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MEMORANDUM

TO: Ross Baker, Senior Mechanical Engineer
KFI Engineers

FROM: Josh Woller, PE (Lic. WI, IL, IN)

DATE: November 28, 2023

RE: Project Orange Traffic Study
SEH No. 171784 14.00

KFI Engineers is developing plans for a processing plant located in the SE portion of the City of Evansville, WI. The site is located on CTH M, South of USH 14. The main purpose of the site is to serve as a processing center. Currently, site preparation work is anticipated to begin in 2024, and it is anticipated the agricultural processing plant will be fully operational by mid-2026.

Due to the anticipated increase in both passenger car and heavy truck traffic a traffic study has been conducted to review existing and proposed traffic operations. The traffic study includes data collection, evaluation of existing traffic operations, and evaluation of build traffic (operations) with the addition of the proposed site and access points.

The site is proposed to have two access points on CTH M north of Gunter Drive. The northern driveway will serve as a site entrance and the southern driveway will serve as a site exit.

See Figure 1 for a Project Location Map and Proposed Site Plan.

Study Area / Data Collection

In general, the overall study area includes USH 14, CTH M, and Weary Road. In order to analyze traffic operations turning movement counts were collected at the two (2) intersections throughout the study area. Per typical industry procedures, SEH utilized video camera equipment to collect and process 13-hour turning movement count data on Thursday, April 6, 2023, and Thursday, April 13, 2023, at the study intersections:

1. USH 14 & CTH M (Traffic Signal)
2. USH 14 & Weary Road (Two-way Stop Control)

The AM and PM peak hours varied slightly between intersections, but in general 7:00-8:00 AM and 3:45-4:45 PM captures the peak periods. Due to the PM peak hour traffic counts being higher the analysis in this memo focuses on the PM peak. See Figure 2 – Existing Traffic Counts for a summary of the traffic counts as well as a location of each count.

Evaluation of Existing Conditions

The study area intersections were analyzed using procedures set forth in the *Highway Capacity Manual 6th Edition (HCM)*. The *Highway Capacity Manual* is published by the Transportation Research Board and is the accepted procedure for analyzing intersection operations. Level of service (LOS) is the metric by

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which roadway operations are defined based on the delay/congestion experienced by users of the facility. LOS ranges from LOS A, little to no delay/congestion, to LOS F, significant delay/congestion. Generally, a LOS D or better indicates acceptable operating conditions during a peak hour. Descriptions of the various levels of service are as follows:

- **LOS A** is the highest level of service that can be achieved. Under this condition, intersection approaches appear quite open, turning movements are easily made, and nearly all drivers find freedom of operation. At signalized and unsignalized intersections, average delays are less than 10 seconds.
- **LOS B** represents stable operation. At signalized intersections, average vehicle delays are 10 to 20 seconds. At unsignalized intersections, average delays are 10 to 15 seconds.
- **LOS C** still represents stable operation, but periodic backups of a few vehicles may develop behind turning vehicles. Most drivers begin to feel restricted, but not objectionably so. At signalized intersections, average vehicle delays are 20 to 35 seconds. At unsignalized intersections, average delays are 15 to 25 seconds.
- **LOS D** represents increasing traffic restrictions as the intersection approaches instability. Delays to approaching vehicles may be substantial during short peaks within the peak period, but periodic clearance of long lines occurs, thus preventing excessive backups. At signalized intersections, average vehicle delays are 35 to 55 seconds. At unsignalized intersections, average delays are 25 to 35 seconds.
- **LOS E** represents the capacity of the intersection. At signalized intersections, average vehicle delays are 55 to 80 seconds. At unsignalized intersections, average delays are 35 to 50 seconds.
- **LOS F** represents jammed conditions where the intersection is over capacity and acceptable gaps for unsignalized intersections in the mainline traffic flow are minimal. At signalized intersections, average vehicle delays exceed 80 seconds. At unsignalized intersections, average delays exceed 50 seconds.

The existing traffic operations capacity analysis is based on the existing geometrics, turning movement counts, and the existing traffic control. Table 1 summarizes the weekday AM and PM peak hour traffic operating conditions for the existing traffic. All intersection movements currently operate at LOS C or better, and overall, all intersections operate at LOS B or better. Synchro / HCM outputs are included in Attachment A.

It should be noted that the EB bypass lane at Weary Road was modeled as a short-left turn lane to best imitate actual operations.

Table 1
Existing Conditions LOS, by Movement

Intersection	Traffic Control	Peak Hour	Level of Service (Delay sec/veh)										Overall Intersection		
			Eastbound			Westbound			Northbound			Southbound			
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left		Thru	Right
Node 6: USH 14 & CTH M	Traffic Signal Control	PM	A (9.2)	A (6.8)	B (13.1)	B (16.2)	C (20.7)	B (18.4)	C (20.5)	B (18.8)				B (13.8)	
Node 3: USH 14 & Weary Road	Two-way Stop Control	PM	A (8.1)	A (0.0)	A (8.4)	A (0.0)	B (14.4)				C (16.5)			A (0.8)	

Site Traffic Forecasting

To address any potential future traffic impacts at the study area intersections, it is necessary to identify the hourly volume of traffic generated by the anticipated development. The traffic volumes expected to be generated are based on the size and type of the proposed use. Due to the uniqueness of the site, the anticipated number of trips and shift information was provided by KFI Engineers based on the operations of similar facilities.

Trip Generation

In order to examine a worst-case scenario analysis maximum anticipated peaks from the development were added to the existing peak periods. As noted, expected peak hour trips were provided by KFI Engineers. See Figure 3 for a summary of trips.

For final build operations a typical week, the development is anticipated to generate 3,036 truck per week with 95% of these trucks operating between Monday and Friday. Furthermore 95% of those trips are expected to occur over a 12-hour period with those trips being evenly distributed over that time. The remaining 5% of trips will occur during off-peak times. During a typical weekday hour, the development is anticipated to generate 90 truck trips (45 entering / 45 exiting).

Employee counts at the facility are expected to be minimal and the proposed shift changes at 6:00 AM and 6:00 PM do not align with the current roadway peak hours. For the purpose of this study, it is assumed that 40 employees (20 entering / 20 exiting) will be generated at shift changes, but since they are outside of the existing roadway peaks they were not included in the analysis.

Mode Split

The development area currently has no pedestrian accommodations and is in a rural area. Given this, no reduction in the number of vehicle trips to include walking and bicycle trips was applied.

Linked and Pass-by Trip Traffic

Due to the development type no reductions were applied for Linked Trips or Pass-by Trips.

Trip Distribution

Trip distribution was based on the existing traffic patterns, the proposed land use, and the location of population centers, as well as site access. Trips were assigned to the study area roadways in accordance with the following trip distribution:

- 33.3% to/from east on USH 14
- 33.3% to/from west on USH 14
- 33.3% to/from south on CTH M

Trip Assignment

Traffic generated by Project Orange was assigned to the existing roadway system based on the trip generation and distribution above for each access alternative that was discussed above. New development trips were assigned and reflect the above directional distributions. The new development trips are shown in Figure 3. The existing traffic volumes and site generated traffic were added together to generate the build total traffic volumes, which are included in Figure 4.

Build Conditions

The total build traffic (including Project Orange generated traffic) PM peak hour operating conditions based on the existing transportation system are summarized in Table 2 below. The total traffic analysis was completed using existing intersection configurations and traffic control.

As can be seen in Table 2, under normal typical weekday operating conditions, access alternative 1, all intersection movements continue to operate at LOS C or better. Overall, all intersections continue to operate at LOS B.

Table 2
Existing Conditions (Build Traffic – Alternative 1) LOS, by Movement

Intersection	Traffic Control	Peak Hour	Level of Service (Delay sec/veh)													
			Eastbound			Westbound			Northbound			Southbound			Overall Intersection	
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right		
Node 6: USH 14 & CTH M	Traffic Signal Control	PM	A (9.6)	A (7.3)		B (13.9)	B (16.8)		C (20.8)	B (18.4)		C (20.7)	B (18.2)		B (14.2)	
Node 3: USH 14 & Weary Road	Two-way Stop Control	PM	A (8.1)	A (0.0)		A (8.5)	A (0.0)		B (14.8)			C (17.2)				A (0.7)
Node 9: CTH M & Project Orange West Driveway (Exit)	Two-way Stop Control	PM	--			B (10.9)			A (0.0)			A (0.0)	A (0.0)		A (1.4)	
Node 10: CTH M & Project Orange West Driveway (Entrance)	Two-way Stop Control	PM	--			A (0.0)			A (0.0)			A (7.6)	A (0.0)		A (0.6)	

Build Conditions – Peak Harvest Season

In addition to the above analysis, it was requested that the study area also be evaluated during the peak harvest season. Traffic counts were collected at the US 14 & CTH M intersection on Thursday, October 19, 2023. In general traffic patterns and volumes were consistent with the April traffic counts. A comparison of the daily totals is included in Attachment B.

The total build traffic (including Project Orange generated traffic and peak harvest season counts) PM peak hour operating conditions based on the existing transportation system are summarized in Table 3 below. The total traffic analysis was completed using existing intersection configurations and traffic control.

As can be seen in Table 3, under normal typical weekday operating conditions, access alternative 1, all intersection movements continue to operate at LOS C or better. Overall, all intersections continue to operate at LOS B.

Table 3
Existing Conditions (Build Traffic (Peak Harvest – Alternative 1) LOS, by Movement

Intersection	Traffic Control	Peak Hour	Level of Service (Delay sec/veh)											Overall Intersection	
			Eastbound			Westbound			Northbound			Southbound			
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru		Right
Node 6: USH 14 & CTH M	Traffic Signal Control	PM	A (9.2)	A (6.8)		B (13.2)	B (15.8)		C (21.5)	B (17.2)		B (19.2)	B (19.3)		B (13.5)
Node 9: CTH M & Project Orange West Driveway (Exit)	Two-way Stop Control	PM	--			B (11.0)			A (0.0)			A (0.0)	A (0.0)		A (1.4)
Node 10: CTH M & Project Orange West Driveway (Entrance)	Two-way Stop Control	PM	--			A (0.0)			A (0.0)			A (8.4)	A (0.0)		A (0.7)

Conclusion

Final Operations

Based on the current site plan layout and build operations all study intersections will continue to operate with acceptable LOS with the addition of Project Orange traffic with no additional roadway improvements needed during both the peak harvest season and off-peak harvest season.

jmw

Figure 1 – Project Location Map / Site Plan

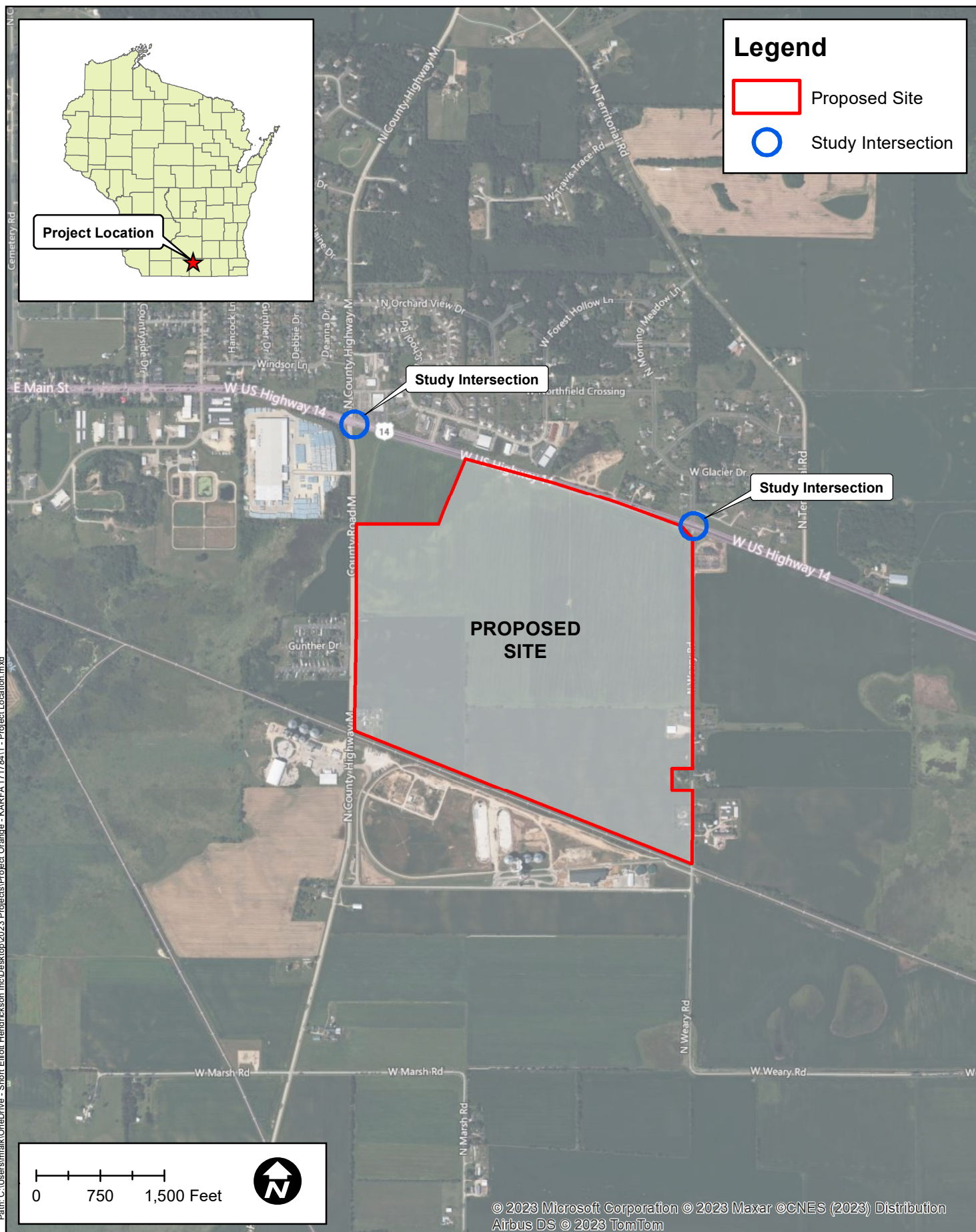
Figure 2 – Existing Traffic Counts

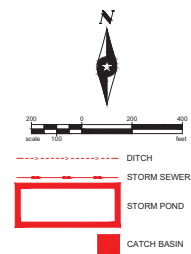
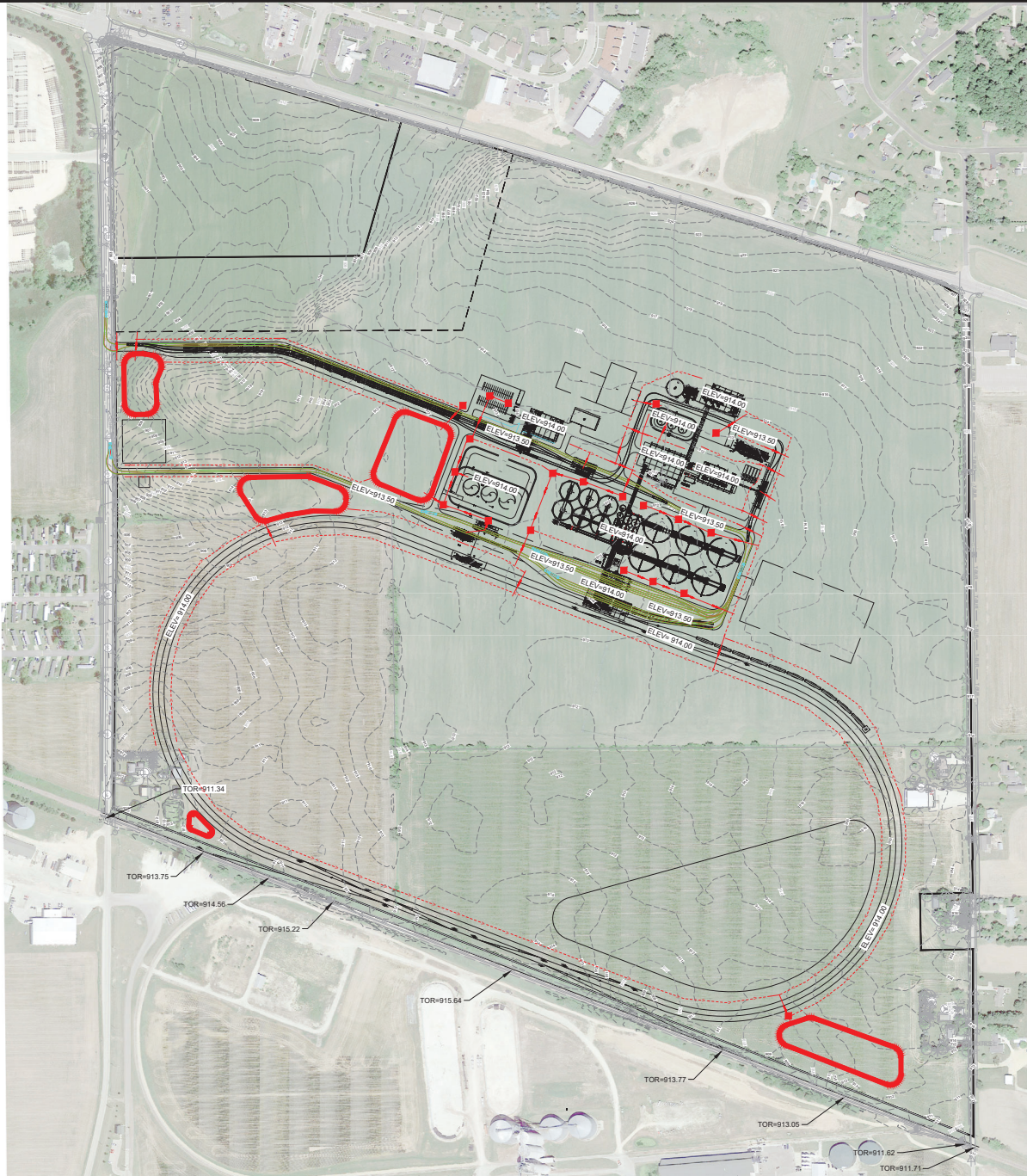
Figure 3 – New Trips

Figure 4 – Build Traffic

Attachment A – Synchro Operational Outputs

Attachment B – Seasonal Traffic Count Comparisons





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NO.	DATE	REVISION	BY	DESIGNED	CHECKED	DATE	SCALE
A	5/25/2023	ISSUED FOR REVIEW	M/JW	M/JW			
B	6/1/2023	UPDATED SITE PLAN AND DRAINAGE PLAN	M/JW	BUR			

OVERALL GRADING PLAN	REVISION NO.
	A
Overall Processing - PROJECT ORANGE	DRAWN BY: KAT17784G29
	CHECKED BY: CIVIL
	DATE PRINTED: 6/1/2023
	DRAWING NO: CIV-0200

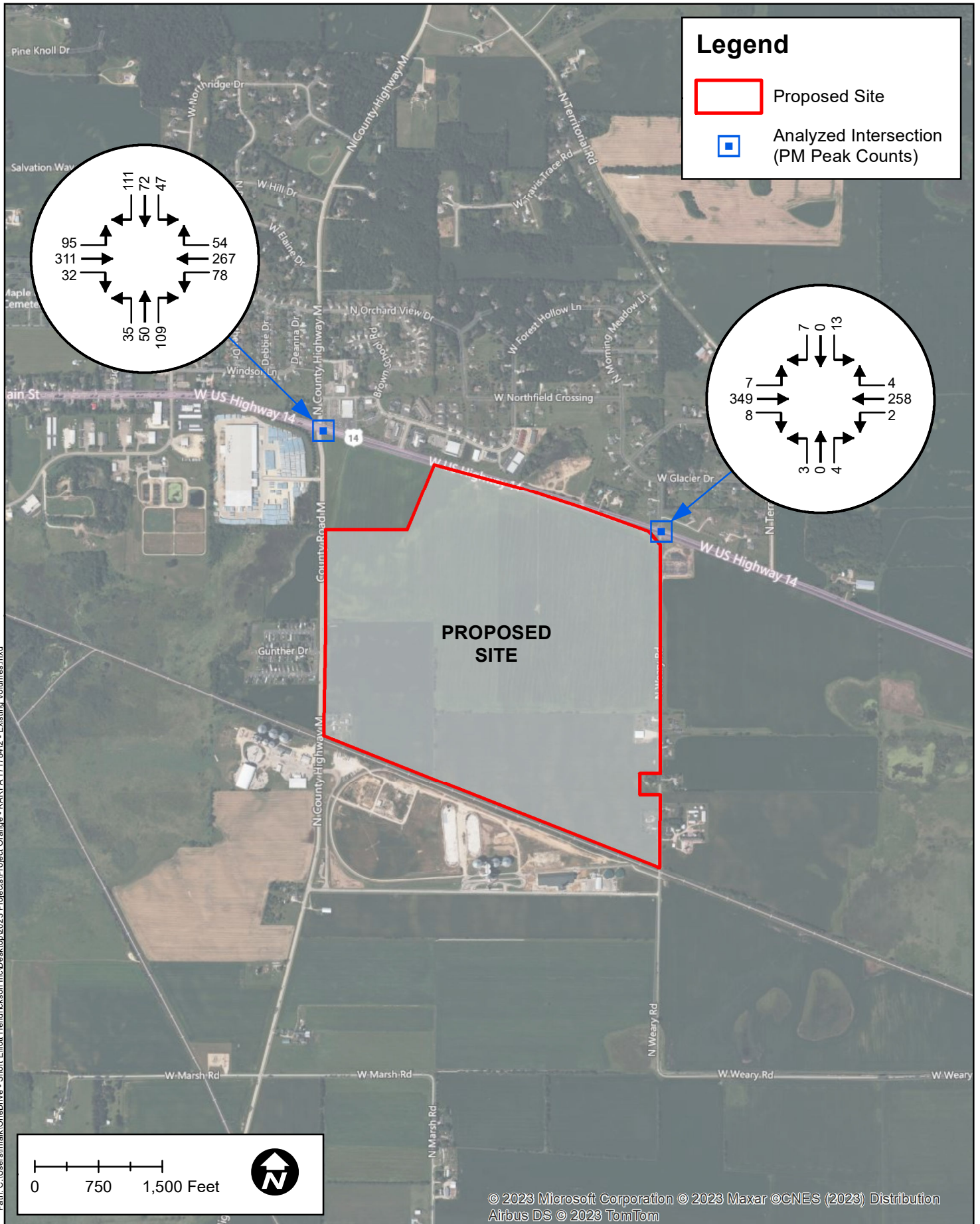
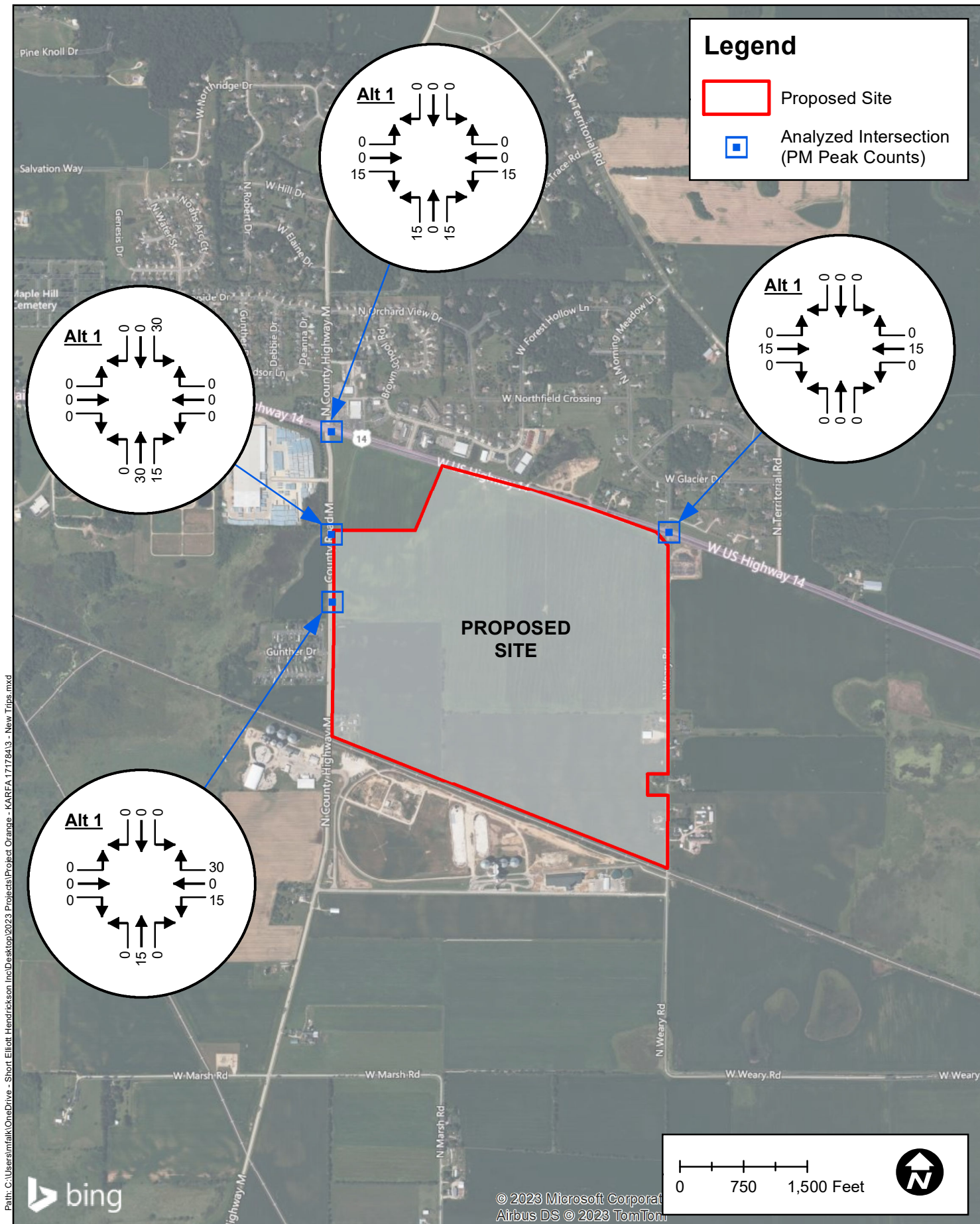


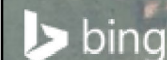
Exhibit 2 - Existing Traffic Volumes

Project Orange TIA

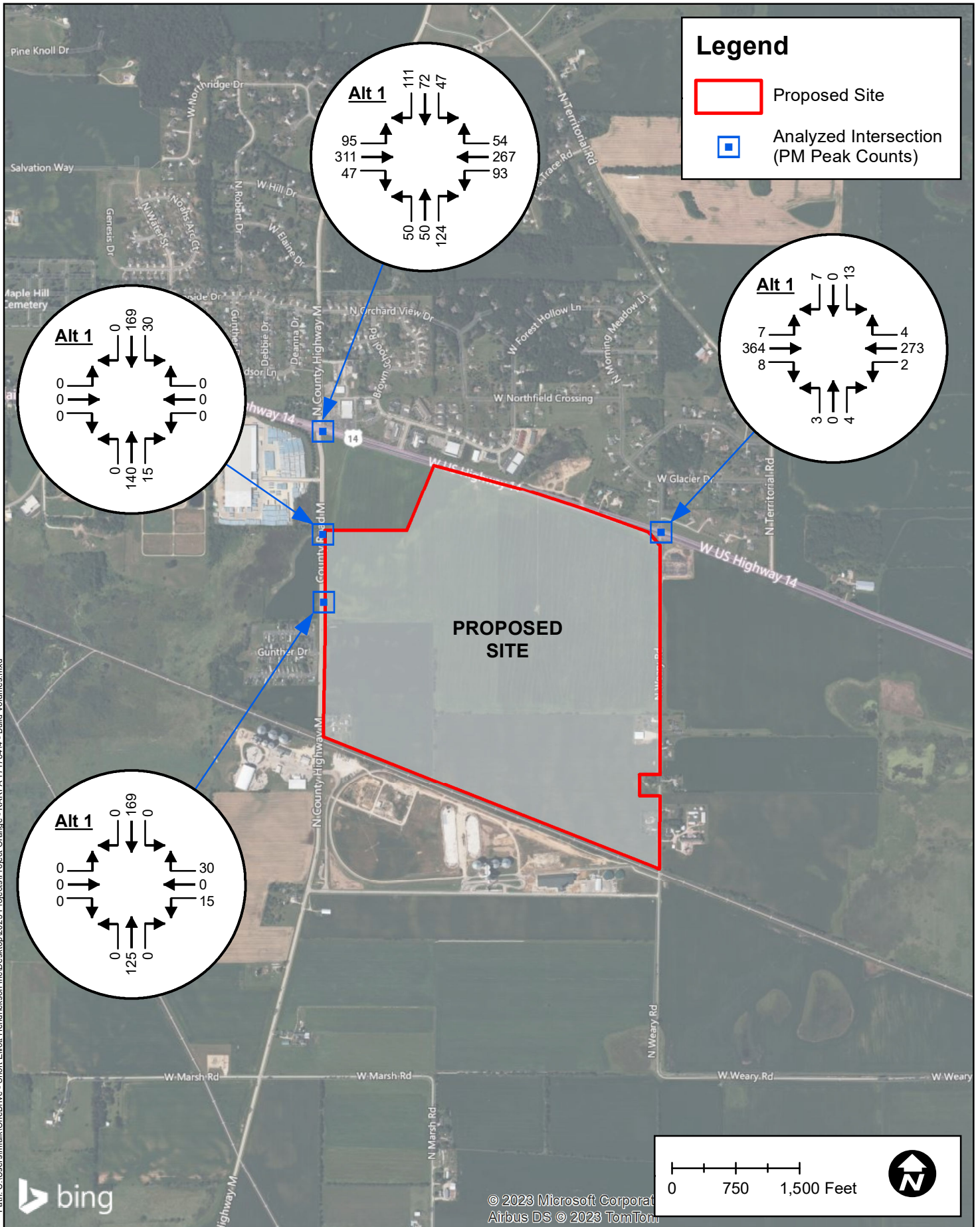
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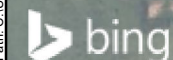
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ATTACHMENT A - SYNCHRO OPERATIONAL OUTPUTS

SYNCHRO OPERATIONAL OUTPUTS - EXISTING CONDITIONS

HCM 6th TWSC
3: Weary Road & USH 14

05/04/2023

Intersection												
Int Delay, s/veh	0.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	349	8	2	258	4	3	0	4	13	0	7
Future Vol, veh/h	7	349	8	2	258	4	3	0	4	13	0	7
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	100	-	-	-	-	100	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	74	74	74	74	74	74	74	74	74	74	74	74
Heavy Vehicles, %	5	5	5	6	6	6	0	0	0	7	7	7
Mvmt Flow	9	472	11	3	349	5	4	0	5	18	0	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	354	0	0	483	0	0	858	856	478	853	856	349
Stage 1	-	-	-	-	-	-	496	496	-	355	355	-
Stage 2	-	-	-	-	-	-	362	360	-	498	501	-
Critical Hdwy	4.15	-	-	4.16	-	-	7.1	6.5	6.2	7.17	6.57	6.27
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.17	5.57	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.17	5.57	-
Follow-up Hdwy	2.245	-	-	2.254	-	-	3.5	4	3.3	3.563	4.063	3.363
Pot Cap-1 Maneuver	1188	-	-	1059	-	-	279	297	591	274	290	683
Stage 1	-	-	-	-	-	-	559	549	-	652	621	-
Stage 2	-	-	-	-	-	-	661	630	-	545	534	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1188	-	-	1059	-	-	273	293	591	269	287	683
Mov Cap-2 Maneuver	-	-	-	-	-	-	273	293	-	269	287	-
Stage 1	-	-	-	-	-	-	555	545	-	647	619	-
Stage 2	-	-	-	-	-	-	649	627	-	536	530	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.1			14.4			16.5		
HCM LOS							B			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	394	1188	-	-	1059	-	-	341
HCM Lane V/C Ratio	0.024	0.008	-	-	0.003	-	-	0.079
HCM Control Delay (s)	14.4	8.1	-	-	8.4	0	-	16.5
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.3

HCM 6th Signalized Intersection Summary

6: CTH M & USH 14

05/04/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	95	311	32	78	267	54	35	50	109	47	72	111
Future Volume (veh/h)	95	311	32	78	267	54	35	50	109	47	72	111
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	1856	1856	1856	1841	1841	1841	1796	1796	1796	1885	1885	1885
Adj Flow Rate, veh/h	109	357	37	90	307	62	40	57	125	54	83	128
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	3	3	3	4	4	4	7	7	7	1	1	1
Cap, veh/h	471	895	93	447	457	92	261	106	234	283	142	219
Arrive On Green	0.11	0.54	0.54	0.31	0.31	0.31	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1767	1653	171	974	1486	300	1124	501	1098	1211	669	1031
Grp Volume(v), veh/h	109	0	394	90	0	369	40	0	182	54	0	211
Grp Sat Flow(s),veh/h/ln	1767	0	1825	974	0	1787	1124	0	1599	1211	0	1700
Q Serve(g_s), s	1.7	0.0	6.2	3.4	0.0	8.8	1.6	0.0	4.9	2.0	0.0	5.4
Cycle Q Clear(g_c), s	1.7	0.0	6.2	3.4	0.0	8.8	7.1	0.0	4.9	7.0	0.0	5.4
Prop In Lane	1.00		0.09	1.00		0.17	1.00		0.69	1.00		0.61
Lane Grp Cap(c), veh/h	471	0	988	447	0	549	261	0	340	283	0	361
V/C Ratio(X)	0.23	0.00	0.40	0.20	0.00	0.67	0.15	0.00	0.54	0.19	0.00	0.58
Avail Cap(c_a), veh/h	1000	0	1683	1047	0	1648	829	0	1147	894	0	1220
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	1.00
Uniform Delay (d), s/veh	8.9	0.0	6.5	12.9	0.0	14.7	20.4	0.0	17.1	20.1	0.0	17.3
Incr Delay (d2), s/veh	0.2	0.0	0.3	0.2	0.0	1.4	0.3	0.0	1.3	0.3	0.0	1.5
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	1.7	0.7	0.0	3.2	0.4	0.0	1.7	0.5	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.2	0.0	6.8	13.1	0.0	16.2	20.7	0.0	18.4	20.5	0.0	18.8
LnGrp LOS	A	A	A	B	A	B	C	A	B	C	A	B
Approach Vol, veh/h	503			459			222			265		
Approach Delay, s/veh	7.3			15.6			18.8			19.1		
Approach LOS	A			B			B			B		
Timer - Assigned Phs	1	2	4		6		8					
Phs Duration (G+Y+Rc), s	11.4	21.0	16.4		32.4		16.4					
Change Period (Y+Rc), s	6.0	6.0	6.0		6.0		6.0					
Max Green Setting (Gmax), s	20.0	45.0	35.0		45.0		35.0					
Max Q Clear Time (g_c+I1), s	3.7	10.8	9.0		8.2		9.1					
Green Ext Time (p_c), s	0.2	3.0	1.4		2.7		1.2					
Intersection Summary												
HCM 6th Ctrl Delay				13.8								
HCM 6th LOS				B								

SYNCHRO OPERATIONAL OUTPUTS - EXISTING CONDITIONS (BUILD)

HCM 6th TWSC
3: Weary Road & USH 14

07/13/2023

Intersection												
Int Delay, s/veh	0.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	364	8	2	273	4	3	0	4	13	0	7
Future Vol, veh/h	7	364	8	2	273	4	3	0	4	13	0	7
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	100	-	-	-	-	100	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	74	74	74	74	74	74	74	74	74	74	74	74
Heavy Vehicles, %	5	5	5	6	6	6	0	0	0	7	7	7
Mvmt Flow	9	492	11	3	369	5	4	0	5	18	0	9

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	374	0	0	503	0	0	898	896	498	893	896	369
Stage 1	-	-	-	-	-	-	516	516	-	375	375	-
Stage 2	-	-	-	-	-	-	382	380	-	518	521	-
Critical Hdwy	4.15	-	-	4.16	-	-	7.1	6.5	6.2	7.17	6.57	6.27
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.17	5.57	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.17	5.57	-
Follow-up Hdwy	2.245	-	-	2.254	-	-	3.5	4	3.3	3.563	4.063	3.363
Pot Cap-1 Maneuver	1168	-	-	1041	-	-	262	282	576	257	274	666
Stage 1	-	-	-	-	-	-	546	538	-	636	608	-
Stage 2	-	-	-	-	-	-	645	617	-	531	523	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1168	-	-	1041	-	-	256	279	576	252	271	666
Mov Cap-2 Maneuver	-	-	-	-	-	-	256	279	-	252	271	-
Stage 1	-	-	-	-	-	-	542	534	-	631	606	-
Stage 2	-	-	-	-	-	-	633	615	-	522	519	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.1			14.8			17.2		
HCM LOS							B			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	375	1168	-	-	1041	-	-	322
HCM Lane V/C Ratio	0.025	0.008	-	-	0.003	-	-	0.084
HCM Control Delay (s)	14.8	8.1	-	-	8.5	0	-	17.2
HCM Lane LOS	B	A	-	-	A	A	-	C
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.3

HCM 6th Signalized Intersection Summary 6: CTH M & USH 14

07/13/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	95	311	47	93	267	54	50	50	124	47	72	111
Future Volume (veh/h)	95	311	47	93	267	54	50	50	124	47	72	111
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	1856	1856	1856	1841	1841	1841	1796	1796	1796	1885	1885	1885
Adj Flow Rate, veh/h	109	357	54	107	307	62	57	57	143	54	83	128
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	3	3	3	4	4	4	7	7	7	1	1	1
Cap, veh/h	460	839	127	435	449	91	275	102	257	281	151	233
Arrive On Green	0.11	0.53	0.53	0.30	0.30	0.30	0.23	0.23	0.23	0.23	0.23	0.23
Sat Flow, veh/h	1767	1575	238	959	1486	300	1124	454	1138	1192	669	1031
Grp Volume(v), veh/h	109	0	411	107	0	369	57	0	200	54	0	211
Grp Sat Flow(s),veh/h/ln	1767	0	1813	959	0	1787	1124	0	1591	1192	0	1700
Q Serve(g_s), s	1.8	0.0	6.8	4.3	0.0	9.0	2.3	0.0	5.5	2.1	0.0	5.4
Cycle Q Clear(g_c), s	1.8	0.0	6.8	4.3	0.0	9.0	7.8	0.0	5.5	7.6	0.0	5.4
Prop In Lane	1.00		0.13	1.00		0.17	1.00		0.71	1.00		0.61
Lane Grp Cap(c), veh/h	460	0	966	435	0	540	275	0	359	281	0	383
V/C Ratio(X)	0.24	0.00	0.43	0.25	0.00	0.68	0.21	0.00	0.56	0.19	0.00	0.55
Avail Cap(c_a), veh/h	978	0	1643	1015	0	1620	814	0	1122	853	0	1198
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	1.00
Uniform Delay (d), s/veh	9.3	0.0	7.0	13.6	0.0	15.2	20.4	0.0	17.0	20.4	0.0	17.0
Incr Delay (d2), s/veh	0.3	0.0	0.3	0.3	0.0	1.5	0.4	0.0	1.4	0.3	0.0	1.2
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	0.6	0.0	2.0	0.8	0.0	3.4	0.6	0.0	1.9	0.5	0.0	2.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.6	0.0	7.3	13.9	0.0	16.8	20.8	0.0	18.4	20.7	0.0	18.2
LnGrp LOS	A	A	A	B	A	B	C	A	B	C	A	B
Approach Vol, veh/h	520			476			257			265		
Approach Delay, s/veh	7.8			16.1			18.9			18.7		
Approach LOS	A			B			B			B		
Timer - Assigned Phs	1	2	4		6		8					
Phs Duration (G+Y+Rc), s	11.4	21.0	17.2		32.4		17.2					
Change Period (Y+Rc), s	6.0	6.0	6.0		6.0		6.0					
Max Green Setting (Gmax), s	20.0	45.0	35.0		45.0		35.0					
Max Q Clear Time (g_c+I1), s	3.8	11.0	9.6		8.8		9.8					
Green Ext Time (p_c), s	0.2	3.1	1.4		2.9		1.4					
Intersection Summary												
HCM 6th Ctrl Delay	14.2											
HCM 6th LOS	B											

Intersection						
Int Delay, s/veh	1.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	30	125	0	0	169
Future Vol, veh/h	15	30	125	0	0	169
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	66	66	20	20	20	20
Mvmt Flow	18	35	147	0	0	199
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	346	147	0	0	147	0
Stage 1	147	-	-	-	-	-
Stage 2	199	-	-	-	-	-
Critical Hdwy	7.06	6.86	-	-	4.3	-
Critical Hdwy Stg 1	6.06	-	-	-	-	-
Critical Hdwy Stg 2	6.06	-	-	-	-	-
Follow-up Hdwy	4.094	3.894	-	-	2.38	-
Pot Cap-1 Maneuver	540	756	-	-	1332	-
Stage 1	746	-	-	-	-	-
Stage 2	703	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	540	756	-	-	1332	-
Mov Cap-2 Maneuver	540	-	-	-	-	-
Stage 1	746	-	-	-	-	-
Stage 2	703	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	10.9	0	0			
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	667	1332	-	
HCM Lane V/C Ratio	-	-	0.079	-	-	
HCM Control Delay (s)	-	-	10.9	0	-	
HCM Lane LOS	-	-	B	A	-	
HCM 95th %tile Q(veh)	-	-	0.3	0	-	

HCM 6th TWSC
10: CTH M & Project Orange West Driveway (Entrance)

07/13/2023

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	140	15	30	169
Future Vol, veh/h	0	0	140	15	30	169
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	152	16	33	184
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	410	160	0	0	168	0
Stage 1	160	-	-	-	-	-
Stage 2	250	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	598	885	-	-	1410	-
Stage 1	869	-	-	-	-	-
Stage 2	792	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	582	885	-	-	1410	-
Mov Cap-2 Maneuver	582	-	-	-	-	-
Stage 1	869	-	-	-	-	-
Stage 2	771	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	0	0		1.1		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	-	1410	-	
HCM Lane V/C Ratio	-	-	-	0.023	-	
HCM Control Delay (s)	-	-	0	7.6	0	
HCM Lane LOS	-	-	A	A	A	
HCM 95th %tile Q(veh)	-	-	-	0.1	-	

HCM 6th Signalized Intersection Summary 6: CTH M & USH 14

11/28/2023

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	140	328	44	72	233	74	44	50	64	61	76	133
Future Volume (veh/h)	140	328	44	72	233	74	44	50	64	61	76	133
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	1811	1811	1811	1856	1856	1856	1752	1752	1752	1885	1885	1885
Adj Flow Rate, veh/h	146	342	46	75	243	77	46	52	67	64	79	139
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	6	6	6	3	3	3	10	10	10	1	1	1
Cap, veh/h	509	852	115	444	408	129	250	148	191	336	130	229
Arrive On Green	0.12	0.55	0.55	0.30	0.30	0.30	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1725	1563	210	988	1351	428	1089	695	896	1283	613	1078
Grp Volume(v), veh/h	146	0	388	75	0	320	46	0	119	64	0	218
Grp Sat Flow(s),veh/h/ln	1725	0	1773	988	0	1779	1089	0	1591	1283	0	1691
Q Serve(g_s), s	2.5	0.0	6.3	2.8	0.0	7.6	2.0	0.0	3.2	2.2	0.0	5.8
Cycle Q Clear(g_c), s	2.5	0.0	6.3	2.8	0.0	7.6	7.8	0.0	3.2	5.4	0.0	5.8
Prop In Lane	1.00		0.12	1.00		0.24	1.00		0.56	1.00		0.64
Lane Grp Cap(c), veh/h	509	0	967	444	0	538	250	0	338	336	0	360
V/C Ratio(X)	0.29	0.00	0.40	0.17	0.00	0.60	0.18	0.00	0.35	0.19	0.00	0.61
Avail Cap(c_a), veh/h	993	0	1608	1041	0	1613	787	0	1122	968	0	1193
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	1.00
Uniform Delay (d), s/veh	8.8	0.0	6.6	13.1	0.0	14.7	21.2	0.0	16.6	18.9	0.0	17.7
Incr Delay (d2), s/veh	0.3	0.0	0.3	0.2	0.0	1.1	0.4	0.0	0.6	0.3	0.0	1.6
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	0.8	0.0	1.8	0.6	0.0	2.8	0.5	0.0	1.1	0.6	0.0	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.2	0.0	6.8	13.2	0.0	15.8	21.5	0.0	17.2	19.2	0.0	19.3
LnGrp LOS	A	A	A	B	A	B	C	A	B	B	A	B
Approach Vol, veh/h	534			395			165			282		
Approach Delay, s/veh	7.5			15.3			18.4			19.3		
Approach LOS	A			B			B			B		
Timer - Assigned Phs	1	2	4			6		8				
Phs Duration (G+Y+Rc), s	12.1	21.0	16.6			33.1		16.6				
Change Period (Y+Rc), s	6.0	6.0	6.0			6.0		6.0				
Max Green Setting (Gmax), s	20.0	45.0	35.0			45.0		35.0				
Max Q Clear Time (g_c+I1), s	4.5	9.6	7.8			8.3		9.8				
Green Ext Time (p_c), s	0.3	2.6	1.5			2.7		0.8				
Intersection Summary												
HCM 6th Ctrl Delay	13.5											
HCM 6th LOS	B											

Intersection						
Int Delay, s/veh	1.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	30	143	0	0	162
Future Vol, veh/h	15	30	143	0	0	162
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	66	66	20	20	20	20
Mvmt Flow	18	35	168	0	0	191

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	359	168	0
Stage 1	168	-	-
Stage 2	191	-	-
Critical Hdwy	7.06	6.86	4.3
Critical Hdwy Stg 1	6.06	-	-
Critical Hdwy Stg 2	6.06	-	-
Follow-up Hdwy	4.094	3.894	2.38
Pot Cap-1 Maneuver	530	734	1308
Stage 1	728	-	-
Stage 2	709	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	530	734	1308
Mov Cap-2 Maneuver	530	-	-
Stage 1	728	-	-
Stage 2	709	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	651	1308	-
HCM Lane V/C Ratio	-	0.081	-	-
HCM Control Delay (s)	-	11	0	-
HCM Lane LOS	-	B	A	-
HCM 95th %tile Q(veh)	-	0.3	0	-

HCM 6th TWSC
10: CTH M & Project Orange West Driveway (Entrance)

11/28/2023

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	0	158	15	30	162
Future Vol, veh/h	0	0	158	15	30	162
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	20	66	66	20
Mvmt Flow	0	0	172	16	33	176

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	422	180	0
Stage 1	180	-	-
Stage 2	242	-	-
Critical Hdwy	6.42	6.22	-
Critical Hdwy Stg 1	5.42	-	-
Critical Hdwy Stg 2	5.42	-	-
Follow-up Hdwy	3.518	3.318	-
Pot Cap-1 Maneuver	588	863	-
Stage 1	851	-	-
Stage 2	798	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	568	863	-
Mov Cap-2 Maneuver	568	-	-
Stage 1	851	-	-
Stage 2	771	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	1.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	1080	-
HCM Lane V/C Ratio	-	-	0.03	-
HCM Control Delay (s)	-	-	0	8.4
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	-

ATTACHMENT B - SEASONAL TRAFFIC COUNT COMPARISON

US 14 at CTH M																										
Time		Southbound CTH M						Westbound USH 14						Northbound CTH M						Eastbound USH 14						VEHICLE TOTAL
		U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	Vehicle Approach Total	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	Vehicle Approach Total	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	Vehicle Approach Total	U Turns	Left Turns	Straight Through	Right Turns	Crosswalk Crossings	Vehicle Approach Total	
Thursday, April 6, 2023	DAILY TOTAL	0	347	422	915	24	1684	0	502	2545	554	0	3601	0	305	436	560	0	1301	0	841	2797	351	4	3989	10575
	Cars	0	339	409	901	24	1649	0	439	2440	539	0	3418	0	209	398	493	0	1100	0	832	2638	231	4	3701	9868
	Heavy Vehicles	0	8	13	14	0	35	0	63	105	15	0	183	0	96	38	67	0	201	0	9	159	120	0	288	707
	Heavy Vehicle %	0.00%	2.31%	3.08%	1.53%	0.00%	2.08%	0.00%	12.55%	4.13%	2.71%	0.00%	5.08%	0.00%	31.48%	8.72%	11.96%	0.00%	15.45%	0.00%	1.07%	5.68%	34.19%	0.00%	7.22%	6.69%
Thursday, October 19, 2023	DAILY TOTAL	0	386	440	1009	19	1835	0	486	2476	592	0	3554	0	314	401	472	0	1187	0	990	2679	310	1	3979	10555
	Cars	0	381	415	989	16	1785	0	429	2345	580	0	3354	0	230	363	425	0	1018	0	970	2519	227	1	3716	9873
	Heavy Vehicles	0	5	25	20	3	50	0	57	131	12	0	200	0	84	38	47	0	169	0	20	160	83	0	263	682
	Heavy Vehicle %	0.00%	1.30%	5.68%	1.98%	15.79%	2.72%	0.00%	11.73%	5.29%	2.03%	0.00%	5.63%	0.00%	26.75%	9.48%	9.96%	0.00%	14.24%	0.00%	2.02%	5.97%	26.77%	0.00%	6.61%	6.46%