

**KWIK STAR STORE
TRAFFIC IMPACT STUDY**

Pella, Iowa | March 5, 2024

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Pella, Iowa | March 5, 2024

Prepared for:

City of Pella

For submittal to:

City of Pella

Iowa Department of Transportation

Snyder & Associates, Inc. Project No. 123.1251


	<p>I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.</p> <p>Justin C. Jackson, DRAFT _____ Date</p> <p>License Number P20538</p> <p>My License Renewal Date is December 31, 2024</p> <p>Pages or sheets covered by this seal:</p> <p>_____</p>
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1. INTRODUCTION

Kwik Trip Inc.'s proposed convenience store is on an 8.5-acre parcel in the southeast quadrant of Iowa Highway (IA) 163 and Washington Street in Pella, Iowa. Access to the development is planned as additional approaches to the intersections of Washington Street with IA 163 Northbound (NB) Ramp and Old 163.

This study evaluated traffic forecasts, peak hour traffic operations and improvement needs associated with the planned development. The scope of this analysis included three study intersections on Washington Street with IA 163 Southbound (SB) Ramp / 15th Street, IA 163 NB Ramp, and Old 163. Figure 1 shows the proposed development parcel and study intersections.



Figure 1: Study Area

2. EXISTING CONDITIONS

Land uses surrounding the proposed site are a mix of industrial, commercial, and agricultural. The proposed site is along Washington Street which is a two-lane rural section minor arterial with a posted speed of 35 mph. Washington Street is the major route to Pella's central business district. Adjacent to the site is Iowa Highway 163 which is a four-lane divided expressway with full access control through Pella. The IA 163 and Washington St interchange has a partial clover leaf configuration with loop ramps in the northwest and northeast quadrants.

Directly adjacent to the proposed site is the IA 163 NB Ramp and Washington St intersection. A south leg is planned for this intersection as an access to the site. The exit ramp approach to the intersection is stop controlled.

The IA 163 SB Ramp terminal intersection is 1,100’ west of the IA 163 NB Ramp terminal intersection. The IA 163 SB Ramp intersection south approach, S 15th Street, services one commercial property and the Pella Municipal Airport. The intersection is signalized with protected/permissive left turn phasing on the Washington Street approaches. The Washington Street approaches have dedicated left turn lanes with 100’ of storage for both left turn lanes. The IA 163 SB Ramp approach has a dedicated right turn lane with 100’ of storage.

The Old 163 and Washington Street intersection is a T-intersection with stop control for the SB Old 163 approach. A right turn island and short channelized right turn lane are provided for this approach... Old 163 is a two-lane rural section collector that services commercial and residential properties. The posted speed limit on Old 163 is 35 mph.

a. Traffic Data

Turning movement 24-hour traffic counts were performed by Snyder & Associates in October of 2023 at the intersections of Washington Street with IA 163 SB Ramp, IA 163 NB Ramp, and Old 163. Iowa DOT conducted turning movement counts at the intersections of Washington Street with IA 163 SB Ramp and IA 163 NB Ramp in 2022 and 2018. Iowa DOT conducted 24-hour two-way counts on Old 163 north of Washington Street in 2002 and 2018. Detailed traffic count data is included in the appendix.

Figure 2 summarizes annual average daily traffic (AADT) of the traffic counts conducted. The data generally shows slight growth from 2018 to 2022 to 2023. Traffic growth trends follow Pella’s population trend which has also increased slightly over the same period.

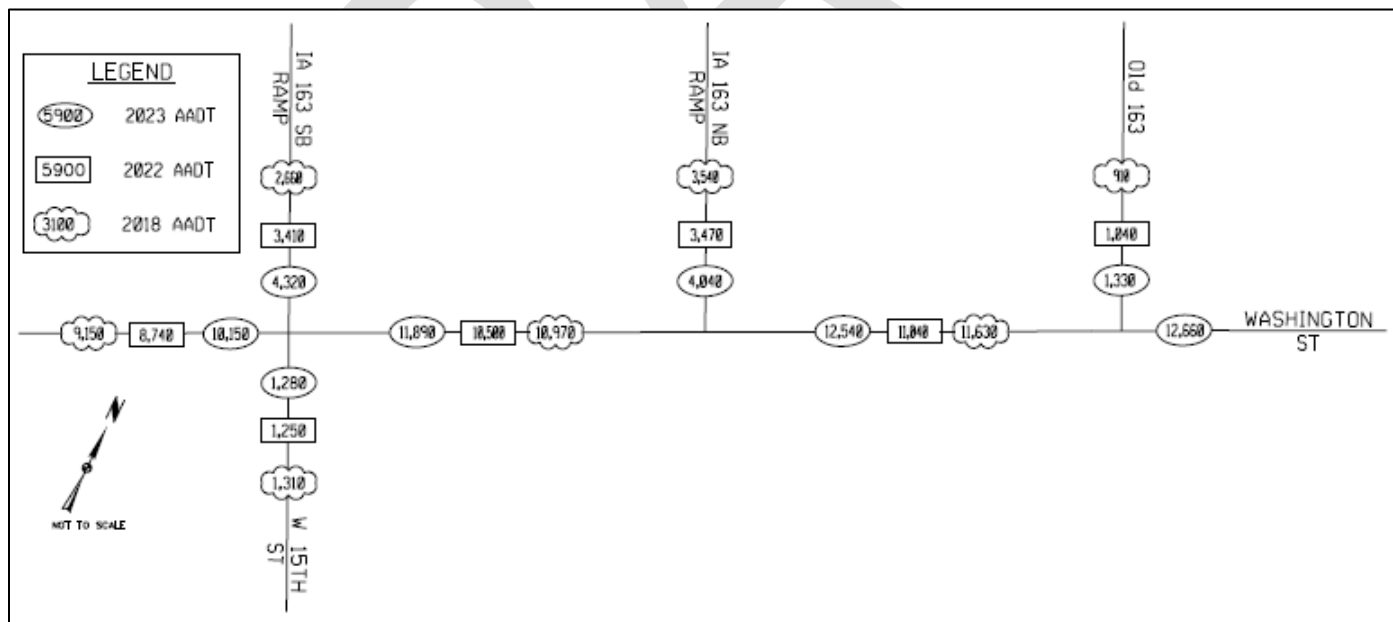


Figure 2: Annual Average Daily Traffic

b. Crash History

Crash data at the study intersections were reviewed using the Iowa DOT online Iowa Crash Analysis Tool. Table 1 summarizes 5-year period (2018-2022) of crash data for the study intersections.

Table 1: 2018-2022 Crash History

Intersection	Crashes (Injuries)	Injury Severity	Crash Rate*	Predominant Major Causes (Crashes)	Predominant Crash Types (Crashes)
IA 163 SB Ramp/ 15 th St & Washington St	13 (2)	2 Possible	0.45	<ul style="list-style-type: none"> Followed too close (5) Other (3) FTYROW: Making Left Turn (2) 	<ul style="list-style-type: none"> Rear-end (10)
IA 163 NB Ramp & Washington St	6 (1)	1 Possible	0.20	<ul style="list-style-type: none"> Other (2) Followed too close (1) Driving too fast for conditions (1) Operating reckless (1) 	<ul style="list-style-type: none"> Rear-end (6)
Old 163 & Washington St	3 (1)	1 Possible	0.14	<ul style="list-style-type: none"> Followed too close (2) Driving too fast for conditions (1) 	<ul style="list-style-type: none"> Rear-end (2) Broadside (1)

*Crashes per million entering vehicles
FTYROW = Failure to Yield Right of Way

The highest crash rate (0.45) for the study intersections is at the IA 163 SB Ramp / 15th St and Washington Street intersection. Crash rates at all study intersections are relatively low with no apparent safety deficiency. Rear-end crashes are the most predominant crash type for the study intersections. Crash data summary is included in the appendix.

3. PROPOSED DEVELOPMENT

The proposed development, shown in Figure 3, is an approximately 9,000 square foot convenience store with 20 passenger vehicle fueling positions and 3 large truck fueling lanes. Proposed access to the site includes the following:

- West access – proposed fourth leg of the intersection of Washington Street and IA 163 NB Ramp
- East access - proposed fourth leg of the intersection of Washington Street and Old 163

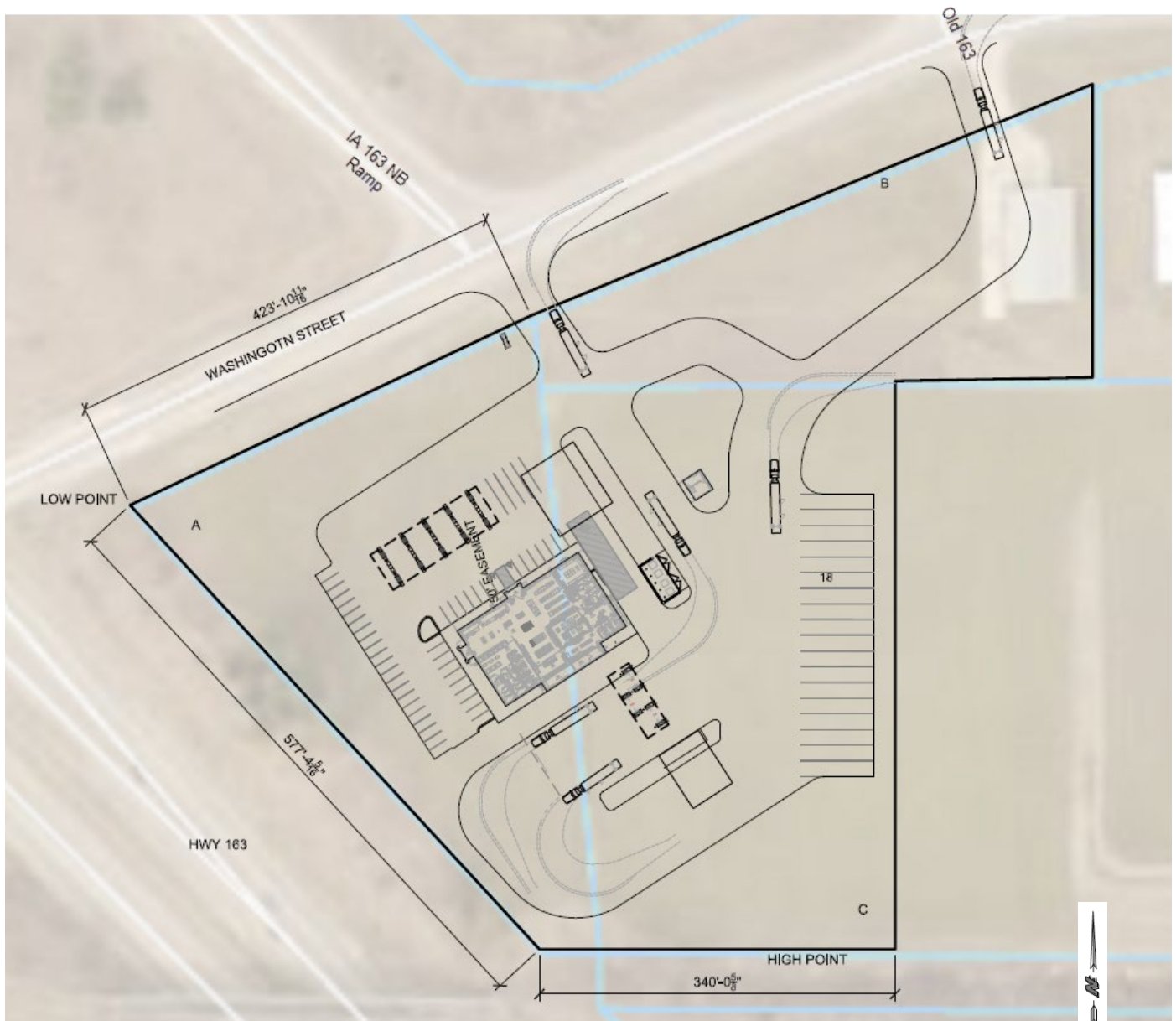


Figure 3: Kwik Star Preliminary Site Layout

4. ANALYSIS OF FUTURE CONDITIONS

a. Trip Generation

Trip generation estimates were derived from procedure provided by the *ITE Trip Generation Manual*. The number of trips generated by the proposed store was determined to be the average of number trips between the *ITE Trip Generation Manual, 11th Edition* and the *Wisconsin DOT Convenience Store/Gas Station Trip Generation Study 2023* for Land Use Code 945 (Convenience Store/Gas Station – gross floor area (GFA) 9,100). The average number of trips was used because ITE's rates are believed to be excessively high for this site and WISDOT rates are based on a lower number of data points for this type of store. Utilizing the average number of trips, the estimated trips fall within Kwik Star's estimated number of peak hour trips between 350

and 420 passenger vehicle trips in the peak hour. Only 2% of their nearly 800 similar stores generate over 420 vehicles per hour. To remain within the range of existing data points of similar sites that the ITE trip generation rates are based on, 16 VFP was used for trip generation estimates. Even though this location does have truck fueling lanes, only passenger VFP were only considered for trip generation as it anticipated that only one to two trucks will access the site during the peak hours. So, truck generation was excluded from the estimated generated trips. Estimated trip generation is shown in Table 2. During each time period, 50% of the trips generated enter the site and 50% of the trips generated exit the site.

Table 2: Trip Generation – Opening Year 2024

Source	Daily		AM		PM	
	Rate	Total Trips	Rate	Total Trips	Rate	Total Trips
ITE	345.75(VFP)	5530	31.6(VFP)	510	26.9(VFP)	430
WISDOT	80.61(VFP) + 2340	3630	5.91(VFP) + 145.74	240	5.91(VFP) + 168.12	260
Average		4580		380		350

b. Trip Distribution

Distribution of the site generated trips to the study intersections was estimated based on background traffic data. It is estimated that site generated traffic will be approximately 34% from the west, 20% from the north, and 46% from the east. The trip distribution of site generated trips for each intersection is shown in Figure 4 below.

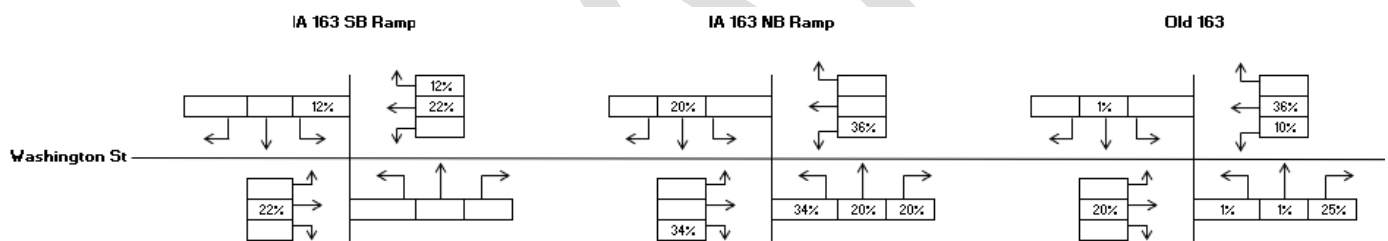


Figure 4: Trip Distribution

Large percentages of the trips for the convenience store land use are “pass-by trips”, meaning trips which are already in the adjacent street traffic stream. The *ITE Trip Generation Handbook, 3rd Edition* average pass-by trip percentages are 62% in the AM peak period and 56% in the PM peak period. A conservative pass-by trip percentage of 50% was used for this analysis.

c. Background Traffic

The 2018, 2022 and 2023 traffic counts at the study intersections were reviewed, and it was determined that the 2022 and 2023 are generally comparable. Opening Year 2024 traffic volumes utilized the 2023 existing traffic volumes as background traffic. Design Year 2044 traffic includes background traffic with an annual growth of 1%. Traffic volumes at the study intersections and proposed site accesses are shown in Exhibit 2 in the appendix. The traffic volumes are shown for existing traffic, generated trips, and total traffic for the AM and PM peak hours in the Opening Year and the Design Year without and with the proposed development.

d. Turn Lane Analysis

The potential need for left or right turn lanes at the study intersections was evaluated using NCHRP 457 criteria. It was determined that eastbound and westbound left turn lanes are warranted on Washington St at the IA 163 NB Ramp intersections with projected opening year traffic during both the AM and PM peak periods. At the intersection of Washington St with Old 163, traffic volumes satisfied the left turn lane warrant on Washington St with projected opening year traffic during the AM and PM peak periods with the exception of AM peak period westbound. Turn lane warrant analysis worksheets are included in the appendix.

e. Traffic Signal Warrant Analysis

Traffic signal warrant volume criteria from the *Manual on Uniform Traffic Control Devices, 2009 Edition* were reviewed. Applicable traffic signal warrant criteria include Warrant 1 (Eight-Hour Vehicular Volume), Warrant 2 (Four-Hour Vehicular Volume), Warrant 3 (Peak Hour Volume), and Warrant 7 (Crash Experience). Rural values were applied due to Pella’s population. Table 3 summarizes the traffic signal warrant analysis for existing conditions and opening year traffic conditions. Analysis found that with existing traffic, Warrants 1-3 are met at the NB Ramp intersection and Warrants 2-3 are met at the Old 163 intersection.

Table 3: Traffic Signal Warrant Analysis (Number of hours)

Warrant	IA 163 NB Ramp		Old 163	
	Existing	Opening	Existing	Opening
Warrant 1A – 8 Hour Minimum Volume	No (7)	No (6)	No (0)	No (0)
Warrant 1B – 8 Hour Interruption of Traffic	Yes (13)	Yes (13)	No (5)	No (5)
Warrant 2 – 4-Hour Volume	Yes (11)	Yes (10)	Yes (4)	Yes (4)
Warrant 3 – Peak Hour Volume	Yes	Yes	Yes	Yes
Warrant 7 – Crash Experience	No	No	No	No

f. Capacity Analysis

Intersection capacity analyses were completed using the *Highway Capacity Manual 6th Edition (HCM 6)* methodology incorporated into *Synchro 11* traffic modeling analysis software. Table 4 shows the Level of Service (LOS) criteria for determining operational performance. LOS A provides the least delay, and LOS F provides the most delay. Typically, LOS D is the minimum acceptable LOS for urban intersections. However, LOS E-F is not unusual for stop controlled minor street or driveway approaches to higher volume arterial streets during peak hours.

Capacity analysis results for existing roadway conditions, 2024 opening year, and 2044 design year are shown in Table 5. Opening year and design year analyses each included analysis scenarios of store open with of no intersection roadway improvements and store open with the recommended traffic signal control and left turn lanes on Washington St at the IA 163 NB Ramp intersection. A design year analysis also included an existing conditions scenario. The Kwik Star accesses were analyzed as single lane approaches.

Table 4: Level of Service (LOS) Definition

LOS	Average Delay per Vehicle (seconds)	
	Signalized Intersection	Unsignalized Intersection
A	< 10	< 10
B	10 to 20	10 to 15
C	20 to 35	15 to 25
D	35 to 55	25 to 35
E	55 to 80	35 to 50
F	> 80 or V/C > 1.0	> 50 or V/C > 1.0

V/C = Volume to Capacity Ratio

Table 5: Capacity Analysis Results

Year -Scenario	Intersection	Control Type	AM Peak		PM Peak	
			Delay (sec)	LOS	Delay (sec)	LOS
2023 – Existing Conditions	IA 163 SB Ramp & Washington St	Signal	10	B	14	B
	IA 163 NB Ramp & Washington St	SB STOP	15	C	21	C
	Old 163 & Washington St	SB STOP	16	C	23	C
2024 – Store Open, No Roadway Improvement	IA 163 SB Ramp & Washington St	Signal	13	B	25	C
		NB STOP	63	F	>300	F
	IA 163 NB Ramp & Washington St	SB STOP	37	E	56	F
		NB STOP	15	C	18	C
		SB STOP	23	C	42	E
2024 – Store Open, Roadway Improvement	IA 163 SB Ramp & Washington St	Signal	13	B	25	C
		Signal	13	B	13	B
	Old 163 & Washington St	NB STOP	15	C	18	C
		SB STOP	23	C	42	E
2044 – Existing Conditions	IA 163 SB Ramp & Washington St	Signal	11	B	27	C
	IA 163 NB Ramp & Washington St	SB STOP	20	C	37	E
	Old 163 & Washington St	SB STOP	20	C	35	E
2044 – Store Open, No Roadway Improvement	IA 163 SB Ramp & Washington St	Signal	11	B	55	D
		NB STOP	152	F	>300	F
	IA 163 NB Ramp & Washington St	SB STOP	95	F	>300	F
		NB STOP	19	C	26	D
		SB STOP	34	D	100	F
2044 – Store Open, Roadway Improvement	IA 163 SB Ramp & Washington St	Signal	25	C	45	D
		Signal	16	B	17	B
	Old 163 & Washington St	NB STOP	19	C	26	D
		SB STOP	34	D	100	F

Analysis results show acceptable operational level of service for all scenarios with the store open with proposed roadway improvements except for the Old 163 & Washington Street intersection north approach in the design year. The approach volumes are relatively low, but signalization of this intersection may ultimately be needed. The delay projected on Old 163 approach is primarily due to due from the background traffic on

Washington Street and not the development generated traffic. The analysis results for scenarios with the store open without proposed roadway improvements did not have acceptable operational level of service.

g. Vehicle Queuing Analysis

Vehicle queuing was evaluated using Synchro for existing conditions, year 2024 store open without roadway improvements, and 2044 design year with store open with proposed roadway improvements. Calculated 95th percentile queue lengths are shown in Table 6. Existing and proposed turn lane lengths are also listed.

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Table 6: Vehicle Queues

Scenario	Intersection	Lanes/ Movements	95 th Percentile Queue (ft)				Existing (e) or Proposed (p) Turn Lane Length (ft)
			w/o Roadway Improvements		w/ Roadway Improvements		
			AM Peak	PM Peak	AM Peak	PM Peak	
2023 Existing Conditions	IA 163 SB Ramp & Washington St	EB-L	99	70	-	-	100 (e)
		EB-TR	87	92			
		WB-L	37	33			100 (e)
		WB-TR	62	186			
		NB-LTR	59	56			
		SB-LT	111	88			
	IA 163 NB Ramp & Washington St	SB-R	75	42	100 (e)		
		EB-LT	26	89	-	-	
		WB-T	0	0			
		WB-R	0	0			215 (e)
	SB-LR	58	86				
	Old 163 & Washington St	EB	52	56	-	-	
WB		13	38				
SB		44	58				
2024 Store Open	IA 163 SB Ramp & Washington St	EB-L	45	39	46	51	100 (e)
		EB-TR	96	94	118	109	
		WB-L	39	111	39	98	100 (e)
		WB-TR	87	222	105	344	
		NB-LTR	44	52	49	49	
		SB-LT	89	186	89	119	
	IA 163 NB Ramp & Washington St	SB-R	39	114	39	91	100 (e)
		EB-LTR	10	109	-	-	
		EB-L	-	-	29	41	100 (p)
		EB-TR	-	-	141	128	
		WB-L	-	-	48	43	100 (p)
		WB-LT	47	65	43	224	
	Old 163 & Washington St	WB-R	0	0	59	127	215 (e)
		NB	137	128	148	101	
		SB	91	120	93	84	
		EB	36	82	44	87	
		WB	44	28	40	59	
		NB-LTR	59	49	60	40	
2044 Store Open	IA 163 SB Ramp & Washington St	SB-LT	31	32	37	32	
		SB-R	39	48	44	39	50 (e)
		EB-L	87	89	97	97	100 (e)
		EB-TR	198	166	166	170	
		WB-L	71	97	36	113	100 (e)
		WB-TR	135	358	162	441	
2044 Store Open	IA 163 SB Ramp & Washington St	NB-LTR	69	50	68	50	
		SB-LT	162	177	142	177	
		SB-R	53	75	58	66	100 (e)
2044 Store Open	IA 163 SB Ramp & Washington St	EB-LTR	45	293	-	-	
		EB-LTR	45	293	-	-	

Scenario	Intersection	Lanes/ Movements	95 th Percentile Queue (ft)				Existing (e) or Proposed (p) Turn Lane Length (ft)
			w/o Roadway Improvements		w/ Roadway Improvements		
			AM Peak	PM Peak	AM Peak	PM Peak	
IA 163 NB Ramp & Washington St		EB-L	-	-	66	125	100 (p)
		EB-TR	-	-	390	204	
		WB-L	-	-	59	92	100 (p)
		WB-LT	84	151	81	331	
		WB-R	4	19	37	201	215 (e)
		NB	191	324	89	124	
		SB	149	475	83	193	
Old 163 & Washington St		EB	80	113	58	91	
		WB	45	104	101	74	
		NB	55	53	59	67	
		SB-L	39	58	35	57	
		SB-R	41	62	41	61	50 (e)

5. CONCLUSIONS & RECOMMENDATIONS

Based on analyses performed, the following recommendations and conclusions are provided:

- The west Kwik Star proposed access should align with IA 163 NB Ramp lanes. Proposed access to have one entering lane and one shared left/through/right exiting lane. Proposed access to be designed to accommodate large truck turning paths not to encroach into other lanes.
- The east Kwik Star proposed access should align with Old 163 lanes. Proposed access to have one entering lane and one shared left/through/right exiting lane. Proposed access to be designed to accommodate large truck turning paths not to encroach into other lanes.
- IA 163 SB Ramp & Washington Street intersection – No physical improvements needed. Coordinate signal timings with adjacent IA 163 NB Ramp proposed traffic signal.
- IA 163 NB Ramp & Washington Street intersection
 - Provide traffic signalization of the intersection with fully actuated vehicle detection on all approaches. Coordinate signal timings with adjacent IA 163 SB Ramp traffic signal.
 - Washington Street eastbound and westbound dedicated left turn lanes should be provided with minimum storage length of 100'. A 100' storage length for the eastbound approach will not require widening on the IA 163 overpass bridge.
 - Southbound approach to maintain current lane configuration and will become a shared left/through/right lane.
- Old 163 & Washington Street intersection – No physical improvements recommended to the west, north, or east approaches. Even though traffic signalization is warranted, traffic signalization is not recommended due to the proximity to the proposed signalized intersection of IA 163 NB Ramp.

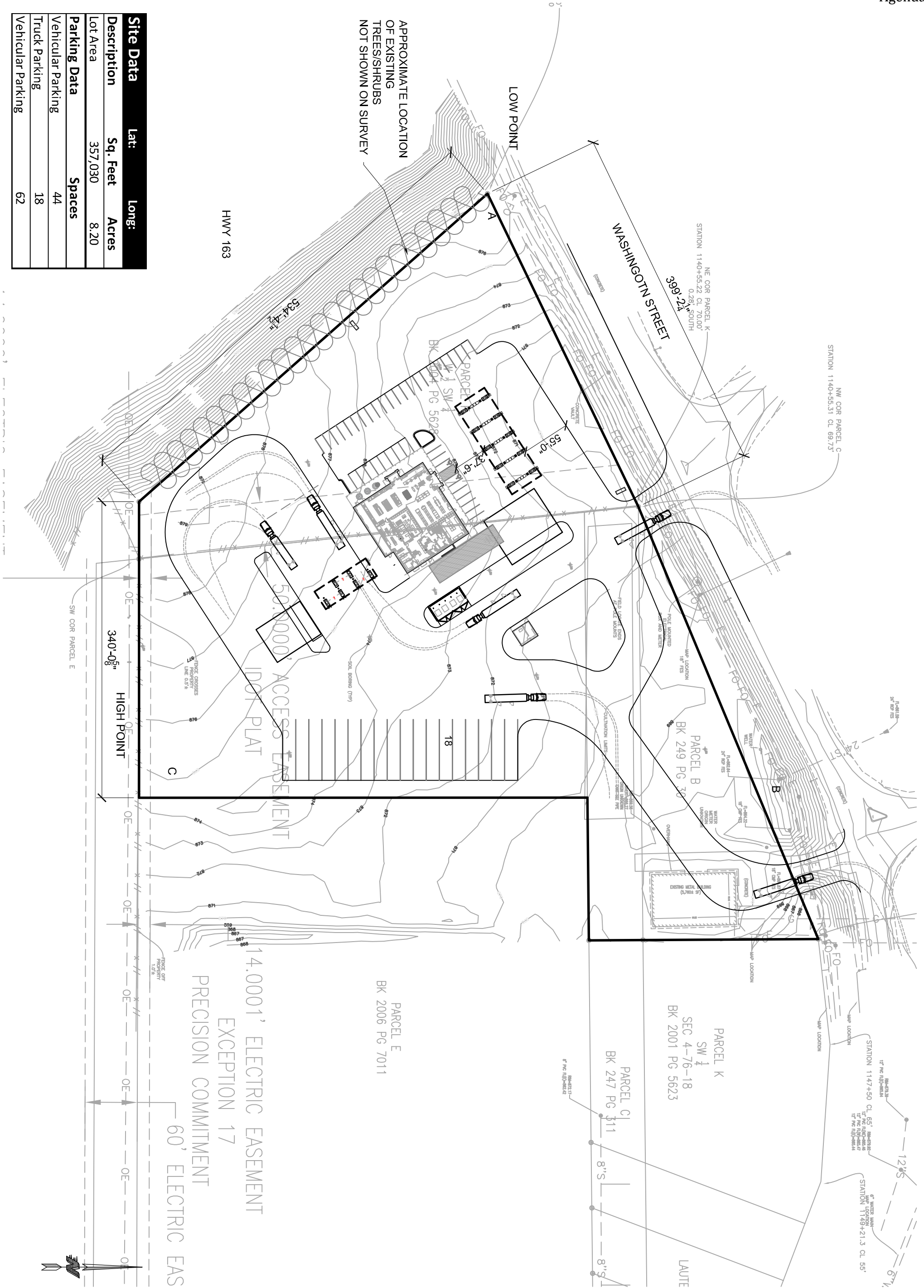
Traffic conditions should be continuously monitored to determine if intersection delays become excessive thus requiring traffic signalization.

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APPENDIX



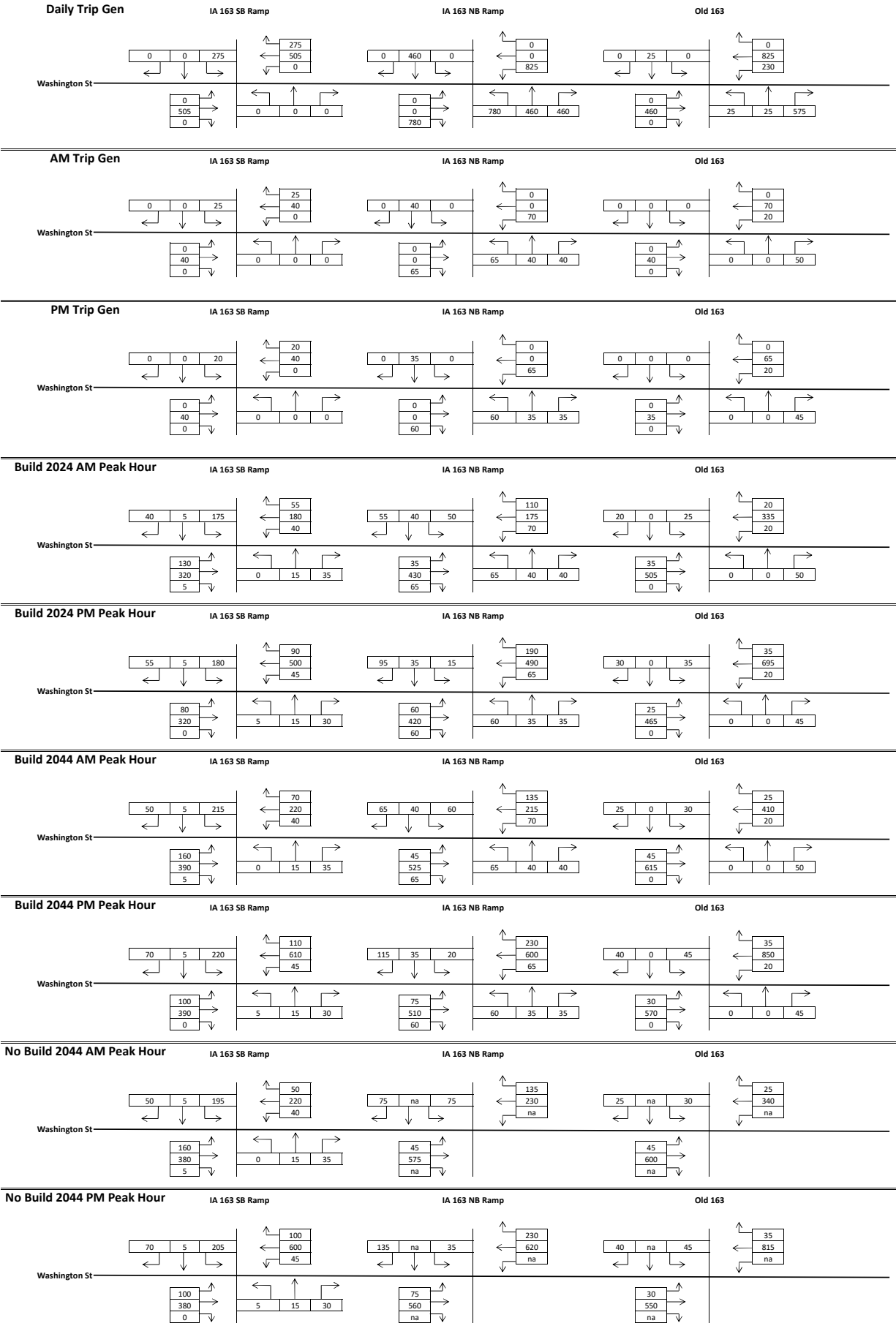


Site Data	Lat:	Long:
Description	Sq. Feet	Acres
Lot Area	357,030	8.20
Parking Data	Spaces	
Vehicle Parking	44	
Truck Parking	18	
Vehicle Parking	62	



KWIK TRIP, Inc.
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 1626 OAK STREET
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 PH. (608) 781-8988
 FAX (608) 781-8980

#	DATE	DESCRIPTION
<p>SITE PLAN</p> <p>GEN 3 CONVENIENCE STORE W/ 10 MPD & 3 LN DIESEL</p> <p>WASHINGTON STREET (OFF HWY 163) PELLA, IA 41.411162, -92.947005</p>		
DRAWN BY		ERR
SCALE	1" = 100'-0"	
PROJ. NO.	0001	
DATE	2023-08-24	
SHEET	SP15	





Snyder & Associates

2727 SW Snyder Blvd
Ankeny, IA 50023

Washington St & IA 163 West Ramp
Pella Kwikstar TIS
Pella, IA
123.1251.01

File Name : CNT_TMC_WashingtonSt-Hwy163WestRamp_2023-10-19
Site Code :
Start Date : 10/19/2023
Page No : 1

Groups Printed- Cars - Heavy Vehicles																						
Start Time	IA 163 West Ramp Southbound					Washington St Westbound					W 15th St Northbound					Washington St Eastbound					Inf. Total	
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total		
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
12:00 AM	1	1	0	0	2	0	5	1	0	6	0	0	1	0	1	0	0	0	0	0	0	9
12:15 AM	1	0	1	0	2	0	1	2	0	3	0	1	0	0	1	0	2	1	0	3	3	9
12:30 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	3	3
12:45 AM	2	1	1	0	4	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5
Total	4	2	2	0	8	0	8	3	0	11	0	1	1	0	2	0	4	1	0	5	6	26
01:00 AM	2	0	0	0	2	0	4	1	0	5	0	0	0	0	0	0	1	0	0	1	8	8
01:15 AM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	4	4
01:30 AM	0	0	2	0	2	0	1	3	0	4	0	0	0	0	0	0	1	0	0	1	7	7
01:45 AM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	3	2	0	0	5	7	7
Total	4	0	2	0	6	0	7	4	0	11	0	0	0	0	0	3	6	0	0	9	26	26
02:00 AM	1	0	1	0	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	3	3
02:15 AM	0	0	0	0	0	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	5	5
02:30 AM	0	0	0	0	0	0	4	1	0	5	0	0	0	0	0	0	0	0	0	0	5	5
02:45 AM	0	0	0	0	0	1	2	0	0	3	0	0	0	0	0	1	1	0	0	2	5	5
Total	1	0	1	0	2	1	12	1	0	14	0	0	0	0	0	1	1	0	0	2	18	18
03:00 AM	2	0	0	0	2	0	1	1	0	2	0	0	0	0	0	0	2	0	0	2	6	6
03:15 AM	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	1	0	0	0	1	3	3
03:30 AM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	2	0	0	2	4	4
03:45 AM	2	1	0	0	3	0	1	0	0	1	0	0	0	0	0	1	4	0	0	5	9	9
Total	4	1	0	0	5	1	5	1	0	7	0	0	0	0	0	2	8	0	0	10	22	22
04:00 AM	3	1	0	0	4	1	3	0	0	4	0	0	1	0	1	2	1	0	0	3	12	12
04:15 AM	3	0	0	0	3	1	1	0	0	2	0	1	3	0	4	3	11	0	0	14	23	23
04:30 AM	5	2	0	0	7	3	4	0	0	7	0	2	3	0	5	5	10	0	0	15	34	34
04:45 AM	9	1	1	0	11	2	3	1	0	6	0	1	5	0	6	2	13	0	0	15	38	38
Total	20	4	1	0	25	7	11	1	0	19	0	4	12	0	16	12	35	0	0	47	107	107
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05:15 AM	11	0	2	0	13	5	4	1	0	10	0	0	9	0	9	6	21	0	0	27	59	59
05:30 AM	25	1	1	0	27	10	8	1	0	19	0	2	12	0	14	7	23	0	0	30	90	90
05:45 AM	11	0	2	0	13	5	9	1	0	15	0	1	7	0	8	8	38	0	0	46	82	82
Total	60	1	5	0	66	22	28	5	0	55	0	5	37	0	42	24	97	0	0	121	284	284
06:00 AM	18	0	0	0	18	2	14	2	0	18	0	0	7	0	7	17	24	0	0	41	84	84
06:15 AM	13	0	4	0	17	3	10	7	0	20	0	0	6	0	6	8	26	0	0	34	77	77
06:30 AM	25	2	11	0	38	6	19	11	0	36	0	0	7	0	7	13	53	0	0	66	147	147
06:45 AM	32	5	7	0	44	6	25	2	0	33	0	2	10	0	12	26	52	0	0	78	167	167
Total	88	7	22	0	117	17	68	22	0	107	0	2	30	0	32	64	155	0	0	219	475	475
07:00 AM	21	0	11	0	32	4	48	0	0	52	0	2	5	0	7	25	53	0	0	78	169	169
07:15 AM	25	1	9	0	35	11	45	10	0	66	1	2	8	0	11	26	79	0	0	105	217	217
07:30 AM	38	3	10	0	51	6	31	6	0	43	1	3	7	0	11	36	90	0	0	126	231	231
07:45 AM	59	0	12	0	71	12	51	12	0	75	0	6	14	0	20	48	88	2	0	138	304	304
Total	143	4	42	0	189	33	175	28	0	236	2	13	34	0	49	135	310	2	0	447	921	921
08:00 AM	39	3	10	0	52	11	49	9	0	69	0	2	6	0	8	21	49	1	0	71	200	200
08:15 AM	31	0	8	0	39	2	54	8	0	64	1	2	8	0	11	6	32	0	0	38	152	152
08:30 AM	27	3	13	0	43	10	46	4	0	60	3	1	8	0	12	15	48	0	0	63	178	178
08:45 AM	26	3	9	0	38	9	49	5	0	63	1	1	8	0	10	14	34	1	0	49	160	160
Total	123	9	40	0	172	32	198	26	0	256	5	6	30	0	41	56	163	2	0	221	690	690
09:00 AM	27	2	8	0	37	10	50	6	0	66	1	2	7	0	10	9	39	0	0	48	161	161



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Washington St & IA 163 West Ramp
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123.1251.01

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Groups Printed- Cars - Heavy Vehicles																						
Start Time	IA 163 West Ramp Southbound					Washington St Westbound					W 15th St Northbound					Washington St Eastbound					Inf. Total	
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total		
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
09:15 AM	27	0	9	0	36	6	36	9	0	51	0	2	6	0	8	8	54	0	0	62	157	157
09:30 AM	17	2	9	0	28	7	40	3	0	50	3	0	4	0	7	9	52	0	0	61	146	146
09:45 AM	22	0	6	0	28	4	55	7	0	66	0	5	7	0	12	4	50	1	0	55	161	161
Total	93	4	32	0	129	27	181	25	0	233	4	9	24	0	37	30	195	1	0	226	625	625
10:00 AM	20	2	2	0	24	6	45	9	0	60	2	0	2	0	4	4	47	0	0	51	139	139
10:15 AM	20	2	7	0	29	6	44	8	0	58	0	1	7	0	8	6	57	1	0	64	159	159
10:30 AM	27	0	11	0	38	5	69	6	0	80	1	2	8	0	11	14	55	0	0	69	198	198
10:45 AM	36	1	15	0	52	3	61	7	0	71	3	1	8	0	12	16	51	0	0	67	202	202
Total	103	5	35	0	143	20	219	30	0	269	6	4	25	0	35	40	210	1	0	251	698	698
11:00 AM	23	1	7	0	31	13	81	3	0	97	0	1	8	0	9	12	55	0	0	67	204	204
11:15 AM	24	1	5	0	30	7	95	11	0	113	1	2	8	0	11	11	83	0	0	94	248	248
11:30 AM	39	2	17	0	58	7	88	7	0	102	1	1	12	0	14	13	71	3	0	87	261	261
11:45 AM	20	0	11	0	31	10	101	8	0	119	1	2	10	0	13	21	72	2	0	95	258	258
Total	106	4	40	0	150	37	365	29	0	431	3	6	38	0	47	57	281	5	0	343	971	971
12:00 PM	34	2	11	0	47	17	107	13	0	137	1	3	17	0	21	32	99	1	0	132	337	337
12:15 PM	15	3	14	0	32	9	105	9	0	123	3	6	13	0	22	22	82	0	0	104	281	281
12:30 PM	24	2	17	0	43	4	90	17	0	111	2	1	3	0	6	16	84	0	0	100	260	260
12:45 PM	25	2	12	0	39	7	91	16	0	114	3	1	13	0	17	19	84	0	0	103	273	273
Total	98	9	54	0	161	37	393	55	0	485	9	11	46	0	66	89	349	1	0	439	1151	1151
01:00 PM	18	1	15	0	34	10	84	11	0	105	0</											



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Washington St & IA 163 West Ramp
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Start Time	IA 163 West Ramp Southbound					Washington St Westbound					W 15th St Northbound					Washington St Eastbound					Int. Total
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	
	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
07:00 PM	13	1	14	0	28	5	70	9	0	84	1	1	1	0	3	8	48	1	0	57	172
07:15 PM	10	3	6	0	19	6	44	4	0	54	1	1	6	0	8	8	48	1	0	57	138
07:30 PM	16	1	8	0	25	3	51	9	0	63	1	1	2	0	4	9	53	0	0	62	154
07:45 PM	13	0	7	0	20	0	48	12	0	60	0	0	0	0	0	6	43	0	0	49	129
Total	52	5	35	0	92	14	213	34	0	261	3	3	9	0	15	31	192	2	0	225	593
08:00 PM	14	0	2	0	16	6	35	9	0	50	1	0	2	0	3	7	35	0	0	42	111
08:15 PM	12	0	2	0	14	2	38	4	0	44	0	0	5	0	5	9	15	0	0	24	87
08:30 PM	18	0	5	0	23	5	37	4	0	46	0	0	0	0	0	4	30	0	0	34	103
08:45 PM	15	1	2	0	18	4	24	5	0	33	0	0	2	0	2	3	21	0	0	24	77
Total	59	1	11	0	71	17	134	22	0	173	1	0	9	0	10	23	101	0	0	124	378
09:00 PM	17	2	7	0	26	2	41	8	0	51	0	1	2	0	3	7	28	0	0	35	115
09:15 PM	17	0	7	0	24	4	14	2	0	20	0	0	1	0	1	8	15	0	0	23	68
09:30 PM	12	0	6	0	18	1	19	4	0	24	1	0	2	0	3	2	18	0	0	20	65
09:45 PM	15	1	5	0	21	0	13	3	0	16	0	0	3	0	3	4	10	0	0	14	54
Total	61	3	25	0	89	7	87	17	0	111	1	1	8	0	10	21	71	0	0	92	302
10:00 PM	10	0	4	0	14	0	17	7	0	24	1	0	0	0	1	2	10	0	0	12	51
10:15 PM	5	1	2	0	8	2	16	0	0	18	0	0	2	0	2	5	3	0	0	8	36
10:30 PM	3	1	2	0	6	2	14	1	0	17	0	0	3	0	3	0	3	0	0	3	29
10:45 PM	6	0	3	0	9	2	13	2	0	17	1	0	1	0	2	0	3	0	0	3	31
Total	24	2	11	0	37	6	60	10	0	76	2	0	6	0	8	7	19	0	0	26	147
11:00 PM	2	0	2	0	4	0	5	6	0	11	0	0	0	0	0	0	3	0	0	3	18
11:15 PM	2	0	2	0	4	0	5	1	0	6	0	0	3	0	3	1	6	0	0	7	20
11:30 PM	2	0	0	0	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	3
11:45 PM	7	0	3	0	10	0	4	1	0	5	0	0	0	0	0	0	2	0	0	2	17
Total	13	0	7	0	20	0	15	8	0	23	0	0	3	0	3	1	11	0	0	12	58
Grand Total	1849	74	680	0	2603	499	4514	627	0	5640	64	125	497	0	686	966	3905	25	0	4896	13825
Approch %	71	2.8	26.1	0	18.8	8.8	80	11.1	0	40.8	9.3	18.2	72.4	0	5	19.7	79.8	0.5	0	35.4	
Total %	13.4	0.5	4.9	0	18.8	3.6	32.7	4.5	0	54.71	0.5	0.9	3.6	0	5	7	28.2	0.2	0	35.4	
Cars	1773	71	655	0	2499	494	4422	555	0	5471	61	118	485	0	664	933	3845	24	0	4802	13436
% Cars	95.9	95.9	96.3	0	96	99	98	88.5	0	97	95.3	94.4	97.6	0	96.8	96.6	98.5	96	0	98.1	97.2
Heavy Vehicles	76	3	25	0	104	5	92	72	0	169	3	7	12	0	22	33	60	1	0	94	389

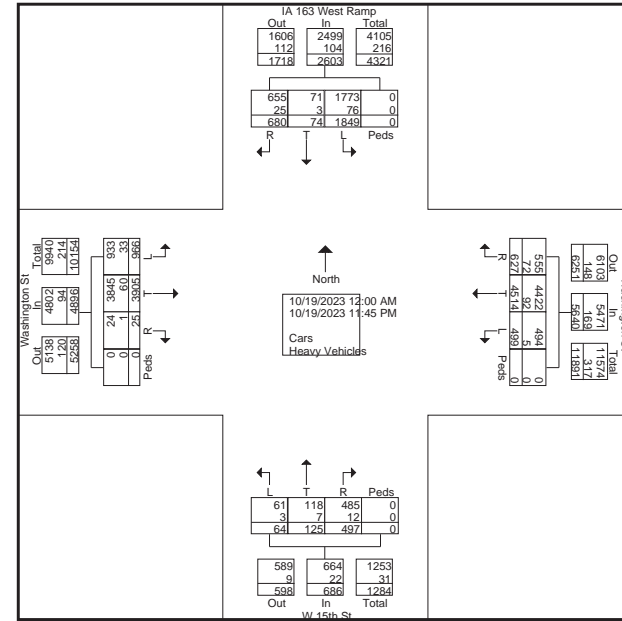


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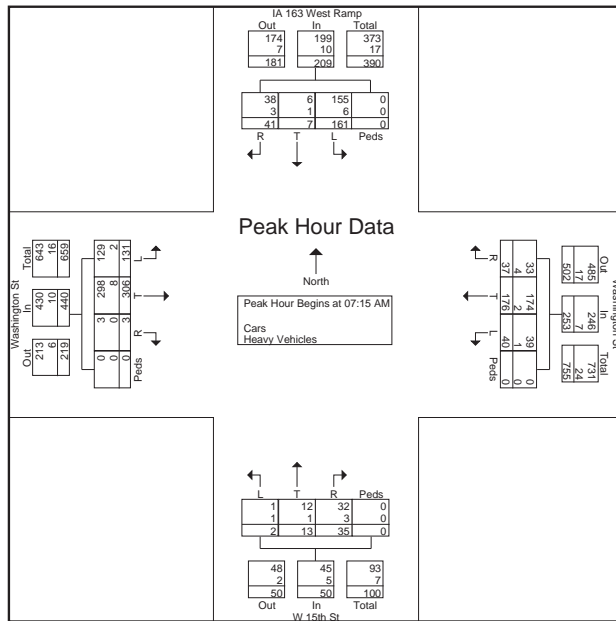
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Washington St & IA 163 West Ramp
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Pella, IA
123.1251.01

File Name : CNT_TMC_WashingtonSt-Hwy163WestRamp_2023-10-19
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Start Time	IA 163 West Ramp Southbound					Washington St Westbound					W 15th St Northbound					Washington St Eastbound					Int. Total
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	
Peak Hour Analysis From 12:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	25	1	9	0	35	11	45	10	0	66	1	2	8	0	11	26	79	0	0	105	217
07:30 AM	38	3	10	0	51	6	31	6	0	43	1	3	7	0	11	36	90	0	0	126	231
07:45 AM	59	0	12	0	71	12	51	12	0	75	0	6	14	0	20	48	88	2	0	138	304
08:00 AM	39	3	10	0	52	11	49	9	0	69	0	2	6	0	8	21	49	1	0	71	200
Total Volume	161	7	41	0	209	40	176	37	0	253	2	13	35	0	50	131	306	3	0	440	952
% App. Total	.682	.583	.854	.000	.736	.833	.863	.771	.000	.843	.500	.542	.625	.000	.625	.682	.850	.375	.000	.797	.783
PHF	.155	.6	.38	0	.199	.39	.174	.33	0	.246	1	.12	.32	0	.45	.129	.298	.3	0	.430	.920
Cars	96.3	85.7	92.7	0	95.2	97.5	98.9	89.2	0	97.2	50.0	92.3	91.4	0	90.0	98.5	97.4	100	0	97.7	96.6
% Cars	6	1	3	0	10	1	2	4	0	7	1	1	3	0	5	2	8	0	0	10	32
Heavy Vehicles	3.7	14.3	7.3	0	4.8	2.5	1.1	10.8	0	2.8	50.0	7.7	8.6	0	10.0	1.5	2.6	0	0	2.3	3.4
% Heavy Vehicles																					



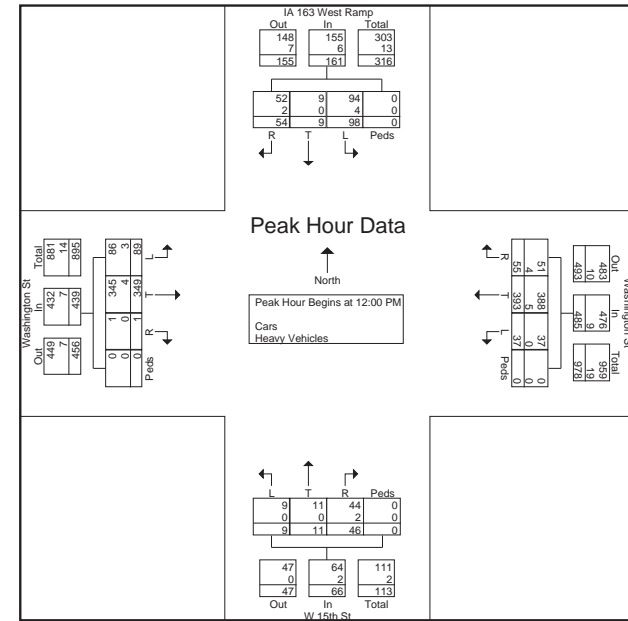
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Ankeny, IA 50023

Washington St & IA 163 West Ramp
Pella Kwikstar TIS
Pella, IA
123.1251.01

File Name : CNT_TMC_WashingtonSt-Hwy163WestRamp_2023-10-19
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Start Time	IA 163 West Ramp Southbound					Washington St Westbound					W 15th St Northbound					Washington St Eastbound					Int. Total
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:00 PM																					
12:00 PM	34	2	11	0	47	17	107	13	0	137	1	3	17	0	21	32	99	1	0	132	337
12:15 PM	15	3	14	0	32	9	105	9	0	123	3	6	13	0	22	22	82	0	0	104	281
12:30 PM	24	2	17	0	43	4	90	17	0	111	2	1	3	0	6	16	84	0	0	100	260
12:45 PM	25	2	12	0	39	7	91	16	0	114	3	1	13	0	17	19	84	0	0	103	273
Total Volume	98	9	54	0	161	37	393	55	0	485	9	11	46	0	66	89	349	1	0	439	1151
% App. Total	.721	.750	.794	.000	.856	.544	.918	.809	.000	.885	.750	.458	.676	.000	.750	.695	.881	.250	.000	.831	.854
PHF	.94	9	52	0	155	37	388	51	0	476	9	11	44	0	64	86	345	1	0	432	1127
Cars	95.9	100	96.3	0	96.3	100	98.7	92.7	0	98.1	100	100	95.7	0	97.0	96.6	98.9	100	0	98.4	97.9
% Cars	4	0	2	0	6	0	5	4	0	9	0	0	2	0	2	3	4	0	0	7	24
Heavy Vehicles	4.1	0	3.7	0	3.7	0	1.3	7.3	0	1.9	0	0	4.3	0	3.0	3.4	1.1	0	0	1.6	2.1
% Heavy Vehicles																					



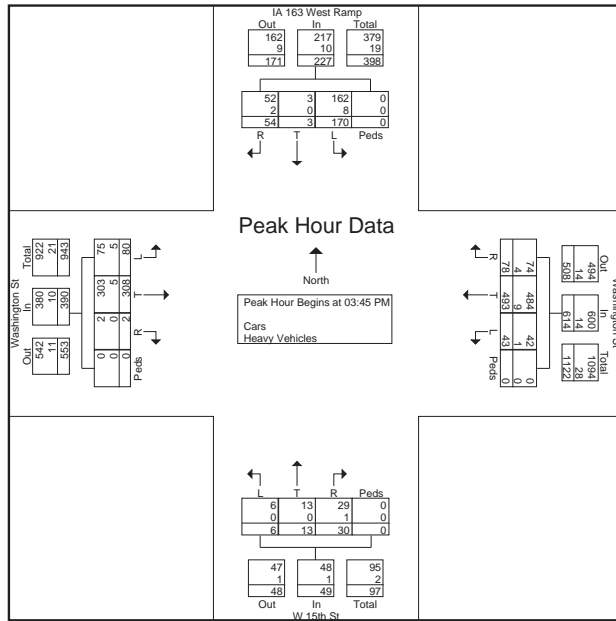


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Washington St & IA 163 West Ramp
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Start Time	IA 163 West Ramp Southbound					Washington St Westbound					W 15th St Northbound					Washington St Eastbound					Int. Total	
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total		
Peak Hour Analysis From 02:00 PM to 11:45 PM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 03:45 PM																						
03:45 PM	43	0	21	0	64	10	108	15	0	133	0	1	12	0	13	14	67	0	0	81	291	
04:00 PM	34	1	9	0	44	12	130	19	0	161	2	6	6	0	14	27	82	0	0	109	328	
04:15 PM	49	1	11	0	61	6	118	19	0	143	2	1	6	0	9	21	83	2	0	106	319	
04:30 PM	44	1	13	0	58	15	137	25	0	177	2	5	6	0	13	18	76	0	0	94	342	
Total Volume	170	3	54	0	227	43	493	78	0	614	6	13	30	0	49	80	308	2	0	390	1280	
% App. Total																						
PHF	.867	.750	.643	.000	.887	.717	.900	.780	.000	.867	.750	.542	.625	.000	.875	.741	.928	.250	.000	.894	.936	
Cars	162	3	52	0	217	42	484	74	0	600	6	13	29	0	48	75	303	2	0	380	1245	
% Cars	95.3	100	96.3	0	95.6	97.7	98.2	94.9	0	97.7	100	100	96.7	0	98.0	93.8	98.4	100	0	97.4	97.3	
Heavy Vehicles	8	0	2	0	10	1	9	4	0	14	0	0	1	0	1	5	5	0	0	10	35	
% Heavy Vehicles	4.7	0	3.7	0	4.4	2.3	1.8	5.1	0	2.3	0	0	3.3	0	2.0	6.3	1.6	0	0	2.6	2.7	



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Start Time	IA 163 East Ramp Southbound					Washington St Westbound					Northbound					Washington St Eastbound					Int. Total	
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total		
Groups Printed- Cars - Heavy Vehicles																						
Factor																						
12:00 AM	2	0	2	0	4	0	4	4	0	8	0	0	0	0	0	0	2	0	0	0	2	14
12:15 AM	1	0	0	0	1	0	3	1	0	4	0	0	0	0	0	0	3	0	0	0	3	8
12:30 AM	1	0	0	0	1	0	1	1	0	2	0	0	0	0	0	1	1	0	0	1	2	5
12:45 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	0	2	3
Total	4	0	2	0	6	0	9	6	0	15	0	0	0	0	0	1	8	0	0	9	30	
01:00 AM	1	0	1	0	2	0	4	1	0	5	0	0	0	0	0	0	3	0	0	0	3	10
01:15 AM	4	0	1	0	5	0	1	0	0	1	0	0	0	0	0	0	3	0	0	0	3	9
01:30 AM	1	0	0	0	1	0	3	0	0	3	0	0	0	0	0	0	1	0	0	0	1	5
01:45 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	3	0	0	0	3	4
Total	6	0	2	0	8	0	9	1	0	10	0	0	0	0	0	0	10	0	0	0	10	28
02:00 AM	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	3
02:15 AM	0	0	1	0	1	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	5
02:30 AM	0	0	2	0	2	0	4	1	0	5	0	0	0	0	0	0	0	0	0	0	0	7
02:45 AM	0	0	1	0	1	0	1	1	0	2	0	0	0	0	0	0	1	0	0	0	1	4
Total	0	0	5	0	5	0	9	3	0	12	0	0	0	0	0	0	2	0	0	0	2	19
03:00 AM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	1	3	0	0	0	4	6
03:15 AM	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
03:30 AM	1	0	1	0	2	0	1	1	0	2	0	0	0	0	0	2	0	0	0	0	2	6
03:45 AM	3	0	0	0	3	0	1	3	0	4	0	0	0	0	0	0	6	0	0	0	6	13
Total	4	0	4	0	8	0	3	4	0	7	0	0	0	0	0	3	9	0	0	0	12	27
04:00 AM	0	0	1	0	1	0	3	3	0	6	0	0	0	0	0	0	5	0	0	0	5	12
04:15 AM	0	0	0	0	0	0	2	4	0	6	0	0	0	0	0	0	15	0	0	0	15	21
04:30 AM	5	0	3	0	8	0	4	1	0	5	0	0	0	0	0	2	18	0	0	0	20	33
04:45 AM	3	0	2	0	5	0	5	6	0	11	0	0	0	0	0	2	24	0	0	0	26	42
Total	8	0	6	0	14	0	14	14	0	28	0	0	0	0	0	4	62	0	0	0	66	108
05:00 AM	5	0	1	0	6	0	12	7	0	19	0	0	0	0	0	6	32	0	0	0	38	63
05:15 AM	11	0	2	0	13	0	7	10	0	17	0	0	0	0	0	5	34	0	0	0	39	89
05:30 AM	10	0	2	0	12	0	17	8	0	25	0	0	0	0	0	13	50	0	0	0	63	100
05:45 AM	13	0	3	0	16	0	13	22	0	35	0	0	0	0	0	7	48	0	0	0	55	106
Total	39	0	8	0	47	0	49	47	0	96	0	0	0	0	0	31	164	0	0	0	195	338
06:00 AM	6	0	4	0	10	0	12	12	0	24	0	0	0	0	0	4	42	0	0	0	46	80
06:15 AM	5	0	4	0	9	0	17	13	0	30	0	0	0	0	0	6	40	0	0	0	46	85
06:30 AM	6	0	3	0	9	0	30	22	0	52	0	0	0	0	0	10	74	0	0	0	84	145
06:45 AM	11	0	10	0	21	0	26	24	0	50	0	0	0	0	0	8	83	0	0	0	91	162
Total	28	0	21	0	49	0	85	71	0	156	0	0	0	0	0	28	239	0	0	0	267	472
07:00 AM	6	0	14	0	20	0	36	33	0	69	0	0	0	0	0	6	74	0	0	0	80	169
07:15 AM	16	0	15	0	31	0	53	27	0	80	0	0	0	0	0	14	97	0	0	0	111	222
07:30 AM	14	0	12	0	26	0	33	24	0	57	0	0	0	0	0	8	127	0	0	0	135	218
07:45 AM	16	0	18	0	34	0	55	33	0	88	0	0	0	0	0	8	154	0	0	0	162	284
Total	52	0	59	0	111	0	177	117	0	294	0	0	0	0	0	36	452	0	0	0	488	893
08:00 AM	11	0	17	0	28	0	51	26	0	77	0	0	0	0	0	5	90	0	0	0	95	200
08:15 AM	6	0	15	0	21	0	48	28	0	76	0	0	0	0	0	5	67	0	0	0	72	169
08:30 AM	13	0	10	0	23	0	52	19	0	71	0	0	0	0	0	7	71	0	0	0	78	172
08:45 AM	3	0	10	0	13	0	52	22	0	74	0	0	0	0	0	7	64	0	0	0	71	158
Total	33	0	52	0	85	0	203	95	0	298	0	0	0	0	0	24	292	0	0	0	316	699
09:00 AM	8	0	15	0	23	0	53	24	0	77	0	0	0	0	0	6	68	0	0	0	74	174



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Washington St & IA 163 East Ramp
Pella Kwikstar TIS
Pella, IA
123.1251.01

File Name : CNT_TMC_WashingtonSt-Hwy163EastRamp_2023-10-19
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Groups Printed- Cars - Heavy Vehicles																					
Start Time	IA 163 East Ramp Southbound					Washington St Westbound					Northbound					Washington St Eastbound					Inf. Total
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	
09:15 AM	5	0	11	0	16	0	40	23	0	63	0	0	0	0	0	6	82	0	0	88	167
09:30 AM	6	0	9	0	15	0	44	25	0	69	0	0	0	0	0	10	61	0	0	71	155
09:45 AM	7	0	9	0	16	0	54	14	0	68	0	0	0	0	0	8	73	0	0	81	165
Total	26	0	44	0	70	0	191	86	0	277	0	0	0	0	0	30	284	0	0	314	661
10:00 AM	3	0	8	0	11	0	53	13	0	66	0	0	0	0	0	3	65	0	0	68	145
10:15 AM	8	0	16	0	24	0	47	22	0	69	0	0	0	0	0	5	79	0	0	84	177
10:30 AM	4	0	20	0	24	0	56	17	0	73	0	0	0	0	0	7	82	0	0	89	186
10:45 AM	6	0	12	0	18	0	62	22	0	84	0	0	0	0	0	10	87	0	0	97	199
Total	21	0	56	0	77	0	218	74	0	292	0	0	0	0	0	25	313	0	0	338	707
11:00 AM	9	0	17	0	26	0	79	21	0	100	0	0	0	0	0	10	72	0	0	82	208
11:15 AM	8	0	20	0	28	0	94	24	0	118	0	0	0	0	0	12	100	0	0	112	258
11:30 AM	15	0	25	0	40	0	77	19	0	96	0	0	0	0	0	8	116	0	0	124	260
11:45 AM	4	0	20	0	24	0	95	26	0	121	0	0	0	0	0	10	91	0	0	101	246
Total	36	0	82	0	118	0	345	90	0	435	0	0	0	0	0	40	379	0	0	419	972
12:00 PM	7	0	22	0	29	0	108	28	0	136	0	0	0	0	0	19	132	0	0	151	316
12:15 PM	8	0	18	0	26	0	103	23	0	126	0	0	0	0	0	17	94	0	0	111	263
12:30 PM	9	0	26	0	35	0	86	33	0	119	0	0	0	0	0	10	100	0	0	110	264
12:45 PM	16	0	14	0	30	0	96	31	0	127	0	0	0	0	0	11	107	0	0	118	275
Total	40	0	80	0	120	0	393	115	0	508	0	0	0	0	0	57	433	0	0	490	1118
01:00 PM	7	0	8	0	15	0	96	31	0	127	0	0	0	0	0	7	97	0	0	104	246
01:15 PM	7	0	17	0	24	0	80	20	0	100	0	0	0	0	0	11	103	0	0	114	238
01:30 PM	4	0	14	0	18	0	59	25	0	84	0	0	0	0	0	9	88	0	0	97	199
01:45 PM	17	0	15	0	32	0	82	25	0	107	0	0	0	0	0	9	87	0	0	96	235
Total	35	0	54	0	89	0	317	101	0	418	0	0	0	0	0	36	375	0	0	411	918
02:00 PM	12	0	17	0	29	0	69	38	0	107	0	0	0	0	0	10	100	0	0	110	246
02:15 PM	4	0	18	0	22	0	82	36	0	118	0	0	0	0	0	8	81	0	0	89	229
02:30 PM	5	0	13	0	18	0	90	41	0	131	0	0	0	0	0	8	84	0	0	92	241
02:45 PM	9	0	24	0	33	0	107	43	0	150	0	0	0	0	0	14	110	0	0	124	307
Total	30	0	72	0	102	0	348	158	0	506	0	0	0	0	0	40	375	0	0	415	1023
03:00 PM	9	0	14	0	23	0	85	26	0	111	0	0	0	0	0	17	100	0	0	117	251
03:15 PM	10	0	19	0	29	0	95	39	0	134	0	0	0	0	0	8	99	0	0	107	270
03:30 PM	11	0	35	0	46	0	110	49	0	159	0	0	0	0	0	9	90	0	0	99	304
03:45 PM	7	0	21	0	28	0	116	41	0	157	0	0	0	0	0	13	113	0	0	126	311
Total	37	0	89	0	126	0	406	155	0	561	0	0	0	0	0	47	402	0	0	449	1136
04:00 PM	5	0	27	0	32	0	129	48	0	177	0	0	0	0	0	13	115	0	0	128	337
04:15 PM	4	0	27	0	31	0	118	52	0	170	0	0	0	0	0	18	117	0	0	135	336
04:30 PM	9	0	30	0	39	0	143	51	0	194	0	0	0	0	0	14	110	0	0	124	357
04:45 PM	9	0	26	0	35	0	98	45	0	143	0	0	0	0	0	14	103	0	0	117	295
Total	27	0	110	0	137	0	488	196	0	684	0	0	0	0	0	59	445	0	0	504	1325
05:00 PM	18	0	24	0	42	0	117	52	0	169	0	0	0	0	0	19	118	0	0	137	348
05:15 PM	12	0	47	0	59	0	108	33	0	141	0	0	0	0	0	14	109	0	0	123	323
05:30 PM	9	0	36	0	45	0	115	37	0	152	0	0	0	0	0	12	96	0	0	108	305
05:45 PM	7	0	30	0	37	0	80	32	0	112	0	0	0	0	0	21	96	0	0	117	266
Total	46	0	137	0	183	0	420	154	0	574	0	0	0	0	0	66	419	0	0	485	1242
06:00 PM	11	0	23	0	34	0	92	33	0	125	0	0	0	0	0	12	94	0	0	106	265
06:15 PM	13	0	18	0	31	0	95	27	0	122	0	0	0	0	0	17	93	0	0	110	263
06:30 PM	3	0	13	0	16	0	81	34	0	115	0	0	0	0	0	13	93	0	0	106	237
06:45 PM	6	0	15	0	21	0	81	20	0	101	0	0	0	0	0	9	80	0	0	89	211
Total	33	0	69	0	102	0	349	114	0	463	0	0	0	0	0	51	360	0	0	411	976



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Washington St & IA 163 East Ramp
Pella Kwikstar TIS
Pella, IA
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File Name : CNT_TMC_WashingtonSt-Hwy163EastRamp_2023-10-19
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Groups Printed- Cars - Heavy Vehicles																					
Start Time	IA 163 East Ramp Southbound					Washington St Westbound					Northbound					Washington St Eastbound					Inf. Total
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	
07:00 PM	5	0	8	0	13	0	78	22	0	100	0	0	0	0	0	8	51	0	0	59	172
07:15 PM	6	0	6	0	12	0	45	26	0	71	0	0	0	0	0	9	53	0	0	62	145
07:30 PM	5	0	8	0	13	0	54	21	0	75	0	0	0	0	0	7	64	0	0	71	159
07:45 PM	3	0	8	0	11	0	52	24	0	76	0	0	0	0	0	7	48	0	0	55	142
Total	19	0	30	0	49	0	229	93	0	322	0	0	0	0	0	31	216	0	0	247	618
08:00 PM	2	0	7	0	9	0	42	19	0	61	0	0	0	0	0	7	41	0	0	48	118
08:15 PM	5	0	7	0	12	0	40	17	0	57	0	0	0	0	0	3	32	0	0	35	104
08:30 PM	1	0	7	0	8	0	37	10	0	47	0	0	0	0	0	2	47	0	0	49	104
08:45 PM	1	0	3	0	4	0	30	11	0	41	0	0	0	0	0	4	33	0	0	37	82
Total	9	0	24	0	33	0	149	57	0	206	0	0	0	0	0	16	153	0	0	169	408
09:00 PM	6	0	9	0	15	0	42	6	0	48	0	0	0	0	0	2	46	0	0	48	111
09:15 PM	3	0	2	0	5	0	18	12	0	30	0	0	0	0	0	6	27	0	0	33	68
09:30 PM	1	0	3	0	4	0	21	5	0	26	0	0	0	0	0	4	29	0	0	33	63
09:45 PM	1	0	3	0	4	0	13	9	0	22	0	0	0	0	0	0	26	0	0	26	52
Total	11	0	17	0	28	0	94	32	0	126	0	0	0	0	0	12	128	0	0	140	294
10:00 PM	0	0	2	0	2	0	23	7	0	30	0	0	0	0	0	1	21	0	0	22	54
10:15 PM	2	0	5	0	7	0	13	3	0	16	0	0	0	0	0	0	11	0	0	11	34
10:30 PM	0	0	4	0	4	0	15	3	0	18	0	0	0	0	0	0	10	0	0	10	32
10:45 PM	1	0	3	0	4	0	12	0	0	12	0	0	0	0	0	0	10	0	0	10	26
Total	3	0	14	0	17	0	63	13	0	76	0	0	0	0	0	1	52	0	0	53	146
11:00 PM	1	0	1	0	2	0	10	6	0	16	0	0	0	0	0	1	4	0	0	5	23
11:15 PM	0	0	1	0	1	0	5	1	0	6	0	0	0	0	0	2	8	0	0	10	17
11:30 PM	2	0	0	0	2	0	1	1	0	2	0	0	0	0	0	0	3	0	0	3	7
11:45 PM	0	0	1	0	1	0	4														

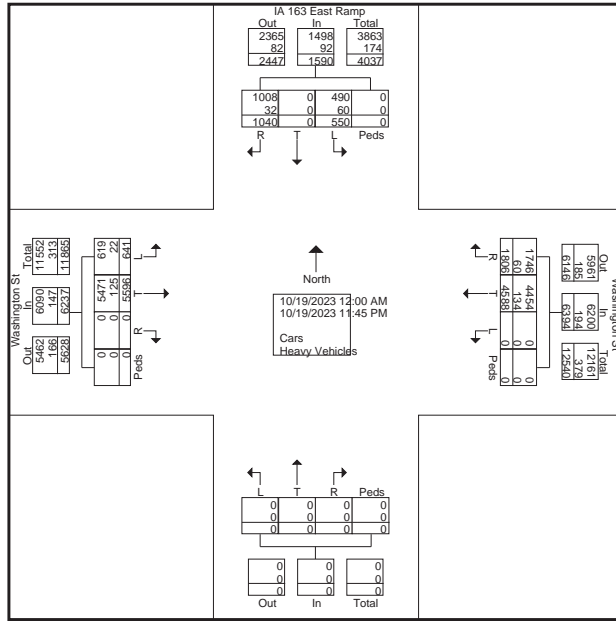


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Washington St & IA 163 East Ramp
Pella Kwikstar TIS
Pella, IA
123.1251.01

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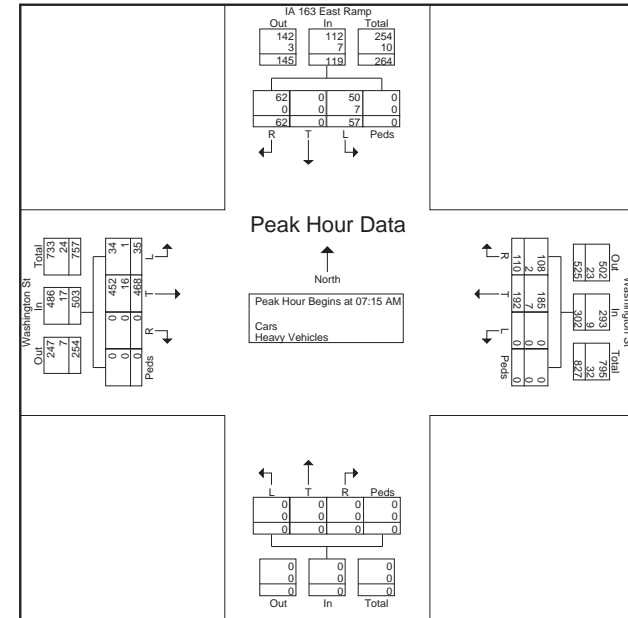
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Ankeny, IA 50023

Washington St & IA 163 East Ramp
Pella Kwikstar TIS
Pella, IA
123.1251.01

File Name : CNT_TMC_WashingtonSt-Hwy163EastRamp_2023-10-19
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Start Time	IA 163 East Ramp Southbound				Washington St Westbound				Northbound				Washington St Eastbound				Int. Total				
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total						
Peak Hour Analysis From 12:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	16	0	15	0	31	0	53	27	0	80	0	0	0	0	0	14	97	0	0	111	222
07:30 AM	14	0	12	0	26	0	33	24	0	57	0	0	0	0	0	8	127	0	0	135	218
07:45 AM	16	0	18	0	34	0	55	33	0	88	0	0	0	0	0	8	154	0	0	162	284
08:00 AM	11	0	17	0	28	0	51	26	0	77	0	0	0	0	0	5	90	0	0	95	200
Total Volume	57	0	62	0	119	0	192	110	0	302	0	0	0	0	0	35	468	0	0	503	924
% App. Total	.891	.000	.861	.000	.875	.000	.873	.833	.000	.858	.000	.000	.000	.000	.000	.625	.760	.000	.000	.776	.813
PHF	50	0	62	0	112	0	185	108	0	293	0	0	0	0	0	34	452	0	0	486	891
Cars	87.7	0	100	0	94.1	0	96.4	98.2	0	97.0	0	0	0	0	0	97.1	96.6	0	0	96.6	96.4
% Cars	7	0	0	0	7	0	7	2	0	9	0	0	0	0	0	1	16	0	0	17	33
Heavy Vehicles	12.3	0	0	0	5.9	0	3.6	1.8	0	3.0	0	0	0	0	0	2.9	3.4	0	0	3.4	3.6
% Heavy Vehicles																					





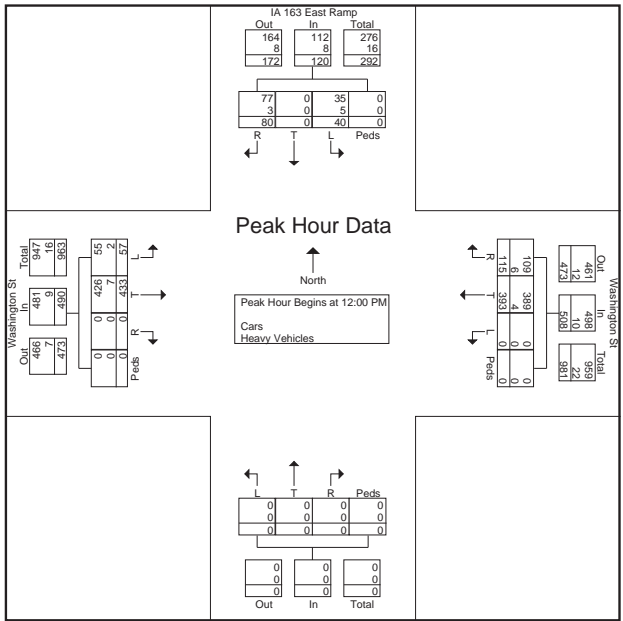
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Ankeny, IA 50023

Washington St & IA 163 East Ramp
Pella Kwikstar TIS
Pella, IA
123.1251.01

File Name : CNT_TMC_WashingtonSt-Hwy163EastRamp_2023-10-19
Site Code :
Start Date : 10/19/2023
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Start Time	IA 163 East Ramp Southbound					Washington St Westbound					Northbound					Washington St Eastbound					Int. Total
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:00 PM																					
12:00 PM	7	0	22	0	29	0	108	28	0	136	0	0	0	0	0	19	132	0	0	151	316
12:15 PM	8	0	18	0	26	0	103	23	0	126	0	0	0	0	0	17	94	0	0	111	263
12:30 PM	9	0	26	0	35	0	86	33	0	119	0	0	0	0	0	10	100	0	0	110	264
12:45 PM	16	0	14	0	30	0	96	31	0	127	0	0	0	0	0	11	107	0	0	118	275
Total Volume	40	0	80	0	120	0	393	115	0	508	0	0	0	0	0	57	433	0	0	490	1118
% App. Total																					
PHF	.625	.000	.769	.000	.857	.000	.910	.871	.000	.934	.000	.000	.000	.000	.750	.820	.000	.000	.811	.884	
Cars	35	0	77	0	112	0	389	109	0	498	0	0	0	0	0	55	426	0	0	481	1091
% Cars	87.5	0	96.3	0	93.3	0	99.0	94.8	0	98.0	0	0	0	0	0	96.5	98.4	0	0	98.2	97.6
Heavy Vehicles	5	0	3	0	8	0	4	6	0	10	0	0	0	0	0	2	7	0	0	9	27
% Heavy Vehicles	12.5	0	3.8	0	6.7	0	1.0	5.2	0	2.0	0	0	0	0	0	3.5	1.6	0	0	1.8	2.4



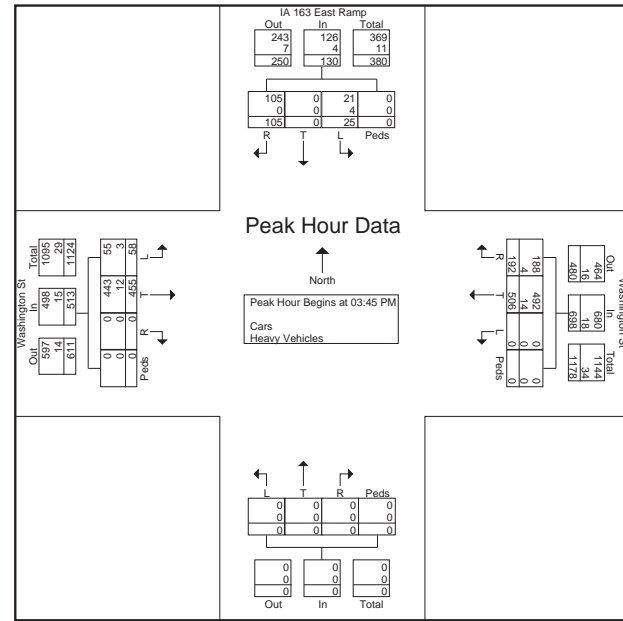
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Washington St & IA 163 East Ramp
Pella Kwikstar TIS
Pella, IA
123.1251.01

File Name : CNT_TMC_WashingtonSt-Hwy163EastRamp_2023-10-19
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Start Time	IA 163 East Ramp Southbound					Washington St Westbound					Northbound					Washington St Eastbound					Int. Total
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	
Peak Hour Analysis From 02:00 PM to 11:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:45 PM																					
03:45 PM	7	0	21	0	28	0	116	41	0	157	0	0	0	0	0	13	113	0	0	126	311
04:00 PM	5	0	27	0	32	0	129	48	0	177	0	0	0	0	0	13	115	0	0	128	337
04:15 PM	4	0	27	0	31	0	118	52	0	170	0	0	0	0	0	18	117	0	0	135	336
04:30 PM	9	0	30	0	39	0	143	51	0	194	0	0	0	0	0	14	110	0	0	124	357
Total Volume	25	0	105	0	130	0	506	192	0	698	0	0	0	0	0	58	455	0	0	513	1341
% App. Total																					
PHF	.694	.000	.875	.000	.833	.000	.885	.923	.000	.899	.000	.000	.000	.000	.806	.972	.000	.000	.950	.939	
Cars	21	0	105	0	126	0	492	188	0	680	0	0	0	0	0	55	443	0	0	498	1304
% Cars	84.0	0	100	0	96.9	0	97.2	97.9	0	97.4	0	0	0	0	0	94.8	97.4	0	0	97.1	97.2
Heavy Vehicles	4	0	0	0	4	0	14	4	0	18	0	0	0	0	0	3	12	0	0	15	37
% Heavy Vehicles	16.0	0	0	0	3.1	0	2.8	2.1	0	2.6	0	0	0	0	0	5.2	2.6	0	0	2.9	2.8





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Washington St & Old Highway 163
Pella Kwikstar TIS
Pella, IA
123.1251.01

File Name : CNT_TMC_WashingtonSt-OldHwy163_2023-10-19
Site Code :
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Start Time	Old Hwy 163					Washington St					Northbound					Washington St					Inf. Total
	Soutbound					Westbound										Eastbound					
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:00 PM	2	0	3	0	5	0	98	3	0	101	0	0	0	0	0	2	52	0	0	54	160
07:15 PM	0	0	4	0	4	0	67	6	0	73	0	0	0	0	0	1	62	0	0	63	140
07:30 PM	3	0	1	0	4	0	74	3	0	77	0	0	0	0	0	1	67	0	0	68	149
07:45 PM	0	0	4	0	4	0	72	4	0	76	0	0	0	0	0	1	50	0	0	51	131
Total	5	0	12	0	17	0	311	16	0	327	0	0	0	0	0	5	231	0	0	236	580
08:00 PM	2	0	3	0	5	0	58	4	0	62	0	0	0	0	0	0	42	0	0	42	109
08:15 PM	1	0	1	0	2	0	57	3	0	60	0	0	0	0	0	0	36	0	0	36	98
08:30 PM	0	0	3	0	3	0	43	5	0	48	0	0	0	0	0	1	47	0	0	48	99
08:45 PM	2	0	3	0	5	0	39	3	0	42	0	0	0	0	0	1	33	0	0	34	81
Total	5	0	10	0	15	0	197	15	0	212	0	0	0	0	0	2	158	0	0	160	387
09:00 PM	3	0	4	0	7	0	44	5	0	49	0	0	0	0	0	1	51	0	0	52	108
09:15 PM	0	0	0	0	0	0	30	1	0	31	0	0	0	0	0	1	29	0	0	30	61
09:30 PM	0	0	2	0	2	0	24	0	0	24	0	0	0	0	0	1	29	0	0	30	56
09:45 PM	0	0	1	0	1	0	21	0	0	21	0	0	0	0	0	1	25	0	0	26	48
Total	3	0	7	0	10	0	119	6	0	125	0	0	0	0	0	4	134	0	0	138	273
10:00 PM	0	0	0	0	0	0	29	0	0	29	0	0	0	0	0	0	21	0	0	21	50
10:15 PM	1	0	0	0	1	0	16	1	0	17	0	0	0	0	0	0	14	0	0	14	32
10:30 PM	0	0	0	0	0	0	17	2	0	19	0	0	0	0	0	0	10	0	0	10	29
10:45 PM	0	0	0	0	0	0	12	0	0	12	0	0	0	0	0	0	11	0	0	11	23
Total	1	0	0	0	1	0	74	3	0	77	0	0	0	0	0	0	56	0	0	56	134
11:00 PM	0	0	1	0	1	0	15	0	0	15	0	0	0	0	0	0	5	0	0	5	21
11:15 PM	0	0	0	0	0	0	7	1	0	8	0	0	0	0	0	1	7	0	0	8	16
11:30 PM	0	0	1	0	1	0	1	0	0	1	0	0	0	0	0	1	4	0	0	5	7
11:45 PM	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	0	9	0	0	9	15
Total	0	0	2	0	2	0	29	1	0	30	0	0	0	0	0	2	25	0	0	27	59
Grand Total	345	1	318	0	664	0	6074	385	0	6459	4	0	0	0	4	284	5851	3	0	6138	13265
Approch %	52	0.2	47.9	0		0	94	6	0		100	0	0	0		4.6	95.3	0	0		
Total %	2.6	0	2.4	0	5	0	45.8	2.9	0	48.7	0	0	0	0	0	2.1	44.1	0	0	46.3	
Cars	319	1	275	0	595	0	5920	350	0	6270	4	0	0	0	4	253	5700	3	0	5956	12825
% Cars	92.5	100	86.5	0	89.6	0	97.5	90.9	0	97.1	100	0	0	0	100	89.1	97.4	100	0	97	96.7
Heavy Vehicles	26	0	43	0	69	0	154	35	0	189	0	0	0	0	0	31	151	0	0	182	440

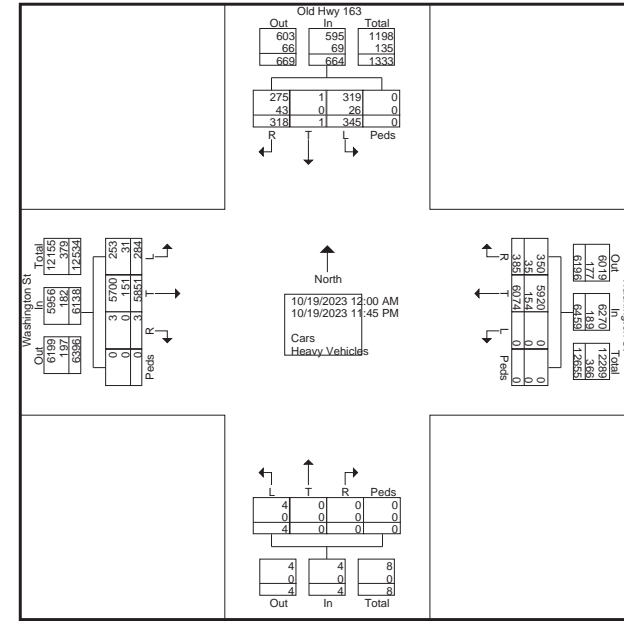


Snyder & Associates

2727 SW Snyder Blvd
Ankeny, IA 50023

Washington St & Old Highway 163
Pella Kwikstar TIS
Pella, IA
123.1251.01

File Name : CNT_TMC_WashingtonSt-OldHwy163_2023-10-19
Site Code :
Start Date : 10/19/2023
Page No : 4





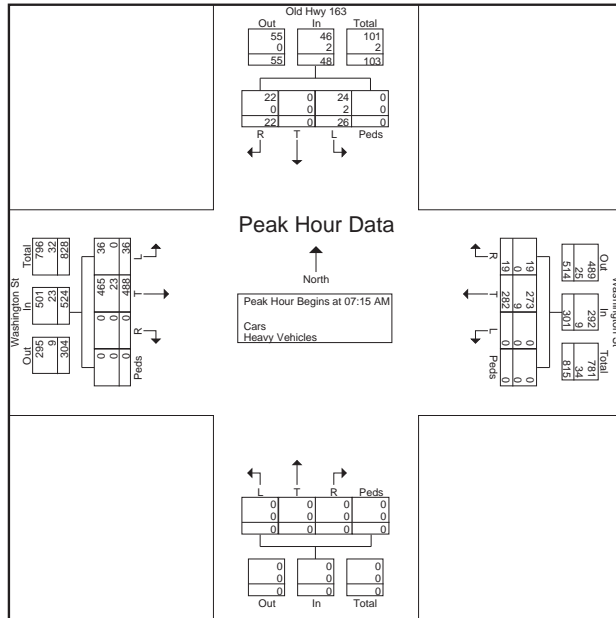
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Pella, IA
123.1251.01

File Name : CNT_TMC_WashingtonSt-OldHwy163_2023-10-19
Site Code :
Start Date : 10/19/2023
Page No : 5

Start Time	Old Hwy 163 Southbound				Washington St Westbound				Northbound				Washington St Eastbound				Int. Total				
	L	T	R	Peds	L	T	R	Peds	L	T	R	Peds	L	T	R	Peds					
Peak Hour Analysis From 12:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	7	0	7	0	14	0	75	7	0	82	0	0	0	0	0	12	101	0	0	113	209
07:30 AM	5	0	1	0	6	0	58	2	0	60	0	0	0	0	0	7	134	0	0	141	207
07:45 AM	4	0	10	0	14	0	77	4	0	81	0	0	0	0	0	12	155	0	0	167	262
08:00 AM	10	0	4	0	14	0	72	6	0	78	0	0	0	0	0	5	98	0	0	103	195
Total Volume	26	0	22	0	48	0	282	19	0	301	0	0	0	0	0	36	465	0	0	524	873
% App. Total	.650	.000	.550	.000	.857	.000	.916	.679	.000	.918	.000	.000	.000	.000	.000	.750	.787	.000	.000	.784	.833
PHF	.24	0	.22	0	.46	0	.273	.19	0	.292	0	0	0	0	0	.36	.465	0	0	.501	.839
Cars	92.3	0	100	0	95.8	0	96.8	100	0	97.0	0	0	0	0	0	100	95.3	0	0	95.6	96.1
Heavy Vehicles	2	0	0	0	2	0	9	0	0	9	0	0	0	0	0	0	23	0	0	23	34
% Heavy Vehicles	7.7	0	0	0	4.2	0	3.2	0	0	3.0	0	0	0	0	0	4.7	0	0	0	4.4	3.9



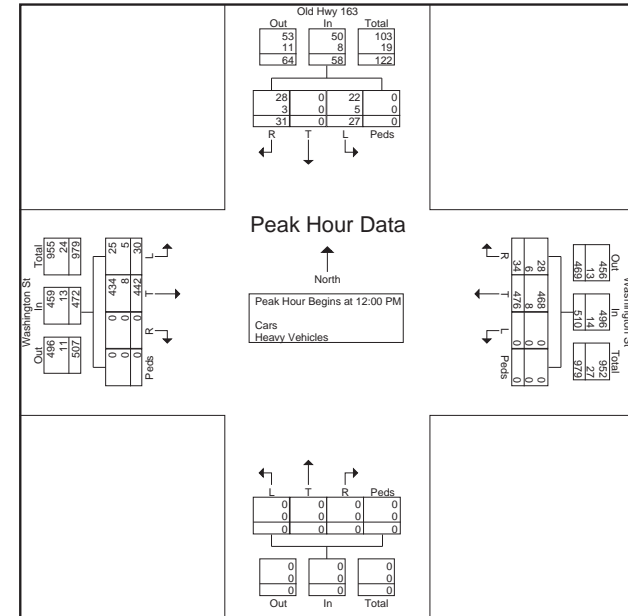
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Washington St & Old Highway 163
Pella Kwikstar TIS
Pella, IA
123.1251.01

File Name : CNT_TMC_WashingtonSt-OldHwy163_2023-10-19
Site Code :
Start Date : 10/19/2023
Page No : 6

Start Time	Old Hwy 163 Southbound				Washington St Westbound				Northbound				Washington St Eastbound				Int. Total				
	L	T	R	Peds	L	T	R	Peds	L	T	R	Peds	L	T	R	Peds					
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:00 PM																					
12:00 PM	8	0	8	0	16	0	129	9	0	138	0	0	0	0	0	8	131	0	0	139	293
12:15 PM	5	0	7	0	12	0	119	10	0	129	0	0	0	0	0	5	97	0	0	102	243
12:30 PM	4	0	5	0	9	0	112	8	0	120	0	0	0	0	0	9	97	0	0	106	235
12:45 PM	10	0	11	0	21	0	116	7	0	123	0	0	0	0	0	8	117	0	0	125	269
Total Volume	27	0	31	0	58	0	476	34	0	510	0	0	0	0	0	30	442	0	0	472	1040
% App. Total	.675	.000	.705	.000	.690	.000	.922	.850	.000	.924	.000	.000	.000	.000	.000	.833	.844	.000	.000	.849	.887
PHF	.22	0	.28	0	.50	0	.468	.28	0	.496	0	0	0	0	0	.25	.434	0	0	.459	1005
Cars	81.5	0	90.3	0	86.2	0	98.3	82.4	0	97.3	0	0	0	0	0	83.3	98.2	0	0	97.2	96.6
Heavy Vehicles	5	0	3	0	8	0	8	6	0	14	0	0	0	0	0	5	8	0	0	13	35
% Heavy Vehicles	18.5	0	9.7	0	13.8	0	1.7	17.6	0	2.7	0	0	0	0	0	16.7	1.8	0	0	2.8	3.4





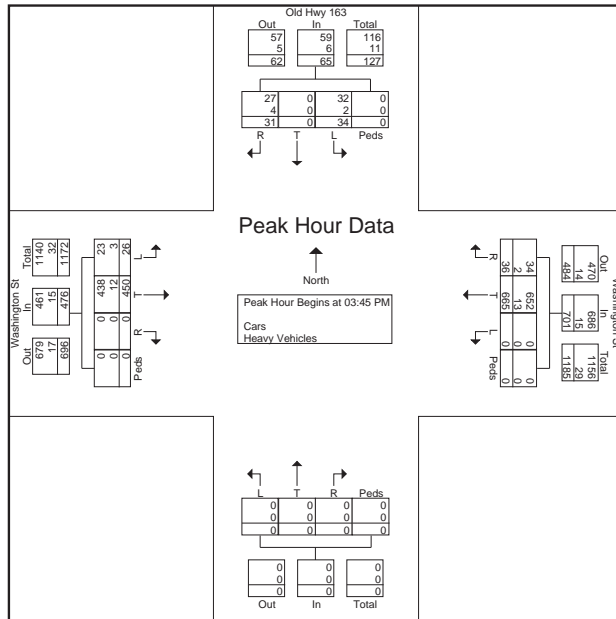
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Washington St & Old Highway 163
Pella Kwikstar TIS
Pella, IA
123.1251.01

File Name : CNT_TMC_WashingtonSt-OldHwy163_2023-10-19
Site Code :
Start Date : 10/19/2023
Page No : 7

Start Time	Old Hwy 163 Southbound					Washington St Westbound					Northbound					Washington St Eastbound					Int. Total
	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	L	T	R	Peds	App. Total	
Peak Hour Analysis From 02:00 PM to 11:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:45 PM																					
03:45 PM	8	0	4	0	12	0	151	18	0	169	0	0	0	0	0	8	108	0	0	116	297
04:00 PM	15	0	14	0	29	0	163	6	0	169	0	0	0	0	0	7	115	0	0	122	320
04:15 PM	6	0	4	0	10	0	163	5	0	168	0	0	0	0	0	7	115	0	0	122	300
04:30 PM	5	0	9	0	14	0	188	7	0	195	0	0	0	0	0	4	112	0	0	116	325
Total Volume	34	0	31	0	65	0	665	36	0	701	0	0	0	0	0	26	450	0	0	476	1242
% App. Total																					
PHF	.567	.000	.554	.000	.560	.000	.884	.500	.000	.899	.000	.000	.000	.000	.000	.813	.978	.000	.000	.975	.955
Cars	32	0	27	0	59	0	652	34	0	686	0	0	0	0	0	23	438	0	0	461	1206
% Cars	94.1	0	87.1	0	90.8	0	98.0	94.4	0	97.9	0	0	0	0	0	88.5	97.3	0	0	96.8	97.1
Heavy Vehicles	2	0	4	0	6	0	13	2	0	15	0	0	0	0	0	3	12	0	0	15	36
% Heavy Vehicles	5.9	0	12.9	0	9.2	0	2.0	5.6	0	2.1	0	0	0	0	0	11.5	2.7	0	0	3.2	2.9





Iowa Crash Analysis Tool
Quick Report
2018-2022

Crash Severity	13	Injury Status Summary	2
Fatal Crash	0	Fatalities	0
Suspected Serious Injury Crash	0	Suspected serious/incapacitating	0
Suspected Minor Injury Crash	0	Suspected minor/non-incapacitating	0
Possible/Unknown Injury Crash	2	Possible (complaint of pain/injury)	2
Property Damage Only	11	Uninjured	0
		Unknown	0
		Not Reported	0

Property/Vehicles/Occupants	
Property Damage Total (dollars):	40,200.00
Average (per crash dollars):	3,092.31
Total Vehicles:	26.00
Average (per crash):	2.00
Total Occupants:	33.00
Average (per crash):	2.54

Average Severity	
Fatalities/Fatal Crash:	0.00
Fatalities/Crash:	0.00
Injuries/Crash:	0.15
Major Injuries/Crash:	0.00
Minor Injuries/Crash:	0.00
Possible/Unknown Injuries/Crash:	0.15



Iowa Crash Analysis Tool
Quick Report
2018-2022

Major Cause	13
Animal	0
Ran stop sign	0
FTYROW: At uncontrolled intersection	0
FTYROW: From stop sign	0
FTYROW: Making left turn	2
FTYROW: From parked position	0
FTYROW: Other	0
Disregarded RR Signal	0
Crossed median (divided)	0
Aggressive driving/road rage	0
Exceeded authorized speed	0
Operating vehicle in an reckless, erratic, ca...	1
Passing: On wrong side	0
Passing: With insufficient distance/inadequa...	0
Passing: Other passing	0
Driver Distraction: Manual operation of an e...	0
Driver Distraction: Talking on a hands free ...	0
Driver Distraction: Other electronic device ...	0
Driver Distraction: Unrestrained animal	0
Driver Distraction: Inattentive/lost in thou...	0
Driver Distraction: Exterior distraction	0
Ran off road - straight	0
Lost control	0
Over correcting/over steering	0
Failure to signal intentions	0
Vehicle stopped on railroad tracks	0
Other: Improper operation	0
Other: Disregarded signs/road markings	0
Downhill runaway	0
Towing improperly	0
Equipment failure	0
Other: Getting off/out of vehicle	0
Improper backing	0
Illegally parked/unattended	0
Operator inexperience	1
Unknown	0
Other: No improper action	1
Ran traffic signal	0
Failed to yield to emergency vehicle	0
FTYROW: Making right turn on red signal	0
FTYROW: From yield sign	0
FTYROW: From driveway	0
FTYROW: To pedestrian	0
Drove around RR grade crossing gates	0
Crossed centerline (undivided)	0
Traveling wrong way or on wrong side of road	0
Driving too fast for conditions	0
Improper or erratic lane changing	0
Followed too close	5
Passing: Where prohibited by signs/markings	0
Passing: Through/around barrier	0
Made improper turn	0
Driver Distraction: Talking on a hand-held d...	0
Driver Distraction: Adjusting devices (radio...	0
Driver Distraction: Passenger	0
Driver Distraction: Reaching for object(s)/f...	0
Driver Distraction: Other interior distracti...	0
Ran off road - right	0
Ran off road - left	0
Swerving/Evasive Action	0
Failed to keep in proper lane	0
Traveling on prohibited traffic way	0
Other: Vision obstructed	0
Other: Disregarded warning sign	0
Other: Illegal off-road driving	0
Separation of units	0
Cargo/equipment loss or shift	0
Oversized load/vehicle	0
Failure to dim lights/have lights on	0
Improper starting	0
Driving less than the posted speed limit	0
Other	3
Not reported	0



Iowa Crash Analysis Tool
Quick Report
2018-2022

Time of Day/Day of Week														
Day of Week	12 AM to 2 AM	2 AM to 4 AM	4 AM to 6 AM	6 AM to 8 AM	8 AM to 10 AM	10 AM to Noon	Noon to 2 PM	2 PM to 4 PM	4 PM to 6 PM	6 PM to 8 PM	8 PM to 10 PM	10 PM to 12 AM	Not reported	Total
Sunday	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wednesday	0	0	0	0	0	0	0	1	2	1	0	0	0	4
Thursday	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Friday	0	0	0	0	2	0	1	1	1	0	0	0	0	5
Saturday	0	0	0	0	0	0	0	0	1	1	0	0	0	2
Total	0	0	0	0	2	2	1	2	4	2	0	0	0	13

Manner of Crash Collision	Count	Surface Conditions	Count
Non-collision (single vehicle)	0	Dry	12
Head-on (front to front)	0	Wet	0
Rear-end (front to rear)	10	Ice/frost	0
Angle, oncoming left turn	1	Snow	1
Broadside (front to side)	1	Slush	0
Sideswipe, same direction	1	Mud, dirt	0
Sideswipe, opposite direction	0	Water (standing or moving)	0
Rear to rear	0	Sand	0
Rear to side	0	Oil	0
Not reported	0	Gravel	0
Other	0	Not reported	0
Unknown	0	Other	0
		Unknown	0

Fixed Object Struck	Count	Fixed Object Struck	Count
Bridge overhead structure	0	Bridge pier or support	0
Bridge/bridge rail parapet	0	Curb/island/raised median	0
Ditch	0	Embankment	0
Ground	0	Culvert/pipe opening	0
Guardrail - face	0	Guardrail - end	0
Concrete traffic barrier (median or right sid...	0	Other traffic barrier	0
Cable barrier	0	Impact attenuator/crash cushion	0
Utility pole/light support	0	Traffic sign support	0
Traffic signal support	0	Other post/pole/support	0
Fire hydrant	0	Mailbox	0
Tree	0	Landscape/shrubbery	0
Snow bank	0	Fence	0
Wall	0	Building	0
Other fixed object	0	None (no fixed object struck)	26



Iowa Crash Analysis Tool
Quick Report
2018-2022

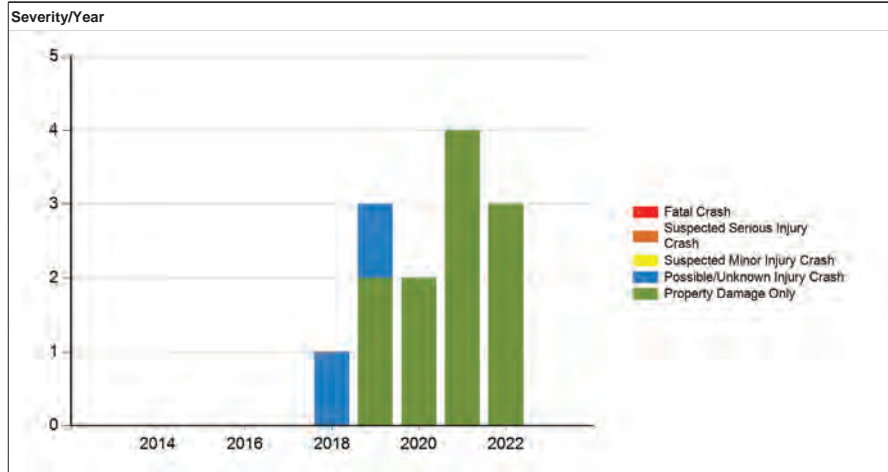
Driver Age/Driver Gender					Alcohol Test Given	Count	
Driver Age - 5 year Bins	Female	Male	Not reported	Unknown	Total		
< 14	0	0	0	0	0	None	25
= 14	0	0	0	0	0	Blood	0
= 15	0	0	0	0	0	Urine	0
= 16	2	1	0	0	3	Breath	0
= 17	0	0	0	0	0	Vitreous	0
= 18	0	1	0	0	1	Refused	1
= 19	0	1	0	0	1	Not reported	0
= 20	0	1	0	0	1		
>= 21 and <= 24	0	2	0	0	2	Drug Test Given	
>= 25 and <= 29	1	0	0	0	1	None	26
>= 30 and <= 34	0	0	0	0	0	Blood	0
>= 35 and <= 39	2	1	0	0	3	Urine	0
>= 40 and <= 44	0	3	0	0	3	Breath	0
>= 45 and <= 49	1	1	0	0	2	Vitreous	0
>= 50 and <= 54	1	1	0	0	2	Refused	0
>= 55 and <= 59	1	0	0	0	1	Not reported	0
>= 60 and <= 64	1	2	0	0	3	Drug Test Result	
>= 65 and <= 69	1	1	0	0	2	Negative	0
>= 70 and <= 74	1	0	0	0	1	Cannabis	0
>= 75 and <= 79	0	0	0	0	0	Central Nervous System depressants	0
>= 80 and <= 84	0	0	0	0	0	Central Nervous System stimulants	0
>= 85 and <= 89	0	0	0	0	0	Hallucinogens	0
>= 90 and <= 94	0	0	0	0	0	Inhalants	0
>= 95	0	0	0	0	0	Narcotic Analgesics	0
Not reported	0	0	0	0	0	Dissociative Anesthetic (PCP)	0
Unknown	0	0	0	0	0	Prescription Drug	0
Total	11	15	0	0	26	Not reported	26
						Other	0

Drug/Alcohol Related	Count
Drug	0
Alcohol (< Statutory)	0
Alcohol (Statutory)	0
Drug and Alcohol (< Statutory)	0
Drug and Alcohol (Statutory)	0
Refused	1
Under Influence of Alcohol/Drugs/Medications	0
None Indicated	12



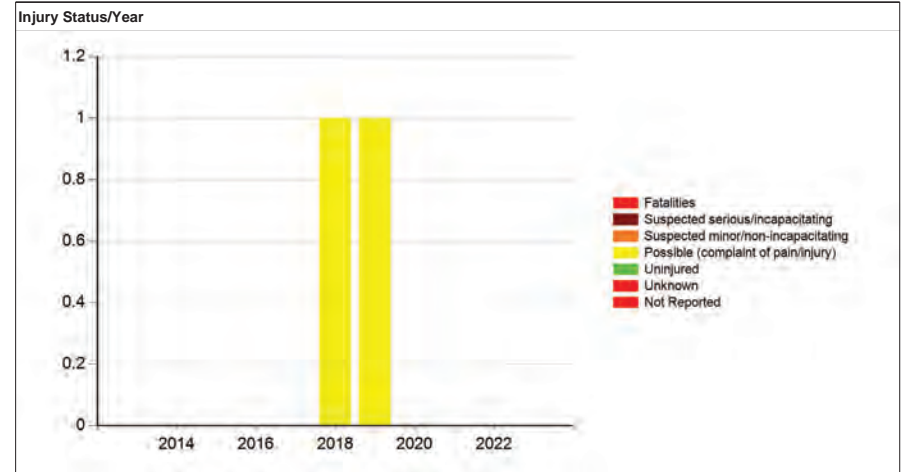
Iowa Crash Analysis Tool
Quick Report
2018-2022

Crash Severity - Annual							
Crash Year	Fatal Crash	Suspected Serious Injury Crash	Suspected Minor Injury Crash	Possible/Unknown Injury Crash	Property Damage Only	Total	
2013	0	0	0	0	0	0	
2014	0	0	0	0	0	0	
2015	0	0	0	0	0	0	
2016	0	0	0	0	0	0	
2017	0	0	0	0	0	0	
2018	0	0	0	1	0	1	
2019	0	0	0	1	2	3	
2020	0	0	0	0	2	2	
2021	0	0	0	0	4	4	
2022	0	0	0	0	3	3	
2023	0	0	0	0	0	0	
Total	0	0	0	2	11	13	



Iowa Crash Analysis Tool
Quick Report
2018-2022

Injury Status - Annual								
Crash Year	Fatalities	Suspected serious/incapacitating	Suspected minor/non-incapacitating	Possible (complaint of pain/injury)	Uninjured	Unknown	Not Reported	Total
2013	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0
2018	0	0	0	1	0	0	0	1
2019	0	0	0	1	0	0	0	1
2020	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0
Total	0	0	0	2	0	0	0	2





Iowa Crash Analysis Tool
Quick Report
2018-2022

Meeting the following criteria	
Jurisdiction:	Statewide
Year:	2018, 2019, 2020, 2021, 2022
Map Selection:	Yes
Filter:	None

Analyst Information	



Iowa Crash Analysis Tool
Quick Report
2018-2022

Crash Severity	6	Injury Status Summary	1
Fatal Crash	0	Fatalities	0
Suspected Serious Injury Crash	0	Suspected serious/incapacitating	0
Suspected Minor Injury Crash	0	Suspected minor/non-incapacitating	0
Possible/Unknown Injury Crash	1	Possible (complaint of pain/injury)	1
Property Damage Only	5	Uninjured	0
		Unknown	0
		Not Reported	0

Property/Vehicles/Occupants	
Property Damage Total (dollars):	24,500.00
Average (per crash dollars):	4,083.33
Total Vehicles:	12.00
Average (per crash):	2.00
Total Occupants:	22.00
Average (per crash):	3.67

Average Severity	
Fatalities/Fatal Crash:	0.00
Fatalities/Crash:	0.00
Injuries/Crash:	0.17
Major Injuries/Crash:	0.00
Minor Injuries/Crash:	0.00
Possible/Unknown Injuries/Crash:	0.17





Iowa Crash Analysis Tool
Quick Report
2018-2022

Major Cause	Count
Animal	0
Ran stop sign	0
FTYROW: At uncontrolled intersection	0
FTYROW: From stop sign	0
FTYROW: Making left turn	0
FTYROW: From parked position	0
FTYROW: Other	0
Disregarded RR Signal	0
Crossed median (divided)	0
Aggressive driving/road rage	0
Exceeded authorized speed	0
Operating vehicle in an reckless, erratic, ca...	1
Passing: On wrong side	0
Passing: With insufficient distance/inadequa...	0
Passing: Other passing	0
Driver Distraction: Manual operation of an e...	0
Driver Distraction: Talking on a hands free ...	0
Driver Distraction: Other electronic device ...	0
Driver Distraction: Unrestrained animal	0
Driver Distraction: Inattentive/lost in thou...	0
Driver Distraction: Exterior distraction	0
Ran off road - straight	0
Lost control	0
Over correcting/over steering	0
Failure to signal intentions	0
Vehicle stopped on railroad tracks	0
Other: Improper operation	0
Other: Disregarded signs/road markings	0
Downhill runaway	0
Towing improperly	0
Equipment failure	0
Other: Getting off/out of vehicle	0
Improper backing	0
Illegally parked/unattended	0
Operator inexperience	0
Unknown	0
Other: No improper action	0
Total	6



Iowa Crash Analysis Tool
Quick Report
2018-2022

Time of Day/Day of Week	12 AM to 2 AM	2 AM to 4 AM	4 AM to 6 AM	6 AM to 8 AM	8 AM to 10 AM	10 AM to Noon	Noon to 2 PM	2 PM to 4 PM	4 PM to 6 PM	6 PM to 8 PM	8 PM to 10 PM	10 PM to 12 AM	Not reported	Total
Sunday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuesday	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Wednesday	0	0	0	0	0	1	0	0	1	0	0	0	0	2
Thursday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Friday	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Saturday	0	0	0	0	0	0	0	1	0	1	0	0	0	2
Total	0	0	0	0	0	1	0	1	3	1	0	0	0	6

Manner of Crash Collision	Count	Surface Conditions	Count
Non-collision (single vehicle)	0	Dry	5
Head-on (front to front)	0	Wet	0
Rear-end (front to rear)	6	Ice/frost	0
Angle, oncoming left turn	0	Snow	1
Broadside (front to side)	0	Slush	0
Sideswipe, same direction	0	Mud, dirt	0
Sideswipe, opposite direction	0	Water (standing or moving)	0
Rear to rear	0	Sand	0
Rear to side	0	Oil	0
Not reported	0	Gravel	0
Other	0	Not reported	0
Unknown	0	Other	0
		Unknown	0

Fixed Object Struck	Count
Bridge overhead structure	0
Bridge/bridge rail parapet	0
Ditch	0
Ground	0
Guardrail - face	0
Concrete traffic barrier (median or right sid...	0
Cable barrier	0
Utility pole/light support	0
Traffic signal support	0
Fire hydrant	0
Tree	0
Snow bank	0
Wall	0
Other fixed object	0
Bridge pier or support	0
Curb/island/raised median	0
Embankment	0
Culvert/pipe opening	0
Guardrail - end	0
Other traffic barrier	0
Impact attenuator/crash cushion	0
Traffic sign support	0
Other post/pole/support	0
Mailbox	0
Landscape/shrubbery	0
Fence	0
Building	0
None (no fixed object struck)	12



Iowa Crash Analysis Tool
Quick Report
2018-2022

Driver Age/Driver Gender					Total
Driver Age - 5 year Bins	Female	Male	Not reported	Unknown	Total
< 14	0	0	0	0	0
= 14	0	1	0	0	1
= 15	0	1	0	0	1
= 16	1	0	0	0	1
= 17	0	0	0	0	0
= 18	0	0	0	0	0
= 19	1	0	0	0	1
= 20	0	0	0	0	0
>= 21 and <= 24	0	1	0	0	1
>= 25 and <= 29	0	0	0	0	0
>= 30 and <= 34	1	0	0	0	1
>= 35 and <= 39	2	0	0	0	2
>= 40 and <= 44	0	3	0	0	3
>= 45 and <= 49	0	0	0	0	0
>= 50 and <= 54	0	0	0	0	0
>= 55 and <= 59	0	0	0	0	0
>= 60 and <= 64	0	1	0	0	1
>= 65 and <= 69	0	0	0	0	0
>= 70 and <= 74	0	0	0	0	0
>= 75 and <= 79	0	0	0	0	0
>= 80 and <= 84	0	0	0	0	0
>= 85 and <= 89	0	0	0	0	0
>= 90 and <= 94	0	0	0	0	0
>= 95	0	0	0	0	0
Not reported	0	0	0	0	0
Unknown	0	0	0	0	0
Total	5	7	0	0	12

Alcohol Test Given	Total
None	12
Blood	0
Urine	0
Breath	0
Vitreous	0
Refused	0
Not reported	0

Drug Test Given	Total
None	12
Blood	0
Urine	0
Breath	0
Vitreous	0
Refused	0
Not reported	0

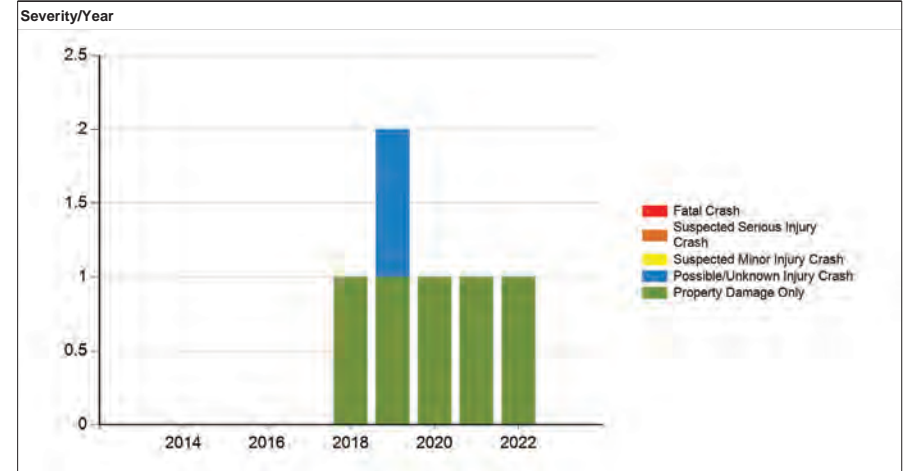
Drug Test Result	Total
Negative	0
Cannabis	0
Central Nervous System depressants	0
Central Nervous System stimulants	0
Hallucinogens	0
Inhalants	0
Narcotic Analgesics	0
Dissociative Anesthetic (PCP)	0
Prescription Drug	0
Not reported	12
Other	0

Drug/Alcohol Related	Total
Drug	0
Alcohol (< Statutory)	0
Alcohol (Statutory)	0
Drug and Alcohol (< Statutory)	0
Drug and Alcohol (Statutory)	0
Refused	0
Under Influence of Alcohol/Drugs/Medications	0
None Indicated	6



Iowa Crash Analysis Tool
Quick Report
2018-2022

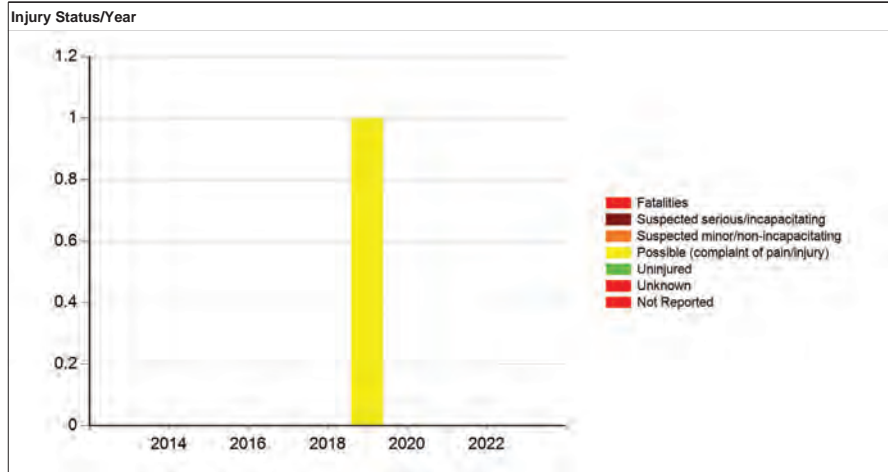
Crash Severity - Annual						
Crash Year	Fatal Crash	Suspected Serious Injury Crash	Suspected Minor Injury Crash	Possible/Unknown Injury Crash	Property Damage Only	Total
2013	0	0	0	0	0	0
2014	0	0	0	0	0	0
2015	0	0	0	0	0	0
2016	0	0	0	0	0	0
2017	0	0	0	0	0	0
2018	0	0	0	0	1	1
2019	0	0	0	1	1	2
2020	0	0	0	0	1	1
2021	0	0	0	0	1	1
2022	0	0	0	0	1	1
2023	0	0	0	0	0	0
Total	0	0	0	1	5	6





Iowa Crash Analysis Tool
Quick Report
2018-2022

Injury Status - Annual									
Crash Year	Fatalities	Suspected serious/incapacitating	Suspected minor/non-incapacitating	Possible (complaint of pain/injury)	Uninjured	Unknown	Not Reported		Total
2013	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	0
2019	0	0	0	1	0	0	0	0	1
2020	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0	0
Total	0	0	0	1	0	0	0	0	1



Iowa Crash Analysis Tool
Quick Report
2018-2022

Meeting the following criteria
Jurisdiction: Statewide
Year: 2018, 2019, 2020, 2021, 2022
Map Selection: Yes
Filter: None

Analyst Information



Iowa Crash Analysis Tool
Quick Report
2018-2022

Crash Severity	3	Injury Status Summary	1
Fatal Crash	0	Fatalities	0
Suspected Serious Injury Crash	0	Suspected serious/incapacitating	0
Suspected Minor Injury Crash	0	Suspected minor/non-incapacitating	0
Possible/Unknown Injury Crash	1	Possible (complaint of pain/injury)	1
Property Damage Only	2	Uninjured	0
		Unknown	0
		Not Reported	0

Property/Vehicles/Occupants	
Property Damage Total (dollars):	14,800.00
Average (per crash dollars):	4,933.33
Total Vehicles:	6.00
Average (per crash):	2.00
Total Occupants:	6.00
Average (per crash):	2.00

Average Severity	
Fatalities/Fatal Crash:	0.00
Fatalities/Crash:	0.00
Injuries/Crash:	0.33
Major Injuries/Crash:	0.00
Minor Injuries/Crash:	0.00
Possible/Unknown Injuries/Crash:	0.33



Iowa Crash Analysis Tool
Quick Report
2018-2022

Major Cause	3
Animal	0
Ran stop sign	0
FTYROW: At uncontrolled intersection	0
FTYROW: From stop sign	0
FTYROW: Making left turn	0
FTYROW: From parked position	0
FTYROW: Other	0
Disregarded RR Signal	0
Crossed median (divided)	0
Aggressive driving/road rage	0
Exceeded authorized speed	0
Operating vehicle in an reckless, erratic, ca...	0
Passing: On wrong side	0
Passing: With insufficient distance/inadequa...	0
Passing: Other passing	0
Driver Distraction: Manual operation of an e...	0
Driver Distraction: Talking on a hands free ...	0
Driver Distraction: Adjusting devices (radio...	0
Driver Distraction: Other electronic device ...	0
Driver Distraction: Unrestrained animal	0
Driver Distraction: Inattentive/lost in thou...	0
Driver Distraction: Exterior distraction	0
Ran off road - straight	0
Lost control	0
Over correcting/over steering	0
Failure to signal intentions	0
Vehicle stopped on railroad tracks	0
Other: Improper operation	0
Other: Disregarded signs/road markings	0
Downhill runaway	0
Towing improperly	0
Equipment failure	0
Other: Getting off/out of vehicle	0
Improper backing	0
Illegally parked/unattended	0
Operator inexperience	0
Unknown	0
Other: No improper action	0
Ran traffic signal	0
Failed to yield to emergency vehicle	0
FTYROW: Making right turn on red signal	0
FTYROW: From yield sign	0
FTYROW: From driveway	0
FTYROW: To pedestrian	0
Drove around RR grade crossing gates	0
Crossed centerline (undivided)	0
Traveling wrong way or on wrong side of road	0
Driving too fast for conditions	1
Improper or erratic lane changing	0
Followed too close	2
Passing: Where prohibited by signs/markings	0
Passing: Through/around barrier	0
Made improper turn	0
Driver Distraction: Talking on a hand-held d...	0
Driver Distraction: Adjusting devices (radio...	0
Driver Distraction: Passenger	0
Driver Distraction: Reaching for object(s)/f...	0
Driver Distraction: Other interior distracti...	0
Ran off road - right	0
Ran off road - left	0
Swerving/Evasive Action	0
Failed to keep in proper lane	0
Traveling on prohibited traffic way	0
Other: Vision obstructed	0
Other: Disregarded warning sign	0
Other: Illegal off-road driving	0
Separation of units	0
Cargo/equipment loss or shift	0
Oversized load/vehicle	0
Failure to dim lights/have lights on	0
Improper starting	0
Driving less than the posted speed limit	0
Other	0
Not reported	0



Iowa Crash Analysis Tool
Quick Report
2018-2022

Time of Day/Day of Week														
Day of Week	12 AM to 2 AM	2 AM to 4 AM	4 AM to 6 AM	6 AM to 8 AM	8 AM to 10 AM	10 AM to Noon	Noon to 2 PM	2 PM to 4 PM	4 PM to 6 PM	6 PM to 8 PM	8 PM to 10 PM	10 PM to 12 AM	Not reported	Total
Sunday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuesday	0	0	0	0	1	0	0	0	0	0	0	0	0	1
Wednesday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thursday	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Friday	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Saturday	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	1	0	0	0	2	0	0	0	0	3

Manner of Crash Collision	Count	Surface Conditions	Count
Non-collision (single vehicle)	0	Dry	1
Head-on (front to front)	0	Wet	1
Rear-end (front to rear)	2	Ice/frost	0
Angle, oncoming left turn	0	Snow	1
Broadside (front to side)	1	Slush	0
Sideswipe, same direction	0	Mud, dirt	0
Sideswipe, opposite direction	0	Water (standing or moving)	0
Rear to rear	0	Sand	0
Rear to side	0	Oil	0
Not reported	0	Gravel	0
Other	0	Not reported	0
Unknown	0	Other	0
		Unknown	0

Fixed Object Struck	Count	Fixed Object Struck	Count
Bridge overhead structure	0	Bridge pier or support	0
Bridge/bridge rail parapet	0	Curb/island/raised median	0
Ditch	0	Embankment	0
Ground	0	Culvert/pipe opening	0
Guardrail - face	0	Guardrail - end	0
Concrete traffic barrier (median or right sid...	0	Other traffic barrier	0
Cable barrier	0	Impact attenuator/crash cushion	0
Utility pole/light support	0	Traffic sign support	0
Traffic signal support	0	Other post/pole/support	0
Fire hydrant	0	Mailbox	0
Tree	0	Landscape/shrubbery	0
Snow bank	0	Fence	0
Wall	0	Building	0
Other fixed object	0	None (no fixed object struck)	6



Iowa Crash Analysis Tool
Quick Report
2018-2022

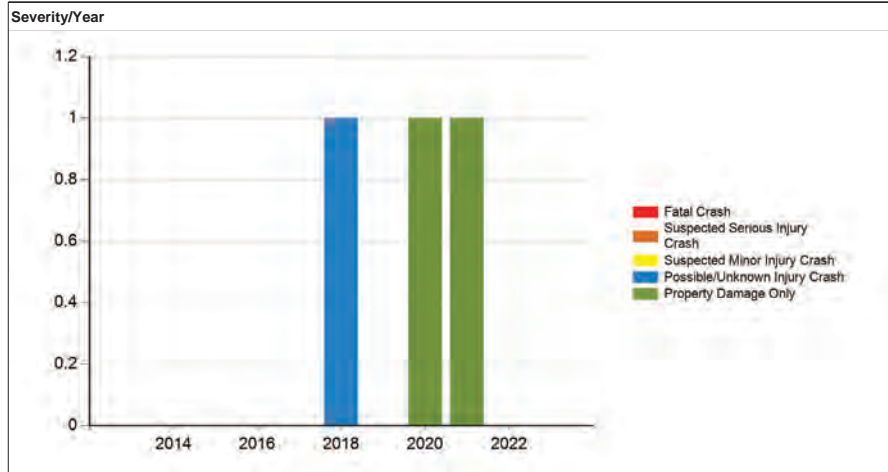
Driver Age/Driver Gender					Alcohol Test Given	Count	
Driver Age - 5 year Bins	Female	Male	Not reported	Unknown	Total		
< 14	0	0	0	0	0	None	6
= 14	0	0	0	0	0	Blood	0
= 15	0	0	0	0	0	Urine	0
= 16	0	0	0	0	0	Breath	0
= 17	0	0	0	0	0	Vitreous	0
= 18	0	1	0	0	1	Refused	0
= 19	0	0	0	0	0	Not reported	0
= 20	0	2	0	0	2	Drug Test Given	
>= 21 and <= 24	0	0	0	0	0	None	6
>= 25 and <= 29	0	0	0	0	0	Blood	0
>= 30 and <= 34	0	1	0	0	1	Urine	0
>= 35 and <= 39	1	1	0	0	2	Breath	0
>= 40 and <= 44	0	0	0	0	0	Vitreous	0
>= 45 and <= 49	0	0	0	0	0	Refused	0
>= 50 and <= 54	0	0	0	0	0	Not reported	0
>= 55 and <= 59	0	0	0	0	0	Drug Test Result	
>= 60 and <= 64	0	0	0	0	0	Negative	0
>= 65 and <= 69	0	0	0	0	0	Cannabis	0
>= 70 and <= 74	0	0	0	0	0	Central Nervous System depressants	0
>= 75 and <= 79	0	0	0	0	0	Central Nervous System stimulants	0
>= 80 and <= 84	0	0	0	0	0	Hallucinogens	0
>= 85 and <= 89	0	0	0	0	0	Inhalants	0
>= 90 and <= 94	0	0	0	0	0	Narcotic Analgesics	0
>= 95	0	0	0	0	0	Dissociative Anesthetic (PCP)	0
Not reported	0	0	0	0	0	Prescription Drug	0
Unknown	0	0	0	0	0	Not reported	6
Total	1	5	0	0	6	Other	0

Drug/Alcohol Related	Count
Drug	0
Alcohol (< Statutory)	0
Alcohol (Statutory)	0
Drug and Alcohol (< Statutory)	0
Drug and Alcohol (Statutory)	0
Refused	0
Under Influence of Alcohol/Drugs/Medications	0
None Indicated	3



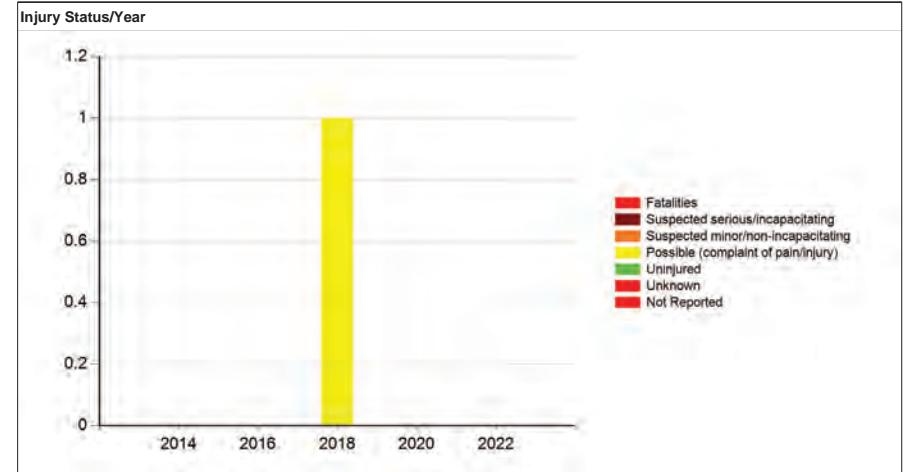
Iowa Crash Analysis Tool
Quick Report
2018-2022

Crash Severity - Annual						
Crash Year	Fatal Crash	Suspected Serious Injury Crash	Suspected Minor Injury Crash	Possible/Unknown Injury Crash	Property Damage Only	Total
2013	0	0	0	0	0	0
2014	0	0	0	0	0	0
2015	0	0	0	0	0	0
2016	0	0	0	0	0	0
2017	0	0	0	0	0	0
2018	0	0	0	1	0	1
2019	0	0	0	0	0	0
2020	0	0	0	0	1	1
2021	0	0	0	0	1	1
2022	0	0	0	0	0	0
2023	0	0	0	0	0	0
Total	0	0	0	1	2	3



Iowa Crash Analysis Tool
Quick Report
2018-2022

Injury Status - Annual								
Crash Year	Fatalities	Suspected serious/incapacitating	Suspected minor/non-incapacitating	Possible (complaint of pain/injury)	Uninjured	Unknown	Not Reported	Total
2013	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0
2018	0	0	0	1	0	0	0	1
2019	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0
2022	0	0	0	0	0	0	0	0
2023	0	0	0	0	0	0	0	0
Total	0	0	0	1	0	0	0	1





Iowa Crash Analysis Tool
Quick Report
2018-2022

Meeting the following criteria

Jurisdiction: Statewide
Year: 2018, 2019, 2020, 2021, 2022
Map Selection: Yes
Filter: None

Analyst Information

PROJECT: <u>Kwik Star TIS Pella</u>	NO.: <u>123.1251</u>
	DATE: <u>11/08/23</u>
SUBJECT: <u>Left Turn Lane Analysis</u>	BY: <u>JCJ</u> CK: _____
<u>Buid 2024 IA 163 NB Ramp & Washington St</u>	

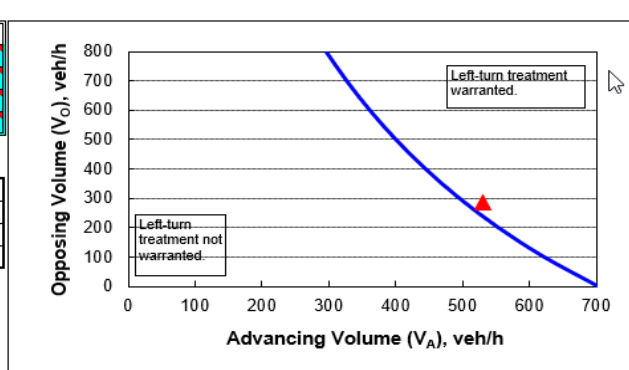
AM Eastbound Washington Street

INPUT

Variable	Value
85 th percentile speed, mph:	40
Percent of left-turns in advancing volume (V _A), %:	7%
Advancing volume (V _A), veh/h:	530
Opposing volume (V _O), veh/h:	285

OUTPUT

Variable	Value
Limiting advancing volume (V _A), veh/h:	503
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



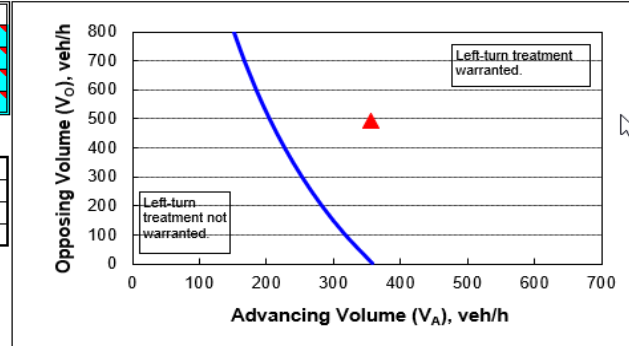
AM Westbound Washington Street

INPUT

Variable	Value
85 th percentile speed, mph:	40
Percent of left-turns in advancing volume (V _A), %:	38%
Advancing volume (V _A), veh/h:	355
Opposing volume (V _O), veh/h:	495

OUTPUT

Variable	Value
Limiting advancing volume (V _A), veh/h:	206
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



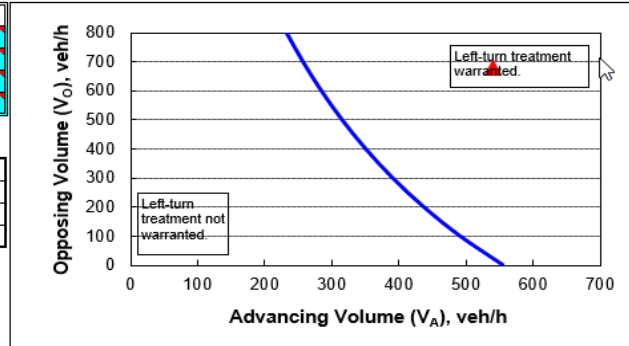
PM Eastbound Washington Street

INPUT

Variable	Value
85 th percentile speed, mph:	40
Percent of left-turns in advancing volume (V _A), %:	11%
Advancing volume (V _A), veh/h:	540
Opposing volume (V _O), veh/h:	680

OUTPUT

Variable	Value
Limiting advancing volume (V _A), veh/h:	263
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



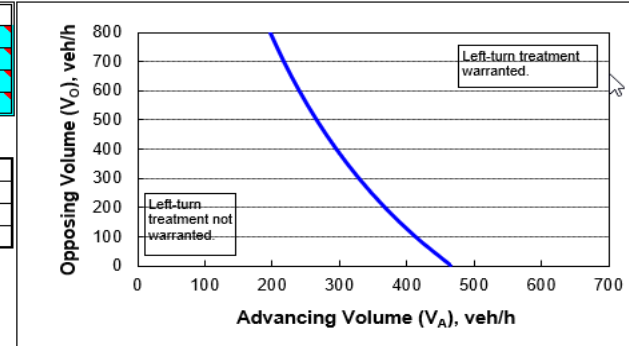
PM Westbound Washington Street

INPUT

Variable	Value
85 th percentile speed, mph:	40
Percent of left-turns in advancing volume (V _A), %:	17%
Advancing volume (V _A), veh/h:	745
Opposing volume (V _O), veh/h:	480

OUTPUT

Variable	Value
Limiting advancing volume (V _A), veh/h:	272
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



PROJECT: <u>Kwik Star TIS Pella</u>	NO.: <u>123.1251</u>
	DATE: <u>11/08/23</u>
SUBJECT: <u>Left Turn Lane Analysis</u>	BY: <u>JCJ</u> CK: _____
<u>Buid 2024 Old 163 & Washington St</u>	

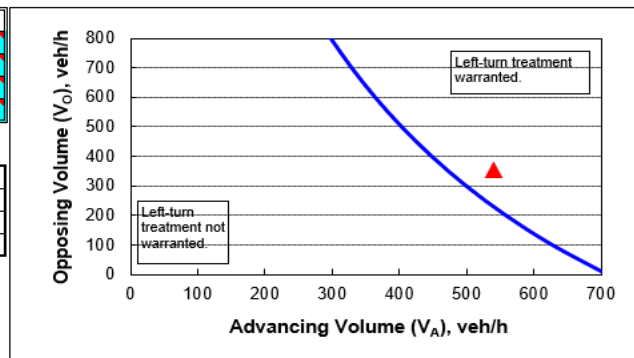
AM Eastbound Washington Street

INPUT

Variable	Value
85 th percentile speed, mph:	40
Percent of left-turns in advancing volume (V _A), %:	6%
Advancing volume (V _A), veh/h:	540
Opposing volume (V _O), veh/h:	355

OUTPUT

Variable	Value
Limiting advancing volume (V _A), veh/h:	470
Guidance for determining the need for a major-road left-turn bay: Left-turn treatment warranted.	



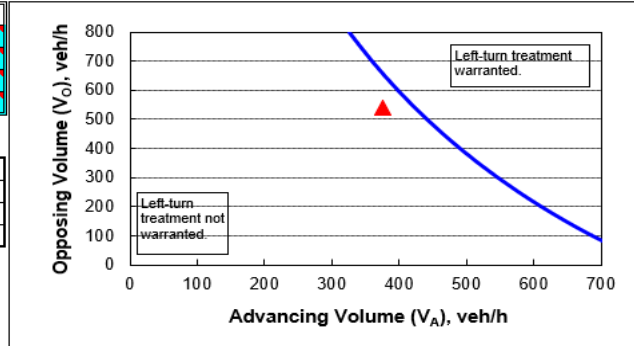
AM Westbound Washington Street

INPUT

Variable	Value
85 th percentile speed, mph:	40
Percent of left-turns in advancing volume (V _A), %:	5%
Advancing volume (V _A), veh/h:	375
Opposing volume (V _O), veh/h:	540

OUTPUT

Variable	Value
Limiting advancing volume (V _A), veh/h:	425
Guidance for determining the need for a major-road left-turn bay: Left-turn treatment NOT warranted.	



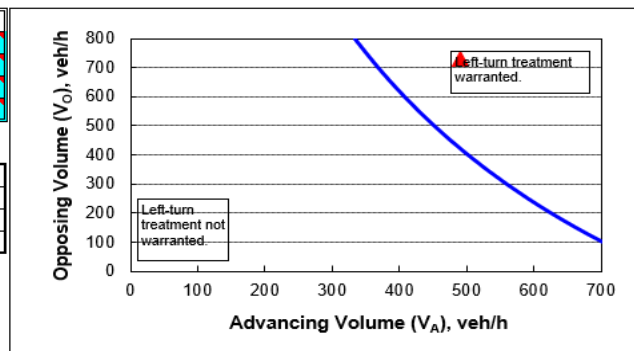
PM Eastbound Washington Street

INPUT

Variable	Value
85 th percentile speed, mph:	40
Percent of left-turns in advancing volume (V _A), %:	5%
Advancing volume (V _A), veh/h:	490
Opposing volume (V _O), veh/h:	730

OUTPUT

Variable	Value
Limiting advancing volume (V _A), veh/h:	358
Guidance for determining the need for a major-road left-turn bay: Left-turn treatment warranted.	



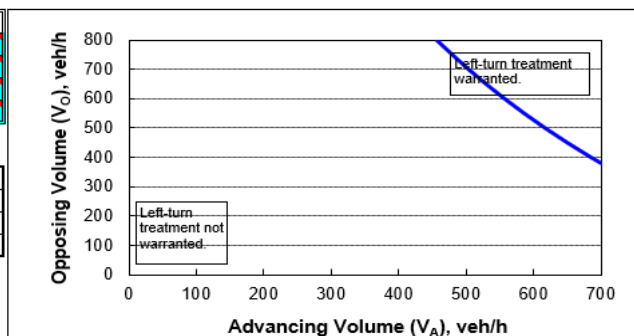
PM Westbound Washington Street

INPUT

Variable	Value
85 th percentile speed, mph:	40
Percent of left-turns in advancing volume (V _A), %:	3%
Advancing volume (V _A), veh/h:	750
Opposing volume (V _O), veh/h:	490

OUTPUT

Variable	Value
Limiting advancing volume (V _A), veh/h:	623
Guidance for determining the need for a major-road left-turn bay: Left-turn treatment warranted.	



Traffic Signal Warrant
Washington St & IA 163 NB Ramp
 Existing Conditions 2023

Study Name: Pella Kwik Star Existing
 Study Date : 10/29/2023

Signal Warrants - Summary

Major Street Approaches

Eastbound: Washington St
 Number of Lanes : 1

Total Approach Volume: 6,237

Westbound: Washington St
 Number of Lanes : 1

Total Approach Volume: 6,394

Minor Street Approaches

Northbound: IA 163 NB Ramp
 Number of Lanes : 1

Total Approach Volume: 0

Southbound: IA 163 NB Ramp
 Number of Lanes : 1

Total Approach Volume: 1,590

Warrant Summary (Rural Values Apply)

Warrant 1 - Eight Hour Vehicular Volumes	Satisfied
Warrant 1A - Minimum Vehicular Volume Not Satisfied	
Required volumes reached for 7 hours, 8 are needed	
Warrant 1B - Interruption of Continuous Traffic	Satisfied
Required volumes reached for 13 hours, 8 are needed	
Warrant 1C - Combination of Warrants	Satisfied
Required 1A volumes reached for 10 hours, 8 are needed	
Required 1B volumes reached for 14 hours, 8 are needed	
Warrant 2 - Four Hour Volumes	Satisfied
Number of hours (11) volumes exceed minimum >= minimum required (4).	
Warrant 3 - Peak Hour	Satisfied
Warrant 3A - Peak Hour Delay Satisfied	
Number of one hour periods (31) volumes exceed minimum >= required (1). Delay data not evaluated.	
Warrant 3B - Peak Hour Volumes	Satisfied
Volumes exceed minimums for at least one hour period.	
Warrant 4 - Pedestrian Volumes	Not Evaluated
Warrant 5 - School Crossing	Not Evaluated
Warrant 6 - Coordinated Signal System	Not Evaluated
Warrant 7 - Crash Experience	Not Satisfied
Number of accidents (0) is less than minimum (5). Volume minimums are met.	
Warrant 8 - Roadway Network	Not Evaluated
Warrant 9 - Intersection Near a Grade Crossing	Not Evaluated

Traffic Signal Warrant
Washington St & IA 163 NB Ramp
 Existing Conditions 2023

Study Name: Pella Kwik Star Existing
 Study Date : 10/29/2023

Warrant 1A - Minimum Volumes

Description

Intended for sites where the volume of intersecting traffic is the principal reason for consideration of a signal installation.

Summary

Only 7 one hour periods meet minimums. Warrant is NOT met.

Site Data Required

Rural Settings Apply = **True**
 Number of Major Lanes = **1**
 Number of Minor Lanes = **1**

Volume Requirements

Rural Factor of 70 % applied
 Veh/Hr Major = **350**
 Veh/Hr Minor = **105**

Time	Major Road Washington St			=	Total	Minor NB	Minor Road IA 163 NB Ramp		Met?
	Major EB	+	Major WB				Minor SB		
15:45 - 16:45	513	+	698	=	1211	0	130		Yes
16:45 - 17:45	485	+	605	=	1090	0	181		Yes
14:45 - 15:45	447	+	554	=	1001	0	131		Yes
11:45 - 12:45	473	+	502	=	975	0	114		Yes
17:45 - 18:45	439	+	474	=	913	0	118		Yes
10:45 - 11:45	415	+	398	=	813	0	112		Yes
07:00 - 08:00	488	+	294	=	782	0	111		Yes
14:30 - 15:30	440	+	526	=	966	0	103		No
14:15 - 15:15	422	+	510	=	932	0	96		No
14:00 - 15:00	415	+	506	=	921	0	102		No
12:45 - 13:45	433	+	438	=	871	0	87		No
13:45 - 14:45	387	+	463	=	850	0	101		No
13:00 - 14:00	411	+	418	=	829	0	89		No
13:15 - 14:15	417	+	398	=	815	0	103		No
13:30 - 14:30	392	+	416	=	808	0	101		No
10:30 - 11:30	380	+	375	=	755	0	96		No
10:15 - 11:15	352	+	326	=	678	0	92		No
06:45 - 07:45	417	+	256	=	673	0	98		No
10:00 - 11:00	338	+	292	=	630	0	77		No
18:45 - 19:45	281	+	347	=	628	0	59		No
06:30 - 07:30	366	+	251	=	617	0	81		No
08:00 - 09:00	316	+	298	=	614	0	85		No
09:45 - 10:45	322	+	276	=	598	0	75		No
08:30 - 09:30	311	+	285	=	596	0	75		No
08:15 - 09:15	295	+	298	=	593	0	80		No

Traffic Signal Warrant Washington St & IA 163 NB Ramp Existing Conditions 2023

Study Name: Pella Kwik Star Existing

Study Date : 10/29/2023

Warrant 1B - Interruption of Continuous Traffic

Description

Intended for sites where the volume of the major street is so heavy that traffic on the minor street suffers excessive delay or hazard.

Summary

13 one hour periods meet minimums.
Warrant IS met.

Site Data Required

Rural Settings Apply = **True**
Number of Major Lanes = 1
Number of Minor Lanes = 1

Volume Requirements

Rural Factor of 70 % applied
Veh/Hr Major = **525**
Veh/Hr Minor = 52

Time	Major Road Washington St			Total	Minor NB	Minor Road IA 163 NB Ramp		Met?
	Major EB	+ Major WB	=			Minor SB		
15:30 - 16:30	488	+	663	= 1151	0	137	Yes	
16:30 - 17:30	501	+	647	= 1148	0	175	Yes	
11:30 - 12:30	487	+	479	= 966	0	119	Yes	
14:30 - 15:30	440	+	526	= 966	0	103	Yes	
17:30 - 18:30	441	+	511	= 952	0	147	Yes	
12:30 - 13:30	446	+	473	= 919	0	104	Yes	
13:30 - 14:30	392	+	416	= 808	0	101	Yes	
07:30 - 08:30	464	+	298	= 762	0	109	Yes	
10:30 - 11:30	380	+	375	= 755	0	96	Yes	
18:30 - 19:30	316	+	387	= 703	0	62	Yes	
06:30 - 07:30	366	+	251	= 617	0	81	Yes	
08:30 - 09:30	311	+	285	= 596	0	75	Yes	
09:30 - 10:30	304	+	272	= 576	0	66	Yes	
06:15 - 07:15	301	+	201	= 502	0	59	No	
19:30 - 20:30	209	+	269	= 478	0	45	No	
19:45 - 20:45	187	+	241	= 428	0	40	No	
06:00 - 07:00	267	+	156	= 423	0	49	No	
20:00 - 21:00	169	+	206	= 375	0	33	No	
05:45 - 06:45	231	+	141	= 372	0	44	No	
20:15 - 21:15	169	+	193	= 362	0	39	No	
20:30 - 21:30	167	+	166	= 333	0	32	No	
05:30 - 06:30	210	+	114	= 324	0	47	No	
05:15 - 06:15	203	+	101	= 304	0	51	No	
20:45 - 21:45	151	+	145	= 296	0	28	No	
05:00 - 06:00	195	+	96	= 291	0	47	No	

Traffic Signal Warrant Washington St & IA 163 NB Ramp Existing Conditions 2023

Study Name: Pella Kwik Star Existing

Study Date : 10/29/2023

Warrant 2 - Four Hour Volumes

Description

Intended for sites where the volume of intersecting traffic during any four hours of the day is the principal reason for consideration of a signal installation.

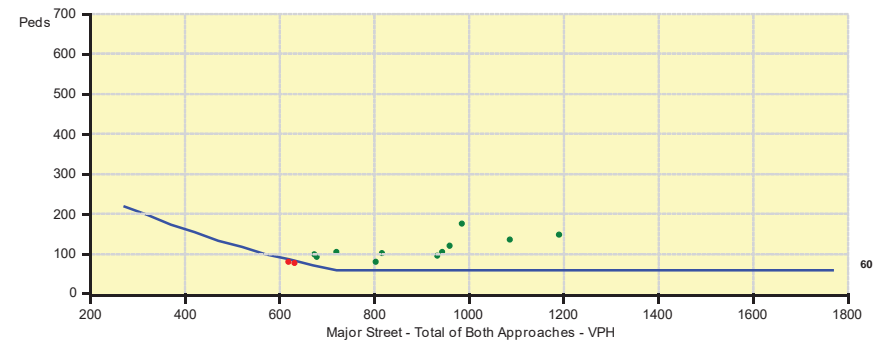
Summary

11 one hour periods meet minimums.
Warrant IS met.

Site Data Required

Rural Settings Apply = **True**
Number of Major Lanes = 1
Number of Minor Lanes = 1

Time	Major Road Washington St			Total	Minor NB	Minor Road IA 163 NB Ramp		Met?
	Major EB	+ Major WB	=			Minor SB		
16:15 - 17:15	513	+	676	= 1189	0	147	Yes	
15:15 - 16:15	460	+	627	= 1087	0	135	Yes	
17:15 - 18:15	454	+	530	= 984	0	175	Yes	
11:15 - 12:15	488	+	471	= 959	0	121	Yes	
12:15 - 13:15	443	+	499	= 942	0	106	Yes	
14:15 - 15:15	422	+	510	= 932	0	96	Yes	
13:15 - 14:15	417	+	398	= 815	0	103	Yes	
18:15 - 19:15	364	+	438	= 802	0	81	Yes	
07:45 - 08:45	407	+	312	= 719	0	106	Yes	
10:15 - 11:15	352	+	326	= 678	0	92	Yes	
06:45 - 07:45	417	+	256	= 673	0	98	Yes	
10:00 - 11:00	338	+	292	= 630	0	77	No	



Traffic Signal Warrant
Washington St & IA 163 NB Ramp
 Existing Conditions 2023

Study Name: Pella Kwik Star Existing
 Study Date : 10/29/2023

Warrant 3A - Peak Hour Delay

Description

Intended for sites where for one hour of the day minor street traffic suffers undue traffic delay entering or crossing the major street.

Summary

36 one hour periods meet minimums.
 Warrant IS met.

Site Data Required

Number of Minor Lanes = 1

Volume and Delay Requirements

Veh/Hr All Approaches = 800
 Veh/Hr Minor = 100
 Total Delay (Veh-Hrs) = 4

Time	Major Road Washington St			Minor Road IA 163 NB Ramp			Warrant Met?		
	Total of All Approaches	Met?	Minor NB	Delay NB	Met?	Minor SB		Delay SB	
15:45 - 16:45	1341	Yes	0	-	---	130	-	Yes	Yes
16:15 - 17:15	1336	Yes	0	-	---	147	-	Yes	Yes
16:00 - 17:00	1325	Yes	0	-	---	137	-	Yes	Yes
16:30 - 17:30	1323	Yes	0	-	---	175	-	Yes	Yes
15:30 - 16:30	1288	Yes	0	-	---	137	-	Yes	Yes
16:45 - 17:45	1271	Yes	0	-	---	181	-	Yes	Yes
17:00 - 18:00	1242	Yes	0	-	---	183	-	Yes	Yes
15:15 - 16:15	1222	Yes	0	-	---	135	-	Yes	Yes
17:15 - 18:15	1159	Yes	0	-	---	175	-	Yes	Yes
15:00 - 16:00	1136	Yes	0	-	---	126	-	Yes	Yes
14:45 - 15:45	1132	Yes	0	-	---	131	-	Yes	Yes
12:00 - 13:00	1118	Yes	0	-	---	120	-	Yes	Yes
17:30 - 18:30	1099	Yes	0	-	---	147	-	Yes	Yes
11:45 - 12:45	1089	Yes	0	-	---	114	-	Yes	Yes
11:30 - 12:30	1085	Yes	0	-	---	119	-	Yes	Yes
11:15 - 12:15	1080	Yes	0	-	---	121	-	Yes	Yes
14:30 - 15:30	1069	Yes	0	-	---	103	-	Yes	Yes
12:15 - 13:15	1048	Yes	0	-	---	106	-	Yes	Yes
17:45 - 18:45	1031	Yes	0	-	---	118	-	Yes	Yes
12:30 - 13:30	1023	Yes	0	-	---	104	-	Yes	Yes
14:00 - 15:00	1023	Yes	0	-	---	102	-	Yes	Yes
18:00 - 19:00	976	Yes	0	-	---	102	-	Yes	Yes
11:00 - 12:00	972	Yes	0	-	---	118	-	Yes	Yes
13:45 - 14:45	951	Yes	0	-	---	101	-	Yes	Yes
10:45 - 11:45	925	Yes	0	-	---	112	-	Yes	Yes

Traffic Signal Warrant
Washington St & IA 163 NB Ramp
 Existing Conditions 2023

Study Name: Pella Kwik Star Existing
 Study Date : 10/29/2023

Warrant 3B - Peak Hour Volumes

Description

Intended for sites where the volume of intersecting traffic during one hour of the day is the principal reason for consideration of a signal installation.

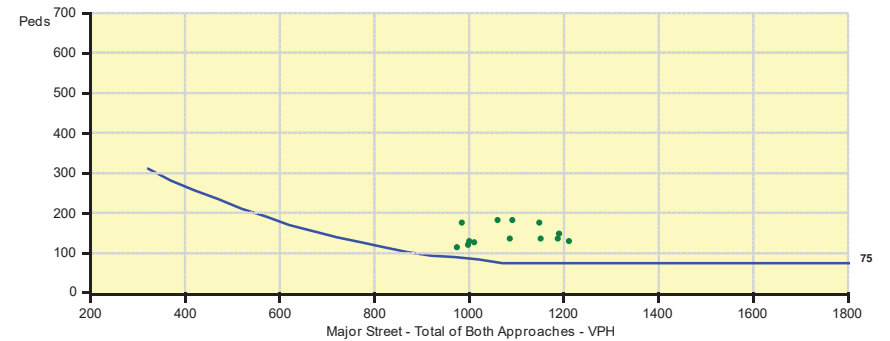
Summary

25 one hour periods meet minimums.
 Warrant IS met.

Site Data Required

Rural Settings Apply = True
 Number of Major Lanes = 1
 Number of Minor Lanes = 1

Time	Major Road Washington St				Total	Minor Road IA 163 NB Ramp		Met?
	Major EB	+	Major WB	=		Minor NB	Minor SB	
15:45 - 16:45	513	+	698	=	1211	0	130	Yes
16:15 - 17:15	513	+	676	=	1189	0	147	Yes
16:00 - 17:00	504	+	684	=	1188	0	137	Yes
15:30 - 16:30	488	+	663	=	1151	0	137	Yes
16:30 - 17:30	501	+	647	=	1148	0	175	Yes
16:45 - 17:45	485	+	605	=	1090	0	181	Yes
15:15 - 16:15	460	+	627	=	1087	0	135	Yes
17:00 - 18:00	485	+	574	=	1059	0	183	Yes
15:00 - 16:00	449	+	561	=	1010	0	126	Yes
14:45 - 15:45	447	+	554	=	1001	0	131	Yes
12:00 - 13:00	490	+	508	=	998	0	120	Yes
17:15 - 18:15	454	+	530	=	984	0	175	Yes



Traffic Signal Warrant
Washington St & IA 163 NB Ramp
 Existing Conditions 2023

Study Name: Pella Kwik Star Existing
 Study Date : 10/29/2023

Warrant 7 - Crash Experience

Description

Intended for sites where the frequency of correctible crashes in the past 12 months is the primary motivation for installing a traffic signal.

Site Data Required

Number of crashes in last 12 months = **0**
 Rural Settings Apply = **True**
 Number of Major Lanes = **1**
 Number of Minor Lanes = **1**

Volume and Pedestrian Data

Hours data meets 80% requirements of Warrant 1A (8 needed) **10** Met? **Yes**
 Hours data meets 80% requirements of Warrant 1B (8 needed) **14** Met? **Yes**
 Hours data meets 80% requirements of Warrant 4 (4,1 needed) **0** Met? **No**

Summary

Number of crashes does not meet minimum.
 Pedestrian volumes do not meet the 80% criteria.

Warrant is NOT met.

Crash and Volume Requirements

Minimum number of crashes = **5**
 Rural Factor of 70 % applied
 Veh/Hr Major: War 1A = **280** War 1B = **420**
 Veh/Hr Minor: War 1A = **84** War 1B = **42**

Major Road
Washington St

Minor Road
IA 163 NB Ramp

Warrant 1A Details

Time	Major EB	+	Major WB	=	Total	Minor NB	Minor SB	Met1A?
16:15 - 17:15	513	+	676	=	1189	0	147	Yes
15:15 - 16:15	460	+	627	=	1087	0	135	Yes
17:15 - 18:15	454	+	530	=	984	0	175	Yes
11:15 - 12:15	488	+	471	=	959	0	121	Yes
12:15 - 13:15	443	+	499	=	942	0	106	Yes
14:15 - 15:15	422	+	510	=	932	0	96	Yes
13:15 - 14:15	417	+	398	=	815	0	103	Yes
07:45 - 08:45	407	+	312	=	719	0	106	Yes
10:15 - 11:15	352	+	326	=	678	0	92	Yes
06:45 - 07:45	417	+	256	=	673	0	98	Yes
18:15 - 19:15	364	+	438	=	802	0	81	No
18:30 - 19:30	316	+	387	=	703	0	62	No

Warrant 1B Details

Time	Major EB	+	Major WB	=	Total	Minor NB	Minor SB	Met1B?
16:00 - 17:00	504	+	684	=	1188	0	137	Yes
17:00 - 18:00	485	+	574	=	1059	0	183	Yes
15:00 - 16:00	449	+	561	=	1010	0	126	Yes
12:00 - 13:00	490	+	508	=	998	0	120	Yes
14:00 - 15:00	415	+	506	=	921	0	102	Yes
18:00 - 19:00	411	+	463	=	874	0	102	Yes
11:00 - 12:00	419	+	435	=	854	0	118	Yes
13:00 - 14:00	411	+	418	=	829	0	89	Yes
07:00 - 08:00	488	+	294	=	782	0	111	Yes
10:00 - 11:00	338	+	292	=	630	0	77	Yes
08:00 - 09:00	316	+	298	=	614	0	85	Yes
09:00 - 10:00	314	+	277	=	591	0	70	Yes

Traffic Signal Warrant
Washington St & IA 163 NB Ramp
 Existing Conditions 2023

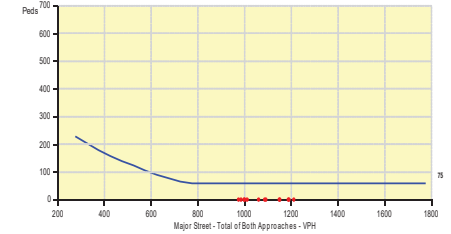
Study Name: Pella Kwik Star Existing
 Study Date : 10/29/2023

Warrant 7 - Crash Experience

Major Road
Washington St

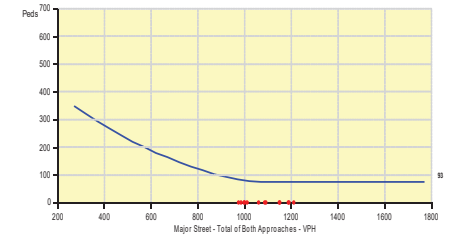
80% of Warrant 4 - 4 Hr Pedestrian Data

Time	EB Vehs	WB Vehs	Total Vehs	EB Peds	WB Peds	Ped Total	Met?
15:45 - 16:45	513	698	1211	0	0	0	No
16:15 - 17:15	513	676	1189	0	0	0	No
16:00 - 17:00	504	684	1188	0	0	0	No
15:30 - 16:30	488	663	1151	0	0	0	No
16:30 - 17:30	501	647	1148	0	0	0	No
16:45 - 17:45	485	605	1090	0	0	0	No
15:15 - 16:15	460	627	1087	0	0	0	No
17:00 - 18:00	485	574	1059	0	0	0	No
15:00 - 16:00	449	561	1010	0	0	0	No
14:45 - 15:45	447	554	1001	0	0	0	No
12:00 - 13:00	490	508	998	0	0	0	No
17:15 - 18:15	454	530	984	0	0	0	No



80% of Warrant 4 - 1 Hr Pedestrian Data

Time	EB Vehs	WB Vehs	Total Vehs	EB Peds	WB Peds	Ped Total	Met?
15:45 - 16:45	513	698	1211	0	0	0	No
16:15 - 17:15	513	676	1189	0	0	0	No
16:00 - 17:00	504	684	1188	0	0	0	No
15:30 - 16:30	488	663	1151	0	0	0	No
16:30 - 17:30	501	647	1148	0	0	0	No
16:45 - 17:45	485	605	1090	0	0	0	No
15:15 - 16:15	460	627	1087	0	0	0	No
17:00 - 18:00	485	574	1059	0	0	0	No
15:00 - 16:00	449	561	1010	0	0	0	No
14:45 - 15:45	447	554	1001	0	0	0	No
12:00 - 13:00	490	508	998	0	0	0	No
17:15 - 18:15	454	530	984	0	0	0	No



Traffic Signal Warrant
Washington St & IA 163 NB Ramp
 Opening Conditions 2024

Study Name: Pella Kwik Star Opening
 Study Date : 10/29/2023

Signal Warrants - Summary

Major Street Approaches

Eastbound: Washington St
 Number of Lanes :2+

Total Approach Volume: 6,941

Westbound: Washington St
 Number of Lanes :2+

Total Approach Volume: 7,040

Minor Street Approaches

Northbound: IA 163 NB Ramp
 Number of Lanes :2+

Total Approach Volume: 1,768

Southbound: IA 163 NB Ramp
 Number of Lanes :2+

Total Approach Volume: 1,962

Warrant Summary (Rural Values Apply)

Warrant 1 - Eight Hour Vehicular Volumes.....Satisfied

Warrant 1A - Minimum Vehicular Volume.....Not Satisfied
 Required volumes reached for 6 hours, 8 are needed

Warrant 1B - Interruption of Continuous Traffic.....Satisfied
 Required volumes reached for 13 hours, 8 are needed

Warrant 1C - Combination of Warrants.....Satisfied
 Required 1A volumes reached for 10 hours, 8 are needed
 Required 1B volumes reached for 14 hours, 8 are needed

Warrant 2 - Four Hour Volumes.....Satisfied
 Number of hours (10) volumes exceed minimum >= minimum required (4).

Warrant 3 - Peak Hour.....Satisfied

Warrant 3A - Peak Hour Delay.....Satisfied
 Number of one hour periods (12) volumes exceed minimum >= required (1). Delay data not evaluated.

Warrant 3B - Peak Hour Volumes.....Satisfied
 Volumes exceed minimums for at least one hour period.

Warrant 4 - Pedestrian Volumes.....Not Evaluated

Warrant 5 - School Crossing.....Not Evaluated

Warrant 6 - Coordinated Signal System.....Not Evaluated

Warrant 7 - Crash Experience.....Not Satisfied
 Number of accidents (0) is less than minimum (5). Volume minimums are met.

Warrant 8 - Roadway Network.....Not Evaluated

Warrant 9 - Intersection Near a Grade Crossing.....Not Evaluated

Traffic Signal Warrant
Washington St & IA 163 NB Ramp
 Opening Conditions 2024

Study Name: Pella Kwik Star Opening
 Study Date : 10/29/2023

Warrant 1A - Minimum Volumes

Description

Intended for sites where the volume of intersecting traffic is the principal reason for consideration of a signal installation.

Summary

Only 6 one hour periods meet minimums.
 Warrant is NOT met.

Site Data Required

Rural Settings Apply = **True**
 Number of Major Lanes = **2 or more**
 Number of Minor Lanes = **2 or more**

Volume Requirements

Rural Factor of 70 % applied
 Veh/Hr Major = **420**
 Veh/Hr Minor = **140**

Time	Major Road Washington St			=	Total	Minor Road IA 163 NB Ramp		Met?
	Major EB	+	Major WB			Minor NB	Minor SB	
15:45 - 16:45	563	+	740	=	1303	120	155	Yes
16:45 - 17:45	533	+	645	=	1178	116	205	Yes
14:45 - 15:45	503	+	602	=	1105	132	159	Yes
11:15 - 12:15	531	+	509	=	1040	107	143	Yes
17:45 - 18:45	487	+	514	=	1001	116	142	Yes
07:15 - 08:15	553	+	345	=	898	122	145	Yes
14:30 - 15:30	496	+	574	=	1070	132	131	No
14:15 - 15:15	478	+	558	=	1036	132	124	No
12:15 - 13:15	492	+	541	=	1033	121	132	No
14:00 - 15:00	471	+	554	=	1025	132	130	No
12:30 - 13:30	492	+	513	=	1005	114	128	No
12:45 - 13:45	476	+	476	=	952	107	109	No
13:45 - 14:45	439	+	508	=	947	124	127	No
11:00 - 12:00	459	+	471	=	930	100	138	No
13:00 - 14:00	451	+	454	=	905	100	109	No
13:15 - 14:15	461	+	437	=	898	108	125	No
13:30 - 14:30	440	+	458	=	898	116	125	No
10:45 - 11:45	453	+	432	=	885	94	131	No
07:00 - 08:00	540	+	338	=	878	128	139	No
10:30 - 11:30	416	+	407	=	823	88	114	No
06:45 - 07:45	466	+	298	=	764	121	124	No
10:15 - 11:15	386	+	356	=	742	82	109	No
06:30 - 07:30	412	+	291	=	703	114	105	No
18:45 - 19:45	317	+	378	=	695	92	80	No
10:00 - 11:00	370		320		690	76	93	No

Traffic Signal Warrant Washington St & IA 163 NB Ramp Opening Conditions 2024

Study Name: Pella Kwik Star Opening

Study Date : 10/29/2023

Warrant 1B - Interruption of Continuous Traffic

Description

Intended for sites where the volume of the major street is so heavy that traffic on the minor street suffers excessive delay or hazard.

Summary

13 one hour periods meet minimums.
Warrant IS met.

Site Data Required

Rural Settings Apply = **True**
Number of Major Lanes = **2 or more**
Number of Minor Lanes = **2 or more**

Volume Requirements

Rural Factor of 70 % applied
Veh/Hr Major = **630**
Veh/Hr Minor = **70**

Time	Major Road Washington St				Total	Minor Road IA 163 NB Ramp		Met?
	Major EB	+	Major WB	=		Minor NB	Minor SB	
15:30 - 16:30	540	+	707	=	1247	124	163	Yes
16:30 - 17:30	549	+	687	=	1236	116	199	Yes
14:30 - 15:30	496	+	574	=	1070	132	131	Yes
11:30 - 12:30	533	+	519	=	1052	114	143	Yes
17:30 - 18:30	489	+	551	=	1040	116	171	Yes
12:30 - 13:30	492	+	513	=	1005	114	128	Yes
13:30 - 14:30	440	+	458	=	898	116	125	Yes
07:30 - 08:30	512	+	340	=	852	116	133	Yes
10:30 - 11:30	416	+	407	=	823	88	114	Yes
18:30 - 19:30	356	+	421	=	777	100	84	Yes
06:30 - 07:30	412	+	291	=	703	114	105	Yes
08:30 - 09:30	355	+	325	=	680	104	95	Yes
09:30 - 10:30	342	+	306	=	648	90	84	Yes
06:15 - 07:15	344	+	239	=	583	107	81	No
19:30 - 20:30	237	+	293	=	530	72	61	No
06:00 - 07:00	307	+	192	=	499	100	69	No
19:45 - 20:45	213	+	263	=	476	66	54	No
05:45 - 06:45	262	+	170	=	432	79	60	No
20:00 - 21:00	193	+	226	=	419	60	45	No
20:15 - 21:15	191	+	212	=	403	56	50	No
20:30 - 21:30	187	+	184	=	371	52	42	No
05:30 - 06:30	232	+	136	=	368	58	59	No
05:15 - 06:15	216	+	116	=	332	37	59	No
20:45 - 21:45	169	+	162	=	331	48	37	No
05:00 - 06:00	199	+	104	=	303	16	51	No

Traffic Signal Warrant Washington St & IA 163 NB Ramp Opening Conditions 2024

Study Name: Pella Kwik Star Opening

Study Date : 10/29/2023

Warrant 2 - Four Hour Volumes

Description

Intended for sites where the volume of intersecting traffic during any four hours of the day is the principal reason for consideration of a signal installation.

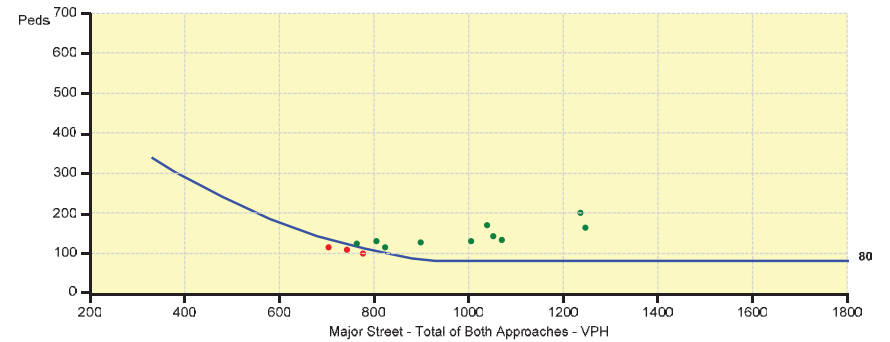
Summary

10 one hour periods meet minimums.
Warrant IS met.

Site Data Required

Rural Settings Apply = **True**
Number of Major Lanes = **2 or more**
Number of Minor Lanes = **2 or more**

Time	Major Road Washington St				Total	Minor Road IA 163 NB Ramp		Met?
	Major EB	+	Major WB	=		Minor NB	Minor SB	
15:30 - 16:30	540	+	707	=	1247	124	163	Yes
16:30 - 17:30	549	+	687	=	1236	116	199	Yes
14:30 - 15:30	496	+	574	=	1070	132	131	Yes
11:30 - 12:30	533	+	519	=	1052	114	143	Yes
17:30 - 18:30	489	+	551	=	1040	116	171	Yes
12:30 - 13:30	492	+	513	=	1005	114	128	Yes
13:30 - 14:30	440	+	458	=	898	116	125	Yes
10:30 - 11:30	416	+	407	=	823	88	114	Yes
07:45 - 08:45	453	+	353	=	806	110	128	Yes
06:45 - 07:45	466	+	298	=	764	121	124	Yes
18:30 - 19:30	356	+	421	=	777	100	84	No
10:15 - 11:15	386	+	356	=	742	82	109	No



Traffic Signal Warrant
Washington St & IA 163 NB Ramp
 Opening Conditions 2024

Study Name: Pella Kwik Star Opening
 Study Date : 10/29/2023

Warrant 3A - Peak Hour Delay

Description

Intended for sites where for one hour of the day minor street traffic suffers undue traffic delay entering or crossing the major street.

Summary

50 one hour periods meet minimums.
 Warrant IS met.

Site Data Required

Number of Minor Lanes = **2 or more**

Volume and Delay Requirements

Veh/Hr All Approaches = **800**
 Veh/Hr Minor = **150**
 Total Delay (Veh-Hrs) = **5**

Time	Major Road Washington St			Minor Road IA 163 NB Ramp			Warrant Met?
	Total of All Approaches	Met?	Delay NB	Minor NB	Delay SB	Minor SB	
15:45 - 16:45	1578	Yes	-	120	-	155	Yes
16:15 - 17:15	1564	Yes	-	116	-	171	Yes
16:00 - 17:00	1553	Yes	-	116	-	161	Yes
16:30 - 17:30	1551	Yes	-	116	-	199	Yes
15:30 - 16:30	1534	Yes	-	124	-	163	Yes
16:45 - 17:45	1499	Yes	-	116	-	205	Yes
15:15 - 16:15	1477	Yes	-	128	-	162	Yes
17:00 - 18:00	1470	Yes	-	116	-	207	Yes
15:00 - 16:00	1400	Yes	-	132	-	154	Yes
14:45 - 15:45	1396	Yes	-	132	-	159	Yes
17:15 - 18:15	1387	Yes	-	116	-	199	Yes
17:30 - 18:30	1327	Yes	-	116	-	171	Yes
12:00 - 13:00	1370	Yes	-	128	-	148	No
14:30 - 15:30	1333	Yes	No	132	-	131	No
11:45 - 12:45	1327	Yes	-	121	-	140	No
11:30 - 12:30	1309	Yes	-	114	-	143	No
14:15 - 15:15	1292	Yes	No	132	-	124	No
11:15 - 12:15	1290	Yes	-	107	-	143	No
14:00 - 15:00	1287	Yes	No	132	-	130	No
12:15 - 13:15	1286	Yes	-	121	-	132	No
17:45 - 18:45	1259	Yes	-	116	-	142	No
12:30 - 13:30	1247	Yes	-	114	-	128	No
18:00 - 19:00	1204	Yes	-	116	-	126	No
13:45 - 14:45	1198	Yes	-	124	-	127	No
12:45 - 13:45	1168	Yes	-	107	-	109	No

Traffic Signal Warrant
Washington St & IA 163 NB Ramp
 Opening Conditions 2024

Study Name: Pella Kwik Star Opening
 Study Date : 10/29/2023

Warrant 3B - Peak Hour Volumes

Description

Intended for sites where the volume of intersecting traffic during one hour of the day is the principal reason for consideration of a signal installation.

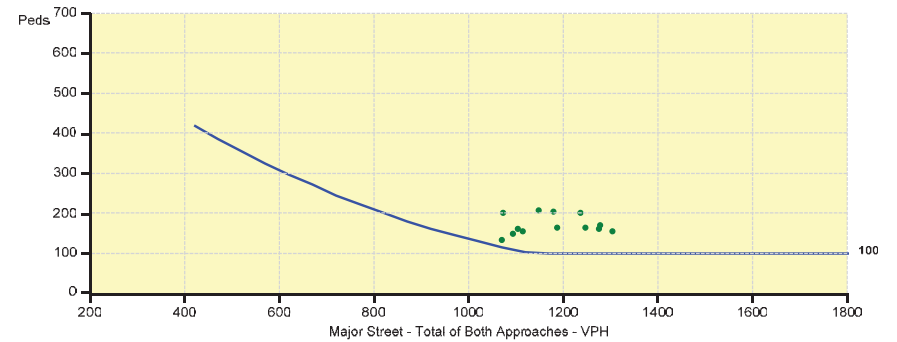
Summary

21 one hour periods meet minimums.
 Warrant IS met.

Site Data Required

Rural Settings Apply = **True**
 Number of Major Lanes = **2 or more**
 Number of Minor Lanes = **2 or more**

Time	Major Road Washington St				Total	Minor Road IA 163 NB Ramp		Met?
	Major EB	+	Major WB	=		Minor NB	Minor SB	
15:45 - 16:45	563	+	740	=	1303	120	155	Yes
16:15 - 17:15	561	+	716	=	1277	116	171	Yes
16:00 - 17:00	552	+	724	=	1276	116	161	Yes
15:30 - 16:30	540	+	707	=	1247	124	163	Yes
16:30 - 17:30	549	+	687	=	1236	116	199	Yes
15:15 - 16:15	514	+	673	=	1187	128	162	Yes
16:45 - 17:45	533	+	645	=	1178	116	205	Yes
17:00 - 18:00	533	+	614	=	1147	116	207	Yes
15:00 - 16:00	505	+	609	=	1114	132	154	Yes
14:45 - 15:45	503	+	602	=	1105	132	159	Yes
12:00 - 13:00	542	+	552	=	1094	128	148	Yes
17:15 - 18:15	502	+	570	=	1072	116	199	Yes



Traffic Signal Warrant Washington St & IA 163 NB Ramp Opening Conditions 2024

Study Name: Pella Kwik Star Opening
Study Date : 10/29/2023

Warrant 7 - Crash Experience

Description

Intended for sites where the frequency of correctible crashes in the past 12 months is the primary motivation for installing a traffic signal.

Site Data Required

Number of crashes in last 12 months = **0**
Rural Settings Apply = **True**
Number of Major Lanes = **2 or more**
Number of Minor Lanes = **2 or more**

Volume and Pedestrian Data

Hours data meets 80% requirements of Warrant 1A (8 needed) **10** Met? **Yes**
Hours data meets 80% requirements of Warrant 1B (8 needed) **14** Met? **Yes**
Hours data meets 80% requirements of Warrant 4 (4,1 needed) **0** Met? **No**

Summary

Number of crashes does not meet minimum.
Pedestrian volumes do not meet the 80% criteria.

Warrant is NOT met.

Crash and Volume Requirements

Minimum number of crashes = **5**
Rural Factor of 70 % applied
Veh/Hr Major: War 1A = **336** War 1B = **504**
Veh/Hr Minor: War 1A = **112** War 1B = **56**

Major Road
Washington St

Minor Road
IA 163 NB Ramp

Warrant 1A Details

Time	Major EB	+	Major WB	=	Total	Minor NB	Minor SB	Met1A?
15:30 - 16:30	540	+	707	=	1247	124	163	Yes
16:30 - 17:30	549	+	687	=	1236	116	199	Yes
14:30 - 15:30	496	+	574	=	1070	132	131	Yes
11:30 - 12:30	533	+	519	=	1052	114	143	Yes
17:30 - 18:30	489	+	551	=	1040	116	171	Yes
12:30 - 13:30	492	+	513	=	1005	114	128	Yes
13:30 - 14:30	440	+	458	=	898	116	125	Yes
07:30 - 08:30	512	+	340	=	852	116	133	Yes
10:30 - 11:30	416	+	407	=	823	88	114	Yes
06:30 - 07:30	412	+	291	=	703	114	105	Yes
18:30 - 19:30	356	+	421	=	777	100	84	No
10:15 - 11:15	386	+	356	=	742	82	109	No

Warrant 1B Details

Time	Major EB	+	Major WB	=	Total	Minor NB	Minor SB	Met1B?
16:15 - 17:15	561	+	716	=	1277	116	171	Yes
15:15 - 16:15	514	+	673	=	1187	128	162	Yes
17:15 - 18:15	502	+	570	=	1072	116	199	Yes
11:15 - 12:15	531	+	509	=	1040	107	143	Yes
14:15 - 15:15	478	+	558	=	1036	132	124	Yes
12:15 - 13:15	492	+	541	=	1033	121	132	Yes
07:15 - 08:15	553	+	345	=	898	122	145	Yes
13:15 - 14:15	461	+	437	=	898	108	125	Yes
18:15 - 19:15	408	+	475	=	883	108	104	Yes
10:15 - 11:15	386	+	356	=	742	82	109	Yes
08:15 - 09:15	339	+	338	=	677	104	100	Yes
09:15 - 10:15	349	+	303	=	652	97	77	Yes

Traffic Signal Warrant Washington St & IA 163 NB Ramp Opening Conditions 2024

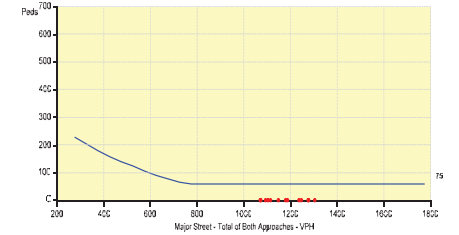
Study Name: Pella Kwik Star Opening
Study Date : 10/29/2023

Warrant 7 - Crash Experience

Major Road
Washington St

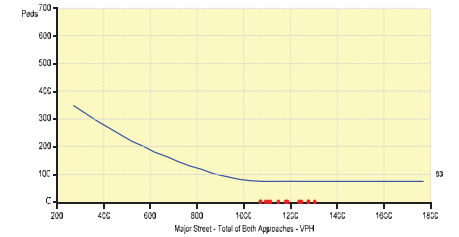
80% of Warrant 4 - 4 Hr Pedestrian Data

Time	EB Vehs	WB Vehs	Total Vehs	EB Peds	WB Peds	Ped Total	Met?
15:45 - 16:45	563	740	1303	0	0	0	No
16:15 - 17:15	561	716	1277	0	0	0	No
16:00 - 17:00	552	724	1276	0	0	0	No
15:30 - 16:30	540	707	1247	0	0	0	No
16:30 - 17:30	549	687	1236	0	0	0	No
15:15 - 16:15	514	673	1187	0	0	0	No
16:45 - 17:45	533	645	1178	0	0	0	No
17:00 - 18:00	533	614	1147	0	0	0	No
15:00 - 16:00	505	609	1114	0	0	0	No
14:45 - 15:45	503	602	1105	0	0	0	No
12:00 - 13:00	542	552	1094	0	0	0	No
17:15 - 18:15	502	570	1072	0	0	0	No



80% of Warrant 4 - 1 Hr Pedestrian Data

Time	EB Vehs	WB Vehs	Total Vehs	EB Peds	WB Peds	Ped Total	Met?
15:45 - 16:45	563	740	1303	0	0	0	No
16:15 - 17:15	561	716	1277	0	0	0	No
16:00 - 17:00	552	724	1276	0	0	0	No
15:30 - 16:30	540	707	1247	0	0	0	No
16:30 - 17:30	549	687	1236	0	0	0	No
15:15 - 16:15	514	673	1187	0	0	0	No
16:45 - 17:45	533	645	1178	0	0	0	No
17:00 - 18:00	533	614	1147	0	0	0	No
15:00 - 16:00	505	609	1114	0	0	0	No
14:45 - 15:45	503	602	1105	0	0	0	No
12:00 - 13:00	542	552	1094	0	0	0	No
17:15 - 18:15	502	570	1072	0	0	0	No



Traffic Signal Warrant
Washington St & Old 163
 Existing Conditions 2023

Study Name: Pella Kwik Star Old 163 Existing
 Study Date : 10/29/2023

Signal Warrants - Summary

Major Street Approaches

Eastbound: Washington St
 Number of Lanes : 1

Total Approach Volume: 6,138

Westbound: Washington St
 Number of Lanes : 1

Total Approach Volume: 6,459

Minor Street Approaches

Northbound: Old 163
 Number of Lanes : 1

Total Approach Volume: 0

Southbound: Old 163
 Number of Lanes : 1

Total Approach Volume: 664

Warrant Summary (Rural Values Apply)

Warrant 1 - Eight Hour Vehicular Volumes	Not Satisfied
Warrant 1A - Minimum Vehicular Volume Not Satisfied	
Required volumes reached for 0 hours, 8 are needed	
Warrant 1B - Interruption of Continuous Traffic	Not Satisfied
Required volumes reached for 5 hours, 8 are needed	
Warrant 1C - Combination of Warrants	Not Satisfied
Required 1A volumes reached for 0 hours, 8 are needed	
Required 1B volumes reached for 7 hours, 8 are needed	
Warrant 2 - Four Hour Volumes	Satisfied
Number of hours (4) volumes exceed minimum >= minimum required (4).	
Warrant 3 - Peak Hour	Satisfied
Warrant 3A - Peak Hour Delay	Not Satisfied
Approach volumes on minor street don't exceed minimums for any one hour period. Delay data not evaluated.	
Warrant 3B - Peak Hour Volumes	Satisfied
Volumes exceed minimums for at least one hour period.	
Warrant 4 - Pedestrian Volumes	Not Evaluated
Warrant 5 - School Crossing	Not Evaluated
Warrant 6 - Coordinated Signal System	Not Evaluated
Warrant 7 - Crash Experience	Not Satisfied
Number of accidents (0) is less than minimum (5). Volume minimums are not met.	
Warrant 8 - Roadway Network	Not Evaluated
Warrant 9 - Intersection Near a Grade Crossing	Not Evaluated

Traffic Signal Warrant
Washington St & Old 163
 Existing Conditions 2023

Study Name: Pella Kwik Star Old 163 Existing
 Study Date : 10/29/2023

Warrant 1A - Minimum Volumes

Description

Intended for sites where the volume of intersecting traffic is the principal reason for consideration of a signal installation.

Summary

Only 0 one hour periods meet minimums. Warrant is NOT met.

Site Data Required

Rural Settings Apply = **True**
 Number of Major Lanes = **1**
 Number of Minor Lanes = **1**

Volume Requirements

Rural Factor of 70 % applied
 Veh/Hr Major = **350**
 Veh/Hr Minor = **105**

Time	Major Road			=	Total	Minor Road		Met?
	Major EB	+	Major WB			Minor NB	Minor SB	
	Washington St					Old 163		
15:45 - 16:45	476	+	701	=	1177	0	65	No
16:15 - 17:15	487	+	664	=	1151	0	65	No
16:00 - 17:00	473	+	673	=	1146	0	62	No
15:30 - 16:30	461	+	665	=	1126	0	64	No
16:30 - 17:30	486	+	635	=	1121	0	75	No
15:15 - 16:15	449	+	633	=	1082	0	64	No
16:45 - 17:45	475	+	592	=	1067	0	71	No
17:00 - 18:00	464	+	562	=	1026	0	71	No
15:00 - 16:00	434	+	577	=	1011	0	43	No
14:45 - 15:45	439	+	560	=	999	0	46	No
12:00 - 13:00	472	+	510	=	982	0	58	No
14:30 - 15:30	427	+	539	=	966	0	40	No
11:30 - 12:30	467	+	498	=	965	0	64	No
17:15 - 18:15	434	+	526	=	960	0	47	No
11:15 - 12:15	472	+	485	=	957	0	66	No
11:45 - 12:45	443	+	512	=	955	0	55	No
12:15 - 13:15	435	+	503	=	938	0	64	No
17:30 - 18:30	421	+	506	=	927	0	37	No
14:15 - 15:15	404	+	523	=	927	0	35	No
12:30 - 13:30	444	+	482	=	926	0	64	No
14:00 - 15:00	408	+	517	=	925	0	35	No
17:45 - 18:45	413	+	466	=	879	0	37	No
12:45 - 13:45	430	+	448	=	878	0	60	No
11:00 - 12:00	414	+	451	=	865	0	68	No
13:45 - 14:45	390		473		863	0	35	No

Traffic Signal Warrant
Washington St & Old 163
 Existing Conditions 2023

Study Name: Pella Kwik Star Old 163 Existing

Study Date : 10/29/2023

Warrant 1B - Interruption of Continuous Traffic

Description

Intended for sites where the volume of the major street is so heavy that traffic on the minor street suffers excessive delay or hazard.

Summary

Only 5 one hour periods meet minimums. Warrant is NOT met.

Site Data Required

Rural Settings Apply = **True**
 Number of Major Lanes = 1
 Number of Minor Lanes = 1

Volume Requirements

Rural Factor of 70 % applied
 Veh/Hr Major = **525**
 Veh/Hr Minor = **52**

Time	Major Road Washington St			=	Total	Minor Road Old 163		Met?
	Major EB	+	Major WB			Minor NB	Minor SB	
16:15 - 17:15	487	+	664	=	1151	0	65	Yes
15:15 - 16:15	449	+	633	=	1082	0	64	Yes
11:45 - 12:45	443	+	512	=	955	0	55	Yes
12:45 - 13:45	430	+	448	=	878	0	60	Yes
10:45 - 11:45	410	+	417	=	827	0	56	Yes
15:00 - 16:00	434	+	577	=	1011	0	43	No
14:45 - 15:45	439	+	560	=	999	0	46	No
14:30 - 15:30	427	+	539	=	966	0	40	No
17:15 - 18:15	434	+	526	=	960	0	47	No
17:30 - 18:30	421	+	506	=	927	0	37	No
14:15 - 15:15	404	+	523	=	927	0	35	No
14:00 - 15:00	408	+	517	=	925	0	35	No
17:45 - 18:45	413	+	466	=	879	0	37	No
13:45 - 14:45	390	+	473	=	863	0	35	No
18:00 - 19:00	397	+	455	=	852	0	35	No
07:15 - 08:15	524	+	301	=	825	0	48	No
07:00 - 08:00	500	+	295	=	795	0	42	No
07:30 - 08:30	485	+	301	=	786	0	37	No
18:15 - 19:15	345	+	432	=	777	0	32	No
10:30 - 11:30	366	+	383	=	749	0	46	No
07:45 - 08:45	424	+	314	=	738	0	39	No
06:45 - 07:45	426	+	265	=	691	0	35	No
18:30 - 19:30	300	+	386	=	686	0	26	No
10:15 - 11:15	348	+	337	=	685	0	48	No
08:00 - 09:00	326	+	313	=	639	0	39	No

Traffic Signal Warrant
Washington St & Old 163
 Existing Conditions 2023

Study Name: Pella Kwik Star Old 163 Existing

Study Date : 10/29/2023

Warrant 1C Combination of Warrants

Description

Intended for sites where the traffic volumes don't meet individual warrants but where Warrants 1A and 1B are both met to 80% of their stated values.

Summary

Only 0 hours meet 1A minimums. Only 7 hours meet 1B minimums. Warrant is NOT met.

Site Data Required

Rural Settings Apply = **True**
 Number of Major Lanes = 1
 Number of Minor Lanes = 1

Volume Requirements

Rural Factor of 70% applied
 Warrant 1A 1B
 Veh/Hr Major = **280 420**
 Veh/Hr Minor = **84 42**

Time	Major Road Washington St			=	Total	Minor Road Old 163		Met1A?
	Major EB	+	Major WB			Minor NB	Minor SB	
15:45 - 16:45	476	+	701	=	1177	0	65	No
16:15 - 17:15	487	+	664	=	1151	0	65	No
16:00 - 17:00	473	+	673	=	1146	0	62	No
15:30 - 16:30	461	+	665	=	1126	0	64	No
16:30 - 17:30	486	+	635	=	1121	0	75	No
15:15 - 16:15	449	+	633	=	1082	0	64	No
16:45 - 17:45	475	+	592	=	1067	0	71	No
17:00 - 18:00	464	+	562	=	1026	0	71	No
15:00 - 16:00	434	+	577	=	1011	0	43	No
14:45 - 15:45	439	+	560	=	999	0	46	No
12:00 - 13:00	472	+	510	=	982	0	58	No
14:30 - 15:30	427	+	539	=	966	0	40	No

Time	Major Road Washington St			=	Total	Minor Road Old 163		Met1B?
	Major EB	+	Major WB			Minor NB	Minor SB	
15:45 - 16:45	476	+	701	=	1177	0	65	Yes
16:45 - 17:45	475	+	592	=	1067	0	71	Yes
14:45 - 15:45	439	+	560	=	999	0	46	Yes
11:15 - 12:15	472	+	485	=	957	0	66	Yes
12:15 - 13:15	435	+	503	=	938	0	64	Yes
07:00 - 08:00	500	+	295	=	795	0	42	Yes
10:15 - 11:15	348	+	337	=	685	0	48	Yes
14:30 - 15:30	427	+	539	=	966	0	40	No
14:15 - 15:15	404	+	523	=	927	0	35	No
14:00 - 15:00	408	+	517	=	925	0	35	No
17:45 - 18:45	413	+	466	=	879	0	37	No
13:45 - 14:45	390	+	473	=	863	0	35	No

Traffic Signal Warrant Washington St & Old 163 Existing Conditions 2023

Study Name: Pella Kwik Star Old 163 Existing
Study Date : 10/29/2023

Warrant 2 - Four Hour Volumes

Description

Intended for sites where the volume of intersecting traffic during any four hours of the day is the principal reason for consideration of a signal installation.

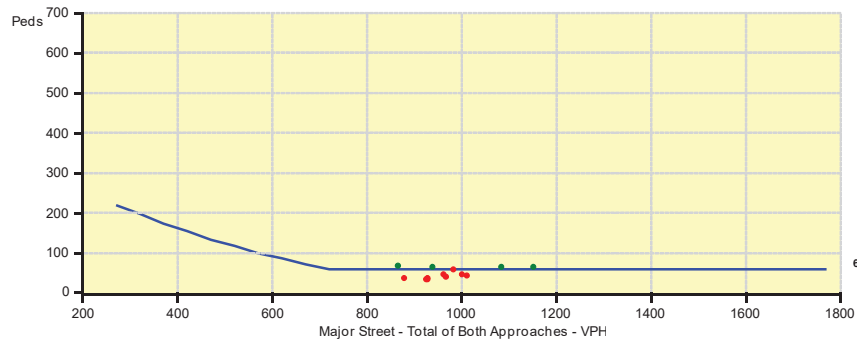
Summary

4 one hour periods meet minimums.
Warrant IS met.

Site Data Required

Rural Settings Apply = True
Number of Major Lanes = 1
Number of Minor Lanes = 1

Time	Major Road Washington St				Total	Minor NB	Minor SB	Met?
	Major EB	+	Major WB	=				
16:15 - 17:15	487	+	664	=	1151	0	65	Yes
15:15 - 16:15	449	+	633	=	1082	0	64	Yes
12:15 - 13:15	435	+	503	=	938	0	64	Yes
11:00 - 12:00	414	+	451	=	865	0	68	Yes
15:00 - 16:00	434	+	577	=	1011	0	43	No
14:45 - 15:45	439	+	560	=	999	0	46	No
12:00 - 13:00	472	+	510	=	982	0	58	No
14:30 - 15:30	427	+	539	=	966	0	40	No
17:15 - 18:15	434	+	526	=	960	0	47	No
17:30 - 18:30	421	+	506	=	927	0	37	No
14:15 - 15:15	404	+	523	=	927	0	35	No
14:00 - 15:00	408	+	517	=	925	0	35	No



Traffic Signal Warrant Washington St & Old 163 Existing Conditions 2023

Study Name: Pella Kwik Star Old 163 Existing
Study Date : 10/29/2023

Warrant 3A - Peak Hour Delay

Description

Intended for sites where for one hour of the day minor street traffic suffers undue traffic delay entering or crossing the major street.

Summary

34 one hour periods meet minimums.
Warrant is NOT met.

Site Data Required

Number of Minor Lanes = 1

Volume and Delay Requirements

Veh/Hr All Approaches = 800
Veh/Hr Minor = 100
Total Delay (Veh-Hrs) = 4

Time	Major Road Washington St			Minor NB	Delay NB	Met?	Minor SB	Delay SB	Met?	Warrant Met?
	Total of All Approaches	Met?	Met?							
15:45 - 16:45	1242	Yes	---	0	-	---	65	-	No	No
16:15 - 17:15	1216	Yes	---	0	-	---	65	-	No	No
16:00 - 17:00	1208	Yes	---	0	-	---	62	-	No	No
16:30 - 17:30	1196	Yes	---	0	-	---	75	-	No	No
15:30 - 16:30	1190	Yes	---	0	-	---	64	-	No	No
15:15 - 16:15	1146	Yes	---	0	-	---	64	-	No	No
16:45 - 17:45	1138	Yes	---	0	-	---	71	-	No	No
17:00 - 18:00	1097	Yes	---	0	-	---	71	-	No	No
15:00 - 16:00	1054	Yes	---	0	-	---	43	-	No	No
14:45 - 15:45	1045	Yes	---	0	-	---	46	-	No	No
12:00 - 13:00	1040	Yes	---	0	-	---	58	-	No	No
11:30 - 12:30	1029	Yes	---	0	-	---	64	-	No	No
11:15 - 12:15	1023	Yes	---	0	-	---	66	-	No	No
11:45 - 12:45	1010	Yes	---	0	-	---	55	-	No	No
17:15 - 18:15	1007	Yes	---	0	-	---	47	-	No	No
14:30 - 15:30	1006	Yes	---	0	-	---	40	-	No	No
12:15 - 13:15	1002	Yes	---	0	-	---	64	-	No	No
12:30 - 13:30	990	Yes	---	0	-	---	64	-	No	No
17:30 - 18:30	964	Yes	---	0	-	---	37	-	No	No
14:15 - 15:15	962	Yes	---	0	-	---	35	-	No	No
14:00 - 15:00	960	Yes	---	0	-	---	35	-	No	No
12:45 - 13:45	938	Yes	---	0	-	---	60	-	No	No
11:00 - 12:00	933	Yes	---	0	-	---	68	-	No	No
17:45 - 18:45	916	Yes	---	0	-	---	37	-	No	No
13:45 - 14:45	898	Yes	---	0	-	---	35	-	No	No

Traffic Signal Warrant Washington St & Old 163 Existing Conditions 2023

Study Name: Pella Kwik Star Old 163 Existing
Study Date : 10/29/2023

Warrant 3B - Peak Hour Volumes

Description

Intended for sites where the volume of intersecting traffic during one hour of the day is the principal reason for consideration of a signal installation.

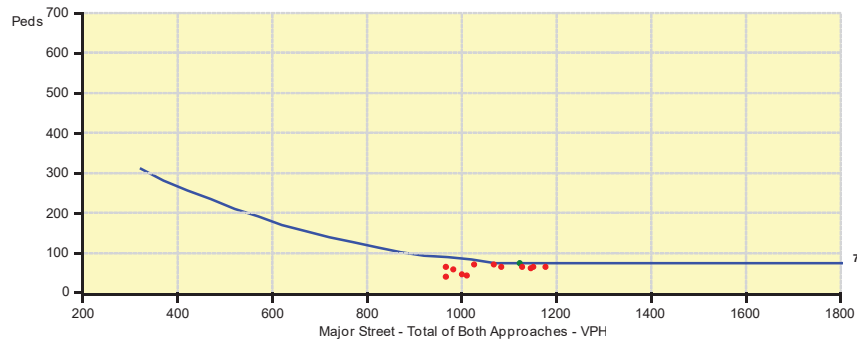
Summary

1 one hour periods meet minimums.
Warrant IS met.

Site Data Required

Rural Settings Apply = **True**
Number of Major Lanes = **1**
Number of Minor Lanes = **1**

Time	Major Road Washington St				Total	Minor Road Old 163		Met?
	Major EB	+	Major WB	=		Minor NB	Minor SB	
16:30 - 17:30	486	+	635	=	1121	0	75	Yes
15:45 - 16:45	476	+	701	=	1177	0	65	No
16:15 - 17:15	487	+	664	=	1151	0	65	No
16:00 - 17:00	473	+	673	=	1146	0	62	No
15:30 - 16:30	461	+	665	=	1126	0	64	No
15:15 - 16:15	449	+	633	=	1082	0	64	No
16:45 - 17:45	475	+	592	=	1067	0	71	No
17:00 - 18:00	464	+	562	=	1026	0	71	No
15:00 - 16:00	434	+	577	=	1011	0	43	No
14:45 - 15:45	439	+	560	=	999	0	46	No
12:00 - 13:00	472	+	510	=	982	0	58	No
14:30 - 15:30	427	+	539	=	966	0	40	No



Traffic Signal Warrant Washington St & Old 163 Existing Conditions 2023

Study Name: Pella Kwik Star Old 163 Existing
Study Date : 10/29/2023

Warrant 7 - Crash Experience

Description

Intended for sites where the frequency of correctible crashes in the past 12 months is the primary motivation for installing a traffic signal.

Summary

Number of crashes does not meet minimum.
Pedestrian volumes do not meet the 80% criteria.
War 1A or 1B volumes do not meet the 80% criteria.
Warrant is NOT met.

Site Data Required

Number of crashes in last 12 months = **0**
Rural Settings Apply = **True**
Number of Major Lanes = **1**
Number of Minor Lanes = **1**

Crash and Volume Requirements

Minimum number of crashes = **5**
Rural Factor of 70 % applied
Veh/Hr Major: War 1A = **280** War 1B = **420**
Veh/Hr Minor: War 1A = **84** War 1B = **42**

Volume and Pedestrian Data

Hours data meets 80% requirements of Warrant 1A (8 needed) **0** Met? **No**
Hours data meets 80% requirements of Warrant 1B (8 needed) **7** Met? **No**
Hours data meets 80% requirements of Warrant 4 (4,1 needed) **0** Met? **No**

Time	Major Road Washington St				Total	Minor Road Old 163		Met1A?
	Major EB	+	Major WB	=		Minor NB	Minor SB	
15:45 - 16:45	476	+	701	=	1177	0	65	No
16:15 - 17:15	487	+	664	=	1151	0	65	No
16:00 - 17:00	473	+	673	=	1146	0	62	No
15:30 - 16:30	461	+	665	=	1126	0	64	No
16:30 - 17:30	486	+	635	=	1121	0	75	No
15:15 - 16:15	449	+	633	=	1082	0	64	No
16:45 - 17:45	475	+	592	=	1067	0	71	No
17:00 - 18:00	464	+	562	=	1026	0	71	No
15:00 - 16:00	434	+	577	=	1011	0	43	No
14:45 - 15:45	439	+	560	=	999	0	46	No
12:00 - 13:00	472	+	510	=	982	0	58	No
14:30 - 15:30	427	+	539	=	966	0	40	No

Warrant 1B Details

Time	Major EB	+	Major WB	=	Total	Minor NB	Minor SB	Met1B?
15:45 - 16:45	476	+	701	=	1177	0	65	Yes
16:45 - 17:45	475	+	592	=	1067	0	71	Yes
14:45 - 15:45	439	+	560	=	999	0	46	Yes
11:15 - 12:15	472	+	485	=	957	0	66	Yes
12:15 - 13:15	435	+	503	=	938	0	64	Yes
07:00 - 08:00	500	+	295	=	795	0	42	Yes
10:15 - 11:15	348	+	337	=	685	0	48	Yes
14:30 - 15:30	427	+	539	=	966	0	40	No
14:15 - 15:15	404	+	523	=	927	0	35	No
14:00 - 15:00	408	+	517	=	925	0	35	No
17:45 - 18:45	413	+	466	=	879	0	37	No
13:45 - 14:45	390	+	473	=	863	0	35	No

Traffic Signal Warrant
 Washington St & Old 163
 Existing Conditions 2023

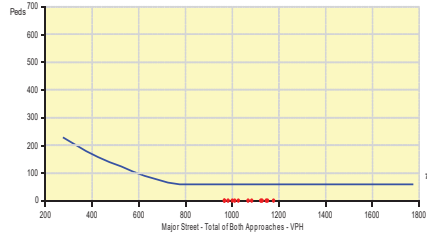
Study Name: Pella Kwik Star Old 163 Existing
 Study Date : 10/29/2023

Warrant 7 - Crash Experience

Major Road
Washington St

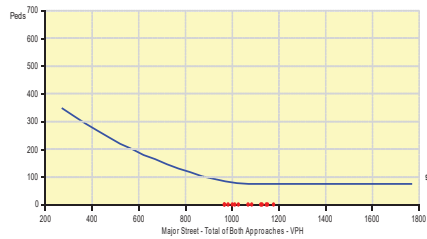
80% of Warrant 4 - 4 Hr Pedestrian Data

Time	EB Vehs	WB Vehs	Total Vehs	EB Peds	WB Peds	Ped Total	Met?
15:45 - 16:45	476	701	1177	0	0	0	No
16:15 - 17:15	487	664	1151	0	0	0	No
16:00 - 17:00	473	673	1146	0	0	0	No
15:30 - 16:30	461	665	1126	0	0	0	No
16:30 - 17:30	486	635	1121	0	0	0	No
15:15 - 16:15	449	633	1082	0	0	0	No
16:45 - 17:45	475	592	1067	0	0	0	No
17:00 - 18:00	464	562	1026	0	0	0	No
15:00 - 16:00	434	577	1011	0	0	0	No
14:45 - 15:45	439	560	999	0	0	0	No
12:00 - 13:00	472	510	982	0	0	0	No
14:30 - 15:30	427	539	966	0	0	0	No



80% of Warrant 4 - 1 Hr Pedestrian Data

Time	EB Vehs	WB Vehs	Total Vehs	EB Peds	WB Peds	Ped Total	Met?
15:45 - 16:45	476	701	1177	0	0	0	No
16:15 - 17:15	487	664	1151	0	0	0	No
16:00 - 17:00	473	673	1146	0	0	0	No
15:30 - 16:30	461	665	1126	0	0	0	No
16:30 - 17:30	486	635	1121	0	0	0	No
15:15 - 16:15	449	633	1082	0	0	0	No
16:45 - 17:45	475	592	1067	0	0	0	No
17:00 - 18:00	464	562	1026	0	0	0	No
15:00 - 16:00	434	577	1011	0	0	0	No
14:45 - 15:45	439	560	999	0	0	0	No
12:00 - 13:00	472	510	982	0	0	0	No
14:30 - 15:30	427	539	966	0	0	0	No



Traffic Signal Warrant
 Washington St & Old 163
 Opening Conditions 2024

Study Name: Pella Kwik Star Old 163 Opening
 Study Date : 10/29/2023

Signal Warrants - Summary

Major Street Approaches

Eastbound: Washington St
 Number of Lanes : 1

Total Approach Volume: 6,301

Westbound: Washington St
 Number of Lanes : 1

Total Approach Volume: 7,056

Minor Street Approaches

Northbound: Old 163
 Number of Lanes : 1

Total Approach Volume: 0

Southbound: Old 163
 Number of Lanes : 1

Total Approach Volume: 664

Warrant Summary (Rural Values Apply)

- Warrant 1 - Eight Hour Vehicular Volumes.....**Not Satisfied**
- Warrant 1A - Minimum Vehicular Volume.....**Not Satisfied**
 Required volumes reached for 0 hours, 8 are needed
- Warrant 1B - Interruption of Continuous Traffic.....**Not Satisfied**
 Required volumes reached for 5 hours, 8 are needed
- Warrant 1C - Combination of Warrants.....**Not Satisfied**
 Required 1A volumes reached for 0 hours, 8 are needed
 Required 1B volumes reached for 7 hours, 8 are needed
- Warrant 2 - Four Hour Volumes.....**Satisfied**
 Number of hours (4) volumes exceed minimum >= minimum required (4).
- Warrant 3 - Peak Hour.....**Satisfied**
- Warrant 3A - Peak Hour Delay.....**Not Satisfied**
 Approach volumes on minor street don't exceed minimums for any one hour period. Delay data not evaluated.
- Warrant 3B - Peak Hour Volumes.....**Satisfied**
 Volumes exceed minimums for at least one hour period.
- Warrant 4 - Pedestrian Volumes.....**Not Evaluated**
- Warrant 5 - School Crossing.....**Not Evaluated**
- Warrant 6 - Coordinated Signal System.....**Not Evaluated**
- Warrant 7 - Crash Experience.....**Not Satisfied**
 Number of accidents (0) is less than minimum (5). Volume minimums are not met.
- Warrant 8 - Roadway Network.....**Not Evaluated**
- Warrant 9 - Intersection Near a Grade Crossing.....**Not Evaluated**

Traffic Signal Warrant
Washington St & Old 163
 Opening Conditions 2024

Study Name: Pella Kwik Star Old 163 Opening
 Study Date : 10/29/2023

Warrant 1A - Minimum Volumes

Description

Intended for sites where the volume of intersecting traffic is the principal reason for consideration of a signal installation.

Summary

Only 0 one hour periods meet minimums. Warrant is NOT met.

Site Data Required

Rural Settings Apply = **True**
 Number of Major Lanes = 1
 Number of Minor Lanes = 1

Volume Requirements

Rural Factor of 70 % applied
 Veh/Hr Major = **350**
 Veh/Hr Minor = **105**

Time	Major Road Washington St			=	Total	Minor Road Old 163		Met?
	Major EB	+	Major WB			Minor NB	Minor SB	
15:45 - 16:45	678	+	745	=	1423	0	65	No
16:00 - 17:00	664	+	715	=	1379	0	62	No
16:15 - 17:15	651	+	707	=	1358	0	65	No
15:30 - 16:30	645	+	712	=	1357	0	64	No
16:30 - 17:30	653	+	674	=	1327	0	75	No
15:15 - 16:15	604	+	679	=	1283	0	64	No
16:45 - 17:45	634	+	634	=	1268	0	71	No
17:00 - 18:00	625	+	603	=	1228	0	71	No
15:00 - 16:00	550	+	627	=	1177	0	43	No
17:15 - 18:15	593	+	567	=	1160	0	47	No
14:45 - 15:45	545	+	609	=	1154	0	46	No
11:45 - 12:45	545	+	557	=	1102	0	55	No
17:30 - 18:30	554	+	545	=	1099	0	37	No
12:00 - 13:00	544	+	555	=	1099	0	58	No
14:30 - 15:30	497	+	588	=	1085	0	40	No
11:30 - 12:30	530	+	534	=	1064	0	64	No
14:15 - 15:15	479	+	572	=	1051	0	35	No
12:15 - 13:15	502	+	546	=	1048	0	64	No
11:15 - 12:15	519	+	519	=	1038	0	66	No
14:00 - 15:00	456	+	565	=	1021	0	35	No
17:45 - 18:45	494	+	506	=	1000	0	37	No
12:30 - 13:30	470	+	519	=	989	0	64	No
18:00 - 19:00	467	+	494	=	961	0	35	No
11:00 - 12:00	473	+	482	=	955	0	68	No
13:45 - 14:45	418	+	517	=	935	0	35	No

Traffic Signal Warrant
Washington St & Old 163
 Opening Conditions 2024

Study Name: Pella Kwik Star Old 163 Opening
 Study Date : 10/29/2023

Warrant 1B - Interruption of Continuous Traffic

Description

Intended for sites where the volume of the major street is so heavy that traffic on the minor street suffers excessive delay or hazard.

Summary

Only 5 one hour periods meet minimums. Warrant is NOT met.

Site Data Required

Rural Settings Apply = **True**
 Number of Major Lanes = 1
 Number of Minor Lanes = 1

Volume Requirements

Rural Factor of 70 % applied
 Veh/Hr Major = **525**
 Veh/Hr Minor = **52**

Time	Major Road Washington St			=	Total	Minor Road Old 163		Met?
	Major EB	+	Major WB			Minor NB	Minor SB	
16:15 - 17:15	651	+	707	=	1358	0	65	Yes
15:15 - 16:15	604	+	679	=	1283	0	64	Yes
11:45 - 12:45	545	+	557	=	1102	0	55	Yes
12:45 - 13:45	426	+	482	=	908	0	60	Yes
10:45 - 11:45	431	+	444	=	875	0	56	Yes
15:00 - 16:00	550	+	627	=	1177	0	43	No
17:15 - 18:15	593	+	567	=	1160	0	47	No
14:45 - 15:45	545	+	609	=	1154	0	46	No
17:30 - 18:30	554	+	545	=	1099	0	37	No
14:30 - 15:30	497	+	588	=	1085	0	40	No
14:15 - 15:15	479	+	572	=	1051	0	35	No
14:00 - 15:00	456	+	565	=	1021	0	35	No
17:45 - 18:45	494	+	506	=	1000	0	37	No
18:00 - 19:00	467	+	494	=	961	0	35	No
13:45 - 14:45	418	+	517	=	935	0	35	No
18:15 - 19:15	433	+	466	=	899	0	32	No
10:30 - 11:30	404	+	414	=	818	0	46	No
18:30 - 19:30	362	+	420	=	782	0	26	No
10:15 - 11:15	344	+	366	=	710	0	48	No
18:45 - 19:45	321	+	381	=	702	0	20	No
07:45 - 08:45	310	+	355	=	665	0	39	No
07:15 - 08:15	309	+	341	=	650	0	48	No
19:00 - 20:00	283	+	354	=	637	0	17	No
08:00 - 09:00	287	+	349	=	636	0	39	No
08:15 - 09:15	283	+	349	=	632	0	34	No

Traffic Signal Warrant Washington St & Old 163 Opening Conditions 2024

Study Name: Pella Kwik Star Old 163 Opening
Study Date : 10/29/2023

Warrant 1C Combination of Warrants

Description

Intended for sites where the traffic volumes don't meet individual warrants but where Warrants 1A and 1B are both met to 80% of their stated values.

Summary

Only 0 hours meet 1A minimums.
Only 7 hours meet 1B minimums.
Warrant is NOT met.

Site Data Required

Rural Settings Apply = True
Number of Major Lanes = 1
Number of Minor Lanes = 1

Volume Requirements

Rural Factor of 70% applied
Warrant 1A 1B
Veh/Hr Major = 280 420

Veh/Hr Minor = 84 42

Time	Major Road Washington St				Total	Minor Road Old 163		Met1A?
	Major EB	+	Major WB	=		Minor NB	Minor SB	
15:45 - 16:45	678	+	745	=	1423	0	65	No
16:00 - 17:00	664	+	715	=	1379	0	62	No
16:15 - 17:15	651	+	707	=	1358	0	65	No
15:30 - 16:30	645	+	712	=	1357	0	64	No
16:30 - 17:30	653	+	674	=	1327	0	75	No
15:15 - 16:15	604	+	679	=	1283	0	64	No
16:45 - 17:45	634	+	634	=	1268	0	71	No
17:00 - 18:00	625	+	603	=	1228	0	71	No
15:00 - 16:00	550	+	627	=	1177	0	43	No
17:15 - 18:15	593	+	567	=	1160	0	47	No
14:45 - 15:45	545	+	609	=	1154	0	46	No
11:45 - 12:45	545	+	557	=	1102	0	55	No

Time	Major Road				Total	Minor Road		Met1B?
	Major EB	+	Major WB	=		Minor NB	Minor SB	
15:45 - 16:45	678	+	745	=	1423	0	65	Yes
16:45 - 17:45	634	+	634	=	1268	0	71	Yes
14:45 - 15:45	545	+	609	=	1154	0	46	Yes
12:15 - 13:15	502	+	546	=	1048	0	64	Yes
11:15 - 12:15	519	+	519	=	1038	0	66	Yes
10:15 - 11:15	344	+	366	=	710	0	48	Yes
07:00 - 08:00	291	+	336	=	627	0	42	Yes
14:30 - 15:30	497	+	588	=	1085	0	40	No
14:15 - 15:15	479	+	572	=	1051	0	35	No
14:00 - 15:00	456	+	565	=	1021	0	35	No
17:45 - 18:45	494	+	506	=	1000	0	37	No
18:00 - 19:00	467	+	494	=	961	0	35	No

Traffic Signal Warrant Washington St & Old 163 Opening Conditions 2024

Study Name: Pella Kwik Star Old 163 Opening
Study Date : 10/29/2023

Warrant 2 - Four Hour Volumes

Description

Intended for sites where the volume of intersecting traffic during any four hours of the day is the principal reason for consideration of a signal installation.

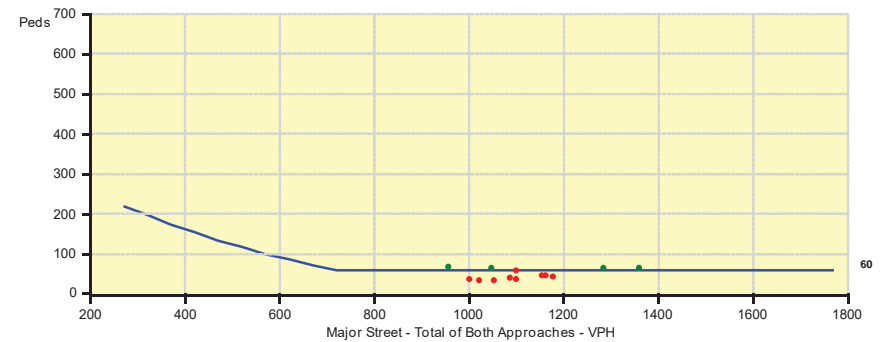
Summary

4 one hour periods meet minimums.
Warrant IS met.

Site Data Required

Rural Settings Apply = True
Number of Major Lanes = 1
Number of Minor Lanes = 1

Time	Major Road Washington St				Total	Minor Road Old 163		Met?
	Major EB	+	Major WB	=		Minor NB	Minor SB	
16:15 - 17:15	651	+	707	=	1358	0	65	Yes
15:15 - 16:15	604	+	679	=	1283	0	64	Yes
12:15 - 13:15	502	+	546	=	1048	0	64	Yes
11:00 - 12:00	473	+	482	=	955	0	68	Yes
15:00 - 16:00	550	+	627	=	1177	0	43	No
17:15 - 18:15	593	+	567	=	1160	0	47	No
14:45 - 15:45	545	+	609	=	1154	0	46	No
17:30 - 18:30	554	+	545	=	1099	0	37	No
12:00 - 13:00	544	+	555	=	1099	0	58	No
14:30 - 15:30	497	+	588	=	1085	0	40	No
14:15 - 15:15	479	+	572	=	1051	0	35	No
14:00 - 15:00	456	+	565	=	1021	0	35	No



Traffic Signal Warrant Washington St & Old 163 Opening Conditions 2024

Study Name: Pella Kwik Star Old 163 Opening
Study Date : 10/29/2023

Warrant 3A - Peak Hour Delay

Description

Intended for sites where for one hour of the day minor street traffic suffers undue traffic delay entering or crossing the major street.

Summary

33 one hour periods meet minimums. Warrant is NOT met.

Site Data Required

Number of Minor Lanes = 1

Volume and Delay Requirements

Veh/Hr All Approaches = 800
Veh/Hr Minor = 100
Total Delay (Veh-Hrs) = 4

Time	Major Road Washington St			Minor Road Old 163			Warrant Met?		
	Total of All Approaches	Met?	Minor NB	Delay NB	Met?	Minor SB		Delay SB	
15:45 - 16:45	1488	Yes	0	-	---	65	-	No	No
16:00 - 17:00	1441	Yes	0	-	---	62	-	No	No
16:15 - 17:15	1423	Yes	0	-	---	65	-	No	No
15:30 - 16:30	1421	Yes	0	-	---	64	-	No	No
16:30 - 17:30	1402	Yes	0	-	---	75	-	No	No
15:15 - 16:15	1347	Yes	0	-	---	64	-	No	No
16:45 - 17:45	1339	Yes	0	-	---	71	-	No	No
17:00 - 18:00	1299	Yes	0	-	---	71	-	No	No
15:00 - 16:00	1220	Yes	0	-	---	43	-	No	No
17:15 - 18:15	1207	Yes	0	-	---	47	-	No	No
14:45 - 15:45	1200	Yes	0	-	---	46	-	No	No
11:45 - 12:45	1157	Yes	0	-	---	55	-	No	No
12:00 - 13:00	1157	Yes	0	-	---	58	-	No	No
17:30 - 18:30	1136	Yes	0	-	---	37	-	No	No
11:30 - 12:30	1128	Yes	0	-	---	64	-	No	No
14:30 - 15:30	1125	Yes	0	-	---	40	-	No	No
12:15 - 13:15	1112	Yes	0	-	---	64	-	No	No
11:15 - 12:15	1104	Yes	0	-	---	66	-	No	No
14:15 - 15:15	1086	Yes	0	-	---	35	-	No	No
14:00 - 15:00	1056	Yes	0	-	---	35	-	No	No
12:30 - 13:30	1053	Yes	0	-	---	64	-	No	No
17:45 - 18:45	1037	Yes	0	-	---	37	-	No	No
11:00 - 12:00	1023	Yes	0	-	---	68	-	No	No
18:00 - 19:00	996	Yes	0	-	---	35	-	No	No
13:45 - 14:45	970	Yes	0	-	---	35	-	No	No

Traffic Signal Warrant Washington St & Old 163 Opening Conditions 2024

Study Name: Pella Kwik Star Old 163 Opening
Study Date : 10/29/2023

Warrant 3B - Peak Hour Volumes

Description

Intended for sites where the volume of intersecting traffic during one hour of the day is the principal reason for consideration of a signal installation.

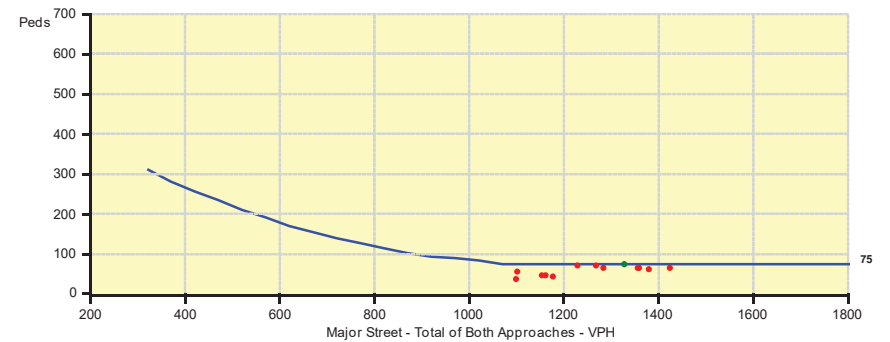
Summary

1 one hour periods meet minimums. Warrant IS met.

Site Data Required

Rural Settings Apply = True
Number of Major Lanes = 1
Number of Minor Lanes = 1

Time	Major Road Washington St				Total	Minor Road Old 163		Met?
	Major EB	+	Major WB	=		Minor NB	Minor SB	
16:30 - 17:30	653	+	674	=	1327	0	75	Yes
15:45 - 16:45	678	+	745	=	1423	0	65	No
16:00 - 17:00	664	+	715	=	1379	0	62	No
16:15 - 17:15	651	+	707	=	1358	0	65	No
15:30 - 16:30	645	+	712	=	1357	0	64	No
15:15 - 16:15	604	+	679	=	1283	0	64	No
16:45 - 17:45	634	+	634	=	1268	0	71	No
17:00 - 18:00	625	+	603	=	1228	0	71	No
15:00 - 16:00	550	+	627	=	1177	0	43	No
17:15 - 18:15	593	+	567	=	1160	0	47	No
14:45 - 15:45	545	+	609	=	1154	0	46	No
11:45 - 12:45	545	+	557	=	1102	0	55	No



Traffic Signal Warrant
Washington St & Old 163
 Opening Conditions 2024

Study Name: Pella Kwik Star Old 163 Opening
 Study Date : 10/29/2023

Warrant 7 - Crash Experience

Description

Intended for sites where the frequency of correctible crashes in the past 12 months is the primary motivation for installing a traffic signal.

Site Data Required

Number of crashes in last 12 months = **0**
 Rural Settings Apply = **True**
 Number of Major Lanes = **1**
 Number of Minor Lanes = **1**

Volume and Pedestrian Data

Hours data meets 80% requirements of Warrant 1A (8 needed) **0** Met? **No**
 Hours data meets 80% requirements of Warrant 1B (8 needed) **7** Met? **No**
 Hours data meets 80% requirements of Warrant 4 (4,1 needed) **0** Met? **No**

Summary

Number of crashes does not meet minimum.
 Pedestrian volumes do not meet the 80% criteria.
 War 1A or 1B volumes do not meet the 80% criteria.
 Warrant is NOT met.

Crash and Volume Requirements

Minimum number of crashes = **5**
 Rural Factor of 70 % applied
 Veh/Hr Major: War 1A = **280** War 1B = **420**
 Veh/Hr Minor: War 1A = **84** War 1B = **42**

Major Road
Washington St

Minor Road
Old 163

Warrant 1A Details

Time	Major EB	+	Major WB	=	Total	Minor NB	Minor SB	Met1A?
15:45 - 16:45	678	+	745	=	1423	0	65	No
16:00 - 17:00	664	+	715	=	1379	0	62	No
16:15 - 17:15	651	+	707	=	1358	0	65	No
15:30 - 16:30	645	+	712	=	1357	0	64	No
16:30 - 17:30	653	+	674	=	1327	0	75	No
15:15 - 16:15	604	+	679	=	1283	0	64	No
16:45 - 17:45	634	+	634	=	1268	0	71	No
17:00 - 18:00	625	+	603	=	1228	0	71	No
15:00 - 16:00	550	+	627	=	1177	0	43	No
17:15 - 18:15	593	+	567	=	1160	0	47	No
14:45 - 15:45	545	+	609	=	1154	0	46	No
11:45 - 12:45	545	+	557	=	1102	0	55	No

Warrant 1B Details

Time	Major EB	+	Major WB	=	Total	Minor NB	Minor SB	Met1B?
15:45 - 16:45	678	+	745	=	1423	0	65	Yes
16:45 - 17:45	634	+	634	=	1268	0	71	Yes
14:45 - 15:45	545	+	609	=	1154	0	46	Yes
12:15 - 13:15	502	+	546	=	1048	0	64	Yes
11:15 - 12:15	519	+	519	=	1038	0	66	Yes
10:15 - 11:15	344	+	366	=	710	0	48	Yes
07:00 - 08:00	291	+	336	=	627	0	42	Yes
14:30 - 15:30	497	+	588	=	1085	0	40	No
14:15 - 15:15	479	+	572	=	1051	0	35	No
14:00 - 15:00	456	+	565	=	1021	0	35	No
17:45 - 18:45	494	+	506	=	1000	0	37	No
18:00 - 19:00	467	+	494	=	961	0	35	No

Traffic Signal Warrant
Washington St & Old 163
 Opening Conditions 2024

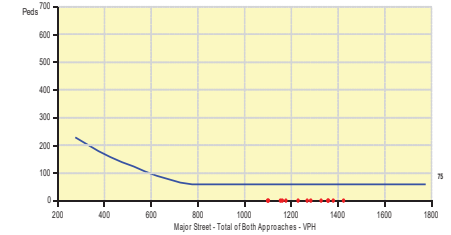
Study Name: Pella Kwik Star Old 163 Opening
 Study Date : 10/29/2023

Warrant 7 - Crash Experience

Major Road
Washington St

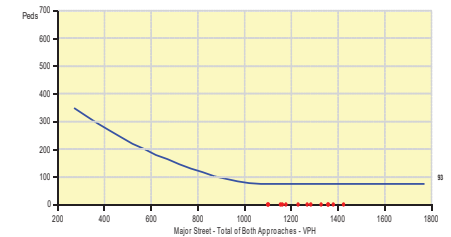
80% of Warrant 4 - 4 Hr Pedestrian Data

Time	EB Vehs	WB Vehs	Total Vehs	EB Peds	WB Peds	Ped Total	Met?
15:45 - 16:45	678	745	1423	0	0	0	No
16:00 - 17:00	664	715	1379	0	0	0	No
16:15 - 17:15	651	707	1358	0	0	0	No
15:30 - 16:30	645	712	1357	0	0	0	No
16:30 - 17:30	653	674	1327	0	0	0	No
15:15 - 16:15	604	679	1283	0	0	0	No
16:45 - 17:45	634	634	1268	0	0	0	No
17:00 - 18:00	625	603	1228	0	0	0	No
15:00 - 16:00	550	627	1177	0	0	0	No
17:15 - 18:15	593	567	1160	0	0	0	No
14:45 - 15:45	545	609	1154	0	0	0	No
11:45 - 12:45	545	557	1102	0	0	0	No



80% of Warrant 4 - 1 Hr Pedestrian Data

Time	EB Vehs	WB Vehs	Total Vehs	EB Peds	WB Peds	Ped Total	Met?
15:45 - 16:45	678	745	1423	0	0	0	No
16:00 - 17:00	664	715	1379	0	0	0	No
16:15 - 17:15	651	707	1358	0	0	0	No
15:30 - 16:30	645	712	1357	0	0	0	No
16:30 - 17:30	653	674	1327	0	0	0	No
15:15 - 16:15	604	679	1283	0	0	0	No
16:45 - 17:45	634	634	1268	0	0	0	No
17:00 - 18:00	625	603	1228	0	0	0	No
15:00 - 16:00	550	627	1177	0	0	0	No
17:15 - 18:15	593	567	1160	0	0	0	No
14:45 - 15:45	545	609	1154	0	0	0	No
11:45 - 12:45	545	557	1102	0	0	0	No



HCM 6th Signalized Intersection Summary
1: 15th St/IA 163 SB Ramp & Washington St

03/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	130	310	5	40	180	40	160	10	40	5	15	35
Future Volume (veh/h)	130	310	5	40	180	40	160	10	40	5	15	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	141	337	5	43	196	43	174	11	43	5	16	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	589	538	8	485	334	73	514	17	281	150	88	180
Arrive On Green	0.12	0.29	0.29	0.05	0.22	0.22	0.18	0.18	0.18	0.18	0.18	0.18
Sat Flow, veh/h	1781	1838	27	1781	1486	326	1501	95	1585	64	498	1017
Grp Volume(v), veh/h	141	0	342	43	0	239	185	0	43	59	0	0
Grp Sat Flow(s),veh/h/ln	1781	0	1865	1781	0	1812	1596	0	1585	1579	0	0
Q Serve(g_s), s	1.6	0.0	4.5	0.5	0.0	3.3	0.0	0.0	0.6	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.6	0.0	4.5	0.5	0.0	3.3	2.7	0.0	0.6	2.7	0.0	0.0
Prop In Lane	1.00		0.01	1.00		0.18	0.94		1.00	0.08		0.64
Lane Grp Cap(c), veh/h	589	0	546	485	0	407	531	0	281	418	0	0
V/C Ratio(X)	0.24	0.00	0.63	0.09	0.00	0.59	0.35	0.00	0.15	0.14	0.00	0.00
Avail Cap(c_a), veh/h	726	0	1226	711	0	1159	1166	0	1014	1172	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	6.8	0.0	8.6	7.7	0.0	9.7	10.6	0.0	9.8	9.9	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.2	0.1	0.0	1.3	0.4	0.0	0.3	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	1.2	0.1	0.0	1.0	0.7	0.0	0.2	0.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.0	0.0	9.8	7.8	0.0	11.1	11.0	0.0	10.0	10.0	0.0	0.0
LnGrp LOS	A	A	A	A	A	B	B	A	B	B	A	A
Approach Vol, veh/h		483			282			228			59	
Approach Delay, s/veh		9.0			10.6			10.8			10.0	
Approach LOS		A			B			B			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		9.5	5.9	12.7		9.5	7.8	10.8				
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		18.0	5.0	18.5		18.0	5.5	18.0				
Max Q Clear Time (g_c+I1), s		4.7	2.5	6.5		4.7	3.6	5.3				
Green Ext Time (p_c), s		0.2	0.0	1.5		0.9	0.1	1.0				
Intersection Summary												
HCM 6th Ctrl Delay			9.9									
HCM 6th LOS			A									

HCM 6th TWSC
2: Washington St & IA 163 NB Ramp

03/05/2024

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	WBT	WBR	SEL	SER						
Lane Configurations		↔	↔	↔	↔	↔						
Traffic Vol, veh/h	35	470	190	110	60	60						
Future Vol, veh/h	35	470	190	110	60	60						
Conflicting Peds, #/hr	0	0	0	0	0	0						
Sign Control	Free	Free	Free	Free	Stop	Stop						
RT Channelized	-	None	-	None	-	None						
Storage Length	-	-	-	200	0	-						
Veh in Median Storage, #	-	0	0	-	0	-						
Grade, %	-	0	0	-	0	-						
Peak Hour Factor	92	92	92	92	92	92						
Heavy Vehicles, %	2	2	2	2	2	2						
Mvmt Flow	38	511	207	120	65	65						
Major/Minor	Major1	Major2	Minor2									
Conflicting Flow All	327	0	0	794	207							
Stage 1	-	-	-	207	-							
Stage 2	-	-	-	587	-							
Critical Hdwy	4.12	-	-	6.42	6.22							
Critical Hdwy Stg 1	-	-	-	5.42	-							
Critical Hdwy Stg 2	-	-	-	5.42	-							
Follow-up Hdwy	2.218	-	-	3.518	3.318							
Pot Cap-1 Maneuver	1233	-	-	357	833							
Stage 1	-	-	-	828	-							
Stage 2	-	-	-	556	-							
Platoon blocked, %	-	-	-	-	-							
Mov Cap-1 Maneuver	1233	-	-	342	833							
Mov Cap-2 Maneuver	-	-	-	342	-							
Stage 1	-	-	-	792	-							
Stage 2	-	-	-	556	-							
Approach	EB	WB	SE									
HCM Control Delay, s	0.6	0	15.1									
HCM LOS			C									
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SELn1							
Capacity (veh/h)	1233	-	-	-	485							
HCM Lane V/C Ratio	0.031	-	-	-	0.269							
HCM Control Delay (s)	8	0	-	-	15.1							
HCM Lane LOS	A	A	-	-	C							
HCM 95th %tile Q(veh)	0.1	-	-	-	1.1							

HCM 6th TWSC
3: Washington St & Old 163

03/05/2024

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↕	↕	↕	↕
Traffic Vol, veh/h	40	490	280	20	30	20
Future Vol, veh/h	40	490	280	20	30	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	25	0	25
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	43	533	304	22	33	22
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	326	0	0	923	304	
Stage 1	-	-	-	304	-	
Stage 2	-	-	-	619	-	
Critical Hdwy	4.12	-	-	6.42	6.22	
Critical Hdwy Stg 1	-	-	-	5.42	-	
Critical Hdwy Stg 2	-	-	-	5.42	-	
Follow-up Hdwy	2.218	-	-	3.518	3.318	
Pot Cap-1 Maneuver	1234	-	-	299	736	
Stage 1	-	-	-	748	-	
Stage 2	-	-	-	537	-	
Platoon blocked, %	-	-	-	-	-	
Mov Cap-1 Maneuver	1234	-	-	284	736	
Mov Cap-2 Maneuver	-	-	-	284	-	
Stage 1	-	-	-	711	-	
Stage 2	-	-	-	537	-	
Approach	EB	WB	SB			
HCM Control Delay, s	0.6	0	15.6			
HCM LOS			C			
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1234	-	-	-	284	736
HCM Lane V/C Ratio	0.035	-	-	-	0.115	0.03
HCM Control Delay (s)	8	0	-	-	19.3	10
HCM Lane LOS	A	A	-	-	C	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.4	0.1

2023 AM Peak Existing Conditions

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th Signalized Intersection Summary
1: 15th St/IA 163 SB Ramp & Washington St

03/05/2024

	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↕	↕		↕	↕			↕	↕		↕	↕
Traffic Volume (veh/h)	80	310	5	40	490	80	170	5	50	10	10	30
Future Volume (veh/h)	80	310	5	40	490	80	170	5	50	10	10	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	87	337	5	43	533	87	185	5	54	11	11	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	377	794	12	564	633	103	407	7	336	117	97	172
Arrive On Green	0.07	0.43	0.43	0.05	0.40	0.40	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1781	1838	27	1781	1568	256	1152	31	1585	82	459	812
Grp Volume(v), veh/h	87	0	342	43	0	620	190	0	54	55	0	0
Grp Sat Flow(s),veh/h/ln	1781	0	1865	1781	0	1824	1183	0	1585	1353	0	0
Q Serve(g_s), s	1.2	0.0	5.6	0.6	0.0	13.4	0.3	0.0	1.2	0.1	0.0	0.0
Cycle Q Clear(g_c), s	1.2	0.0	5.6	0.6	0.0	13.4	7.0	0.0	1.2	6.9	0.0	0.0
Prop In Lane	1.00		0.01	1.00		0.14	0.97		1.00	0.20		0.60
Lane Grp Cap(c), veh/h	377	0	805	564	0	736	414	0	336	386	0	0
V/C Ratio(X)	0.23	0.00	0.42	0.08	0.00	0.84	0.46	0.00	0.16	0.14	0.00	0.00
Avail Cap(c_a), veh/h	454	0	964	690	0	943	719	0	688	736	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.5	0.0	8.6	7.0	0.0	11.7	16.3	0.0	14.0	14.0	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.4	0.1	0.0	5.6	0.8	0.0	0.2	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	1.7	0.2	0.0	5.0	1.6	0.0	0.4	0.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.8	0.0	9.0	7.0	0.0	17.3	17.1	0.0	14.2	14.2	0.0	0.0
LnGrp LOS	A	A	A	A	A	B	B	A	B	B	A	A
Approach Vol, veh/h	429			663			244			55		
Approach Delay, s/veh	8.9			16.7			16.5			14.2		
Approach LOS	A			B			B			B		
Timer - Assigned Phs	2	3	4	6	7	8						
Phs Duration (G+Y+Rc), s	13.9	6.5	23.4	13.9	7.7	22.1						
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5						
Max Green Setting (Gmax), s	18.9	5.1	22.5	18.9	5.1	22.5						
Max Q Clear Time (g_c+I1), s	8.9	2.6	7.6	9.0	3.2	15.4						
Green Ext Time (p_c), s	0.1	0.0	1.7	0.8	0.0	2.3						
Intersection Summary												
HCM 6th Ctrl Delay	14.1											
HCM 6th LOS	B											

2023 PM Peak Existing Conditions

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th TWSC
2: Washington St & IA 163 NB Ramp

03/05/2024

Intersection						
Int Delay, s/veh	2.5					
Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↕	↑	↕	↕	↕
Traffic Vol, veh/h	60	460	510	190	30	110
Future Vol, veh/h	60	460	510	190	30	110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	200	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	65	500	554	207	33	120
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	761	0	0	1184	554	
Stage 1	-	-	-	554	-	
Stage 2	-	-	-	630	-	
Critical Hdwy	4.12	-	-	6.42	6.22	
Critical Hdwy Stg 1	-	-	-	5.42	-	
Critical Hdwy Stg 2	-	-	-	5.42	-	
Follow-up Hdwy	2.218	-	-	3.518	3.318	
Pot Cap-1 Maneuver	851	-	-	209	532	
Stage 1	-	-	-	575	-	
Stage 2	-	-	-	531	-	
Platoon blocked, %	-	-	-	-	-	
Mov Cap-1 Maneuver	851	-	-	187	532	
Mov Cap-2 Maneuver	-	-	-	187	-	
Stage 1	-	-	-	514	-	
Stage 2	-	-	-	531	-	
Approach	EB	WB	SE			
HCM Control Delay, s	1.1	0	20.6			
HCM LOS	C					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SELn1	SERn2
Capacity (veh/h)	851	-	-	-	381	
HCM Lane V/C Ratio	0.077	-	-	-	0.399	
HCM Control Delay (s)	9.6	0	-	-	20.6	
HCM Lane LOS	A	A	-	-	C	
HCM 95th %tile Q(veh)	0.2	-	-	-	1.9	

2023 PM Peak Existing Conditions

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th TWSC
3: Washington St & Old 163

03/05/2024

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↑	↕	↕	↕
Traffic Vol, veh/h	30	450	670	40	30	30
Future Vol, veh/h	30	450	670	40	30	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	25	0	25
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	489	728	43	33	33
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	771	0	0	1283	728	
Stage 1	-	-	-	728	-	
Stage 2	-	-	-	555	-	
Critical Hdwy	4.12	-	-	6.42	6.22	
Critical Hdwy Stg 1	-	-	-	5.42	-	
Critical Hdwy Stg 2	-	-	-	5.42	-	
Follow-up Hdwy	2.218	-	-	3.518	3.318	
Pot Cap-1 Maneuver	844	-	-	182	423	
Stage 1	-	-	-	478	-	
Stage 2	-	-	-	575	-	
Platoon blocked, %	-	-	-	-	-	
Mov Cap-1 Maneuver	844	-	-	172	423	
Mov Cap-2 Maneuver	-	-	-	172	-	
Stage 1	-	-	-	452	-	
Stage 2	-	-	-	575	-	
Approach	EB	WB	SB			
HCM Control Delay, s	0.6	0	22.5			
HCM LOS	C					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	844	-	-	-	172	423
HCM Lane V/C Ratio	0.039	-	-	-	0.19	0.077
HCM Control Delay (s)	9.4	0	-	-	30.8	14.2
HCM Lane LOS	A	A	-	-	D	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.7	0.2

2023 PM Peak Existing Conditions

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th Signalized Intersection Summary
1: 15th St/IA 163 SB Ramp & Washington St

03/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔		↔	↔
Traffic Volume (veh/h)	130	320	5	40	180	55	175	5	40	5	15	35
Future Volume (veh/h)	130	320	5	40	180	55	175	5	40	5	15	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	141	348	5	43	196	60	190	5	43	5	16	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	539	560	8	431	296	91	467	7	274	117	89	179
Arrive On Green	0.14	0.30	0.30	0.05	0.22	0.22	0.17	0.17	0.17	0.17	0.17	0.17
Sat Flow, veh/h	1781	1839	26	1781	1374	421	1568	41	1585	57	515	1036
Grp Volume(v), veh/h	141	0	353	43	0	256	195	0	43	59	0	0
Grp Sat Flow(s),veh/h/ln	1781	0	1866	1781	0	1795	1609	0	1585	1608	0	0
Q Serve(g_s), s	2.0	0.0	5.9	0.7	0.0	4.7	0.0	0.0	0.8	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.0	0.0	5.9	0.7	0.0	4.7	3.7	0.0	0.8	3.7	0.0	0.0
Prop In Lane	1.00		0.01	1.00		0.23	0.97		1.00	0.08		0.64
Lane Grp Cap(c), veh/h	539	0	568	431	0	386	474	0	274	386	0	0
V/C Ratio(X)	0.26	0.00	0.62	0.10	0.00	0.66	0.41	0.00	0.16	0.15	0.00	0.00
Avail Cap(c_a), veh/h	573	0	1008	590	0	935	921	0	795	921	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.4	0.0	10.8	10.2	0.0	13.0	13.9	0.0	12.8	12.9	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	1.1	0.1	0.0	2.0	0.6	0.0	0.3	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	1.9	0.2	0.0	1.6	1.2	0.0	0.3	0.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.7	0.0	11.9	10.3	0.0	15.0	14.5	0.0	13.0	13.0	0.0	0.0
LnGrp LOS	A	A	B	B	A	B	B	A	B	B	A	A
Approach Vol, veh/h		494			299			238			59	
Approach Delay, s/veh		11.0			14.3			14.2			13.0	
Approach LOS		B			B			B			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		12.8	6.7	16.8		12.8	9.9	13.6				
Change Period (Y+Rc), s		6.5	4.9	* 5.8		6.5	4.9	* 5.8				
Max Green Setting (Gmax), s		18.2	5.0	* 20		18.2	5.7	* 19				
Max Q Clear Time (g_c+I1), s		5.7	2.7	7.9		5.7	4.0	6.7				
Green Ext Time (p_c), s		0.2	0.0	1.5		0.9	0.1	1.1				

Intersection Summary												
HCM 6th Ctrl Delay				12.7								
HCM 6th LOS				B								

Notes
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
2: KS West/IA 163 NB Ramp & Washington St

03/05/2024

Intersection												
Int Delay, s/veh	13											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↔			↔	↔		↔			↔	↔
Traffic Vol, veh/h	35	430	65	70	175	110	50	40	55	65	40	40
Future Vol, veh/h	35	430	65	70	175	110	50	40	55	65	40	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	200	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	38	467	71	76	190	120	54	43	60	71	43	43
Major/Minor	Major1	Major2	Minor2	Minor1								
Conflicting Flow All	310	0	0	538	0	0	964	956	190	1033	1041	503
Stage 1	-	-	-	-	-	-	342	342	-	579	579	-
Stage 2	-	-	-	-	-	-	622	614	-	454	462	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1250	-	-	1030	-	-	235	258	852	211	230	569
Stage 1	-	-	-	-	-	-	673	638	-	501	501	-
Stage 2	-	-	-	-	-	-	474	483	-	586	565	-
Platoon blocked, %												
Mov Cap-1 Maneuver	1250	-	-	1030	-	-	163	224	852	151	200	569
Mov Cap-2 Maneuver	-	-	-	-	-	-	163	224	-	151	200	-
Stage 1	-	-	-	-	-	-	643	580	-	479	479	-
Stage 2	-	-	-	-	-	-	381	462	-	458	514	-
Approach	EB	WB	SE	NW								
HCM Control Delay, s	0.5		1.7				37			62.7		
HCM LOS			E							F		
Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR	SELn1				
Capacity (veh/h)	207	1250	-	-	1030	-	-	264				
HCM Lane V/C Ratio	0.761	0.03	-	-	0.074	-	-	0.597				
HCM Control Delay (s)	62.7	8	0	-	8.8	0	-	37				
HCM Lane LOS	F	A	A	-	A	A	-	E				
HCM 95th %tile Q(veh)	5.2	0.1	-	-	0.2	-	-	3.5				

HCM 6th TWSC
3: KS East /Old 163 & Washington St

03/05/2024

Intersection												
Int Delay, s/veh	2.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕											
Traffic Vol, veh/h	35	505	5	20	335	20	5	5	50	25	5	20
Future Vol, veh/h	35	505	5	20	335	20	5	5	50	25	5	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	25	-	-	-	-	-	25
Veh in Median Storage, #	-	0	-	-	0	-	-	-	0	-	-	0
Grade, %	-	0	-	-	0	-	-	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	38	549	5	22	364	22	5	5	54	27	5	22
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	386	0	0	554	0	0	1061	1058	552	1065	1038	364
Stage 1	-	-	-	-	-	-	628	628	-	408	408	-
Stage 2	-	-	-	-	-	-	433	430	-	657	630	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1172	-	-	1016	-	-	202	225	533	200	231	681
Stage 1	-	-	-	-	-	-	471	476	-	620	597	-
Stage 2	-	-	-	-	-	-	601	583	-	454	475	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1172	-	-	1016	-	-	181	208	533	166	214	681
Mov Cap-2 Maneuver	-	-	-	-	-	-	181	208	-	166	214	-
Stage 1	-	-	-	-	-	-	449	454	-	591	580	-
Stage 2	-	-	-	-	-	-	560	567	-	384	453	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0.5			15.4			22.7		
HCM LOS	C			C			C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2			
Capacity (veh/h)	412	1172	-	-	1016	-	-	172	681			
HCM Lane V/C Ratio	0.158	0.032	-	-	0.021	-	-	0.19	0.032			
HCM Control Delay (s)	15.4	8.2	0	-	8.6	0	-	30.8	10.5			
HCM Lane LOS	C	A	A	-	A	A	-	D	B			
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0.1	-	-	0.7	0.1			

2024 AM Peak Stop Open, No Roadway Improvement

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th Signalized Intersection Summary
1: 15th St/IA 163 SB Ramp & Washington St

03/05/2024

Movement												
	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕											
Traffic Volume (veh/h)	80	320	0	45	500	90	180	5	55	5	15	30
Future Volume (veh/h)	80	320	0	45	500	90	180	5	55	5	15	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No											
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	87	348	0	49	543	98	196	5	60	5	16	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	319	797	0	512	597	108	253	3	367	68	105	165
Arrive On Green	0.09	0.43	0.00	0.05	0.39	0.39	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	1781	1870	0	1781	1542	278	563	14	1585	0	452	710
Grp Volume(v), veh/h	87	348	0	49	0	641	201	0	60	54	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1781	0	1820	577	0	1585	1162	0	0
Q Serve(g_s), s	1.6	7.6	0.0	0.9	0.0	19.4	0.0	0.0	1.8	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.6	7.6	0.0	0.9	0.0	19.4	13.5	0.0	1.8	13.5	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.15	0.98		1.00	0.09		0.61
Lane Grp Cap(c), veh/h	319	797	0	512	0	705	256	0	367	337	0	0
V/C Ratio(X)	0.27	0.44	0.00	0.10	0.00	0.91	0.79	0.00	0.16	0.16	0.00	0.00
Avail Cap(c_a), veh/h	322	797	0	584	0	756	256	0	367	337	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	12.1	11.8	0.0	9.9	0.0	16.9	24.6	0.0	17.9	17.9	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.4	0.0	0.1	0.0	14.5	14.8	0.0	0.2	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	2.7	0.0	0.3	0.0	9.6	3.7	0.0	0.6	0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.6	12.2	0.0	9.9	0.0	31.3	39.5	0.0	18.1	18.1	0.0	0.0
LnGrp LOS	B	B	A	A	A	C	D	A	B	B	A	A
Approach Vol, veh/h	435			690			261			54		
Approach Delay, s/veh	12.3			29.8			34.5			18.1		
Approach LOS	B			C			C			B		
Timer - Assigned Phs	2		3		4		6		7		8	
Phs Duration (G+Y+Rc), s	20.0		7.6		30.6		20.0		9.9		28.3	
Change Period (Y+Rc), s	6.5		4.9		* 5.8		6.5		4.9		* 5.8	
Max Green Setting (Gmax), s	13.5		5.1		* 24		13.5		5.1		* 24	
Max Q Clear Time (g_c+I1), s	15.5		2.9		9.6		15.5		3.6		21.4	
Green Ext Time (p_c), s	0.0		0.0		1.7		0.0		0.0		1.1	
Intersection Summary												
HCM 6th Ctrl Delay	24.9											
HCM 6th LOS	C											
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

2024 PM Peak Stop Open, No Roadway Improvement

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th TWSC
2: KS West/IA 163 NB Ramp & Washington St

03/05/2024

Intersection												
Int Delay, s/veh	40.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↕		↕		↕		↕		↕		↕	
Traffic Vol, veh/h	60	420	60	65	490	190	15	35	95	60	35	35
Future Vol, veh/h	60	420	60	65	490	190	15	35	95	60	35	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	200	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	65	457	65	71	533	207	16	38	103	65	38	38

Major/Minor	Major1	Major2	Minor2	Minor1
Conflicting Flow All	740	0	0	522
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	867	-	-	1044
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	867	-	-	1044
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	1.1	0.8	56	\$ 419.3
HCM LOS			F	F

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR	SELn1
Capacity (veh/h)	86	867	-	-	1044	-	-	217
HCM Lane V/C Ratio	1.643	0.075	-	-	0.068	-	-	0.726
HCM Control Delay (s)	\$ 419.3	9.5	0	-	8.7	0	-	56
HCM Lane LOS	F	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	11.5	0.2	-	-	0.2	-	-	4.8

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

2024 PM Peak Stop Open, No Roadway Improvement

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th TWSC
3: KS East/Old 163 & Washington St

03/05/2024

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↕		↕		↕		↕		↕		↕	
Traffic Vol, veh/h	25	465	0	20	695	35	5	5	45	35	5	30
Future Vol, veh/h	25	465	0	20	695	35	5	5	45	35	5	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	25	-	-	-	-	-	25
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	505	0	22	755	38	5	5	49	38	5	33

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	793	0	0	505
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	828	-	-	1060
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	828	-	-	1060
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	18.4	42
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	328	828	-	-	1060	-	-	104	409
HCM Lane V/C Ratio	0.182	0.033	-	-	0.021	-	-	0.418	0.08
HCM Control Delay (s)	18.4	9.5	0	-	8.5	0	-	62.5	14.6
HCM Lane LOS	C	A	A	-	A	A	-	F	B
HCM 95th %tile Q(veh)	0.7	0.1	-	-	0.1	-	-	1.8	0.3

2024 PM Peak Stop Open, No Roadway Improvement

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th Signalized Intersection Summary
1: 15th St/IA 163 SB Ramp & Washington St

03/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔		↔	↔
Traffic Volume (veh/h)	130	320	5	40	180	55	175	5	40	5	15	35
Future Volume (veh/h)	130	320	5	40	180	55	175	5	40	5	15	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	141	348	5	43	196	60	190	5	43	5	16	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	539	560	8	431	296	91	467	7	274	117	89	179
Arrive On Green	0.14	0.30	0.30	0.05	0.22	0.22	0.17	0.17	0.17	0.17	0.17	0.17
Sat Flow, veh/h	1781	1839	26	1781	1374	421	1568	41	1585	57	515	1036
Grp Volume(v), veh/h	141	0	353	43	0	256	195	0	43	59	0	0
Grp Sat Flow(s), veh/h/ln	1781	0	1866	1781	0	1795	1609	0	1585	1608	0	0
Q Serve(g_s), s	2.0	0.0	5.9	0.7	0.0	4.7	0.0	0.0	0.8	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.0	0.0	5.9	0.7	0.0	4.7	3.7	0.0	0.8	3.7	0.0	0.0
Prop In Lane	1.00		0.01	1.00		0.23	0.97		1.00	0.08		0.64
Lane Grp Cap(c), veh/h	539	0	568	431	0	386	474	0	274	386	0	0
V/C Ratio(X)	0.26	0.00	0.62	0.10	0.00	0.66	0.41	0.00	0.16	0.15	0.00	0.00
Avail Cap(c_a), veh/h	573	0	1008	590	0	935	921	0	795	921	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.4	0.0	10.8	10.2	0.0	13.0	13.9	0.0	12.8	12.9	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	1.1	0.1	0.0	2.0	0.6	0.0	0.3	0.2	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.5	0.0	1.9	0.2	0.0	1.6	1.2	0.0	0.3	0.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	8.7	0.0	11.9	10.3	0.0	15.0	14.5	0.0	13.0	13.0	0.0	0.0
LnGrp LOS	A	A	B	B	A	B	B	A	B	B	A	A
Approach Vol, veh/h		494			299			238			59	
Approach Delay, s/veh		11.0			14.3			14.2			13.0	
Approach LOS		B			B			B			B	
Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	12.8	6.7	16.8		12.8	9.9	13.6					
Change Period (Y+Rc), s	6.5	4.9	* 5.8		6.5	4.9	* 5.8					
Max Green Setting (Gmax), s	18.2	5.0	* 20		18.2	5.7	* 19					
Max Q Clear Time (g_c+I1), s	5.7	2.7	7.9		5.7	4.0	6.7					
Green Ext Time (p_c), s	0.2	0.0	1.5		0.9	0.1	1.1					

Intersection Summary												
HCM 6th Ctrl Delay		12.7										
HCM 6th LOS		B										

Notes
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th Signalized Intersection Summary
2: KS West/IA 163 NB Ramp & Washington St

03/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔		↔	↔
Traffic Volume (veh/h)	35	430	65	70	175	110	50	40	55	65	40	40
Future Volume (veh/h)	35	430	65	70	175	110	50	40	55	65	40	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	38	467	71	76	190	120	54	43	60	71	43	43
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	602	582	88	391	738	625	185	81	91	221	79	65
Arrive On Green	0.04	0.37	0.37	0.07	0.39	0.39	0.14	0.14	0.14	0.14	0.14	0.14
Sat Flow, veh/h	1781	1586	241	1781	1870	1585	472	575	648	660	562	461
Grp Volume(v), veh/h	38	0	538	76	190	120	157	0	0	157	0	0
Grp Sat Flow(s), veh/h/ln	1781	0	1827	1781	1870	1585	1695	0	0	1682	0	0
Q Serve(g_s), s	0.5	0.0	10.8	1.0	2.8	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.5	0.0	10.8	1.0	2.8	2.0	3.3	0.0	0.0	3.3	0.0	0.0
Prop In Lane	1.00		0.13	1.00		1.00	0.34		0.38	0.45		0.27
Lane Grp Cap(c), veh/h	602	0	670	391	738	625	358	0	0	366	0	0
V/C Ratio(X)	0.06	0.00	0.80	0.19	0.26	0.19	0.44	0.00	0.00	0.43	0.00	0.00
Avail Cap(c_a), veh/h	748	0	949	488	971	823	763	0	0	758	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	7.3	0.0	11.6	8.3	8.3	8.1	16.5	0.0	0.0	16.5	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	3.4	0.2	0.2	0.1	0.8	0.0	0.0	0.8	0.0	0.0
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%), veh/ln	0.1	0.0	3.7	0.3	0.8	0.5	1.2	0.0	0.0	1.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d), s/veh	7.3	0.0	15.0	8.5	8.5	8.2	17.3	0.0	0.0	17.3	0.0	0.0
LnGrp LOS	A	A	B	A	A	A	B	A	A	B	A	A
Approach Vol, veh/h		576			386			157			157	
Approach Delay, s/veh		14.5			8.4			17.3			17.3	
Approach LOS		B			A			B			B	
Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	12.3	7.8	20.8		12.3	6.7	21.9					
Change Period (Y+Rc), s	6.5	4.9	* 5.8		6.5	4.9	* 5.8					
Max Green Setting (Gmax), s	16.5	5.1	* 21		16.5	5.1	* 21					
Max Q Clear Time (g_c+I1), s	5.3	3.0	12.8		5.3	2.5	4.8					
Green Ext Time (p_c), s	0.6	0.0	2.2		0.6	0.0	1.2					

Intersection Summary												
HCM 6th Ctrl Delay		13.4										
HCM 6th LOS		B										

Notes
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
3: KS East /Old 163 & Washington St

03/05/2024

Intersection												
Int Delay, s/veh	2.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔ ↕ ↖ ↗ ↘ ↙ ↚ ↛ ↜ ↝ ↞ ↠											
Traffic Vol, veh/h	35	505	5	20	335	20	5	5	50	25	5	20
Future Vol, veh/h	35	505	5	20	335	20	5	5	50	25	5	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	25	-	-	-	-	-	25
Veh in Median Storage, #	-	0	-	-	0	-	-	-	0	-	-	0
Grade, %	-	0	-	-	0	-	-	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	38	549	5	22	364	22	5	5	54	27	5	22
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	386	0	0	554	0	0	1061	1058	552	1065	1038	364
Stage 1	-	-	-	-	-	-	628	628	-	408	408	-
Stage 2	-	-	-	-	-	-	433	430	-	657	630	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1172	-	-	1016	-	-	202	225	533	200	231	681
Stage 1	-	-	-	-	-	-	471	476	-	620	597	-
Stage 2	-	-	-	-	-	-	601	583	-	454	475	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1172	-	-	1016	-	-	181	208	533	166	214	681
Mov Cap-2 Maneuver	-	-	-	-	-	-	181	208	-	166	214	-
Stage 1	-	-	-	-	-	-	449	454	-	591	580	-
Stage 2	-	-	-	-	-	-	560	567	-	384	453	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0.5			15.4			22.7		
HCM LOS	C			C			C			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2			
Capacity (veh/h)	412	1172	-	-	1016	-	-	172	681			
HCM Lane V/C Ratio	0.158	0.032	-	-	0.021	-	-	0.19	0.032			
HCM Control Delay (s)	15.4	8.2	0	-	8.6	0	-	30.8	10.5			
HCM Lane LOS	C	A	A	-	A	A	-	D	B			
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0.1	-	-	0.7	0.1			

2024 AM Peak Store Open, Roadway Improvement

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th Signalized Intersection Summary
1: 15th St/IA 163 SB Ramp & Washington St

03/05/2024

Intersection Summary												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔ ↕ ↖ ↗ ↘ ↙ ↚ ↛ ↜ ↝ ↞ ↠											
Traffic Volume (veh/h)	80	320	0	45	500	90	180	5	55	5	15	30
Future Volume (veh/h)	80	320	0	45	500	90	180	5	55	5	15	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No											
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	87	348	0	49	543	98	196	5	60	5	16	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	319	797	0	512	597	108	253	3	367	68	105	165
Arrive On Green	0.09	0.43	0.00	0.05	0.39	0.39	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	1781	1870	0	1781	1542	278	563	14	1585	0	452	710
Grp Volume(v), veh/h	87	348	0	49	0	641	201	0	60	54	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1781	0	1820	577	0	1585	1162	0	0
Q Serve(g_s), s	1.6	7.6	0.0	0.9	0.0	19.4	0.0	0.0	1.8	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.6	7.6	0.0	0.9	0.0	19.4	13.5	0.0	1.8	13.5	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.15	0.98		1.00	0.09		0.61
Lane Grp Cap(c), veh/h	319	797	0	512	0	705	256	0	367	337	0	0
V/C Ratio(X)	0.27	0.44	0.00	0.10	0.00	0.91	0.79	0.00	0.16	0.16	0.00	0.00
Avail Cap(c_a), veh/h	322	797	0	584	0	756	256	0	367	337	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	12.1	11.8	0.0	9.9	0.0	16.9	24.6	0.0	17.9	17.9	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.4	0.0	0.1	0.0	14.5	14.8	0.0	0.2	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	2.7	0.0	0.3	0.0	9.6	3.7	0.0	0.6	0.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.6	12.2	0.0	9.9	0.0	31.3	39.5	0.0	18.1	18.1	0.0	0.0
LnGrp LOS	B	B	A	A	A	C	D	A	B	B	A	A
Approach Vol, veh/h	435			690			261			54		
Approach Delay, s/veh	12.3			29.8			34.5			18.1		
Approach LOS	B			C			C			B		
Timer - Assigned Phs	2			3			4			6		
Phs Duration (G+Y+Rc), s	20.0			7.6			30.6			20.0		
Change Period (Y+Rc), s	6.5			4.9			* 5.8			6.5		
Max Green Setting (Gmax), s	13.5			5.1			* 24			13.5		
Max Q Clear Time (g_c+I), s	15.5			2.9			9.6			15.5		
Green Ext Time (p_c), s	0.0			0.0			1.7			0.0		
Intersection Summary												
HCM 6th Ctrl Delay	24.9											
HCM 6th LOS	C											
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

2024 PM Peak Store Open, Roadway Improvement

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th Signalized Intersection Summary
2: KS West/IA 163 NB Ramp & Washington St

03/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	60	420	60	65	490	190	15	35	95	60	35	35
Future Volume (veh/h)	60	420	60	65	490	190	15	35	95	60	35	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	65	457	65	71	533	207	16	38	103	65	38	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	381	589	84	402	695	589	113	69	159	225	84	66
Arrive On Green	0.06	0.37	0.37	0.07	0.37	0.37	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1781	1602	228	1781	1870	1585	100	471	1088	645	578	451
Grp Volume(v), veh/h	65	0	522	71	533	207	157	0	0	141	0	0
Grp Sat Flow(s),veh/h/ln	1781	0	1829	1781	1870	1585	1658	0	0	1675	0	0
Q Serve(g_s), s	0.9	0.0	10.1	0.9	10.1	3.8	0.6	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.9	0.0	10.1	0.9	10.1	3.8	3.5	0.0	0.0	2.9	0.0	0.0
Prop In Lane	1.00		0.12	1.00		1.00	0.10		0.66	0.46		0.27
Lane Grp Cap(c), veh/h	381	0	673	402	695	589	341	0	0	376	0	0
V/C Ratio(X)	0.17	0.00	0.78	0.18	0.77	0.35	0.46	0.00	0.00	0.38	0.00	0.00
Avail Cap(c_a), veh/h	488	0	979	507	1006	852	772	0	0	766	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.1	0.0	11.2	8.1	11.1	9.1	16.2	0.0	0.0	15.9	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	2.4	0.2	2.2	0.4	1.0	0.0	0.0	0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	3.4	0.3	3.3	1.0	1.2	0.0	0.0	1.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.3	0.0	13.7	8.3	13.3	9.5	17.1	0.0	0.0	16.5	0.0	0.0
LnGrp LOS	A	A	B	A	B	A	B	A	A	B	A	A
Approach Vol, veh/h		587			811			157			141	
Approach Delay, s/veh		13.1			11.9			17.1			16.5	
Approach LOS		B			B			B			B	
Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	12.4	7.2	20.6		12.4	7.1	20.7					
Change Period (Y+Rc), s	6.5	4.5	* 5.8		6.5	4.5	* 5.8					
Max Green Setting (Gmax), s	16.6	5.1	* 22		16.6	5.0	* 22					
Max Q Clear Time (g_c+I1), s	4.9	2.9	12.1		5.5	2.9	12.1					
Green Ext Time (p_c), s	0.6	0.0	2.2		0.6	0.0	2.9					

Intersection Summary												
HCM 6th Ctrl Delay	13.2											
HCM 6th LOS	B											

Notes
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
3: KS East /Old 163 & Washington St

03/05/2024

Intersection												
Int Delay, s/veh	3.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Vol, veh/h	25	465	0	20	695	35	5	5	45	35	5	30
Future Vol, veh/h	25	465	0	20	695	35	5	5	45	35	5	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	25	-	-	-	-	-	25
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	505	0	22	755	38	5	5	49	38	5	33

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	793	0	0	505
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	828	-	-	1060
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	828	-	-	1060
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	18.4	42
HCM LOS			C	E

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	328	828	-	-	1060	-	-	104	409
HCM Lane V/C Ratio	0.182	0.033	-	-	0.021	-	-	0.418	0.08
HCM Control Delay (s)	18.4	9.5	0	-	8.5	0	-	62.5	14.6
HCM Lane LOS	C	A	A	-	A	A	-	F	B
HCM 95th %tile Q(veh)	0.7	0.1	-	-	0.1	-	-	1.8	0.3

HCM 6th Signalized Intersection Summary
1: 15th St/IA 163 SB Ramp & Washington St

03/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔		↔	↔
Traffic Volume (veh/h)	130	310	5	40	180	40	160	10	40	5	15	35
Future Volume (veh/h)	130	310	5	40	180	40	160	10	40	5	15	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	172	411	7	53	239	53	212	13	53	5	16	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	561	580	10	443	375	83	509	18	323	134	108	217
Arrive On Green	0.12	0.32	0.32	0.06	0.25	0.25	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	1781	1834	31	1781	1482	329	1430	88	1585	58	531	1066
Grp Volume(v), veh/h	172	0	418	53	0	292	225	0	53	59	0	0
Grp Sat Flow(s),veh/h/ln	1781	0	1865	1781	0	1811	1518	0	1585	1655	0	0
Q Serve(g_s), s	2.1	0.0	6.3	0.7	0.0	4.6	1.9	0.0	0.9	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.1	0.0	6.3	0.7	0.0	4.6	4.2	0.0	0.9	0.9	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.18	0.94		1.00	0.08		0.64
Lane Grp Cap(c), veh/h	561	0	590	443	0	458	527	0	323	459	0	0
V/C Ratio(X)	0.31	0.00	0.71	0.12	0.00	0.64	0.43	0.00	0.16	0.13	0.00	0.00
Avail Cap(c_a), veh/h	704	0	1076	644	0	989	997	0	865	1016	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	7.3	0.0	9.7	8.1	0.0	10.7	11.7	0.0	10.5	10.5	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	1.6	0.1	0.0	1.5	0.5	0.0	0.2	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	1.9	0.2	0.0	1.4	1.1	0.0	0.2	0.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.6	0.0	11.2	8.3	0.0	12.2	12.3	0.0	10.8	10.7	0.0	0.0
LnGrp LOS	A	A	B	A	A	B	B	A	B	B	A	A
Approach Vol, veh/h		590			345			278			59	
Approach Delay, s/veh		10.2			11.6			12.0			10.7	
Approach LOS		B			B			B			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		11.2	6.4	14.6		11.2	8.4	12.6				
Change Period (Y+Rc), s		4.5	4.5	4.5		4.5	4.5	4.5				
Max Green Setting (Gmax), s		17.5	5.5	18.5		17.5	6.5	17.5				
Max Q Clear Time (g_c+I1), s		2.9	2.7	8.3		6.2	4.1	6.6				
Green Ext Time (p_c), s		0.2	0.0	1.8		1.1	0.1	1.2				
Intersection Summary												
HCM 6th Ctrl Delay			11.0									
HCM 6th LOS			B									

2044 AM Peak Existing Conditions

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th TWSC
2: Washington St & IA 163 NB Ramp

03/05/2024

Intersection						
Int Delay, s/veh	2.9					
Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↔	↔	↔	↔	↔
Traffic Vol, veh/h	35	470	190	110	60	60
Future Vol, veh/h	35	470	190	110	60	60
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	200	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	46	623	252	146	80	80
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	398	0	0	967	252	
Stage 1	-	-	-	252	-	
Stage 2	-	-	-	715	-	
Critical Hdwy	4.12	-	-	6.42	6.22	
Critical Hdwy Stg 1	-	-	-	5.42	-	
Critical Hdwy Stg 2	-	-	-	5.42	-	
Follow-up Hdwy	2.218	-	-	3.518	3.318	
Pot Cap-1 Maneuver	1161	-	-	282	787	
Stage 1	-	-	-	790	-	
Stage 2	-	-	-	485	-	
Platoon blocked, %	-	-	-	-	-	
Mov Cap-1 Maneuver	1161	-	-	265	787	
Mov Cap-2 Maneuver	-	-	-	265	-	
Stage 1	-	-	-	742	-	
Stage 2	-	-	-	485	-	
Approach	EB	WB	SE			
HCM Control Delay, s	0.6	0	20.1			
HCM LOS			C			
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SEL	SE
Capacity (veh/h)	1161	-	-	-	396	
HCM Lane V/C Ratio	0.04	-	-	-	0.402	
HCM Control Delay (s)	8.2	0	-	-	20.1	
HCM Lane LOS	A	A	-	-	C	
HCM 95th %tile Q(veh)	0.1	-	-	-	1.9	

2044 AM Peak Existing Conditions

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th TWSC
3: Washington St & Old 163

03/05/2024

Intersection						
Int Delay, s/veh	1.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕	↕	↕	↕
Traffic Vol, veh/h	40	490	280	20	30	20
Future Vol, veh/h	40	490	280	20	30	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	25	0	25
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	53	650	371	27	40	27
Major/Minor	Major1	Major2	Minor2			
Conflicting Flow All	398	0	0	1127	371	
Stage 1	-	-	-	371	-	
Stage 2	-	-	-	756	-	
Critical Hdwy	4.12	-	-	6.42	6.22	
Critical Hdwy Stg 1	-	-	-	5.42	-	
Critical Hdwy Stg 2	-	-	-	5.42	-	
Follow-up Hdwy	2,218	-	-	3,518	3,318	
Pot Cap-1 Maneuver	1161	-	-	226	675	
Stage 1	-	-	-	698	-	
Stage 2	-	-	-	464	-	
Platoon blocked, %	-	-	-	-	-	
Mov Cap-1 Maneuver	1161	-	-	210	675	
Mov Cap-2 Maneuver	-	-	-	210	-	
Stage 1	-	-	-	648	-	
Stage 2	-	-	-	464	-	
Approach	EB	WB	SB			
HCM Control Delay, s	0.6	0	19.9			
HCM LOS			C			
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1161	-	-	-	210	675
HCM Lane V/C Ratio	0.046	-	-	-	0.189	0.039
HCM Control Delay (s)	8.2	0	-	-	26.1	10.6
HCM Lane LOS	A	A	-	-	D	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.7	0.1

2044 AM Peak Existing Conditions

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th Signalized Intersection Summary
1: 15th St/IA 163 SB Ramp & Washington St

03/05/2024

	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↕	↕		↕	↕			↕	↕		↕	↕
Traffic Volume (veh/h)	80	310	5	40	490	80	170	5	50	10	10	30
Future Volume (veh/h)	80	310	5	40	490	80	170	5	50	10	10	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00		1.00	1.00		1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	106	411	7	53	650	106	225	7	66	11	11	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	266	857	15	495	706	115	258	5	449	65	71	107
Arrive On Green	0.06	0.47	0.47	0.05	0.45	0.45	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1781	1834	31	1781	1569	256	537	17	1585	0	251	377
Grp Volume(v), veh/h	106	0	418	53	0	756	232	0	66	55	0	0
Grp Sat Flow(s),veh/h/ln	1781	0	1865	1781	0	1824	554	0	1585	628	0	0
Q Serve(g_s), s	2.1	0.0	10.3	1.0	0.0	26.0	0.0	0.0	2.1	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.1	0.0	10.3	1.0	0.0	26.0	18.9	0.0	2.1	18.9	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.14	0.97		1.00	0.20		0.60
Lane Grp Cap(c), veh/h	266	0	872	495	0	821	263	0	449	243	0	0
V/C Ratio(X)	0.40	0.00	0.48	0.11	0.00	0.92	0.88	0.00	0.15	0.23	0.00	0.00
Avail Cap(c_a), veh/h	287	0	908	548	0	888	263	0	449	243	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	14.3	0.0	12.2	9.4	0.0	17.2	27.0	0.0	17.9	18.8	0.0	0.0
Incr Delay (d2), s/veh	1.0	0.0	0.4	0.1	0.0	14.0	27.4	0.0	0.1	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	3.7	0.4	0.0	12.3	5.6	0.0	0.7	0.6	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.3	0.0	12.6	9.5	0.0	31.2	54.4	0.0	18.0	19.2	0.0	0.0
LnGrp LOS	B	A	B	A	A	C	D	A	B	B	A	A
Approach Vol, veh/h	524			809			298			55		
Approach Delay, s/veh	13.1			29.8			46.4			19.2		
Approach LOS	B			C			D			B		
Timer - Assigned Phs	2	3	4	6	7	8						
Phs Duration (G+Y+Rc), s	23.4	7.6	35.7	23.4	8.8	34.5						
Change Period (Y+Rc), s	4.5	4.5	4.5	4.5	4.5	4.5						
Max Green Setting (Gmax), s	18.9	5.1	32.5	18.9	5.1	32.5						
Max Q Clear Time (g_c+I1), s	20.9	3.0	12.3	20.9	4.1	28.0						
Green Ext Time (p_c), s	0.0	0.0	2.4	0.0	0.0	2.1						
Intersection Summary												
HCM 6th Ctrl Delay				27.2								
HCM 6th LOS				C								

2044 PM Peak Existing Conditions

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th TWSC
2: Washington St & IA 163 NB Ramp

03/05/2024

Intersection						
Int Delay, s/veh	4.4					
Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↕	↑	↕	↕	↕
Traffic Vol, veh/h	60	460	510	190	30	110
Future Vol, veh/h	60	460	510	190	30	110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	200	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	80	610	676	252	40	146

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	928	0	0 1446 676
Stage 1	-	-	- 676 -
Stage 2	-	-	- 770 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	737	-	- 145 453
Stage 1	-	-	- 505 -
Stage 2	-	-	- 457 -
Platoon blocked, %	-	-	- -
Mov Cap-1 Maneuver	737	-	- 121 453
Mov Cap-2 Maneuver	-	-	- 121 -
Stage 1	-	-	- 422 -
Stage 2	-	-	- 457 -

Approach	EB	WB	SE
HCM Control Delay, s	1.2	0	38.5
HCM LOS	E		

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SELn1
Capacity (veh/h)	737	-	-	-	285
HCM Lane V/C Ratio	0.108	-	-	-	0.651
HCM Control Delay (s)	10.5	0	-	-	38.5
HCM Lane LOS	B	A	-	-	E
HCM 95th %tile Q(veh)	0.4	-	-	-	4.2

2044 PM Peak Existing Conditions

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th TWSC
3: Washington St & Old 163

03/05/2024

Intersection						
Int Delay, s/veh	1.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↑	↕	↕	↕
Traffic Vol, veh/h	30	450	670	40	30	30
Future Vol, veh/h	30	450	670	40	30	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	25	0	25
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	597	888	53	40	40

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	941	0	0 1565 888
Stage 1	-	-	- 888 -
Stage 2	-	-	- 677 -
Critical Hdwy	4.12	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.218	-	- 3.518 3.318
Pot Cap-1 Maneuver	729	-	- 123 343
Stage 1	-	-	- 402 -
Stage 2	-	-	- 505 -
Platoon blocked, %	-	-	- -
Mov Cap-1 Maneuver	729	-	- 113 343
Mov Cap-2 Maneuver	-	-	- 113 -
Stage 1	-	-	- 369 -
Stage 2	-	-	- 505 -

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	35.1
HCM LOS	E		

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	729	-	-	-	113	343
HCM Lane V/C Ratio	0.055	-	-	-	0.352	0.116
HCM Control Delay (s)	10.2	0	-	-	53.2	16.9
HCM Lane LOS	B	A	-	-	F	C
HCM 95th %tile Q(veh)	0.2	-	-	-	1.4	0.4

2044 PM Peak Existing Conditions

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th Signalized Intersection Summary
1: 15th St/IA 163 SB Ramp & Washington St

03/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔	↔		↔	↔		↔	↔	↔		↔	↔
Traffic Volume (veh/h)	130	320	5	40	180	55	175	5	40	5	15	35
Future Volume (veh/h)	130	320	5	40	180	55	175	5	40	5	15	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	172	424	7	53	239	73	232	7	53	5	16	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	372	502	8	275	317	97	279	7	571	72	137	249
Arrive On Green	0.09	0.27	0.27	0.05	0.23	0.23	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	1781	1835	30	1781	1375	420	412	18	1585	0	382	691
Grp Volume(v), veh/h	172	0	431	53	0	312	239	0	53	59	0	0
Grp Sat Flow(s),veh/h/ln	1781	0	1865	1781	0	1795	430	0	1585	1072	0	0
Q Serve(g_s), s	3.9	0.0	11.9	1.2	0.0	8.8	0.0	0.0	1.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.9	0.0	11.9	1.2	0.0	8.8	19.6	0.0	1.2	19.6	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.23	0.97		1.00	0.08		0.64
Lane Grp Cap(c), veh/h	372	0	510	275	0	413	285	0	571	458	0	0
V/C Ratio(X)	0.46	0.00	0.85	0.19	0.00	0.75	0.84	0.00	0.09	0.13	0.00	0.00
Avail Cap(c_a), veh/h	372	0	623	348	0	597	285	0	571	458	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	14.6	0.0	18.7	15.4	0.0	19.5	20.8	0.0	11.5	12.0	0.0	0.0
Incr Delay (d2), s/veh	0.9	0.0	8.8	0.3	0.0	3.3	19.2	0.0	0.1	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	5.7	0.4	0.0	3.6	4.4	0.0	0.4	0.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.5	0.0	27.5	15.7	0.0	22.8	40.0	0.0	11.6	12.1	0.0	0.0
LnGrp LOS	B	A	C	B	A	C	D	A	B	B	A	A
Approach Vol, veh/h		603			365			292			59	
Approach Delay, s/veh		24.1			21.8			34.9			12.1	
Approach LOS		C			C			C			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		26.1	7.7	20.7		26.1	10.0	18.3				
Change Period (Y+Rc), s		6.5	4.9	* 5.8		6.5	4.9	* 5.8				
Max Green Setting (Gmax), s		19.6	5.0	* 18		19.6	5.1	* 18				
Max Q Clear Time (g_c+I1), s		21.6	3.2	13.9		21.6	5.9	10.8				
Green Ext Time (p_c), s		0.0	0.0	1.0		0.0	0.0	1.0				
Intersection Summary												
HCM 6th Ctrl Delay			25.3									
HCM 6th LOS			C									
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

2044 AM Peak Stop Open, No Roadway Improvement

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th TWSC
2: KS West/IA 163 NB Ramp & Washington St

03/05/2024

Intersection												
Int Delay, s/veh	28.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations		↔			↔	↔		↔			↔	↔
Traffic Vol, veh/h	35	430	65	70	175	110	50	40	55	65	40	40
Future Vol, veh/h	35	430	65	70	175	110	50	40	55	65	40	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	200	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	46	570	71	76	232	146	66	43	73	71	43	43
Major/Minor	Major1	Major2	Minor2	Minor1								
Conflicting Flow All	378	0	0	641	0	0	1125	1117	232	1213	1228	606
Stage 1	-	-	-	-	-	-	384	384	-	698	698	-
Stage 2	-	-	-	-	-	-	741	733	-	515	530	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1180	-	-	943	-	-	182	207	807	159	178	497
Stage 1	-	-	-	-	-	-	639	611	-	431	442	-
Stage 2	-	-	-	-	-	-	408	426	-	543	527	-
Platoon blocked, %												
Mov Cap-1 Maneuver	1180	-	-	943	-	-	114	174	807	103	150	497
Mov Cap-2 Maneuver	-	-	-	-	-	-	114	174	-	103	150	-
Stage 1	-	-	-	-	-	-	600	547	-	405	415	-
Stage 2	-	-	-	-	-	-	313	400	-	407	472	-
Approach	EB	WB	SE	NW								
HCM Control Delay, s	0.6	1.5	94.4	152.9								
HCM LOS			F	F								
Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR	SELn1				
Capacity (veh/h)	148	1180	-	-	943	-	-	198				
HCM Lane V/C Ratio	1.065	0.039	-	-	0.081	-	-	0.923				
HCM Control Delay (s)	152.9	8.2	0	0	9.2	0	0	94.4				
HCM Lane LOS	F	A	A	-	A	A	-	F				
HCM 95th %tile Q(veh)	8.3	0.1	-	-	0.3	-	-	7.4				

2044 AM Peak Stop Open, No Roadway Improvement

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th TWSC
3: KS East /Old 163 & Washington St

03/05/2024

Intersection												
Int Delay, s/veh	3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔ ↗ ↘ ↙ ↘ ↗ ↙ ↘ ↗ ↘ ↙ ↘ ↗ ↘											
Traffic Vol, veh/h	35	505	5	20	335	20	5	5	50	25	5	20
Future Vol, veh/h	35	505	5	20	335	20	5	5	50	25	5	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	25	-	-	-	-	-	25
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	46	670	5	22	444	27	5	5	54	33	5	27
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	471	0	0	675	0	0	1283	1280	673	1282	1255	444
Stage 1	-	-	-	-	-	-	765	765	-	488	488	-
Stage 2	-	-	-	-	-	-	518	515	-	794	767	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1091	-	-	916	-	-	142	166	455	142	172	614
Stage 1	-	-	-	-	-	-	396	412	-	561	550	-
Stage 2	-	-	-	-	-	-	541	535	-	381	411	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1091	-	-	916	-	-	122	150	455	112	155	614
Mov Cap-2 Maneuver	-	-	-	-	-	-	122	150	-	112	155	-
Stage 1	-	-	-	-	-	-	369	384	-	523	532	-
Stage 2	-	-	-	-	-	-	495	517	-	308	383	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0.4			18.8			34.3		
HCM LOS	C			C			C			D		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2			
Capacity (veh/h)	326	1091	-	-	916	-	-	117	614			
HCM Lane V/C Ratio	0.2	0.043	-	-	0.024	-	-	0.33	0.043			
HCM Control Delay (s)	18.8	8.4	0	-	9	0	-	50.2	11.1			
HCM Lane LOS	C	A	A	-	A	A	-	F	B			
HCM 95th %tile Q(veh)	0.7	0.1	-	-	0.1	-	-	1.3	0.1			

2044 AM Peak Stop Open, No Roadway Improvement

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th Signalized Intersection Summary
1: 15th St/IA 163 SB Ramp & Washington St

03/05/2024

Intersection Summary												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔ ↗ ↘ ↙ ↘ ↗ ↙ ↘ ↗ ↘ ↙ ↘ ↗ ↘											
Traffic Volume (veh/h)	80	320	0	45	500	90	180	5	55	5	15	30
Future Volume (veh/h)	80	320	0	45	500	90	180	5	55	5	15	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No											
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	106	424	0	60	663	119	239	7	73	5	16	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	282	985	0	531	794	143	172	3	379	44	92	145
Arrive On Green	0.06	0.53	0.00	0.04	0.51	0.51	0.24	0.24	0.24	0.24	0.24	0.24
Sat Flow, veh/h	1781	1870	0	1781	1543	277	391	11	1585	0	387	608
Grp Volume(v), veh/h	106	424	0	60	0	782	246	0	73	54	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1781	0	1820	402	0	1585	996	0	0
Q Serve(g_s), s	2.4	12.5	0.0	1.4	0.0	32.9	0.0	0.0	3.3	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.4	12.5	0.0	1.4	0.0	32.9	21.5	0.0	3.3	21.5	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.15	0.97		1.00	0.09		0.61
Lane Grp Cap(c), veh/h	282	985	0	531	0	937	175	0	379	282	0	0
V/C Ratio(X)	0.38	0.43	0.00	0.11	0.00	0.83	1.41	0.00	0.19	0.19	0.00	0.00
Avail Cap(c_a), veh/h	284	985	0	555	0	937	175	0	379	282	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	16.0	13.0	0.0	9.9	0.0	18.6	39.1	0.0	27.3	27.4	0.0	0.0
Incr Delay (d2), s/veh	0.8	1.4	0.0	0.1	0.0	8.7	213.1	0.0	0.2	0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	5.2	0.0	0.5	0.0	14.6	14.2	0.0	1.2	0.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	16.8	14.4	0.0	10.0	0.0	27.3	252.2	0.0	27.6	27.7	0.0	0.0
LnGrp LOS	B	B	A	A	A	C	F	A	C	C	A	A
Approach Vol, veh/h	530			842			319			54		
Approach Delay, s/veh	14.9			26.1			200.8			27.7		
Approach LOS	B			C			F			C		
Timer - Assigned Phs	2	3	4	6			7	8				
Phs Duration (G+Y+Rc), s	28.0	8.8	53.2	28.0			9.9	52.1				
Change Period (Y+Rc), s	6.5	4.9	* 5.8	6.5			4.9	* 5.8				
Max Green Setting (Gmax), s	21.5	5.1	* 46	21.5			5.1	* 46				
Max Q Clear Time (g_c+I1), s	23.5	3.4	14.5	23.5			4.4	34.9				
Green Ext Time (p_c), s	0.0	0.0	2.7	0.0			0.0	4.2				
Intersection Summary												
HCM 6th Ctrl Delay	54.7											
HCM 6th LOS	D											
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

2044 PM Peak Stop Open, No Roadway Improvement

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th TWSC
2: KS West/IA 163 NB Ramp & Washington St

03/05/2024

Intersection												
Int Delay, s/veh	120.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↕		↕		↕		↕		↕		↕	
Traffic Vol, veh/h	60	420	60	65	490	190	15	35	95	60	35	35
Future Vol, veh/h	60	420	60	65	490	190	15	35	95	60	35	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	200	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	80	557	65	71	650	252	20	38	126	65	38	38

Major/Minor	Major1	Major2	Minor2	Minor1
Conflicting Flow All	902	0	0	622
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	754	-	-	959
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	754	-	-	959
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	SE	NW
HCM Control Delay, s	1.2	0.7	298.3	\$ 1306
HCM LOS			F	F

Minor Lane/Major Mvmt	NWLn1	EBL	EBT	EBR	WBL	WBT	WBR	SELn1
Capacity (veh/h)	41	754	-	-	959	-	-	128
HCM Lane V/C Ratio	3.446	0.106	-	-	0.074	-	-	1.437
HCM Control Delay (s)	\$ 1306	10.3	0	-	9.1	0	-	298.3
HCM Lane LOS	F	B	A	-	A	A	-	F
HCM 95th %tile Q(veh)	15.9	0.4	-	-	0.2	-	-	12.5

Notes
 -: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

2044 PM Peak Stop Open, No Roadway Improvement

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th TWSC
3: KS East/Old 163 & Washington St

03/05/2024

Intersection												
Int Delay, s/veh	6.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↕		↕		↕		↕		↕		↕	
Traffic Vol, veh/h	25	465	0	20	695	35	5	5	45	35	5	30
Future Vol, veh/h	25	465	0	20	695	35	5	5	45	35	5	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	25	-	-	-	-	-	25
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	33	617	0	22	922	46	5	5	49	46	5	40

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	968	0	0	617
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.12	-	-	4.12
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.218	-	-	2.218
Pot Cap-1 Maneuver	712	-	-	963
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	712	-	-	963
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	26.4	111.8
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	227	712	-	-	963	-	-	61	327
HCM Lane V/C Ratio	0.263	0.047	-	-	0.023	-	-	0.85	0.122
HCM Control Delay (s)	26.4	10.3	0	-	8.8	0	-	184.2	17.5
HCM Lane LOS	D	B	A	-	A	A	-	F	C
HCM 95th %tile Q(veh)	1	0.1	-	-	0.1	-	-	3.9	0.4

2044 PM Peak Stop Open, No Roadway Improvement

Synchro 11 Report
Pella Kwik Star TIS

HCM 6th Signalized Intersection Summary
1: 15th St/IA 163 SB Ramp & Washington St

03/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	130	320	5	40	180	55	175	5	40	5	15	35
Future Volume (veh/h)	130	320	5	40	180	55	175	5	40	5	15	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	172	424	7	53	239	73	232	7	53	5	16	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	372	502	8	275	317	97	279	7	571	72	137	249
Arrive On Green	0.09	0.27	0.27	0.05	0.23	0.23	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	1781	1835	30	1781	1375	420	412	18	1585	0	382	691
Grp Volume(v), veh/h	172	0	431	53	0	312	239	0	53	59	0	0
Grp Sat Flow(s),veh/h/ln	1781	0	1865	1781	0	1795	430	0	1585	1072	0	0
Q Serve(g_s), s	3.9	0.0	11.9	1.2	0.0	8.8	0.0	0.0	1.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.9	0.0	11.9	1.2	0.0	8.8	19.6	0.0	1.2	19.6	0.0	0.0
Prop In Lane	1.00		0.02	1.00		0.23	0.97		1.00	0.08		0.64
Lane Grp Cap(c), veh/h	372	0	510	275	0	413	285	0	571	458	0	0
V/C Ratio(X)	0.46	0.00	0.85	0.19	0.00	0.75	0.84	0.00	0.09	0.13	0.00	0.00
Avail Cap(c_a), veh/h	372	0	623	348	0	597	285	0	571	458	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	14.6	0.0	18.7	15.4	0.0	19.5	20.8	0.0	11.5	12.0	0.0	0.0
Incr Delay (d2), s/veh	0.9	0.0	8.8	0.3	0.0	3.3	19.2	0.0	0.1	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.4	0.0	5.7	0.4	0.0	3.6	4.4	0.0	0.4	0.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.5	0.0	27.5	15.7	0.0	22.8	40.0	0.0	11.6	12.1	0.0	0.0
LnGrp LOS	B	A	C	B	A	C	D	A	B	B	A	A
Approach Vol, veh/h		603			365			292			59	
Approach Delay, s/veh		24.1			21.8			34.9			12.1	
Approach LOS		C			C			C			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		26.1	7.7	20.7		26.1	10.0	18.3				
Change Period (Y+Rc), s		6.5	4.9	* 5.8		6.5	4.9	* 5.8				
Max Green Setting (Gmax), s		19.6	5.0	* 18		19.6	5.1	* 18				
Max Q Clear Time (g_c+I1), s		21.6	3.2	13.9		21.6	5.9	10.8				
Green Ext Time (p_c), s		0.0	0.0	1.0		0.0	0.0	1.0				
Intersection Summary												
HCM 6th Ctrl Delay			25.3									
HCM 6th LOS			C									
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 6th Signalized Intersection Summary
2: KS West/IA 163 NB Ramp & Washington St

03/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	35	430	65	70	175	110	50	40	55	65	40	40
Future Volume (veh/h)	35	430	65	70	175	110	50	40	55	65	40	40
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	46	570	71	76	232	146	66	43	73	71	43	43
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	593	676	84	351	811	687	180	78	103	209	91	71
Arrive On Green	0.05	0.41	0.41	0.07	0.43	0.43	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1781	1631	203	1781	1870	1585	493	508	671	637	596	465
Grp Volume(v), veh/h	46	0	641	76	232	146	182	0	0	157	0	0
Grp Sat Flow(s),veh/h/ln	1781	0	1834	1781	1870	1585	1672	0	0	1698	0	0
Q Serve(g_s), s	0.7	0.0	14.8	1.1	3.8	2.7	0.8	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.7	0.0	14.8	1.1	3.8	2.7	4.6	0.0	0.0	3.8	0.0	0.0
Prop In Lane	1.00		0.11	1.00		1.00	0.36		0.40	0.45		0.27
Lane Grp Cap(c), veh/h	593	0	760	351	811	687	360	0	0	371	0	0
V/C Ratio(X)	0.08	0.00	0.84	0.22	0.29	0.21	0.51	0.00	0.00	0.42	0.00	0.00
Avail Cap(c_a), veh/h	701	0	982	425	1002	849	694	0	0	696	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	7.1	0.0	12.4	9.2	8.6	8.3	18.8	0.0	0.0	18.5	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.0	5.4	0.3	0.2	0.2	1.1	0.0	0.0	0.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	5.6	0.3	1.2	0.7	1.7	0.0	0.0	1.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.1	0.0	17.8	9.5	8.8	8.5	19.9	0.0	0.0	19.3	0.0	0.0
LnGrp LOS	A	A	B	A	A	A	B	A	A	B	A	A
Approach Vol, veh/h		687			454			182			157	
Approach Delay, s/veh		17.1			8.8			19.9			19.3	
Approach LOS		B			A			B			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		13.7	8.0	25.3		13.7	7.2	26.2				
Change Period (Y+Rc), s		6.5	4.9	* 5.8		6.5	4.9	* 5.8				
Max Green Setting (Gmax), s		17.5	5.1	* 25		17.5	5.1	* 25				
Max Q Clear Time (g_c+I1), s		5.8	3.1	16.8		6.6	2.7	5.8				
Green Ext Time (p_c), s		0.6	0.0	2.7		0.7	0.0	1.7				
Intersection Summary												
HCM 6th Ctrl Delay			15.1									
HCM 6th LOS			B									
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 6th TWSC
3: KS East /Old 163 & Washington St

03/05/2024

Intersection												
Int Delay, s/veh	3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕											
Traffic Vol, veh/h	35	505	5	20	335	20	5	5	50	25	5	20
Future Vol, veh/h	35	505	5	20	335	20	5	5	50	25	5	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	25	-	-	-	-	-	25
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	46	670	5	22	444	27	5	5	54	33	5	27
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	471	0	0	675	0	0	1283	1280	673	1282	1255	444
Stage 1	-	-	-	-	-	-	765	765	-	488	488	-
Stage 2	-	-	-	-	-	-	518	515	-	794	767	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1091	-	-	916	-	-	142	166	455	142	172	614
Stage 1	-	-	-	-	-	-	396	412	-	561	550	-
Stage 2	-	-	-	-	-	-	541	535	-	381	411	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1091	-	-	916	-	-	122	150	455	112	155	614
Mov Cap-2 Maneuver	-	-	-	-	-	-	122	150	-	112	155	-
Stage 1	-	-	-	-	-	-	369	384	-	523	532	-
Stage 2	-	-	-	-	-	-	495	517	-	308	383	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.5			0.4			18.8			34.3		
HCM LOS	C			C			C			D		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2			
Capacity (veh/h)	326	1091	-	-	916	-	-	117	614			
HCM Lane V/C Ratio	0.2	0.043	-	-	0.024	-	-	0.33	0.043			
HCM Control Delay (s)	18.8	8.4	0	-	9	0	-	50.2	11.1			
HCM Lane LOS	C	A	A	-	A	A	-	F	B			
HCM 95th %tile Q(veh)	0.7	0.1	-	-	0.1	-	-	1.3	0.1			

HCM 6th Signalized Intersection Summary
1: 15th St/IA 163 SB Ramp & Washington St

03/05/2024

Intersection Summary												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕ ↔ ↕											
Traffic Volume (veh/h)	80	320	0	45	500	90	180	5	55	5	15	30
Future Volume (veh/h)	80	320	0	45	500	90	180	5	55	5	15	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No											
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	106	424	0	60	663	119	239	7	73	5	16	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	535	985	0	531	794	143	172	3	379	44	92	145
Arrive On Green	0.06	0.53	0.00	0.09	1.00	1.00	0.24	0.24	0.24	0.24	0.24	0.24
Sat Flow, veh/h	1781	1870	0	1781	1543	277	391	11	1585	0	387	608
Grp Volume(v), veh/h	106	424	0	60	0	782	246	0	73	54	0	0
Grp Sat Flow(s),veh/h/ln	1781	1870	0	1781	0	1820	402	0	1585	996	0	0
Q Serve(g_s), s	2.4	12.5	0.0	1.4	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0
Cycle Q Clear(g_c), s	2.4	12.5	0.0	1.4	0.0	0.0	21.5	0.0	3.3	21.5	0.0	0.0
Prop In Lane	1.00		0.00	1.00		0.15	0.97		1.00	0.09		0.61
Lane Grp Cap(c), veh/h	535	985	0	531	0	937	175	0	379	282	0	0
V/C Ratio(X)	0.20	0.43	0.00	0.11	0.00	0.83	1.41	0.00	0.19	0.19	0.00	0.00
Avail Cap(c_a), veh/h	537	985	0	555	0	937	175	0	379	282	0	0
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	0.80	0.00	0.80	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	8.8	13.0	0.0	9.4	0.0	0.0	39.1	0.0	27.3	27.4	0.0	0.0
Incr Delay (d2), s/veh	0.2	1.4	0.0	0.1	0.0	0.1	213.1	0.0	0.2	0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	5.2	0.0	0.5	0.0	1.8	14.2	0.0	1.2	0.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.0	14.4	0.0	9.5	0.0	7.1	252.2	0.0	27.6	27.7	0.0	0.0
LnGrp LOS	A	B	A	A	A	A	F	A	C	C	A	A
Approach Vol, veh/h	530			842			319			54		
Approach Delay, s/veh	13.3			7.3			200.8			27.7		
Approach LOS	B			A			F			C		
Timer - Assigned Phs	2	3	4	6			7	8				
Phs Duration (G+Y+Rc), s	28.0	8.8	53.2	28.0			9.9	52.1				
Change Period (Y+Rc), s	6.5	4.9	* 5.8	6.5			4.9	* 5.8				
Max Green Setting (Gmax), s	21.5	5.1	* 46	21.5			5.1	* 46				
Max Q Clear Time (g_c+I1), s	23.5	3.4	14.5	23.5			4.4	2.0				
Green Ext Time (p_c), s	0.0	0.0	2.7	0.0			0.0	6.8				
Intersection Summary												
HCM 6th Ctrl Delay	45.1											
HCM 6th LOS	D											
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 6th Signalized Intersection Summary
2: KS West/IA 163 NB Ramp & Washington St

03/05/2024

Movement	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (veh/h)	60	420	60	65	490	190	15	35	95	60	35	35
Future Volume (veh/h)	60	420	60	65	490	190	15	35	95	60	35	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No		No		No		No		No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	80	557	65	71	650	252	20	38	126	65	38	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	438	1048	122	672	1188	1007	59	55	153	127	64	49
Arrive On Green	0.10	1.00	1.00	0.05	0.64	0.64	0.13	0.13	0.13	0.13	0.13	0.13
Sat Flow, veh/h	1781	1644	192	1781	1870	1585	114	427	1175	526	490	375
Grp Volume(v), veh/h	80	0	622	71	650	252	184	0	0	141	0	0
Grp Sat Flow(s),veh/h/ln	1781	0	1836	1781	1870	1585	1715	0	0	1391	0	0
Q Serve(g_s), s	1.3	0.0	0.0	1.2	17.5	6.2	0.3	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	1.3	0.0	0.0	1.2	17.5	6.2	9.2	0.0	0.0	8.9	0.0	0.0
Prop In Lane	1.00		0.10	1.00		1.00	0.11		0.68	0.46		0.27
Lane Grp Cap(c), veh/h	438	0	1170	672	1188	1007	267	0	0	239	0	0
V/C Ratio(X)	0.18	0.00	0.53	0.11	0.55	0.25	0.69	0.00	0.00	0.59	0.00	0.00
Avail Cap(c_a), veh/h	461	0	1170	699	1188	1007	371	0	0	332	0	0
HCM Platoon Ratio	2.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.92	0.00	0.92	1.00	1.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	6.3	0.0	0.0	4.8	9.2	7.1	38.2	0.0	0.0	37.7	0.0	0.0
Incr Delay (d2), s/veh	0.2	0.0	1.6	0.1	1.8	0.6	3.1	0.0	0.0	2.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	0.5	0.4	6.6	2.0	4.1	0.0	0.0	3.1	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.5	0.0	1.6	4.8	11.0	7.7	41.3	0.0	0.0	40.0	0.0	0.0
LnGrp LOS	A	A	A	A	B	A	D	A	A	D	A	A
Approach Vol, veh/h		702			973			184			141	
Approach Delay, s/veh		2.2			9.7			41.3			40.0	
Approach LOS		A			A			D			D	
Timer - Assigned Phs	2	3	4		6	7	8					
Phs Duration (G+Y+Rc), s	18.2	8.7	63.2		18.2	8.8	63.0					
Change Period (Y+Rc), s	6.5	4.5	* 5.8		6.5	4.5	* 5.8					
Max Green Setting (Gmax), s	17.5	5.5	* 50		17.5	5.5	* 50					
Max Q Clear Time (g_c+I1), s	10.9	3.2	2.0		11.2	3.3	19.5					
Green Ext Time (p_c), s	0.4	0.0	4.8		0.5	0.0	5.8					

Intersection Summary												
HCM 6th Ctrl Delay		12.1										
HCM 6th LOS		B										

Notes
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
3: KS East /Old 163 & Washington St

03/05/2024

Intersection												
Int Delay, s/veh	6.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Vol, veh/h	25	465	0	20	695	35	5	5	45	35	5	30
Future Vol, veh/h	25	465	0	20	695	35	5	5	45	35	5	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	25	-	-	-	-	-	25
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	33	617	0	22	922	46	5	5	49	46	5	40

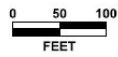
Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	968	0	617	0
Stage 1	-	-	683	683
Stage 2	-	-	1012	1012
Critical Hdwy	4.12	-	4.12	-
Critical Hdwy Stg 1	-	-	6.12	5.52
Critical Hdwy Stg 2	-	-	6.12	5.52
Follow-up Hdwy	2.218	-	2.218	-
Pot Cap-1 Maneuver	712	-	963	-
Stage 1	-	-	439	449
Stage 2	-	-	288	317
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	712	-	963	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	408	418
Stage 2	-	-	236	301

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.2	26.4	111.8
HCM LOS			D	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	227	712	-	-	963	-	-	61	327
HCM Lane V/C Ratio	0.263	0.047	-	-	0.023	-	-	0.85	0.122
HCM Control Delay (s)	26.4	10.3	0	-	8.8	0	-	184.2	17.5
HCM Lane LOS	D	B	A	-	A	A	-	F	C
HCM 95th %tile Q(veh)	1	0.1	-	-	0.1	-	-	3.9	0.4

4/23/2024
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IA 163 NB Ramp & Washington Street

Intersection Concept

Pella, Iowa

04/23/2024

OPINION OF PROBABLE PROJECT COSTS



WASHINGTON STREET AND IA 163 NB RAMP INTERSECTION IMPROVEMENTS
CONCEPT
PELLA, IOWA

ITEM #	ITEM CODE	DESCRIPTION	Division 1 QTY	Division 2 QTY	UNIT	UNIT PRICE	Division 1 (City Cost)	Division 2 (Kwik Star Cost)	EXTENDED COST	
1	2102-2710070	Excavation, Class 10, Roadway and Borrow	3200	300	CY	\$ 10.00	\$ 32,000.00	\$ 3,000.00	\$ 35,000.00	
2	2105-8425015	Topsoil, Strip, Salvage, and Spread	1900	100	CY	\$ 15.00	\$ 28,500.00	\$ 1,500.00	\$ 30,000.00	
3	2115-0100000	Modified Subbase	400	250	CY	\$ 50.00	\$ 20,000.00	\$ 12,500.00	\$ 32,500.00	
4	2121-7425010	Granular Shoulders, Type A	1600		TON	\$ 35.00	\$ 56,000.00	\$ -	\$ 56,000.00	
5	2123-7450020	Shoulder Finishing, Earth	20		STA	\$ 400.00	\$ 8,000.00	\$ -	\$ 8,000.00	
6	2301-6911722	Portland Cement Concrete Pavement Samples	0.9	0.1	LS	\$ 2,000.00	\$ 1,800.00	\$ 200.00	\$ 2,000.00	
7	2302-1200100	Portland Cement Concrete Pavement Widening, 10 in.	1450	1250	SY	\$ 110.00	\$ 159,500.00	\$ 137,500.00	\$ 297,000.00	
8	2416-1180024	Aprons, Concrete, 24 in. dia.	3		EACH	\$ 1,500.00	\$ 4,500.00	\$ -	\$ 4,500.00	
9	2416-1180024	Culvert, Concrete Roadway Pipe, 24 in. dia.	80		LF	\$ 75.00	\$ 6,000.00	\$ -	\$ 6,000.00	
10	2502-6745952	Removal of Subdrain	2500		LF	\$ 5.00	\$ 12,500.00	\$ -	\$ 12,500.00	
11	2502-8212036	Subdrain, Longitudinal, (Shoulder) 6 in. dia.	2200		LF	\$ 25.00	\$ 55,000.00	\$ -	\$ 55,000.00	
12	2502-8221306	Subdrain Outlet, DR-306	10		EACH	\$ 500.00	\$ 5,000.00	\$ -	\$ 5,000.00	
13	2510-6745850	Removal of Pavement	1200		SY	\$ 12.00	\$ 14,400.00	\$ -	\$ 14,400.00	
14	2524-6765010	Remove and Reinstall Sign As Per Plan	15		EACH	\$ 200.00	\$ 3,000.00	\$ -	\$ 3,000.00	
15	2525-0000100	Traffic Signalization	1		LS	\$ 200,000.00	\$ 200,000.00	\$ -	\$ 200,000.00	
16	2527-9263109	Painted Pavement Markings, Waterborne or Solvent-Based	75		STA	\$ 150.00	\$ 11,250.00	\$ -	\$ 11,250.00	
17	2527-9263180	Pavement Markings Removed	15		STA	\$ 75.00	\$ 1,125.00	\$ -	\$ 1,125.00	
18	2528-8445110	Traffic Control	1		LS	\$ 20,000.00	\$ 20,000.00	\$ -	\$ 20,000.00	
19	2533-4980005	Mobilization	0.9	0.1	LS	\$ 35,000.00	\$ 31,500.00	\$ 3,500.00	\$ 35,000.00	
20	2599-9999010	Clearing and Grubbing	1		LS	\$ 5,000.00	\$ 5,000.00	\$ -	\$ 5,000.00	
21	2599-9999010	SWPPP Preparation	1		LS	\$ 2,000.00	\$ 2,000.00	\$ -	\$ 2,000.00	
22	2599-9999010	SWPPP Management	1		LS	\$ 3,500.00	\$ 3,500.00	\$ -	\$ 3,500.00	
23	2601-2634150	Mulching, Wood Cellulose Fiber	1.5		ACRE	\$ 3,000.00	\$ 4,500.00	\$ -	\$ 4,500.00	
24	2601-2636043	Seeding and Fertilizing (Rural)	0.5		ACRE	\$ 4,000.00	\$ 2,000.00	\$ -	\$ 2,000.00	
25	2601-2636044	Seeding and Fertilizing (Urban)	0.75	0.25	ACRE	\$ 4,500.00	\$ 3,375.00	\$ 1,125.00	\$ 4,500.00	
26	2602-0000020	Silt Fence	750		LF	\$ 2.50	\$ 1,875.00	\$ -	\$ 1,875.00	
27	2602-0000030	Silt Fence for Ditch Checks	200		LF	\$ 3.00	\$ 600.00	\$ -	\$ 600.00	
28	2602-0000071	Removal of Silt Fence or Silt Fence for Ditch Checks	950		LF	\$ 1.00	\$ 950.00	\$ -	\$ 950.00	
29	2602-0000101	Maintenance of Silt Fence or Silt Fence for Ditch Check	950		LF	\$ 1.00	\$ 950.00	\$ -	\$ 950.00	
30	2602-0000309	Perimeter and Slope Sediment Control Device, 9 in. dia.	600		LF	\$ 5.00	\$ 3,000.00	\$ -	\$ 3,000.00	
31	2602-0000350	Removal of Perimeter and Slope Sediment Control Device	600		LF	\$ 1.00	\$ 600.00	\$ -	\$ 600.00	
							Subtotal:	\$ 698,425.00	\$ 159,325.00	\$ 857,750.00
							Contingency (20%):	\$ 140,000.00	\$ 32,000.00	\$ 172,000.00
							CONSTRUCTION TOTAL:	\$ 839,000.00	\$ 192,000.00	\$ 1,030,000.00
							Engineering Design and Construction Administration (15%):	\$ 126,000.00	\$ 29,000.00	\$ 155,000.00
							PROJECT TOTAL:	\$ 965,000.00	\$ 221,000.00	\$ 1,185,000.00