Swift and Associates, LLC
Town Planners, Civil and Traffic Engineers

Joshua Trickey, E.I., Boulder County Public Works

via email, 4/3/2022

Dear Josh,

I have reviewed the February 15, 2022 "Gold Hill Townsite Speed Study" by the Boulder County Public Works division (noted as BC1), and would like to offer the following observations and recommendations. To help navigate this document, an index is provided below.

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Thoroughfares Defined and Maintained

It's important to understand how thoroughfares in the County are defined[1]. The County Comprehensive Plan[2] Gold Hill is classified as an "historic community"[3]. Also, the designation "townsite" is often used to describe Gold Hill. Concerning road classification, "*Local (L), Local Secondary (LS) Provides access to specific land uses, particularly residential. Roads of these classifications are two-lane facilities, although in isolated cases, one-lane roads may exist (townsites, forest access, etc.).*"[4]

Appendix 1 shows a portion of the Boulder County Road Map and its legend. Gold Hill Road, Gold Run and Sunshine all appear to be Residential Collectors. As they enter the historic town, they seem to shift to Local status and indicated as a local arterial fronting the school. This is confusing and needs explanation. The Local Secondary classification has "…*sidewalks, signed bicycle routes,...*"[5] Neither of these exists and should not be classified as such given the context. The report simply states that the roadways in Gold Hill are "local". This is a problem because it ignores nuance required for understand County code/guidelines and discussions about current

[1] Boulder County (BC2), *Boulder County Multimodal Transportation Standards*, July 1, 2012
[2] Boulder County (BC3), *Boulder County Comprehensive Plan 'Goals, Policies, and Maps Element'*", July, 2018
[3] Boulder County (BC4), "*Transportation Master Plan",* 2/18/2020, p. 133
[4] Ibid., BC2, p. 17
[5] Ibid., BC2, p. 17

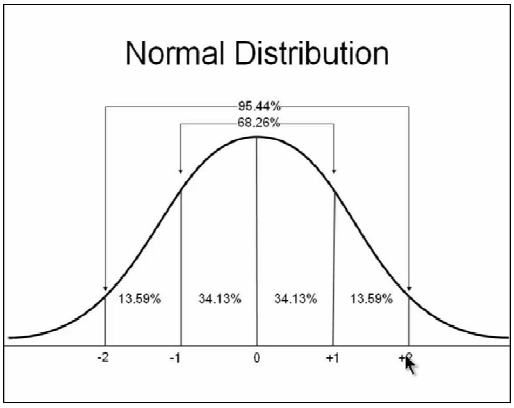
problems. In any event, these issues need to be clarified at the upcoming Gold Hill Town Meeting (GHTM).

The report addresses traffic calming techniques and maintenance of them comes into play. The County roads are accepted for maintenance based on certain criteria, among them it states "*The roads have a usable traveled way to provide for the safe flow of travel*."[6] In addition, the current gravel surface will remain because the local residents largely support this condition and the County Comprehensive Plan states in TR 3.05, "*Consider the paving of County-owned roads when the minimum level of 500 vehicles per day, average daily traffic, is attained*." The current daily traffic volumes range around 177 vpd[7]. These provisions are important when considering potential traffic calming techniques (see below).

Gold Hill Townsite Speed Study

The Gold Hill Townsite Speed Study presents data from a speed study done for several segments of thoroughfares throughout the town. This is a second study done in the last 9 years[8]. The results did not represent observed conditions by the residents and the author. Part of the problem was that the measuring devices (signs, rubber hoses across the road) had a tendency to warn and then slow traffic (see exhibits, Appendix 2). This concern was corrected by the current study by placing small sensors in unobservable places. The current Gold Hill Townsite Speed Study showed much more realistic conditions including faster vehicle travel speeds.

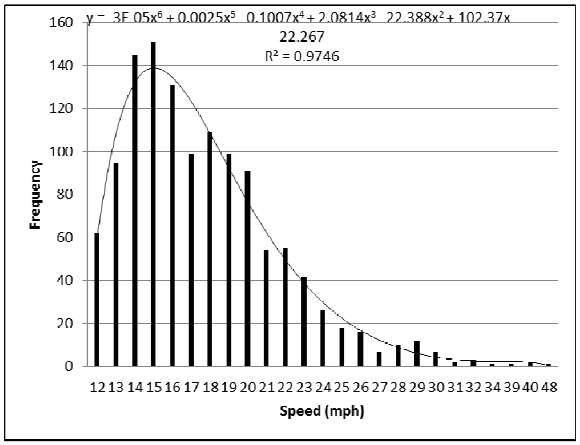
Speed Distribution



The Gold Hill Townsite Speed Study has quite a bit of data, so to fit our analysis into a reasonable time frame we looked at the Main Street section between Gold Run and Hill Street. This represented weekly data. One of the regularly used criteria in setting speed limits is to determine the 85th percentile speed. In many cases the speed is set 5 mph above this benchmark. The 85th percentile speed is determined by the 1st standard deviation in a normally distributed curve. This hypothetical curve is shown adjacent. The peak occurrence of vehicle speeds usually at the top of the curve, or 50% of the curve's area, represented as '0' on the X axis. One standard deviation represents 34.13% and is shown as -1 or +1 on the X axis. Summing 50 and 34.1 percent we find 84.13%, or rounded off to 85% for our purposes. Speed data very often forms a normal distribution as shown. If it is skewed right or left, then another type of analysis should be done or, when modeled, adjustments to the data time line or headway determinant is required. The study mentions the 85th percentile in the analysis for each road segment. On PDF page 4 of the study, it states

> "*When evaluating vehicle speeds and the speed limit the primary consideration is the 85th percentile speed. It is generally recommended that the speed limit be within 5 MPH of the*

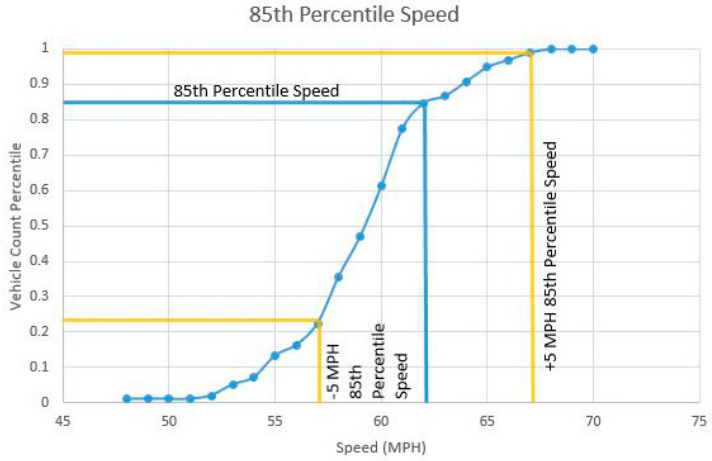
[6] Ibid., BC2, Section 2.2.2.3
[7] BC1, cover sheet
[8] A previous speed and volume study was done June 25-July 2, 2013.



85th percentile speed. If the 85th percentile speed is 10 MPH or more over the speed limit, it is generally recommended that the speed limit be reviewed in greater detail."

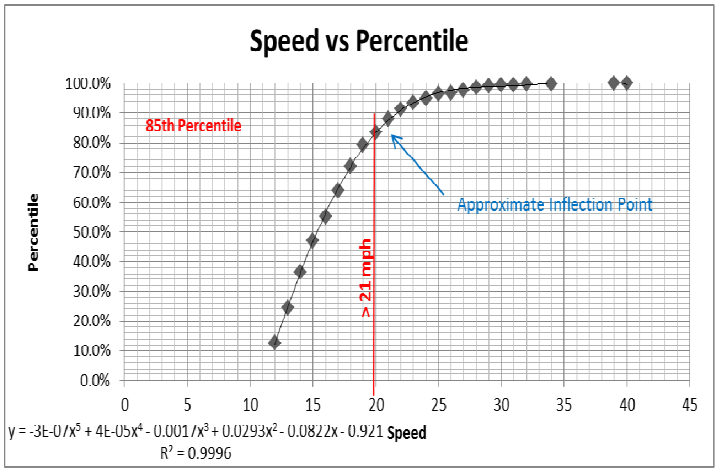
First of all, the weekly data suggests that the distribution is left skewed and the 85th percentile determination invalid as shown adjacent. The 5th order polynomial regression curve is shown to simply show the form of the data. This presents us with a problem. **We ask that the County staff address this at the meeting this April.**

There is another analysis that may be considered. If one plots the area of the curve related to speed, it forms a rough"S -curve" like the one shown below left.



This is from another traffic study and because it has 2 tails and fairly symmetrical it is most likely a normal distribution. Also, the 85th percentile speed appears at approximately the inflection point of the upper limb of the S curve.

Now, let us look at the weekly data as plotted from the Gold Hill study;



Notice that there is no tail to the curve on the left side. The 85th percentile speed from the data doesn't quite reach the inflection point of the upper curve which seems to be somewhat lower at about 18mph. Also, the data is very smooth and not "bumpy" like the example above. Also, it is a bit odd how we get an R^2 corrected value of 0.9996 (or, it fits 99.96% of the data. Are they are correlating the data points to their computer generated line?)

In any event, there is a problem here and we look forward to hearing from staff in a couple of weeks. The study does state "If the 85th percentile speed is 10 MPH or more over the speed limit, it is generally recommended that the speed limit be reviewed in greater detail."[9] We agree and look forward to our discussion

[9] Boulder County Public Works, *Gold Hill Townsite Speed Study*, February 15, 2022, PDF p. 5

Speed Study Narrative

The potential for traffic calming is addressed on page 4 of the study stating "*The section includes review of relevant data to quantify the amount of speeding and identify key information that may determine eligibility and priority for any potential traffic calming. The sections covered are Main Street and Gold Run Street."*[10]. yet it further states "*When evaluating vehicle speeds and the speed limit the primary consideration is the 85th percentile speed*." We have outlined our problems with this approach above. Further (p. 5) "*Even with traffic calming, speeding may still occur, however, traffic calming may help discourage excessive vehicle speeds…Main Street and Gold Run Street are the primary candidates for traffic calming and the data above is [sic.] what will be used to determine priority and eligibility for traffic calming*." We are aware of the emergency vehicle access needs, particularly with regard to the existence of the fire station at the west end of Main Street. The study mentions this; "*Accommodations for emergency vehicles should be considered if any active traffic calming measures are proposed*." As a side note, members of the fire service here have said that they are not adverse to the use of speed bumps/humps, but we feel that there may be other techniques more appropriate. This, however, is up to the fire department and the town residents and should be explored with County staff at some time in the future.

Crash rates are another important factor in safety considerations. "*The overall crash rate is 573 per 100-million vehicle miles which is higher than the national average*."[11] But there were no injuries reported.

In terms of the analysis of pedestrian activity, it is extremely important to recognize that the town experiences quite a number of pedestrians occupying the public right-of-way (ROW). This is largely due to activity generated by the businesses on Main Street. The report acknowledges this; "*Pedestrian Activity is high based on the surrounding residential land use and businesses*."

Speed limit recommendations in the study are as follows;

Main Street (Boulder Street to Gold Run Street):

> *The recommended speed limit was 20 MPH. However, it should be noted that the USLIMITS2 program cannot recommend a speed limit lower than 20 MPH.*
> It may be prudent to post a 15 mph speed limit in any event to slow traffic before entering areas of dense pedestrian traffic.

Gold Run Street (Gold Hill Road to Boulder Street):

> *Since the 85th percentile speed is less than 20 MPH, USLIMITS2 cannot recommend a speed limit.*
> Same comment as above.

Boulder Street (End of Lick Skillet Road to End of Gold Run Road)

> *The Recommended Speed Limit for this section is 20 MPH.*
> Agree.

[10] Ibid., Boulder County Public Works
[11] Ibid., Boulder County Public Works, p. 5

In the conclusion, the study states "*the county is not approving any traffic calming projects at this time*.[12]" Perhaps we can discuss a meeting to, at least, identify potential traffic calming methods.

Recommendations

1. Since the County seems amenable to some traffic calming, we would suggest that a meeting be held to discuss community supported techniques.
2. The County should look at the raw data and reevaluate the 85th percentile analysis.
3. Introduce "Historic Townsite" into County regulations that deal with street types, not just "Local". They have distinct characteristics.

This report is submitted from our perspective only and we look forward to the community's response at the GHTM this April.

Sincerely,

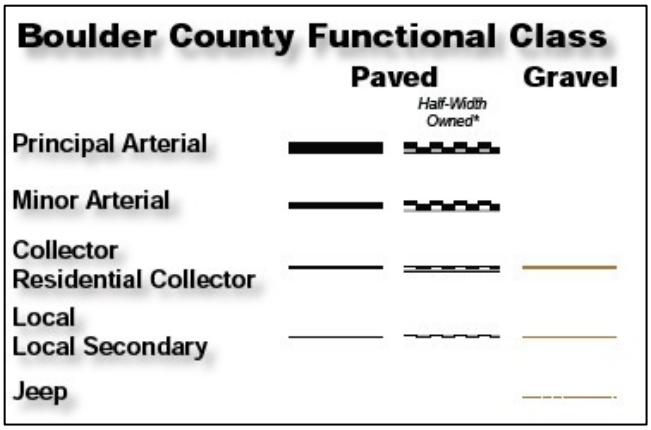
Peter Swift, PE
Swift and Associates, LLC

April 3, 2022

[12] Ibid., Boulder County Public Works, p. 10

APPENDIX 1

Road Map, Legend and Classifications



From; Boulder County Transportation Master Plan, 2018

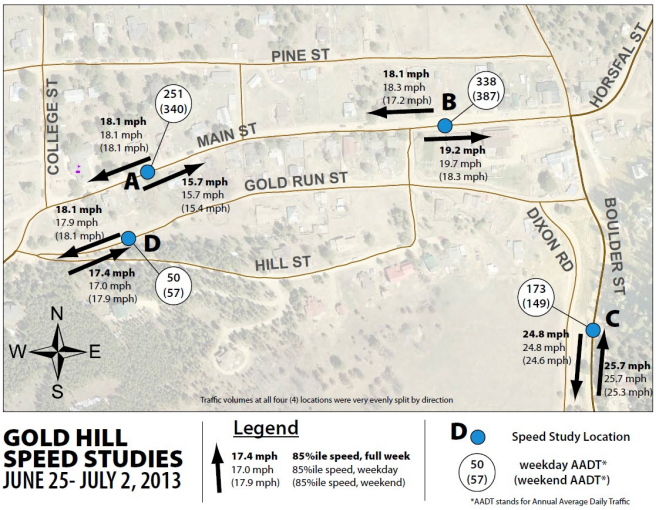
TABLE S1-3: ROADWAY CLASSIFICATIONS

Purpose	Roadway Classification	Modal Features
Regional Travel Corridor	Principal Arterial Minor Arterial	Vehicle travel, fixed route and frequent transit service, regional shared use paths, bikeable shoulders, marked bicycle lanes
Local Circulation Corridor	Collector Residential Collector	Vehicle travel, fixed route and frequent transit service, non-fixed route/demand response transit, shared-use paths, bikeable shoulders, marked bicycle lanes, sidewalks
Local Access Corridor	Local – Primary Local – Subdivisions	Vehicle travel, on-street parking, fixed route transit service (infrequent), non-fixed route/demand response transit, sidewalks, signed bicycle routes, shared roadways

Source: Boulder County Transportation

APPENDIX 2

2013 study



APPENDIX 3; County Recommendations, signage