MEMORANDUM

TO: Ted Cherry, Town of Granby

FROM: Eric Mahoney, EI
Dan Cokley, PE

DATE: 5/2/2025

RE: **Mesa St & Agate Ave (US 40) – Pedestrian Crossing Analysis**

COLORADO LICENSED
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05.02.25
PROFESSIONAL ENGINEER

The purpose of this memorandum is to provide a recommendation regarding the installation of a Rectangular Rapid Flashing Beacon for the pedestrian crossing on Agate Ave at the intersection with Mesa St in Granby, Colorado. The existing intersection is shown in Figure 1. Agate Avenue features two lanes for each direction of travel separated by a striped two-way left turn lane. Mesa Street is a two-lane street without a striped centerline. SGM understands that the Town would like to perform this analysis due to the proximity of the crossing to the Granby Elementary School, and Middle and High Schools within ½ mile directly to the north with destinations of convenience stores and a coffee shop on the south side of Agate Avenue. This contributes to higher volumes of student pedestrians using the crossing.

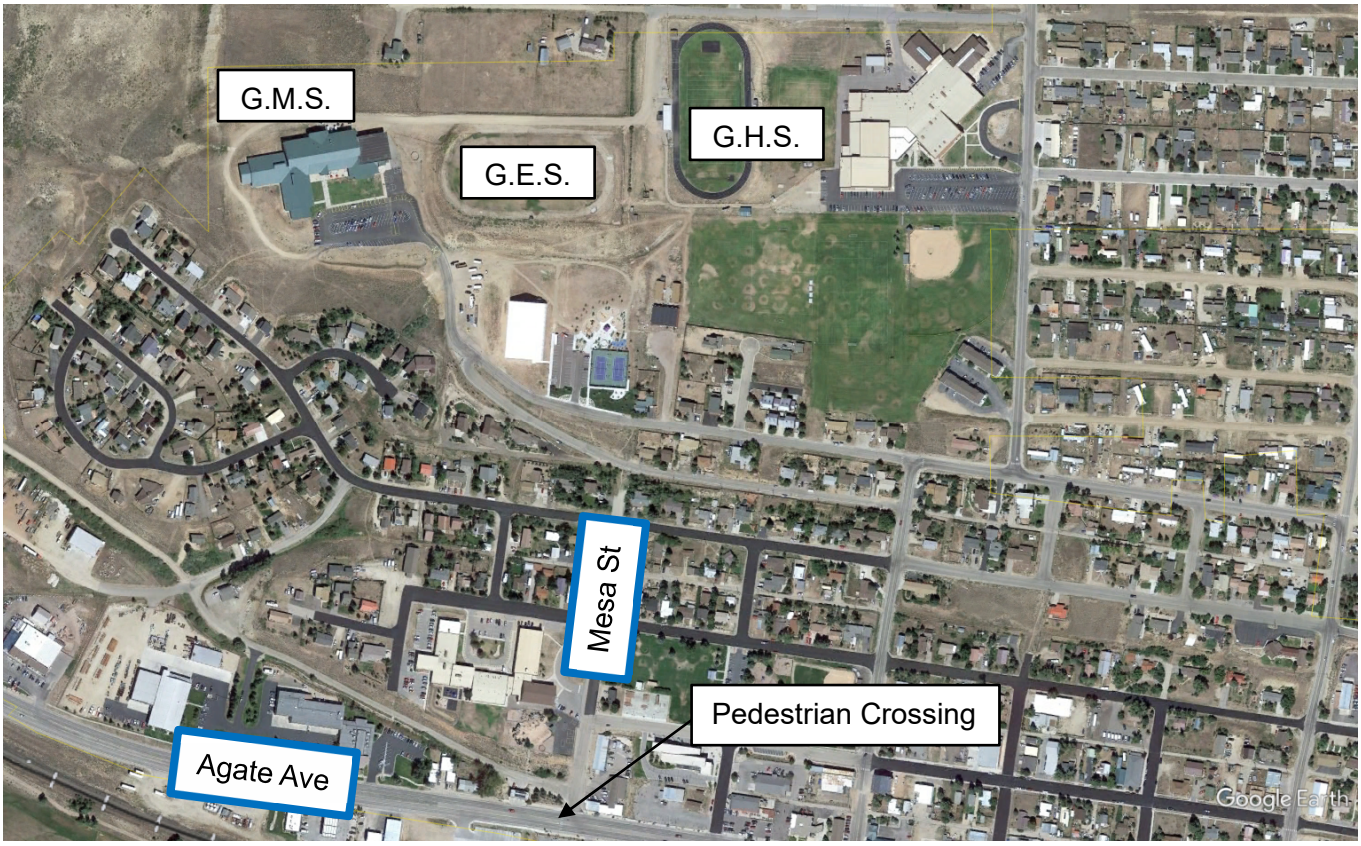


Figure 1 - Agate Ave and Mesa St

Pedestrian Crossing Installation Guide:

The evaluation criteria used in this memo are from the CDOT Pedestrian Crossing Installation Guide, 2021 Edition. The guide provides a Pedestrian Crossing Evaluation Flowchart, which is used to determine the appropriate crossing treatment (if any). The full flowchart is included in Attachment A.

Existing Volumes:

SGM performed 12-hour traffic counts (7 AM – 7 PM) on February 19th – 21st, 2025, at the Agate Ave and Mesa St intersection. The counts included pedestrian crossing volumes. A detailed summary of the count information is included in Attachment B.

Pedestrian Crossing Evaluation

CDOT count station 101868 reports an ADT of 11,000 on Agate Ave in Granby. The crossing is not part of a multi-use path. The minimum pedestrian volume thresholds are as follows:

- 20 peds per hour in any one hour, or
- 18 peds per hour in any two hours, or
- 15 peds per hour in any three hours, or
- 10 school-age pedestrians traveling to or from school in any one hour.

The peak pedestrian volumes observed by SGM are shown in Table 1. Review of the collected video shows that all 6 pedestrians in the 1- and 2- hour peaks appear to be school-age pedestrians.

Table 1 - Peak Pedestrian Volumes

Peak Duration	Total Peds	PPH	Start Time
1-Hour	6	6	2/19/2025 16:00
2-Hour	6	3	2/19/2025 14:45
3-Hour	7	2.3	2/19/2025 13:30

The raw counts do not meet the minimum pedestrian volume thresholds. However, section 4.2.1 of the CDOT Pedestrian Crossing Guidelines states that pedestrian crossing volumes should be collected during “warm-weather months and during fair weather conditions.” SGM collected count volumes in February and observed snowfall/precipitation on every day that counts occurred. Therefore, it is reasonable to apply a seasonal/weather adjustment factor to the pedestrian crossing volumes.

The National Bicycle and Pedestrian Documentation project provides Count Adjustment Factors (2009) to seasonally adjust pedestrian volumes (Attachment C). The observed February volumes can be scaled to May volumes by applying a factor of 9.5%/5%, or 1.9. The factors used for each month are the average of the “Long Winter” and “Moderate Climate” factors provided by the NBPD. The adjusted pedestrian volumes are shown in Table 2.

Table 2 – Peak Adjusted Pedestrian Volumes

Peak Duration	Total Peds (Adjusted)	PPH (Adjusted)
1-Hour	11.4	11.4
2-Hour	11.4	5.7
3-Hour	13.3	4.4

Based on the observed data, it is assumed that 100% of the crossing volume consists of school-aged pedestrians. After applying the seasonal adjustment factor, the minimum volume of threshold of 10 school-aged pedestrians in any one hour is met.

The nearest marked or protected crossing is more than 300-feet away, and there is adequate stopping distance at the crossing location. Therefore, Table C.1 can be used to determine the appropriate pedestrian crossing treatment.

Table C1. Criteria for Pedestrian Crossing Treatments at Uncontrolled Locations

The criteria for pedestrian crossing treatments at uncontrolled locations is intended as a general minimum. Engineering judgment should be used on a case-by-case basis. Prevailing speed may be used if significantly different than posted speed.

Roadway Configuration	Roadway ADT and Posted Speed (mph)															
	1,500 – 9,000 vpd				9,001 – 12,000 vpd				12,001 – 15,000 vpd				> 15,000 vpd			
	≤30	35	40	≥45	≤30	35	40	≥45	≤30	35	40	≥45	≤30	35	40	≥45
2 lanes, one-way street	A	B	C	E	A	B	C	E	B	B	C	E	B	C	C	E
2 lanes, two-way street with no median	A	B	C	E	A	B	C	E	B	B	C	E	B	C	C	E
3 lanes with raised median	A	B	D	E	A	C	D	E	B	D	D	E	C	D	D	E
3 lanes without raised median	C	C	D	E	C	C	D	E	C	C	D	E	C	D	D	E
4 lanes with raised median	A	B	C	E	A	B	C	E	B	B	C	E	B	C	C	E
4 lanes, two-way street without raised median	A	D	D	E	B	D	D	E	B	D	D	E	D	D	D	E
5 lanes with raised median	A	B	D	E	B	C	D	E	B	C	D	E	C	C	D	E
5 lanes without raised median	D	D	D	E	D	D	D	E	D	D	D	E	D	D	D	E
6 lanes with or without raised median	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F

D. Install marked crosswalk with enhanced signs, pedestrian activated RRFBs, and geometric improvements to increase visibility pedestrian and reduce exposure.

Summary

Based on the above analysis, conducted in accordance with the CDOT Pedestrian Crossing Installation Guide, the recommended pedestrian crossing improvements at this location consist of the following: enhanced signs, pedestrian activated Rectangular Rapid Flashing Beacons (RRFBs), and geometric improvements.

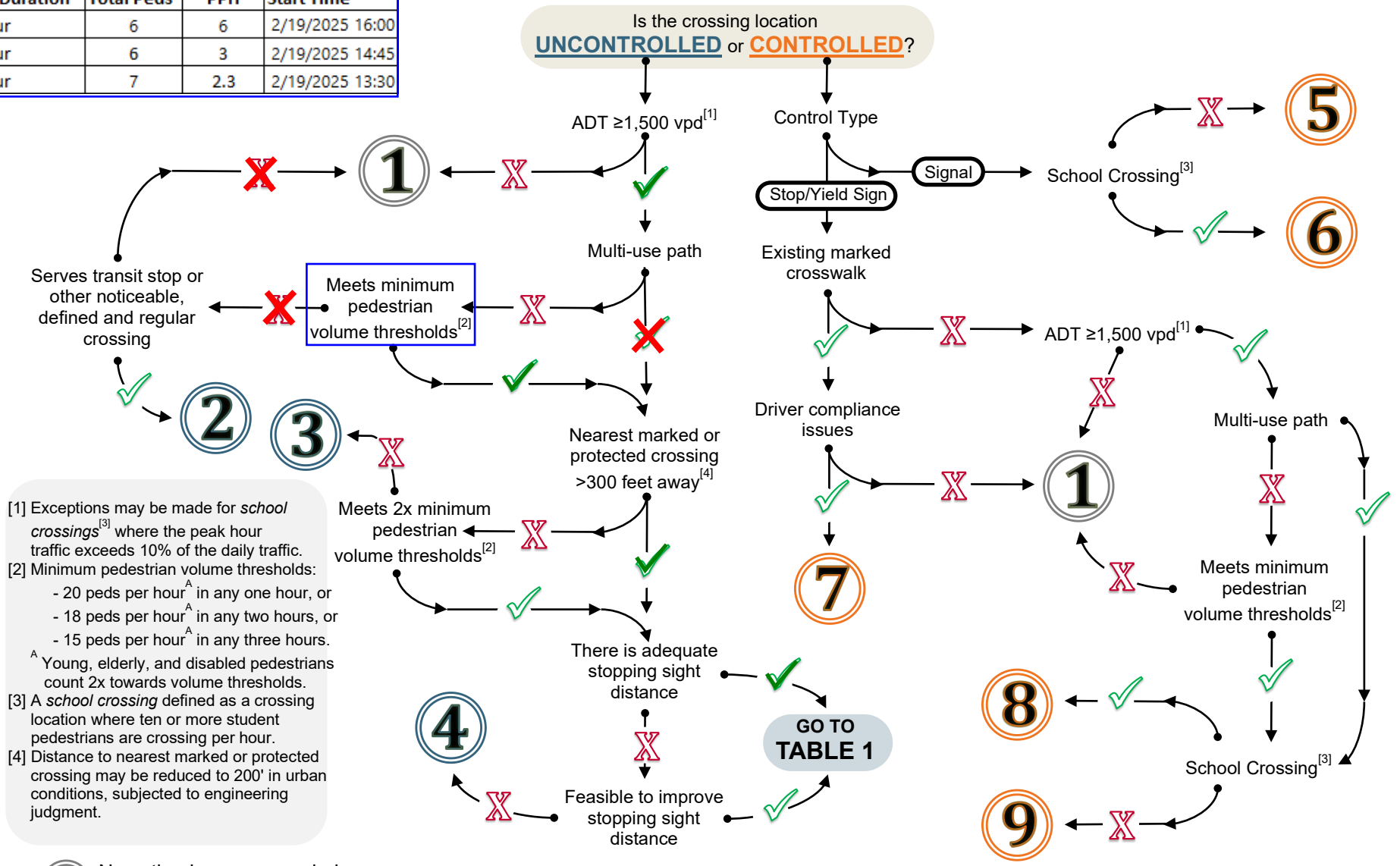
Attachments:

A. Pedestrian Crossing Evaluation Flowchart
B. 2025 SGM Count Data
C. Seasonal Adjustment Factors

Peak Pedestrian Volumes SB/NB

Peak Duration	Total Peds	PPH	Start Time
1-Hour	6	6	2/19/2025 16:00
2-Hour	6	3	2/19/2025 14:45
3-Hour	7	2.3	2/19/2025 13:30

Figure C3. Pedestrian Crossing Evaluation Flowchart



[1] Exceptions may be made for *school crossings*[3] where the peak hour traffic exceeds 10% of the daily traffic.
[2] Minimum pedestrian volume thresholds:
- 20 peds per hour[A] in any one hour, or
- 18 peds per hour[A] in any two hours, or
- 15 peds per hour[A] in any three hours.

[A] Young, elderly, and disabled pedestrians count 2x towards volume thresholds.
[3] A *school crossing* defined as a crossing location where ten or more student pedestrians are crossing per hour.
[4] Distance to nearest marked or protected crossing may be reduced to 200' in urban conditions, subjected to engineering judgment.

1. No action is recommended at this time.
2. Consider installing an unmarked pedestrian crossing facilitation.
3. Direct pedestrians to the nearest marked or protected crossing.
4. Direct pedestrians to the nearest marked or protected crossing, **OR** consider installing a pedestrian hybrid beacon, traffic signal, or grade-separated crossing.
5. Install a marked crosswalk.
6. Install a marked crosswalk with a school crossing sign (S1-1) on a mast arm.
7. Consider neck downs, median refuge, or additional signs to increase drive awareness of pedestrians.
8. Install marked crosswalk with school pedestrian crossing sign (S1-1) and down arrow (16-7p) at the crosswalk plus an advanced (S1-1) signs.
9. Install marked crosswalk with W11-2 advanced pedestrian signs.

ATTACHMENT A

AADT = Annual Average Daily Traffic

Select	Station ID	Route	Start	End	Description	AADT	Year
	101868	040A	211.876	212.502	ON SH 40, AGATE AVE E/O MESA ST, GRANBY	11,000	2023

Table C1. Criteria for Pedestrian Crossing Treatments at Uncontrolled Locations

The criteria for pedestrian crossing treatments at uncontrolled locations is intended as a general minimum. Engineering judgment should be used on a case-by-case basis. Prevailing speed may be used if significantly different than posted speed.

Roadway Configuration	Roadway ADT and Posted Speed (mph)															
	1,500 – 9,000 vpd				9,001 – 12,000 vpd				12,001 – 15,000 vpd				> 15,000 vpd			
	≤30	35	40	≥45	≤30	35	40	≥45	≤30	35	40	≥45	≤30	35	40	≥45
2 lanes, one-way street	A	B	C	E	A	B	C	E	B	B	C	E	B	C	C	E
2 lanes, two-way street with no median	A	B	C	E	A	B	C	E	B	B	C	E	B	C	C	E
3 lanes with raised median	A	B	D	E	A	C	D	E	B	D	D	E	C	D	D	E
3 lanes without raised median	C	C	D	E	C	C	D	E	C	C	D	E	C	D	D	E
4 lanes with raised median	A	B	C	E	A	B	C	E	B	B	C	E	B	C	C	E
4 lanes, two-way street without raised median	A	D	D	E	B	D	D	E	B	D	D	E	D	D	D	E
5 lanes with raised median	A	B	D	E	B	C	D	E	B	C	D	E	C	C	D	E
5 lanes without raised median	D	D	D	E	D	D	D	E	D	D	D	E	D	D	D	E
6 lanes with or without raised median	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F

Treatment Descriptions:

A. Install marked crosswalk with enhanced roadside signs.

Install a marked crosswalk with a standard W11-2 with a W16-7p plaque mounted on the side of the roadway at the crosswalk location and a standard W11-2 advanced pedestrian warning sign. Use S1-1 signs for school crossing locations. An optional R6-1 may be used in addition.

B. Install marked crosswalk with enhanced roadside and in-roadway signs.

C. Install marked crosswalk with enhanced signs and geometric improvements to increase pedestrian visibility and reduce exposure.

D. Install marked crosswalk with enhanced signs, pedestrian activated RRFBs, and geometric improvements to increase visibility pedestrian and reduce exposure.

E. Do not install marked crosswalk at uncontrolled crossing. Determine if speed limit can effectively be reduced to 40 mph by making geometric or other infrastructure changes (i.e., bulb out, median refuge, etc.). If so, utilize criteria D above. If this is not possible, if pedestrian volume meets warrants, consider a pedestrian hybrid beacon, pedestrian traffic signal, or grade separated crossing.

F. Do not install marked crosswalk at uncontrolled crossings with three (3) or more through lanes per direction or where the speed limit is greater or equal to 45 mph and/or there is not a median refuge on a 5-lane crossing. Consider pedestrian hybrid beacon, pedestrian traffic signal, or separated crossing.

SIGHT DISTANCE LOOKING WEST

SIGHT DISTANCE LOOKING EAST

ATTACHMENT B

Study Name	Agate & Mesa
Start Date	Wednesday, February 19, 2025 7:00 AM
End Date	Friday, February 21, 2025 7:00 PM
Site Code	

Overview

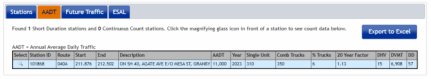
This report contains turning movement volume (TMV) data of vehicular traffic in the intersection of study.

Content

Summary	Contains a TMV summary of all vehicular traffic in the intersection for defined peak periods
TMV Table	Contains a pivot table of the TMV road and crosswalk data
TMV Data	Contains measured TMV data of all vehicular traffic in the intersection for each approach
Ped Data	Contains detected pedestrian information for the intersection's crosswalks

Traffic Study

	Wednesday, February 19, 2025 7:00 AM
Start Date	
	Friday, February 21, 2025 7:00 PM
End Date	
Classification Categories	Lights, Buses, Trucks, Pedestrians
02/19/2025 AM Peaks	7:45 AM - 8:45 AM
02/19/2025 PM Peaks	4:30 PM - 5:30 PM
02/20/2025 AM Peaks	7:15 AM - 8:15 AM
02/20/2025 PM Peaks	3:45 PM - 4:45 PM
02/21/2025 AM Peaks	11:00 AM - 12:00 PM
02/21/2025 PM Peaks	3:45 PM - 4:45 PM



Pedestrian Peaks Summary (From

Peak Duration	Total Peds (Adjusted)	PPH (Adjusted)
1-Hour	11.4	11.4
2-Hour	11.4	5.7
3-Hour	13.3	4.4

ATTACHMENT C

NATIONAL BICYCLE & PEDESTRIAN DOCUMENTATION PROJECT

Count Adjustment Factors

March 2009

While more year-long automatic count data is needed from different parts of the county, especially for pedestrians and on-street bicyclists, enough data now exists to allow us to adjust counts done almost any period on multi-use paths and pedestrian districts to an annual figure.

All percentages in the following tables represent the percentage of the total period (day, week, or month).

How to Use This Data

The factors in the following tables are designed to extrapolate daily, monthly, and annual users based on counts done during any period of a day, month, or year. The factors currently are designed to be used by (a) multi-use pathways (PATH) and (b) higher density pedestrian and entertainment areas (PED).

How Many Counts Can it Be Based On?

Given the variability of bicycle and pedestrian activity, we strongly encourage that all estimates be based on the average of at least two (2) and preferably three (3) counts during the same time period and week, especially for lower volume areas. For example, counts could be done from 2-4pm on consecutive weekdays (Tuesday – Thursday) during the same week, or, in consecutive weeks. Weekday counts should always be done Tuesday through Thursday, and never on a holiday. Weekend counts can be done on either day.

Bicyclists versus Pedestrians

The factors used in these formulas are for combined bicyclist and pedestrian volumes. Once you have calculated your total daily, monthly, or annual volume, you can simply multiple the total by the percent breakdown between bikes and pedestrians based on your original count information.

Start with the Hour Count

Once you have collected your count information and developed an average weekday and weekend count volume for bicyclists and/or pedestrians, pick any one (1) hour period from either of those days.

<u>Adjustment Factor</u>

Your next step is to multiply those counts by 1.05.

Sample #1

Average 1 hour weekday count: 236 bikes/peds x 1.05 = 248

Average 1 hour weekend day count: 540 bikes/peds x 1.05 = 567

This adjustment factor is done to reflect the bicyclists/pedestrians who use the facility between 11pm and 6am, or, about 5% of the average daily total. The count formulas are all based on total counts between 6am and 10pm, since many available counts only cover those periods. If you are certain your facility gets virtually no use between those hours, you can forgo this step.

Calculate Daily Weekday and Weekend Daily Total

Identify the weekday and weekend hour your counts are from in Table 1 below. Be sure to use the PATH column for all multi-use paths, and the PED column for all higher density pedestrian areas with some entertainment uses such as restaurants. Be sure to select the correct time of year (April-September, or, October-March) as well.

Sample #2: done in June on a multiuse path (weekday = 4-5pm, weekend day = 12-1pm):

Adjusted weekday hourly count = 248/.07 = 3,542 daily users

Adjusted weekend day hourly count = 567/.1= 5,670 daily users

Calculating Average Weekly Volumes

We need to adjust these figures based on the day of the week. See table 2 below. Find the day of the week your counts were done, and factor them by that percent. If you did multiple counts on different days of the week, then take the average of those factors.

Sample #3: counts were done on a Tuesday and a Saturday.

Adjusted weekday count = 3,542/.13 = 27,246 average weekly users

Adjusted weekend count = 5,670/.18 = 31,500

Add these two figures together, and divide by 2: 27,246+31,500=58,746/2 = 29,373 people

The average weekly volumes for that month are 29,373 people.

Convert to Monthly Volumes

To convert from average weekly volumes to an average monthly volume, multiply the average weekly volume by the average number of weeks in a month (4.33 weeks).

Sample #4: 29,373 x 4.33 = 127,282 people.

This is the average monthly volume for the month the counts were conducted.

Convert to Annual Totals

To convert from the average monthly volume for the month the counts were taken into an annual total, divide the average monthly figure by the factor from Table 3 for the month the counts were conducted. Use the general climate zones described. Some climate zone types are not included.

Sample #5: counts were done in June in a moderate climate zone.

Average monthly volumes = 127,282/.08 = 1,591,037 people.

Based on these sample figures, it is estimated that almost 1.6 million people use the pathway annually.

Average Monthly and Daily Figures

To identify the average monthly and daily figures, simply divide the annual figure by 12 (for month) or by 365 (for daily figures).

Monthly average = 1,591,037/12 = 132,586 people

Daily Average = 1,591,037/365 = 4,359 people

Table 1

Hourly Adjustment Factors

Multi-use paths and pedestrian entertainment areas by season

	April - September 6am - 9pm					October - March 6am - 9pm			
	---- PATH------		-----PED-----			---- PATH------		-----PED-----	
	wkdy	wkend	wkdy	wkend		wkdy	wkend	wkdy	wkend
0600	2%	1%	1%	1%	0600	2%	0%	1%	0%
0700	4%	3%	2%	1%	0700	4%	2%	2%	1%
0800	7%	6%	4%	3%	0800	6%	6%	3%	2%
0900	9%	9%	5%	3%	0900	7%	10%	5%	4%
1000	9%	9%	6%	5%	1000	9%	10%	6%	5%
1100	9%	11%	7%	6%	1100	9%	11%	8%	8%
1200	8%	10%	9%	7%	1200	9%	11%	9%	10%
1300	7%	9%	9%	7%	1300	9%	10%	10%	13%
1400	7%	8%	8%	9%	1400	9%	10%	9%	11%
1500	7%	8%	8%	9%	1500	8%	10%	8%	8%
1600	7%	7%	7%	9%	1600	8%	8%	7%	7%
1700	7%	6%	7%	8%	1700	7%	5%	6%	6%
1800	7%	5%	7%	8%	1800	6%	3%	7%	6%
1900	5%	4%	7%	8%	1900	4%	2%	7%	6%
2000	4%	3%	7%	8%	2000	2%	1%	6%	6%
2100	2%	2%	6%	8%	2100	2%	1%	5%	5%

Table 2

Daily Adjustment Factors

Note: Holidays use weekend rates.

MON	14%
TUES	13%
WED	12%
THURS	12%
FRI	14%
SAT	18%
SUN	18%

Table 3

Monthly Adjustment Factors by Climate Area

Month	Climate Region: Long Winter Short summer	Moderate Climate	Very hot summer Mild winter
JAN	3%	7%	10%
FEB	3%	7%	12%
MAR	7%	8%	10%
APR	11%	8%	9%
MAY	11%	8%	8%
JUN	12%	8%	8%
JUL	13%	12%	7%
AUG	14%	16%	7%
SEP	11%	8%	6%
OCT	6%	6%	7%
NOV	6%	6%	8%
DEC	3%	6%	8%