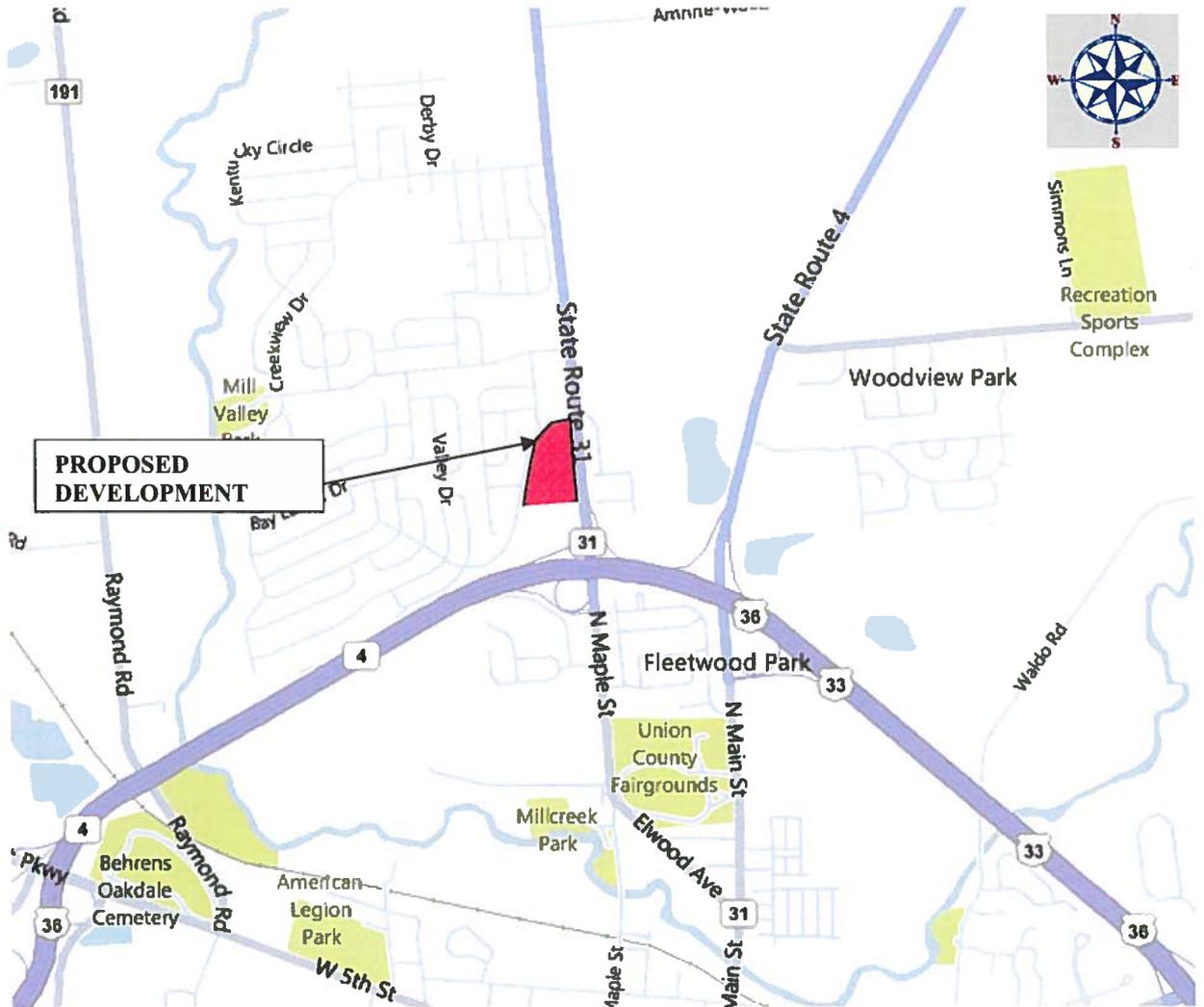


TRAFFIC IMPACT STUDY

Twigg Property Traffic Impact Study

Prepared for:

City of Marysville - Union County, Ohio



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APRIL 14, 2011
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1. EXECUTIVE SUMMARY

INTRODUCTION & PURPOSE

M•E Companies was retained by Turkey Hill Minit Markets to conduct a Traffic Impact Study for a proposed 5 acre mixed use development consisting of a Gasoline/Service Station with Convenience Market and Car Wash; 10,000 square foot Shopping Center and two 3,000 square foot Fast-Food Restaurants with Drive Thru Windows located in the City of Marysville in Union County, Ohio. The gas/service station has a total of 16 vehicle fueling positions with a 6,000 square foot Convenience Market and a car wash. The development will be located on the southwest corner of the S.R. 31 & Mill Road/Echo Drive intersection, approximately 1000 feet north of US 33. The purpose of this report is to determine the impacts to the area and any roadway improvements necessary to mitigate those impacts generated by the proposed development.

EXISTING CONDITIONS

State Route 31 (speed limit 50 mph) runs north to south. Mill Road (speed limit 25 mph) runs east to west and intersects S.R. 31 just east of the proposed site. Mill Road will be considered as an east to west roadway. The intersection of S.R. 31 & Mill Road/Echo Drive is presently signalized with exclusive left turn lanes northbound and southbound and one thru lane in each direction on S.R. 31. Mill Road is a two-lane roadway with an exclusive left turn lane eastbound at S.R. 31. All legs are considered single lane approaches. Crashes (see Appendix H) at the S.R. 31 & Mill Road intersection reflect typical ranges for a signalized intersection, therefore there does not appear to be a safety issue at this intersection.

TRAFFIC COUNTS & PROJECTIONS

Intersection movement counts for both the morning and evening peak hours were taken at the S.R. 31 & Mill Road/Echo Drive; Mill Rd. & Cobblestone Way; and Mill Rd. & McDonalds drive intersections. These counts were taken between the hours of 6:00 - 8:30am and 4:00 - 6:00pm based upon the typical peak hours. Twenty four-hour mechanical tube counts were also collected on Mill Road. The existing

counts were grown using a 1.50% growth rate obtained from the City. The *Institute of Transportation Engineers (ITE) Trip Generation Handbook* was used to determine the trips for each of the land uses in the development.

The existing traffic patterns at the intersection of S.R. 31 & Mill Road was used to determine the directional distribution of the proposed development site. Pass-By and Diverted Linked trips were developed into the trip distribution percentages (Exhibit 3). The opening year for this development (Gasoline Station only) is 2011 therefore the design year should be 2021 (entire development) according to the City guidelines. The study will examine no-build and build conditions for the 2021 design year. The development trips were added to the background traffic, from Exhibits 1 & 2, to determine the opening year 2011 and design year 2021 build scenarios, Exhibits 6 & 7.

SIGNAL WARRANT ANALYSIS

The intersection of S.R. 31 / Mill Road is an existing signalized intersection therefore a signal warrant analysis was not performed at this intersection. Volumes for 8 hours or greater were not available for the development therefore we took a conservative approach and used the AM and PM peak hour trips for the development and used them for the AM and PM hourly volumes (see Appendix D). A 1.5% growth rate obtained from the City was used to develop the 2021 hourly ADT. The ADT's are as follows:

Opening Year 2011: Major - Mill Road = 4,149 (Two Way)

Minor - Cobblestone Way = 416 (One Way)

Minor - Development Entrance = 2,436 (One Way)

Design Year 2021: Major - Mill Road = 4,815 (Two Way)

Minor - Cobblestone Way = 483 (One Way)

Minor - Development Entrance = 2,832 (One Way)

Table 2: Traffic Signal Warrant Guidelines from the City of Marysville TIS standards was used to determine if the intersection meets signal Warrant 1. Using

the data above, the conditions were analyzed for both Condition A and Condition B in the opening year 2011 and design year 2021. The intersection of Mill Road & Cobblestone Way/the Proposed Development Drive does **not** warrant a signal for 2011 Opening Day or Design Year 2021. Refer to Appendix D for more details.

HIGHWAY CAPACITY ANALYSIS

Highway Capacity Software (HCS) was used to evaluate the operation of the existing and proposed intersections within the study area in order to determine the level of service for opening year 2011 and design year 2021 for build and no build conditions. In addition HCS analysis is used to determine if additional lanes are needed at the intersection in order to obtain an acceptable Levels of Service (LOS). Acceptable levels of service are considered a "D" according to the City of Marysville. In order to obtain an acceptable LOS D during the 2021 build conditions at S.R. 31/Mill Road an eastbound right turn lane is needed. The 2021 Build condition for, the Mill Rd./Cobblestone Way stop controlled intersection has a westbound left turn lane added into the analysis since it was determined in the Storage Lane Analysis Section 9 that a westbound left turn lane is warranted. See the summary layout on page 6 for more details.

STORAGE LANE ANALYSIS

Turn lane warrants for the S.R. 31/Mill Rd./Echo Dr. (signalized) intersection was performed in the HCS analysis. An eastbound right turn lane is warranted at this intersection. At the Mill Road & Cobblestone Way (unsignalized) intersection turn lane warrants were performed using the Ohio Department of Transportation (ODOT) Location & Design Volume 1 Figures 401-5aE and 401-6aE (see Appendix F). According to Figure 401-5aE, in the design year 2021 with a 20% westbound left turning percentage and 481 vehicles in the one lane, a **westbound left turn is warranted** into the development.

Storage lane length calculations were performed using ODOT criteria for the traffic movements directly affected by the proposed development at the development

drive and at the intersection of S.R. 31 and Mill Road. A spreadsheet using 2021 build volume, located in Appendix F, was developed by M•E Companies to summarize the calculations.

- A length of 450' was calculated for the eastbound right turn lane on Mill Road at S.R. 31. The distance along Mill Road between Cobblestone Way/Development Entrance and S.R. 31 is approximately 430' and therefore the AM peak hour might at times back up through the Mill Rd./Cobblestone Way intersection. However, since this calculated length of 450' is for the AM peak and in the design year, we therefore recommend that the eastbound right turn lane be constructed from the Mill Rd./Cobblestone Way intersection to the S.R. 31/Mill Road intersection only.
- The intersection of Mill Road & the Proposed Development Drive will require a 150' westbound left turn lane based upon the turn lane warrants. Copies of the calculations can be found in Appendix E.

RECOMMENDATIONS

Listed below are the recommended improvements at each intersection determined from the analysis for the study area.

S.R. 31 & Mill Road/Echo Drive

The proposed development will degrade the Level of Service and the functionality of the intersection.

Eastbound Left lane on Mill Rd. with a length of 150 feet.

Eastbound through on Mill Rd. with a length of 100 feet.

Eastbound Right turn lane on Mill Rd. is warranted with a length of 450 feet. Because the proposed entrance is 430 feet from the stop line at SR 31, the right turn lane length will be 430' instead.

The existing signal should be retimed to include phasing for an overlap right with a new five section signal head added. The existing loop detectors may need to be replaced due to the revised intersection layout. The aforementioned improvements

appear to be necessary in the 2021 design year based on current traffic volumes, proposed development and anticipated growth.

Mill Road & Cobblestone Way/Proposed Development Drive

Westbound Left turn lane on Mill Road is warranted with length of 150 feet.

The aforementioned improvements appear to be necessary in the 2021 design year based on current traffic volumes, proposed development and anticipated growth.

See the next page for a summary layout of the area and Appendix A for a schematic of the proposed roadway layout.



FIGURE 1 SUMMARY LAYOUT
2021 (AM) PM PEAK
BUILD

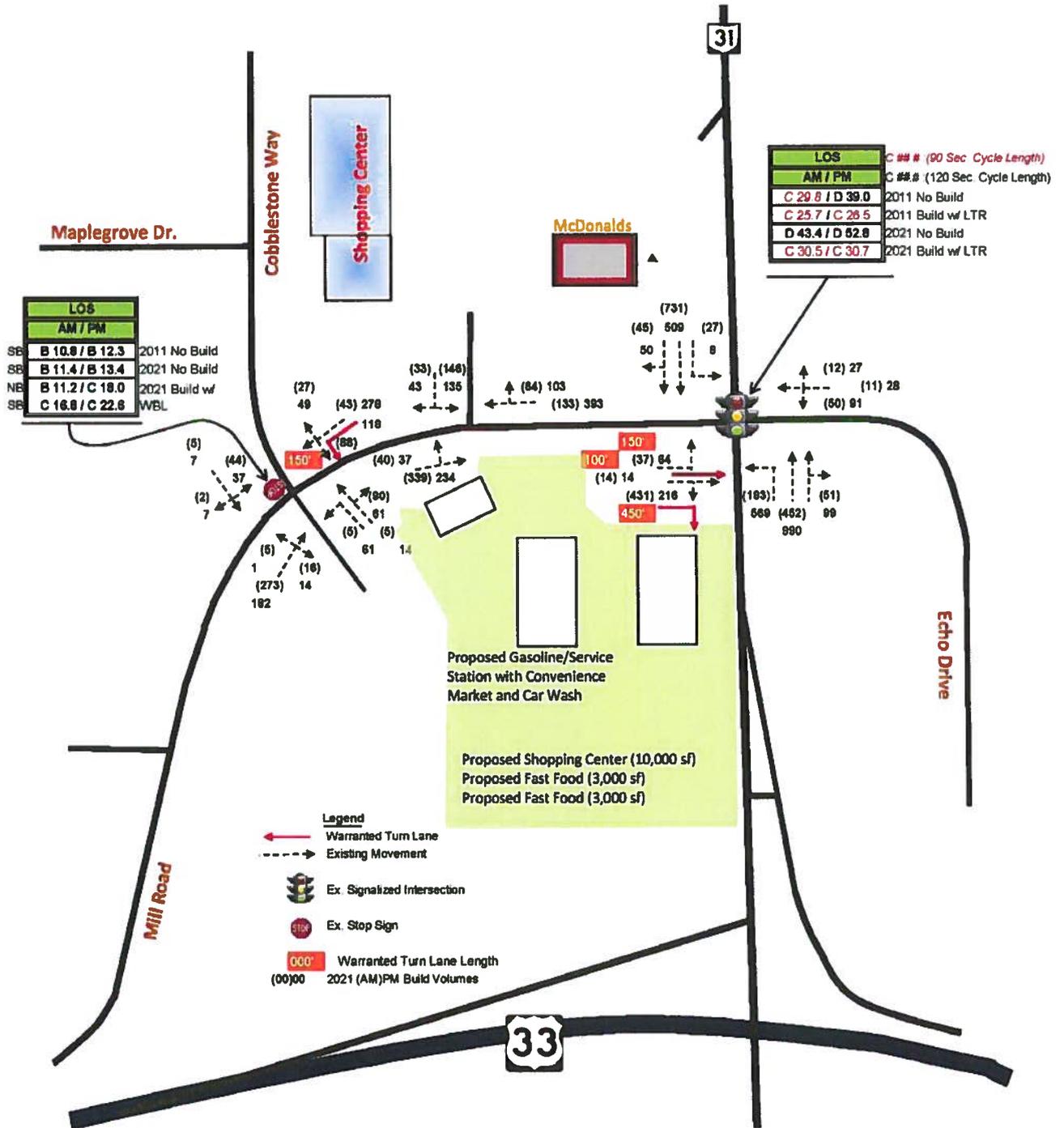


FIGURE 1 - SUMMARY LAYOUT

2. INTRODUCTION & PURPOSE

M•E Companies was retained by Turkey Hill Minit Markets to conduct a Traffic Impact Study for a proposed 5 acre mixed use development consisting of a Gasoline/Service Station with Convenience Market and Car Wash; 10,000 square foot Shopping Center and two 3,000 square foot Fast-Food Restaurants with Drive Thru Windows located in the City of Marysville in Union County, Ohio. The gas/service station has a total of 16 vehicle fueling positions with a 6,000 square foot Convenience Market and a car wash. The development will be located on the southwest corner of the S.R. 31 & Mill Road/Echo Drive intersection, approximately 1000 feet north of US 33.

The Gasoline/Service Station with will be built out in late 2011 and will be the only development in the 2011 Opening Year. The other three developments will be built out by 2021. The purpose of this report is to determine the impacts to the area and any roadway improvements necessary to mitigate those impacts generated by the proposed development.

A proposed site layout for the Gasoline/Service Station is presented on the next page and in Appendix A. A Site layout for the other developments is not available at this time.

3. EXISTING CONDITIONS

Currently the site is a vacant lot on which the proposed mixed use development will be constructed. S.R. 31 runs north to south. Mill Road runs east to west and intersects S.R. 31 just east of the proposed site. Mill Road will be considered as an east to west roadway. The intersection of S.R. 31 & Mill Road/Echo Drive is presently signalized with exclusive left turn lanes northbound and southbound and one thru lane in each direction on S.R. 31. Mill Road is a two-lane roadway with an exclusive left turn lane eastbound at S.R. 31. S.R. 31 and Mill Road have speed limits of 50 mph and 25 mph, respectively. Crashes (see Appendix H) at the S.R. 31 & Mill Road intersection reflect typical ranges for a signalized intersection, therefore there does not appear to be a safety issue at this intersection. See aerial below.



FIGURE 3

4. TRAFFIC COUNTS

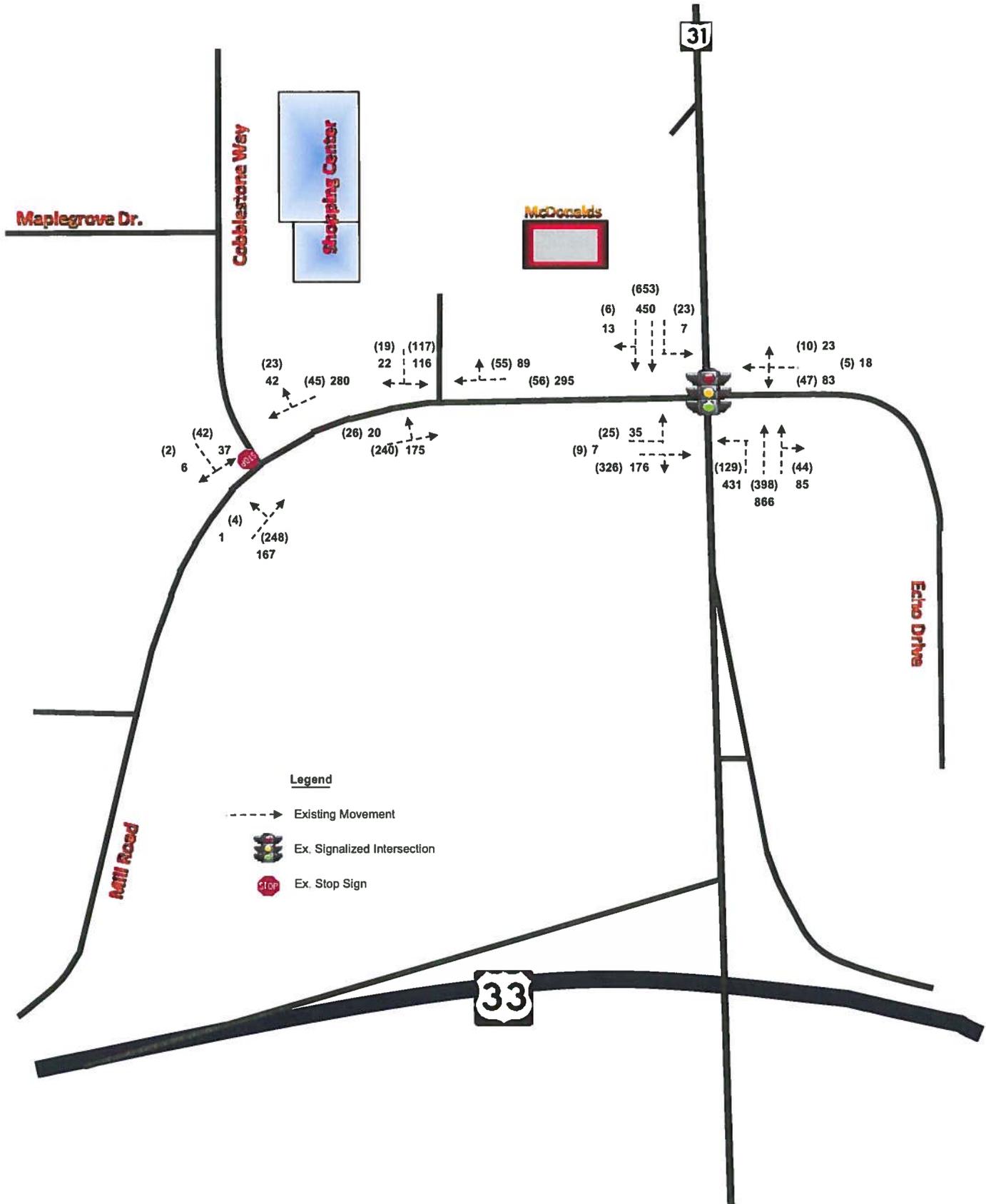
Intersection movement counts as shown in Figure 4 for both the morning and evening peak hours were taken at the S.R. 31 & Mill Road/Echo Drive; Mill Rd. & Cobblestone Way; and Mill Rd. & McDonalds drive intersections. These counts were taken between the hours of 6:00 – 8:30am and 4:00 – 6:00pm based upon the typical peak hours. Twenty four-hour mechanical tube counts were also collected on Mill Road. The existing counts were grown using a 1.50% growth rate obtained from the City. Refer to Appendix B for traffic counts.

Twigg Property - TIS

TURNING MOVEMENTS

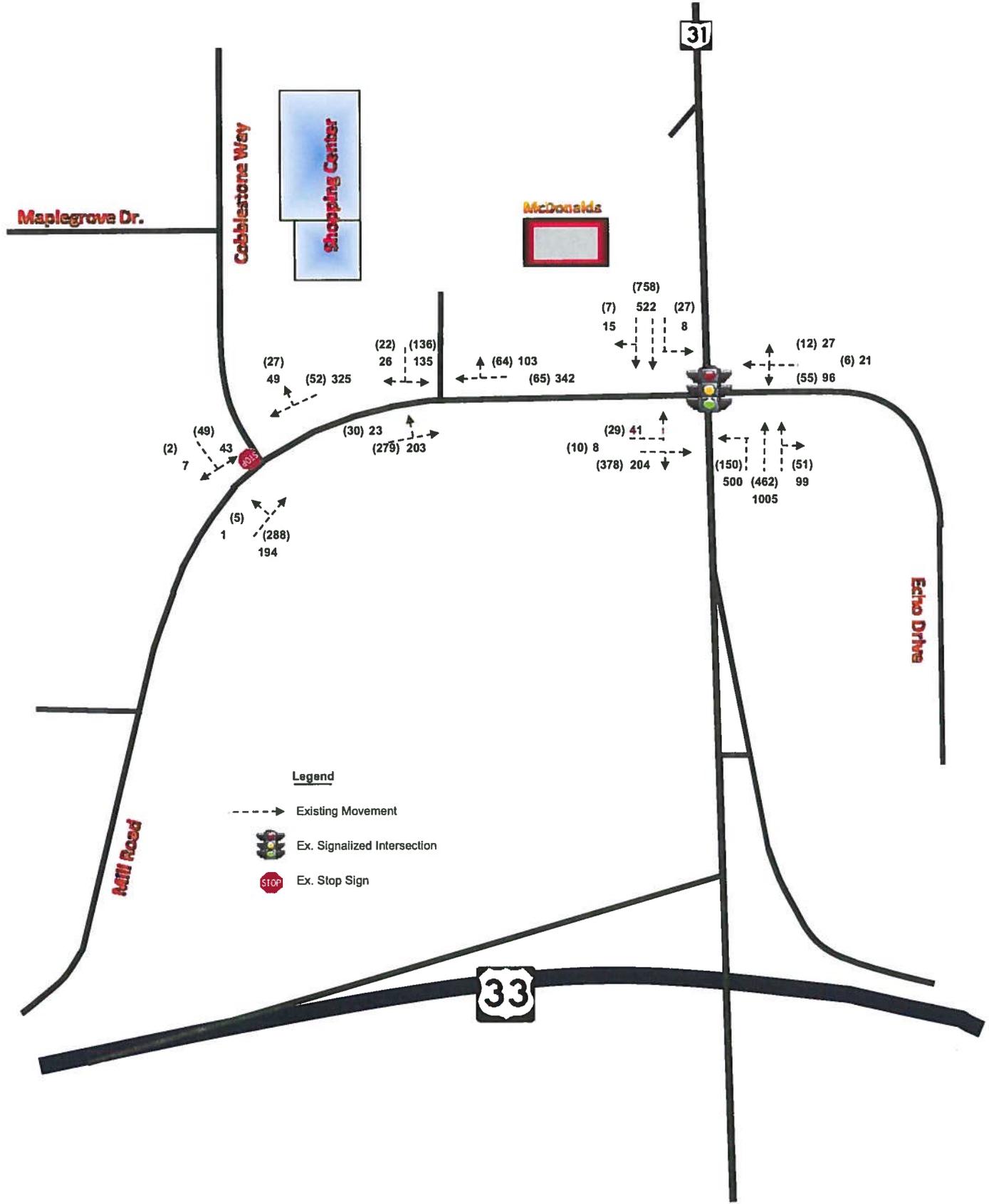
Intersection	EASTBOUND			WESTBOUND			NORTHBOUND			SOUTHBOUND			
	L	T	R	L	T	R	L	T	R	L	T	R	
2011 No Build - Exhibit 1 (Peak Hour Turning Movement Counts)													
S.R. 31 & Mill Rd./Echo Dr.	25	9	326	47	5	10	129	398	44	23	653	6	AM
	35	7	176	83	18	23	431	866	85	7	450	13	PM
Mill Rd. & Cobblestone Way	4	248	0	0	45	23	0	0	0	42	0	2	AM
	1	167	0	0	280	42	0	0	0	37	0	6	PM
Mill Rd. & McDonalds Ent./Exit	26	240	0	0	56	55	0	0	0	117	0	19	AM
	20	175	0	0	295	89	0	0	0	116	0	22	PM
2021 No Build - Exhibit 2													
1.5% Growth													
S.R. 31 & Mill Rd./Echo Dr.	29	10	378	55	6	12	150	462	51	27	758	7	AM
	41	8	204	96	21	27	500	1005	99	8	522	15	PM
Mill Rd. & Cobblestone Way	5	288	0	0	52	27	0	0	0	49	0	2	AM
	1	194	0	0	325	49	0	0	0	43	0	7	PM
Mill Rd. & McDonalds Ent./Exit	30	279	0	0	65	64	0	0	0	136	0	22	AM
	23	203	0	0	342	103	0	0	0	135	0	26	PM

FIGURE 4





2021 EXHIBIT 2
(AM) PM PEAK
NO BUILD



5. PROPOSED SITE DEVELOPMENT

The *Institute of Transportation Engineers (ITE) Trip Generation Handbook* is the most widely accepted publication for projecting traffic volumes; specifically related to how the site is used. The ITE category used to determine the trips generated for the proposed Gas/Service station was 946- Gasoline/Service Station with Convenience Market and Car Wash. The proposed gasoline/service station will have 16 vehicle fueling positions. Based upon the ITE charts the AM and PM peak hour will generate a total of 191 and 223 trip ends, respectively. The ITE category used to determine the trips generated for the proposed Shopping Center was 820- Shopping Center. The proposed shopping center will have a total of 10,000 gross square footage. Based upon the ITE charts the AM and PM peak hour will generate a total of 40 and 136 trip ends, respectively. The ITE category used to determine the trips generated for the proposed Fast-Food Restaurant was 934- Fast-Food Restaurant with Drive-Through Window. The proposed fast-food restaurant will have a total of 3,000 gross square footage. Based upon the ITE charts the AM and PM peak hour will generate a total of 49 and 34 trip ends, respectively. Refer to Appendix C for trip generation data.

The entire development will have one full access drive on Mill Road across from Cobblestone Way. The basis for directional distribution of the proposed mixed use development site was determined based upon examination of the surrounding area and the existing traffic patterns at the intersection of S.R. 31 & Mill Road. The distribution for the site will have a large AM movement west to east on Mill Road and north to south on S.R. 31 heading towards the City of Marysville and US 33. The PM movement will have almost the opposite movement as the AM but have larger volumes all around. Refer to Section 6 Traffic Projections and Exhibit 3 for more details regarding the directional distribution percentages for the proposed mixed used development.

TRIP GENERATION

ITE Land Use Description:	Gasoline/Service Station with Convenience Market and Car Wash			
ITE Land Use Code:	946			
Vehicle Fueling Positions	16			TRIP ENDS
main parcel				
AM Peak Hour of Adj St Rate (One Hr 7-9 am) =		11.93	Trips	191 = trips during AM Pk Hr of adjacent street
		% In = 51%		97
		%Out = 49%		94
PM Peak Hour of Adj St Rate (One Hr 4-6 pm) =		13.94	Trips	223 = trips during PM Pk Hr of adjacent street
		% In = 51%		114
		%Out = 49%		109

Trip Generation Assumptions:

ITE Land Use Description:	Fast-Food Restaurant with Drive-Through Window			
ITE Land Use Code:	934			
per 1000 Square Footage	3			TRIP ENDS
main parcel				
AM Peak Hour of Adj St Rate (One Hr 7-9 am) =		49	Trips	49 = trips during AM Pk Hr of adjacent street
		% In = 51%		25
		%Out = 49%		24
PM Peak Hour of Adj St Rate (One Hr 4-6 pm) =		34	Trips	34 = trips during PM Pk Hr of adjacent street
		% In = 52%		18
		%Out = 48%		16

Trip Generation Assumptions:

ITE Land Use Description:	Shopping Center			
ITE Land Use Code:	820			
per 1000 Square Footage	10			TRIP ENDS
main parcel				
AM Peak Hour of Adj St Rate = $Ln(T) = 0.59Ln(X)+2.32 =$		40	Trips	40 = trips during AM Pk Hr of adjacent street
		% In = 61%		24
		%Out = 39%		15
PM Peak Hour of Adj St Rate = $Ln(T) = 0.67Ln(X)+3.37 =$		136	Trips	136 = trips during PM Pk Hr of adjacent street
		% In = 49%		67
		%Out = 51%		69

Trip Generation Assumptions:

FIGURE 5

6. TRAFFIC PROJECTIONS

The opening year for this development is considered 2011, although only the gas station will be built out by this year. For the purposes of this study we used the total trips of the entire development to determine the design year. According to the City guidelines, based upon a minimum trip end in the peak hour, for 280 or 393 trip ends for the proposed development the design year should be 10 year from opening day, therefore the design year will be 2021. The study will examine no-build and build conditions for 2021 design year.

The trip distributions for opening year 2011 and design year 2021 are considered the same for this report. Pass-By trips (trips already on the adjacent existing roadway) and Diverted Linked trips (trips diverted via adjacent streets) were also considered in developing the trip distribution patterns (percentages) shown in Exhibit 3.

For the multi-use development trip generation an internal capture (trips already in the development going from one land use to another) percentage was calculated for both AM and PM peak hours using the ITE chart located in Appendix C. This internal capture percentage 25% and 30% for the AM and PM peak hours, respectively, was the amount of trips reduced from the design year total trip ends.

The gas/service station trips (Exhibit 4) were added to the background traffic (Exhibit 1 2011 No Build) to determine the opening year 2011 Build scenario (Exhibit 6). The entire development trips (Exhibit 5) were added to the background traffic (Exhibit 2 2021 No Build) to determine the design year 2021 Build scenario (Exhibit 7). The opening year 2011 volumes were used for Signal Warrant analyses and the design year 2021 build volumes were used for turn lane warrants and lengths.

EXHIBIT 4
2011 (AM) PM PEAK
Trip Generation

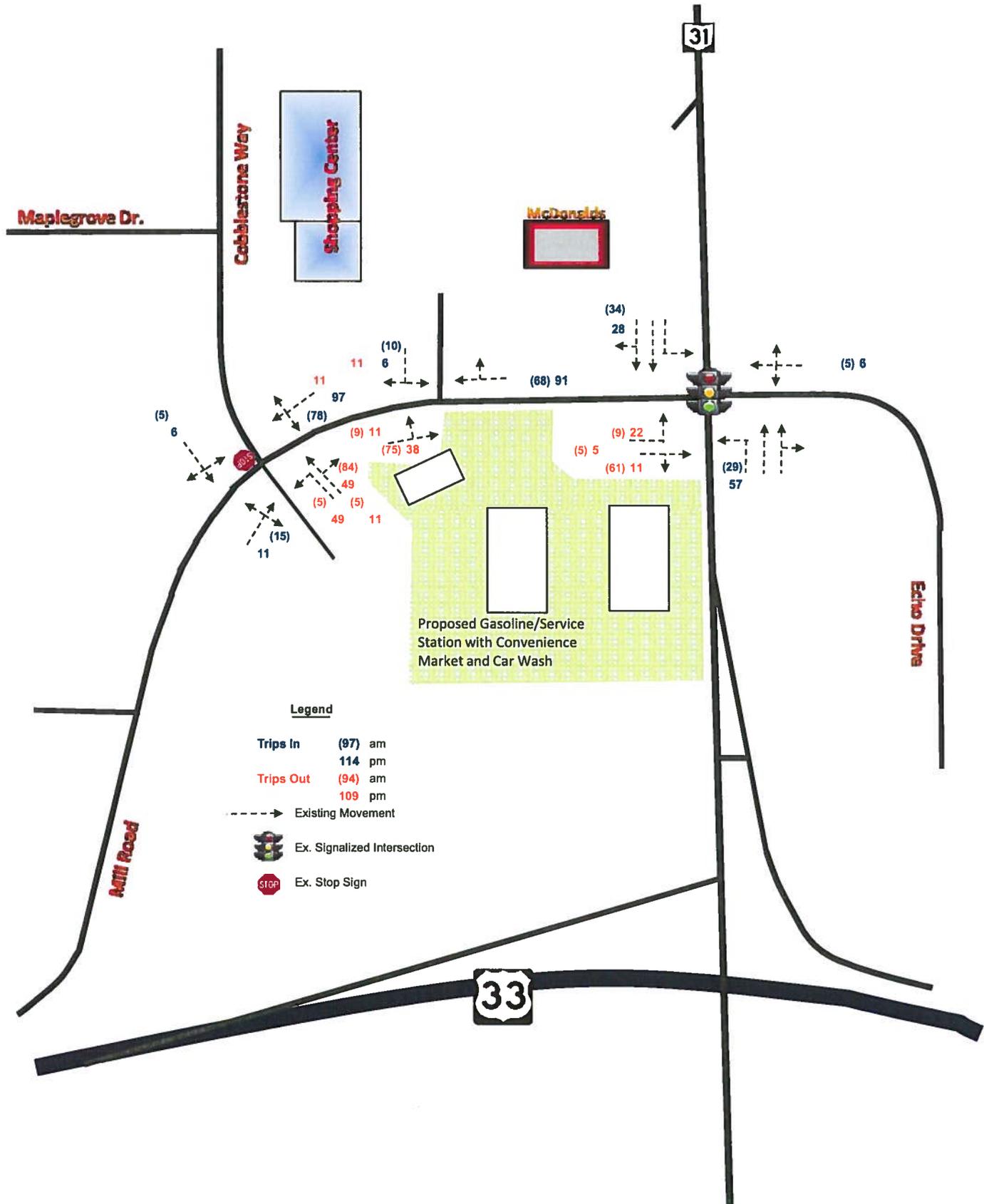
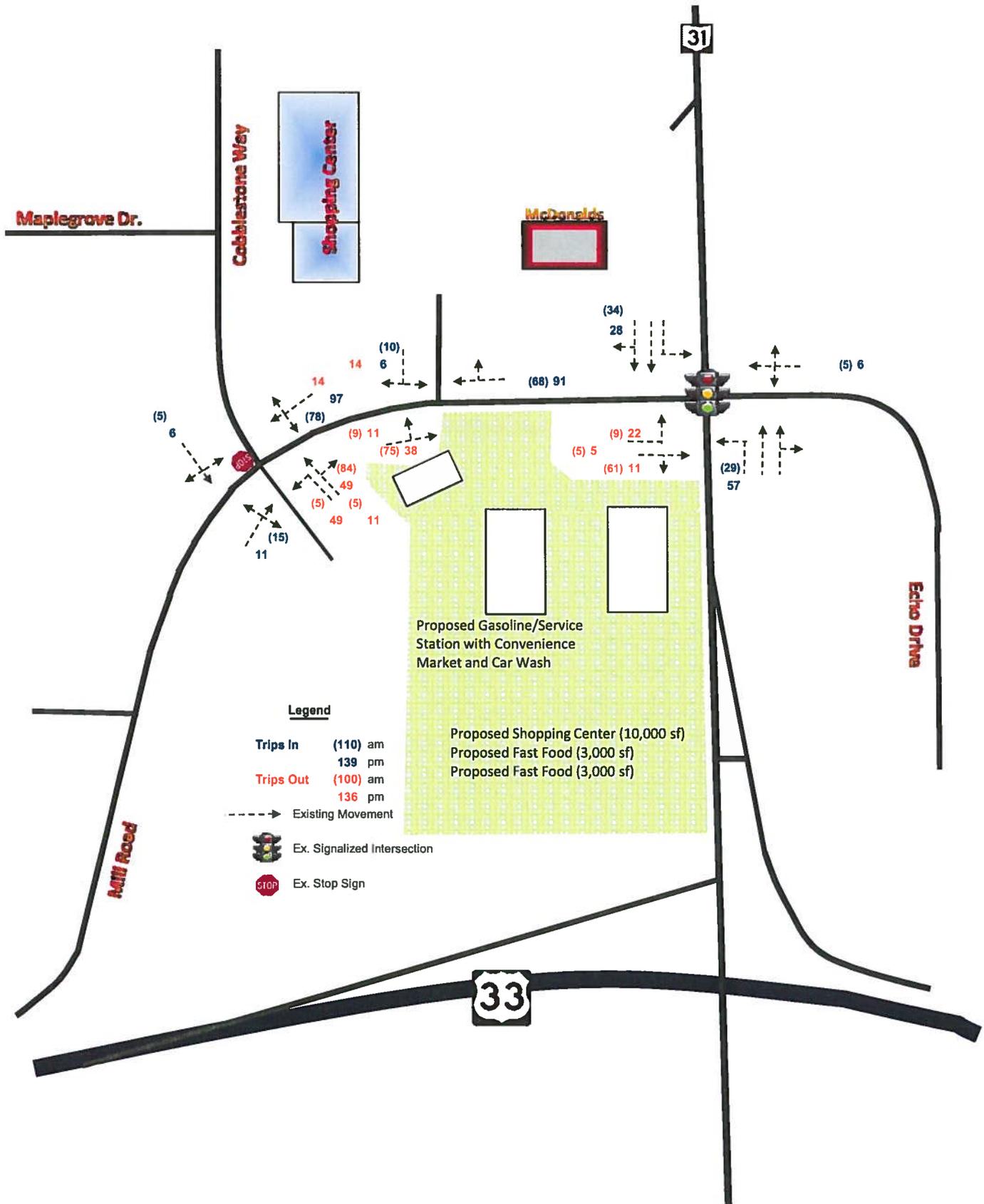


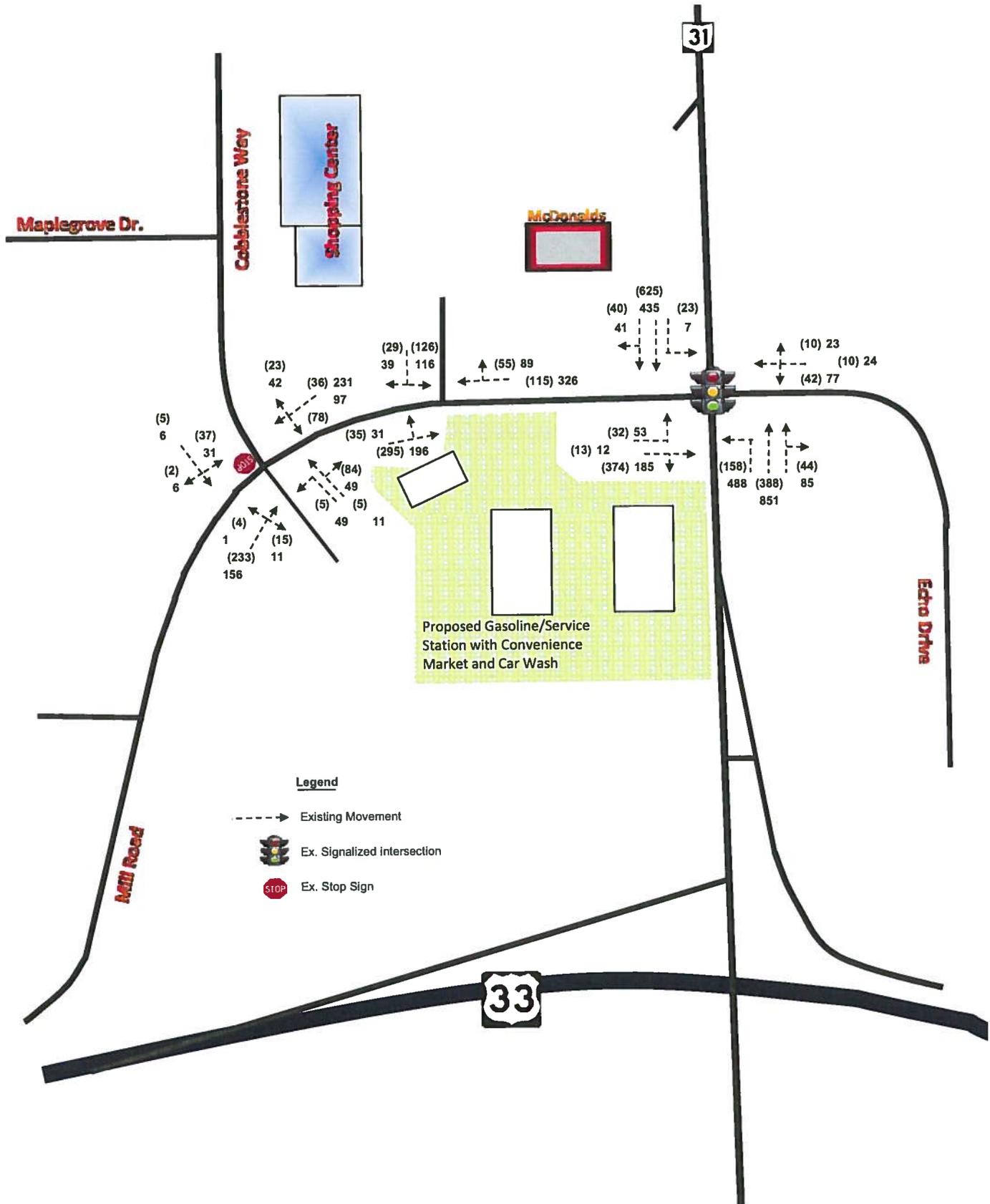


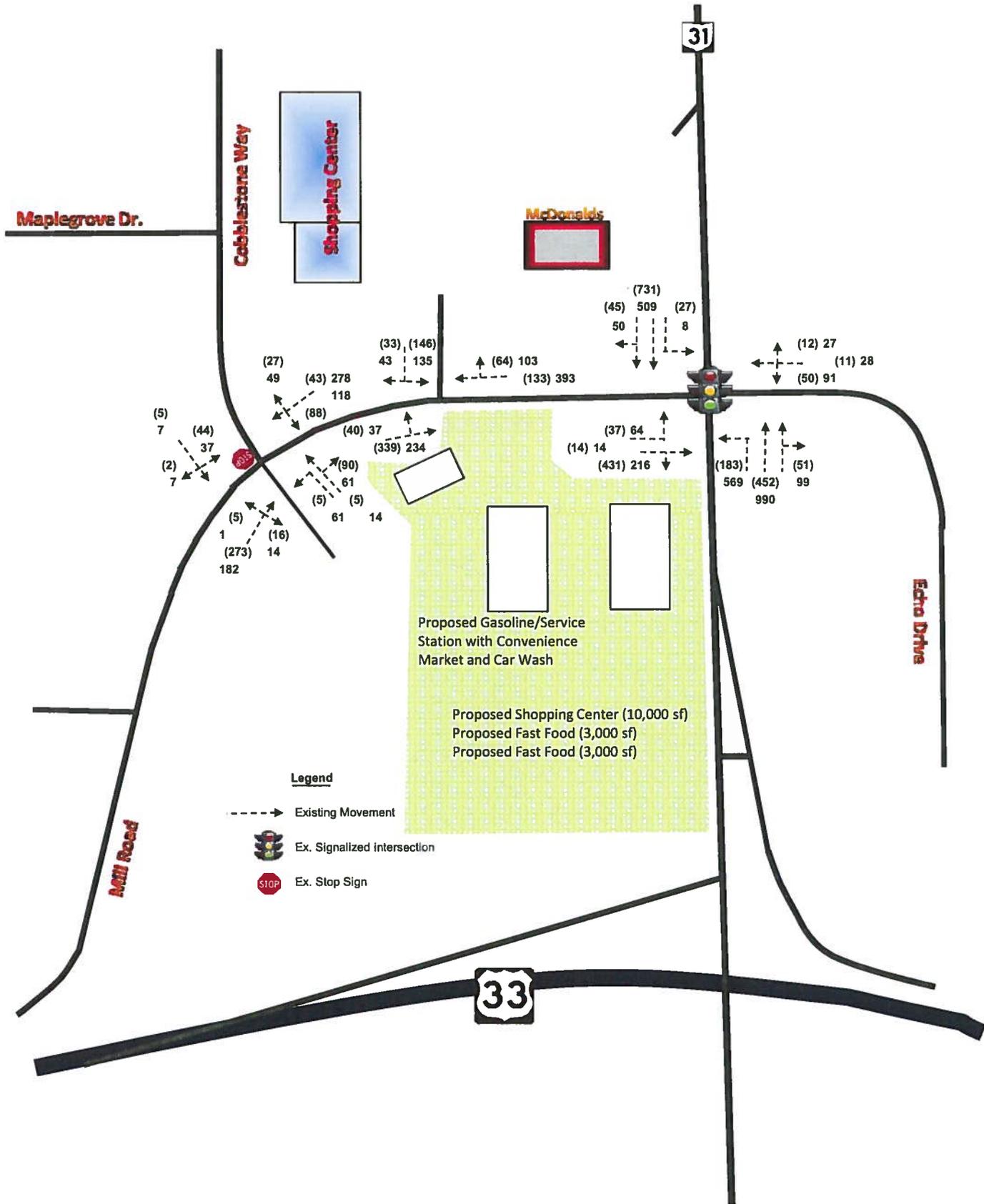
EXHIBIT 5 2021 (AM) PM PEAK Trip Generation





2011 EXHIBIT 6 (AM) PM PEAK BUILD





7. SIGNAL WARRANT ANALYSIS

The intersection of S.R. 31 / Mill Road is an existing signalized intersection therefore a signal warrant analysis was not performed at this intersection.

Twenty four hour volumes were collected on the intersection of Mill Road & Cobblestone Way/Development Entrance and an Average Daily Traffic volume was calculated for each leg. Volumes for 8 hours or greater were not available for a development therefore we took a conservative approach and used the AM and PM peak hour trips for the development and used them for the AM and PM hourly volumes (see Appendix D). The ADT's are as follows:

Opening Year 2011: Major - Mill Road = 4,149 (Two Way)

Minor - Cobblestone Way = 416 (One Way)

Minor - Development Entrance = 2,436 (One Way)

Design Year 2021: Major - Mill Road = 4,815 (Two Way)

Minor - Cobblestone Way = 483 (One Way)

Minor - Development Entrance = 2,832 (One Way)

The hourly volumes for the 2011 background traffic were grown using a 1.5% growth rate obtained from the City to develop the 2021 hourly ADT volumes used in the design year 2021 signal warrant analysis. The development trips are not grown. All legs of the Mill Road/Cobblestone Way intersection are considered single lane approaches. Table 2: Traffic Signal Warrant Guidelines, shown on the next page, from the City of Marysville TIS standards was used to determine if the intersection meets signal Warrant 1. Using the data above, the conditions were analyzed for both Condition A and Condition B in the opening year 2011 and design year 2021 (see highlighted rows). The intersection of Mill Road & Cobblestone Way/the Proposed development drive does **not** warrant a signal for 2011 Opening Day or Design Year 2021. Refer to Appendix D for more details.

Table 2: Traffic Signal Warrant Guidelines

Condition A - Minimum Vehicular Volume*			
Number of Approach Lanes		ADT	
Major	Minor	Major	Minor
1	1	8,300	5,000
2	1	10,000	5,000
2	2	10,000	6,700
1	2	8,300	6,700
Condition B - Interruption of Continuous Traffic*			
Number of Approach Lanes		ADT	
Major	Minor	Major	Minor
1	1	12,500	2,500
2	1	15,000	2,500
2	2	15,000	3,300
1	2	12,500	3,300

* When the 85th percentile speed of major street traffic exceeds 40 mph, the warrants are 70 percent of the guidelines above.

FIGURE 6

8. HIGHWAY CAPACITY ANALYSIS

Highway Capacity Software, HCS plus version 5.5 (HCS) was used to evaluate the operation of the existing intersection of S.R. 31 /Mill Road and the proposed intersection within the study area in order to determine the level of service for opening year 2011 and design year 2021 for build and no build conditions. In addition HCS analysis is used to determine if additional lanes are needed at the intersection in order to obtain acceptable Levels of Service (LOS). Acceptable levels of service are considered a "D" according to the City of Marysville.

In order to obtain an acceptable LOS E during the 2021 build conditions at S.R. 31/Mill Road an exclusive eastbound left, thru, and right turn lane is needed. The HCS analysis for 2021 Build with improvements (one lane for eastbound left, thru and right) and the 2021 Build with No Improvements are also shown on the summary layout on page 6.

The Mill Road /Proposed Development Drive intersection was analyzed using unsignalized stop control. The 2021 Build condition for this intersection has a westbound left turn lane added into the analysis since it was determined in the Storage Lane Analysis Section 9 that a westbound left turn lane is warranted.

9. STORAGE LANE ANALYSIS

Turn lane warrants for the S.R. 31/Mill Rd./Echo Dr. (signalized) intersection was performed in the HCS analysis. An eastbound right turn lane is warranted at this intersection.

At the Mill Road & Cobblestone Way (unsignalized) intersection turn lane warrants were performed using the Ohio Department of Transportation (ODOT) Location & Design Volume 1 Figures 401-5aE and 401-6aE (see Appendix F). According to Figure 401-5aE, in the design year 2021 with a 20% westbound left turning percentage and 481 vehicles in the one lane, **a westbound left turn is warranted** into the development.

Storage lane length calculations were performed using criteria detailed in ODOT L&D Volume 1 Section 400 Figures 401-9E and 401-10E, for the traffic movements directly affected by the proposed development at the development drive and at the intersection of S.R. 31 and Mill Road. A spreadsheet, located in Appendix F, was developed by M•E Companies to summarize the calculations. The Design year 2021 build volumes were used in the calculations.

A length of 450' was calculated for the eastbound right turn lane on Mill Road at S.R. 31. The distance along Mill Road between Cobblestone Way/Development Entrance and S.R. 31 is approximately 430', therefore the AM peak hour might at times back up through the Mill Rd./Cobblestone Way intersection. However, since this calculated length of 450' is for the AM peak and in the design year, we therefore recommend that the eastbound right turn lane be constructed from the Mill Rd./Cobblestone Way intersection to the S.R. 31/Mill Road intersection only. In addition we would recommend revising the signal phasing at the intersection for an overlap right turn lane. A length of 150' for the left turn lane eastbound and a 100' length for the through movement was calculated for Mill Road at S.R. 31. A roadway layout was developed which illustrates the left turn length (150'), the through lane (100') and a right turn lane. Because the right turn lane will operate on an overlap phase and the back-up will only occur during the AM peak it was decided that it wasn't necessary to make the roadway cross section 4 lanes wide on Mill Road from the intersection of S.R. 31 to the development drive.

The intersection of Mill Road & the Proposed Development Drive will require a westbound left turn lane based upon the turn lane warrants. A length of 150' was calculated for this westbound left turn lane. Copies of the calculations can be found in Appendix E.

10. CONCLUSIONS AND RECOMMENDATIONS

M•E Companies was retained by Turkey Hill Minit Markets to conduct a Traffic Impact Study for a proposed 5 acre mixed use development consisting of a Gasoline/Service Station with Convenience Market and Car Wash; 10,000 square foot Shopping Center and two 3,000 square foot Fast-Food Restaurants with Drive Thru Windows located in the City of Marysville in Union County, Ohio. The gas/service station has a total of 16 vehicle fueling positions with a 6,000 square foot Convenience Market and a car wash. The development will be located on the southwest corner of the S.R. 31 & Mill Road/Echo Drive intersection, approximately 1000 feet north of US 33. A summary of the results can be found on page 6 (Figure 1).

The trips from the development in 2021 degrade the Level of Service of the S.R. 31/Mill Road intersection from a LOS D to LOS E. Therefore, an eastbound right turn lane was added to achieve a LOS C at the intersection. Because of the westbound left turning volume (20%) on Mill Road into the development a westbound left turn lane is warranted at the Mill Road & Cobblestone Way/Development Drive intersection.

Listed below are the recommended improvements at each intersection determined from the analysis for the study area.

S.R. 31 & Mill Road/Echo Drive

The proposed development will degrade the Level of Service and the functionality of the intersection.

Eastbound Left/Through lane on Mill Rd. with a length of 150 feet.

Eastbound Left/Through lane on Mil Rd. with a length of 100 feet.

Eastbound Right turn lane on Mill Rd. is warranted with a length of 430 feet. (Shortened from 450' due to distance to the next intersection.

The existing signal should be retimed to include phasing for an overlap right with a new five section signal head added. The existing loop detectors will need replaced. The aforementioned improvements appear to be necessary in the 2021 design year

based on current traffic volumes, proposed development and anticipated growth.

Mill Road & Cobblestone Way/Proposed Development Drive

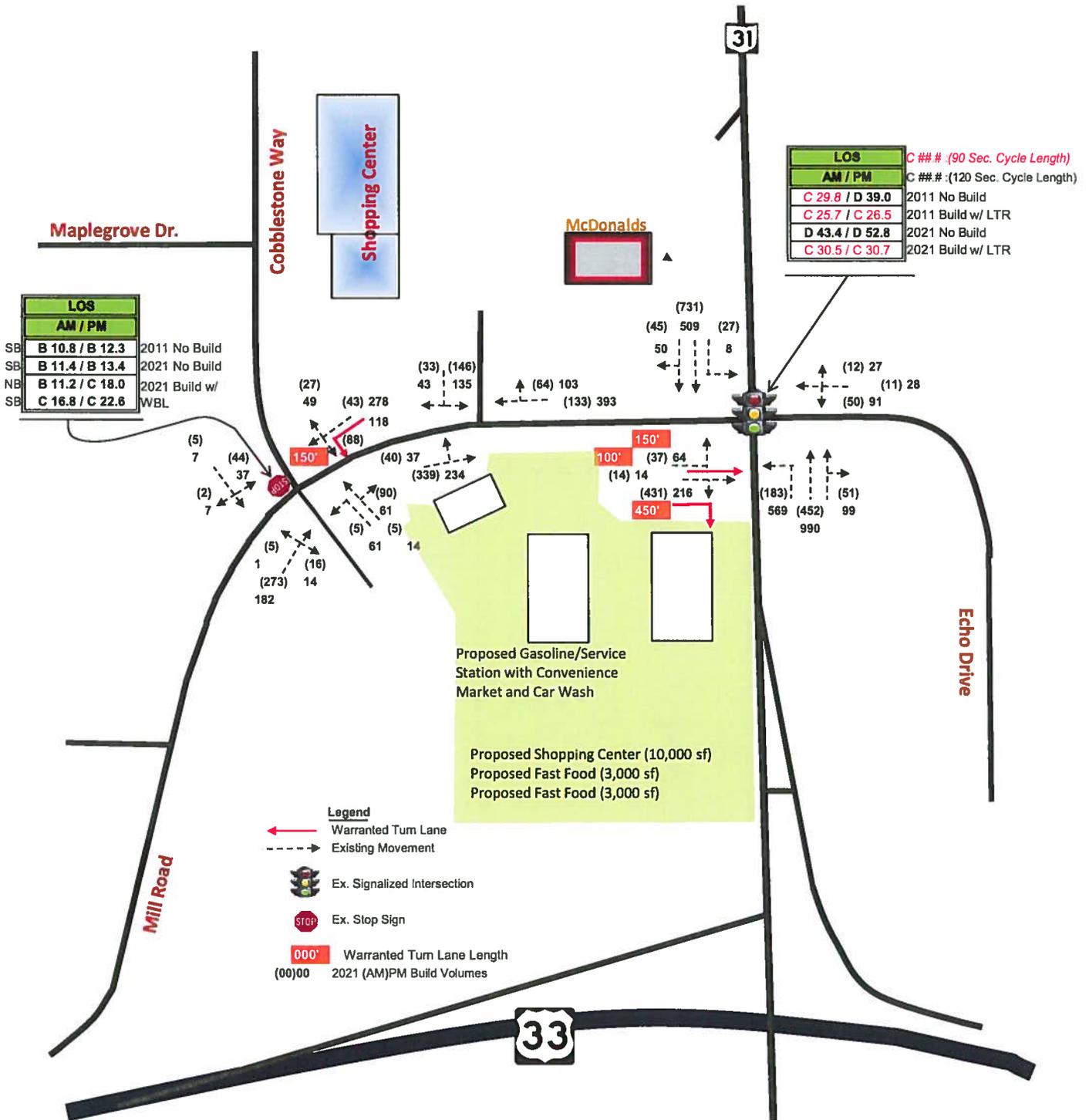
Westbound Left turn lane on Mill Road is warranted with length of 150 feet.

The aforementioned improvements appear to be necessary in the 2021 design year based on current traffic volumes, proposed development and anticipated growth.

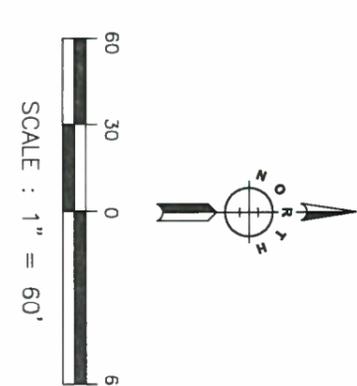
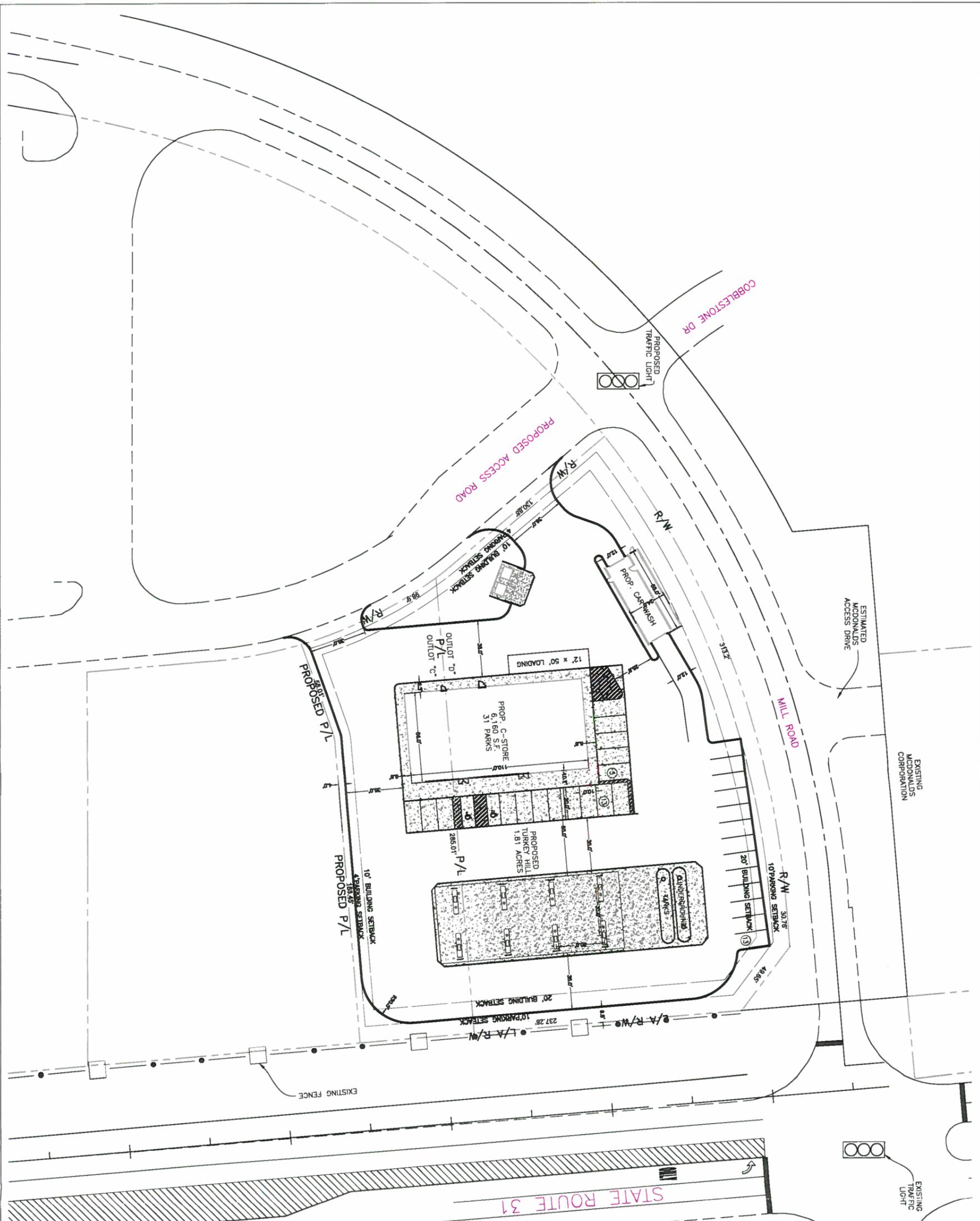
See the following page for a summary layout of the area and Appendix A for a schematic of the proposed roadway layout.



FIGURE 1 SUMMARY LAYOUT
2021 (AM) PM PEAK BUILD



Appendix A:
Site Plan



- 1) SITE IS ZONED B--1
- 2) GAS STATION AND CAR WASH ARE CONDITIONAL USE INB-1 ZONING DISTRICT. CONDITIONAL USE REQUIRES APPROVAL OF PLANNING COMMISSION
- 3) OLD S.R. 31 IS LIMITED ACCESS RIGHT-OF-WAY BY SELLER
- 4) ALL PROPERTY LINES AND ROAD INFORMATION PROVIDED
- 5) EXISTING OUTLOT "D" IS 1.36 ACRES
- 6) EXISTING OUTLOT "C" IS 1.34 ACRES
- 7) TURKEY HILL OUTLOT WILL REQUIRE 1.81 ACRES
- 8) 0.45 ACRES WILL BE SPLIT FROM EXISTING OUTLOT "C" AND COMBINED WITH OUTLOT "D" TO FACILITATE TURKEY HILL DEVELOPMENT
- 9) RESIDUAL OF OUTLOT "C" WILL BE 0.89 ACRES

DESIGN TEAM	DATE
DRAWN BY: CK	
CHECKED BY: JDL	
SCALE: 1" = 60'	
SHEET: 1	
DATE: 04/04/11	

**CONCEPT SITE PLAN
MILL VALLEY**

MILL RD
& STATE ROUTE 31
MARYSVILLE, OH

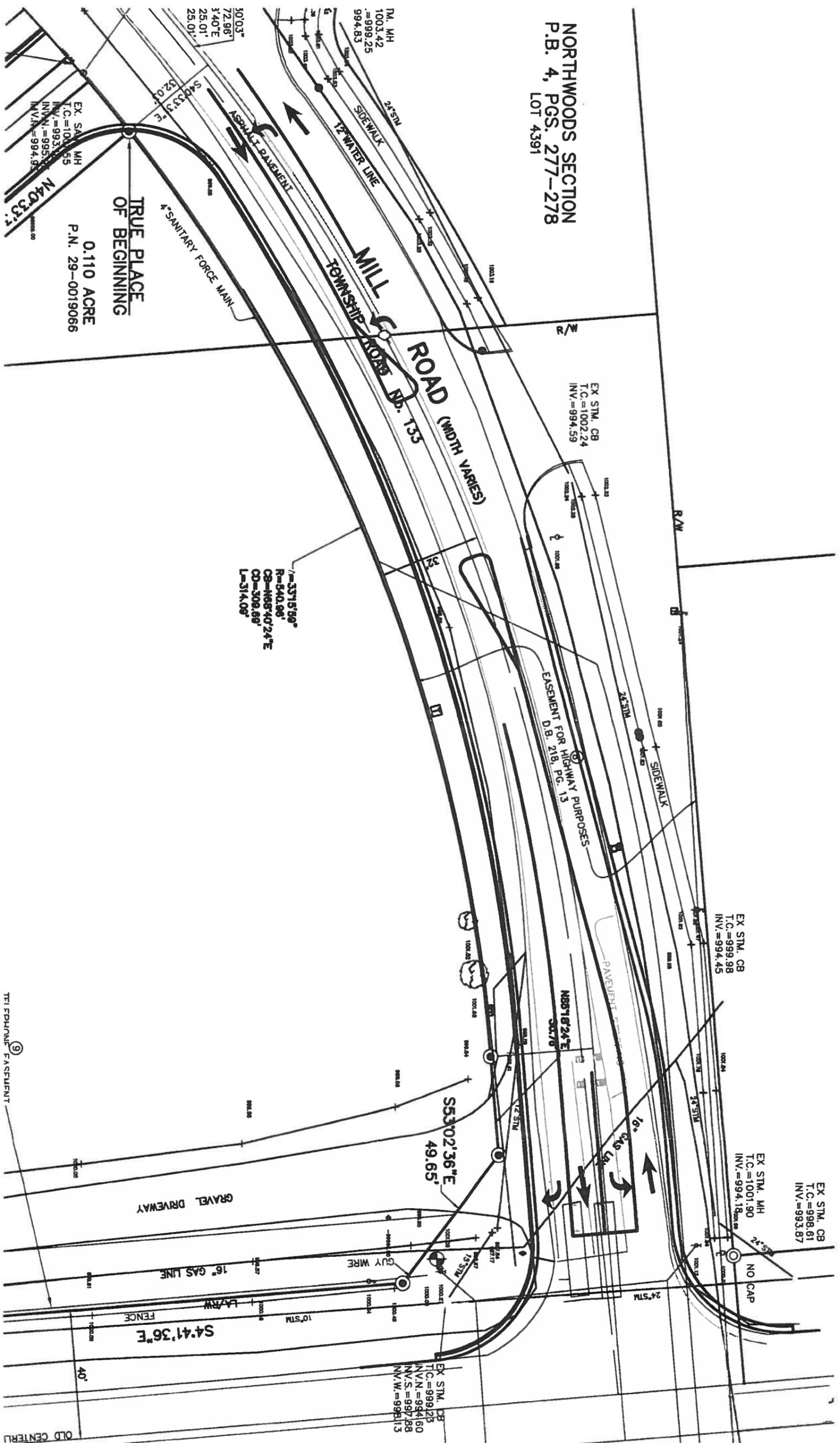
NO.	REVISIONS	DATE

M&E COMPANIES
Achieving Exceptional Results through Management and Engineering

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**NORTHWOODS SECTION
P.B. 4, PGS. 277-278
LOT 4391**



**TRUE PLACE
OF BEGINNING**
0.110 ACRE
P.N. 29-0019066

TIE EASEMENT ⑨

OLD CENTERLINE

40'

S4°41'36"E

16" GAS LINE

GUY WIRE

GRAVEL DRIVEWAY

10" STM

12" STM

Appendix B:
Raw Traffic Counts

Twigg Property - TIS

TURNING MOVEMENTS

Intersection	EASTBOUND			WESTBOUND			NORTHBOUND			SOUTHBOUND			
	L	T	R	L	T	R	L	T	R	L	T	R	
2011 No Build - Exhibit 1 (Peak Hour Turning Movement Counts)													
S.R. 31 & Mill Rd./Echo Dr.	25	9	326	47	5	10	129	398	44	23	653	6	AM
	35	7	176	83	18	23	431	866	85	7	450	13	PM
Mill Rd. & Cobblestone Way	4	248	0	0	45	23	0	0	0	42	0	2	AM
	1	167	0	0	280	42	0	0	0	37	0	6	PM
Mill Rd. & McDonalds Ent./Exit	26	240	0	0	56	55	0	0	0	117	0	19	AM
	20	175	0	0	295	89	0	0	0	116	0	22	PM
2021 No Build - Exhibit 2													
1.5% Growth													
S.R. 31 & Mill Rd./Echo Dr.	29	10	378	55	6	12	150	462	51	27	758	7	AM
	41	8	204	96	21	27	500	1005	99	8	522	15	PM
Mill Rd. & Cobblestone Way	5	288	0	0	52	27	0	0	0	49	0	2	AM
	1	194	0	0	325	49	0	0	0	43	0	7	PM
Mill Rd. & McDonalds Ent./Exit	30	279	0	0	65	64	0	0	0	136	0	22	AM
	23	203	0	0	342	103	0	0	0	135	0	26	PM

	EASTBOUND			WESTBOUND			NORTHBOUND			SOUTHBOUND			
	L	T	R	L	T	R	L	T	R	L	T	R	
2011 Build - Exhibit 6													
S.R. 31 & Mill Rd./Echo Dr.	32	13	374	42	10	10	158	388	44	23	625	40	AM
	53	12	185	77	24	23	488	851	85	7	435	41	PM
Mill Rd. & Cobblestone Way	4	233	15	78	36	23	5	5	84	37	5	2	AM
	1	156	11	97	231	42	49	11	49	31	6	6	PM
Mill Rd. & McDonalds Ent./Exit	35	295	0	0	115	55	0	0	0	126	0	29	AM
	31	196	0	0	326	89	0	0	0	116	0	28	PM
2021 Build - Exhibit 7													
				1.5% Growth									
S.R. 31 & Mill Rd./Echo Dr.	37	14	431	50	11	12	183	452	51	27	731	45	AM
	64	14	216	91	28	27	569	990	99	8	509	50	PM
Mill Rd. & Cobblestone Way	5	273	16	88	43	27	5	5	90	44	5	2	AM
	1	182	14	118	278	49	61	14	61	37	7	7	PM
Mill Rd. & McDonalds Ent./Exit	40	339	0	0	133	64	0	0	0	146	0	33	AM
	37	234	0	0	393	103	0	0	0	135	0	32	PM

File Name: J:\TSS\1111-033 Turkey Hill TIA\Traffic\TrafficCounts\01_CobblestoneAM_031611.ppd

Start Date: 3/16/2011

Start Time: 6:30:00 AM

Site Code: 00000004

Comment 1:

Comment 2:

Comment 3:

Comment 4:

Start Time	Northbound			Eastbound			Southbound			Westbound			Intersection Total	
	right	thru	left	right	thru	left	right	thru	left	right	thru	left		
6:30 AM	0	0	0	0	0	0	0	3	0	0	3	0	0	106
6:45 AM	0	0	0	0	0	0	0	0	0	8	4	11	0	93
7:00 AM	0	0	0	0	0	0	0	0	10	0	6	15	0	86
7:15 AM	0	0	0	0	2	0	0	2	0	10	6	11	0	76
7:30 AM	0	0	0	0	2	0	0	0	14	0	7	8	0	109
7:45 AM	0	0	0	0	0	0	0	0	6	0	10	17	0	84
8:00 AM	0	0	0	0	0	0	0	0	3	0	2	15	0	78
8:15 AM	0	0	0	0	0	1	0	1	0	10	1	17	0	65

File Name: J:\TSS\1111-033 Turkey Hill TIA\Traffic\TrafficCounts\CobblestonePM.ppd

Start Date: 3/8/2011

Start Time: 4:00:00 PM

Site Code: 11033001

Comment 1:

Comment 2:

Comment 3:

Comment 4:

Start Time	Northbound			Eastbound			Southbound			Westbound			Intersection Total				
	right	thru	left	right	thru	left	right	thru	left	right	thru	left					
04:00 PM	0	0	0	0	0	48	0	0	1	0	10	0	13	54	0	0	126
04:15 PM	0	0	0	0	0	36	1	0	1	0	12	0	14	60	0	0	124
04:30 PM	0	0	0	0	0	37	0	0	2	0	5	0	15	73	0	0	132
04:45 PM	0	0	0	0	0	37	2	0	1	0	3	0	9	73	0	0	125
05:00 PM	0	0	0	0	0	37	0	0	2	0	9	0	18	63	0	0	129
05:15 PM	0	0	0	0	0	40	1	0	1	0	8	0	5	77	0	0	132
05:30 PM	0	0	0	0	0	45	0	0	3	0	7	0	10	67	0	0	132
05:45 PM	0	0	0	0	0	45	0	0	0	0	13	0	9	73	0	0	140

File Name: J:\TSS\1111-033 Turkey Hill TIA\Traffic\TrafficCounts\03_SR31AM_031711.ppd

Start Date: 3/17/2011
 Start Time: 6:30:00 AM
 Site Code: 00000000

Comment 1:
 Comment 2:
 Comment 3:
 Comment 4:

Start Time	Northbound			Eastbound			Southbound			Westbound			Intersection Total	
	right	thru	left	right	thru	left	right	thru	left	right	thru	left		
6:30 AM	11	39	27	0	93	4	0	0	166	2	0	12	0	356
6:45 AM	16	45	19	0	104	4	0	0	191	4	0	13	0	400
7:00 AM	11	62	24	0	68	4	0	0	163	5	0	12	0	352
7:15 AM	12	65	26	0	81	5	0	0	161	4	0	13	0	377
7:30 AM	9	68	29	0	98	4	0	3	190	4	0	11	0	424
7:45 AM	12	83	31	0	89	2	0	1	136	3	0	15	0	389
8:00 AM	13	127	29	0	67	1	0	1	143	6	0	13	0	408
8:15 AM	10	120	40	0	72	2	0	1	184	10	0	8	0	456

File Name: J:\TSS\1111-033 Turkey Hill TIA\Traffic\TrafficCounts\03_SR31PM.ppd

Start Date: 3/10/2011

Start Time: 4:00:00 PM

Site Code: 00000003

Comment 1:

Comment 2:

Comment 3:

Comment 4:

Start Time	Northbound			Eastbound			Southbound			Westbound			Intersection Total				
	right	thru	left	right	thru	left	right	thru	left	right	thru	left					
04:00 PM	3	192	71	0	48	8	26	0	6	125	4	0	6	9	14	0	512
04:15 PM	10	178	100	0	74	1	6	0	2	102	1	0	1	1	6	0	482
04:30 PM	30	230	107	0	48	0	6	0	4	117	3	0	7	2	21	0	575
04:45 PM	16	200	113	0	40	1	7	0	0	129	1	0	8	4	17	0	536
05:00 PM	18	194	103	0	30	3	14	0	7	86	1	0	5	7	31	0	499
05:15 PM	21	242	108	0	58	3	8	0	2	118	2	0	3	5	14	0	584
05:30 PM	18	202	99	0	34	1	4	0	3	106	0	0	2	4	18	0	491
05:45 PM	10	165	100	0	81	9	4	0	1	96	3	0	3	5	15	0	492

File Name: J:\TSS11111-033 Turkey Hill TIA\Traffic\TrafficCounts\02_Commercial\AccessDriveAM_031611.ppd

Start Date: 3/16/2011

Start Time: 6:30:00 AM

Site Code: 00000005

Comment 1:

Comment 2:

Comment 3:

Comment 4:

Start Time	Northbound			Eastbound			Southbound			Westbound			Intersection Total	
	right	thru	left	right	thru	left	right	thru	left	right	thru	left		
6:30 AM	0	0	0	0	0	11	4	0	24	0	4	12	0	127
6:45 AM	0	0	0	0	72	3	3	0	19	0	9	12	0	118
7:00 AM	0	0	0	0	51	9	7	0	24	0	16	17	0	124
7:15 AM	0	0	0	0	48	7	5	0	39	0	15	14	0	128
7:30 AM	0	0	0	0	69	7	4	0	35	0	15	13	0	143
7:45 AM	0	0	0	0	56	2	6	0	24	0	8	4	0	100
8:00 AM	0	0	0	0	42	8	4	0	27	0	15	14	0	110
8:15 AM	0	0	0	0	38	5	2	0	32	0	20	7	0	104

File Name: J:\TSS\11\11-033 Turkey Hill TIA\Traffic\TrafficCounts\02_CommercialAccessDrivePM.ppd

Start Date: 3/8/2011

Start Time: 4:00:00 PM

Site Code: 00000001

Comment 1:

Comment 2:

Comment 3:

Comment 4:

Start Time	Northbound			Eastbound			Southbound			Westbound			Intersection Total		
	right	thru	left	right	thru	left	right	thru	left	right	thru	left			
04:00 PM	0	0	0	0	0	8	1	9	0	32	0	37	40	0	183
04:15 PM	0	0	0	0	0	9	4	4	0	27	0	23	66	0	167
04:30 PM	0	0	0	0	0	44	0	8	0	26	0	30	72	0	182
04:45 PM	0	0	0	0	1	37	0	2	0	33	1	21	77	0	177
05:00 PM	0	0	0	0	0	48	0	5	0	20	0	24	70	0	172
05:15 PM	0	0	0	0	0	46	0	7	0	37	0	14	76	0	188
05:30 PM	0	0	0	0	0	43	2	2	0	33	0	18	57	0	155
05:45 PM	0	0	0	0	0	43	0	7	0	22	0	14	71	0	163

M-E Companies, Inc.
4150 Beiden Village St. Suite 104
Canton, OH 44718

Site Code: 000000000002

Station ID:

Mill Road, Northwoods Dr. to Cobblestone

Latitude: 0' 0.000 Undefined

Start Time	09-Mar-11 Wed	Westbound	Eastbound	Total
12:00 AM		27	6	33
01:00		16	5	21
02:00		21	5	26
03:00		11	0	11
04:00		8	4	12
05:00		2	21	23
06:00		8	87	95
07:00		52	254	306
08:00		65	268	333
09:00		63	146	209
10:00		57	99	156
11:00		48	69	117
12:00 PM		74	69	143
01:00		83	80	163
02:00		86	80	166
03:00		132	100	232
04:00		199	132	331
05:00		247	141	388
06:00		239	133	372
07:00		237	135	372
08:00		155	79	234
09:00		156	57	213
10:00		90	45	135
11:00		36	22	58
Total		2112	2037	4149
Percent		50.9%	49.1%	
AM Peak Vol.		08:00	08:00	08:00
		65	268	333
PM Peak Vol.		17:00	17:00	17:00
		247	141	388
Grand Total Percent		2112	2037	4149
		50.9%	49.1%	
ADT		ADT 4,149	ADT 4,149	AAADT 4,149

M-E Companies, Inc.
4150 Belden Village St. Suite 104
Canton, OH 44718

Site Code: 000000000006

Station ID:

Mill Road - Cobblestone to SR 31

Latitude: 0' 0.000 Undefined

Start Time	15-Mar-11 Tue	Westbound	Eastbound	Total
12:00 AM		21	4	25
01:00		33	9	42
02:00		10	5	15
03:00		5	4	9
04:00		0	20	20
05:00		18	114	132
06:00		82	271	353
07:00		115	308	423
08:00		127	289	416
09:00		135	192	327
10:00		116	162	278
11:00		149	158	307
12:00 PM		150	199	349
01:00		137	156	293
02:00		216	184	400
03:00		273	217	490
04:00		359	233	592
05:00		373	255	628
06:00		287	256	543
07:00		229	144	373
08:00		200	119	319
09:00		123	85	208
10:00		82	42	124
11:00		36	13	49
Total		3276	3439	6715
Percent		48.8%	51.2%	
AM Peak		11:00	07:00	07:00
Vol.		149	308	423
PM Peak		17:00	18:00	17:00
Vol.		373	256	628
Grand Total		3276	3439	6715
Percent		48.8%	51.2%	
ADT		ADT 6,715	ADT 6,715	ADT 6,715

M-E Companies, Inc.
4150 Belden Village St. Suite 104
Canton, OH 44718

Site Code: 000000000003

Station ID:

Echo Drive - 2way

Latitude: 0' 0.000 Undefined

Start Time	09-Mar-11 Wed	Eastbound	Westbound	Total
12:00 AM		0	0	0
01:00		0	0	0
02:00		0	0	0
03:00		2	0	2
04:00		3	2	5
05:00		7	1	8
06:00		28	12	40
07:00		76	39	115
08:00		61	37	98
09:00		30	15	45
10:00		30	19	49
11:00		30	22	52
12:00 PM		38	30	68
01:00		38	25	63
02:00		39	24	63
03:00		72	45	117
04:00		86	68	154
05:00		86	54	140
06:00		20	22	42
07:00		7	6	13
08:00		12	4	16
09:00		6	1	7
10:00		2	0	2
11:00		2	2	4
Total		675	428	1103
Percent		61.2%	38.8%	
AM Peak		07:00	07:00	07:00
Vol.		76	39	115
PM Peak		16:00	16:00	16:00
Vol.		86	68	154
Grand Total		675	428	1103
Percent		61.2%	38.8%	
ADT		ADT 1,103	ADT 1,103	AADT 1,103

M-E Companies, Inc.
4150 Belden Village St. Suite 104
Canton, OH 44718

Site Code: 000000000001

Station ID:

Cobblestone Way, South of Maplegrove Dr.

Latitude: 0' 0.000 Undefined

Start Time	09-Mar-11 Wed	Northbound	Southbound	Total
12:00 AM		3	1	4
01:00		1	0	1
02:00		2	1	3
03:00		2	0	2
04:00		1	0	1
05:00		0	1	1
06:00		3	16	19
07:00		15	34	49
08:00		37	41	78
09:00		25	27	52
10:00		20	18	38
11:00		15	15	30
12:00 PM		21	14	35
01:00		21	15	36
02:00		15	10	25
03:00		25	21	46
04:00		48	40	88
05:00		49	29	78
06:00		65	50	115
07:00		38	40	78
08:00		36	21	57
09:00		26	11	37
10:00		26	8	34
11:00		13	3	16
Total		507	416	923
Percent		54.9%	45.1%	
AM Peak		08:00	08:00	08:00
Vol.		37	41	78
PM Peak		18:00	18:00	18:00
Vol.		65	50	115
Grand Total		507	416	923
Percent		54.9%	45.1%	
ADT		ADT 923	ADT 923	ADT 923

Appendix C:

**ITE Trip Generation Land
Use**

TRIP GENERATION

ITE Land Use Description:		Gasoline/Service Station with Convenience Market and Car Wash		
ITE Land Use Code:		946		
Vehicle Fueling Positions	16			TRIP ENDS
main parcel				
AM Peak Hour of Adj St Rate (One Hr 7-9 am) =		11.93	Trips	191
		% In = 51%		97
		%Out = 49%		94
PM Peak Hour of Adj St Rate (One Hr 4-6 pm) =		13.94	Trips	223
		% In = 51%		114
		%Out = 49%		109

Trip Generation Assumptions:

ITE Land Use Description:		Fast-Food Restaurant with Drive-Through Window		
ITE Land Use Code:		934		
per 1000 Square Footage	3			TRIP ENDS
main parcel				
AM Peak Hour of Adj St Rate (One Hr 7-9 am) =		49	Trips	49
		% In = 51%		25
		%Out = 49%		24
PM Peak Hour of Adj St Rate (One Hr 4-6 pm) =		34	Trips	34
		% In = 52%		18
		%Out = 48%		16

Trip Generation Assumptions:

ITE Land Use Description:		Shopping Center		
ITE Land Use Code:		820		
per 1000 Square Footage	10			TRIP ENDS
main parcel				
AM Peak Hour of Adj St Rate = $\text{Ln}(T) = 0.59\text{Ln}(X)+2.32 =$		40	Trips	40
		% In = 61%		24
		%Out = 39%		15
PM Peak Hour of Adj St Rate = $\text{Ln}(T) = 0.67\text{Ln}(X)+3.37 =$		136	Trips	136
		% In = 49%		67
		%Out = 51%		69

Trip Generation Assumptions:

Land Use: 946

Gasoline/Service Station with Convenience Market and Car Wash

Description

This land use includes gasoline/service stations with convenience markets and car washes where the primary business is the fueling of motor vehicles. They may also have ancillary facilities for servicing and repairing motor vehicles. These service stations are generally located at intersections or interchanges. Convenience market (open 24 hours) (Land Use 851), convenience market (open 15-16 hours) (Land Use 852), convenience market with gasoline pumps (Land Use 853), gasoline/service station (Land Use 944) and gasoline/service station with convenience market (Land Use 945) are related uses.

Additional Data

The independent variable, vehicle fueling position, is defined as the maximum number of vehicles that can be fueled simultaneously.

Gasoline/service stations in this land use include "pay-at-the-pump" and traditional fueling stations.

The sites were surveyed between the late 1980s and the 2000s throughout the United States.

Source Numbers

334, 340, 347, 348, 355, 385, 440, 445, 540, 580, 586, 617

Gasoline/Service Station with Convenience Market and Car Wash (946)

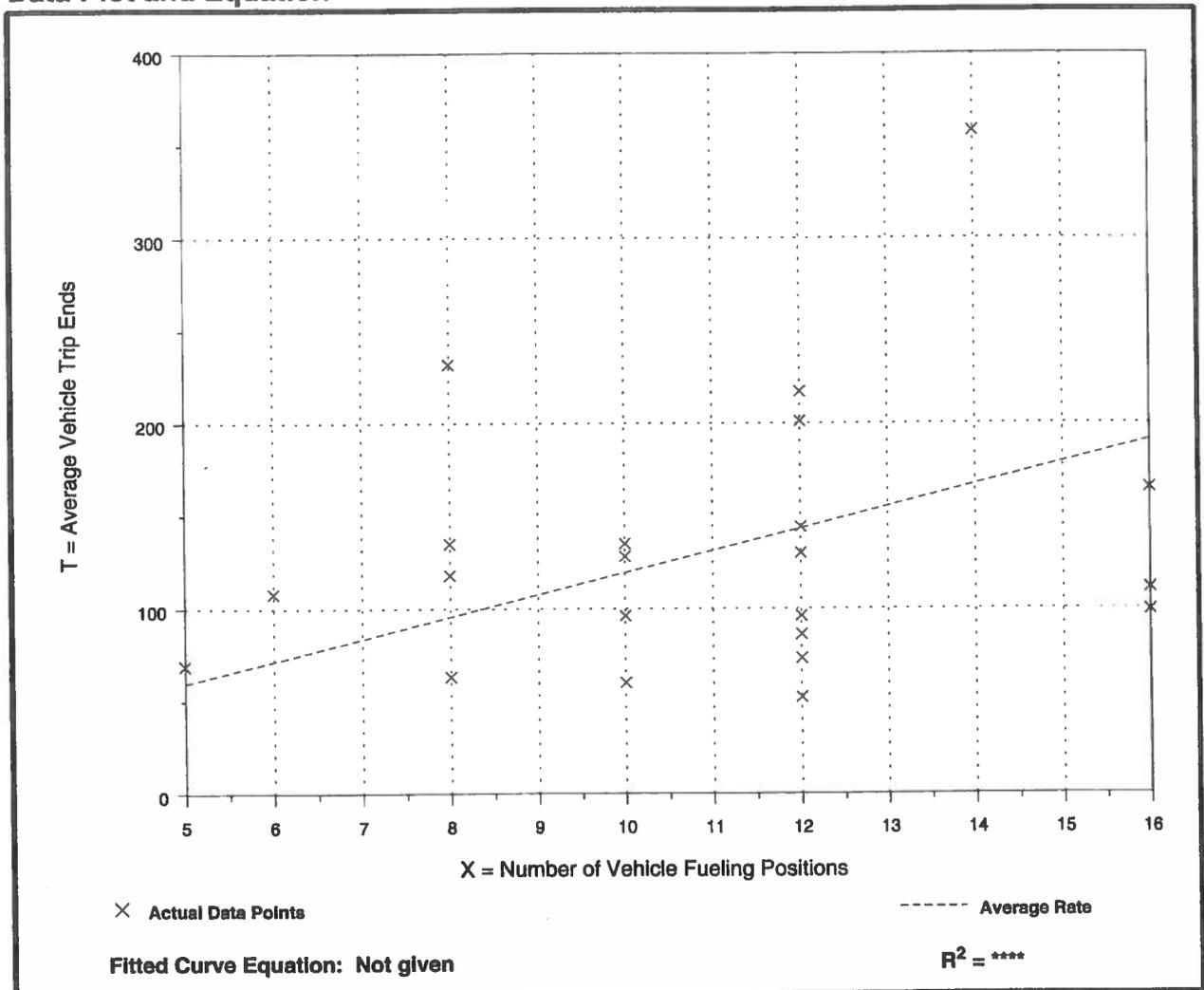
Average Vehicle Trip Ends vs: **Vehicle Fueling Positions**
 On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 22
 Average Vehicle Fueling Positions: 11
 Directional Distribution: 51% entering, 49% exiting

Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
11.93	4.33 - 29.00	7.04

Data Plot and Equation



Gasoline/Service Station with Convenience Market and Car Wash (946)

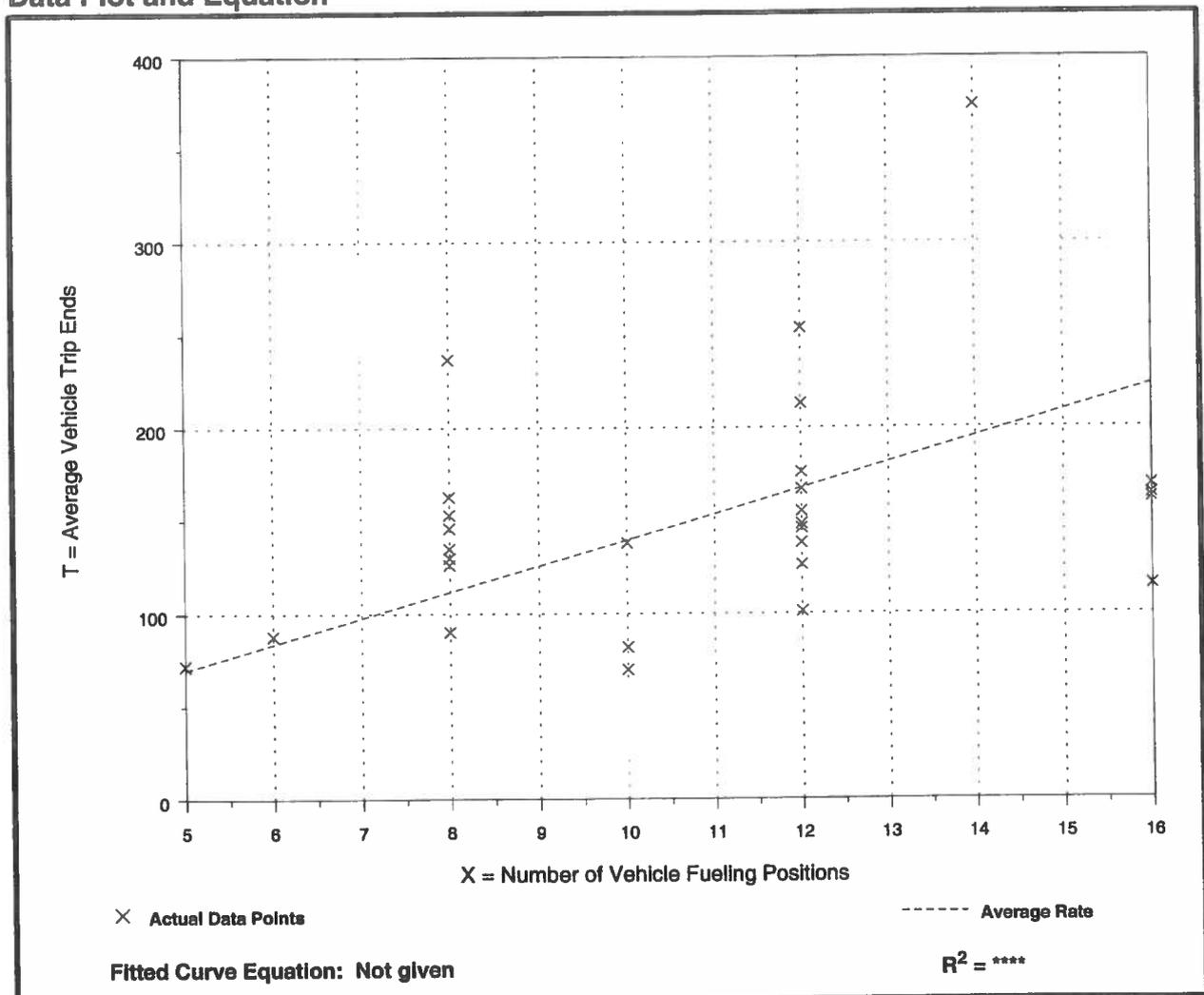
Average Vehicle Trip Ends vs: Vehicle Fueling Positions
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 30
 Average Vehicle Fueling Positions: 11
 Directional Distribution: 51% entering, 49% exiting

Trip Generation per Vehicle Fueling Position

Average Rate	Range of Rates	Standard Deviation
13.94	7.00 - 29.63	6.31

Data Plot and Equation



Land Use: 820

Shopping Center

Description

A shopping center is an integrated group of commercial establishments that is planned, developed, owned and managed as a unit. A shopping center's composition is related to its market area in terms of size, location and type of store. A shopping center also provides on-site parking facilities sufficient to serve its own parking demands. Specialty retail center (Land Use 814) and factory outlet center (Land Use 823) are related uses.

Additional Data

Shopping centers, including neighborhood centers, community centers, regional centers and super regional centers, were surveyed for this land use. Some of these centers contained non-merchandising facilities, such as office buildings, movie theaters, restaurants, post offices, banks, health clubs and recreational facilities (for example, ice skating rinks or indoor miniature golf courses). The centers ranged in size from 1,700 to 2.2 million square feet gross leasable area (GLA). The centers studied were located in suburban areas throughout the United States and therefore represent typical U.S. suburban conditions.

Many shopping centers, in addition to the integrated unit of shops in one building or enclosed around a mall, include outparcels (peripheral buildings or pads located on the perimeter of the center adjacent to the streets and major access points). These buildings are typically drive-in banks, retail stores, restaurants, or small offices. Although the data herein do not indicate which of the centers studied included peripheral buildings, it can be assumed that some of the data show their effect.

The vehicle trips generated at a shopping center are based upon the total GLA of the center. In cases of smaller centers without an enclosed mall or peripheral buildings, the GLA could be the same as the gross floor area of the building.

Separate equations have been developed for shopping centers during the Christmas shopping season. Plots were included for the weekday peak hour of adjacent street traffic and the Saturday peak hour of the generator.

Information on approximate hourly, monthly and daily variation in shopping center traffic is shown in Tables 1–4. It should be noted, however, that the information contained in these tables is based on a limited sample size. Therefore, caution should be exercised when applying the data. Also, some information provided in the tables may conflict with the results obtained by applying the average rate or regression equations. When this occurs, it is suggested that the results from the average rate or regression equations be used, as they are based on a larger number of studies.

Shopping Center (820)

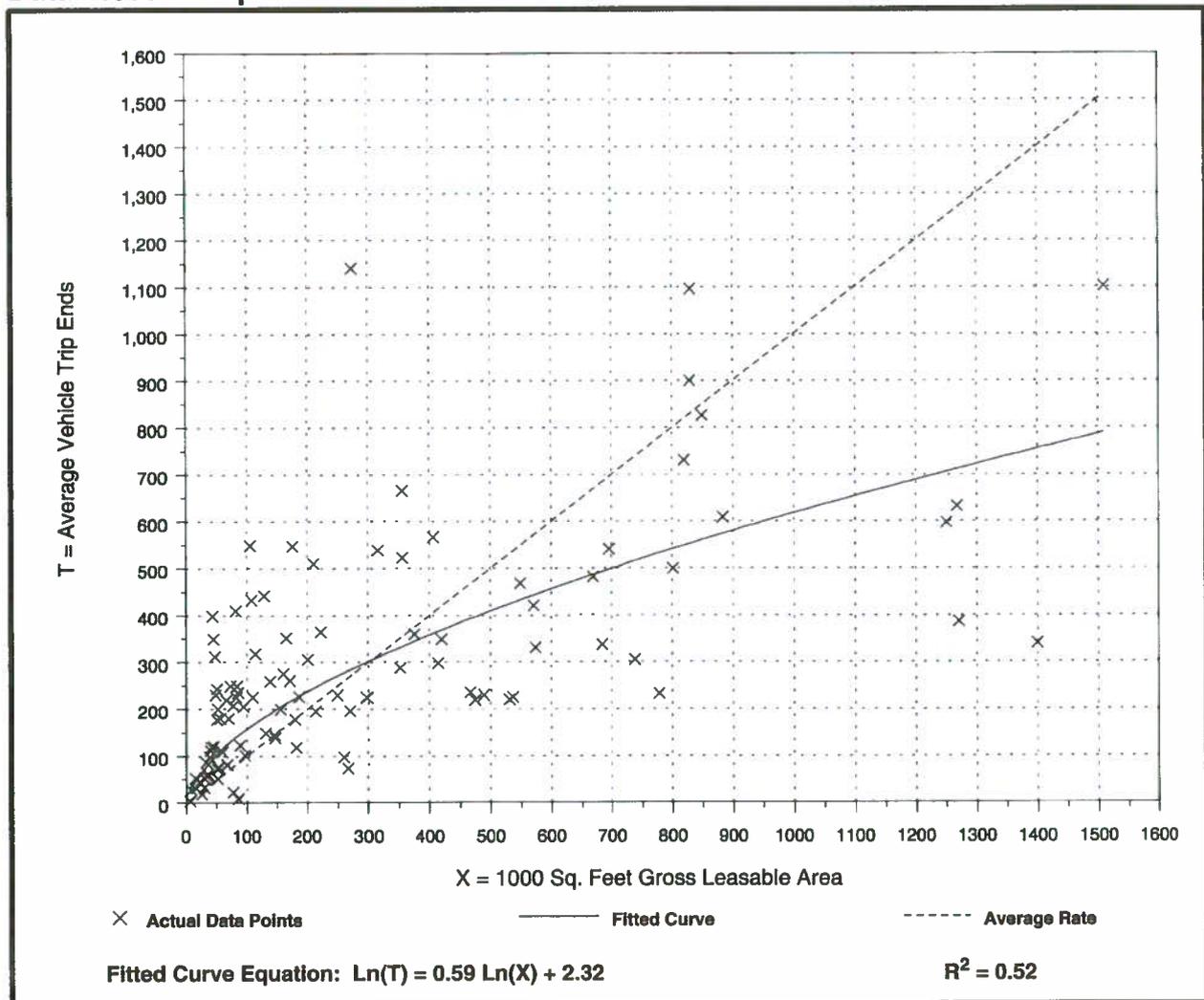
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Leasable Area
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 101
 Average 1000 Sq. Feet GLA: 296
 Directional Distribution: 61% entering, 39% exiting

Trip Generation per 1000 Sq. Feet Gross Leasable Area

Average Rate	Range of Rates	Standard Deviation
1.00	0.10 - 9.05	1.38

Data Plot and Equation



Shopping Center (820)

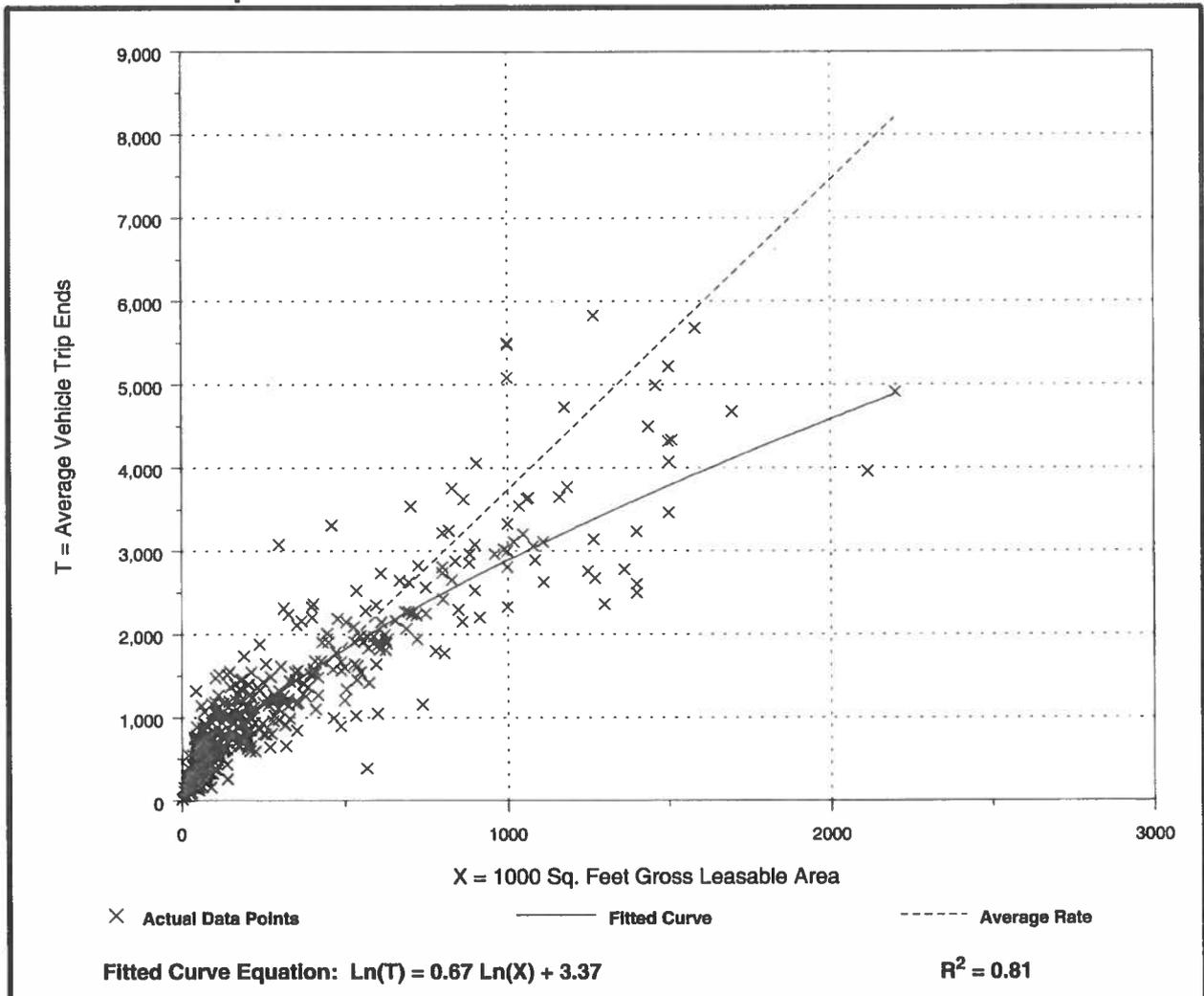
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Leasable Area
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 412
 Average 1000 Sq. Feet GLA: 379
 Directional Distribution: 49% entering, 51% exiting

Trip Generation per 1000 Sq. Feet Gross Leasable Area

Average Rate	Range of Rates	Standard Deviation
3.73	0.68 - 29.27	2.74

Data Plot and Equation



Land Use: 934

Fast-Food Restaurant with Drive-Through Window

Description

This category includes fast-food restaurants with drive-through windows. This type of restaurant is characterized by a large carry-out clientele; long hours of service (some are open for breakfast, all are open for lunch and dinner, some are open late at night or 24 hours per day); and high turnover rates for eat-in customers. These limited-service eating establishments do not provide table service. Non-drive-through patrons generally order at a cash register and pay before they eat. High-turnover (sit-down) restaurant (Land Use 932), fast-food restaurant without drive-through window (Land Use 933) and fast-food restaurant with drive-through window and no indoor seating (Land Use 935) are related uses.

Additional Data

Users should exercise caution when applying statistics during the a.m. peak periods, as the sites contained in the database for this land use may or may not be open for breakfast. In cases where it was confirmed that the sites were not open for breakfast, data for the a.m. peak hour of the adjacent street traffic were removed from the database.

The outdoor seating area is not included in the overall gross floor area. Therefore, the number of seats may be a more reliable independent variable on which to establish trip generation rates for facilities having significant outdoor seating.

One site indicated that a two-story play area and video arcade were included in the gross floor area.

The sites were surveyed between the 1980s and the 2000s throughout the United States.

It has been speculated that hamburger restaurants may generate trips at a higher rate than other types of fast-food restaurants. The database was tested in an attempt to verify this assumption; the data neither verified nor disproved it. Future research is needed in this area.

Source Numbers

163, 164, 168, 180, 181, 241, 245, 278, 294, 300, 301, 319, 338, 340, 342, 343, 358, 389, 438, 502, 552, 555, 577, 583, 584, 617, 640, 641

Fast-Food Restaurant with Drive-Through Window (934)

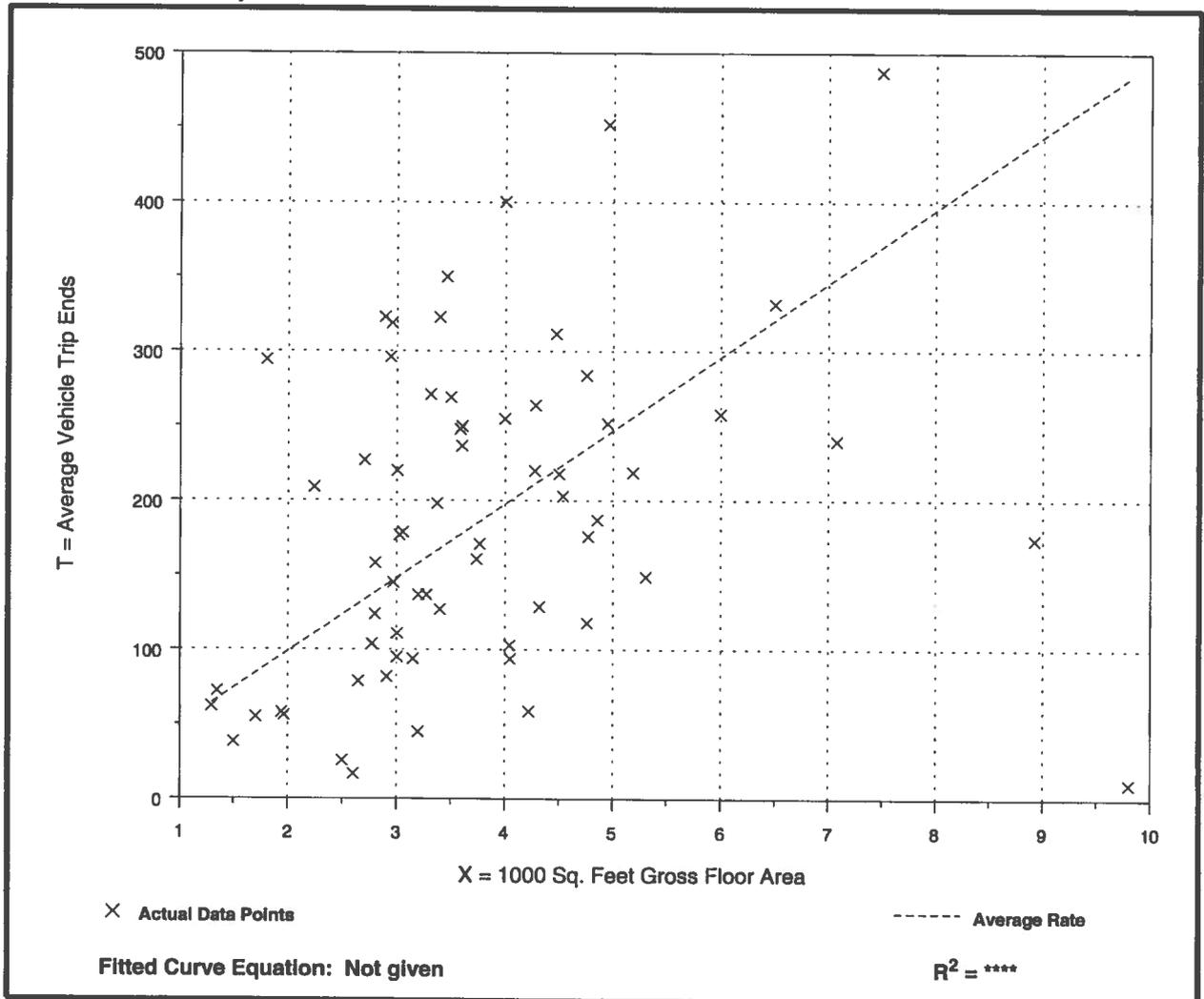
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Floor Area
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 65
 Average 1000 Sq. Feet GFA: 4
 Directional Distribution: 51% entering, 49% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
49.35	1.02 - 163.33	28.30

Data Plot and Equation



Fast-Food Restaurant with Drive-Through Window (934)

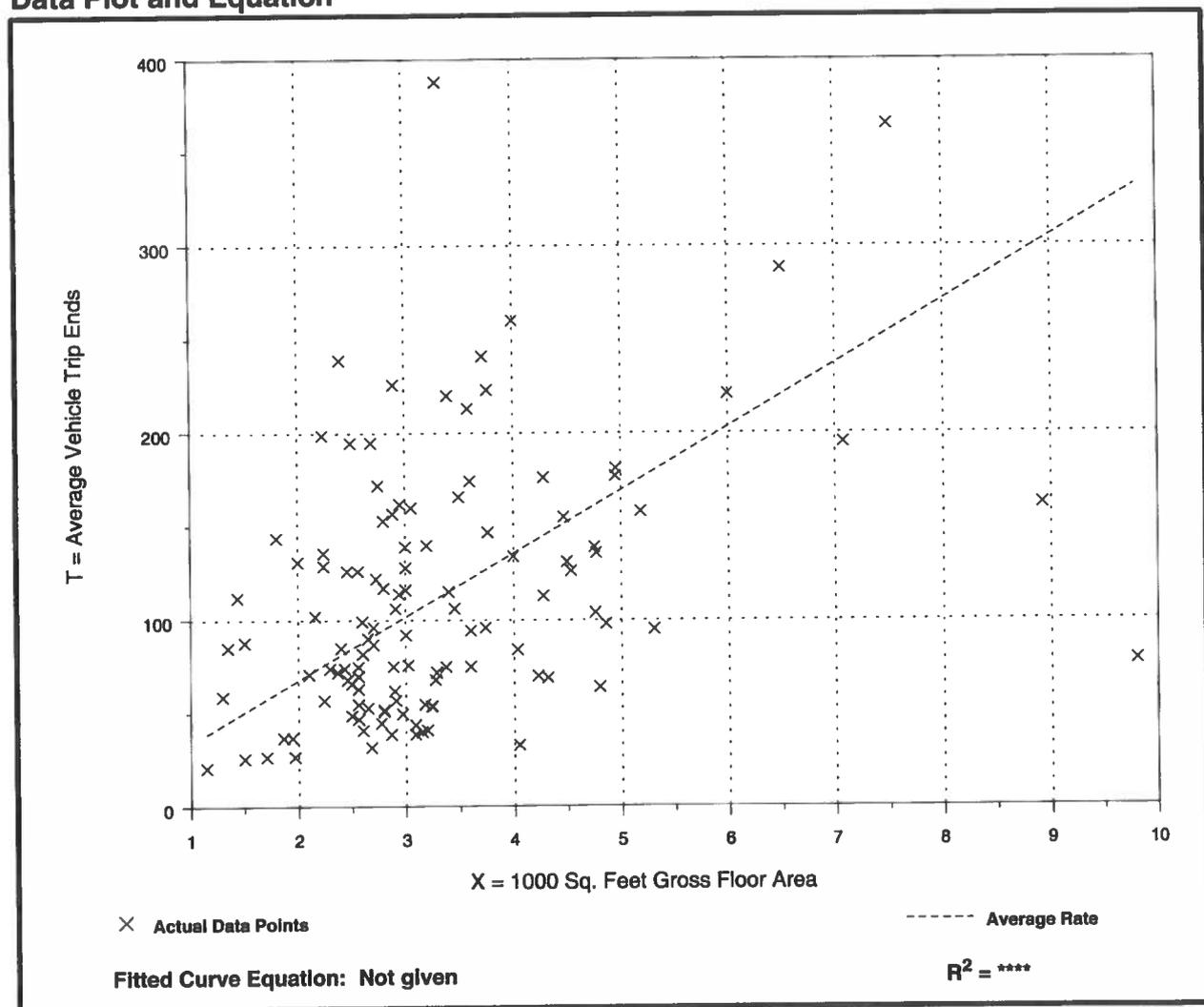
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Floor Area
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 118
 Average 1000 Sq. Feet GFA: 3
 Directional Distribution: 52% entering, 48% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
33.84	7.96 - 117.15	19.93

Data Plot and Equation



Analyst J. Watt
 Date 04/07/2011

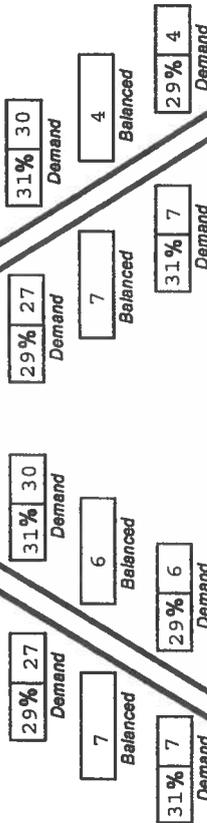
Name of Dvlp't Twigg Property
 Time Period AM Peak Hour of
Adj Street Traffic

MULTI-USE DEVELOPMENT TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

LAND USE A Gasoline/Service Station

ITE LU Code <u>946</u> Size <u>16</u> Fueling Positions		
	Internal	External
Enter	10	87
Exit	14	80
Total	24	167
%	12%	88%

Exit to External 80
 Enter from External 87



LAND USE B Fast-Food

ITE LU Code <u>934</u> Size <u>3,000</u> sq.ft.		
	Internal	External
Enter	1.1	14
Exit	1.2	12
Total	2.3	26
%	47%	53%

Exit to External 1.2
 Enter from External 1.4

LAND USE C Shopping Center

ITE LU Code <u>820</u> Size <u>10,000</u> sq.ft.		
	Internal	External
Enter	1.3	1.1
Exit	.8	.7
Total	2.1	1.8
%	52%	48%

Enter from External 1.1
 Exit to External .7

Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	LAND USE C	TOTAL
Enter	87	14	11	112
Exit	80	12	7	99
Total	167	26	18	211
Single-Use Trip Gen. Est.	191	49	40	280
			INTERNAL CAPTURE	25%

Source: Kaku Associates, Inc.

Analyst J. Watt
 Date 04/07/2011

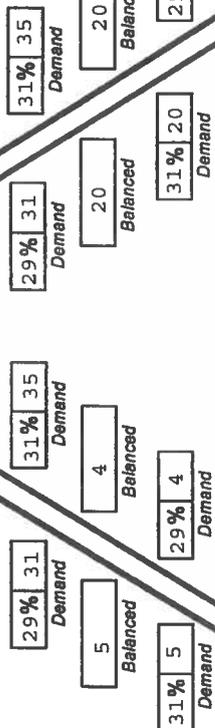
Name of Dvlpmt Twigg Property
 Time Period PM Peak Hour of
Adj Street Traffic

MULTI-USE DEVELOPMENT TRIP GENERATION AND INTERNAL CAPTURE SUMMARY

LAND USE A Gasoline/Service Station

ITE LU Code <u>946</u> Size <u>16</u> Fueling Positions			
	Total	Internal	External
Enter	114	24	90
Exit	109	25	84
Total	223	49	174
%	100%	22%	78%

Exit to External 84
 Enter from External 90



LAND USE B Fast-Food

ITE LU Code <u>934</u> Size <u>3,000</u> sq. ft.			
	Total	Internal	External
Enter	18	10	8
Exit	16	8	8
Total	34	18	16
%	100%	53%	47%

Exit to External 8
 Enter from External 8

LAND USE C Shopping Center

ITE LU Code <u>820</u> Size <u>10,000</u> sq. ft.			
	Total	Internal	External
Enter	67	24	43
Exit	69	25	44
Total	136	49	87
%	100%	36%	64%

Enter from External 43
 Exit to External 44

Net External Trips for Multi-Use Development

	LAND USE A	LAND USE B	LAND USE C	TOTAL
Enter	90	8	43	141
Exit	84	8	44	136
Total	174	16	87	277
Single-Use Trip Gen. Est.	223	34	136	393
				INTERNAL CAPTURE
				30%

Source: Kaku Associates, Inc.

Appendix D:
Signal Warrant Analysis

Table 2: Traffic Signal Warrant Guidelines

Condition A - Minimum Vehicular Volume*			
Number of Approach Lanes		ADT	
Major	Minor	Major	Minor
1	1	8,300	5,000
2	1	10,000	5,000
2	2	10,000	6,700
1	2	8,300	6,700
Condition B - Interruption of Continuous Traffic*			
Number of Approach Lanes		ADT	
Major	Minor	Major	Minor
1	1	12,500	2,500
2	1	15,000	2,500
2	2	15,000	3,300
1	2	12,500	3,300

* When the 85th percentile speed of major street traffic exceeds 40 mph, the warrants are 70 percent of the guidelines above.

TRAFFIC COUNTS

Project: Twigg Property TIS
Intersection: Mill Road & Cobblestone Way
Location: City of Marysville

Date of Count: All: 3/25/2010 Thursday Growth Factor
Growth Rate = 1.5% 1.16

Time	2011 Raw Traffic Counts				2021 Traffic Counts				Total Major Approach Volumes
	Major - Mill		Minor - Cobblestone		Major - Mill		Minor - Cobblestone		
	WB	EB	SB	NB	WB	EB	SB	NB	
12:00 AM	27	6	1	94	31	7	1	100	38
1:00 AM	16	5	0	94	19	6	0	100	24
2:00 AM	21	5	1	94	24	6	1	100	30
3:00 AM	11	0	0	94	13	0	0	100	13
4:00 AM	8	4	0	94	9	5	0	100	14
5:00 AM	2	21	1	94	2	24	1	100	27
6:00 AM	8	87	16	94	9	101	19	100	110
7:00 AM	52	254	34	94	60	295	39	100	355
8:00 AM	65	268	41	94	75	311	48	100	386
9:00 AM	63	146	27	94	73	169	31	100	243
10:00 AM	57	99	18	94	66	115	21	100	181
11:00 AM	48	69	15	94	56	80	17	100	136
12:00 PM	74	69	14	109	86	80	16	136	166
1:00 PM	83	80	15	109	96	93	17	136	189
2:00 PM	86	80	10	109	100	93	12	136	193
3:00 PM	132	100	21	109	153	116	24	136	269
4:00 PM	199	132	40	109	231	153	46	136	384
5:00 PM	247	141	29	109	287	164	34	136	450
6:00 PM	239	133	50	109	277	154	58	136	432
7:00 PM	237	135	40	109	275	157	46	136	432
8:00 PM	155	79	21	109	180	92	24	136	272
9:00 PM	156	57	11	109	181	66	13	136	247
10:00 PM	90	45	8	109	104	52	9	136	157
11:00 PM	36	22	3	109	42	26	3	136	67
ADT	4149		416	2436	4815		483	2832	

Appendix E:

**Storage Lane Length
Analysis Worksheets**



Turn Lane Length Worksheet

Design Data

Project ID: Twigg Property TIS Date: 24-Mar-11
 E-W Road: Mill Road/Echo Drive N-S Road: Cobblestone Way
 Analyst: J. Wait Checked By: D. Weaver
 Analyzed Year: 2021 Build

Input Values: SIGNALIZED OR UNSIGNALIZED STOPPED CROSSROAD OR UNSIGNALIZED THROUGH ROAD

AM Peak Hour Volume (vehicles)

Eastbound		Westbound		Northbound		Southbound	
Left	Right	Left	Through	Right	Left	Through	Right
5	273	16	88	43	27	5	5
						90	44
						5	5
						5	2

PM Peak Hour Volume (vehicles)

Eastbound		Westbound		Northbound		Southbound	
Left	Right	Left	Through	Right	Left	Through	Right
1	182	14	118	49	61	14	37
						61	7
						14	7
						7	7

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

	Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right
Left	1	1	1	1	1	1	1	1	0
Through	1	1	1	1	1	1	1	1	1
Right	0	0	0	0	0	0	0	0	0
Offset Left ? (y,n)	n	n	n	n	n	n	n	n	n
Offset Dist. (ft.)	0	0	0	0	0	0	0	0	0

Design Speed (mph)

Eastbound	30	Westbound	30	Northbound	25	Southbound	25
-----------	----	-----------	----	------------	----	------------	----

Cycle Length

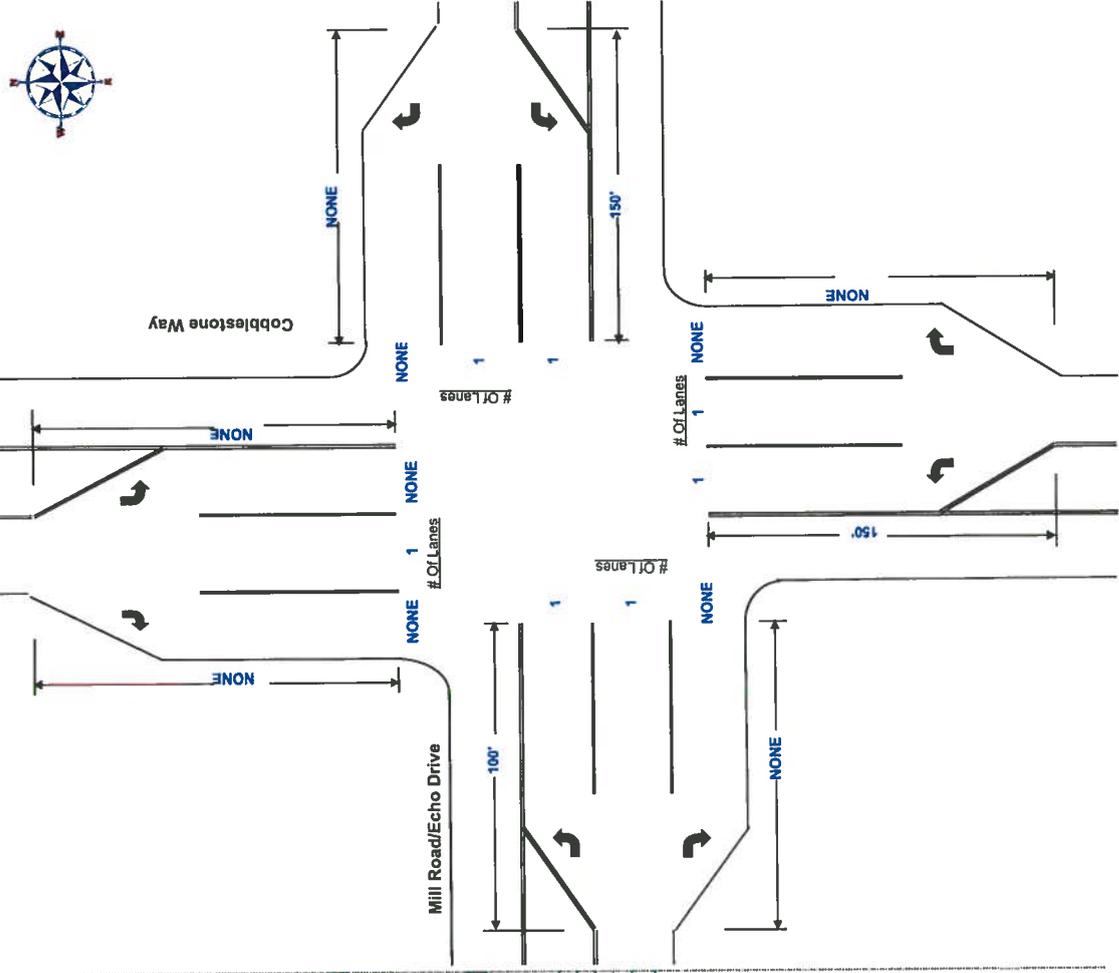
AM (sec)	60
PM (sec)	60

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Direction	Left	Through	Right
Eastbound	100	250	NONE
Westbound	150	300	NONE
Northbound	150	NONE	NONE
Southbound	150	100	NONE

Standard Layout (Not to scale)





Turn Lane Length Worksheet

Design Data

Project ID: Twigg Property TIS Date: 2-May-11
 E-W Road: Mill Road/Echo Drive N-S Road: S.R. 31
 Analyst: J. Watt Checked By: D. Weaver
 Analyzed Year: 2021 Build

Input Values:
 Type of Traffic Control:
 SIGNALIZED OR UNSIGNALIZED STOPPED CROSSROAD OR UNSIGNALIZED THROUGH ROAD

AM Peak Hour Volume (vehicles)

Eastbound			Westbound			Northbound			Southbound		
Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
37	14	431	50	11	12	183	452	51	27	731	45

PM Peak Hour Volume (vehicles)

Eastbound			Westbound			Northbound			Southbound		
Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
64	14	216	91	28	27	569	990	99	6	509	50

Intersection Geometry - Number of Lanes (Use 0 if Turn Lane is Shared, i.e., Not Exclusive)

Eastbound			Westbound			Northbound			Southbound		
Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
1	1	1	0	1	1	1	1	1	1	1	1
Offset Left ? (y/n)	n	n	n	n	n	n	n	n	n	n	n
Offset Dist. (ft.)	0	0	0	0	0	0	0	0	0	0	0

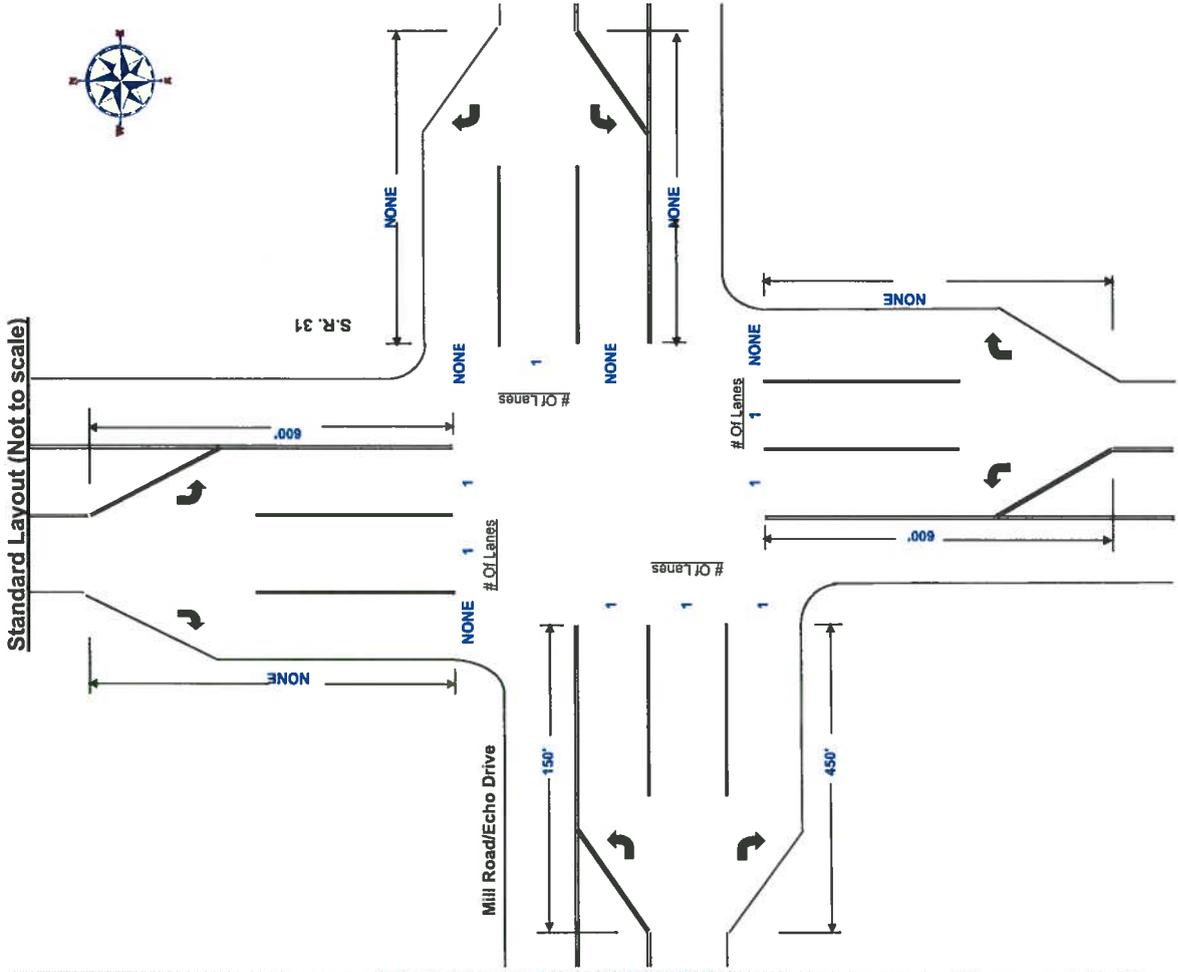
Design Speed (mph): Eastbound Westbound Northbound Southbound

Cycle Length: AM (sec) PM (sec)

Analysis Results:

Turn Lane Length and Through Storage (ft.)

Direction	Through	Storage
Eastbound	150	NONE
Through	100	NONE
Right	450	NONE
Northbound	600 Lane Blocked	600 Lane Blocked
Left	875	725
Through	NONE	NONE
Right		



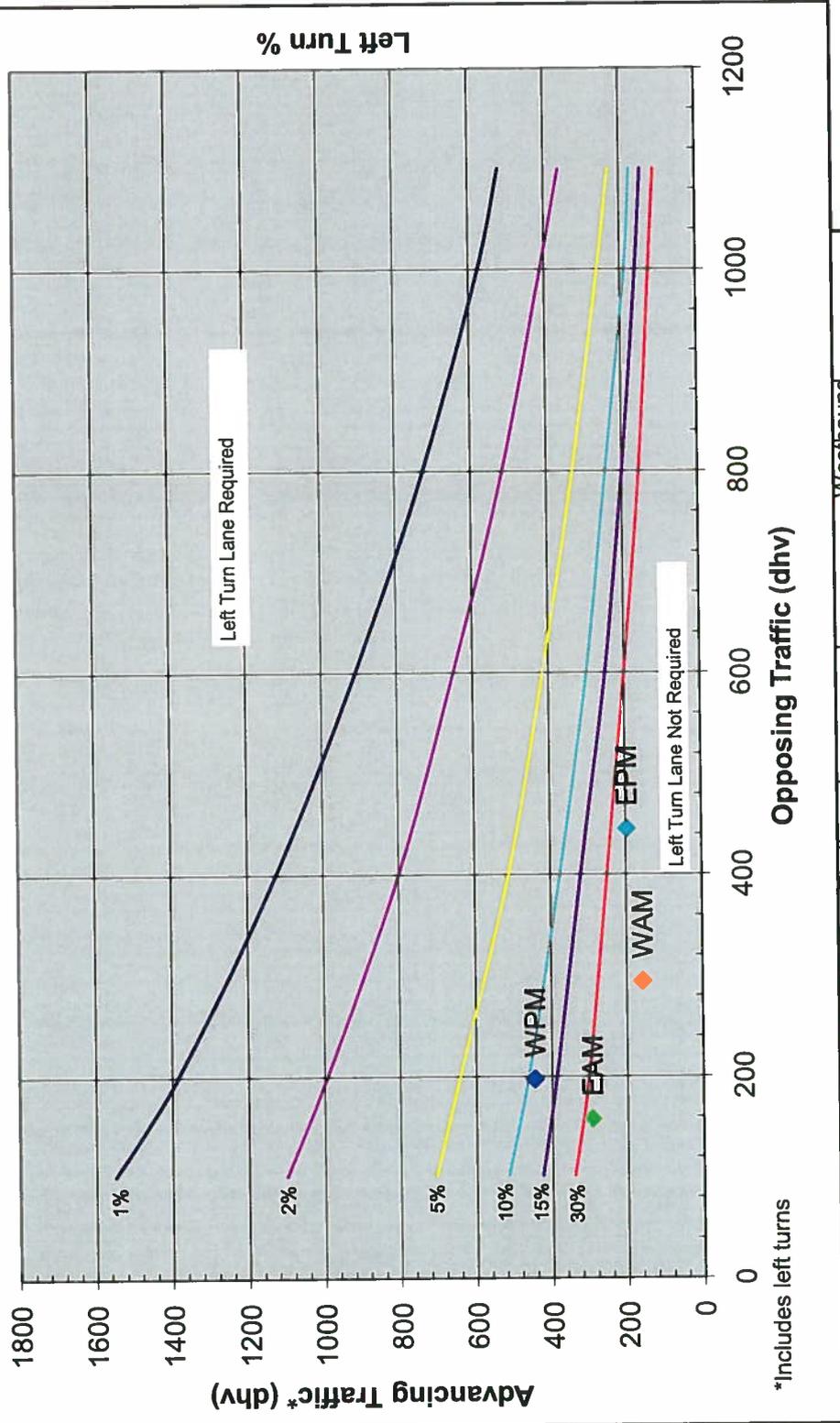
Appendix F:
Turn Lane Warrant

Calc by: JAW
 Chk by: DLW
 Date: 4/8/2011

Mill Road & Cobblestone Way

2-Lane Highway Left Turn Lane Warrant

(=< 40 mph or 70 kph Posted Speed)



*Includes left turns

	Eastbound		Westbound	
	AM	PM	AM	PM
Des. Yr. 2021	294	197	158	445
Advancing	158	445	294	197
Opposing	2%	1%	56%	26%
% Left	NO	NO	NO	YES
Warranted				

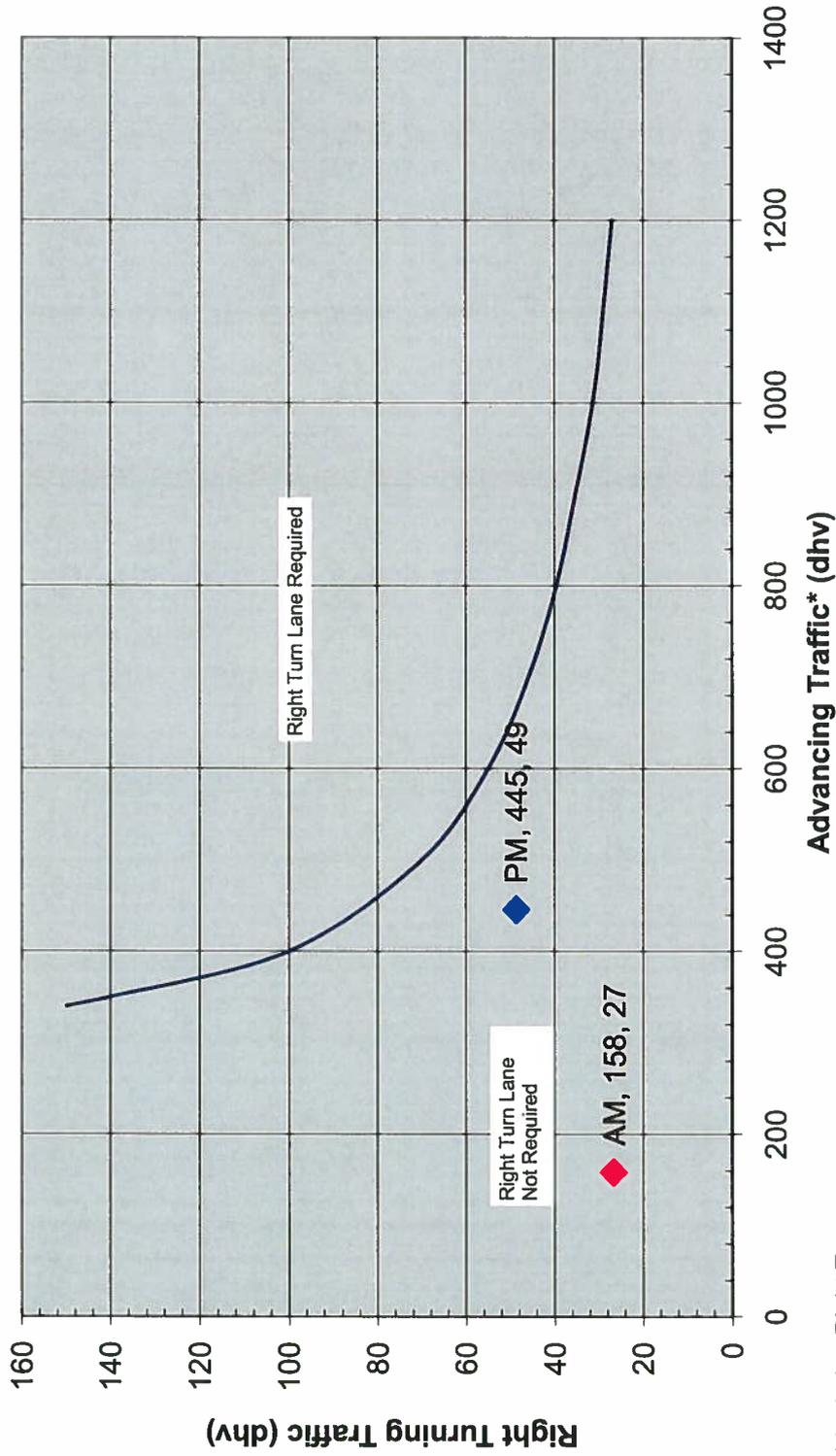


Calc by: JAW
 Chk by: DLW
 Date: 4/8/2011

Mill Road & Cobblestone Way

2 Lane Highway Right Turn Lane Warrant

(=< 40 mph or 70 kph Posted Speed)



* Includes Right Turns

Design Year	Eastbound		Westbound	
	AM	PM	AM	PM
Advancing Traffic	294	197	158	445
Right Turning Traffic	16	14	27	49
Warranted	NO	NO	NO	NO

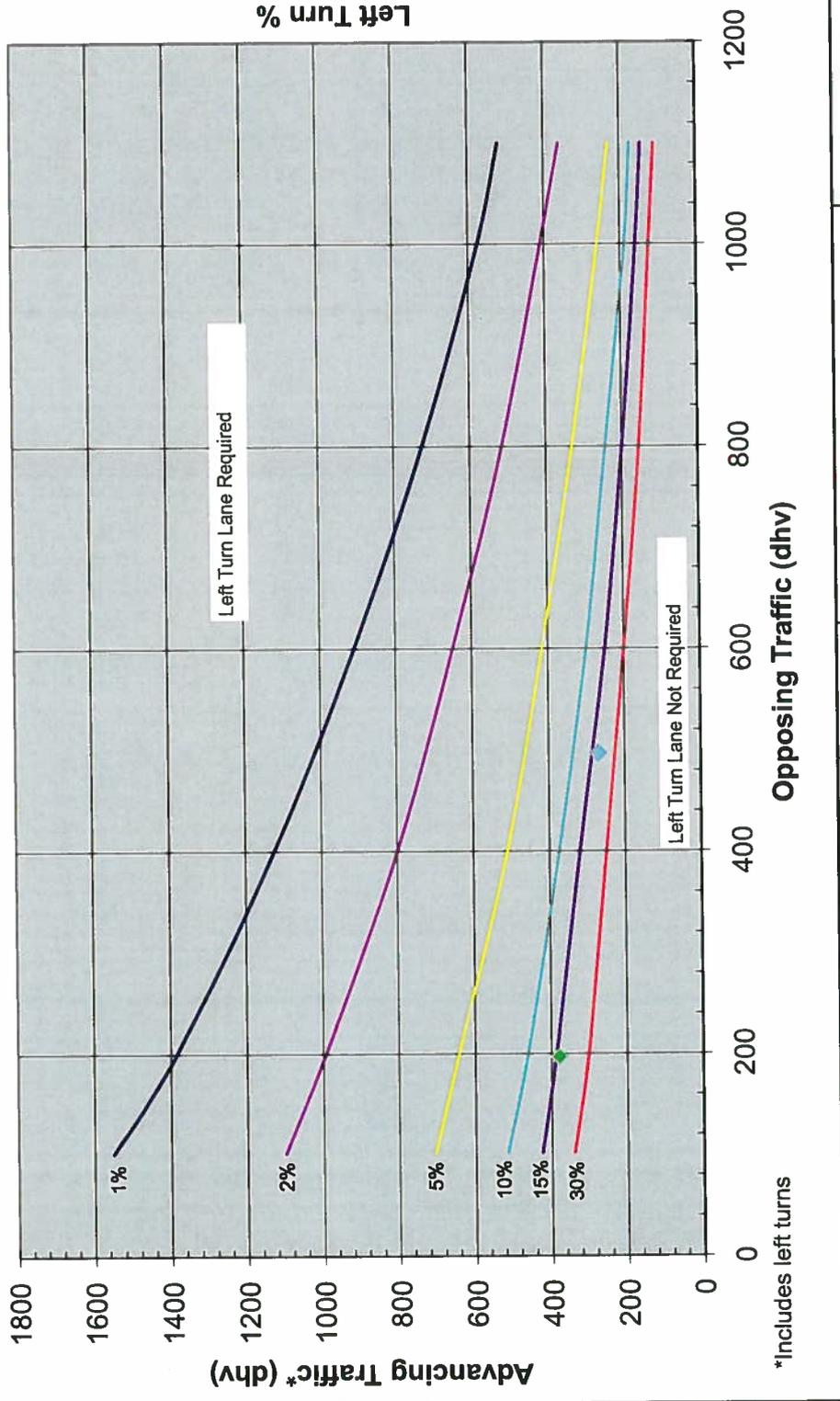


Calc by: JAW
 Chk by: DLW
 Date: 4/8/2011

Mill Road & McDonald's Drive

2-Lane Highway Left Turn Lane Warrant

(=< 40 mph or 70 kph Posted Speed)



*Includes left turns

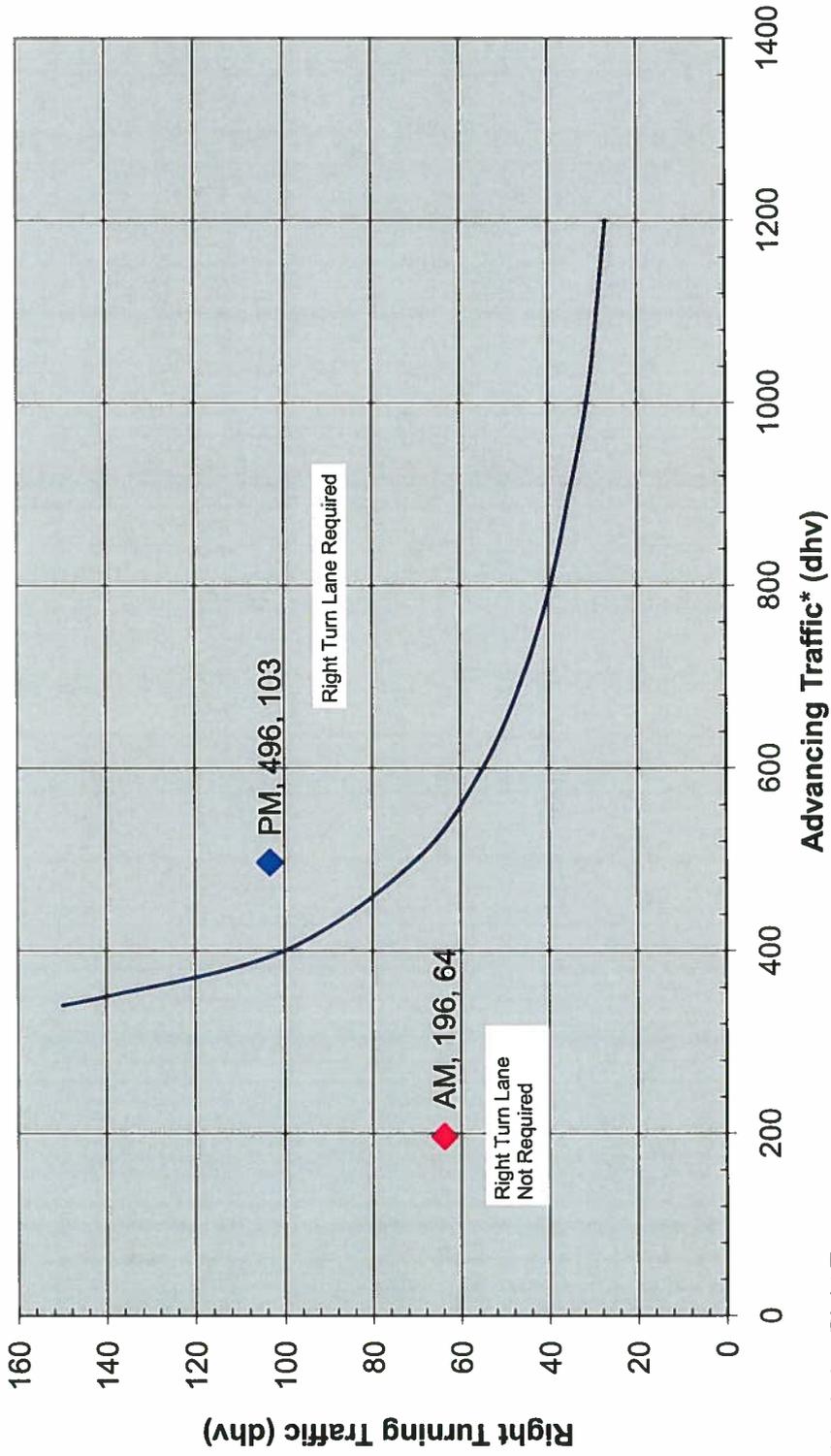
	Eastbound	
	AM	PM
Des. Yr. 2021	379	271
Advancing	196	496
Opposing	11%	14%
% Left	NO	NO
Warranted		



Calc by: JAW
 Chk by: DLW
 Date: 4/8/2011

Mill Road & McDonald's Drive Build

2 Lane Highway Right Turn Lane Warrant (= < 40 mph or 70 kph Posted Speed)



* Includes Right Turns

Design Year	Build	Westbound	
		AM	PM
Advancing	Design Year	196	496
Right Turning Traffic	Right Turning Traffic	64	103
Warranted	Warranted	NO	YES

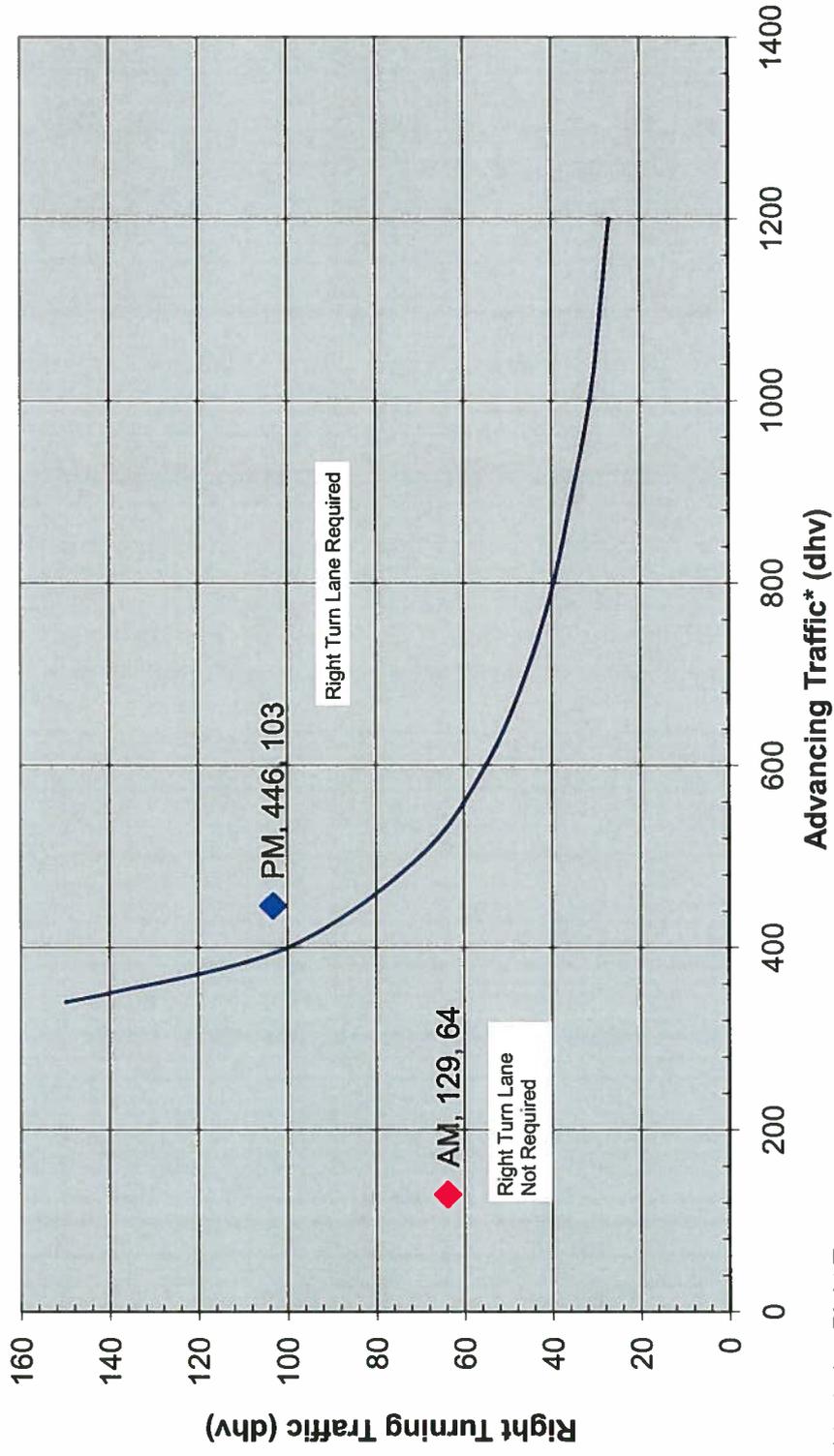


Calc by: JAW
 Chk by: DLW
 Date: 4/8/2011

Mill Road & McDonald's Drive No Build

2 Lane Highway Right Turn Lane Warrant

(=< 40 mph or 70 kph Posted Speed)



* Includes Right Turns

Design Year	No Build		Westbound	
	Design Year	AM	PM	PM
Advancing	Advancing	129	446	446
Right Turning Traffic	Right Turning Traffic	64	103	103
Warranted	Warranted	NO	YES	YES



Appendix G:

**Capacity Analysis
Worksheets**

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	J. Watt			Intersection	Mill Road & Cobblestone Way			
Agency/Co.	M-E Companies, Inc.			Jurisdiction	City of Marysville			
Date Performed	3/24/2011			Analysis Year	2011 No Build			
Analysis Time Period	AM Peak							
Project Description <i>Twigg Property TIS</i>								
East/West Street: <i>Mill Road</i>				North/South Street: <i>Cobblestone Way</i>				
Intersection Orientation: <i>East-West</i>				Study Period (hrs): <i>0.25</i>				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	4	248			45	23		
Peak-Hour Factor, PHF	0.90	0.90	1.00	1.00	0.90	0.90		
Hourly Flow Rate, HFR (veh/h)	4	275	0	0	50	25		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LT					TR		
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				42		2		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.90	1.00	0.90		
Hourly Flow Rate, HFR (veh/h)	0	0	0	46	0	2		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)		0			0			
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration					LR			
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
v (veh/h)	4						48	
C (m) (veh/h)	1537						664	
v/c	0.00						0.07	
95% queue length	0.01						0.23	
Control Delay (s/veh)	7.3						10.8	
LOS	A						B	
Approach Delay (s/veh)	--	--					10.8	
Approach LOS	--	--					B	

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	J. Watt			Intersection	Mill Road & Cobblestone Way			
Agency/Co.	M-E Companies, Inc.			Jurisdiction	City of Marysville			
Date Performed	3/24/2011			Analysis Year	2011 No Build			
Analysis Time Period	PM Peak							
Project Description <i>Twigg Property TIS</i>								
East/West Street: <i>Mill Road</i>				North/South Street: <i>Cobblestone Way</i>				
Intersection Orientation: <i>East-West</i>				Study Period (hrs): <i>0.25</i>				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	1	167			280	42		
Peak-Hour Factor, PHF	0.90	0.90	1.00	1.00	0.90	0.90		
Hourly Flow Rate, HFR (veh/h)	1	185	0	0	311	46		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0				0	
Lanes	0	1	0	0	1	0		
Configuration	LT						TR	
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				37		6		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.90	1.00	0.90		
Hourly Flow Rate, HFR (veh/h)	0	0	0	41	0	6		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration				LR				
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT					LR		
v (veh/h)	1						47	
C (m) (veh/h)	1213						538	
v/c	0.00						0.09	
95% queue length	0.00						0.29	
Control Delay (s/veh)	8.0						12.3	
LOS	A					B		
Approach Delay (s/veh)	--	--				12.3		
Approach LOS	--	--				B		

TWO-WAY STOP CONTROL SUMMARY							
General Information				Site Information			
Analyst	J. Watt			Intersection	Mill Road & Cobblestone Way		
Agency/Co.	M-E Companies, Inc.			Jurisdiction	City of Marysville		
Date Performed	3/24/2011			Analysis Year	2021 No Build		
Analysis Time Period	AM Peak						
Project Description Twigg Property TIS				North/South Street: Cobblestone Way			
East/West Street: Mill Road				Study Period (hrs): 0.25			
Intersection Orientation: East-West							
Vehicle Volumes and Adjustments							
Major Street	Eastbound			Westbound			
Movement	1	2	3	4	5	6	
	L	T	R	L	T	R	
Volume (veh/h)	5	288			52	27	
Peak-Hour Factor, PHF	0.90	0.90	1.00	1.00	0.90	0.90	
Hourly Flow Rate, HFR (veh/h)	5	320	0	0	57	30	
Percent Heavy Vehicles	0	--	--	0	--	--	
Median Type	Undivided						
RT Channelized			0				0
Lanes	0	1	0	0	1		0
Configuration	LT						TR
Upstream Signal		0			0		
Minor Street	Northbound			Southbound			
Movement	7	8	9	10	11	12	
	L	T	R	L	T	R	
Volume (veh/h)				49		2	
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.90	1.00	0.90	
Hourly Flow Rate, HFR (veh/h)	0	0	0	54	0	2	
Percent Heavy Vehicles	0	0	0	0	0	0	
Percent Grade (%)		0			0		
Flared Approach		N			N		
Storage		0			0		
RT Channelized			0				0
Lanes	0	0	0	0	0		0
Configuration					LR		
Delay, Queue Length, and Level of Service							
Approach	Eastbound	Westbound	Northbound			Southbound	
Movement	1	4	7	8	9	10	11
Lane Configuration	LT						LR
v (veh/h)	5						56
C (m) (veh/h)	1522						615
v/c	0.00						0.09
95% queue length	0.01						0.30
Control Delay (s/veh)	7.4						11.4
LOS	A						B
Approach Delay (s/veh)	--	--					11.4
Approach LOS	--	--					B

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	J. Watt			Intersection	Mill Road & Cobblestone Way			
Agency/Co.	M-E Companies, Inc.			Jurisdiction	City of Marysville			
Date Performed	3/24/2011			Analysis Year	2021 No Build			
Analysis Time Period	PM Peak							
Project Description <i>Twigg Property TIS</i>								
East/West Street: <i>Mill Road</i>				North/South Street: <i>Cobblestone Way</i>				
Intersection Orientation: <i>East-West</i>				Study Period (hrs): <i>0.25</i>				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	1	194			325	49		
Peak-Hour Factor, PHF	0.90	0.90	1.00	1.00	0.90	0.90		
Hourly Flow Rate, HFR (veh/h)	1	215	0	0	361	54		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LT					TR		
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				43		7		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.90	1.00	0.90		
Hourly Flow Rate, HFR (veh/h)	0	0	0	47	0	7		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration					LR			
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
v (veh/h)	1						54	
C (m) (veh/h)	1155						483	
v/c	0.00						0.11	
95% queue length	0.00						0.38	
Control Delay (s/veh)	8.1						13.4	
LOS	A						B	
Approach Delay (s/veh)	--	--					13.4	
Approach LOS	--	--					B	

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	J. Watt			Intersection	Mill Road & Cobblestone Way			
Agency/Co.	M-E Companies, Inc.			Jurisdiction	City of Marysville			
Date Performed	3/24/2011			Analysis Year	2021 Build			
Analysis Time Period	AM Peak							
Project Description <i>Twigg Property TIS</i>								
East/West Street: <i>Mill Road</i>				North/South Street: <i>Cobblestone Way</i>				
Intersection Orientation: <i>East-West</i>				Study Period (hrs): <i>0.25</i>				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	5	273	16	88	43	27		
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90		
Hourly Flow Rate, HFR (veh/h)	5	303	17	97	47	30		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	1	1	0		
Configuration	LTR			L		TR		
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)	5	5	90	44	5	2		
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90		
Hourly Flow Rate, HFR (veh/h)	5	5	100	48	5	2		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	1	1	0	0	1	0		
Configuration	L		TR		LTR			
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LTR	L	L		TR		LTR	
v (veh/h)	5	97	5		105		55	
C (m) (veh/h)	1535	1251	396		703		332	
v/c	0.00	0.08	0.01		0.15		0.17	
95% queue length	0.01	0.25	0.04		0.52		0.59	
Control Delay (s/veh)	7.4	8.1	14.2		11.0		18.0	
LOS	A	A	B		B		C	
Approach Delay (s/veh)	--	--	11.2			18.0		
Approach LOS	--	--	B			C		

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	J. Watt			Intersection	Mill Road & Cobblestone Way			
Agency/Co.	M-E Companies, Inc.			Jurisdiction	City of Marysville			
Date Performed	3/24/2011			Analysis Year	2021 Build			
Analysis Time Period	PM Peak							
Project Description Twigg Property TIS								
East/West Street: Mill Road				North/South Street: Cobblestone Way				
Intersection Orientation: East-West				Study Period (hrs): 0.25				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	1	182	14	118	278	49		
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90		
Hourly Flow Rate, HFR (veh/h)	1	202	15	131	308	54		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	1	1	0		
Configuration	LTR			L		TR		
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)	61	14	61	37	7	7		
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90		
Hourly Flow Rate, HFR (veh/h)	67	15	67	41	7	7		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)	0			0				
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	1	1	0	0	1	0		
Configuration	L		TR		LTR			
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LTR	L	L		TR		LTR	
v (veh/h)	1	131	67		82		55	
C (m) (veh/h)	1208	1365	268		608		259	
v/c	0.00	0.10	0.25		0.13		0.21	
95% queue length	0.00	0.32	0.96		0.46		0.78	
Control Delay (s/veh)	8.0	7.9	22.9		11.8		22.6	
LOS	A	A	C		B		C	
Approach Delay (s/veh)	--	--	16.8			22.6		
Approach LOS	--	--	C			C		

TWO-WAY STOP CONTROL SUMMARY								
General Information					Site Information			
Analyst	J. Watt				Intersection	Mill Road & McDonald's Dr.		
Agency/Co.	M-E Companies, Inc.				Jurisdiction	City of Marysville		
Date Performed	3/24/2011				Analysis Year	2011 No Build		
Analysis Time Period	AM Peak							
Project Description <i>Twigg Property TIS</i>								
East/West Street: <i>Mill Road</i>					North/South Street: <i>McDonald's Drive</i>			
Intersection Orientation: <i>East-West</i>					Study Period (hrs): <i>0.25</i>			
Vehicle Volumes and Adjustments								
Major Street		Eastbound			Westbound			
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	26	240			55	56		
Peak-Hour Factor, PHF	0.90	0.90	1.00	1.00	0.90	0.90		
Hourly Flow Rate, HFR (veh/h)	28	266	0	0	61	62		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0				0	
Lanes	0	1	0	0	1	0		
Configuration	LT					TR		
Upstream Signal		0			0			
Minor Street		Northbound			Southbound			
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				117		19		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.90	1.00	0.90		
Hourly Flow Rate, HFR (veh/h)	0	0	0	130	0	21		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)		0			0			
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration					LR			
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
v (veh/h)	28						151	
C (m) (veh/h)	1477						622	
v/c	0.02						0.24	
95% queue length	0.06						0.95	
Control Delay (s/veh)	7.5						12.6	
LOS	A						B	
Approach Delay (s/veh)	--	--					12.6	
Approach LOS	--	--					B	

TWO-WAY STOP CONTROL SUMMARY								
General Information					Site Information			
Analyst	J. Watt				Intersection	Mill Road & McDonald's Dr.		
Agency/Co.	M-E Companies, Inc.				Jurisdiction	City of Marysville		
Date Performed	3/24/2011				Analysis Year	2011 No Build		
Analysis Time Period	PM Peak							
Project Description <i>Twigg Property TIS</i>								
East/West Street: <i>Mill Road</i>					North/South Street: <i>McDonald's Drive</i>			
Intersection Orientation: <i>East-West</i>					Study Period (hrs): <i>0.25</i>			
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	20	175			89	295		
Peak-Hour Factor, PHF	0.90	0.90	1.00	1.00	0.90	0.90		
Hourly Flow Rate, HFR (veh/h)	22	194	0	0	98	327		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0				0	
Lanes	0	1	0	0	1	0		
Configuration	LT						TR	
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				116		22		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.90	1.00	0.90		
Hourly Flow Rate, HFR (veh/h)	0	0	0	128	0	24		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)		0			0			
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration					LR			
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT					LR		
v (veh/h)	22						152	
C (m) (veh/h)	1145						553	
v/c	0.02						0.27	
95% queue length	0.06						1.11	
Control Delay (s/veh)	8.2						14.0	
LOS	A					B		
Approach Delay (s/veh)	--	--				14.0		
Approach LOS	--	--				B		

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	J. Watt			Intersection	Mill Road & McDonald's Dr.			
Agency/Co.	M-E Companies, Inc.			Jurisdiction	City of Marysville			
Date Performed	3/24/2011			Analysis Year	2021 No Build			
Analysis Time Period	AM Peak							
Project Description <i>Twigg Property TIS</i>								
East/West Street: <i>Mill Road</i>				North/South Street: <i>McDonald's Drive</i>				
Intersection Orientation: <i>East-West</i>				Study Period (hrs): <i>0.25</i>				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	30	279			64	65		
Peak-Hour Factor, PHF	0.90	0.90	1.00	1.00	0.90	0.90		
Hourly Flow Rate, HFR (veh/h)	33	310	0	0	71	72		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0				0	
Lanes	0	1	0	0	1	0		
Configuration	LT					TR		
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				136		22		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.90	1.00	0.90		
Hourly Flow Rate, HFR (veh/h)	0	0	0	151	0	24		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)		0			0			
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration					LR			
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT						LR	
v (veh/h)	33						175	
C (m) (veh/h)	1452						568	
v/c	0.02						0.31	
95% queue length	0.07						1.30	
Control Delay (s/veh)	7.5						14.1	
LOS	A						B	
Approach Delay (s/veh)	--	--					14.1	
Approach LOS	--	--					B	

TWO-WAY STOP CONTROL SUMMARY								
General Information				Site Information				
Analyst	J. Watt			Intersection	Mill Road & McDonald's Dr.			
Agency/Co.	M-E Companies, Inc.			Jurisdiction	City of Marysville			
Date Performed	3/24/2011			Analysis Year	2021 No Build			
Analysis Time Period	PM Peak							
Project Description <i>Twigg Property TIS</i>								
East/West Street: <i>Mill Road</i>				North/South Street: <i>McDonald's Drive</i>				
Intersection Orientation: <i>East-West</i>				Study Period (hrs): <i>0.25</i>				
Vehicle Volumes and Adjustments								
Major Street	Eastbound			Westbound				
Movement	1	2	3	4	5	6		
	L	T	R	L	T	R		
Volume (veh/h)	23	203			103	342		
Peak-Hour Factor, PHF	0.90	0.90	1.00	1.00	0.90	0.90		
Hourly Flow Rate, HFR (veh/h)	25	225	0	0	114	380		
Percent Heavy Vehicles	0	--	--	0	--	--		
Median Type	Undivided							
RT Channelized			0			0		
Lanes	0	1	0	0	1	0		
Configuration	LT						TR	
Upstream Signal		0			0			
Minor Street	Northbound			Southbound				
Movement	7	8	9	10	11	12		
	L	T	R	L	T	R		
Volume (veh/h)				135		26		
Peak-Hour Factor, PHF	1.00	1.00	1.00	0.90	1.00	0.90		
Hourly Flow Rate, HFR (veh/h)	0	0	0	150	0	28		
Percent Heavy Vehicles	0	0	0	0	0	0		
Percent Grade (%)		0			0			
Flared Approach		N			N			
Storage		0			0			
RT Channelized			0			0		
Lanes	0	0	0	0	0	0		
Configuration				LR				
Delay, Queue Length, and Level of Service								
Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	LT					LR		
v (veh/h)	25						178	
C (m) (veh/h)	1080						499	
v/c	0.02						0.36	
95% queue length	0.07						1.60	
Control Delay (s/veh)	8.4						16.2	
LOS	A					C		
Approach Delay (s/veh)	--	--				16.2		
Approach LOS	--					C		

SHORT REPORT												
General Information						Site Information						
Analyst	J. Watt					Intersection	S.R. 31 & Mill Rd./Echo Dr.					
Agency or Co.	M-E Companies, Inc.					Area Type	All other areas					
Date Performed	3/24/2011					Jurisdiction	City of Marysville					
Time Period	AM Peak					Analysis Year	2011 No Build					
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1	1	0	0	1	0	1	2	0	1	1	0
Lane Group	L	TR			LTR		L	TR		L	TR	
Volume (vph)	25	9	326	47	5	10	129	398	44	23	653	6
% Heavy Vehicles	2	2	2	2	2	2	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed/Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup Lost Time	2.0	2.0			2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green	2.0	2.0			2.0		2.0	2.0		2.0	2.0	
Arrival Type	3	3			3		3	3		3	3	
Unit Extension	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0			12.0		12.0	12.0		12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0	0			0		0	0		0	0	
Minimum Pedestrian Time		3.2			3.2			3.2			3.2	
Phasing	EB Only	EW Perm	03	04	Excl. Left	NS Perm	07	08				
Timing	G = 8.0	G = 14.7	G =	G =	G = 8.0	G = 39.3	G =	G =				
	Y = 4	Y = 6	Y =	Y =	Y = 4	Y = 6	Y =	Y =				
Duration of Analysis (hrs) = 0.25						Cycle Length C = 90.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate	28	372			69		143	491		26	733	
Lane Group Capacity	469	472			161		241	1526		518	812	
v/c Ratio	0.06	0.79			0.43		0.59	0.32		0.05	0.90	
Green Ratio	0.32	0.30			0.16		0.59	0.44		0.59	0.44	
Uniform Delay d ₁	21.4	29.1			33.9		16.5	16.6		8.0	23.6	
Delay Factor k	0.11	0.33			0.11		0.18	0.11		0.11	0.42	
Incremental Delay d ₂	0.1	8.7			1.8		3.9	0.1		0.0	13.4	
PF Factor	1.000	1.000			1.000		1.000	1.000		1.000	1.000	
Control Delay	21.5	37.8			35.7		20.4	16.7		8.0	36.9	
Lane Group LOS	C	D			D		C	B		A	D	
Approach Delay	36.6			35.7			17.6			35.9		
Approach LOS	D			D			B			D		
Intersection Delay	29.8			Intersection LOS						C		

SHORT REPORT												
General Information						Site Information						
Analyst J. Watt Agency or Co. M-E Companies, Inc. Date Performed 3/24/2011 Time Period AM Peak						Intersection S.R. 31 & Mill Rd./Echo Dr. Area Type All other areas Jurisdiction City of Marysville Analysis Year 2011 Build						
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1	1	0	0	1	0	1	2	0	1	1	0
Lane Group	L	TR			LTR		L	TR		L	TR	
Volume (vph)	32	13	374	42	10	10	158	388	44	23	625	40
% Heavy Vehicles	2	2	2	2	2	2	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed/Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup Lost Time	2.0	2.0			2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green	2.0	2.0			2.0		2.0	2.0		2.0	2.0	
Arrival Type	3	3			3		3	3		3	3	
Unit Extension	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0			12.0		12.0	12.0		12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0	0			0		0	0		0	0	
Minimum Pedestrian Time		3.2			3.2			3.2			3.2	
Phasing	EB Only	EW Perm	03	04	Excl. Left	NS Perm	07	08				
Timing	G = 7.0	G = 17.5	G =	G =	G = 7.0	G = 38.5	G =	G =				
	Y = 4	Y = 6	Y =	Y =	Y = 4	Y = 6	Y =	Y =				
Duration of Analysis (hrs) = 0.25						Cycle Length C = 90.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate	36	430			69		176	480		26	738	
Lane Group Capacity	483	504			173		221	1494		495	790	
v/c Ratio	0.07	0.85			0.40		0.80	0.32		0.05	0.93	
Green Ratio	0.34	0.32			0.19		0.57	0.43		0.57	0.43	
Uniform Delay d ₁	20.3	28.8			31.7		19.2	17.1		8.8	24.5	
Delay Factor k	0.11	0.39			0.11		0.34	0.11		0.11	0.45	
Incremental Delay d ₂	0.1	13.3			1.5		18.1	0.1		0.0	18.0	
PF Factor	1.000	1.000			1.000		1.000	1.000		1.000	1.000	
Control Delay	20.3	42.1			33.2		37.3	17.2		8.8	42.6	
Lane Group LOS	C	D			C		D	B		A	D	
Approach Delay	40.4			33.2			22.6			41.4		
Approach LOS	D			C			C			D		
Intersection Delay	34.6						Intersection LOS				C	

SHORT REPORT												
General Information						Site Information						
Analyst J. Watt Agency or Co. M-E Companies, Inc. Date Performed 3/24/2011 Time Period PM Peak						Intersection S.R. 31 & Mill Rd./Echo Dr. Area Type All other areas Jurisdiction City of Marysville Analysis Year 2011 Build						
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1	1	0	0	1	0	1	2	0	1	1	0
Lane Group	L	TR			LTR		L	TR		L	TR	
Volume (vph)	53	12	185	77	24	23	488	851	85	7	435	41
% Heavy Vehicles	2	2	2	2	2	2	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed/Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup Lost Time	2.0	2.0			2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green	2.0	2.0			2.0		2.0	2.0		2.0	2.0	
Arrival Type	3	3			3		3	3		3	3	
Unit Extension	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0			12.0		12.0	12.0		12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0	0			0		0	0		0	0	
Minimum Pedestrian Time		3.2			3.2			3.2			3.2	
Phasing	EB Only	EW Perm	03		04		NB Only	NS Perm	07		08	
Timing	G = 7.0	G = 24.0	G =	G =	G = 28.0	G = 41.0	G =	G =				
	Y = 4	Y = 6	Y =	Y =	Y = 4	Y = 6	Y =	Y =				
Duration of Analysis (hrs) = 0.25							Cycle Length C = 120.0					
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate	59	219			139		542	1040		8	529	
Lane Group Capacity	405	467			250		516	2129		176	628	
v/c Ratio	0.15	0.47			0.56		1.05	0.49		0.05	0.84	
Green Ratio	0.31	0.29			0.20		0.63	0.61		0.34	0.34	
Uniform Delay d ₁	30.4	34.9			43.2		32.9	13.1		26.4	36.5	
Delay Factor k	0.11	0.11			0.15		0.50	0.11		0.11	0.38	
Incremental Delay d ₂	0.2	0.7			2.7		53.5	0.2		0.1	10.1	
PF Factor	1.000	1.000			1.000		1.000	1.000		1.000	1.000	
Control Delay	30.5	35.6			45.9		86.4	13.3		26.5	46.6	
Lane Group LOS	C	D			D		F	B		C	D	
Approach Delay	34.5			45.9			38.3			46.3		
Approach LOS	C			D			D			D		
Intersection Delay	40.0			Intersection LOS						D		

HCS+™ DETAILED REPORT												
General Information						Site Information						
Analyst DLW						Intersection S.R. 31 & Mill Rd./Echo Dr.						
Agency or Co. M-E Companies, Inc.						Area Type All other areas						
Date Performed 3/24/2011						Jurisdiction City of Marysville						
Time Period AM Peak						Analysis Year 2011 Build w/LTR						
						Project ID Twigg Property TIS						
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N _l	1	1	1	0	1	0	1	2	0	1	1	0
Lane Group	L	T	R		LTR		L	TR		L	TR	
Volume, V (vph)	32	13	374	42	10	10	158	388	44	23	625	40
% Heavy Vehicles, %HV	2	2	2	2	2	2	2	2	2	2	2	2
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, I _l	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3	3		3		3	3		3	3	
Unit Extension, UE	3.0	3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000	1.000		1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q _b	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0	12.0		12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N _m												
Buses Stopping, N _b	0	0	0		0		0	0		0	0	
Min. Time for Pedestrians, G _p	3.2			3.2			3.2			3.2		
Phasing	EB Only	EW Perm	03	04	Excl. Left	NS Perm	07	08				
Timing	G = 7.0	G = 15.5	G =	G =	G = 7.0	G = 40.5	G =	G =				
	Y = 4	Y = 6	Y =	Y =	Y = 4	Y = 6	Y =	Y =				
Duration of Analysis, T = 0.25						Cycle Length, C = 90.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	36	14	416		69		176	480		26	738	
Lane Group Capacity, c	454	549	695		247		235	1571		518	831	
v/c Ratio, X	0.08	0.03	0.60		0.28		0.75	0.31		0.05	0.89	
Total Green Ratio, g/C	0.32	0.29	0.44		0.17		0.59	0.45		0.59	0.45	
Uniform Delay, d ₁	21.7	22.6	19.2		32.4		16.9	15.8		7.9	22.7	
Progression Factor, PF	1.000	1.000	1.000		1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.11	0.19		0.11		0.30	0.11		0.11	0.41	
Incremental Delay, d ₂	0.1	0.0	1.4		0.6		12.5	0.1		0.0	11.5	
Initial Queue Delay, d ₃	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Control Delay	21.7	22.6	20.6		33.0		29.4	15.9		7.9	34.2	
Lane Group LOS	C	C	C		C		C	B		A	C	
Approach Delay	20.8			33.0			19.5			33.3		
Approach LOS	C			C			B			C		
Intersection Delay	25.7			X _c = 0.75			Intersection LOS			C		

HCS+™ DETAILED REPORT												
General Information						Site Information						
Analyst DLW						Intersection S.R. 31 & Mill Rd./Echo Dr.						
Agency or Co. M-E Companies, Inc.						Area Type All other areas						
Date Performed 3/24/2011						Jurisdiction City of Marysville						
Time Period PM Peak						Analysis Year 2011 Build w/LTR						
						Project ID Twigg Property TIS						
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N ₁	1	1	1	0	1	0	1	2	0	1	1	0
Lane Group	L	T	R		LTR		L	TR		L	TR	
Volume, V (vph)	53	12	185	77	24	23	488	851	85	7	435	41
% Heavy Vehicles, %HV	2	2	2	2	2	2	2	2	2	2	2	2
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l ₁	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3	3		3		3	3		3	3	
Unit Extension, UE	3.0	3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000	1.000		1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q _b	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0	12.0		12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N _m												
Buses Stopping, N _b	0	0	0		0		0	0		0	0	
Min. Time for Pedestrians, G _p	3.2			3.2			3.2			3.2		
Phasing	EW Perm	02	03	04	NB Only	NS Perm	07	08				
Timing	G = 19.0	G =	G =	G =	G = 20.0	G = 33.0	G =	G =				
	Y = 6	Y =	Y =	Y =	Y = 6	Y = 6	Y =	Y =				
Duration of Analysis, T = 0.25						Cycle Length, C = 90.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	59	13	206		139		542	1040		8	529	
Lane Group Capacity, c	268	393	792		308		541	2294		188	674	
v/c Ratio, X	0.22	0.03	0.26		0.45		1.00	0.45		0.04	0.78	
Total Green Ratio, g/C	0.21	0.21	0.50		0.21		0.66	0.66		0.37	0.37	
Uniform Delay, d ₁	29.4	28.2	12.9		31.0		21.7	7.6		18.3	25.3	
Progression Factor, PF	1.000	1.000	1.000		1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.11	0.11		0.11		0.50	0.11		0.11	0.33	
Incremental Delay, d ₂	0.4	0.0	0.2		1.1		39.1	0.1		0.1	6.1	
Initial Queue Delay, d ₃	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Control Delay	29.8	28.2	13.1		32.0		60.9	7.7		18.4	31.4	
Lane Group LOS	C	C	B		C		E	A		B	C	
Approach Delay	17.4			32.0			25.9			31.2		
Approach LOS	B			C			C			C		
Intersection Delay	26.5			X _c = 0.87			Intersection LOS			C		

SHORT REPORT													
General Information						Site Information							
Analyst <i>J. Watt</i> Agency or Co. <i>M-E Companies, Inc.</i> Date Performed <i>3/24/2011</i> Time Period <i>AM Peak</i>						Intersection <i>S.R. 31 & Mill Rd./Echo Dr.</i> Area Type <i>All other areas</i> Jurisdiction <i>City of Marysville</i> Analysis Year <i>2021 No Build</i>							
Volume and Timing Input													
	EB			WB			NB			SB			
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
Number of Lanes	1	1	0	0	1	0	1	2	0	1	1	0	
Lane Group	L	TR			LTR		L	TR		L	TR		
Volume (vph)	29	10	378	55	6	12	150	462	51	27	758	7	
% Heavy Vehicles	2	2	2	2	2	2	2	2	2	2	2	2	
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Pretimed/Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A	
Startup Lost Time	2.0	2.0			2.0		2.0	2.0		2.0	2.0		
Extension of Effective Green	2.0	2.0			2.0		2.0	2.0		2.0	2.0		
Arrival Type	3	3			3		3	3		3	3		
Unit Extension	3.0	3.0			3.0		3.0	3.0		3.0	3.0		
Ped/Bike/RTOR Volume	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Width	12.0	12.0			12.0		12.0	12.0		12.0	12.0		
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N	
Parking/Hour													
Bus Stops/Hour	0	0			0		0	0		0	0		
Minimum Pedestrian Time		3.2			3.2			3.2			3.2		
Phasing	EB Only	EW Perm	03			04		Excl. Left	NS Perm		07		08
Timing	G = 10.0	G = 24.6	G =	G =	G = 8.0	G = 57.4	G =	G =					
	Y = 4	Y = 6	Y =	Y =	Y = 4	Y = 6	Y =	Y =					
Duration of Analysis (hrs) = 0.25						Cycle Length C = 120.0							
Lane Group Capacity, Control Delay, and LOS Determination													
	EB			WB			NB			SB			
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
Adjusted Flow Rate	32	431			81		167	570		30	850		
Lane Group Capacity	488	511			160		180	1671		465	890		
v/c Ratio	0.07	0.84			0.51		0.93	0.34		0.06	0.96		
Green Ratio	0.34	0.32			0.20		0.60	0.48		0.60	0.48		
Uniform Delay d ₁	27.0	37.9			42.3		34.7	19.5		10.7	30.1		
Delay Factor k	0.11	0.38			0.11		0.44	0.11		0.11	0.46		
Incremental Delay d ₂	0.1	12.2			2.6		46.7	0.1		0.1	20.1		
PF Factor	1.000	1.000			1.000		1.000	1.000		1.000	1.000		
Control Delay	27.1	50.1			44.9		81.5	19.6		10.7	50.1		
Lane Group LOS	C	D			D		F	B		B	D		
Approach Delay	48.5			44.9			33.6			48.8			
Approach LOS	D			D			C			D			
Intersection Delay	43.4			Intersection LOS							D		

SHORT REPORT												
General Information						Site Information						
Analyst	J. Watt					Intersection	S.R. 31 & Mill Rd./Echo Dr.					
Agency or Co.	M-E Companies, Inc.					Area Type	All other areas					
Date Performed	3/24/2011					Jurisdiction	City of Marysville					
Time Period	PM Peak					Analysis Year	2021 No Build					
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1	1	0	0	1	0	1	2	0	1	1	0
Lane Group	L	TR			LTR		L	TR		L	TR	
Volume (vph)	41	8	204	96	21	27	500	1005	99	8	522	15
% Heavy Vehicles	2	2	2	2	2	2	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed/Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup Lost Time	2.0	2.0			2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green	2.0	2.0			2.0		2.0	2.0		2.0	2.0	
Arrival Type	3	3			3		3	3		3	3	
Unit Extension	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0			12.0		12.0	12.0		12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0	0			0		0	0		0	0	
Minimum Pedestrian Time		3.2			3.2			3.2			3.2	
Phasing	EB Only	EW Perm	03	04	NB Only	NS Perm	07	08				
Timing	G = 8.0	G = 22.6	G =	G =	G = 27.0	G = 42.4	G =	G =				
	Y = 4	Y = 6	Y =	Y =	Y = 4	Y = 6	Y =	Y =				
Duration of Analysis (hrs) = 0.25						Cycle Length C = 120.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate	46	236			160		556	1227		9	597	
Lane Group Capacity	412	460			226		465	2140		151	655	
v/c Ratio	0.11	0.51			0.71		1.20	0.57		0.06	0.91	
Green Ratio	0.30	0.29			0.19		0.63	0.61		0.35	0.35	
Uniform Delay d ₁	30.6	35.7			45.6		37.4	13.9		25.6	37.0	
Delay Factor k	0.11	0.12			0.27		0.50	0.17		0.11	0.43	
Incremental Delay d ₂	0.1	1.0			9.8		107.4	0.4		0.2	17.1	
PF Factor	1.000	1.000			1.000		1.000	1.000		1.000	1.000	
Control Delay	30.7	36.7			55.4		144.8	14.3		25.8	54.1	
Lane Group LOS	C	D			E		F	B		C	D	
Approach Delay	35.7			55.4			55.0			53.7		
Approach LOS	D			E			E			D		
Intersection Delay	52.8			Intersection LOS						D		

SHORT REPORT													
General Information						Site Information							
Analyst	J. Watt					Intersection	S.R. 31 & Mill Rd./Echo Dr.						
Agency or Co.	M-E Companies, Inc.					Area Type	All other areas						
Date Performed	3/24/2011					Jurisdiction	City of Marysville						
Time Period	AM Peak					Analysis Year	2021 No Build (ELT, EBR)						
Volume and Timing Input													
	EB			WB			NB			SB			
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
Number of Lanes	0	1	1	0	1	0	1	2	0	1	1	0	
Lane Group		LT	R		LTR		L	TR		L	TR		
Volume (vph)	29	10	378	55	6	12	150	462	51	27	758	7	
% Heavy Vehicles	2	2	2	2	2	2	2	2	2	2	2	2	
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Pretimed/Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A	
Startup Lost Time		2.0	2.0		2.0		2.0	2.0		2.0	2.0		
Extension of Effective Green		2.0	2.0		2.0		2.0	2.0		2.0	2.0		
Arrival Type		3	3		3		3	3		3	3		
Unit Extension		3.0	3.0		3.0		3.0	3.0		3.0	3.0		
Ped/Bike/RTOR Volume	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Width		12.0	12.0		12.0		12.0	12.0		12.0	12.0		
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N	
Parking/Hour													
Bus Stops/Hour		0	0		0		0	0		0	0		
Minimum Pedestrian Time		3.2			3.2			3.2			3.2		
Phasing	EB Only	EW Perm	03	04	Excl. Left	NS Perm	07	08					
Timing	G = 7.0	G = 12.0	G =	G =	G = 7.0	G = 44.0	G =	G =					
	Y = 4	Y = 6	Y =	Y =	Y = 4	Y = 6	Y =	Y =					
Duration of Analysis (hrs) = 0.25						Cycle Length C = 90.0							
Lane Group Capacity, Control Delay, and LOS Determination													
	EB			WB			NB			SB			
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
Adjusted Flow Rate		43	420		81		167	570		30	850		
Lane Group Capacity		383	633		183		221	1708		509	909		
v/c Ratio		0.11	0.66		0.44		0.76	0.33		0.06	0.94		
Green Ratio		0.26	0.40		0.13		0.63	0.49		0.63	0.49		
Uniform Delay d ₁		25.7	22.1		35.9		20.6	14.0		6.6	21.7		
Delay Factor k		0.11	0.24		0.11		0.31	0.11		0.11	0.45		
Incremental Delay d ₂		0.1	2.6		1.7		13.8	0.1		0.0	16.4		
PF Factor		1.000	1.000		1.000		1.000	1.000		1.000	1.000		
Control Delay		25.8	24.7		37.6		34.4	14.2		6.7	38.1		
Lane Group LOS		C	C		D		C	B		A	D		
Approach Delay		24.8			37.6			18.8			37.0		
Approach LOS		C			D			B			D		
Intersection Delay		28.2			Intersection LOS						C		

SHORT REPORT

General Information				Site Information			
Analyst	J. Watt			Intersection	S.R. 31 & Mill Rd./Echo Dr.		
Agency or Co.	M-E Companies, Inc.			Area Type	All other areas		
Date Performed	3/24/2011			Jurisdiction	City of Marysville		
Time Period	PM Peak			Analysis Year	2021 No Build (ELT, EBR)		

Volume and Timing Input													
	EB			WB			NB			SB			
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
Number of Lanes	0	1	1	0	1	0	1	2	0	1	1	0	
Lane Group		LT	R		LTR		L	TR		L	TR		
Volume (vph)	41	8	204	96	21	27	500	1005	99	8	522	15	
% Heavy Vehicles	2	2	2	2	2	2	2	2	2	2	2	2	
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Pretimed/Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A	
Startup Lost Time		2.0	2.0		2.0		2.0	2.0		2.0	2.0		
Extension of Effective Green		2.0	2.0		2.0		2.0	2.0		2.0	2.0		
Arrival Type		3	3		3		3	3		3	3		
Unit Extension		3.0	3.0		3.0		3.0	3.0		3.0	3.0		
Ped/Bike/RTOR Volume	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Width		12.0	12.0		12.0		12.0	12.0		12.0	12.0		
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N	
Parking/Hour													
Bus Stops/Hour		0	0		0		0	0		0	0		
Minimum Pedestrian Time		3.2			3.2			3.2			3.2		
Phasing	EB Only	EW Perm	03			04			NB Only	NS Perm	07		08
Timing	G = 7.0	G = 22.3	G =	G =			G = 26.9			G = 43.8	G =		
	Y = 4	Y = 6	Y =	Y =			Y = 4			Y = 6	Y =		
Duration of Analysis (hrs) = 0.25							Cycle Length C = 120.0						

Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	Adjusted Flow Rate		55	227		160		556	1227		9	597
Lane Group Capacity		374	873		258		479	2178		156	677	
v/c Ratio		0.15	0.26		0.62		1.16	0.56		0.06	0.88	
Green Ratio		0.28	0.55		0.19		0.64	0.62		0.36	0.36	
Uniform Delay d ₁		32.7	14.1		45.0		35.9	13.2		24.7	35.7	
Delay Factor k		0.11	0.11		0.20		0.50	0.16		0.11	0.41	
Incremental Delay d ₂		0.2	0.2		4.5		93.4	0.3		0.2	13.0	
PF Factor		1.000	1.000		1.000		1.000	1.000		1.000	1.000	
Control Delay		32.8	14.2		49.5		129.2	13.5		24.9	48.7	
Lane Group LOS		C	B		D		F	B		C	D	
Approach Delay		17.9			49.5			49.6			48.3	
Approach LOS		B			D			D			D	
Intersection Delay		46.2			Intersection LOS					D		

SHORT REPORT													
General Information						Site Information							
Analyst <i>J. Watt</i> Agency or Co. <i>M-E Companies, Inc.</i> Date Performed <i>3/24/2011</i> Time Period <i>AM Peak</i>						Intersection <i>S.R. 31 & Mill Rd./Echo Dr.</i> Area Type <i>All other areas</i> Jurisdiction <i>City of Marysville</i> Analysis Year <i>2021 Build</i>							
Volume and Timing Input													
	EB			WB			NB			SB			
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
Number of Lanes	1	1	0	0	1	0	1	2	0	1	1	0	
Lane Group	L	TR			LTR		L	TR		L	TR		
Volume (vph)	37	14	431	50	11	12	183	452	51	27	731	45	
% Heavy Vehicles	2	2	2	2	2	2	2	2	2	2	2	2	
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	
Pretimed/Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A	
Startup Lost Time	2.0	2.0			2.0		2.0	2.0		2.0	2.0		
Extension of Effective Green	2.0	2.0			2.0		2.0	2.0		2.0	2.0		
Arrival Type	3	3			3		3	3		3	3		
Unit Extension	3.0	3.0			3.0		3.0	3.0		3.0	3.0		
Ped/Bike/RTOR Volume	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Width	12.0	12.0			12.0		12.0	12.0		12.0	12.0		
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N	
Parking/Hour													
Bus Stops/Hour	0	0			0		0	0		0	0		
Minimum Pedestrian Time		3.2			3.2			3.2			3.2		
Phasing	EB Only	EW Perm	03	04	Excl. Left	NS Perm	07	08					
Timing	G = 8.0	G = 26.9	G =	G =	G = 10.0	G = 55.1	G =	G =					
	Y = 4	Y = 6	Y =	Y =	Y = 4	Y = 6	Y =	Y =					
Duration of Analysis (hrs) = 0.25						Cycle Length C = 120.0							
Lane Group Capacity, Control Delay, and LOS Determination													
	EB			WB			NB			SB			
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
Adjusted Flow Rate	41	495			81		203	559		30	862		
Lane Group Capacity	477	516			150		210	1603		481	848		
v/c Ratio	0.09	0.96			0.54		0.97	0.35		0.06	1.02		
Green Ratio	0.34	0.32			0.22		0.59	0.46		0.59	0.46		
Uniform Delay d ₁	27.0	39.8			41.1		25.4	20.9		10.8	32.5		
Delay Factor k	0.11	0.47			0.14		0.47	0.11		0.11	0.50		
Incremental Delay d ₂	0.1	29.5			3.9		52.4	0.1		0.1	35.1		
PF Factor	1.000	1.000			1.000		1.000	1.000		1.000	1.000		
Control Delay	27.0	69.3			45.0		77.8	21.0		10.9	67.5		
Lane Group LOS	C	E			D		E	C		B	E		
Approach Delay	66.0			45.0			36.2			65.6			
Approach LOS	E			D			D			E			
Intersection Delay	55.1						Intersection LOS						E

SHORT REPORT

General Information				Site Information			
Analyst	J. Watt			Intersection	S.R. 31 & Mill Rd./Echo Dr.		
Agency or Co.	M-E Companies, Inc.			Area Type	All other areas		
Date Performed	3/24/2011			Jurisdiction	City of Marysville		
Time Period	PM Peak			Analysis Year	2021 Build		

Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes	1	1	0	0	1	0	1	2	0	1	1	0
Lane Group	L	TR			LTR		L	TR		L	TR	
Volume (vph)	64	14	216	91	28	27	569	990	99	8	509	50
% Heavy Vehicles	2	2	2	2	2	2	2	2	2	2	2	2
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed/Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup Lost Time	2.0	2.0			2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green	2.0	2.0			2.0		2.0	2.0		2.0	2.0	
Arrival Type	3	3			3		3	3		3	3	
Unit Extension	3.0	3.0			3.0		3.0	3.0		3.0	3.0	
Ped/Bike/RTOR Volume	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0			12.0		12.0	12.0		12.0	12.0	
Parking/Grade/Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking/Hour												
Bus Stops/Hour	0	0			0		0	0		0	0	
Minimum Pedestrian Time		3.2			3.2			3.2			3.2	
Phasing	EB Only	EW Perm	03		04		NB Only	NS Perm	07		08	
Timing	G = 7.0	G = 21.1	G =	G =	G = 29.4	G = 42.5	G =	G =				
	Y = 4	Y = 6	Y =	Y =	Y = 4	Y = 6	Y =	Y =				
Duration of Analysis (hrs) = 0.25							Cycle Length C = 120.0					

Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	Adjusted Flow Rate	71	256			162		632	1210		9	622
Lane Group Capacity	372	428			201		496	2212		154	651	
v/c Ratio	0.19	0.60			0.81		1.27	0.55		0.06	0.96	
Green Ratio	0.28	0.27			0.18		0.65	0.63		0.35	0.35	
Uniform Delay d ₁	32.9	38.3			47.5		37.7	12.4		25.6	37.8	
Delay Factor k	0.11	0.19			0.35		0.50	0.15		0.11	0.47	
Incremental Delay d ₂	0.3	2.3			20.9		138.4	0.3		0.2	24.7	
PF Factor	1.000	1.000			1.000		1.000	1.000		1.000	1.000	
Control Delay	33.2	40.6			68.4		176.1	12.7		25.7	62.5	
Lane Group LOS	C	D			E		F	B		C	E	
Approach Delay	39.0			68.4			68.8			62.0		
Approach LOS	D			E			E			E		
Intersection Delay	64.0			Intersection LOS						E		

HCS+™ DETAILED REPORT												
General Information						Site Information						
Analyst J. Watt						Intersection S.R. 31 & Mill Rd./Echo Dr.						
Agency or Co. M-E Companies, Inc.						Area Type All other areas						
Date Performed 3/24/2011						Jurisdiction City of Marysville						
Time Period AM Peak						Analysis Year 2021 Build w/LTR						
						Project ID Twigg Property TIS						
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N _i	1	1	1	0	1	0	1	2	0	1	1	0
Lane Group	L	T	R		LTR		L	TR		L	TR	
Volume, V (vph)	37	14	431	50	11	12	183	452	51	27	731	45
% Heavy Vehicles, %HV	2	2	2	2	2	2	2	2	2	2	2	2
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l _i	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3	3		3		3	3		3	3	
Unit Extension, UE	3.0	3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000	1.000		1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q _b	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0	12.0		12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N _m												
Buses Stopping, N _b	0	0	0		0		0	0		0	0	
Min. Time for Pedestrians, G _p	3.2			3.2			3.2			3.2		
Phasing	EB Only	EW Perm	03	04	Excl. Left	NS Perm	07	08				
Timing	G = 8.0	G = 11.5	G =	G =	G = 8.0	G = 44.5	G =	G =				
	Y = 4	Y = 5	Y =	Y =	Y = 4	Y = 5	Y =	Y =				
Duration of Analysis, T = 0.25						Cycle Length, C = 90.0						
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	41	16	479		81		203	559		30	862	
Lane Group Capacity, c	397	486	642		182		240	1727		529	913	
v/c Ratio, X	0.10	0.03	0.75		0.45		0.85	0.32		0.06	0.94	
Total Green Ratio, g/C	0.27	0.26	0.41		0.13		0.64	0.49		0.64	0.49	
Uniform Delay, d ₁	24.7	24.8	22.8		36.3		24.0	13.7		6.4	21.6	
Progression Factor, PF	1.000	1.000	1.000		1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.11	0.30		0.11		0.38	0.11		0.11	0.46	
Incremental Delay, d ₂	0.1	0.0	4.8		1.7		23.4	0.1		0.0	17.8	
Initial Queue Delay, d ₃	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Control Delay	24.8	24.8	27.6		38.0		47.3	13.8		6.5	39.4	
Lane Group LOS	C	C	C		D		D	B		A	D	
Approach Delay	27.3			38.0			22.7			38.3		
Approach LOS	C			D			C			D		
Intersection Delay	30.5			X _c = 0.85			Intersection LOS			C		

HCS+™ DETAILED REPORT												
General Information						Site Information						
Analyst J. Watt						Intersection S.R. 31 & Mill Rd./Echo Dr.						
Agency or Co. M-E Companies, Inc.						Area Type All other areas						
Date Performed 3/24/2011						Jurisdiction City of Marysville						
Time Period PM Peak						Analysis Year 2021 Build w/LTR						
						Project ID Twigg Property TIS						
Volume and Timing Input												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of Lanes, N _i	1	1	1	0	1	0	1	2	0	1	1	0
Lane Group	L	T	R		LTR		L	TR		L	TR	
Volume, V (vph)	64	14	216	91	28	27	569	990	99	8	509	50
% Heavy Vehicles, %HV	2	2	2	2	2	2	2	2	2	2	2	2
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Pretimed (P) or Actuated (A)	A	A	A	A	A	A	A	A	A	A	A	A
Start-up Lost Time, l _i	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	
Extension of Effective Green, e	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	
Arrival Type, AT	3	3	3		3		3	3		3	3	
Unit Extension, UE	3.0	3.0	3.0		3.0		3.0	3.0		3.0	3.0	
Filtering/Metering, I	1.000	1.000	1.000		1.000		1.000	1.000		1.000	1.000	
Initial Unmet Demand, Q _b	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Ped / Bike / RTOR Volumes	0	0	0	0	0	0	0	0	0	0	0	0
Lane Width	12.0	12.0	12.0		12.0		12.0	12.0		12.0	12.0	
Parking / Grade / Parking	N	0	N	N	0	N	N	0	N	N	0	N
Parking Maneuvers, N _m												
Buses Stopping, N _b	0	0	0		0		0	0		0	0	
Min. Time for Pedestrians, G _p	3.2			3.2			3.2			3.2		
Phasing	EW Perm	02	03	04	NB Only	NS Perm	07	08				
Timing	G = 15.8	G =	G =	G =	G = 26.0	G = 34.2	G =	G =				
	Y = 4	Y =	Y =	Y =	Y = 4	Y = 6	Y =	Y =				
Duration of Analysis, T = 0.25							Cycle Length, C = 90.0					
Lane Group Capacity, Control Delay, and LOS Determination												
	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Adjusted Flow Rate, v	71	16	240		162		632	1210		9	622	
Lane Group Capacity, c	211	327	806		255		606	2495		165	698	
v/c Ratio, X	0.34	0.05	0.30		0.64		1.04	0.48		0.05	0.89	
Total Green Ratio, g/C	0.18	0.18	0.51		0.18		0.74	0.71		0.38	0.38	
Uniform Delay, d ₁	32.5	30.9	12.8		34.4		25.4	5.7		17.7	26.2	
Progression Factor, PF	1.000	1.000	1.000		1.000		1.000	1.000		1.000	1.000	
Delay Calibration, k	0.11	0.11	0.11		0.22		0.50	0.11		0.11	0.42	
Incremental Delay, d ₂	0.9	0.1	0.2		5.1		48.2	0.1		0.1	13.7	
Initial Queue Delay, d ₃	0.0	0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Control Delay	33.5	30.9	13.0		39.6		73.6	5.8		17.8	39.8	
Lane Group LOS	C	C	B		D		E	A		B	D	
Approach Delay	18.3			39.6			29.1			39.5		
Approach LOS	B			D			C			D		
Intersection Delay	30.7			X _c = 1.09			Intersection LOS			C		

Appendix H:
Crashes



OHIO STATE HIGHWAY PATROL

OFFICE OF BUSINESS SERVICES - STATISTICAL ANALYSIS UNIT

2006-2010 Union County Intersection Crashes at SR 31 & Mill Rd/Echo Dr

Year	Month	Day_of_Week	Hour	Severity	Report	Agency	Cause
2006	May	Tuesday	2100	Injury	80-0578-80	OSHP	Unknown
2006	June	Wednesday	1815	Property	80-06-160	Sheriff	Failure To Yield
2006	August	Tuesday	0719	Property	06C00233	Marysville PD	Following Too Closely
2006	September	Saturday	1400	Injury	80-1011-80	OSHP	Failure To Yield
2006	September	Wednesday	1712	Property	80-06-299	Sheriff	Improper Lane Change
2006	November	Saturday	1940	Injury	80-1360-80	OSHP	Failure To Yield
2006	December	Saturday	1858	Property	80-06-485	Sheriff	Following Too Closely
2007	February	Friday	0835	Property	80-07-064	Sheriff	Failure To Control
2007	October	Thursday	0711	Property	80-07-415	Sheriff	Unsafe Speed
2007	November	Monday	1333	Injury	07C00415	Marysville PD	Failure To Yield
2008	January	Wednesday	0739	Injury	08C00024	Marysville PD	Unknown
2008	February	Friday	0535	Property	08C00074	Marysville PD	Failure To Control
2008	March	Wednesday	0544	Injury	08C00110	Marysville PD	Improper Turn
2008	June	Monday	1616	Property	08C00206	Marysville PD	Following Too Closely
2008	August	Wednesday	1624	Property	08C00278	Marysville PD	Following Too Closely
2008	September	Monday	1713	Property	08C00317	Marysville PD	Failure To Yield
2008	October	Wednesday	0709	Injury	08C00352	Marysville PD	Following Too Closely
2009	June	Saturday	1046	Property	09C00175	Marysville PD	Following Too Closely
2009	July	Thursday	2220	Property	09C00211	Marysville PD	Failure To Yield
2009	October	Thursday	1801	Injury	09000314	Marysville PD	Failure To Yield
2009	December	Tuesday	1101	Property	09C00379	Marysville PD	Improper Backing
2010	May	Wednesday	1937	Property	10C00164	Marysville PD	Failure To Yield
2010	June	Monday	2244	Injury	10C00202	Marysville PD	Improper Turn
2010	July	Sunday	1953	Property	10C00238	Marysville PD	Following Too Closely
2010	August	Monday	1447	Property	10C00255	Marysville PD	Following Too Closely
2010	August	Monday	1412	Injury	10C00263	Marysville PD	Failure To Yield
2010	September	Monday	1818	Property	10C00298	Marysville PD	Improper Backing
2010	December	Wednesday	2033	Property	10C00417	Marysville PD	Failure To Control
2010	December	Wednesday	2120	Property	10C00418	Marysville PD	Failure To Control
2010	December	Tuesday	1603	Property	10C00427	Marysville PD	Failure To Yield

N = 30

Note: 2010 data provisional as of 3/16/2011.