A					E				F	
Approach Delay (s/veh)	0.7				0.3				40.8				56.9			
Approach LOS									E				F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CRF	Intersection	STH 21 and Sand Pit Rd
Agency/Co.	Westwood	Jurisdiction	WisDOT NE
Date Performed	1/21/2021	East/West Street	STH 21
Analysis Year	2027	North/South Street	Sand Pit Road
Time Analyzed	AM Peak LTLs	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	STH 21, Omro - Oshkosh		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	1	0	1	1	1		0	1	0		0	1	0
Configuration		L	T	R		L	T	R			LTR				LTR	
Volume (veh/h)		4	557	14		6	262	11		6	14	4		83	46	13
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No											
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

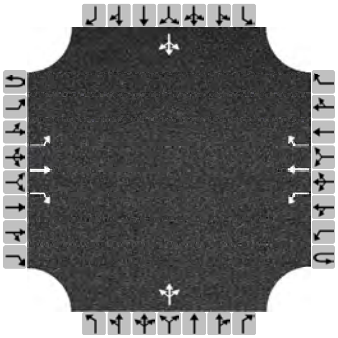
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		4				7					26				154	
Capacity, c (veh/h)		1259				955					264				259	
v/c Ratio		0.00				0.01					0.10				0.60	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.3				3.5	
Control Delay (s/veh)		7.9				8.8					20.1				37.6	
Level of Service (LOS)		A				A					C				E	
Approach Delay (s/veh)	0.1				0.2				20.1				37.6			
Approach LOS									C				E			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CRF	Intersection	STH 21 and Sand Pit Rd
Agency/Co.	Westwood	Jurisdiction	WisDOT NE
Date Performed	1/21/2021	East/West Street	STH 21
Analysis Year	2027	North/South Street	Sand Pit Road
Time Analyzed	PM Peak LTLs	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	STH 21, Omro - Oshkosh		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	1	0	1	1	1		0	1	0		0	1	0
Configuration		L	T	R		L	T	R			LTR				LTR	
Volume (veh/h)		16	436	10		11	527	86		7	34	12		30	22	6
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No											
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

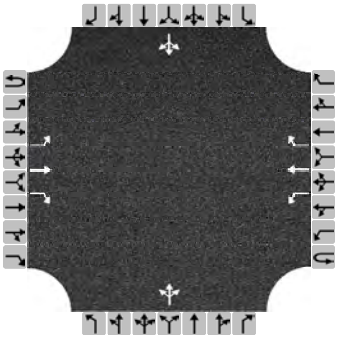
Flow Rate, v (veh/h)		17				12					58				63	
Capacity, c (veh/h)		918				1073					206				176	
v/c Ratio		0.02				0.01					0.28				0.36	
95% Queue Length, Q_{95} (veh)		0.1				0.0					1.1				1.5	
Control Delay (s/veh)		9.0				8.4					29.1				36.6	
Level of Service (LOS)		A				A					D				E	
Approach Delay (s/veh)	0.5				0.2				29.1				36.6			
Approach LOS									D				E			

HCS7 Two-Way Stop-Control Report

General Information

Analyst	CRF	Intersection	STH 21 and Sand Pit Rd
Agency/Co.	Westwood	Jurisdiction	WisDOT NE
Date Performed	1/21/2021	East/West Street	STH 21
Analysis Year	2047	North/South Street	Sand Pit Road
Time Analyzed	AM Peak LTLs	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	STH 21, Omro - Oshkosh		

Lanes


Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	1	0	1	1	1		0	1	0		0	1	0
Configuration		L	T	R		L	T	R			LTR				LTR	
Volume (veh/h)		5	583	16		7	276	14		7	19	4		103	64	16
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No											
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

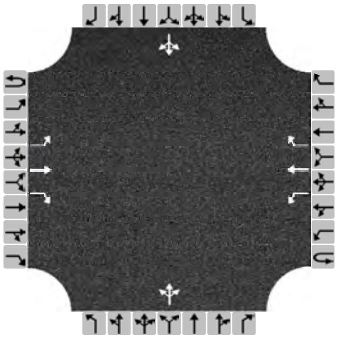
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		5				8					33				199	
Capacity, c (veh/h)		1239				931					235				237	
v/c Ratio		0.00				0.01					0.14				0.84	
95% Queue Length, Q_{95} (veh)		0.0				0.0					0.5				6.6	
Control Delay (s/veh)		7.9				8.9					22.8				68.3	
Level of Service (LOS)		A				A					C				F	
Approach Delay (s/veh)	0.1				0.3				22.8				68.3			
Approach LOS									C				F			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CRF	Intersection	STH 21 and Sand Pit Rd
Agency/Co.	Westwood	Jurisdiction	WisDOT NE
Date Performed	1/21/2021	East/West Street	STH 21
Analysis Year	2047	North/South Street	Sand Pit Road
Time Analyzed	PM Peak LTLs	Peak Hour Factor	0.92
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	STH 21, Omro - Oshkosh		

Lanes



Major Street: East-West

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	1	1	1	0	1	1	1		0	1	0		0	1	0
Configuration		L	T	R		L	T	R			LTR				LTR	
Volume (veh/h)		21	458	12		13	547	107		9	47	14		36	31	8
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)									0				0			
Right Turn Channelized	No				No											
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

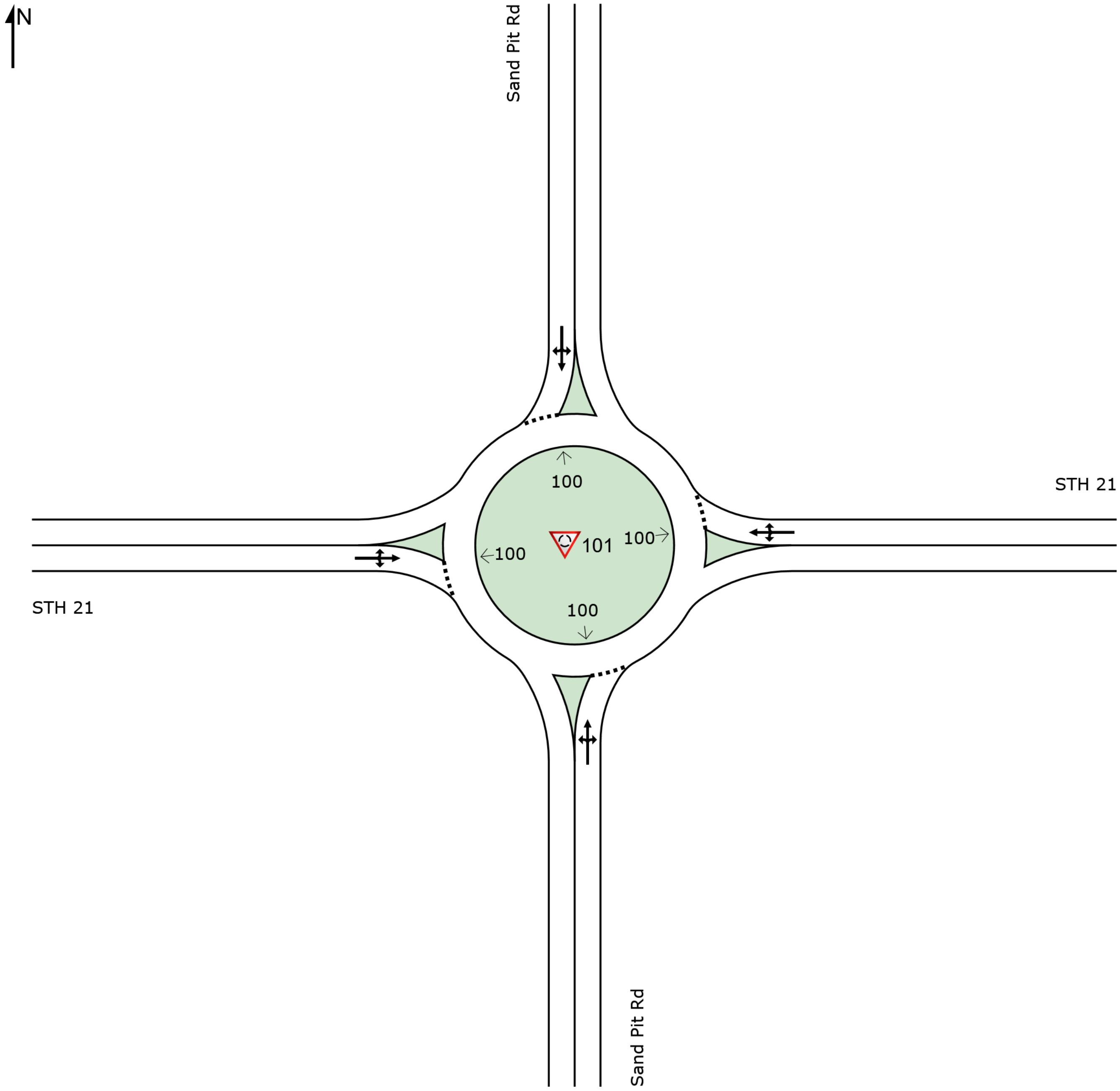
Flow Rate, v (veh/h)		23				14					76				82	
Capacity, c (veh/h)		884				1049					177				149	
v/c Ratio		0.03				0.01					0.43				0.55	
95% Queue Length, Q_{95} (veh)		0.1				0.0					2.0				2.7	
Control Delay (s/veh)		9.2				8.5					39.8				55.2	
Level of Service (LOS)		A				A					E				F	
Approach Delay (s/veh)	0.6				0.3				39.8				55.2			
Approach LOS									E				F			

SITE LAYOUT

Site: 101 [AM 2027 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT FLOWS FOR SITE (INPUT)

Approach movement input flow rates (veh/h)

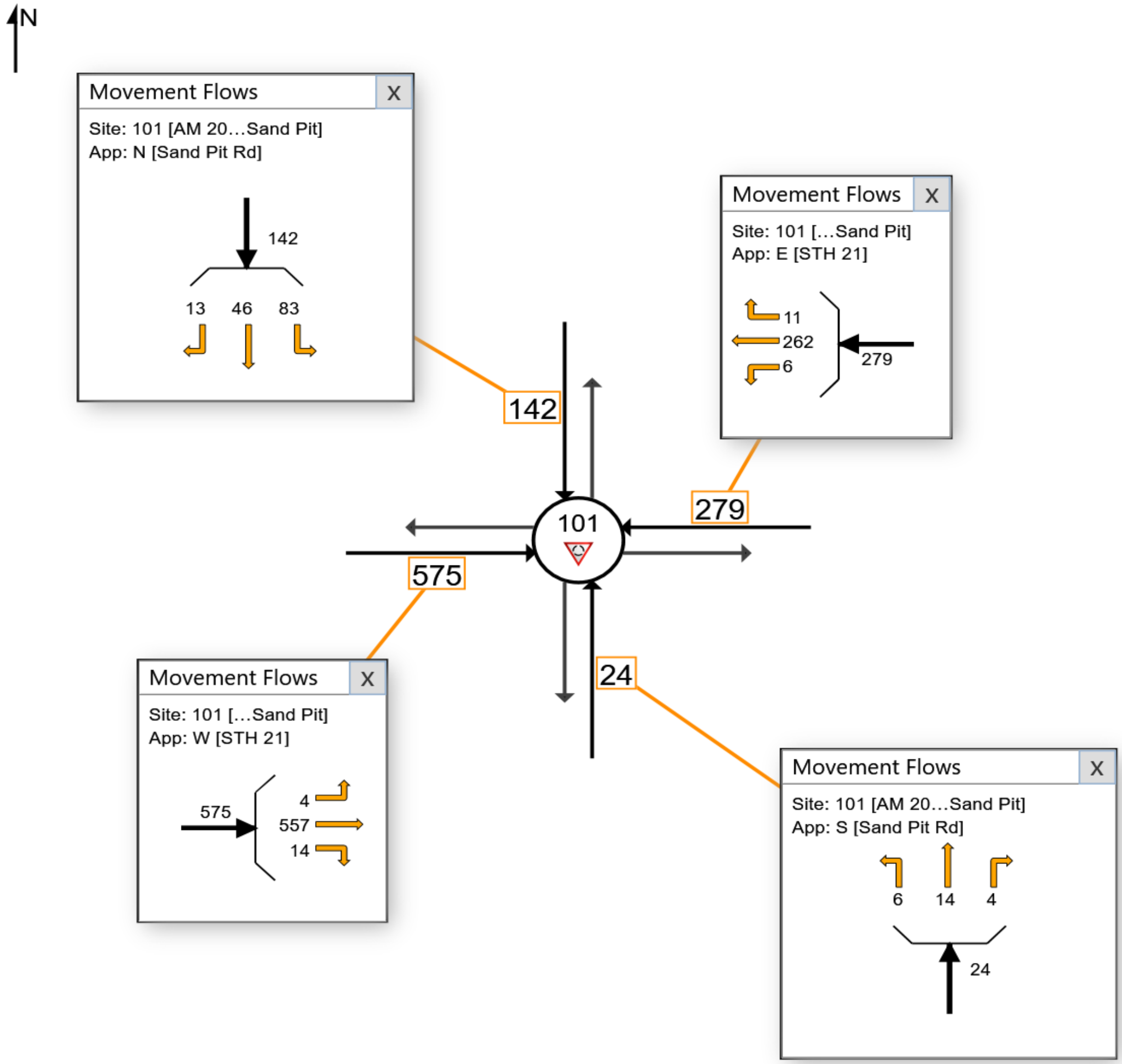
All Movement Classes

Site: 101 [AM 2027 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



INPUT COMPARISON

Site A: 101 [AM 2027 Sand Pit (Site Folder: General)]

Site B:

Intersection - Site Data

SITE	AM 2027 Sand Pit	Defaults - US HCM (Customary)
	No Difference	

Intersection - Site Properties

SITE	AM 2027 Sand Pit	Defaults - US HCM (Customary)
	NA	

Intersection - Approach & Exit Data

SITE	Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Approach Distance ft	Extra Bunching (Site Analysis) %	Extra Bunching (Network Analysis) %	Exit Distance ft	Approach Control	Area Type Factor
AM 2027 Sand Pit	South	Sand Pit Rd	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	South	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-
AM 2027 Sand Pit	East	STH 21	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	East	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-
AM 2027 Sand Pit	North	Sand Pit Rd	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	North	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-
AM 2027 Sand Pit	West	STH 21	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	West	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-

Movement Definitions - Included Movement Classes

SITE	Included	Name	ID	Model Designation
		No Difference		

Movement Definitions - Origin-Destination Movements

SITE	To Approach	Turn	OD Mov ID
	No Difference		
SITE	U-Turn Before Intersection	Exclude U-Turn Before Intersection From Signal Analysis	
	No Difference		

Lane Geometry - Lane Configuration

SITE	Leg Item	Config	Type	Control	Slip/ Bypass Control	Length	Width	Grade	Island					
									[Front Width	Back Width	Fill Style	Cnct To	For Ped Stgn	Short Strip Isl]

	ft	ft	%	ft	ft
No Difference					

Lane Geometry - Lane Disciplines

SITE	To Approach	Turn	Free Queue Distance ft	Movement Class(es)
No Difference				

Lane Geometry - Lane Disciplines - Lane Change Data

SITE	Movement Class	% Lane Change to Left %	% Lane Change to Right %
No Difference			

Lane Geometry - Lane Data

Approach Lane Data											
SITE	Approach Lane	Basic Satn Flow tcu/h	Util Ratio %	Satn Speed mph	Capacity Adj %	Use Given Cap Adj in Network Analysis	Set As Dominant Lane	Include SLip/ ByPass Lane in Entry Lane Count	Apply Satn Flow Est	Short Lane Capacity	Delay Model Param
No Difference											

Merge Analysis									
SITE	Exit Lane	Merge Lane Number	Apply Merge Analysis	Merge Type	Percent Opposing in Short Lane %	Percent Opposing in Merge Lane %	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min
No Difference									

Lane Movements - Flow Proportions

		To Exit Leg			
SITE	Exit Lane	South %	East %	North %	West %
Light Vehicles (LV)					
From: South	App. Lane 1				
AM 2027 Sand Pit	Exit Lane 1	-	100	100	100
Defaults - US HCM (Customary)	Exit Lane 1	-	-	100	100
From: East	App. Lane 1				
AM 2027 Sand Pit	Exit Lane 1	100	-	100	100
Defaults - US HCM (Customary)	Exit Lane 1	100	-	-	100
From: North	App. Lane 1				
AM 2027 Sand Pit	Exit Lane 1	100	100	-	100
Defaults - US HCM (Customary)	Exit Lane 1	100	100	-	-
From: West	App. Lane 1				
AM 2027 Sand Pit	Exit Lane 1	100	100	100	-
Defaults - US HCM (Customary)	Exit Lane 1	-	100	100	-
Heavy Vehicles (HV)					
From: South	App. Lane 1				

AM 2027 Sand Pit	Exit Lane 1	-	100	100	100
Defaults - US HCM (Customary)	Exit Lane 1	-	-	100	100
From: East	App. Lane 1				
AM 2027 Sand Pit	Exit Lane 1	100	-	100	100
Defaults - US HCM (Customary)	Exit Lane 1	100	-	-	100
From: North	App. Lane 1				
AM 2027 Sand Pit	Exit Lane 1	100	100	-	100
Defaults - US HCM (Customary)	Exit Lane 1	100	100	-	-
From: West	App. Lane 1				
AM 2027 Sand Pit	Exit Lane 1	100	100	100	-
Defaults - US HCM (Customary)	Exit Lane 1	-	100	100	-

Lane Movements - Blockage Calibration

		To Exit Leg			
SITE	Exit Lane	South	East	North	West
From: South	App. Lane 1				
AM 2027 Sand Pit	Exit Lane 1	-	1	1	1
Defaults - US HCM (Customary)	Exit Lane 1	-	-	1	1
From: East	App. Lane 1				
AM 2027 Sand Pit	Exit Lane 1	1	-	1	1
Defaults - US HCM (Customary)	Exit Lane 1	1	-	-	1
From: North	App. Lane 1				
AM 2027 Sand Pit	Exit Lane 1	1	1	-	1
Defaults - US HCM (Customary)	Exit Lane 1	1	1	-	-
From: West	App. Lane 1				
AM 2027 Sand Pit	Exit Lane 1	1	1	1	-
Defaults - US HCM (Customary)	Exit Lane 1	-	1	1	-

Roundabouts - Options

SITE	AM 2027 Sand Pit	Defaults - US HCM (Customary)
	No Difference	

Roundabouts - Geometry

SITE	Location	Name	Circ. Lanes	Circ. Width ft	Island Diameter ft	Inscribed Diameter ft	Entry Radius ft	Entry Angle °	Raindrop Design	Circ Trans Line	Downstream Circ Lanes
AM 2027 Sand Pit	South	Sand Pit Rd	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	South	RoadName	2	30	100	-	65	30	No	No	-
AM 2027 Sand Pit	East	STH 21	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	East	RoadName	2	30	100	-	65	30	No	No	-
AM 2027 Sand Pit	North	Sand Pit Rd	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	North	RoadName	2	30	100	-	65	30	No	No	-
AM 2027 Sand Pit	West	STH 21	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	West	RoadName	2	30	100	-	65	30	No	No	-

HCM 2010 Roundabout Model Parameters

SITE	Location	Name	Single L.Circ: Single L.Entry		Single L.Circ: Multi L.Entry		Multi L.Circ: Single L.Entry		Multi L.Circ: Dominant Lane		Multi L.Circ: Subdominant Lane	
			Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
AM 2027 Sand Pit	South	Sand Pit Rd	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	South	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
AM 2027 Sand Pit	East	STH 21	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	East	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
AM 2027 Sand Pit	North	Sand Pit Rd	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	North	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
AM 2027 Sand Pit	West	STH 21	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	West	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092

HCM 6 Roundabout Model Calibration

SITE	Location	Name	Model Calib. Factor (HCM6)	Entry/Circ. Flow Adjust. (HCM6)
AM 2027 Sand Pit	South	Sand Pit Rd	1	None
Defaults - US HCM (Customary)	South	RoadName	1	None
AM 2027 Sand Pit	East	STH 21	1	None
Defaults - US HCM (Customary)	East	RoadName	1	None
AM 2027 Sand Pit	North	Sand Pit Rd	1	None
Defaults - US HCM (Customary)	North	RoadName	1	None
AM 2027 Sand Pit	West	STH 21	1	None
Defaults - US HCM (Customary)	West	RoadName	1	None

Pedestrians - Pedestrian Movements

SITE	Main Crossing/ Slip/Bypass Lane Crossing	Volume ped	Peak Flow %	Flow Scale %	Growth Rate %
No Difference					

Pedestrians - Pedestrian Movement Data

SITE	Main Crossing/ Slip/Bypass Lane Crossing	Mov. ID	Crossing Distance ft	Conflict Zone Length ft	Oppng Ped.Fac.	P.Deg. Satn	Walking Speed ft/sec	App. Trav. Distance ft	Downst. Distance ft	Queue Space ft	Cr. Setback Distance
No Difference											

Volumes - Volume Data Settings

SITE	AM 2027 Sand Pit	Defaults - US HCM (Customary)
No Difference		

Volumes - Vehicle Volumes

SITE	Movement Class	To Exit Leg
NA		

Volumes - Volume Factors

SITE	To Approach	Peak Flow Factor %	Flow Scale %	Growth Rate %/year
No Difference				

Gap Acceptance - Gap Acceptance Data

SITE	Opposed Movement	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %	Opng. Peds (UnSig)
No Difference							

Gap Acceptance - Settings

Gap Acceptance Options

No Difference

Gap Acceptance Data for Specific Applications

SITE	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %

No Difference

Merge Analysis & Zebra Crossing Analysis Parameters

SITE	Movement Class	Parameter	Zebra Crossing on Slip/Bypass Lane	Midblock Zebra Crossing	Merge Analysis	
					[Exit Short Lane	Merge Lane]

No Difference

Vehicle Movement Data - Path Data

SITE	Turn	Approach Cruise Speed mph	Exit Cruise Speed mph	Negotiation Speed mph	Negotiation Distance ft	Downstream Distance ft	Negotiation Radius ft

No Difference

Vehicle Movement Data - Calibration

SITE	Turn	Queue Space ft	Vehicle Length ft	Vehicle Occupancy pers/veh	Turn Veh Effect		Gap Accp Factor	Opng. Veh Factor	Prac. Deg. Of Satn.
					[Factor	Radius] ft			

No Difference

Site Demand & Sensitivity

SITE	AM 2027 Sand Pit	Defaults - US HCM (Customary)

No Difference

Parameter Settings - Options

SITE	AM 2027 Sand Pit	Defaults - US HCM (Customary)

No Difference

Parameter Settings - Model Parameters

SITE	AM 2027 Sand Pit	Defaults - US HCM (Customary)

No Difference

Parameter Settings - Cost

Efficiency Parameters

SITE	Movement Class	Desired Speed mph	Lower Limit of Speed Efficiency for TTI

No Difference

Vehicle Cost Parameters

SITE	Movement Class	Veh Cost Method	Veh Operating Cost			Veh Time Cost	
			[Pump Price of Fuel $/Gal	Fuel Res. Cost Factor	Ratio of Running Cost to Fuel Cost]	[Avg. Income $/h	Time Value Factor]
AM 2027 Sand Pit	Light Vehicles (LV)	Operating Cost	2.3	0.7	3	27	0.4
Defaults - US HCM (Customary)	Light Vehicles (LV)	Operating Cost	2.5	0.7	3	29	0.4
AM 2027 Sand Pit	Heavy Vehicles (HV)	Operating Cost	2.3	0.7	3	27	0.4
Defaults - US HCM (Customary)	Heavy Vehicles (HV)	Operating Cost	2.5	0.7	3	29	0.4

SITE	AM 2027 Sand Pit	Cost Options Defaults - US HCM (Customary)
No Difference		

SITE	Pedestrian Cost Parameters
Not Applicable	

Parameter Settings - Vehicle Parameters

SITE	Movement Class	Vehicle Parameters Mass lb	 Max Power kW	CO2 to Fuel Rate
No Difference				

Parameter Settings - Fuel Consumption

SITE	Movement Class	fi	Fuel & Emission Model Parameters A	B	Beta
No Difference					

Parameter Settings - CO Emission

SITE	Movement Class	fi	Fuel & Emission Model Parameters A	B	Beta
No Difference					

Parameter Settings - HC Emission

SITE	Movement Class	fi	Fuel & Emission Model Parameters A	B	Beta
No Difference					

Parameter Settings - NOx Emission

SITE	Movement Class	fi	Fuel & Emission Model Parameters A	B	Beta
No Difference					

Parameter Settings - Advanced

SITE	AM 2027 Sand Pit	Defaults - US HCM (Customary)
No Difference		

MOVEMENT SUMMARY

Site: 101 [AM 2027 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Sand Pit Rd														
3	L2	6	3.0	7	3.0	0.038	5.7	LOS A	0.1	3.5	0.56	0.49	0.56	34.2
8	T1	14	3.0	15	3.0	0.038	5.7	LOS A	0.1	3.5	0.56	0.49	0.56	34.1
18	R2	4	3.0	4	3.0	0.038	5.7	LOS A	0.1	3.5	0.56	0.49	0.56	33.1
Approach		24	3.0	26	3.0	0.038	5.7	LOS A	0.1	3.5	0.56	0.49	0.56	34.0
East: STH 21														
1	L2	6	3.0	7	3.0	0.231	4.7	LOS A	1.1	28.6	0.12	0.04	0.12	35.4
6	T1	262	3.0	285	3.0	0.231	4.7	LOS A	1.1	28.6	0.12	0.04	0.12	35.3
16	R2	11	3.0	12	3.0	0.231	4.7	LOS A	1.1	28.6	0.12	0.04	0.12	34.3
Approach		279	3.0	303	3.0	0.231	4.7	LOS A	1.1	28.6	0.12	0.04	0.12	35.3
North: Sand Pit Rd														
7	L2	83	3.0	90	3.0	0.153	5.0	LOS A	0.6	16.1	0.42	0.31	0.42	33.6
4	T1	46	3.0	50	3.0	0.153	5.0	LOS A	0.6	16.1	0.42	0.31	0.42	33.5
14	R2	13	3.0	14	3.0	0.153	5.0	LOS A	0.6	16.1	0.42	0.31	0.42	32.6
Approach		142	3.0	154	3.0	0.153	5.0	LOS A	0.6	16.1	0.42	0.31	0.42	33.5
West: STH 21														
5	L2	4	3.0	4	3.0	0.536	9.3	LOS A	3.6	93.1	0.47	0.31	0.47	33.1
2	T1	557	3.0	605	3.0	0.536	9.3	LOS A	3.6	93.1	0.47	0.31	0.47	33.0
12	R2	14	3.0	15	3.0	0.536	9.3	LOS A	3.6	93.1	0.47	0.31	0.47	32.1
Approach		575	3.0	625	3.0	0.536	9.3	LOS A	3.6	93.1	0.47	0.31	0.47	33.0
All Vehicles		1020	3.0	1109	3.0	0.536	7.4	LOS A	3.6	93.1	0.37	0.24	0.37	33.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 101 [AM 2027 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: Sand Pit Rd													
Lane 1[d]	26	3.0	681	0.038	100	5.7	LOS A	0.1	3.5	Full	1600	0.0	0.0
Approach	26	3.0		0.038		5.7	LOS A	0.1	3.5				
East: STH 21													
Lane 1[d]	303	3.0	1311	0.231	100	4.7	LOS A	1.1	28.6	Full	1600	0.0	0.0
Approach	303	3.0		0.231		4.7	LOS A	1.1	28.6				
North: Sand Pit Rd													
Lane 1[d]	154	3.0	1007	0.153	100	5.0	LOS A	0.6	16.1	Full	1600	0.0	0.0
Approach	154	3.0		0.153		5.0	LOS A	0.6	16.1				
West: STH 21													
Lane 1[d]	625	3.0	1166	0.536	100	9.3	LOS A	3.6	93.1	Full	1600	0.0	0.0
Approach	625	3.0		0.536		9.3	LOS A	3.6	93.1				
Intersection	1109	3.0		0.536		7.4	LOS A	3.6	93.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Sand Pit Rd

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	7	15	4	26	3.0	681	0.038	100	NA	NA
Approach	7	15	4	26	3.0		0.038			

East: STH 21

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	7	285	12	303	3.0	1311	0.231	100	NA	NA
Approach	7	285	12	303	3.0		0.231			

North: Sand Pit Rd

Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From N To Exit:	E	S	W							
Lane 1	90	50	14	154	3.0	1007	0.153	100	NA	NA
Approach	90	50	14	154	3.0		0.153			

West: STH 21

Mov.	L2	T1	R2	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
From W To Exit:	N	E	S							
Lane 1	4	605	15	625	3.0	1166	0.536	100	NA	NA
Approach	4	605	15	625	3.0		0.536			

	Total	%HV	Deg.Satn (v/c)
Intersection	1109	3.0	0.536

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

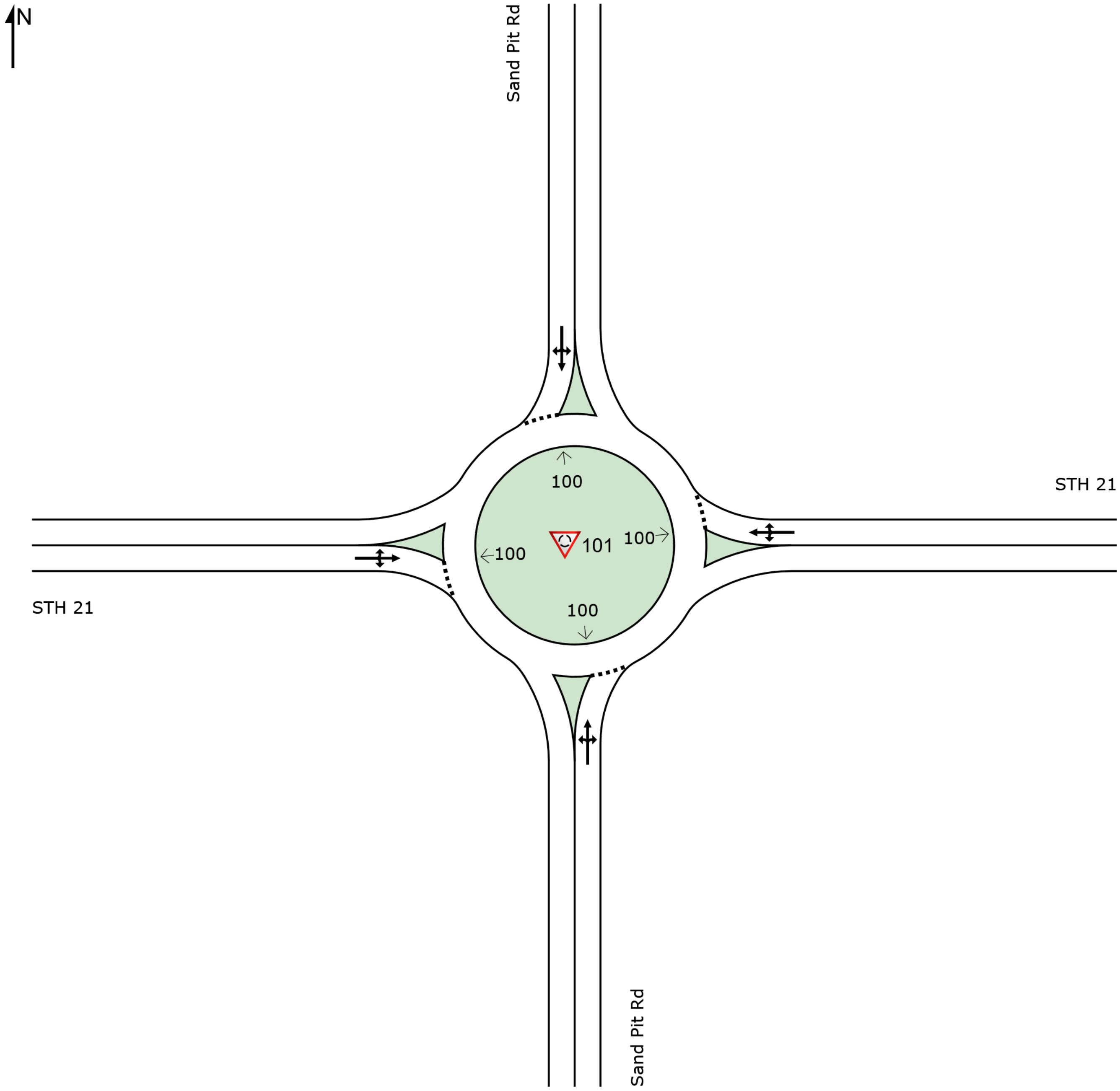
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Sand Pit Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: STH 21 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Sand Pit Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: STH 21 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 101 [PM 2027 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT FLOWS FOR SITE (INPUT)

Approach movement input flow rates (veh/h)

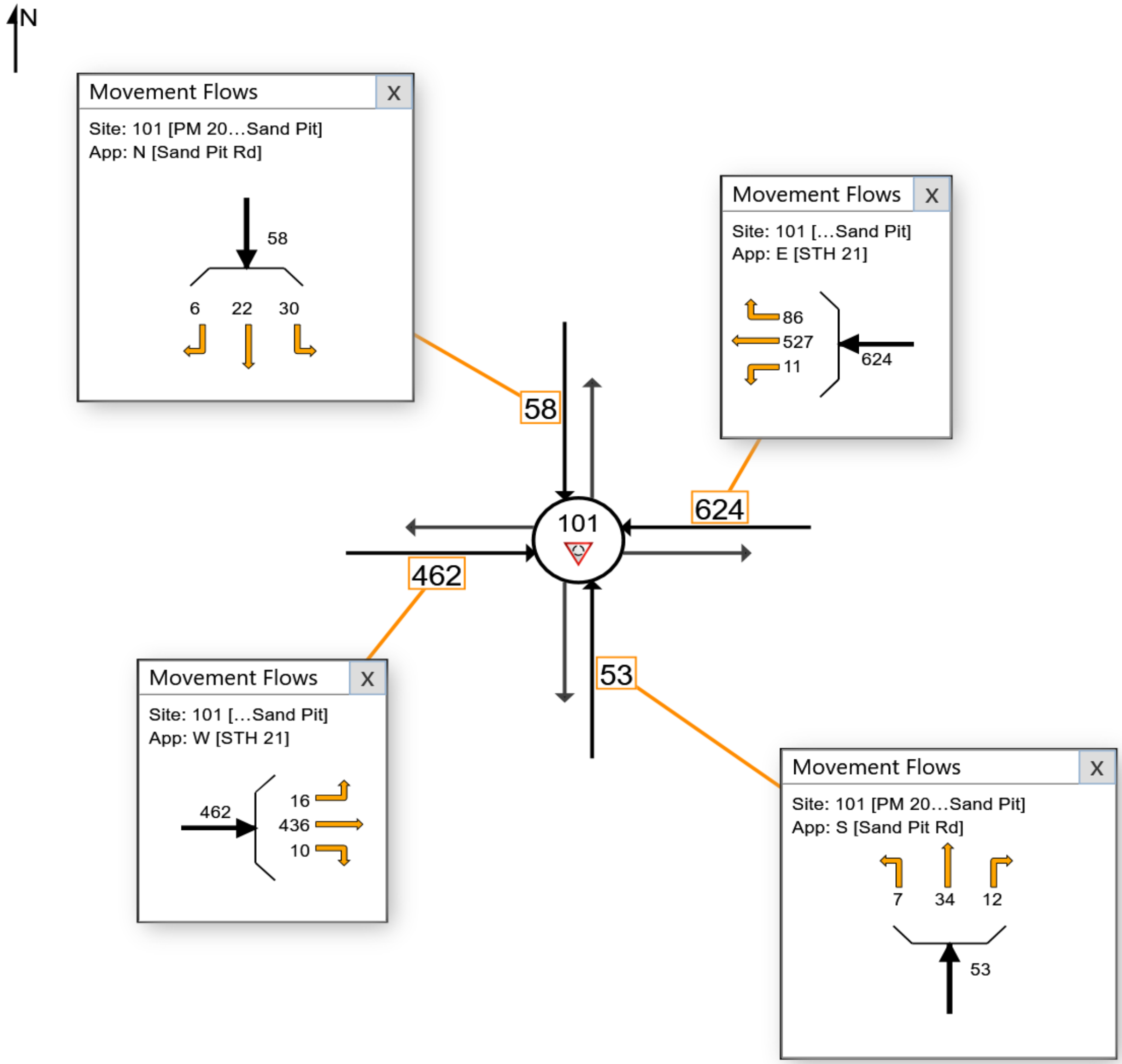
All Movement Classes

Site: 101 [PM 2027 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



INPUT COMPARISON

Site A: 101 [PM 2027 Sand Pit (Site Folder: General)]

Site B:

Intersection - Site Data

SITE	PM 2027 Sand Pit	Defaults - US HCM (Customary)
	No Difference	

Intersection - Site Properties

SITE	PM 2027 Sand Pit	Defaults - US HCM (Customary)
	NA	

Intersection - Approach & Exit Data

SITE	Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Approach Distance ft	Extra Bunching (Site Analysis) %	Extra Bunching (Network Analysis) %	Exit Distance ft	Approach Control	Area Type Factor
PM 2027 Sand Pit	South	Sand Pit Rd	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	South	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-
PM 2027 Sand Pit	East	STH 21	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	East	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-
PM 2027 Sand Pit	North	Sand Pit Rd	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	North	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-
PM 2027 Sand Pit	West	STH 21	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	West	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-

Movement Definitions - Included Movement Classes

SITE	Included	Name	ID	Model Designation
		No Difference		

Movement Definitions - Origin-Destination Movements

SITE	To Approach	Turn	OD Mov ID
	No Difference		

SITE	U-Turn Before Intersection	Exclude U-Turn Before Intersection From Signal Analysis
	No Difference	

Lane Geometry - Lane Configuration

SITE	Leg Item	Config	Type	Control	Slip/ Bypass Control	Length	Width	Grade	Island					
									[Front Width	Back Width	Fill Style	Cnct To	For Ped Stgn	Short Strip Isl]

	ft	ft	%	ft	ft
No Difference					

Lane Geometry - Lane Disciplines

SITE	To Approach	Turn	Free Queue Distance ft	Movement Class(es)
No Difference				

Lane Geometry - Lane Disciplines - Lane Change Data

SITE	Movement Class	% Lane Change to Left %	% Lane Change to Right %
No Difference			

Lane Geometry - Lane Data

Approach Lane Data

SITE	Approach Lane	Basic Satn Flow tcu/h	Util Ratio %	Satn Speed mph	Capacity Adj %	Use Given Cap Adj in Network Analysis	Set As Dominant Lane	Include SLip/ ByPass Lane in Entry Lane Count	Apply Satn Flow Est	Short Lane Capacity	Delay Model Param
No Difference											

Merge Analysis

SITE	Exit Lane	Merge Lane Number	Apply Merge Analysis	Merge Type	Percent Opposing in Short Lane %	Percent Opposing in Merge Lane %	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min
No Difference									

Lane Movements - Flow Proportions

SITE	Exit Lane	To Exit Leg			
		South %	East %	North %	West %
Light Vehicles (LV)					
From: South	App. Lane 1				
PM 2027 Sand Pit	Exit Lane 1	-	100	100	100
Defaults - US HCM (Customary)	Exit Lane 1	-	-	100	100
From: East	App. Lane 1				
PM 2027 Sand Pit	Exit Lane 1	100	-	100	100
Defaults - US HCM (Customary)	Exit Lane 1	100	-	-	100
From: North	App. Lane 1				
PM 2027 Sand Pit	Exit Lane 1	100	100	-	100
Defaults - US HCM (Customary)	Exit Lane 1	100	100	-	-
From: West	App. Lane 1				
PM 2027 Sand Pit	Exit Lane 1	100	100	100	-
Defaults - US HCM (Customary)	Exit Lane 1	-	100	100	-
Heavy Vehicles (HV)					
From: South	App. Lane 1				

PM 2027 Sand Pit	Exit Lane 1	-	100	100	100
Defaults - US HCM (Customary)	Exit Lane 1	-	-	100	100
From: East	App. Lane 1				
PM 2027 Sand Pit	Exit Lane 1	100	-	100	100
Defaults - US HCM (Customary)	Exit Lane 1	100	-	-	100
From: North	App. Lane 1				
PM 2027 Sand Pit	Exit Lane 1	100	100	-	100
Defaults - US HCM (Customary)	Exit Lane 1	100	100	-	-
From: West	App. Lane 1				
PM 2027 Sand Pit	Exit Lane 1	100	100	100	-
Defaults - US HCM (Customary)	Exit Lane 1	-	100	100	-

Lane Movements - Blockage Calibration

SITE	Exit Lane	To Exit Leg			
		South	East	North	West
From: South	App. Lane 1				
PM 2027 Sand Pit	Exit Lane 1	-	1	1	1
Defaults - US HCM (Customary)	Exit Lane 1	-	-	1	1
From: East	App. Lane 1				
PM 2027 Sand Pit	Exit Lane 1	1	-	1	1
Defaults - US HCM (Customary)	Exit Lane 1	1	-	-	1
From: North	App. Lane 1				
PM 2027 Sand Pit	Exit Lane 1	1	1	-	1
Defaults - US HCM (Customary)	Exit Lane 1	1	1	-	-
From: West	App. Lane 1				
PM 2027 Sand Pit	Exit Lane 1	1	1	1	-
Defaults - US HCM (Customary)	Exit Lane 1	-	1	1	-

Roundabouts - Options

SITE	PM 2027 Sand Pit	Defaults - US HCM (Customary)
	No Difference	

Roundabouts - Geometry

SITE	Location	Name	Circ. Lanes	Circ. Width ft	Island Diameter ft	Inscribed Diameter ft	Entry Radius ft	Entry Angle °	Raindrop Design	Circ Trans Line	Downstream Circ Lanes
PM 2027 Sand Pit	South	Sand Pit Rd	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	South	RoadName	2	30	100	-	65	30	No	No	-
PM 2027 Sand Pit	East	STH 21	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	East	RoadName	2	30	100	-	65	30	No	No	-
PM 2027 Sand Pit	North	Sand Pit Rd	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	North	RoadName	2	30	100	-	65	30	No	No	-
PM 2027 Sand Pit	West	STH 21	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	West	RoadName	2	30	100	-	65	30	No	No	-

HCM 2010 Roundabout Model Parameters

SITE	Location	Name	Single L.Circ: Single L.Entry		Single L.Circ: Multi L.Entry		Multi L.Circ: Single L.Entry		Multi L.Circ: Dominant Lane		Multi L.Circ: Subdominant Lane	
			Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
PM 2027 Sand Pit	South	Sand Pit Rd	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	South	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
PM 2027 Sand Pit	East	STH 21	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	East	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
PM 2027 Sand Pit	North	Sand Pit Rd	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	North	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
PM 2027 Sand Pit	West	STH 21	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	West	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092

HCM 6 Roundabout Model Calibration

SITE	Location	Name	Model Calib. Factor (HCM6)	Entry/Circ. Flow Adjust. (HCM6)
PM 2027 Sand Pit	South	Sand Pit Rd	1	None
Defaults - US HCM (Customary)	South	RoadName	1	None
PM 2027 Sand Pit	East	STH 21	1	None
Defaults - US HCM (Customary)	East	RoadName	1	None
PM 2027 Sand Pit	North	Sand Pit Rd	1	None
Defaults - US HCM (Customary)	North	RoadName	1	None
PM 2027 Sand Pit	West	STH 21	1	None
Defaults - US HCM (Customary)	West	RoadName	1	None

Pedestrians - Pedestrian Movements

SITE	Main Crossing/ Slip/Bypass Lane Crossing	Volume ped	Peak Flow %	Flow Scale %	Growth Rate %
No Difference					

Pedestrians - Pedestrian Movement Data

SITE	Main Crossing/ Slip/Bypass Lane Crossing	Mov. ID	Crossing Distance ft	Conflict Zone Length ft	Oppng Ped.Fac.	P.Deg. Satn	Walking Speed ft/sec	App. Trav. Distance ft	Downst. Distance ft	Queue Space ft	Cr. Setback Distance
No Difference											

Volumes - Volume Data Settings

SITE	PM 2027 Sand Pit	Defaults - US HCM (Customary)
No Difference		

Volumes - Vehicle Volumes

SITE	Movement Class	To Exit Leg
NA		

Volumes - Volume Factors

SITE	To Approach	Peak Flow Factor %	Flow Scale %	Growth Rate %/year
No Difference				

Gap Acceptance - Gap Acceptance Data

SITE	Opposed Movement	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %	Opng. Peds (UnSig)
No Difference							

Gap Acceptance - Settings

Gap Acceptance Options

No Difference

Gap Acceptance Data for Specific Applications

SITE	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %

No Difference

Merge Analysis & Zebra Crossing Analysis Parameters

					Merge Analysis	
SITE	Movement Class	Parameter	Zebra Crossing on Slip/Bypass Lane	Midblock Zebra Crossing	[Exit Short Lane	Merge Lane]

No Difference

Vehicle Movement Data - Path Data

SITE	Turn	Approach Cruise Speed mph	Exit Cruise Speed mph	Negotiation Speed mph	Negotiation Distance ft	Downstream Distance ft	Negotiation Radius ft

No Difference

Vehicle Movement Data - Calibration

SITE	Turn	Queue Space ft	Vehicle Length ft	Vehicle Occupancy pers/veh	Turn Veh Effect [Factor	Radius] ft	Gap Accp Factor	Opng. Veh Factor	Prac. Deg. Of Satn.

No Difference

Site Demand & Sensitivity

SITE	PM 2027 Sand Pit	Defaults - US HCM (Customary)

No Difference

Parameter Settings - Options

SITE	PM 2027 Sand Pit	Defaults - US HCM (Customary)

No Difference

Parameter Settings - Model Parameters

SITE	PM 2027 Sand Pit	Defaults - US HCM (Customary)

No Difference

Parameter Settings - Cost

Efficiency Parameters

SITE	Movement Class	Desired Speed mph	Lower Limit of Speed Efficiency for TTI

No Difference

Vehicle Cost Parameters

			Veh Operating Cost			Veh Time Cost	
SITE	Movement Class	Veh Cost Method	[Pump Price of Fuel $/Gal	Fuel Res. Cost Factor	Ratio of Running Cost to Fuel Cost]	[Avg. Income $/h	Time Value Factor]
PM 2027 Sand Pit	Light Vehicles (LV)	Operating Cost	2.3	0.7	3	27	0.4
Defaults - US HCM (Customary)	Light Vehicles (LV)	Operating Cost	2.5	0.7	3	29	0.4
PM 2027 Sand Pit	Heavy Vehicles (HV)	Operating Cost	2.3	0.7	3	27	0.4
Defaults - US HCM (Customary)	Heavy Vehicles (HV)	Operating Cost	2.5	0.7	3	29	0.4

Cost Options		
SITE	PM 2027 Sand Pit	Defaults - US HCM (Customary)
No Difference		

Pedestrian Cost Parameters
SITE
Not Applicable

Parameter Settings - Vehicle Parameters

SITE	Movement Class	Vehicle Parameters Mass lb	 Max Power kW	CO2 to Fuel Rate
No Difference				

Parameter Settings - Fuel Consumption

SITE	Movement Class	fi	Fuel & Emission Model Parameters A	 B	Beta
No Difference					

Parameter Settings - CO Emission

SITE	Movement Class	fi	Fuel & Emission Model Parameters A	 B	Beta
No Difference					

Parameter Settings - HC Emission

SITE	Movement Class	fi	Fuel & Emission Model Parameters A	 B	Beta
No Difference					

Parameter Settings - NOx Emission

SITE	Movement Class	fi	Fuel & Emission Model Parameters A	 B	Beta
No Difference					

Parameter Settings - Advanced

SITE	PM 2027 Sand Pit	Defaults - US HCM (Customary)
No Difference		

MOVEMENT SUMMARY

Site: 101 [PM 2027 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: Sand Pit Rd														
3	L2	7	3.0	8	3.0	0.071	5.2	LOS A	0.3	6.8	0.51	0.43	0.51	34.8
8	T1	34	3.0	37	3.0	0.071	5.2	LOS A	0.3	6.8	0.51	0.43	0.51	34.7
18	R2	12	3.0	13	3.0	0.071	5.2	LOS A	0.3	6.8	0.51	0.43	0.51	33.7
Approach		53	3.0	58	3.0	0.071	5.2	LOS A	0.3	6.8	0.51	0.43	0.51	34.5
East: STH 21														
1	L2	11	3.0	12	3.0	0.536	8.8	LOS A	3.9	101.0	0.31	0.14	0.31	33.3
6	T1	527	3.0	573	3.0	0.536	8.8	LOS A	3.9	101.0	0.31	0.14	0.31	33.2
16	R2	86	3.0	93	3.0	0.536	8.8	LOS A	3.9	101.0	0.31	0.14	0.31	32.3
Approach		624	3.0	678	3.0	0.536	8.8	LOS A	3.9	101.0	0.31	0.14	0.31	33.1
North: Sand Pit Rd														
7	L2	30	3.0	33	3.0	0.083	5.6	LOS A	0.3	7.9	0.54	0.48	0.54	33.5
4	T1	22	3.0	24	3.0	0.083	5.6	LOS A	0.3	7.9	0.54	0.48	0.54	33.4
14	R2	6	3.0	7	3.0	0.083	5.6	LOS A	0.3	7.9	0.54	0.48	0.54	32.5
Approach		58	3.0	63	3.0	0.083	5.6	LOS A	0.3	7.9	0.54	0.48	0.54	33.3
West: STH 21														
5	L2	16	3.0	17	3.0	0.399	6.7	LOS A	2.4	60.2	0.26	0.12	0.26	34.3
2	T1	436	3.0	474	3.0	0.399	6.7	LOS A	2.4	60.2	0.26	0.12	0.26	34.2
12	R2	10	3.0	11	3.0	0.399	6.7	LOS A	2.4	60.2	0.26	0.12	0.26	33.2
Approach		462	3.0	502	3.0	0.399	6.7	LOS A	2.4	60.2	0.26	0.12	0.26	34.2
All Vehicles		1197	3.0	1301	3.0	0.536	7.7	LOS A	3.9	101.0	0.31	0.17	0.31	33.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 101 [PM 2027 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: Sand Pit Rd													
Lane 1[d]	58	3.0	808	0.071	100	5.2	LOS A	0.3	6.8	Full	1600	0.0	0.0
Approach	58	3.0		0.071		5.2	LOS A	0.3	6.8				
East: STH 21													
Lane 1[d]	678	3.0	1266	0.536	100	8.8	LOS A	3.9	101.0	Full	1600	0.0	0.0
Approach	678	3.0		0.536		8.8	LOS A	3.9	101.0				
North: Sand Pit Rd													
Lane 1[d]	63	3.0	756	0.083	100	5.6	LOS A	0.3	7.9	Full	1600	0.0	0.0
Approach	63	3.0		0.083		5.6	LOS A	0.3	7.9				
West: STH 21													
Lane 1[d]	502	3.0	1258	0.399	100	6.7	LOS A	2.4	60.2	Full	1600	0.0	0.0
Approach	502	3.0		0.399		6.7	LOS A	2.4	60.2				
Intersection	1301	3.0		0.536		7.7	LOS A	3.9	101.0				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

[d] Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Sand Pit Rd

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	8	37	13	58	3.0	808	0.071	100	NA	NA
Approach	8	37	13	58	3.0		0.071			

East: STH 21

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	12	573	93	678	3.0	1266	0.536	100	NA	NA
Approach	12	573	93	678	3.0		0.536			

North: Sand Pit Rd										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	33	24	7	63	3.0	756	0.083	100	NA	NA
Approach	33	24	7	63	3.0		0.083			

West: STH 21										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	17	474	11	502	3.0	1258	0.399	100	NA	NA
Approach	17	474	11	502	3.0		0.399			

	Total	%HV	Deg.Satn (v/c)
Intersection	1301	3.0	0.536

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

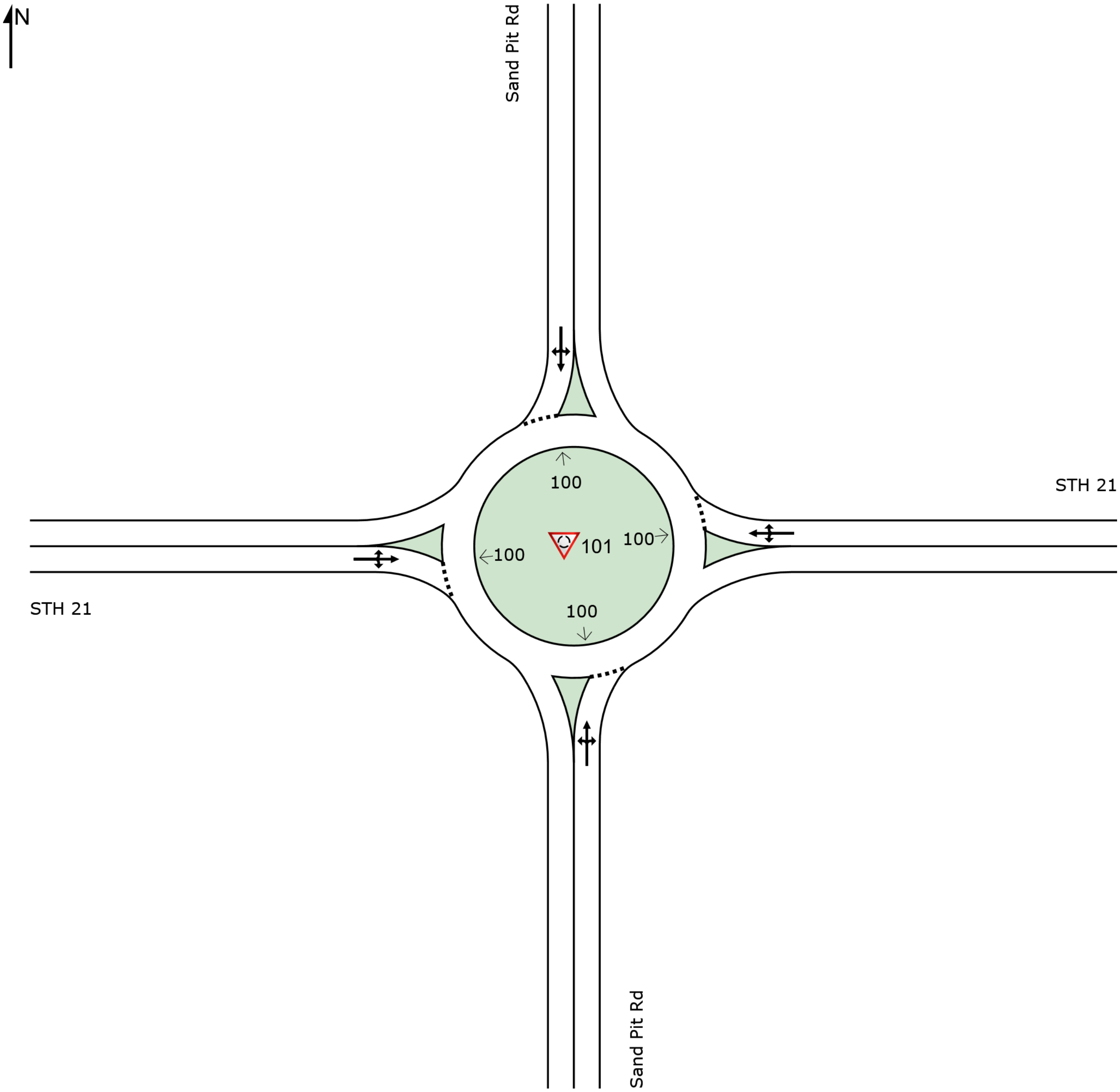
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Sand Pit Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: STH 21 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Sand Pit Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: STH 21 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 101 [AM 2047 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT FLOWS FOR SITE (INPUT)

Approach movement input flow rates (veh/h)

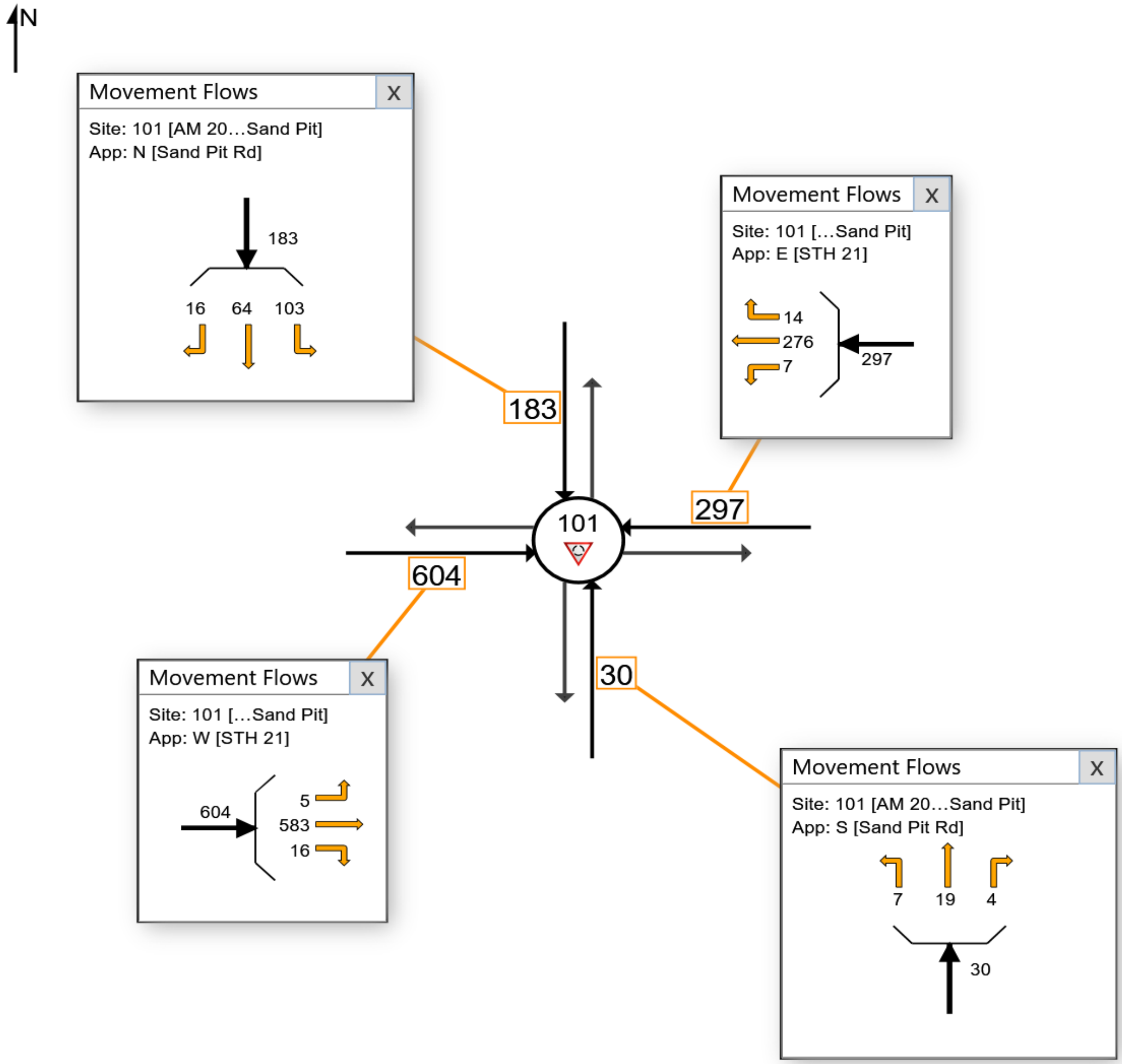
All Movement Classes

Site: 101 [AM 2047 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



INPUT COMPARISON

Site A: 101 [AM 2047 Sand Pit (Site Folder: General)]

Site B:

Intersection - Site Data

SITE	AM 2047 Sand Pit	Defaults - US HCM (Customary)
No Difference		

Intersection - Site Properties

SITE	AM 2047 Sand Pit	Defaults - US HCM (Customary)
NA		

Intersection - Approach & Exit Data

SITE	Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Approach Distance ft	Extra Bunching (Site Analysis) %	Extra Bunching (Network Analysis) %	Exit Distance ft	Approach Control	Area Type Factor
AM 2047 Sand Pit	South	Sand Pit Rd	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	South	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-
AM 2047 Sand Pit	East	STH 21	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	East	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-
AM 2047 Sand Pit	North	Sand Pit Rd	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	North	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-
AM 2047 Sand Pit	West	STH 21	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	West	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-

Movement Definitions - Included Movement Classes

SITE	Included	Name	ID	Model Designation
No Difference				

Movement Definitions - Origin-Destination Movements

SITE	To Approach	Turn	OD Mov ID
No Difference			

SITE	U-Turn Before Intersection	Exclude U-Turn Before Intersection From Signal Analysis
No Difference		

Lane Geometry - Lane Configuration

SITE	Leg Item	Config	Type	Control	Slip/ Bypass Control	Length	Width	Grade	Island					
									[Front Width	Back Width	Fill Style	Cnct To	For Ped Stgn	Short Strip Isl]

	ft	ft	%	ft	ft
No Difference					

Lane Geometry - Lane Disciplines

SITE	To Approach	Turn	Free Queue Distance ft	Movement Class(es)
No Difference				

Lane Geometry - Lane Disciplines - Lane Change Data

SITE	Movement Class	% Lane Change to Left %	% Lane Change to Right %
No Difference			

Lane Geometry - Lane Data

Approach Lane Data											
SITE	Approach Lane	Basic Satn Flow tcu/h	Util Ratio %	Satn Speed mph	Capacity Adj %	Use Given Cap Adj in Network Analysis	Set As Dominant Lane	Include SLip/ ByPass Lane in Entry Lane Count	Apply Satn Flow Est	Short Lane Capacity	Delay Model Param
No Difference											

Merge Analysis									
SITE	Exit Lane	Merge Lane Number	Apply Merge Analysis	Merge Type	Percent Opposing in Short Lane %	Percent Opposing in Merge Lane %	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min
No Difference									

Lane Movements - Flow Proportions

SITE	Exit Lane	To Exit Leg South %	East %	North %	West %
Light Vehicles (LV)					
From: South	App. Lane 1				
AM 2047 Sand Pit	Exit Lane 1	-	100	100	100
Defaults - US HCM (Customary)	Exit Lane 1	-	-	100	100
From: East	App. Lane 1				
AM 2047 Sand Pit	Exit Lane 1	100	-	100	100
Defaults - US HCM (Customary)	Exit Lane 1	100	-	-	100
From: North	App. Lane 1				
AM 2047 Sand Pit	Exit Lane 1	100	100	-	100
Defaults - US HCM (Customary)	Exit Lane 1	100	100	-	-
From: West	App. Lane 1				
AM 2047 Sand Pit	Exit Lane 1	100	100	100	-
Defaults - US HCM (Customary)	Exit Lane 1	-	100	100	-
Heavy Vehicles (HV)					
From: South	App. Lane 1				

AM 2047 Sand Pit	Exit Lane 1	-	100	100	100
Defaults - US HCM (Customary)	Exit Lane 1	-	-	100	100
From: East	App. Lane 1				
AM 2047 Sand Pit	Exit Lane 1	100	-	100	100
Defaults - US HCM (Customary)	Exit Lane 1	100	-	-	100
From: North	App. Lane 1				
AM 2047 Sand Pit	Exit Lane 1	100	100	-	100
Defaults - US HCM (Customary)	Exit Lane 1	100	100	-	-
From: West	App. Lane 1				
AM 2047 Sand Pit	Exit Lane 1	100	100	100	-
Defaults - US HCM (Customary)	Exit Lane 1	-	100	100	-

Lane Movements - Blockage Calibration

			To Exit Leg		
SITE	Exit Lane	South	East	North	West
From: South	App. Lane 1				
AM 2047 Sand Pit	Exit Lane 1	-	1	1	1
Defaults - US HCM (Customary)	Exit Lane 1	-	-	1	1
From: East	App. Lane 1				
AM 2047 Sand Pit	Exit Lane 1	1	-	1	1
Defaults - US HCM (Customary)	Exit Lane 1	1	-	-	1
From: North	App. Lane 1				
AM 2047 Sand Pit	Exit Lane 1	1	1	-	1
Defaults - US HCM (Customary)	Exit Lane 1	1	1	-	-
From: West	App. Lane 1				
AM 2047 Sand Pit	Exit Lane 1	1	1	1	-
Defaults - US HCM (Customary)	Exit Lane 1	-	1	1	-

Roundabouts - Options

SITE	AM 2047 Sand Pit	Defaults - US HCM (Customary)
	No Difference	

Roundabouts - Geometry

SITE	Location	Name	Circ. Lanes	Circ. Width ft	Island Diameter ft	Inscribed Diameter ft	Entry Radius ft	Entry Angle °	Raindrop Design	Circ Trans Line	Downstream Circ Lanes
AM 2047 Sand Pit	South	Sand Pit Rd	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	South	RoadName	2	30	100	-	65	30	No	No	-
AM 2047 Sand Pit	East	STH 21	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	East	RoadName	2	30	100	-	65	30	No	No	-
AM 2047 Sand Pit	North	Sand Pit Rd	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	North	RoadName	2	30	100	-	65	30	No	No	-
AM 2047 Sand Pit	West	STH 21	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	West	RoadName	2	30	100	-	65	30	No	No	-

HCM 2010 Roundabout Model Parameters

SITE	Location	Name	Single L.Circ: Single L.Entry		Single L.Circ: Multi L.Entry		Multi L.Circ: Single L.Entry		Multi L.Circ: Dominant Lane		Multi L.Circ: Subdominant Lane	
			Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
AM 2047 Sand Pit	South	Sand Pit Rd	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	South	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
AM 2047 Sand Pit	East	STH 21	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	East	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
AM 2047 Sand Pit	North	Sand Pit Rd	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	North	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
AM 2047 Sand Pit	West	STH 21	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	West	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092

HCM 6 Roundabout Model Calibration

SITE	Location	Name	Model Calib. Factor (HCM6)	Entry/Circ. Flow Adjust. (HCM6)
AM 2047 Sand Pit	South	Sand Pit Rd	1	None
Defaults - US HCM (Customary)	South	RoadName	1	None
AM 2047 Sand Pit	East	STH 21	1	None
Defaults - US HCM (Customary)	East	RoadName	1	None
AM 2047 Sand Pit	North	Sand Pit Rd	1	None
Defaults - US HCM (Customary)	North	RoadName	1	None
AM 2047 Sand Pit	West	STH 21	1	None
Defaults - US HCM (Customary)	West	RoadName	1	None

Pedestrians - Pedestrian Movements

SITE	Main Crossing/ Slip/Bypass Lane Crossing	Volume ped	Peak Flow %	Flow Scale %	Growth Rate %

No Difference

Pedestrians - Pedestrian Movement Data

SITE	Main Crossing/ Slip/Bypass Lane Crossing	Mov. ID	Crossing Distance ft	Conflict Zone Length ft	Oppng Ped.Fac.	P.Deg. Satn	Walking Speed ft/sec	App. Trav. Distance ft	Downst. Distance ft	Queue Space ft	Cr. Setback Distance

No Difference

Volumes - Volume Data Settings

SITE	AM 2047 Sand Pit	Defaults - US HCM (Customary)

No Difference

Volumes - Vehicle Volumes

SITE	Movement Class	To Exit Leg

NA

Volumes - Volume Factors

SITE	To Approach	Peak Flow Factor %	Flow Scale %	Growth Rate %/year

No Difference

Gap Acceptance - Gap Acceptance Data

SITE	Opposed Movement	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %	Opng. Peds (UnSig)

No Difference

Gap Acceptance - Settings

Gap Acceptance Options

No Difference

Gap Acceptance Data for Specific Applications

SITE	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %

No Difference

Merge Analysis & Zebra Crossing Analysis Parameters

					Merge Analysis	
SITE	Movement Class	Parameter	Zebra Crossing on Slip/Bypass Lane	Midblock Zebra Crossing	[Exit Short Lane	Merge Lane]

No Difference

Vehicle Movement Data - Path Data

SITE	Turn	Approach Cruise Speed mph	Exit Cruise Speed mph	Negotiation Speed mph	Negotiation Distance ft	Downstream Distance ft	Negotiation Radius ft

No Difference

Vehicle Movement Data - Calibration

					Turn Veh Effect				
SITE	Turn	Queue Space ft	Vehicle Length ft	Vehicle Occupancy pers/veh	[Factor	Radius] ft	Gap Accp Factor	Opng. Veh Factor	Prac. Deg. Of Satn.

No Difference

Site Demand & Sensitivity

SITE	AM 2047 Sand Pit	Defaults - US HCM (Customary)

No Difference

Parameter Settings - Options

SITE	AM 2047 Sand Pit	Defaults - US HCM (Customary)

No Difference

Parameter Settings - Model Parameters

SITE	AM 2047 Sand Pit	Defaults - US HCM (Customary)

No Difference

Parameter Settings - Cost

Efficiency Parameters

SITE	Movement Class	Desired Speed mph	Lower Limit of Speed Efficiency for TTI

No Difference

Vehicle Cost Parameters

			Veh Operating Cost			Veh Time Cost	
SITE	Movement Class	Veh Cost Method	[Pump Price of Fuel $/Gal	Fuel Res. Cost Factor	Ratio of Running Cost to Fuel Cost]	[Avg. Income $/h	Time Value Factor]
AM 2047 Sand Pit	Light Vehicles (LV)	Operating Cost	2.3	0.7	3	27	0.4
Defaults - US HCM (Customary)	Light Vehicles (LV)	Operating Cost	2.5	0.7	3	29	0.4
AM 2047 Sand Pit	Heavy Vehicles (HV)	Operating Cost	2.3	0.7	3	27	0.4
Defaults - US HCM (Customary)	Heavy Vehicles (HV)	Operating Cost	2.5	0.7	3	29	0.4

Cost Options		
SITE	AM 2047 Sand Pit	Defaults - US HCM (Customary)
No Difference		

Pedestrian Cost Parameters
SITE
Not Applicable

Parameter Settings - Vehicle Parameters

SITE	Movement Class	Vehicle Parameters Mass lb	Max Power kW	CO2 to Fuel Rate
No Difference				

Parameter Settings - Fuel Consumption

SITE	Movement Class	fi	Fuel & Emission Model Parameters A	B	Beta
No Difference					

Parameter Settings - CO Emission

SITE	Movement Class	fi	Fuel & Emission Model Parameters A	B	Beta
No Difference					

Parameter Settings - HC Emission

SITE	Movement Class	fi	Fuel & Emission Model Parameters A	B	Beta
No Difference					

Parameter Settings - NOx Emission

SITE	Movement Class	fi	Fuel & Emission Model Parameters A	B	Beta
No Difference					

Parameter Settings - Advanced

SITE	AM 2047 Sand Pit	Defaults - US HCM (Customary)
No Difference		

MOVEMENT SUMMARY

Site: 101 [AM 2047 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total	HV]	[Total	HV]				[Veh.	Dist]				
		veh/h	%	veh/h	%	v/c	sec		veh	ft				mph
South: Sand Pit Rd														
3	L2	7	3.0	8	3.0	0.050	6.1	LOS A	0.2	4.5	0.58	0.53	0.58	34.0
8	T1	19	3.0	21	3.0	0.050	6.1	LOS A	0.2	4.5	0.58	0.53	0.58	34.0
18	R2	4	3.0	4	3.0	0.050	6.1	LOS A	0.2	4.5	0.58	0.53	0.58	33.0
Approach		30	3.0	33	3.0	0.050	6.1	LOS A	0.2	4.5	0.58	0.53	0.58	33.8
East: STH 21														
1	L2	7	3.0	8	3.0	0.248	4.9	LOS A	1.2	31.2	0.14	0.05	0.14	35.3
6	T1	276	3.0	300	3.0	0.248	4.9	LOS A	1.2	31.2	0.14	0.05	0.14	35.2
16	R2	14	3.0	15	3.0	0.248	4.9	LOS A	1.2	31.2	0.14	0.05	0.14	34.2
Approach		297	3.0	323	3.0	0.248	4.9	LOS A	1.2	31.2	0.14	0.05	0.14	35.2
North: Sand Pit Rd														
7	L2	103	3.0	112	3.0	0.201	5.6	LOS A	0.9	21.9	0.45	0.35	0.45	33.4
4	T1	64	3.0	70	3.0	0.201	5.6	LOS A	0.9	21.9	0.45	0.35	0.45	33.3
14	R2	16	3.0	17	3.0	0.201	5.6	LOS A	0.9	21.9	0.45	0.35	0.45	32.4
Approach		183	3.0	199	3.0	0.201	5.6	LOS A	0.9	21.9	0.45	0.35	0.45	33.3
West: STH 21														
5	L2	5	3.0	5	3.0	0.587	10.6	LOS B	4.1	105.7	0.56	0.41	0.56	32.5
2	T1	583	3.0	634	3.0	0.587	10.6	LOS B	4.1	105.7	0.56	0.41	0.56	32.4
12	R2	16	3.0	17	3.0	0.587	10.6	LOS B	4.1	105.7	0.56	0.41	0.56	31.5
Approach		604	3.0	657	3.0	0.587	10.6	LOS B	4.1	105.7	0.56	0.41	0.56	32.4
All Vehicles		1114	3.0	1211	3.0	0.587	8.1	LOS A	4.1	105.7	0.43	0.31	0.43	33.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

LANE SUMMARY

Site: 101 [AM 2047 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	95% BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	v/c	%	sec			ft		ft	%	%
South: Sand Pit Rd													
Lane 1[d]	33	3.0	648	0.050	100	6.1	LOS A	0.2	4.5	Full	1600	0.0	0.0
Approach	33	3.0		0.050		6.1	LOS A	0.2	4.5				
East: STH 21													
Lane 1[d]	323	3.0	1301	0.248	100	4.9	LOS A	1.2	31.2	Full	1600	0.0	0.0
Approach	323	3.0		0.248		4.9	LOS A	1.2	31.2				
North: Sand Pit Rd													
Lane 1[d]	199	3.0	990	0.201	100	5.6	LOS A	0.9	21.9	Full	1600	0.0	0.0
Approach	199	3.0		0.201		5.6	LOS A	0.9	21.9				
West: STH 21													
Lane 1[d]	657	3.0	1119	0.587	100	10.6	LOS B	4.1	105.7	Full	1600	0.0	0.0
Approach	657	3.0		0.587		10.6	LOS B	4.1	105.7				
Intersection	1211	3.0		0.587		8.1	LOS A	4.1	105.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Sand Pit Rd

Mov.	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.
From S						veh/h	v/c	%	%	
To Exit:	W	N	E							
Lane 1	8	21	4	33	3.0	648	0.050	100	NA	NA
Approach	8	21	4	33	3.0		0.050			

East: STH 21

Mov.	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane No.
From E						veh/h	v/c	%	%	
To Exit:	S	W	N							
Lane 1	8	300	15	323	3.0	1301	0.248	100	NA	NA
Approach	8	300	15	323	3.0		0.248			

North: Sand Pit Rd

Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	112	70	17	199	3.0	990	0.201	100	NA	NA
Approach	112	70	17	199	3.0		0.201			

West: STH 21

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	5	634	17	657	3.0	1119	0.587	100	NA	NA
Approach	5	634	17	657	3.0		0.587			

	Total	%HV	Deg.Satn (v/c)
Intersection	1211	3.0	0.587

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

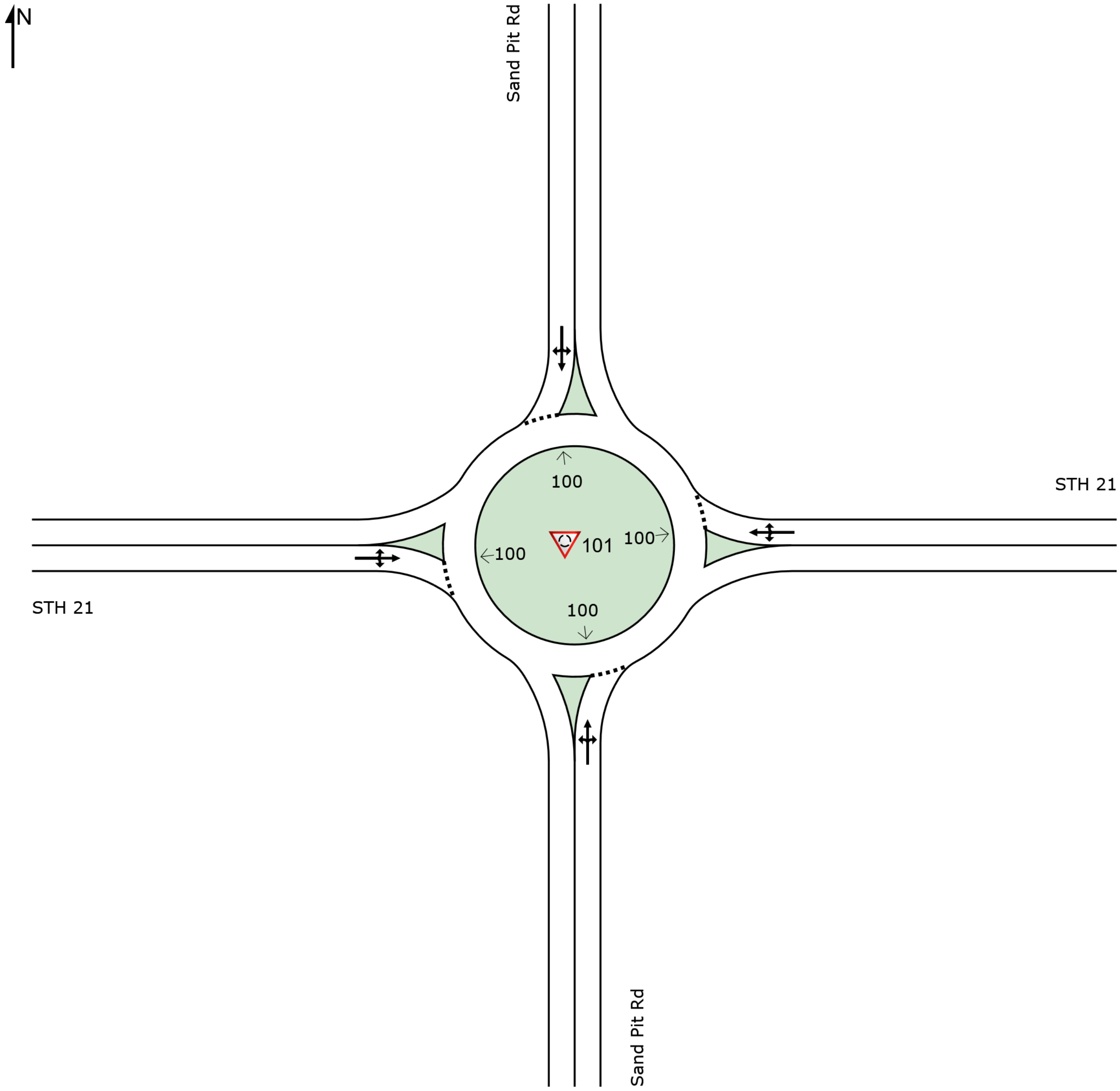
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Sand Pit Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: STH 21 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Sand Pit Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: STH 21 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 101 [PM 2047 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



MOVEMENT FLOWS FOR SITE (INPUT)

Approach movement input flow rates (veh/h)

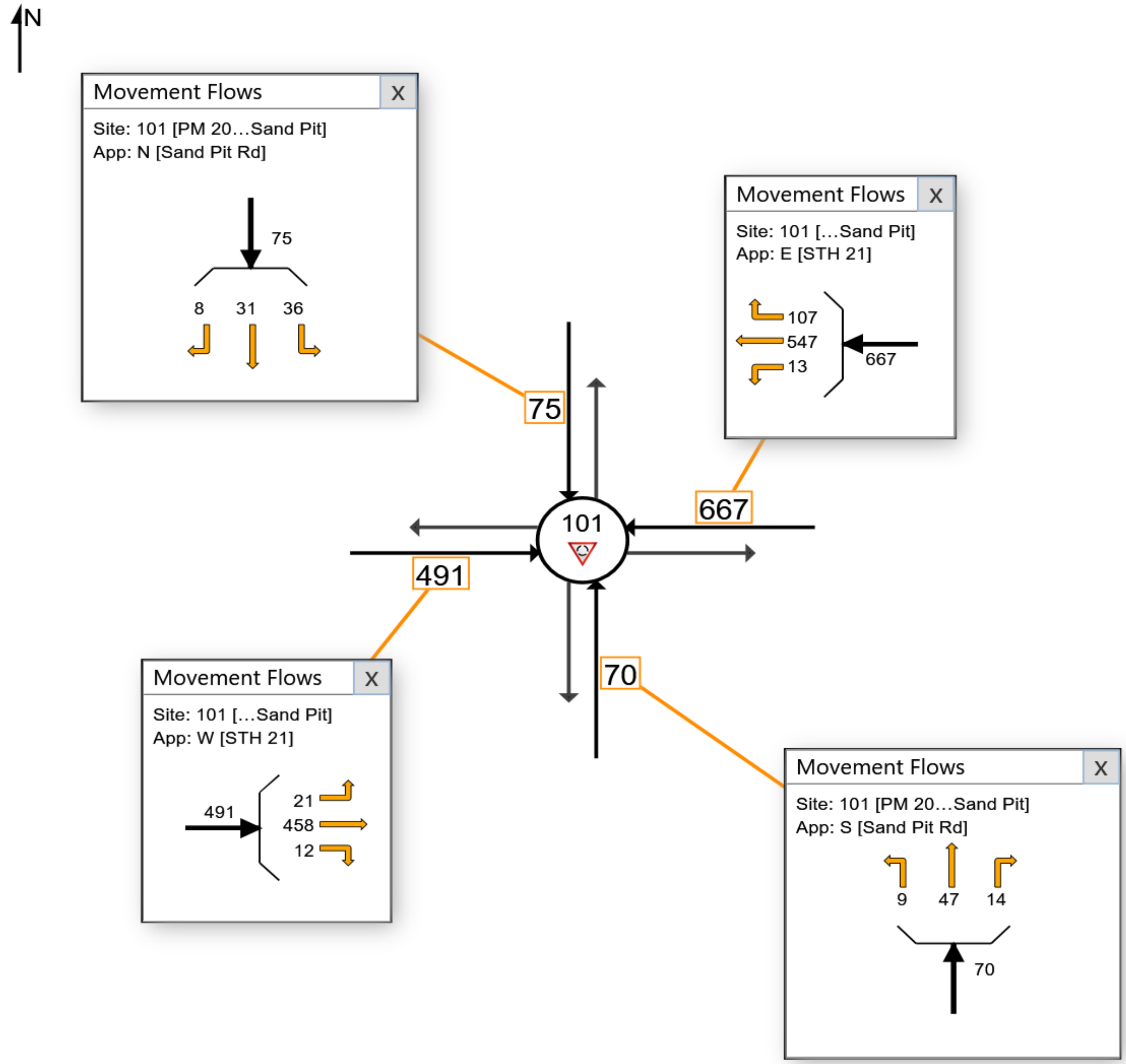
All Movement Classes

Site: 101 [PM 2047 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Use the button below to open or close all popup boxes. Click value labels to open selected ones.
Click and drag popup boxes to move to preferred positions.

Close All Popups



INPUT COMPARISON

Site A: 101 [PM 2047 Sand Pit (Site Folder: General)]

Site B:

Intersection - Site Data

SITE	PM 2047 Sand Pit	Defaults - US HCM (Customary)
No Difference		

Intersection - Site Properties

SITE	PM 2047 Sand Pit	Defaults - US HCM (Customary)
NA		

Intersection - Approach & Exit Data

SITE	Location	Name	Type	No. of App. Lanes	No. of Exit Lanes	Approach Distance ft	Extra Bunching (Site Analysis) %	Extra Bunching (Network Analysis) %	Exit Distance ft	Approach Control	Area Type Factor
PM 2047 Sand Pit	South	Sand Pit Rd	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	South	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-
PM 2047 Sand Pit	East	STH 21	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	East	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-
PM 2047 Sand Pit	North	Sand Pit Rd	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	North	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-
PM 2047 Sand Pit	West	STH 21	Two Way	1	1	1600.0	0	-	-	Yield	-
Defaults - US HCM (Customary)	West	RoadName	Two Way	1	1	1600.0	0	-	-	Yield	-

Movement Definitions - Included Movement Classes

SITE	Included	Name	ID	Model Designation
No Difference				

Movement Definitions - Origin-Destination Movements

SITE	To Approach	Turn	OD Mov ID
No Difference			

SITE	U-Turn Before Intersection	Exclude U-Turn Before Intersection From Signal Analysis
No Difference		

Lane Geometry - Lane Configuration

SITE	Leg Item	Config	Type	Control	Slip/ Bypass Control	Length	Width	Grade	Island [Front Width	Back Width	Fill Style	Cnct To	For Ped Stgn	Short Strip Isl]

ft	ft	%	ft	ft
No Difference				

Lane Geometry - Lane Disciplines

SITE	To Approach	Turn	Free Queue Distance ft	Movement Class(es)
No Difference				

Lane Geometry - Lane Disciplines - Lane Change Data

SITE	Movement Class	% Lane Change to Left %	% Lane Change to Right %
No Difference			

Lane Geometry - Lane Data

Approach Lane Data

SITE	Approach Lane	Basic Satn Flow tcu/h	Util Ratio %	Satn Speed mph	Capacity Adj %	Use Given Cap Adj in Network Analysis	Set As Dominant Lane	Include SLip/ ByPass Lane in Entry Lane Count	Apply Satn Flow Est	Short Lane Capacity	Delay Model Param
No Difference											

Merge Analysis

SITE	Exit Lane	Merge Lane Number	Apply Merge Analysis	Merge Type	Percent Opposing in Short Lane %	Percent Opposing in Merge Lane %	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min
No Difference									

Lane Movements - Flow Proportions

SITE	Exit Lane	To Exit Leg South %	East %	North %	West %
Light Vehicles (LV)					
From: South	App. Lane 1				
PM 2047 Sand Pit	Exit Lane 1	-	100	100	100
Defaults - US HCM (Customary)	Exit Lane 1	-	-	100	100
From: East	App. Lane 1				
PM 2047 Sand Pit	Exit Lane 1	100	-	100	100
Defaults - US HCM (Customary)	Exit Lane 1	100	-	-	100
From: North	App. Lane 1				
PM 2047 Sand Pit	Exit Lane 1	100	100	-	100
Defaults - US HCM (Customary)	Exit Lane 1	100	100	-	-
From: West	App. Lane 1				
PM 2047 Sand Pit	Exit Lane 1	100	100	100	-
Defaults - US HCM (Customary)	Exit Lane 1	-	100	100	-
Heavy Vehicles (HV)					
From: South	App. Lane 1				

PM 2047 Sand Pit	Exit Lane 1	-	100	100	100
Defaults - US HCM (Customary)	Exit Lane 1	-	-	100	100
From: East	App. Lane 1				
PM 2047 Sand Pit	Exit Lane 1	100	-	100	100
Defaults - US HCM (Customary)	Exit Lane 1	100	-	-	100
From: North	App. Lane 1				
PM 2047 Sand Pit	Exit Lane 1	100	100	-	100
Defaults - US HCM (Customary)	Exit Lane 1	100	100	-	-
From: West	App. Lane 1				
PM 2047 Sand Pit	Exit Lane 1	100	100	100	-
Defaults - US HCM (Customary)	Exit Lane 1	-	100	100	-

Lane Movements - Blockage Calibration

SITE	Exit Lane	To Exit Leg South	East	North	West
From: South	App. Lane 1				
PM 2047 Sand Pit	Exit Lane 1	-	1	1	1
Defaults - US HCM (Customary)	Exit Lane 1	-	-	1	1
From: East	App. Lane 1				
PM 2047 Sand Pit	Exit Lane 1	1	-	1	1
Defaults - US HCM (Customary)	Exit Lane 1	1	-	-	1
From: North	App. Lane 1				
PM 2047 Sand Pit	Exit Lane 1	1	1	-	1
Defaults - US HCM (Customary)	Exit Lane 1	1	1	-	-
From: West	App. Lane 1				
PM 2047 Sand Pit	Exit Lane 1	1	1	1	-
Defaults - US HCM (Customary)	Exit Lane 1	-	1	1	-

Roundabouts - Options

SITE	PM 2047 Sand Pit	Defaults - US HCM (Customary)
	No Difference	

Roundabouts - Geometry

SITE	Location	Name	Circ. Lanes	Circ. Width ft	Island Diameter ft	Inscribed Diameter ft	Entry Radius ft	Entry Angle °	Raindrop Design	Circ Trans Line	Downstream Circ Lanes
PM 2047 Sand Pit	South	Sand Pit Rd	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	South	RoadName	2	30	100	-	65	30	No	No	-
PM 2047 Sand Pit	East	STH 21	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	East	RoadName	2	30	100	-	65	30	No	No	-
PM 2047 Sand Pit	North	Sand Pit Rd	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	North	RoadName	2	30	100	-	65	30	No	No	-
PM 2047 Sand Pit	West	STH 21	1	20	100	-	100	30	No	No	-
Defaults - US HCM (Customary)	West	RoadName	2	30	100	-	65	30	No	No	-

HCM 2010 Roundabout Model Parameters

SITE	Location	Name	Single L.Circ: Single L.Entry		Single L.Circ: Multi L.Entry		Multi L.Circ: Single L.Entry		Multi L.Circ: Dominant Lane		Multi L.Circ: Subdominant Lane	
			Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B	Para. A	Para. B
PM 2047 Sand Pit	South	Sand Pit Rd	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	South	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
PM 2047 Sand Pit	East	STH 21	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	East	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
PM 2047 Sand Pit	North	Sand Pit Rd	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	North	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
PM 2047 Sand Pit	West	STH 21	1385	0.000944	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092
Defaults - US HCM (Customary)	West	RoadName	1380	0.00102	1420	0.00091	1420	0.00085	1420	0.00085	1350	0.00092

HCM 6 Roundabout Model Calibration

SITE	Location	Name	Model Calib. Factor (HCM6)	Entry/Circ. Flow Adjust. (HCM6)
PM 2047 Sand Pit	South	Sand Pit Rd	1	None
Defaults - US HCM (Customary)	South	RoadName	1	None
PM 2047 Sand Pit	East	STH 21	1	None
Defaults - US HCM (Customary)	East	RoadName	1	None
PM 2047 Sand Pit	North	Sand Pit Rd	1	None
Defaults - US HCM (Customary)	North	RoadName	1	None
PM 2047 Sand Pit	West	STH 21	1	None
Defaults - US HCM (Customary)	West	RoadName	1	None

Pedestrians - Pedestrian Movements

SITE	Main Crossing/ Slip/Bypass Lane Crossing	Volume ped	Peak Flow %	Flow Scale %	Growth Rate %
No Difference					

Pedestrians - Pedestrian Movement Data

SITE	Main Crossing/ Slip/Bypass Lane Crossing	Mov. ID	Crossing Distance ft	Conflict Zone Length ft	Oppng Ped.Fac.	P.Deg. Satn	Walking Speed ft/sec	App. Trav. Distance ft	Downst. Distance ft	Queue Space ft	Cr. Setback Distance
No Difference											

Volumes - Volume Data Settings

SITE	PM 2047 Sand Pit	Defaults - US HCM (Customary)
No Difference		

Volumes - Vehicle Volumes

SITE	Movement Class	To Exit Leg
NA		

Volumes - Volume Factors

SITE	To Approach	Peak Flow Factor %	Flow Scale %	Growth Rate %/year
No Difference				

Gap Acceptance - Gap Acceptance Data

SITE	Opposed Movement	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %	Opng. Peds (UnSig)
No Difference							

Gap Acceptance - Settings

Gap Acceptance Options

No Difference

Gap Acceptance Data for Specific Applications

SITE	Critical Gap sec	Follow-up Headway sec	Minimum Departures veh/min	Exiting Flow Effect %	% Opp. By Nearest Lane %

No Difference

Merge Analysis & Zebra Crossing Analysis Parameters

SITE	Movement Class	Parameter	Zebra Crossing on Slip/Bypass Lane	Midblock Zebra Crossing	Merge Analysis	
					[Exit Short Lane	Merge Lane]

No Difference

Vehicle Movement Data - Path Data

SITE	Turn	Approach Cruise Speed mph	Exit Cruise Speed mph	Negotiation Speed mph	Negotiation Distance ft	Downstream Distance ft	Negotiation Radius ft

No Difference

Vehicle Movement Data - Calibration

SITE	Turn	Queue Space ft	Vehicle Length ft	Vehicle Occupancy pers/veh	Turn Veh Effect		Gap Accp Factor	Opng. Veh Factor	Prac. Deg. Of Satn.
					[Factor	Radius] ft			

No Difference

Site Demand & Sensitivity

SITE	PM 2047 Sand Pit	Defaults - US HCM (Customary)

No Difference

Parameter Settings - Options

SITE	PM 2047 Sand Pit	Defaults - US HCM (Customary)

No Difference

Parameter Settings - Model Parameters

SITE	PM 2047 Sand Pit	Defaults - US HCM (Customary)

No Difference

Parameter Settings - Cost

Efficiency Parameters

SITE	Movement Class	Desired Speed mph	Lower Limit of Speed Efficiency for TTI

No Difference

Vehicle Cost Parameters

SITE	Movement Class	Veh Cost Method	Veh Operating Cost			Veh Time Cost	
			[Pump Price of Fuel $/Gal	Fuel Res. Cost Factor	Ratio of Running Cost to Fuel Cost]	[Avg. Income $/h	Time Value Factor]
PM 2047 Sand Pit	Light Vehicles (LV)	Operating Cost	2.3	0.7	3	27	0.4
Defaults - US HCM (Customary)	Light Vehicles (LV)	Operating Cost	2.5	0.7	3	29	0.4
PM 2047 Sand Pit	Heavy Vehicles (HV)	Operating Cost	2.3	0.7	3	27	0.4
Defaults - US HCM (Customary)	Heavy Vehicles (HV)	Operating Cost	2.5	0.7	3	29	0.4

	Cost Options	
SITE	PM 2047 Sand Pit	Defaults - US HCM (Customary)
	No Difference	

SITE	Pedestrian Cost Parameters
	Not Applicable

Parameter Settings - Vehicle Parameters

SITE	Movement Class	Vehicle Parameters		CO2 to Fuel Rate
		Mass lb	Max Power kW	
		No Difference		

Parameter Settings - Fuel Consumption

SITE	Movement Class	Fuel & Emission Model Parameters			
		fi	A	B	Beta
		No Difference			

Parameter Settings - CO Emission

SITE	Movement Class	Fuel & Emission Model Parameters			
		fi	A	B	Beta
		No Difference			

Parameter Settings - HC Emission

SITE	Movement Class	Fuel & Emission Model Parameters			
		fi	A	B	Beta
		No Difference			

Parameter Settings - NOx Emission

SITE	Movement Class	Fuel & Emission Model Parameters			
		fi	A	B	Beta
		No Difference			

Parameter Settings - Advanced

SITE	PM 2047 Sand Pit	Defaults - US HCM (Customary)
	No Difference	

MOVEMENT SUMMARY

Site: 101 [PM 2047 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total	HV]	[Total	HV]				[Veh.	Dist]				
		veh/h	%	veh/h	%	v/c	sec		veh	ft				mph
South: Sand Pit Rd														
3	L2	9	3.0	10	3.0	0.098	5.6	LOS A	0.4	9.3	0.53	0.47	0.53	34.6
8	T1	47	3.0	51	3.0	0.098	5.6	LOS A	0.4	9.3	0.53	0.47	0.53	34.5
18	R2	14	3.0	15	3.0	0.098	5.6	LOS A	0.4	9.3	0.53	0.47	0.53	33.5
Approach		70	3.0	76	3.0	0.098	5.6	LOS A	0.4	9.3	0.53	0.47	0.53	34.3
East: STH 21														
1	L2	13	3.0	14	3.0	0.585	9.8	LOS A	4.6	117.8	0.39	0.21	0.39	32.8
6	T1	547	3.0	595	3.0	0.585	9.8	LOS A	4.6	117.8	0.39	0.21	0.39	32.7
16	R2	107	3.0	116	3.0	0.585	9.8	LOS A	4.6	117.8	0.39	0.21	0.39	31.8
Approach		667	3.0	725	3.0	0.585	9.8	LOS A	4.6	117.8	0.39	0.21	0.39	32.6
North: Sand Pit Rd														
7	L2	36	3.0	39	3.0	0.111	6.0	LOS A	0.4	10.5	0.56	0.52	0.56	33.4
4	T1	31	3.0	34	3.0	0.111	6.0	LOS A	0.4	10.5	0.56	0.52	0.56	33.3
14	R2	8	3.0	9	3.0	0.111	6.0	LOS A	0.4	10.5	0.56	0.52	0.56	32.4
Approach		75	3.0	82	3.0	0.111	6.0	LOS A	0.4	10.5	0.56	0.52	0.56	33.2
West: STH 21														
5	L2	21	3.0	23	3.0	0.432	7.3	LOS A	2.6	67.4	0.31	0.16	0.31	34.0
2	T1	458	3.0	498	3.0	0.432	7.3	LOS A	2.6	67.4	0.31	0.16	0.31	33.9
12	R2	12	3.0	13	3.0	0.432	7.3	LOS A	2.6	67.4	0.31	0.16	0.31	33.0
Approach		491	3.0	534	3.0	0.432	7.3	LOS A	2.6	67.4	0.31	0.16	0.31	33.9
All Vehicles		1303	3.0	1416	3.0	0.585	8.4	LOS A	4.6	117.8	0.38	0.22	0.38	33.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site 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 (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: WESTWOOD INFRASTRUCTURE | Licence: PLUS / 1PC | Processed: Wednesday, March 24, 2021 9:27:38 AM
Project: N:\3001091.00\Traffic\Analysis\Sand Pit Rd\Roundabout\Sand Pit Rd.sip9

LANE SUMMARY

Site: 101 [PM 2047 Sand Pit (Site Folder: General)]

New Site
Site Category: (None)
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: Sand Pit Rd													
Lane 1[d]	76	3.0	780	0.098	100	5.6	LOS A	0.4	9.3	Full	1600	0.0	0.0
Approach	76	3.0		0.098		5.6	LOS A	0.4	9.3				
East: STH 21													
Lane 1[d]	725	3.0	1240	0.585	100	9.8	LOS A	4.6	117.8	Full	1600	0.0	0.0
Approach	725	3.0		0.585		9.8	LOS A	4.6	117.8				
North: Sand Pit Rd													
Lane 1[d]	82	3.0	737	0.111	100	6.0	LOS A	0.4	10.5	Full	1600	0.0	0.0
Approach	82	3.0		0.111		6.0	LOS A	0.4	10.5				
West: STH 21													
Lane 1[d]	534	3.0	1236	0.432	100	7.3	LOS A	2.6	67.4	Full	1600	0.0	0.0
Approach	534	3.0		0.432		7.3	LOS A	2.6	67.4				
Intersection	1416	3.0		0.585		8.4	LOS A	4.6	117.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: Sand Pit Rd

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	10	51	15	76	3.0	780	0.098	100	NA	NA
Approach	10	51	15	76	3.0		0.098			

East: STH 21

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	14	595	116	725	3.0	1240	0.585	100	NA	NA
Approach	14	595	116	725	3.0		0.585			

North: Sand Pit Rd										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	39	34	9	82	3.0	737	0.111	100	NA	NA
Approach	39	34	9	82	3.0		0.111			
West: STH 21										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	23	498	13	534	3.0	1236	0.432	100	NA	NA
Approach	23	498	13	534	3.0		0.432			

	Total	%HV	Deg.Satn (v/c)
Intersection	1416	3.0	0.585

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: Sand Pit Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: STH 21 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Sand Pit Rd Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: STH 21 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										