

PROVIDING TRAFFIC ENGINEERING SOLUTIONS

TRAFFIC IMPACT ANALYSIS

DATE:

October 12, 2020

TO:

Ryan Cardinal, P.E.

Cardinal Engineering LLC

FROM:

Donald J Lee, P.E.

John A Bieberitz, P.E., PTOE Traffic Analysis & Design, Inc. RECEIVED

OCT 16 2020

RACINE COUNTY

SUBJECT:

Asphalt Contractors Gravel Pit - Traffic Impact Analysis

Town of Burlington, Racine County, WI

INTRODUCTION

Asphalt Contractors is proposing a new gravel pit operation on a parcel of land located approximately ½-mile west of McHenry Street / County Trunk Highway (CTH) P, to the west of Fish Hatchery Road in the town of Burlington, Racine County, Wisconsin. The new gravel pit is proposed to provide a dedicated gravel supply for their asphalt operation which is located approximately 2 ½-miles to the north of the proposed gravel pit site along CTH P on Market Street (Exhibit 1). Access to the new gravel pit is proposed via the existing Sun Ray Hills Drive which is located on the west approach of the CTH P intersection with Fish Hatchery Road. This traffic impact analysis (TIA) report was prepared to address the peak hour traffic impacts of the proposed gravel pit traffic at the CTH P intersection with Fish Hatchery Road.

STUDY AREA

Study Intersections

The study area for this TIA includes the following intersection:

• McHenry Street (CTH P) & Fish Hatchery Road (two-way stop)

The intersection is shown on the study area map on Exhibit 1. A transportation detail illustrating existing intersection lane configurations, speed limits, and approximate intersection spacing is shown in Exhibit 3.

Study Area Roadways

McHenry Street (CTH P) is a two-lane rural undivided north/south arterial highway with a posted speed limit of 45 miles-per-hour (mph) within the limits of the study area. The Wisconsin Department of Transportation (WisDOT) 2017 annual average daily traffic (AADT) volumes on CTH P were 8,600-vpd north of Fish Hatchery Road and 3,000-vpd (2014 count) to the south.

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Fish Hatchery Road is a two-lane northwest/southeast local collector roadway with a posted speed limit of 35-mph within the limits of the study area. Fish Hatchery Road exists as the east approach of the conventional four-legged two-way stop-controlled intersection with CTH P. The west approach of the intersection is the main driveway to the Sun Ray Hills development, which is currently vacant. The WisDOT 2011 AADT volume on Fish Hatchery Road was 1,500-vpd immediately east of CTH P.

DATA COLLECTION Crash History

A crash analysis, looking at crashes over the past 5 years (January 1, 2015 through December 31, 2019), was also completed as part of this study and found that no significant crash patterns were observed at the CTH P intersection with Fish Hatchery Road. Detailed crash statistics as well as a collision diagram are shown in Exhibit 5. It is noted that only 1 crash was documented at this intersection over the analysis time period and that crash was a late-night crash involving drugs or alcohol where a single vehicle ran off the road and hit an object. Because no crash patterns were observed and the one crash involved drugs or alcohol, no geometric modifications are recommended at the study intersection for safety reasons.

Existing Traffic Counts

Turning movement traffic counts were collected at the CTH P intersection with Fish Hatchery Road on Monday, October 5th during the afternoon (3:00 to 6:00 pm) peak period and Tuesday, October 6th during the morning (6:00 to 9:00 am) peak period. Based on the turning movement traffic counts, the peak traffic hours at the study intersection were determined to occur from 7:15-8:15 a.m. (AM peak hour) and from 2:45-3:45 p.m. (PM peak hour). The traffic volume counts were compiled for these peak hours and are shown on Exhibit 4A as the Existing Traffic Counts. The full traffic count data collected for this study is in Appendix A.

Factored Traffic Volumes

Since the turning movement counts for this study were conducted during the fall of the current year 2020 health crisis/pandemic, historic hourly data from WisDOT's 2017 AADT count station located along CTH P, north of Fish Hatchery Road, was compared to the weekday AM and weekday PM hourly through volumes along the CTH P corridor collected as part of this study. Based on the comparison of historic hourly weekday data, the weekday AM peak hour traffic volumes collected as part of this study in October were approximately 30-percent lower and the weekday PM peak hour traffic volumes were approximately 3-percent lower than the traffic volumes during the historic typical weekday peak hour conditions. Therefore, the CTH P through volumes were "factored up" to typical (pre-Covid) conditions. The existing factored traffic volumes are shown as the Year 2020 Background (Factored) Traffic Volumes on Exhibit 4B.

PROPOSED DEVELOPMENT Site Description

A conceptual site plan for the proposed gravel pit is shown on Exhibit 2. The existing site includes a closed 164-acre campground resort within a mostly wooded area. Additional wooded

lands exist to the north, west and south. Agriculture/farming lands exist directly to the east, two gravel pit operations exist to the north and a residential neighborhood exists to the south. The main access to the site is via a ½-mile long single lane driveway that intersects CTH P on the west approach of the Fish Hatchery Road intersection. Operations on the site are expected to include:

- The new site is proposed to provide a dedicated gravel supply for the existing asphalt operation which is located approximately 2 ½-miles to the north along CTH P on Market Street.
- Two (2) full time seasonal employees on-site during the typical daytime hours (7:00am to 5:00pm).
- Three (3) trucks are expected to haul gravel between the proposed site and the existing asphalt plant located to the north.
- Material will be hauled out of the site traveling north along CTH P to the existing asphalt plant located to the north. Approximately 5 loads are expected to be delivered every hour between 7:00am and 5:00pm for a total of 50 loads each weekday, Monday through Friday.
- Current hauling operations provide material from a site located to the south. The current haul route includes trucks traveling along STH 50, turning north on CTH P past the proposed site to the existing asphalt plant to the north.
- Although not a regular part of the operation, there is potential for additional commercial customers purchasing and hauling material from the site occasionally.

Trip Generation

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 proposed gravel pit. Traffic volumes expected to be generated are based on the expected trucking operations at the site provided by the owner.

The trip generation table developed for the proposed gravel pit is shown on Exhibit 6. Trips are broken out by employee, typical trucking operation and potential commercial trucking operation. Based on the expected uses, the total number of employee and truck trips expected for the proposed development is about 204 trips per weekday, with 22 trips (12 in/10 out) during the weekday AM peak hour and 22 trips (10 in/12 out) during the weekday PM peak hour.

Of the total trips expected on site, 100 weekday daily trips (50 trucks) including 10 peak hour trips (5 trucks entering and 5 trucks leaving) are expected from typical operation with an additional 100 weekday daily trips (50 trucks) including 10 peak hour trips (5 trucks entering and 5 trucks leaving) possible occasionally through a commercial local road project.

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Trip Distribution

As stated above, current hauling operations provide material from a site located to the south. The current haul route includes trucks traveling along STH 50, turning north on CTH P past the proposed site to the existing asphalt plant to the north and returning back to the existing gravel pit along CTH P. These current truck trips will be replaced with trucks hauling material from the site and traveling north along CTH P to the existing asphalt plant located approximately 2 ½-miles to the north along CTH P on Market Street.

The potential commercial customers would be expected to follow the current haul route to/from the south along CTH P.

Traffic Assignment

The new/redistributed truck trips for the typical hauling operations is shown in Exhibit 7A. The new truck trips for the potential commercial hauling operations is shown in Exhibit 7B. Employee new trips are expected outside the limits of the adjacent street peak hours.

The new/redistributed truck trips (Exhibit 7A) were added to the new truck trips for the potential commercial hauling operations (Exhibit 7B) and the Year 2020 Background traffic volumes (Exhibit 4B) to generate the "Build" traffic volumes for the analysis. The Build traffic volumes are shown on Exhibit 8.

PEAK HOUR TRAFFIC OPERATIONS & QUEUES

The study intersection was analyzed using the Synchro 10 traffic analysis model (outputs based on the Highway Capacity Manual, 6th Edition) and the peak hour turning movement volumes estimated for the intersection. Intersection operation is defined by "level of service". Level of Service (LOS) is a quantitative measure that refers to the overall quality of flow at an intersection ranging from very good, represented by LOS 'A', to very poor, represented by LOS 'F'. For the purposes of this study, LOS D or better was used to define acceptable peak hour operating conditions.

The capacity analysis tables showing the peak hour LOS, delays (in seconds per vehicle), and queues (in feet) for both the Background traffic condition and for the Build traffic condition. The Synchro capacity analysis worksheets for all analysis scenarios are located in Appendix B.

Background Traffic Operations

The study intersection was evaluated with the existing geometrics and traffic control.

All turning movements at the CTH P intersection with Fish Hatchery Road are currently operating at LOS C or better (Exhibit 9A) during the weekday AM and PM peak hours with the Year 2020 Background traffic volumes.

Build Traffic Operations

The site access driveway to CTH P was evaluated with stop-sign control on the west and east approaches and free flow movements along CTH P.

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With the additional traffic from the proposed gravel pit, all turning movements at the study intersection are expected to continue to operate acceptably at LOS C or better (Exhibit 9B) during the weekday AM and PM peak hours. All traffic queues are expected to be negligible (1 vehicle or less) at the study intersection.

From an AADT perspective, with the new haul route traffic patterns, the AADT along CTH P is not expected to change since north of Fish Hatchery Road, the trucks will still be utilizing CTH P as they are currently utilizing the highway under the current haul route operation and south of Fish Hatchery Road the potential new commercial trucks will be replacing the truck trips from the old hauling pattern from STH 50 to CTH P.

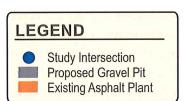
RECOMMENDATIONS

The CTH P intersection with Fish Hatchery Road is expected to continue to operate acceptably during the peak hours with the additional traffic expected from the proposed gravel pit. A very low volume of new traffic (5 vehicles or less for any particular movement) is expected at the proposed driveway location during any hour of the typical weekday. The intersection is expected to operate acceptably with minimal to no increases in delay or queue lengths for any movement during the typical weekday AM and weekday PM peak hours under the build traffic conditions. In addition, based on a review of the crash history at the intersection, there is no existing crash patterns observed at the intersection. Therefore, other than widening the west approch to allow for one inbound lane and one outbound lane with adequate radiuses for truck turning movements, no changes to the geometrics or traffic control are recommended at the CTH P intersection with Fish Hatchery Road under the build traffic conditions.

Burlington Township, Racine County, Wisconsin







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EXHIBIT 1
PROJECT OVERVIEW MAP

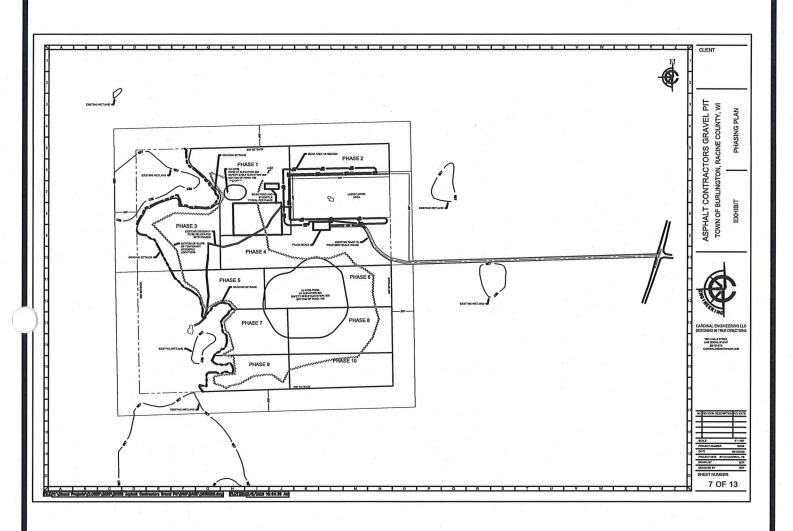






EXHIBIT 2 PROPOSED SITE PLAN

LEGEND



Stop Sign
Existing Lane Configuration

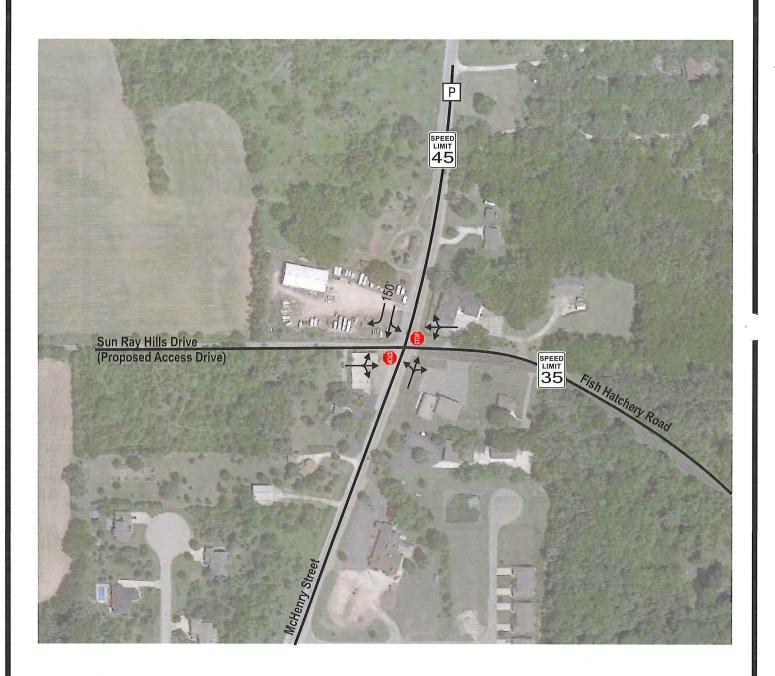






EXHIBIT 3 EXISTING TRANSPORTATION DETAIL

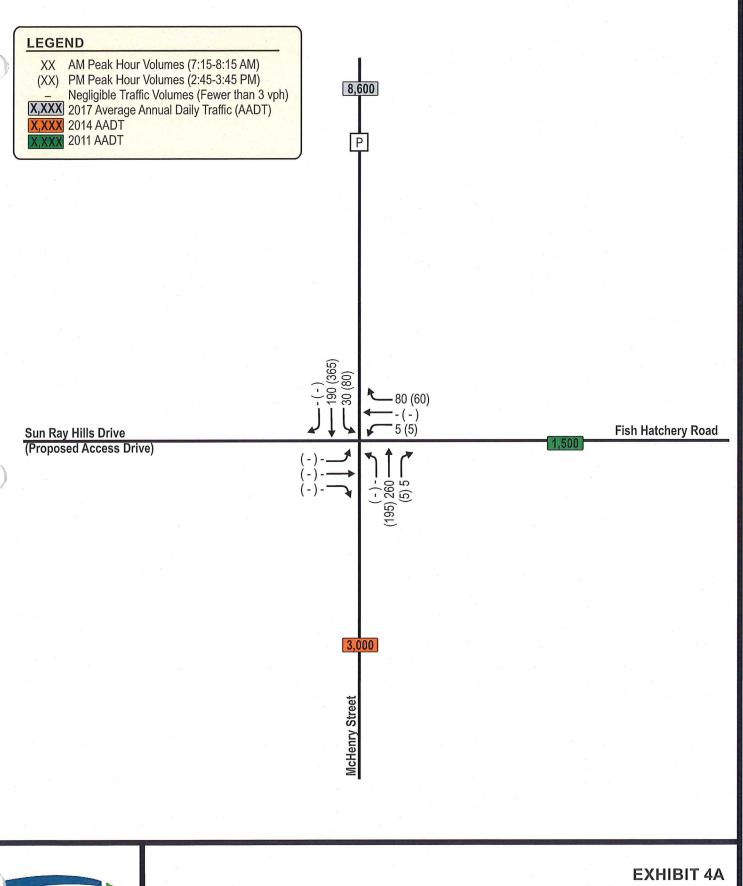






EXHIBIT 4A
EXISTING TRAFFIC VOLUMES

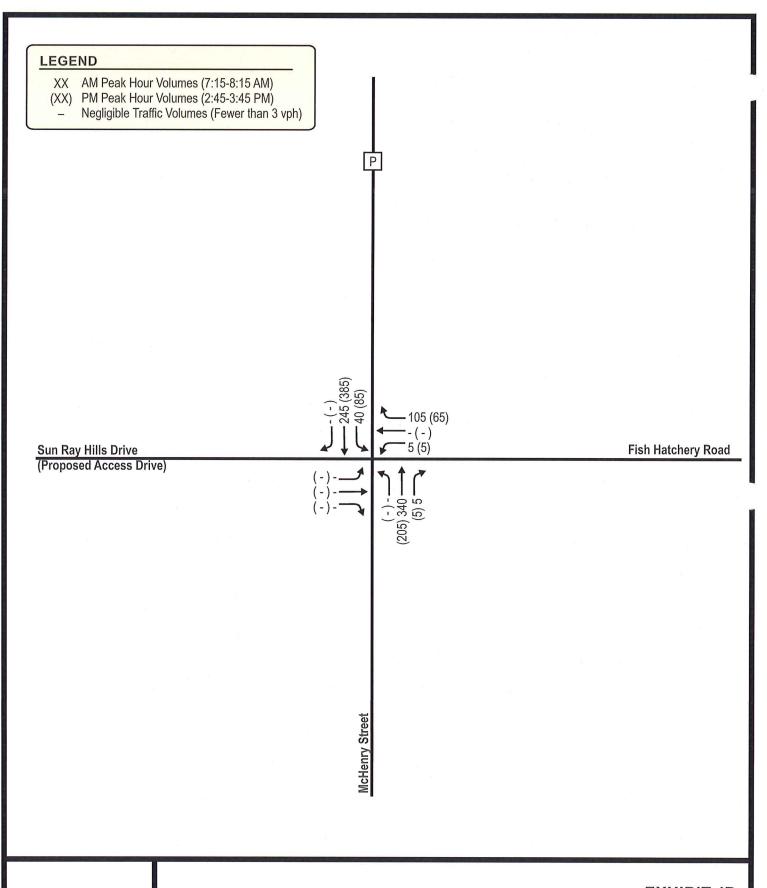






EXHIBIT 4B BACKGROUND (FACTORED) TRAFFIC VOLUMES

Intersection Collision Diagram



5 Years

0 Months

C PDO TOT. ECON. LOS

0 \$

0 \$

4,000

4,000

1/1/2015

6,700

Rural GPS Coordinates 42.639918, -88.287665

12/31/2019

Location:

McHenry Street & Fish Hatchery Road

Municipality:

Traffic Control:

Burlington Racine

0.2

County:

Minor Street Stop

SBI

TOTAL CRASHES:

AVG. CRASHES/YEAR:

CRASH RATE: 0.08 per MEV

KAB CRASH RATE:0.00 per MEV

ECONOMIC LOSS*:\$

*KAB = \$85K, C=\$25K, PDO=\$4K

From:

AADT:

Area Type

2015 2016

2017

To:

Entering ADT 750

K = Fatal, A = Incapacitating Injury, B = Non-Incapacitating Injury, C = Possible Injury, PDO = Property Damage Only

0 0 0 1 1\$

Sun Ray Hills Entrance

ECON. LOS COLOR SCA

Fish Hatchery Rd (35mph)

>\$300 K >\$100 K

-)	1	Entering ADT	15	0 EB	
		ANNUA	AL CRA	SH TRE	NDS	A
1.2						
1					100	
8.0						
0.6						
0.4						
0.2						
0						
				2018 QUENC		

ROAD C	ONL	1110
DRY	1 1	100%
WET	0	0%
SNOW	0	0%
ICE	0	0%
OTH.	0	0%
TOT.	1	-

DAY/TIME TRENDS

LIGHT	CONDITIO	N
DAY	0 0%	
DARK	1 100%	
TOT.	1	

NOTES:

NDITIONS	DRIVER BEI	HAV	IOR
0%	ALCOHOL	1	100%
100%	DRUGS	1	100%
	SPEED	0	0%
			5

≥ 0 4		
SEASON		
SPRING	0	0%
SUMMER	1 1	100%
FALL	0	0%
WINTER	0	0%
TOT.	- 1	

		1					_		
NB †	CRASH TYPE	K	Α	В	C	PDO	TOT.	E	CON. LOS
	LT-ANGLE	0	0	0	0	0	0	\$	-
1,500	RT-ANGLE	0	0	0	0	0	0	\$	-
4,	PEDESTRIJ	0	0	0	0	0	0	\$	-
	RT-TURN REAR-END	0	0	0	0	0	0	\$	-
P D	REAR-END	0	0	0	0	0	0	\$	-
Entering ADT	SIDE-SWIPE-SAME	0	0	0	0	0	0	\$	-
ш	BICYCLE-RELATED	0	0	0	0	0	0	\$	-
	PARKED-VEHICLE	0	0	0	0	0	0	\$	-
	FIXED-OBJECT	0	0	0	0	1	1	\$	4,000
	DRIVEWAY-RELAT	0	0	0	0	0	0	\$	-
	HEAD-ON	0	0	0	0	0	0	\$	-
	MISC. OTHER	0	0	0	0	0	0	\$	-
1	TOTAL	0	0	0	0	1	1	\$	4,000

FAILUI	RE T	O YIELD	DISRG	RD. C	ONTROL	VEHICLE DAMAGE						
NB	0	0%	NB	0	0%	OTHER/UNK.	0	0%				
SB	0	0%	SB	0	0%	NONE	0	0%				
EB	0	0%	EB	0	0%	VERY MINOR	0	0%				
WB	0	0%	WB	0	0%	MINOR	0	0%				
TBD	0	0%	TBD	1.1	100%	MODERATE	0	0%				
TOT.	0	0%	TOT.	1	100%	SEVERE	1	100%				
			TBD = verif	ication f	rom cras	VERY SEVERE	0	0%				
			report need	ed for di	rection	TOTAL VEHICLES	1					

	12 A	M 1 AM	2AM	3 AM	4AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	111 AN	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PA	UNK		TOT
MON	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	MON	0
TUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TUE	0
WED	Ō	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	WED	0
THU	0	0	0	0	. 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	THU	0
FRI	0	0	0	0	0	0	0	0	0	0	, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	FRI	0
SAT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SAT	0
SUN	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SUN	1
	12 A	M 1 AM	2 AM	3 AM	4AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AN	111 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PN	111 PN	UNK	-	TO
тот.	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	. 0	0	0	0	0	0	0	0	0	тот.	1





EXHIBIT 5 CRASH DIAGRAM

Exhibit 6
On-Site Trip Generation Table

		on one mp or	cheration	IUDIC							
	ITE	STATE OF THE STATE	Weekday		AM Peak	(PM Peak				
Land Use Code Proposed Size		Daily	In	Out	Total	In	Out	Total			
Gravel Pit (employees)	TADI	2 Employees	4	2	0	2	0	2	2		
Graver Fit (employees)	IADI	2 Employees	TADI	(100%)	(0%)	TADI	(0%)	(100%)	TADI		
Gravel Pit (trucking)	TADI	5 loads / hour	100	5	5	10	5	5	10		
Graver Fit (trucking)	IADI	J loads / flour	TADI	(50%)	(50%)	TADI	(50%)	(50%)	TADI		
Gravel Pit (commercial)	TADI	5 loads / hour	100	5	5	10	5	5	10		
Graver Fit (Commercial)	IADI	5 loads / flour	TADI	(50%)	(50%)	TADI	(50%)	(50%)	TADI		
Total New Trips			204	12	10	22	10	12	22		
Total New Trips			204	12	10	22	10	12	2		

One staff/loader per site per day (one shift, 7:00 am to 5:00 pm) during hauling operations - traveling to/from site off peak Assumes approx 50 trucks per typical peak day (100 total trips) over 10 hours of trucking (7:00 am to 5:00 pm), Mon-Fri Assumes local road project for commercial use, worst case 5 truck per hour during peak hours over 4 weeks in summer

ORIGIN/DESTINATION - Trucking To/From

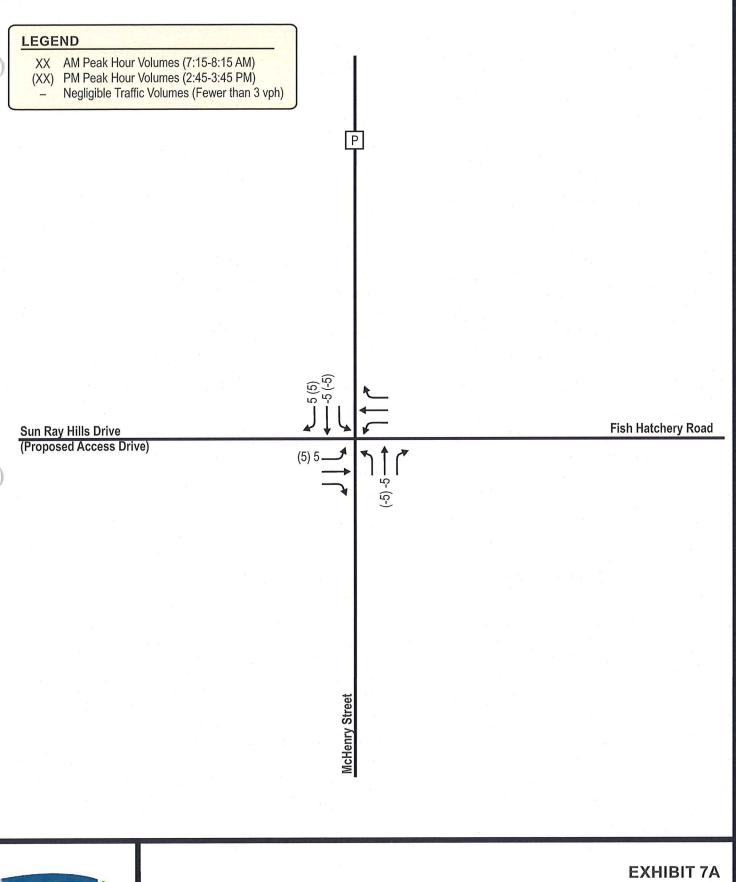
		100	5	5	10	5	5	10
South on CTH P	100%	100	5	5	10	5	5	10
North on CTH P	0%	0	0	0	0	0	0	0

ORIGIN/DESTINATION - Commercial To/From

-		100	5	5	10	5	5	10
South on CTH P	100%	100	5	5	10	5	5	10
North on CTH P	0%	0	0	0	0	0	0	0



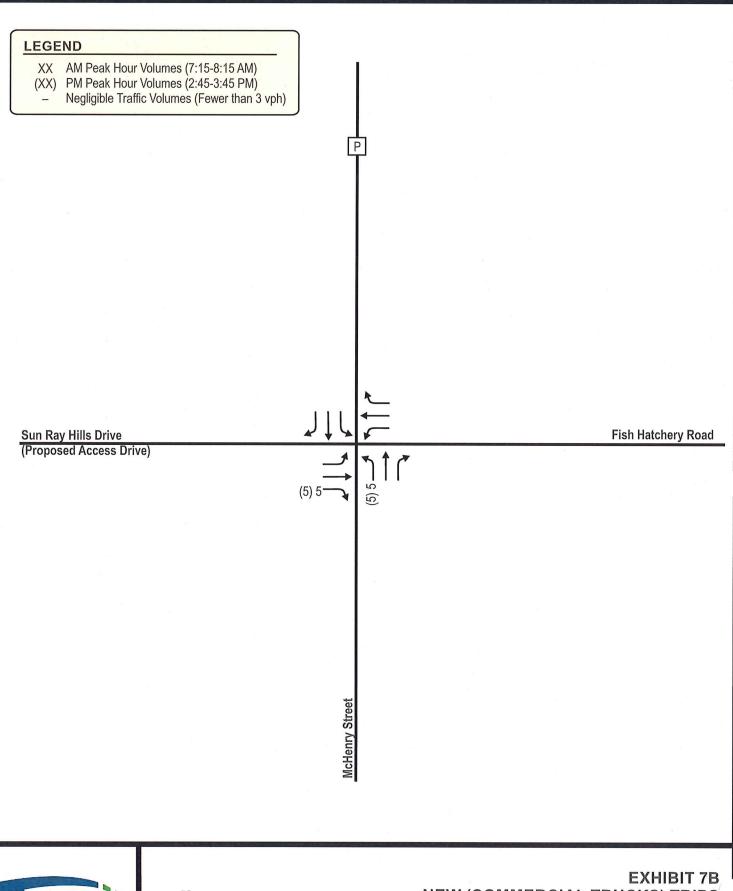
EXHIBIT 6
TRIP GENERATION & DISTRIBUTION TABLES







NEW/REDISTRIBUTED (TYPICAL HAUL ROUTE) TRUCK TRIPS







NEW (COMMERCIAL TRUCKS) TRIPS

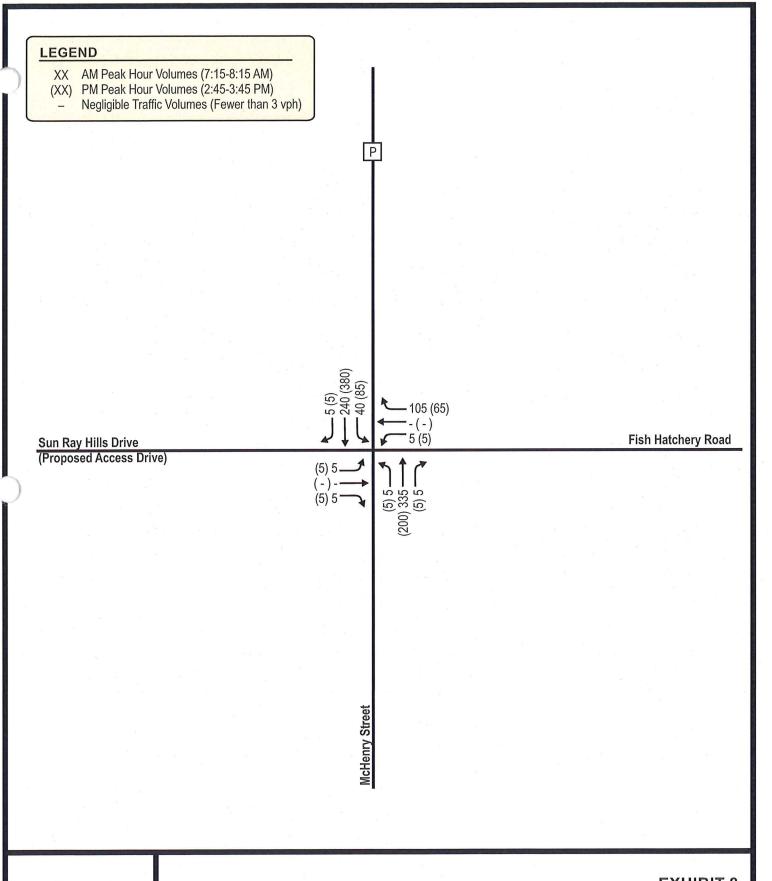






EXHIBIT 8
BUILD TRAFFIC VOLUMES

Exhibit 9A

Background Traffic Peak Hour Operating Conditions

Existing Geometrics and Traffic Control

				Leve	l of S	Servi	се р	er Mo	ovem	ent l	оу А	oproa	ach		Intersection
	Peak			Eastbound		Westbound			Northbound			Southboun			Level of
Intersection	Hour		LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	Service
		LOS		С		В		Α			- A	1	*		
#100 - McHenry Street (CTH P)	AM	Delay	15 0			12		8			9		*	Α	
& Fish Hatchery Road		Queue				25		0			25		*		
Two-Way Stop Control	PM	LOS	С			В		Α			А		*		
Two way dop donadi		Delay	17			11			8		8		*	A	
e		Queue		0			25	11		0		2	5	*	

(-) movement that isn't available or allowed * free flow movement Delay value shown in seconds, Queue value shown in feet

Exhibit 9B

Build Traffic Peak Hour Operating Conditions

Existing Geometrics and Traffic Control

			Level of Service per Movement by Approach											Intersection	
	Peak		Eastl	We	Westbound			Northbound			thbo	und	Level of		
Intersection	Hour		LT T	H RI	LT	TH	RT	LT	TH	RT	LT	TH	RT	Service	
#100 - McHenry Street (CTH P) & Fish Hatchery Road Two-Way Stop Control	АМ	LOS	(C -		В	1-1		Α		P	4	*		
		Delay	2	20		12		8		8	8 *		Α		
		Queue	2	5		25			0		2	5	*		
	РМ	LOS	(2		В			Α		P	4	*	А	
		Delay	2	2		11			8		8	3	*		
		Queue	2	:5		25			0		2	5	*		

(-) movement that isn't available or allowed * free flow movement Delay value shown in seconds, Queue value shown in feet



EXHIBIT 9
PEAK HOUR OPERATING CONDITIONS