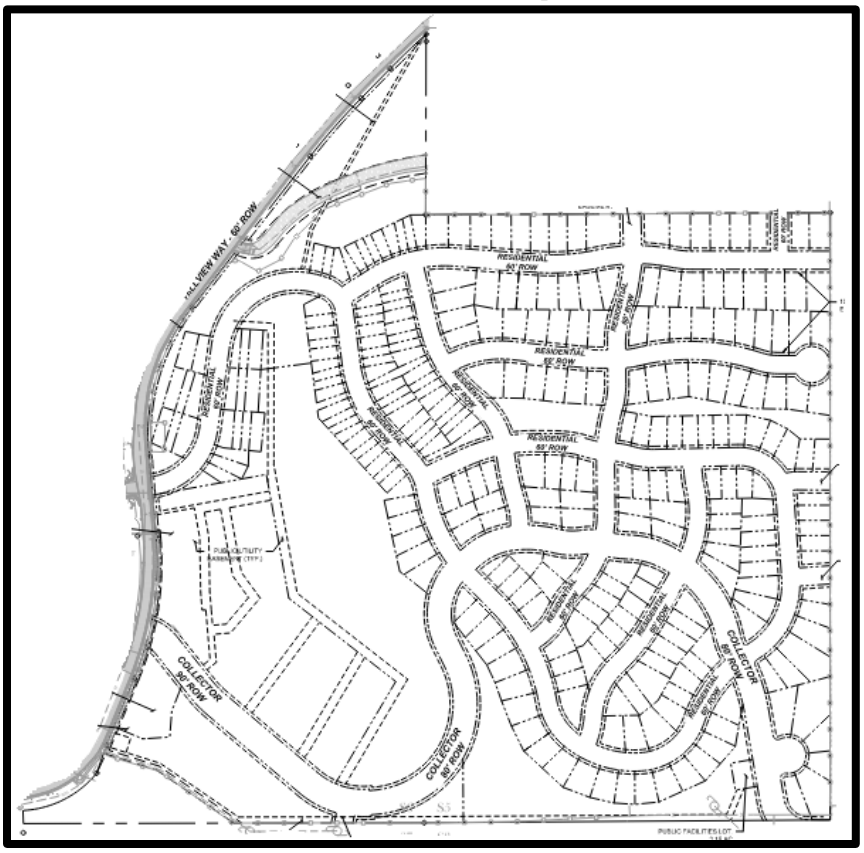
Traffic Impact Study

Hillview Subdivision – Missoula, MT



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Cushing Terrell Project No. HILLVIEW_SUBDIV
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APPENDICES

1.0 EXECUTIVE SUMMARY

The Hillview Subdivision is a 105.9-acre residential project east of Hillview Way in Missoula, Montana. The development will be constructed in eight phases over the next 8 years. Phase 1 is the initial phase and consists of 204 multi-family units to be constructed by the end of calendar year 2022. These units will have access provided via a new collector roadway that will intersect Hillview Way directly across from Village View Way (a private drive approach). There will be two new access points to the new collector serving the multi-family units in Phase 1. Each new access point will have left-turn storage bays for vehicles turning into the multi-family units off the newly constructed Village View Way in the eastbound direction. The new Village View Way collector roadway will be constructed to serve the multi-family units only under Phase 1. The necessary area for the roadway in Phase 1 construction will be placed in a public access easement. Sometime in the future, if and when Phases 2 through 8 are developed, this public access easement will change to public right-of-way dedication coincident with Full Build-Out activities of the development and extension of the Village View Way collector roadway.

Phase 1 is the primary focus of this Traffic Impact Study (TIS). However, as requested by City of Missoula staff, the impact of all eight phases at Full Build-Out of the development is also presented to ensure that any construction completed as part of the Phase 1 multi-family development does not adversely affect future development considerations of other portions of the Hillview Subdivision.

The findings of this TIS conclude that there is no major degradation at the study intersections resulting from Phase 1 activities associated with the multi-family units. At Full Build-Out, the study intersections are expected to operate within a Level of Service "C" subject to the addition of southbound left-turn lanes (~bays) added to the intersections of Hillview Way with Village View Way and Clearview Way, respectively. These left-turn bays are likely to be required at the conclusion of Phase 3 of the development; however, traffic volumes and analysis should be reviewed at the conclusion of each phase to ensure that traffic patterns have materialized as assumed, and that development phases have not been modified from those planned at this time.

2.0 INTRODUCTION/PROJECT DESCRIPTION

This document reports the study of the possible traffic and access effects of the new residential development located adjacent to Hillview Way and within the city limits of Missoula, Montana. The document provides information regarding possible traffic impacts in the area directly attributable to the development, and identifies traffic mitigation efforts, if any, that the site work may require. **Figure 1** shows the location of the proposed Hillview Subdivision in Missoula.

The development to be constructed on the site includes 105.9 acres of land located east of Hillview Way. At full buildout, the property will include 204 multi-family units, 82 townhomes, 202 single-family lots and 6,000 SF of commercial space (tentatively identified as a 2,000 SF coffee shop and a 4,000 SF daycare, but subject to change). The total developable area of the property is 54.0 acres and includes the available area for multi-family, townhome, single-family, and commercial lots. The remaining land includes 51.9 acres and is for road right of way, park land, open space and municipal uses.

Figure 1 – Location of Proposed Hillview Subdivision in Missoula, MT

Access to the development will be at two locations across from existing intersections with Hillview Way. These two access locations will be at the intersections of Hillview Way with Clearview Way and Village View Way, respectively. The project will be constructed in 8 phases over the next 8 years. The build-out of the development is assumed to be complete by the end of 2029. Details of the project phasing are shown in **Table 1**. **Appendix A** shows the preliminary phasing plan in graphical form.

Table 1 – Project Phasing

ID	Year	Multi-Family (MF)	Single-Family (SF)	Townhome (TH)	Commercial	Total
Phase 1	2022	204	-	-	-	204
Phase 2	2023	-	-	20	-	20
Phase 3	2024	-	-	62	1	63
Phase 4	2025	-	32	-	-	32
Phase 5	2026	-	37	-	-	37
Phase 6	2027	-	37	-	-	37
Phase 7	2028	-	49	-	-	49
Phase 8	2029	-	47	-	-	47
	TOTAL	**204**	**202**	**82**	**1**	**489**

The Hillview Subdivision development plan is shown in **Figure 2**.

Figure 2 – Proposed Hillview Subdivision Development Plan

3.0 EXISTING CONDITIONS

This section discusses existing conditions adjacent to and in the general vicinity of the proposed development area.

3.1 Adjacent Roadways

Hillview Way is a two-lane undivided roadway that carries 1,900 AADT (near the intersection with 55th Street) and 4,177 AADT (just south of the intersection with 39th Street). These are year

2020 AADT's obtained from the Montana Department of Transportation's (MDT) online interactive map gallery for station ID's #32-3A-065 and #32-3A-180, respectively. In the immediate vicinity of the Hillview Subdivision, Hillview Way is estimated to carry about 2,200 vpd. The roadway is classified as a major collector roadway. The speed limit is 25 mph adjacent to the proposed Hillview Subdivision in the vicinity of Clearview Way and Village View Way. Just past Clearview Way to the north, the speed limit increases to 35 mph for the rest of its length to the intersection with 39th Street.

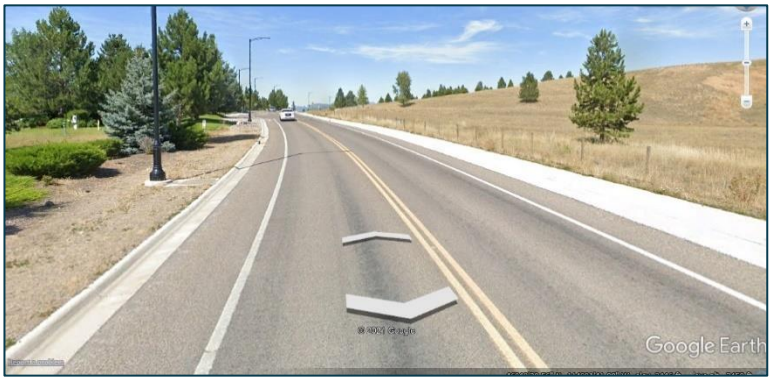


Photo 1: Hillview Way between Clearview Way and Village View Way (looking north)

Clearview Way is a two-lane, local roadway. It has on street parking on both sides and allows two-way traffic. The roadway is located in public right-of-way, and ultimately connects to 39th Street at 23rd Avenue via a serpentine route of local roads through residential neighborhoods. There are sidewalks on both sides of Clearview View near the connection to Hillview Way.

Photo 2: Clearview Way (looking east towards Hillview Way)

Village View Way is a two-lane, private drive (i.e. not public right-of-way) which provides access to the Village at Elk Hills residential complex. There is only one ingress/egress point to the development. In the vicinity of the intersection with Hillview Way, there is sidewalk on the south side of the facility.

Photo 3: Village View Way (looking east towards Hillview Way)

39th Street is a two-lane, minor arterial roadway. It has a two-way, center turn lane (TWCTL) for turning movements to adjacent streets and driveways. Bicycle lanes and pedestrian sidewalks are found on both sides of the roadway.

Photo 4: 39th Street (looking east towards the Hillview Way intersection)

The existing intersections analyzed in the study area include the following:

Hillview Way/Clearview Way – this is a "tee" intersection with stop sign control on the west leg (Clearview Way) of the intersection. There are no "formal" auxiliary turn lanes. Clearview Way is oriented in a northwest / southeast direction and eventually connects to 23rd Avenue via a serpentine route of local roads through residential neighborhoods.

Hillview Way/Village View Way – this is a "tee" intersection with no stop sign control on the west leg (Village View Way) of the intersection. There are no "formal" auxiliary turn lanes. This approach serves a multi-family unit residential area with no other access points to or through the residential area. As noted earlier, Village View Way on the west side of Hillview Way is a private drive facility and is not public right-of-way.

Hillview Way/39th Street – this is a four-legged intersection with traffic signalized control. All four legs of the intersection exhibit a designated left-turn, thru- and right-turn lane. In addition, the south and west legs have a bicycle lane that extends to the stop bars of each of those legs. The east leg has a bicycle lane several hundred feet back from the intersection, however the lane terminates and does not extend into the intersection proper. The streets entering this intersection are named as: 39th Street (west leg), Hillview Way (south leg), SW Higgins Avenue (east leg) and Russell Street (north leg).

3.2 Traffic Data

In October 2021 Cushing Terrell collected traffic data at area intersections to evaluate current operational characteristics. These counts included peak-hour turning movement counts at the intersections of Hillview Way with Clearview Way, Village View Way, and 39th Street, respectively. Counts were completed for the AM peak period (between 7 AM and 9 AM), and for the PM peak period (between 4 pm and 6 pm). Collected traffic data is included in **Appendix B** of this report.

The raw data collected for this project may be adjusted for seasonal variations using data collected from MDT's automatic count stations located on Orange Street Bridge in Missoula (Site #A-037) and on Van Buren Street north of I-90 (Site #A-067). This data from 2020 (the most recent full count year available) indicates traffic counts collected in October are 104% to 106% of the AADT (Average Annual Daily Traffic) volume in this area. In this case the raw data could be factored down by 4% to 6% to match the AADT values for this area. However, these factors were not applied to the raw traffic data to provide a slightly more conservative result from the traffic analysis.

3.3 Historic Traffic Data

Historic traffic data was assembled from the Montana Department of Transportation (MDT) online interactive map gallery for three stations in close proximity to the proposed development (station ID's 32-3A-065, 32-3A-066, and 32-3A-180. This data is presented in **Table 2**. The three sites were chosen because they are the two logical directions in which traffic could distribute to and from the development. Examination of the three count stations doesn't yield any notable trends in the data, other than the year 2020 saw a decrease in AADTs just south of 39th Street and also on 55th Street just west of the Hillview Way intersection likely due to the impact of COVID-19 and workers staying in their homes. There was a reported traffic volume decrease along Hillview Way, just south of 39th Street, from 2016 to 2018 which is likely related to reconstruction of Hillview Way from a rural roadway to an urban roadway. If the traffic data anomalies between 2016 and 2018 are removed, and the Covid-19 impact ignored, then the overall traffic volume growth rate for the roads entering this area can be considered to be relatively flat using the AADTs in **Table 2**.

Table 2 – Historic AADT* Data (in vehicles per day)

Location	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
55th Street, btwn Gharrett Ave and Bridger Ct #32-3A-065	1,770	1,730	1,640	1,580	2,403	2,216	2,205	1,740	1,633	1,901
55th Street, just west of Hillview Way Intersection #32-3A-066	1,660	1,410	1,870	1,900	1,366	1,350	1,606	1,521	1,499	1,146
Hillview Way, just south of 39th Street #32-3A-180	5,030	4,990	5,220	5,310	5,450	2,764	2,742	2,783	4,491	4,177

**AADT = Average Annual Daily Traffic*

3.4 Level of Service

Using the data collected for this project, Cushing Terrell conducted a Level of Service (LOS) analysis at the study intersections. This evaluation was conducted in accordance with the procedures outlined in the Transportation Research Board's Highway Capacity Manual (HCM) - Special Report 209 and the Synchro 11 with SimTraffic simulation software. Intersections are graded from A to F representing the average delay that a vehicle entering an intersection can expect. Typically, a LOS of C or better is considered acceptable for peak-hour conditions. **Table 3** shows the existing 2021 LOS at the study intersections. The analysis shows that all intersections in this area will function at LOS C or better under existing traffic volume conditions. The LOS calculations are included in **Appendix D**.

Table 3 – Existing Level of Service Summary

Hillview Way Intersection	AM Peak Hour		PM Peak Hour	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Clearview Way*	11.4	B	11.7	B
Village View Way*	10.8	B	11.1	B
39th Street**	19.5	B	24.4	C

*Eastbound Delay & LOS for Unsignalized Intersection
**Signalized Intersection (90 second cycle length per MDT phasing/timing plan)

4.0 TRIP GENERATION

Cushing Terrell performed a trip generation analysis to determine the anticipated future traffic volumes from the proposed development phases using the trip generation rates contained in Trip Generation (Institute of Transportation Engineers, Tenth Edition). These rates are the national standard and are based on the most current information available to planners. A vehicle "trip" is defined as any trip that either begins or ends at the development site. Cushing Terrell

determined that the critical traffic impacts on the intersections and roadways would occur during the weekday morning and evening peak hours. According to the ITE trip generation rates, Phase 1 of the development would produce 65 AM peak hour trips, 84 PM peak hour trips, and 1,110 daily trips. At full build-out, incorporating all eight phases, the development could produce a maximum potential 471 AM peak hour trips, 444 PM peak hour trips, and 4,437 daily trips. See **Table 4** for detailed trip generation information.

Table 4 - Trip Generation Rates

Land Use (ITE Code)	Units	AM Peak Hour Trip Ends per Unit	Total AM Peak Hour Trip Ends	PM Peak Hour Trip Ends per Unit	Total PM Peak Hour Trip Ends	Weekday Trip Ends per Unit	Total Weekday Trip Ends
Phase 1 - 2022							
Multi-family (221)	204 EA	0.32	65 18in/47out	0.41	84 50in/34out	5.44	1,110
Subtotal			**65**		**84**		**1,110**
Phase 2 - 2023							
Townhomes (220)	20 EA	0.56	11 3in/8out	0.67	13 8in/5out	7.32	146
Subtotal			**11**		**13**		**146**
Phase 3 - 2024							
Townhomes (220)	62 EA	0.56	35 10in/25out	0.67	42 25in/17out	7.32	454
Commercial - Daycare (565) *	4,000 SF	11.73	47 25in/22out	11.82	47 22in/25out	47.62	190
Commercial – Coffee Shop (936) *	2,000 SF	79.91	160 82in/72out	28.23	56 28in/28out	315.17**	630
Subtotal			**242**		**145**		**1,274**
Phase 4 - 2025							
Single-Family	32 LOTS	0.76	24 6in/18out	1.00	32 20in/12out	9.44	302
Subtotal			**24**		**32**		**302**
Phase 5 - 2026							
Single-Family	37 LOTS	0.76	28 7in/21out	1.00	37 24in/13out	9.44	349
Subtotal			**28**		**37**		**349**
Phase 6 - 2027							
Single-Family	37 LOTS	0.76	28 7in/21out	1.00	37 24in/13out	9.44	349

Land Use (ITE Code)	Units	AM Peak Hour Trip Ends per Unit	Total AM Peak Hour Trip Ends	PM Peak Hour Trip Ends per Unit	Total PM Peak Hour Trip Ends	Weekday Trip Ends per Unit	Total Weekday Trip Ends
Subtotal			**28**		**37**		**349**
Phase 7 - 2028							
Single-Family	49 LOTS	0.76	37 10in/27out	1.00	49 31in/18out	9.44	463
Subtotal			**37**		**49**		**463**
Phase 8 - 2029							
Single-Family	47 LOTS	0.76	36 9in/27out	1.00	47 39in/17out	9.44	444
Subtotal			**36**		**47**		**444**
Total at Full Build-Out	**489**		**471 177in/294out**		**444 262in/182out**		**4,437**

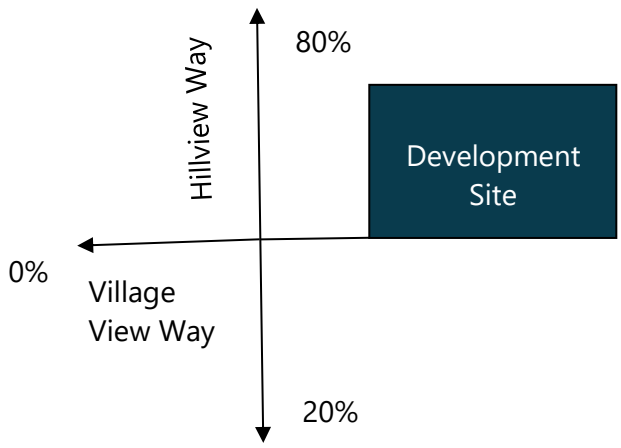
*Commercial space of 6,000 SF tentatively identified as a 2,000 SF coffee shop and a 4,000 SF daycare; however, is subject to change.

**For ITE Code 936 (Coffee Shop w/out Drive-Thru Window) there is not a published trip generation rate for ADTs. Thus, a comparable ADT trip generation rate was selected using ITE Code 930 (Fast Casual Restaurant), which had a rate of 315.17 daily trips per 1000 SF. This results in an estimated ADT of 630 vpd.

5.0 TRIP DISTRIBUTION

The traffic distribution and assignment for the proposed subdivision was based upon the existing volumes along the adjacent roadways and peak-hour traffic volumes. Drivers are expected to distribute onto the surrounding road network (i.e. Hillview Way) as shown on **Figure 3**. The 80% of traffic distributed to the north on Hillview Way, and the 20% of traffic distributed to the south on Hillview Way, closely matches the existing traffic volume distributions at Hillview Way and Clearview Way.

Figure 3 – Peak-Hour Trip Distribution



6.0 TRAFFIC VOLUMES

Using the existing traffic count data and the proposed development's trip generation and distribution values, Cushing Terrell developed a future traffic model for the existing condition (October 2021), completion of Phase 1 (2022) and completion of the Hillview Subdivision at full – build-out (2029). The relevant intersection volumes are shown in **Appendix C** of this report and is the basis by which intersection capacity was calculated in **Section 7.0** of this report.

Table 5 below portrays roadway ADT (Average Daily Traffic) volumes on Hillview Way, the proposed Village View Way (collector road) and the proposed Clearview Way (Local Road) being developed with the subdivision for Phase 1 and Full Build-Out. Note that for Phase 1, only a portion of Village View Way will be developed, thus one hundred percent of the Phase 1 traffic is assigned to Village View Way. All volume references are in vehicles per day (vpd).

Table 5 – ADT Traffic Volume Impacts at Phase 1 & Full Build-Out

	ADT Volume	Village View Way (Collector Road)	Clearview View Way (Local Road)	Hillview Way
Trip Generation	Existing	0	0	2,200***
Phase 1*	1,100	1,100	0	3,300
Full Build-Out**	4,437	3,328	1,109	6,637

*Phase 1: Distribution of ADTs is 100% to Village View Way.
**Full Build-Out: Distribution of ADTs is 75% to Village View Way and 25% to Clearview Way.
***Estimate based on adjacent MDT traffic counts on both (1) Hillview Way & (2) 55th Street

The values represented in **Table 5** indicate that the new Village View collector roadway will carry 1,100 vpd at the end of Phase 1 and 3,328 vpd at Full Build-Out of the development. The new Clearview Way local roadway will carry 0 vpd at the end of Phase 1 and 1,109 vpd at Full Build-Out. Lastly, Hillview Way directly adjacent to the development is estimated to carry 2,200 vpd under current conditions (year 2021), 3,300 vpd at the end of Phase 1, and 6,637 vpd at Full Build-Out.

7.0 CAPACITY ANALYSIS

Using the trip generation and trip distribution rates, Cushing Terrell determined the future Level of Service for the area intersections for Phase 1 and Full Build-Out. The anticipated intersection LOS with the proposed development in place for both scenarios is shown in **Tables 6 and 7**. The LOS calculations are included in **Appendix D** of this report. The tables indicate that the construction of Phase 1 and the Full Build-Out of the Hillview Subdivision will not cause any new roadway capacity problems in this area. The total vehicle delay at the three study intersections will increase only slightly from Phase 1 activities associated with the multi-family units. At Full Build-Out, the study intersections are expected to operate within a Level of Service "C" subject

to the addition of southbound left-turn lanes (~bays) added to the intersections of Hillview Way with Village View Way and Clearview Way, respectively. These left-turn bays are likely to be required at the conclusion of Phase 3 of the development; however, traffic volumes and analysis should be reviewed at the conclusion of each phase to ensure that traffic patterns have materialized as assumed, and that development phases have not been modified from those planned at this time. At the signalized intersection of Hillview Way and 39th Street, it is worth noting that the average vehicle delay and overall LOS at this intersection is heavily influenced by the existing cycle length at the traffic signal. Delay and LOS at a traffic signal can usually be improved with lower cycle lengths, but this is often difficult to implement with the geometry, traffic patterns and adjacent land use constrictions (i.e. existing drive approaches). Traffic signal timing at this location can handle a wide range of traffic volumes.

Table 6 – Level of Service Summary AM Peak Period

Hillview Way Intersection	Existing		Phase 1		Full Build-Out	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Clearview Way*	11.4	B	11.9	B	21.0/14.1	C/B
Village View Way**	10.8	B	12.4/10.9	B/B	24.3/16.4	C/C
39th Street***	19.5	B	19.5	B	20.5	C
EB Approach	*19.9*	*B*	*19.8*	*B*	*21.1*	*C*
WB Approach	*20.0*	*B*	*19.9*	*B*	*18.8*	*B*
NB Approach	*18.3*	*B*	*18.6*	*B*	*20.9*	*C*
SB Approach	*18.8*	*B*	*18.9*	*B*	*20.9*	*C*

*Eastbound Delay & LOS for Unsignalized Intersection
**Eastbound/Westbound Delay & LOS for Unsignalized Intersection
***Signalized Intersection

Table 7 – Level of Service Summary PM Peak Period

Hillview Way Intersection	Existing		Phase 1		Full Build-Out	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Clearview Way*	11.7	B	12.3	B	20.9/12.4	C/B
Village View Way**	11.1	B	12.7/10.3	B/B	19.2/13.3	C/B
39th Street***	24.4	C	24.4	C	25.2	C
EB Approach	*20.4*	*C*	*20.5*	*C*	*21.1*	*C*
WB Approach	*26.5*	*C*	*26.3*	*C*	*26.4*	*C*
NB Approach	*22.5*	*C*	*22.9*	*C*	*24.0*	*C*
SB Approach	*26.1*	*C*	*26.3*	*C*	*28.8*	*C*

*Eastbound Delay & LOS for Unsignalized Intersection
**Eastbound/Westbound Delay & LOS for Unsignalized Intersection
***Signalized Intersection

8.0 LEFT-TURN LANE ANALYSIS

An assessment of left-turn lane needs was made based on the traffic generation, distribution and assignment assumptions at the intersections of Hillview Way with Village View Way and Clearview Way, respectively. Guidance for installing left-turn lanes is varied, and is based on capacity, volume of traffic, intersection control and safety. Consideration can be based on one of these factors, or several factors in combination. Engineering judgement is also utilized when deciding when to install left-turn lanes on a roadway at an intersection.

In general, the following guidelines are considered in determining the need for exclusive left-turn lanes at an intersection. Exclusive left-turn lanes should be considered for the following situations (per Montana Department of Transportation guidelines, "Intersections At-Grade, Chapter 28, November 2007"):

1. at all public intersections on all multi-lane urban and rural highways, regardless of traffic volumes;
2. at the free-flowing leg of any unsignalized intersection on a 2-lane urban or rural highway that satisfies the criteria in Figure 28.4F (see **Appendix E**);
3. at any intersection where a capacity analysis determines a left-turn lane is necessary to meet the level-of-service criteria;
4. as a general rule, on the major roadway at any unsignalized intersection;
5. at high volume driveway approaches that satisfy the criteria in Figure 28.4F (see **Appendix E**);
6. at any intersection where the crash experience, traffic operations and/or sight distance restrictions (e.g., intersection beyond a crest vertical curve) indicate a significant conflict related to left-turning vehicles.

Phase 1 Assessment

Left-turn lane warrants were evaluated for an exclusive southbound left-turn bay at the intersection of Hillview Way and Village View Way. Phase 1 construction will result in completion of the multi-family units. The "advancing" and "opposing" vehicle volumes during the AM and PM peak hours, in conjunction with the "percent left turns" in the advancing vehicle volumes, were directly plotted on Figure 28.4F (see **Appendix E**). The results of this assessment confirm that an exclusive southbound left-turn lane on Hillview Way at the intersection with Village View Way is not required to accommodate Phase 1 expected traffic.

Hillview Way (at Village View Way)

- AM Peak Hour – Left-turn Lane Not Required
- PM Peak Hour – Left-turn Lane Not Required

Full Build-Out Assessment

Left-turn lane warrants were evaluated for an exclusive southbound left-turn bay at the intersection of Hillview Way and Village View Way, and also at the intersection of Hillview Way and Clearview Way, for the Full Build-Out of the development. Full Build-Out of the development is anticipated to occur at the conclusion of the year 2029. By plotting relevant volume data points, in conjunction with the "percent left turns" in the advancing vehicle

volumes, left-turn lane warrants were evaluated for the AM and PM peak hours (see **Appendix E**). The results of this assessment are as follows:

Hillview Way (at Village View Way)

- AM Peak Hour – Left-turn Lane Required
- PM Peak Hour – Left-turn Lane Required

Hillview Way (at Clearview Way)

- AM Peak Hour – Left-turn Lane Not Required
- PM Peak Hour – Left-turn Lane Required

Interim Phases

A preliminary assessment was also made to determine at which phase exclusive southbound left-turn lanes may be required on Hillview Way at both intersections to the development. Based on the previous analysis it's been determined that:

- An exclusive southbound left-turn lane on Hillview Way at Village View Way is not needed for Phase 1.
- An exclusive southbound left-turn lane on Hillview Way at Village View Way is needed for Full Build-Out.
- An exclusive southbound left-turn lane on Hillview Way at Clearview Way is needed for Full Build-Out.

Identifying exactly when exclusive southbound left-turn lanes will be required during interim phase development is a function of traffic patterns as they develop and routes that drivers elect to take to and from the development. An initial assessment suggests that southbound left-turn lanes at the two intersections may be required at the end of Phase 3 of the development. This is based on the introduction of heavy left turns into both approaches due to the multi-family, townhome and commercial uses (adjacent to Village View Way) all being completed by the end of Phase 3.

9.0 AREAWIDE ASSESSMENT OF ROAD CLASSIFICATIONS

City of Missoula staff asked that land uses to the east, between the easterly boundary of the full development and Heaven's Gate Road, be reviewed with some trip generation incorporated at a high level to determine if land use changes in that area would impact roadway functional classification and right of way needs for the Village View Way new collector roadway being constructed with Full Build-Out of the Hillview Subdivision. New land development could potentially occur to the east of the subdivision in the future and would use Heaven's Gate Road to access Rimel Road, which then would access the Village View Way new collector roadway traversing the development.

Assumptions were made for five parcels of land that could be potentially developed some time in the future. Four of the parcels were assumed to be residential single-family (SF) housing developments with a potential density equal to that roughly proposed with the Hillview Subdivision (approximately 7 single family units per acre). The four parcels are 10 acres, 10 acres,

5 acres and 5 acres in size, respectively. The fifth parcel is owned by Missoula County Schools, and for this exercise a possible K-8 school was identified to be on the 20-acre parcel. The school data was generally modelled after the Target Range Elementary School and resulted in approximately 500 students being assigned to the 20-acre parcel east of the proposed Hillview Subdivision.

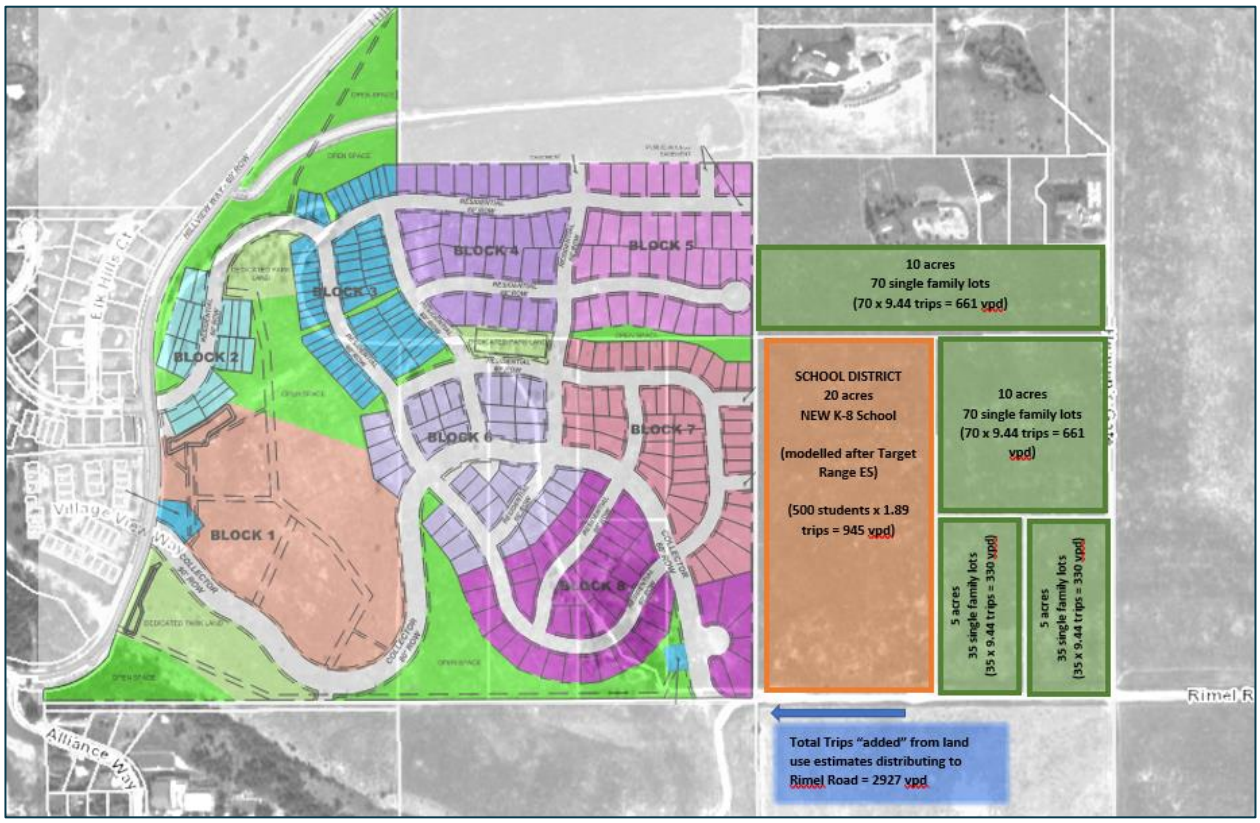
The land use assumptions resulted in the addition of 2,927 vehicles per day (vpd) that potentially could be added to Village View Way via a future improved Rimel Road. See **Table 8** for more information. The potential Hillview Way volume of 9,564 vpd and Village View Way volume of 6,255 vpd (i.e. Full Build-Out plus Future Easterly Land Use) are within the maximum planning capacities of approximately 11,000 vpd for a city collector roadway with an 80-foot right of way width.

Table 8 – ADT Traffic Volume Impact of Future Land Uses to the East (in vpd)

	ADT Volume	Village View Way (Collector Road)	Clearview View Way (Local Road)	Hillview Way
Trip Generation	Existing	0	0	2,200
Phase 1*	1,100	1,100	0	3,300
Full Build-Out**	4,437	3,328	1,109	6,637
Future Land Uses to the East of the Development***	**2,927**	**2,927**	**0**	**9,564**

*Phase 1: Distribution of ADTs is 100% to Village View Way.
**Full Build-Out: Distribution of ADTs is 75% to Village View Way and 25% to Clearview Way.
***Future Land Use: All of the trips generated are assumed to access Village View Way via Rimel Road.

Figure 4 – Future Land Use Assumptions to the East of Development Boundary



The ADTs volumes represented above are conservative in terms of their ultimate impact on Village View Way and are considered a worst-case scenario. There will be three connecting "spurs" to the east from the local internal development roads to provide future access points to the School District property and another private land holding. In addition, a fourth "spur" will be in the form of a cul-de-sac that could provide an additional access point. See **Figure 4**. Ultimately, though, all of this traffic will find its' way down to Hillview Way, which is the major collector roadway on the City's transportation system in this area.

10.0 FINDINGS AND RECOMMENDATION

This report indicates that the traffic generated for Phase 1, and at Full Build-Out, of the Hillview Subdivision can be adequately accommodated by the proposed access roads and recommended improvements to the area transportation network. The analysis presented in this report indicates that all intersections will operate at a LOS C or better at Phase 1 (year 2022) and Full Build-Out (year 2029) with the Hillview Subdivision anticipated traffic. The following recommendations are made based on this study:

<u>Phase 1</u>

- Village View Way to the east of Hillview Way should be designed and constructed as a collector roadway in accordance with City of Missoula collector road standards to a 25-mph design speed. The necessary area for the roadway in Phase 1 construction will be

placed in a public access easement. Sometime in the future, if and when Phases 2 through 8 are developed, this public access easement will change to an 80-foot public right-of-way dedication coincident with Full Build-Out activities of the development and extension of the Village View Way collector roadway.

- Village View Way should dead end in a temporary cul-de-sac just past the easterly approach of Phase 1 until future phases of the development build out to the east. Village View Way will become the major route through Full Build-Out of the development and ultimately will connect to Rimel Road in the future.

- Left-turn bays should be provided at both access points for eastbound left-turning traffic into the multi-family units. These left-turn bays will be critical for future phases of the Hillview Subdivision as traffic generation increases. The left-turn bays should have a minimum of 100 feet of storage and utilize an 8:1 taper rate into the left-turn bay.

- Provide stop control at the intersection of Village View Way and Hillview Way. Stop sign placement should be on the east leg of the intersection. Note that the existing west leg of the intersection should be stop controlled as well, however it is a private road and not under the jurisdiction of the City of Missoula.

Full Build-Out

- Extend Village View Way through the development to terminate at the southeast corner of the property, near Rimel Road. Design and construct as a collector roadway in accordance with City of Missoula collector road standards. Provide an 80-foot right of way dedication and a 25-mph design speed. Design and construct all remaining subdivision roads to a residential local roadway standard in accordance with City of Missoula local roadway standards. Provide a 60-foot right of way dedication and a 25-mph design speed.

- Provide stop control at the intersection of Clearview Way and Hillview Way. Stop sign placement should be on the east leg of the intersection. Note that the existing west leg of the intersection already has stop control in place and is a public road under the jurisdiction of the City of Missoula.

- All internal subdivision intersections should begin as uncontrolled intersections (i.e. no stop signs or yield signs). Reevaluate at the end of each phase of the development as traffic patterns are reviewed.

- Add designated southbound left-turn bays to Hillview Way at the intersections with Village View Way and Clearview Way, respectively. These should be in place by the end of construction of Phase 3. This is based on the introduction of heavy left turns into both approaches due to the multi-family, townhome and commercial uses (adjacent to Village View Way) all being completed by the end of Phase 3. Bays should be a minimum of 150 feet in length each (storage) and include an 8:1 taper rate.

- Pedestrian connectivity will be provided via internal sidewalks on both sides of all internal roads. The sidewalks will connect to sidewalk improvements proposed on Village View Way and Clearview Way. Pedestrians will then be able to utilize the sidewalks to access open space and Park areas within the development, and also access the sidewalk on the east side of Hillview Way and the on-street bicycle lanes on both sides of Hillview Way.

- A trail system will be provided within the development area that will connect through the open space lots and the internal roads. This will provide additional access opportunities for non-motorized and recreational opportunities.

- The intersection of the first approach to the multi-family housing along Village View Way should be monitored for a potential Rectangular Rapid Flashing Beacon (RRFB) installation when the commercial use on the south side of Village View Way is constructed in Phase 3. Depending on the actual commercial use developed (i.e. coffee store, daycare, etc.), there may be observable pedestrian movements back and forth across Village View Way at this location.

APPENDICES

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Appendix A: Preliminary Phasing Plan

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800.757.9522

LEGEND	
PHASE 1	
PHASE 2	
PHASE 3	
PHASE 4	
PHASE 5	
PHASE 6	
PHASE 7	
PHASE 8	
PARKLAND DEDICATION	
OPEN SPACE DEDICATION	

TYPE	AREA (AC)	% OF TOTAL
Multi-Family	9.2	8.7
Single Family	36.2	34.2
Townhome	7.8	7.4
Commercial	0.8	0.8
Right-of-Way	24.0	22.6
Park Land	7.2	6.8
Open Space <25%	6.0	5.7
Open Space >25%	14.5	13.7
Municipal	0.2	0.2
TOTAL	105.9	100.0

	Year	MF	SF	TH	Commercial	TOTAL
Phase 1	2022	204	-	-	-	204
Phase 2	2023	-	-	21	-	21
Phase 3	2024	-	-	62	1	63
Phase 4	2025	-	32	-	-	32
Phase 5	2026	-	37	-	-	37
Phase 6	2027	-	37	-	-	37
Phase 7	2028	-	49	-	-	49
Phase 8	2029	-	47	-	-	47
	TOTAL	204	202	83	1	490

NORTH

1 / X102 PRELIMINARY PHASING PLAN

0 75 150 300
SCALE: 1" = 150'

NOT FOR CONSTRUCTION - PRELIMINARY DESIGN

MISSOULA, MONTANA
HILLVIEW

SCHEMATIC DESIGN

11.23.2021
DRAWN BY | MAHONEY
CHECKED BY | MASCIA
REVISIONS

PRELIMINARY PHASING PLAN

X102

Cushing Terrell

Appendix B: Traffic Counts

Cushing Terrell

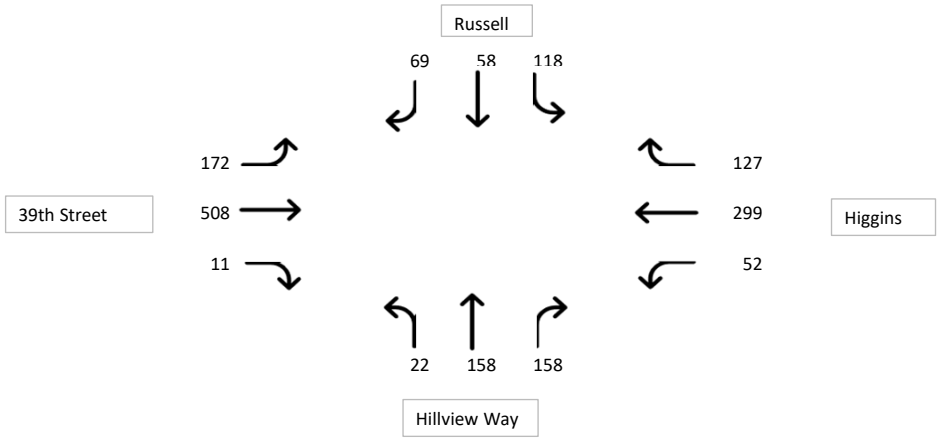
306 W. Railroad St., Suite 104
Missoula, MT 59802

File Name : #1 HILLVIEW&39TH
Site Code : 1
Start Date : 10/27/2021
Page Number : 1

Groups Printed - Class 1

	Russell Southbound				Higgins Westbound				Hillview Way Northbound				39th Street Eastbound				
Start Time	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Int. Total**
7:00 AM	8	10	7	0	19	33	2	0	10	19	3	0	0	37	24	0	172
7:15 AM	11	7	24	0	20	41	4	0	27	49	6	0	3	77	32	1	302
7:30 AM	15	10	17	0	34	62	12	0	37	53	10	0	0	144	34	0	428
7:45 AM	12	11	22	0	31	76	19	0	39	58	6	0	3	110	60	0	447
Total	46	38	70	0	104	212	37	0	113	179	25	0	6	368	150	1	1349
8:00 AM	22	16	25	0	27	71	14	0	34	42	9	1	3	107	57	0	428
8:15 AM	17	12	27	0	25	57	10	0	36	46	8	0	3	107	33	0	381
8:30 AM	17	12	37	0	36	80	10	0	52	35	2	0	1	162	46	1	491
8:45 AM	13	18	29	0	39	91	18	0	36	35	3	4	4	132	36	0	458
Total	69	58	118	0	127	299	52	0	158	158	22	5	11	508	172	1	1758
Grand Total	115	96	188	0	231	511	89	0	271	337	47	5	17	876	322	2	3107
Apprch %	28.8	24.1	47.1	0.0	27.8	61.5	10.7	0.0	41.1	51.1	7.1	0.8	1.4	72.0	26.5	0.2	
Total %	3.7	3.1	6.1	0.0	2.0	16.4	2.9	0.0	8.7	10.8	1.5	0.2	0.5	28.2	10.4	0.1	
PHF =	0.784	0.806	0.797		0.814	0.821	0.722		0.760	0.859	0.611		0.688	0.784	0.754		
PH Volume	69	58	118		127	299	52		158	158	22		11	508	172		

Peak Hour 8:00 to 8:45 AM



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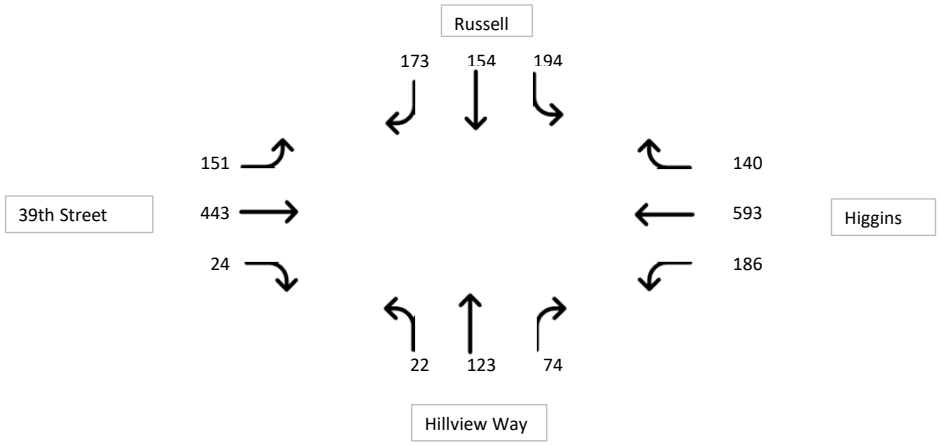
306 W. Railroad St., Suite 104
Missoula, MT 59802

File Name : #1 HILLVIEW&39TH
Site Code : 1
Start Date : 10/27/2021
Page Number : 1

Groups Printed - Class 1

	Russell Southbound				Higgins Westbound				Hillview Way Northbound				39th Street Eastbound				
Start Time	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Int. Total**
4:00 PM	38	38	41	0	31	168	53	0	22	12	5	0	5	82	24	0	519
4:15 PM	53	40	48	0	35	151	48	0	12	26	5	0	1	95	47	0	561
4:30 PM	34	41	55	0	28	126	42	0	19	37	7	0	4	78	37	0	508
4:45 PM	31	36	41	0	30	137	48	0	18	27	6	0	6	203	38	0	621
Total	156	155	185	0	124	582	191	0	71	102	23	0	16	458	146	0	2209
5:00 PM	53	39	47	0	34	166	43	0	18	29	5	0	7	89	40	0	570
5:15 PM	55	38	51	0	48	164	53	0	19	30	4	0	7	73	36	0	578
5:30 PM	32	52	54	0	32	123	41	0	15	14	0	0	6	88	33	0	490
5:45 PM	52	33	43	0	28	113	45	0	12	21	1	1	6	75	31	0	461
Total	192	162	195	0	142	566	182	0	64	94	10	1	26	325	140	0	2099
Grand Total	348	317	380	0	266	1148	373	0	135	196	33	1	42	783	286	0	4308
Apprch %	33.3	30.3	36.4	0.0	14.9	64.2	20.9	0.0	37.0	53.7	9.0	0.3	3.8	70.5	25.7	0.0	
Total %	8.1	7.4	8.8	0.0	6.2	26.6	8.7	0.0	3.1	4.5	0.8	0.0	1.0	18.2	6.6	0.0	
PHF =	0.786	0.939	0.882		0.729	0.893	0.877		0.974	0.831	0.786		0.857	0.546	0.944		
PH Volume	173	154	194		140	593	186		74	123	22		24	443	151		

Peak Hour 4:30 to 5:15 PM



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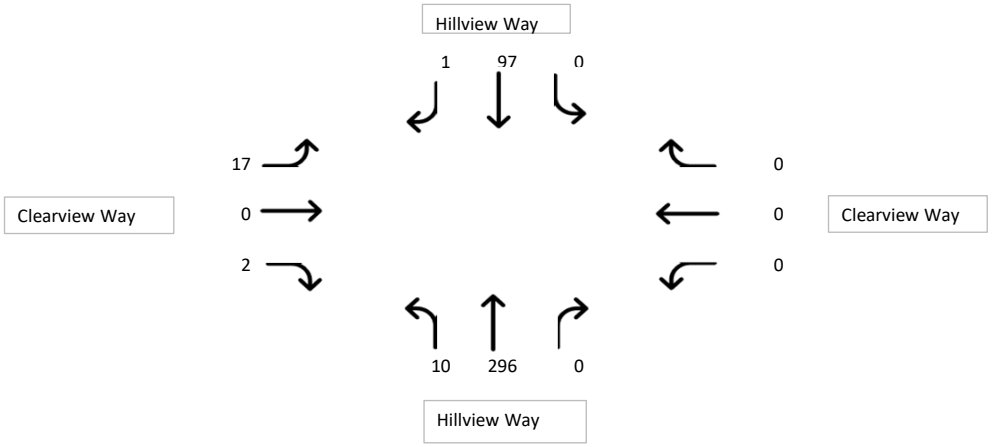
306 W. Railroad St., Suite 104
Missoula, MT 59802

File Name : #2 HILLVIEW&CLEARVIEW
Site Code : 2
Start Date : 10/28/2021
Page Number : 1

Groups Printed - Class 1

	Hillview Way Southbound				Clearview Way Westbound				Hillview Way Northbound				Clearview Way Eastbound				
Start Time	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Int. Total**
7:00 AM	0	4	0	0	0	0	0	0	0	33	0	0	0	0	0	0	37
7:15 AM	0	8	0	0	0	0	0	0	0	55	0	1	0	0	2	0	66
7:30 AM	0	15	0	0	0	0	0	0	0	77	4	0	0	0	4	0	100
7:45 AM	1	22	0	0	0	0	0	0	0	57	2	0	0	0	8	0	90
Total	1	49	0	0	0	0	0	0	0	222	6	1	0	0	14	0	293
8:00 AM	0	40	0	0	0	0	0	0	0	85	1	1	2	0	1	0	130
8:15 AM	0	20	0	0	0	0	0	0	0	77	3	0	0	0	4	0	104
8:30 AM	1	21	0	0	0	0	0	0	0	42	3	0	0	0	3	0	70
8:45 AM	1	14	0	0	0	0	0	0	0	49	1	0	1	0	2	0	68
Total	2	95	0	0	0	0	0	0	0	253	8	1	3	0	10	0	372
Grand Total	3	144	0	0	0	0	0	0	0	475	14	2	3	0	24	0	665
Apprch %	2.0	98.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	96.7	2.9	0.4	11.1	0.0	88.9	0.0	
Total %	0.5	21.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	71.4	2.1	0.3	0.5	0.0	3.6	0.0	
PHF =	0.250	0.606	0.000		0.000	0.000	0.000		0.000	0.871	0.625		0.250	0.000	0.531		
PH Volume	1	97	0		0	0	0		0	296	10		2	0	17		

Peak Hour 7:30 to 8:15 AM



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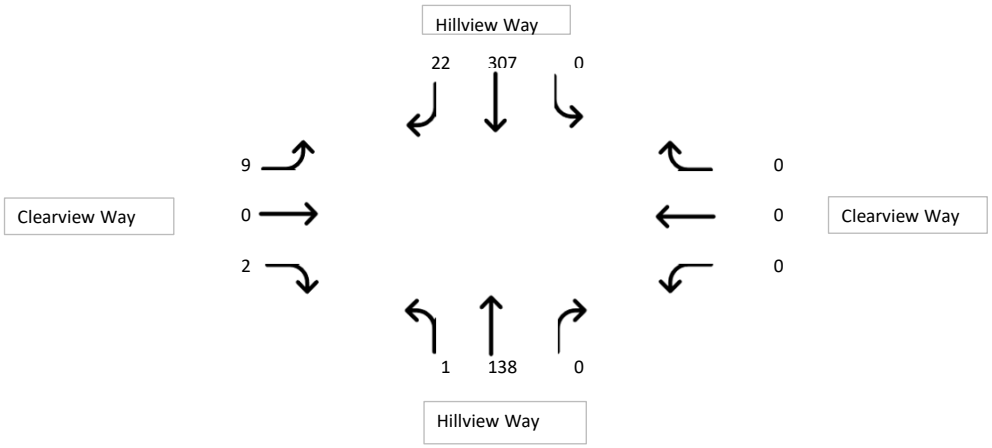
306 W. Railroad St., Suite 104
Missoula, MT 59802

File Name : #2 HILLVIEW&CLEARVIEW
Site Code : 2
Start Date : 10/28/2021
Page Number : 1

Groups Printed - Class 1

	Hillview Way Southbound				Clearview Way Westbound				Hillview Way Northbound				Clearview Way Eastbound				
Start Time	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Int. Total**
4:00 PM	5	62	0	0	0	0	0	0	0	27	2	0	1	0	0	0	97
4:15 PM	6	73	0	0	0	0	0	0	0	27	2	0	1	0	3	0	112
4:30 PM	7	52	0	0	0	0	0	0	0	38	0	0	1	0	0	0	98
4:45 PM	2	64	0	0	0	0	0	0	0	31	1	0	2	0	1	0	101
Total	20	251	0	0	0	0	0	0	0	123	5	0	5	0	4	0	408
5:00 PM	8	68	0	0	0	0	0	0	0	37	0	0	1	0	2	0	116
5:15 PM	6	90	0	0	0	0	0	0	0	31	1	0	0	0	2	1	131
5:30 PM	3	74	0	0	0	0	0	0	0	33	0	0	1	0	3	0	114
5:45 PM	5	75	0	0	0	0	0	0	0	37	0	0	0	0	2	0	119
Total	22	307	0	0	0	0	0	0	0	138	1	0	2	0	9	1	480
Grand Total	42	558	0	0	0	0	0	0	0	261	6	0	7	0	13	1	888
Apprch %	7.0	93.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	97.8	2.2	0.0	33.3	0.0	61.9	4.8	
Total %	4.7	62.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.4	0.7	0.0	0.8	0.0	1.5	0.1	
PHF =	0.688	0.853	0.000		0.000	0.000	0.000		0.000	0.932	0.250		0.500	0.000	0.750		
PH Volume	22	307	0		0	0	0		0	138	1		2	0	9		

Peak Hour 5:00 to 5:45 PM



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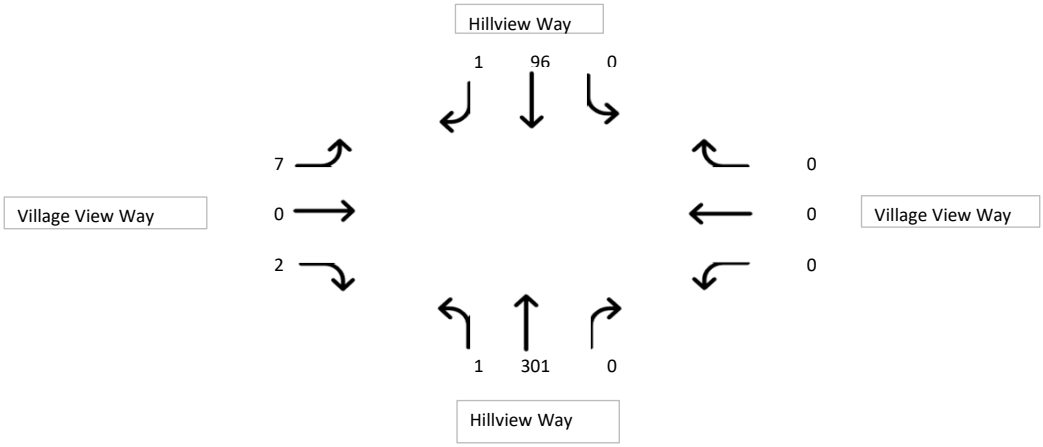
306 W. Railroad St., Suite 104
Missoula, MT 59802

File Name : #3 HILLVIEW&VILLAGEVIE
Site Code : 3
Start Date : 10/28/2021
Page Number : 1

Groups Printed - Class 1

	Hillview Way Southbound				Village View Way Westbound				Hillview Way Northbound				Village View Way Eastbound				
Start Time	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Int. Total**
7:00 AM	0	4	0	0	0	0	0	0	0	31	0	0	0	0	1	0	36
7:15 AM	0	8	0	0	0	0	0	0	0	57	0	0	0	0	0	0	65
7:30 AM	0	15	0	0	0	0	0	0	0	77	0	0	0	0	4	0	96
7:45 AM	0	21	0	0	0	0	0	0	0	57	1	0	2	0	2	0	83
Total	0	48	0	0	0	0	0	0	0	222	1	0	2	0	7	0	280
8:00 AM	1	41	0	0	0	0	0	0	0	84	0	0	0	0	1	0	127
8:15 AM	0	19	0	0	0	0	0	0	0	83	0	0	0	0	0	0	102
8:30 AM	0	23	0	0	0	0	0	0	0	38	0	0	0	0	2	0	63
8:45 AM	2	13	0	0	0	0	0	0	0	50	0	0	0	0	2	0	67
Total	3	96	0	0	0	0	0	0	0	255	0	0	0	0	5	0	359
Grand Total	3	144	0	0	0	0	0	0	0	477	1	0	2	0	12	0	639
Apprch %	2.0	98.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	99.8	0.2	0.0	14.3	0.0	85.7	0.0	
Total %	0.5	22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74.6	0.2	0.0	0.3	0.0	1.9	0.0	
PHF =	0.250	0.585	0.000		0.000	0.000	0.000		0.000	0.896	0.250		0.250	0.000	0.438		
PH Volume	1	96	0		0	0	0		0	301	1		2	0	7		

Peak Hour 7:30 to 8:15 AM



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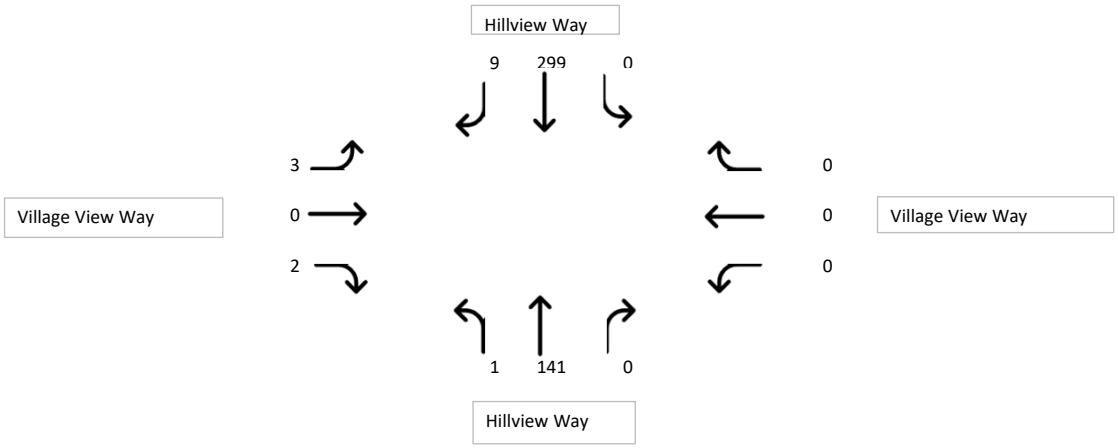
306 W. Railroad St., Suite 104
Missoula, MT 59802

File Name : #3 HILLVIEW&VILLAGEVIE
Site Code : 3
Start Date : 10/28/2021
Page Number : 1

Groups Printed - Class 1

	Hillview Way Southbound				Village View Way Westbound				Hillview Way Northbound				Village View Way Eastbound				
Start Time	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Right**	**Thru**	**Left**	**Peds**	**Int. Total**
4:00 PM	1	59	0	0	0	0	0	0	0	24	1	0	1	0	2	0	88
4:15 PM	2	73	0	0	0	0	0	0	0	28	1	0	0	0	0	0	104
4:30 PM	2	47	0	0	0	0	0	0	0	35	0	0	0	0	1	0	85
4:45 PM	3	59	0	0	0	0	0	0	0	29	0	0	1	0	2	0	94
Total	8	238	0	0	0	0	0	0	0	116	2	0	2	0	5	0	371
5:00 PM	2	68	0	0	0	0	0	0	0	37	0	0	1	0	0	0	108
5:15 PM	3	89	0	0	0	0	0	0	0	35	1	0	0	0	3	0	131
5:30 PM	2	69	0	0	0	0	0	0	0	32	0	0	1	0	0	0	104
5:45 PM	2	73	0	0	0	0	0	0	0	37	0	0	0	0	0	0	112
Total	9	299	0	0	0	0	0	0	0	141	1	0	2	0	3	0	455
Grand Total	17	537	0	0	0	0	0	0	0	257	3	0	4	0	8	0	826
Apprch %	3.1	96.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	98.8	1.2	0.0	33.3	0.0	66.7	0.0	
Total %	2.1	65.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.1	0.4	0.0	0.5	0.0	1.0	0.0	
PHF =	0.750	0.840	0.000		0.000	0.000	0.000		0.000	0.953	0.250		0.500	0.000	0.250		
PH Volume	9	299	0		0	0	0		0	141	1		2	0	3		

Peak Hour 5:00 to 5:45 PM

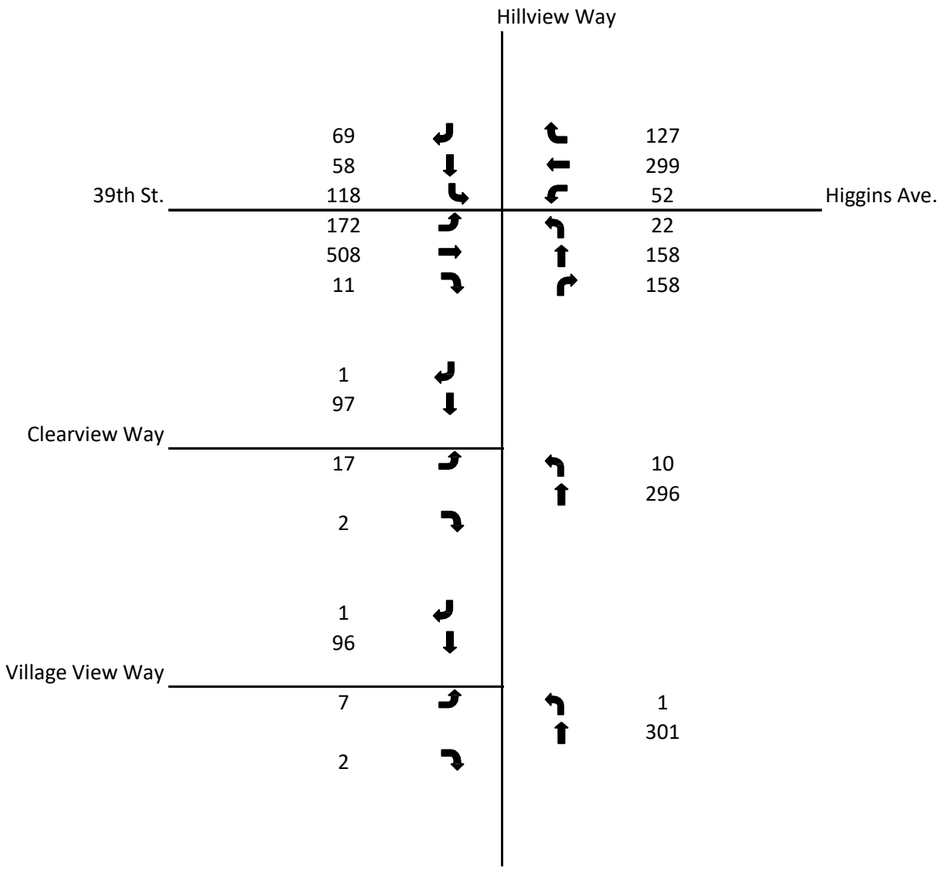


Cushing Terrell

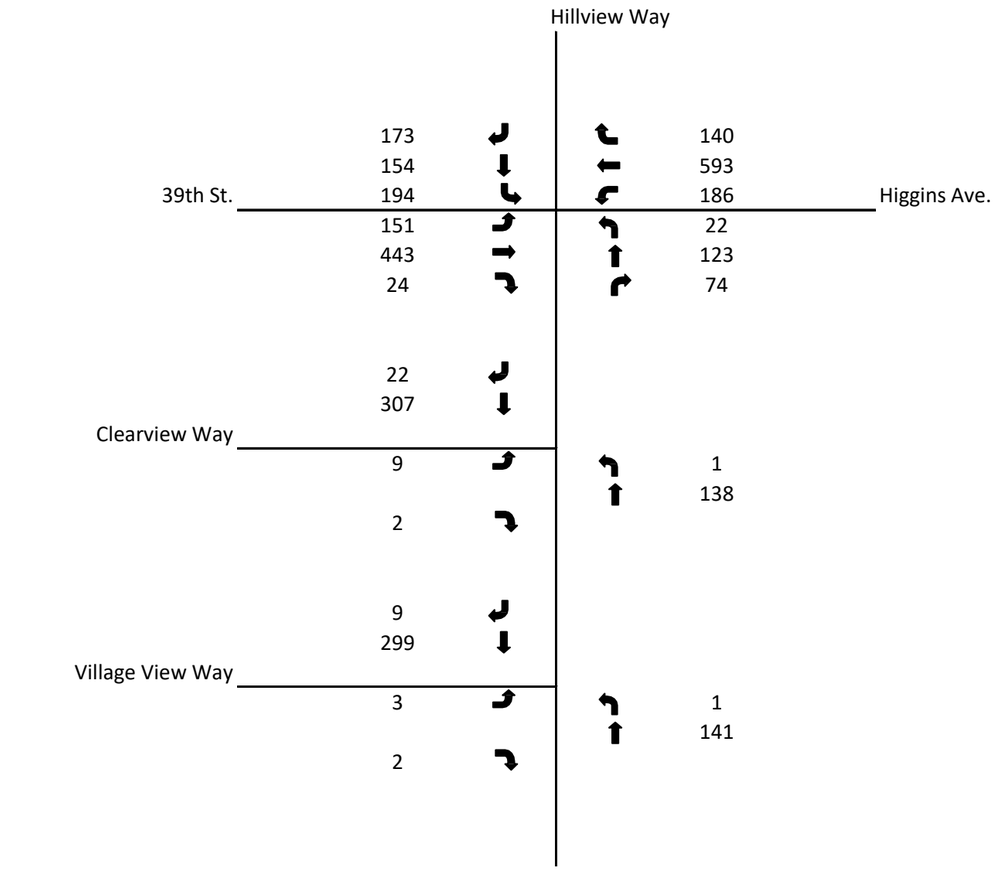
Appendix C: Traffic Model

Hillview Subdivision
Traffic Model

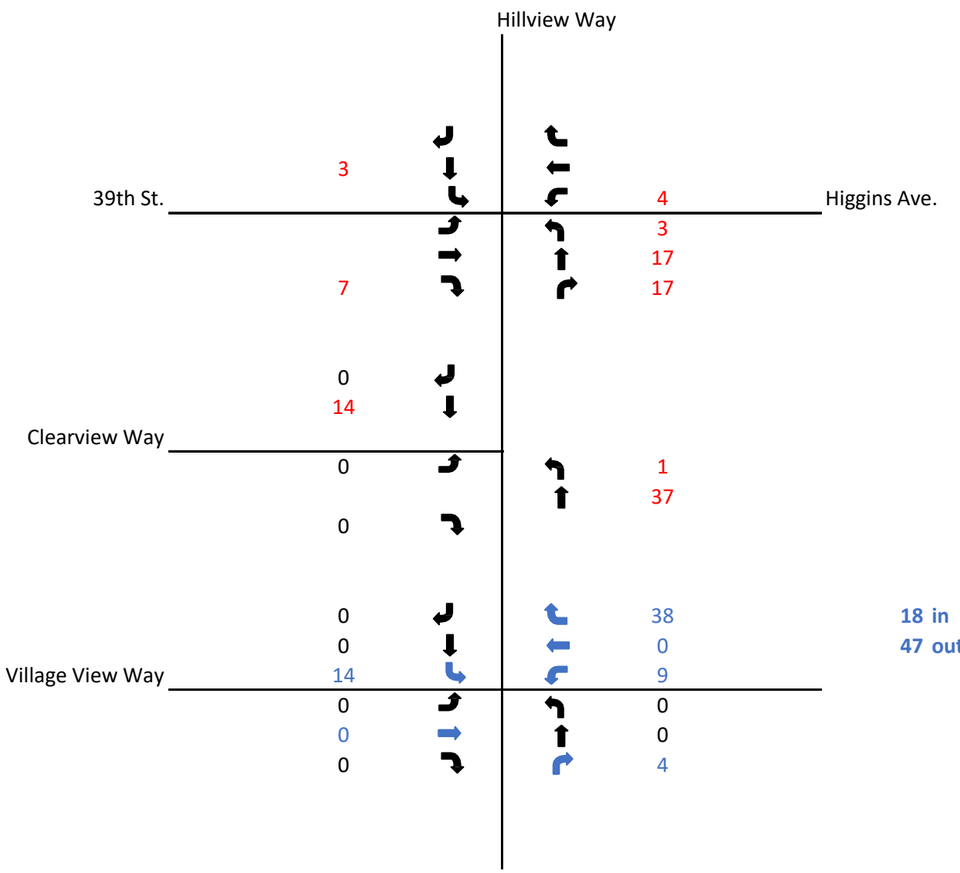
AM Peak Hour
(15 Min x 4)



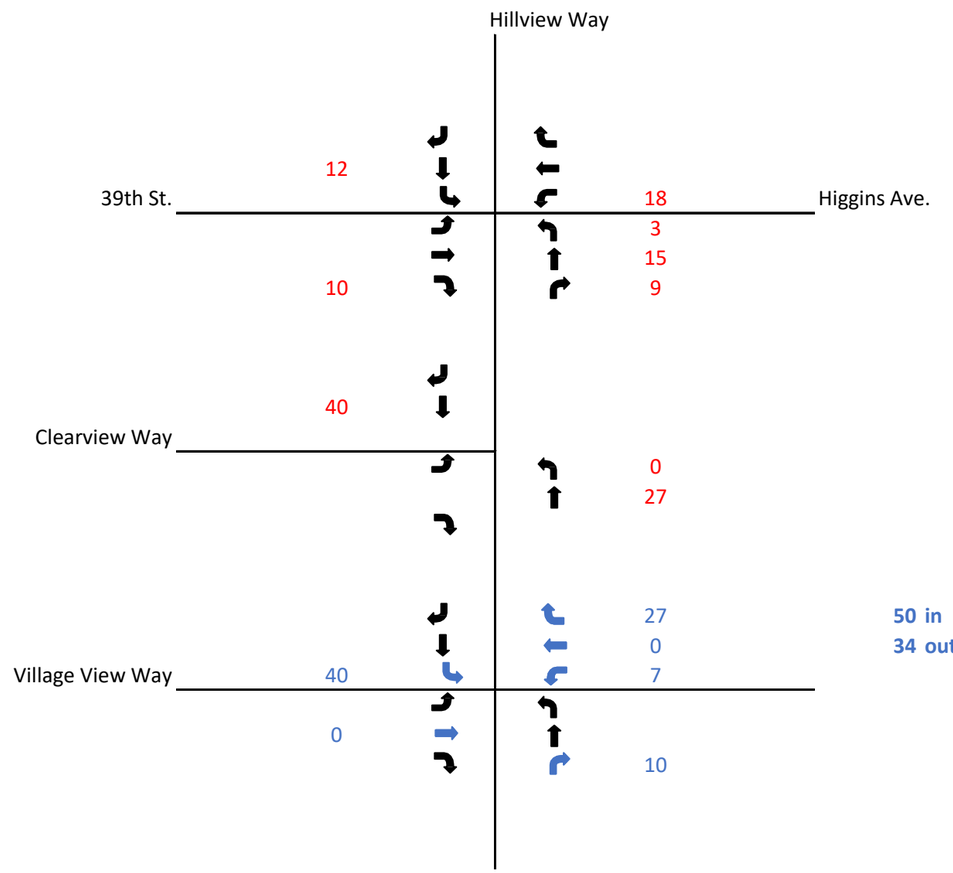
PM Peak Hour
(15 Min x 4)



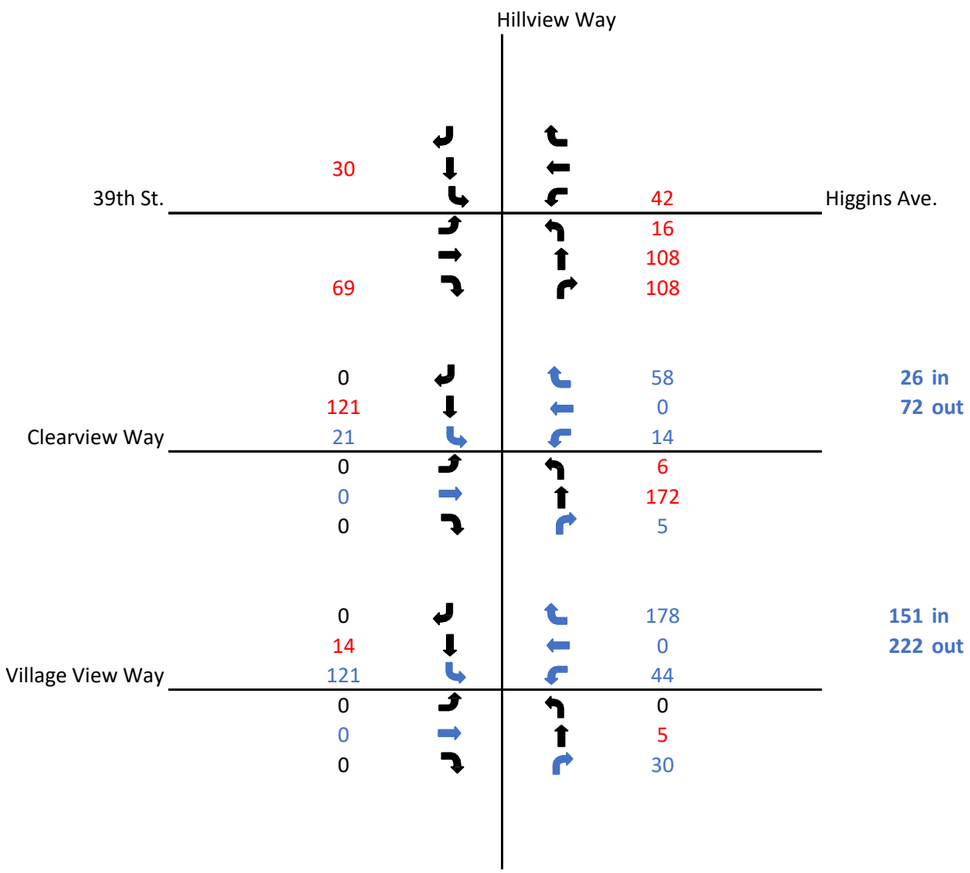
Hillview Subdivision
Traffic Model
Phase 1
AM Peak Hour
Site Generated Traffic



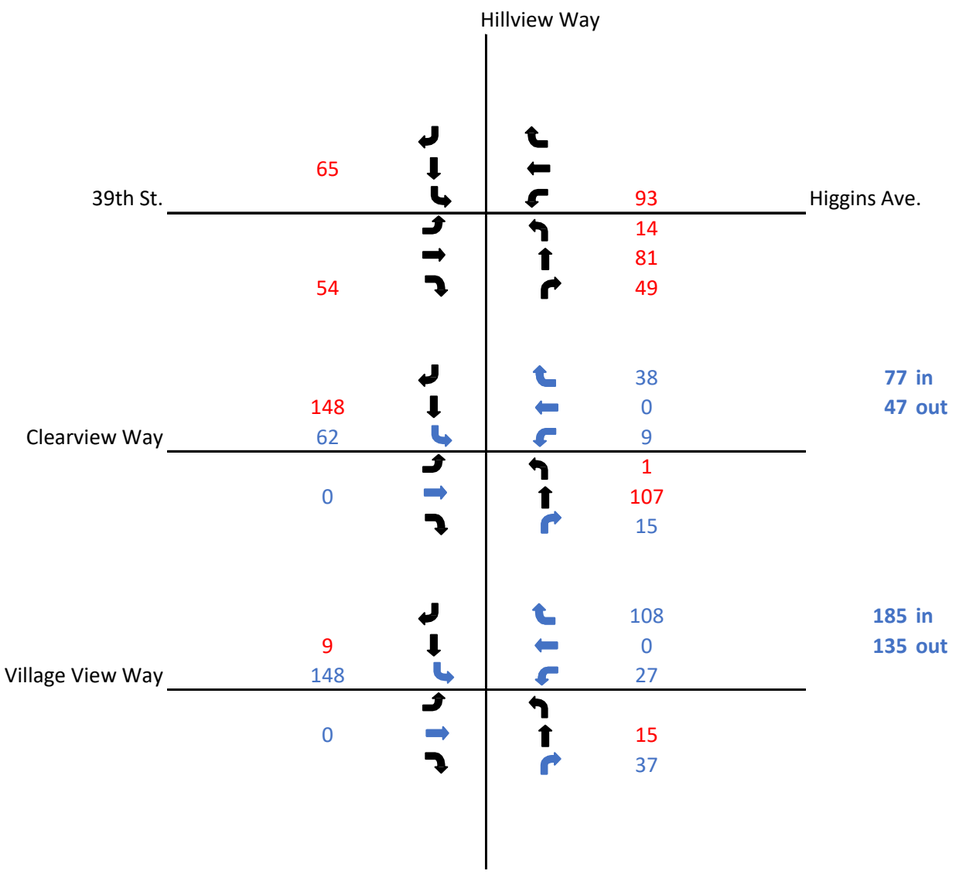
Phase 1
PM Peak Hour
Site Generated Traffic



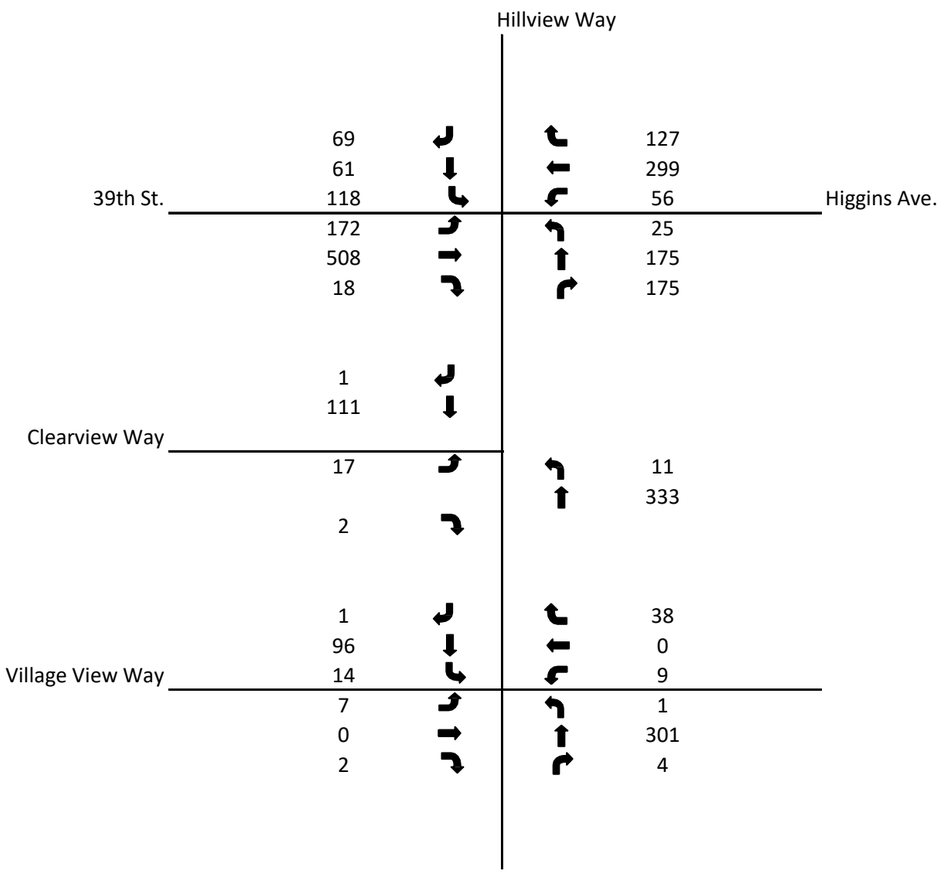
Hillview Subdivision
Traffic Model
Full Build
AM Peak Hour
Site Generated Traffic



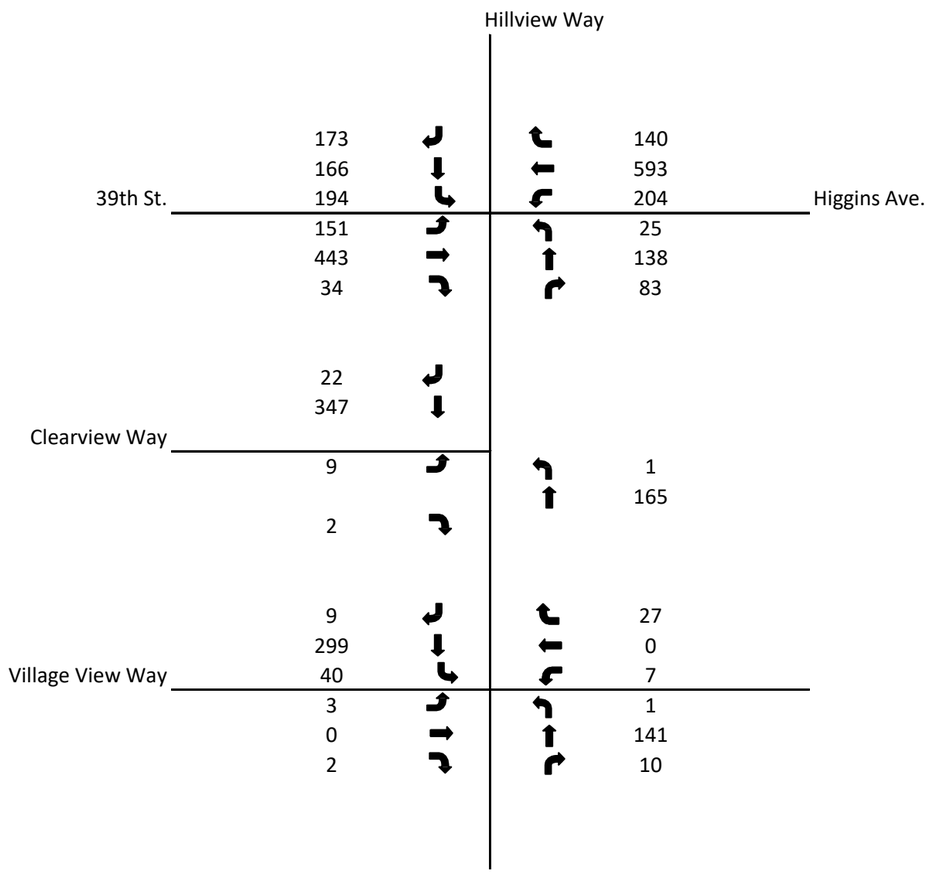
Full Build
PM Peak Hour
Site Generated Traffic



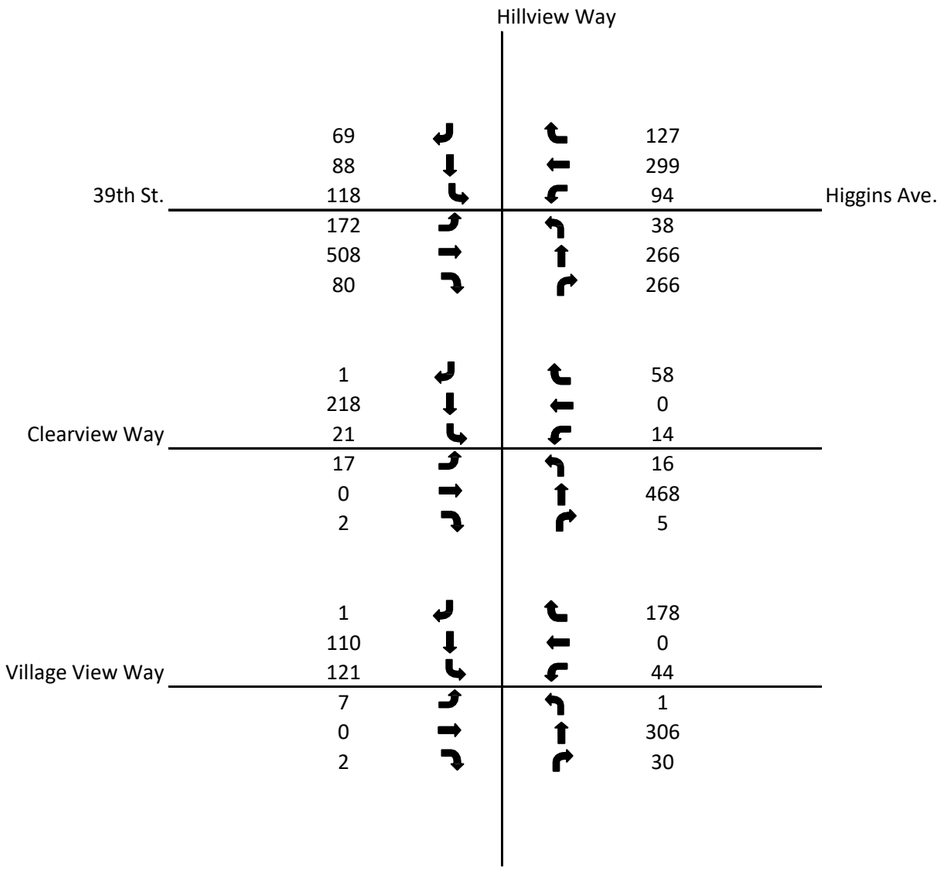
Hillview Subdivision
Traffic Model
Phase 1
AM Peak Hour
Total Projected Traffic



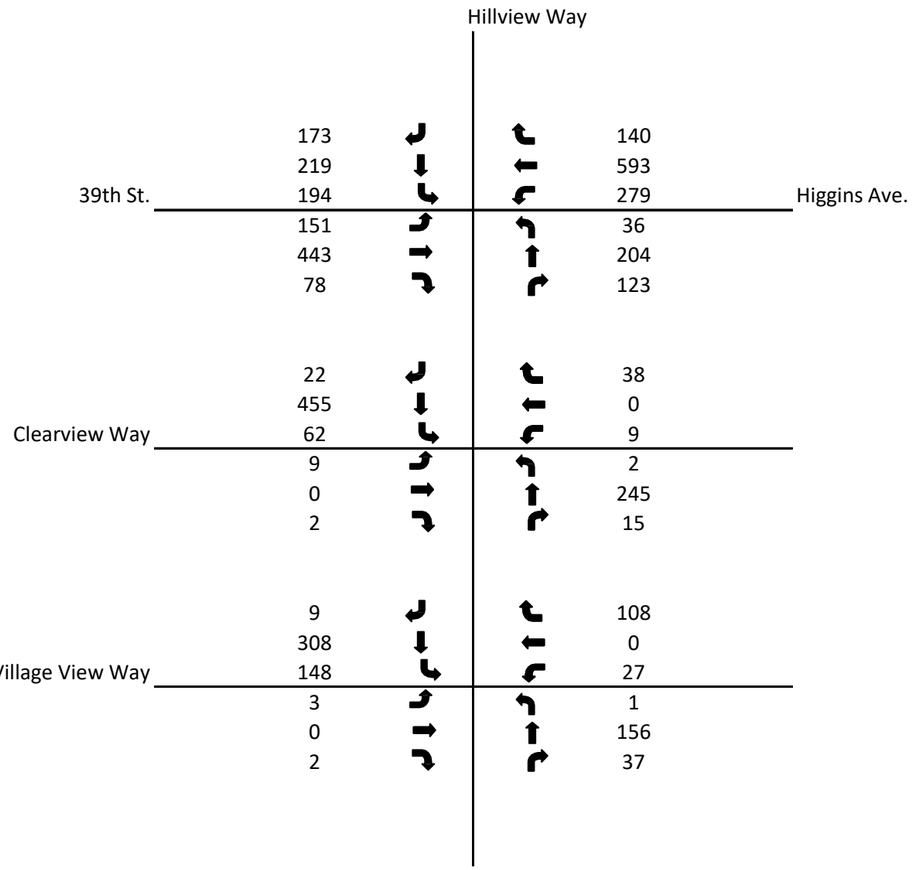
Phase 1
PM Peak Hour
Total Projected Traffic



Hillview Subdivision
Traffic Model
Full Build
AM Peak Hour
Total Projected Traffic



Full Build
PM Peak Hour
Total Projected Traffic

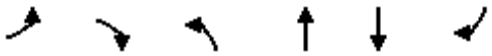


Cushing Terrell

Appendix D: LOS Calculations

HCM Unsignalized Intersection Capacity Analysis
6: Hillview Way & Village View Way

11/22/2021



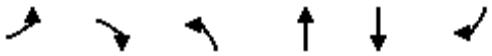
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	2	1	301	96	1
Future Volume (Veh/h)	7	2	1	301	96	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	2	1	327	104	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	434	104	105			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	434	104	105			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	579	950	1486			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	10	328	105
Volume Left	8	1	0
Volume Right	2	0	1
cSH	628	1486	1700
Volume to Capacity	0.02	0.00	0.06
Queue Length 95th (ft)	1	0	0
Control Delay (s)	10.8	0.0	0.0
Lane LOS	B	A	
Approach Delay (s)	10.8	0.0	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	26.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
6: Hillview Way & Village View Way

11/22/2021



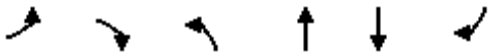
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	2	1	141	299	9
Future Volume (Veh/h)	3	2	1	141	299	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	2	1	153	325	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)					478	
pX, platoon unblocked						
vC, conflicting volume	485	330	335			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	485	330	335			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	541	712	1224			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	5	154	335
Volume Left	3	1	0
Volume Right	2	0	10
cSH	598	1224	1700
Volume to Capacity	0.01	0.00	0.20
Queue Length 95th (ft)	1	0	0
Control Delay (s)	11.1	0.1	0.0
Lane LOS	B	A	
Approach Delay (s)	11.1	0.1	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	26.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Hillview Way & Clearview Way

11/22/2021



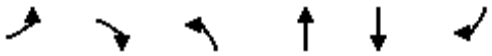
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	2	10	296	97	1
Future Volume (Veh/h)	17	2	10	296	97	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	2	11	322	105	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	450	106	106			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	450	106	106			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	100	99			
cM capacity (veh/h)	563	949	1485			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	20	333	106
Volume Left	18	11	0
Volume Right	2	0	1
cSH	587	1485	1700
Volume to Capacity	0.03	0.01	0.06
Queue Length 95th (ft)	3	1	0
Control Delay (s)	11.4	0.3	0.0
Lane LOS	B	A	
Approach Delay (s)	11.4	0.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	32.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Hillview Way & Clearview Way

11/29/2021



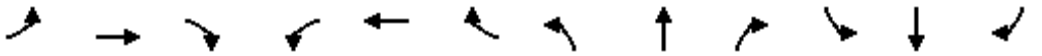
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	9	2	1	138	307	22
Future Volume (Veh/h)	9	2	1	138	307	22
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	2	1	150	334	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	498	346	358			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	498	346	358			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	531	697	1201			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	12	151	358
Volume Left	10	1	0
Volume Right	2	0	24
cSH	553	1201	1700
Volume to Capacity	0.02	0.00	0.21
Queue Length 95th (ft)	2	0	0
Control Delay (s)	11.7	0.1	0.0
Lane LOS	B	A	
Approach Delay (s)	11.7	0.1	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	27.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
9: Hillview Way/Russell Street & 39th Street/Higgins Avenue

12/27/2021



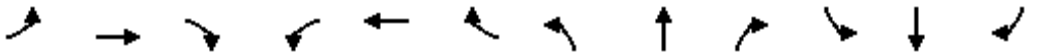
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	172	508	11	52	299	127	22	158	158	118	58	69
Future Volume (vph)	172	508	11	52	299	127	22	158	158	118	58	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.38	1.00	1.00	0.31	1.00	1.00	0.72	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	707	1863	1583	571	1863	1583	1334	1863	1583	1208	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	187	552	12	57	325	138	24	172	172	128	63	75
RTOR Reduction (vph)	0	0	7	0	0	94	0	0	115	0	0	50
Lane Group Flow (vph)	187	552	5	57	325	44	24	172	57	128	63	25
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	37.4	29.5	29.5	27.6	23.7	23.7	24.5	24.5	24.5	24.5	24.5	24.5
Effective Green, g (s)	37.4	29.5	29.5	27.6	23.7	23.7	24.5	24.5	24.5	24.5	24.5	24.5
Actuated g/C Ratio	0.51	0.40	0.40	0.37	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.33
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	497	743	631	276	597	507	442	617	524	400	617	524
v/s Ratio Prot	c0.05	c0.30		0.01	0.17			0.09			0.03	
v/s Ratio Perm	0.14		0.00	0.07		0.03	0.02		0.04	c0.11		0.02
v/c Ratio	0.38	0.74	0.01	0.21	0.54	0.09	0.05	0.28	0.11	0.32	0.10	0.05
Uniform Delay, d1	10.8	19.0	13.4	15.4	20.7	17.5	16.8	18.2	17.1	18.5	17.1	16.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	4.0	0.0	0.4	1.0	0.1	0.2	1.1	0.4	2.1	0.3	0.2
Delay (s)	11.2	23.0	13.4	15.8	21.7	17.6	17.0	19.3	17.5	20.6	17.4	16.9
Level of Service	B	C	B	B	C	B	B	B	B	C	B	B
Approach Delay (s)		19.9			20.0			18.3			18.8	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	73.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Hillview Way/Russell Street & 39th Street/Higgins Avenue

12/27/2021



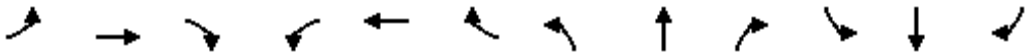
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	151	443	24	186	593	140	22	123	74	194	154	173
Future Volume (vph)	151	443	24	186	593	140	22	123	74	194	154	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.14	1.00	1.00	0.31	1.00	1.00	0.65	1.00	1.00	0.67	1.00	1.00
Satd. Flow (perm)	267	1863	1583	574	1863	1583	1214	1863	1583	1250	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	164	482	26	202	645	152	24	134	80	211	167	188
RTOR Reduction (vph)	0	0	16	0	0	91	0	0	57	0	0	133
Lane Group Flow (vph)	164	482	10	202	645	61	24	134	23	211	167	55
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	42.5	33.0	33.0	42.5	33.0	33.0	24.2	24.2	24.2	24.2	24.2	24.2
Effective Green, g (s)	42.5	33.0	33.0	42.5	33.0	33.0	24.2	24.2	24.2	24.2	24.2	24.2
Actuated g/C Ratio	0.51	0.40	0.40	0.51	0.40	0.40	0.29	0.29	0.29	0.29	0.29	0.29
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	309	743	631	432	743	631	355	545	463	365	545	463
v/s Ratio Prot	c0.06	0.26		0.05	c0.35			0.07			0.09	
v/s Ratio Perm	0.21		0.01	0.19		0.04	0.02		0.01	c0.17		0.03
v/c Ratio	0.53	0.65	0.02	0.47	0.87	0.10	0.07	0.25	0.05	0.58	0.31	0.12
Uniform Delay, d1	14.4	20.2	15.0	12.2	22.8	15.5	21.1	22.3	21.0	24.9	22.7	21.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	2.0	0.0	0.8	10.5	0.1	0.4	1.1	0.2	6.5	1.5	0.5
Delay (s)	16.1	22.1	15.0	13.0	33.4	15.6	21.5	23.4	21.2	31.4	24.2	22.0
Level of Service	B	C	B	B	C	B	C	C	C	C	C	C
Approach Delay (s)		20.4			26.5			22.5			26.1	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	82.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Hillview Way & Village View Way

11/29/2021



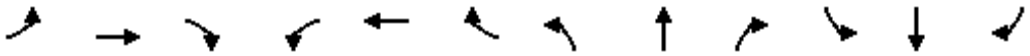
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	0	2	9	0	38	1	301	4	14	96	1
Future Volume (Veh/h)	7	0	2	9	0	38	1	301	4	14	96	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	0	2	10	0	41	1	327	4	15	104	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	506	468	104	468	466	329	105			331		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	506	468	104	468	466	329	105			331		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	98	100	94	100			99		
cM capacity (veh/h)	445	487	950	500	488	712	1486			1228		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	10	51	332	120
Volume Left	8	10	1	15
Volume Right	2	41	4	1
cSH	498	658	1486	1228
Volume to Capacity	0.02	0.08	0.00	0.01
Queue Length 95th (ft)	2	6	0	1
Control Delay (s)	12.4	10.9	0.0	1.1
Lane LOS	B	B	A	A
Approach Delay (s)	12.4	10.9	0.0	1.1
Approach LOS	B	B		

Intersection Summary				
Average Delay	1.6			
Intersection Capacity Utilization	26.3%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
6: Hillview Way & Village View Way

11/29/2021



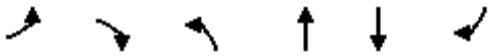
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	0	2	7	0	27	1	141	10	40	299	9
Future Volume (Veh/h)	3	0	2	7	0	27	1	141	10	40	299	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	0	2	8	0	29	1	153	11	43	325	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	606	582	330	578	582	158	335			164		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	606	582	330	578	582	158	335			164		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	100	100	98	100	97	100			97		
cM capacity (veh/h)	387	411	712	415	412	887	1224			1414		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	5	37	165	378
Volume Left	3	8	1	43
Volume Right	2	29	11	10
cSH	473	712	1224	1414
Volume to Capacity	0.01	0.05	0.00	0.03
Queue Length 95th (ft)	1	4	0	2
Control Delay (s)	12.7	10.3	0.1	1.1
Lane LOS	B	B	A	A
Approach Delay (s)	12.7	10.3	0.1	1.1
Approach LOS	B	B		

Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	39.9%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: Hillview Way & Clearview Way

11/29/2021



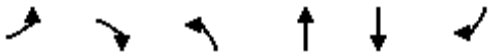
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	2	11	333	111	1
Future Volume (Veh/h)	17	2	11	333	111	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	2	12	362	121	1
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	508	122	122			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	508	122	122			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	100	99			
cM capacity (veh/h)	521	930	1465			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	20	374	122
Volume Left	18	12	0
Volume Right	2	0	1
cSH	545	1465	1700
Volume to Capacity	0.04	0.01	0.07
Queue Length 95th (ft)	3	1	0
Control Delay (s)	11.9	0.3	0.0
Lane LOS	B	A	
Approach Delay (s)	11.9	0.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	34.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
3: Hillview Way & Clearview Way

11/29/2021



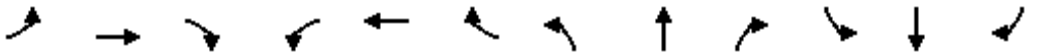
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	9	2	1	165	347	22
Future Volume (Veh/h)	9	2	1	165	347	22
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	2	1	179	377	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	570	389	401			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	570	389	401			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	483	659	1158			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	12	180	401
Volume Left	10	1	0
Volume Right	2	0	24
cSH	505	1158	1700
Volume to Capacity	0.02	0.00	0.24
Queue Length 95th (ft)	2	0	0
Control Delay (s)	12.3	0.1	0.0
Lane LOS	B	A	
Approach Delay (s)	12.3	0.1	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	29.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
9: Hillview Way/Russell Street & 39th Street/Higgins Avenue

12/27/2021



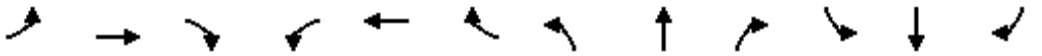
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	172	508	18	56	299	127	25	175	175	118	61	69
Future Volume (vph)	172	508	18	56	299	127	25	175	175	118	61	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.38	1.00	1.00	0.31	1.00	1.00	0.71	1.00	1.00	0.64	1.00	1.00
Satd. Flow (perm)	707	1863	1583	571	1863	1583	1330	1863	1583	1188	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	187	552	20	61	325	138	27	190	190	128	66	75
RTOR Reduction (vph)	0	0	12	0	0	94	0	0	127	0	0	50
Lane Group Flow (vph)	187	552	8	61	325	44	27	190	63	128	66	25
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	37.4	29.5	29.5	27.6	23.7	23.7	24.5	24.5	24.5	24.5	24.5	24.5
Effective Green, g (s)	37.4	29.5	29.5	27.6	23.7	23.7	24.5	24.5	24.5	24.5	24.5	24.5
Actuated g/C Ratio	0.51	0.40	0.40	0.37	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.33
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	497	743	631	276	597	507	440	617	524	393	617	524
v/s Ratio Prot	c0.05	c0.30		0.01	0.17			0.10			0.04	
v/s Ratio Perm	0.14		0.01	0.07		0.03	0.02		0.04	c0.11		0.02
v/c Ratio	0.38	0.74	0.01	0.22	0.54	0.09	0.06	0.31	0.12	0.33	0.11	0.05
Uniform Delay, d1	10.8	19.0	13.4	15.5	20.7	17.5	16.9	18.4	17.2	18.5	17.1	16.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	4.0	0.0	0.4	1.0	0.1	0.3	1.3	0.5	2.2	0.3	0.2
Delay (s)	11.2	23.0	13.4	15.9	21.7	17.6	17.1	19.7	17.7	20.7	17.5	16.9
Level of Service	B	C	B	B	C	B	B	B	B	C	B	B
Approach Delay (s)		19.8			19.9			18.6			18.9	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	73.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Hillview Way/Russell Street & 39th Street/Higgins Avenue

12/27/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	151	443	34	204	593	140	25	138	83	194	166	173
Future Volume (vph)	151	443	34	204	593	140	25	138	83	194	166	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.14	1.00	1.00	0.30	1.00	1.00	0.63	1.00	1.00	0.66	1.00	1.00
Satd. Flow (perm)	268	1863	1583	566	1863	1583	1174	1863	1583	1232	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	164	482	37	222	645	152	27	150	90	211	180	188
RTOR Reduction (vph)	0	0	22	0	0	91	0	0	64	0	0	133
Lane Group Flow (vph)	164	482	15	222	645	61	27	150	26	211	180	55
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	42.3	32.8	32.8	42.7	33.0	33.0	24.2	24.2	24.2	24.2	24.2	24.2
Effective Green, g (s)	42.3	32.8	32.8	42.7	33.0	33.0	24.2	24.2	24.2	24.2	24.2	24.2
Actuated g/C Ratio	0.51	0.40	0.40	0.52	0.40	0.40	0.29	0.29	0.29	0.29	0.29	0.29
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	309	738	627	433	743	631	343	545	463	360	545	463
v/s Ratio Prot	c0.06	0.26		0.06	c0.35			0.08			0.10	
v/s Ratio Perm	0.21		0.01	0.20		0.04	0.02		0.02	c0.17		0.03
v/c Ratio	0.53	0.65	0.02	0.51	0.87	0.10	0.08	0.28	0.06	0.59	0.33	0.12
Uniform Delay, d1	14.4	20.3	15.2	12.3	22.8	15.5	21.2	22.5	21.0	25.0	22.9	21.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	2.1	0.0	1.0	10.5	0.1	0.4	1.2	0.2	6.8	1.6	0.5
Delay (s)	16.2	22.4	15.2	13.3	33.4	15.6	21.6	23.8	21.3	31.8	24.5	22.0
Level of Service	B	C	B	B	C	B	C	C	C	C	C	C
Approach Delay (s)		20.5			26.3			22.7			26.3	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	24.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	82.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	75.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
6: Hillview Way & Village View Way

11/29/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	7	0	2	44	0	178	1	306	30	121	110	1
Future Volume (Veh/h)	7	0	2	44	0	178	1	306	30	121	110	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	8	0	2	48	0	193	1	333	33	132	120	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	929	752	120	738	736	350	121			366		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	929	752	120	738	736	350	121			366		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	100	84	100	72	100			89		
cM capacity (veh/h)	164	301	931	305	308	694	1467			1193		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	10	241	367	253
Volume Left	8	48	1	132
Volume Right	2	193	33	1
cSH	196	553	1467	1193
Volume to Capacity	0.05	0.44	0.00	0.11
Queue Length 95th (ft)	4	55	0	9
Control Delay (s)	24.3	16.4	0.0	4.9
Lane LOS	C	C	A	A
Approach Delay (s)	24.3	16.4	0.0	4.9
Approach LOS	C	C		

Intersection Summary				
Average Delay	6.3			
Intersection Capacity Utilization	53.4%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
6: Hillview Way & Village View Way

11/29/2021

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	0	2	27	0	108	1	156	37	148	308	9
Future Volume (Veh/h)	3	0	2	27	0	108	1	156	37	148	308	9
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	0	2	29	0	117	1	170	40	161	335	10
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	971	874	340	856	859	190	345			210		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	971	874	340	856	859	190	345			210		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	88	100	86	100			88		
cM capacity (veh/h)	182	254	702	252	259	852	1214			1361		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	5	146	211	506
Volume Left	3	29	1	161
Volume Right	2	117	40	10
cSH	259	578	1214	1361
Volume to Capacity	0.02	0.25	0.00	0.12
Queue Length 95th (ft)	1	25	0	10
Control Delay (s)	19.2	13.3	0.0	3.4
Lane LOS	C	B	A	A
Approach Delay (s)	19.2	13.3	0.0	3.4
Approach LOS	C	B		

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	53.6%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: Hillview Way & Clearview Way

11/29/2021

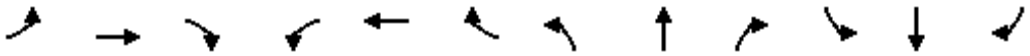
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	17	0	2	14	0	58	16	468	5	21	218	1
Future Volume (Veh/h)	17	0	2	14	0	58	16	468	5	21	218	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	0	2	15	0	63	17	509	5	23	237	1
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	892	832	238	831	830	512	238			514		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	892	832	238	831	830	512	238			514		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	100	100	95	100	89	99			98		
cM capacity (veh/h)	227	295	801	281	295	562	1329			1052		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	20	78	531	261
Volume Left	18	15	17	23
Volume Right	2	63	5	1
cSH	245	471	1329	1052
Volume to Capacity	0.08	0.17	0.01	0.02
Queue Length 95th (ft)	7	15	1	2
Control Delay (s)	21.0	14.1	0.4	0.9
Lane LOS	C	B	A	A
Approach Delay (s)	21.0	14.1	0.4	0.9
Approach LOS	C	B		

Intersection Summary				
Average Delay	2.2			
Intersection Capacity Utilization	39.4%	ICU Level of Service	A	
Analysis Period (min)	15			

HCM Unsignalized Intersection Capacity Analysis
3: Hillview Way & Clearview Way

11/29/2021



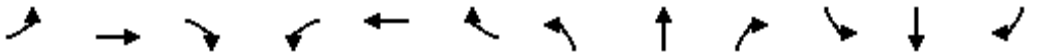
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	0	2	9	0	38	2	245	15	62	455	22
Future Volume (Veh/h)	9	0	2	9	0	38	2	245	15	62	455	22
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	10	0	2	10	0	41	2	266	16	67	495	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	960	927	507	921	931	274	519			282		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	960	927	507	921	931	274	519			282		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	100	100	96	100	95	100			95		
cM capacity (veh/h)	214	254	566	240	252	765	1047			1280		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	12	51	284	586
Volume Left	10	10	2	67
Volume Right	2	41	16	24
cSH	239	535	1047	1280
Volume to Capacity	0.05	0.10	0.00	0.05
Queue Length 95th (ft)	4	8	0	4
Control Delay (s)	20.9	12.4	0.1	1.4
Lane LOS	C	B	A	A
Approach Delay (s)	20.9	12.4	0.1	1.4
Approach LOS	C	B		

Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	56.0%	ICU Level of Service	B	
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis
9: Hillview Way/Russell Street & 39th Street/Higgins Avenue

12/27/2021



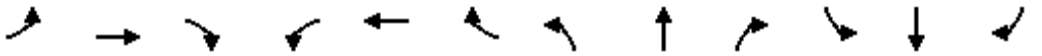
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	172	508	80	94	299	127	38	266	266	118	88	69
Future Volume (vph)	172	508	80	94	299	127	38	266	266	118	88	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.40	1.00	1.00	0.26	1.00	1.00	0.69	1.00	1.00	0.49	1.00	1.00
Satd. Flow (perm)	746	1863	1583	481	1863	1583	1294	1863	1583	919	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	187	552	87	102	325	138	41	289	289	128	96	75
RTOR Reduction (vph)	0	0	54	0	0	91	0	0	195	0	0	51
Lane Group Flow (vph)	187	552	33	102	325	47	41	289	94	128	96	24
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	38.4	29.0	29.0	31.6	25.6	25.6	24.5	24.5	24.5	24.5	24.5	24.5
Effective Green, g (s)	38.4	29.0	29.0	31.6	25.6	25.6	24.5	24.5	24.5	24.5	24.5	24.5
Actuated g/C Ratio	0.51	0.38	0.38	0.42	0.34	0.34	0.32	0.32	0.32	0.32	0.32	0.32
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	506	715	608	303	631	536	419	604	513	298	604	513
v/s Ratio Prot	c0.05	c0.30		0.03	0.17			c0.16			0.05	
v/s Ratio Perm	0.14		0.02	0.11		0.03	0.03		0.06	0.14		0.02
v/c Ratio	0.37	0.77	0.05	0.34	0.52	0.09	0.10	0.48	0.18	0.43	0.16	0.05
Uniform Delay, d1	10.8	20.4	14.6	14.5	20.0	17.0	17.8	20.4	18.3	20.0	18.2	17.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	5.2	0.0	0.7	0.7	0.1	0.5	2.7	0.8	4.5	0.6	0.2
Delay (s)	11.2	25.5	14.7	15.1	20.7	17.1	18.3	23.1	19.1	24.5	18.7	17.7
Level of Service	B	C	B	B	C	B	B	C	B	C	B	B
Approach Delay (s)		21.1			18.8			20.9			20.9	
Approach LOS		C			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	20.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	75.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
9: Hillview Way/Russell Street & 39th Street/Higgins Avenue

12/27/2021



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	151	443	78	279	593	140	36	204	123	194	219	173
Future Volume (vph)	151	443	78	279	593	140	36	204	123	194	219	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.15	1.00	1.00	0.28	1.00	1.00	0.54	1.00	1.00	0.56	1.00	1.00
Satd. Flow (perm)	278	1863	1583	530	1863	1583	1001	1863	1583	1049	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	164	482	85	303	645	152	39	222	134	211	238	188
RTOR Reduction (vph)	0	0	52	0	0	91	0	0	95	0	0	133
Lane Group Flow (vph)	164	482	33	303	645	61	39	222	39	211	238	55
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	41.2	31.8	31.8	43.6	33.0	33.0	24.2	24.2	24.2	24.2	24.2	24.2
Effective Green, g (s)	41.2	31.8	31.8	43.6	33.0	33.0	24.2	24.2	24.2	24.2	24.2	24.2
Actuated g/C Ratio	0.50	0.38	0.38	0.53	0.40	0.40	0.29	0.29	0.29	0.29	0.29	0.29
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	308	717	609	438	744	632	293	545	463	307	545	463
v/s Ratio Prot	0.06	0.26		c0.09	c0.35			0.12			0.13	
v/s Ratio Perm	0.20		0.02	0.28		0.04	0.04		0.02	c0.20		0.03
v/c Ratio	0.53	0.67	0.05	0.69	0.87	0.10	0.13	0.41	0.08	0.69	0.44	0.12
Uniform Delay, d1	14.7	21.1	16.0	12.8	22.8	15.5	21.5	23.4	21.2	25.9	23.7	21.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	2.5	0.0	4.7	10.4	0.1	0.9	2.3	0.4	11.9	2.5	0.5
Delay (s)	16.4	23.6	16.0	17.5	33.2	15.6	22.4	25.7	21.5	37.7	26.2	21.9
Level of Service	B	C	B	B	C	B	C	C	C	D	C	C
Approach Delay (s)		21.1			26.4			24.0			28.8	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	25.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	82.6	Sum of lost time (s)	16.0
Intersection Capacity Utilization	79.4%	ICU Level of Service	D
Analysis Period (min)	15		

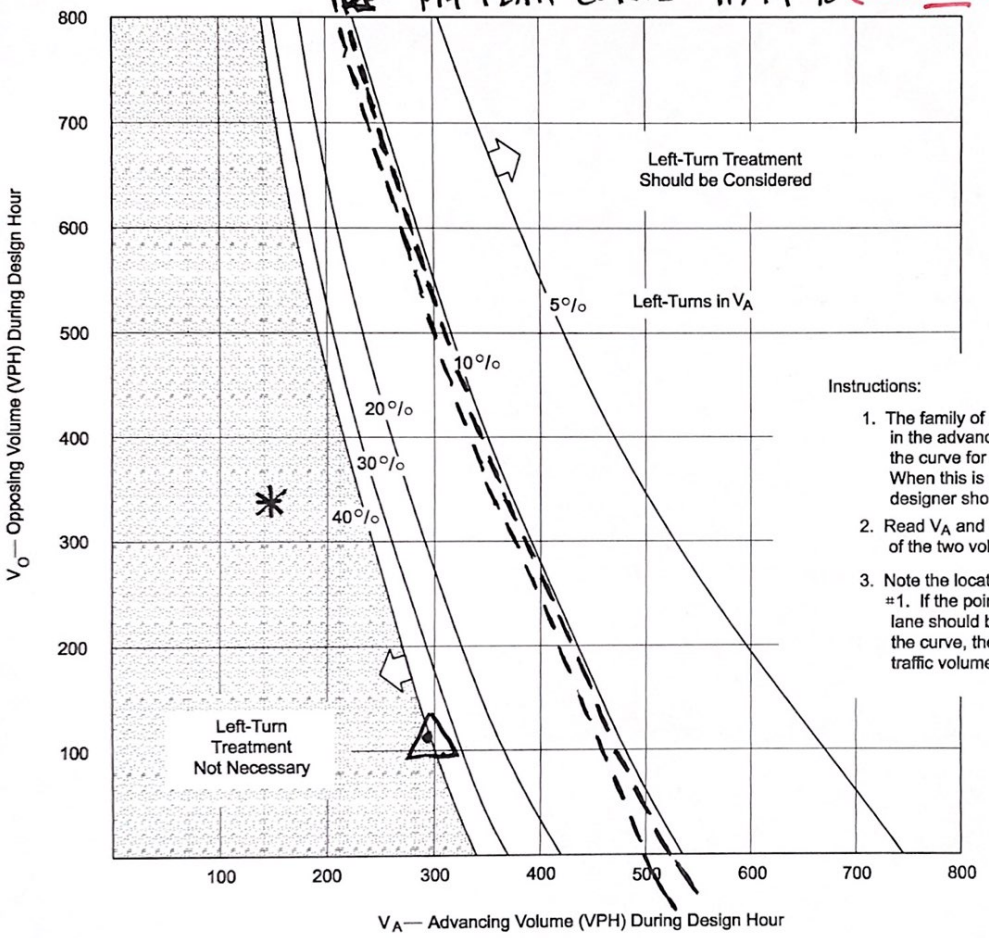
c Critical Lane Group

Cushing Terrell

Appendix E: Left-Turn Lane Warrants

PHASE 1 (2022)
Village View WAY

← AM PEAK CURVE = 12.61% (LTL NOT NEEDED)
← PM PEAK CURVE = 11.49% (LTL NOT NEEDED)



V_A = Total advancing traffic volume which includes all turning traffic

V_O = Total opposing traffic volume which includes all turning traffic

Instructions:

1. The family of curves represent the percent of left turns in the advancing volume (V_A). The designer should locate the curve for the actual percentage of left turns. When this is not an even increment of five, the designer should estimate where the curve lies.
2. Read V_A and V_O into the chart and locate the intersection of the two volumes.
3. Note the location of the point in #2 relative to the curve in #1. If the point is to the right of the curve, then a left-turn lane should be considered. If the point is to the left of the curve, then a left-turn lane is not warranted based on traffic volumes.

△ AM PEAK HOUR

✳ PM PEAK HOUR

AM curve = $\frac{14 \text{ vph}}{111 \text{ vph}} = 12.61\%$

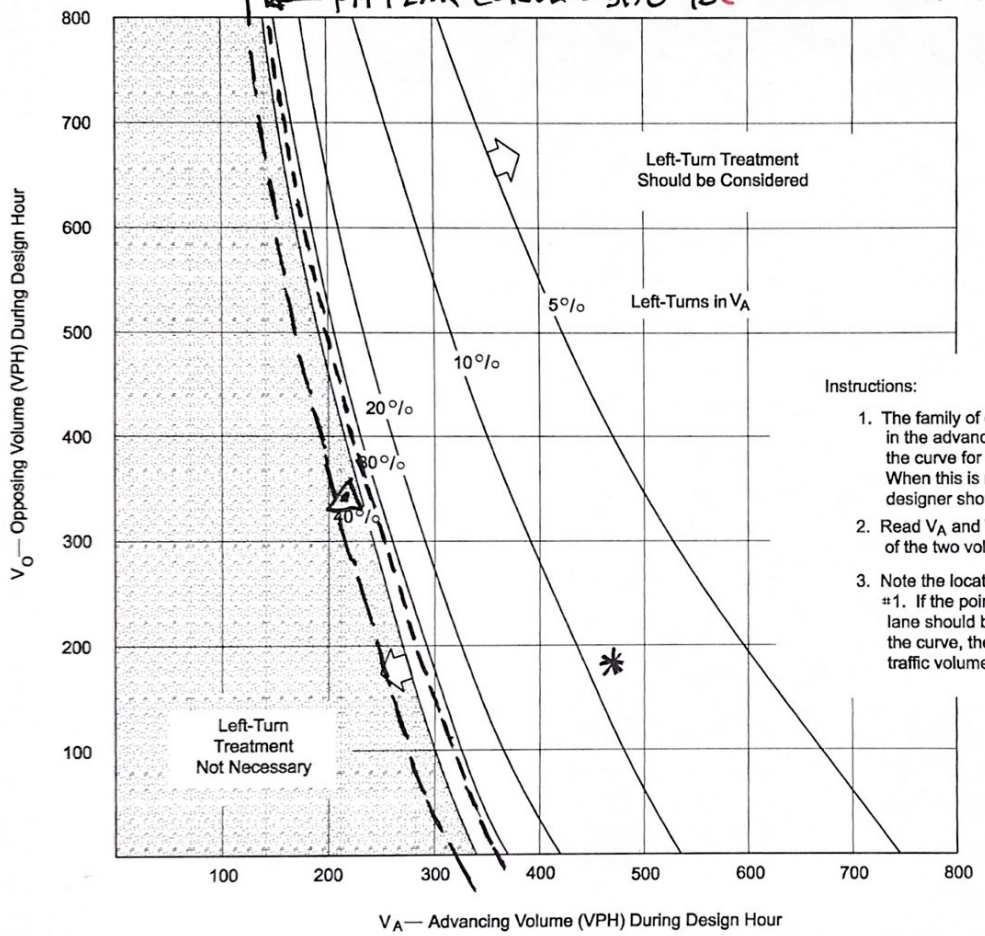
PM curve = $\frac{40 \text{ vph}}{348 \text{ vph}} = 11.49\%$

VOLUME GUIDELINES FOR LEFT-TURN LANES AT UNSIGNALIZED INTERSECTIONS ON 2-LANE HIGHWAYS (45 MPH) (US Customary)

Figure 28.4F

FULL Build-out (2029)
(Village View way)

← AM PEAK CURVE = 52.2% (LTL IS NEEDED)
← PM PEAK CURVE = 31.8% (LTL IS NEEDED)



V_A = Total advancing traffic volume which includes all turning traffic

V_O = Total opposing traffic volume which includes all turning traffic

Instructions:

1. The family of curves represent the percent of left turns in the advancing volume (V_A). The designer should locate the curve for the actual percentage of left turns. When this is not an even increment of five, the designer should estimate where the curve lies.
2. Read V_A and V_O into the chart and locate the intersection of the two volumes.
3. Note the location of the point in #2 relative to the curve in #1. If the point is to the right of the curve, then a left-turn lane should be considered. If the point is to the left of the curve, then a left-turn lane is not warranted based on traffic volumes.

△ AM PEAK HOUR
* PM PEAK HOUR

AM Curve = $\frac{121 \text{ vph}}{232 \text{ vph}} = 52.2\%$

PM Curve = $\frac{148 \text{ vph}}{465 \text{ vph}} = 31.8\%$

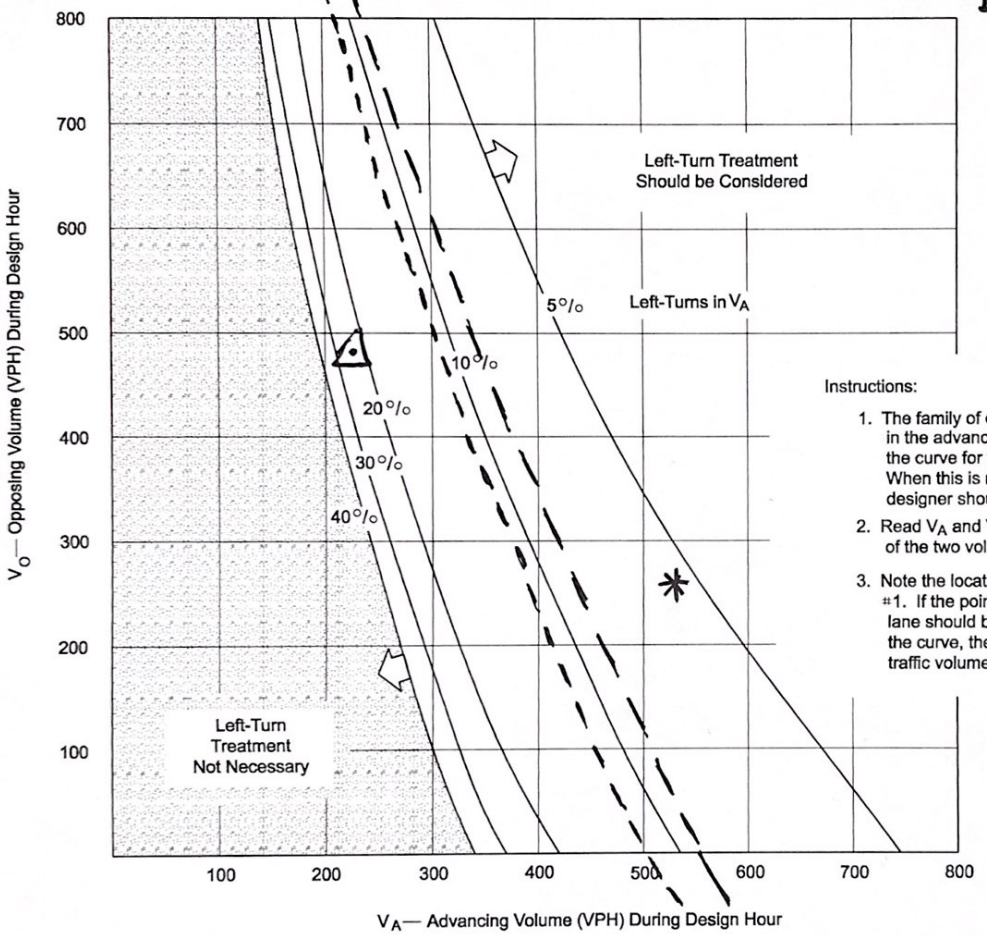
VOLUME GUIDELINES FOR LEFT-TURN LANES AT UNSIGNALIZED INTERSECTIONS ON 2-LANE HIGHWAYS (45 MPH) (US Customary)

Figure 28.4F

PM PEAK Curve = 11.5 % (LTL IS NEEDED)

AM Peak Curve = 8.75 % (LTL NOT NEEDED)

FULL BUILD-OUT (2029) (Clearview Way)



V_A = Total advancing traffic volume which includes all turning traffic

V_O = Total opposing traffic volume which includes all turning traffic

Instructions:

1. The family of curves represent the percent of left turns in the advancing volume (V_A). The designer should locate the curve for the actual percentage of left turns. When this is not an even increment of five, the designer should estimate where the curve lies.
2. Read V_A and V_O into the chart and locate the intersection of the two volumes.
3. Note the location of the point in #2 relative to the curve in #1. If the point is to the right of the curve, then a left-turn lane should be considered. If the point is to the left of the curve, then a left-turn lane is not warranted based on traffic volumes.

△ AM PEAK HOUR

✱ PM PEAK HOUR

$$\text{AM Curve} = \frac{21 \text{ vph}}{240 \text{ vph}} = 8.75\%$$

$$\text{PM Curve} = \frac{62 \text{ vph}}{539 \text{ vph}} = 11.5\%$$

VOLUME GUIDELINES FOR LEFT-TURN LANES AT UNSIGNALIZED INTERSECTIONS ON 2-LANE HIGHWAYS (45 MPH) (US Customary)

Figure 28.4F