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June 19, 2006

Monique Gardner
Kocal Management Group, Inc.
PO Box 1459
Folsom, CA 95763

Re: Clubhouse Drive Traffic Calming Evaluation

Dear Ms. Gardner:

Fehr & Peers has completed a traffic calming evaluation of Clubhouse Drive for the Whitney Oaks Community Association in the City of Rocklin. This purpose of our evaluation was to verify previous speed surveys and develop a traffic calming plan to reduce the magnitude by which drivers are speeding.

The recommendations contained in this report are based on our extensive experience in preparing traffic calming plans for other municipalities. The basis for our recommendations is rooted in knowledge of the fields' "best practices" and familiarity with municipality's' adopted policy's relating to traffic calming locally and abroad. Factors influencing the selection of devices include capital cost to the community, potential loss of on-street parking, slope of the roadway, and ability to effectively reduce vehicle speeds.

The following presents our findings and recommendations.

UNDERSTANDING OF TRAFFIC CONCERNS

Clubhouse Drive is a loop road providing access to the Whitney Oaks Community Association via two gated access points. Clubhouse drive is approximately two miles in length and has a posted speed limit of 20 miles per hour. The roadway has both horizontal and vertical curves with the elevation gradually increasing to over 100 feet from the access gates to Clubhouse Court. As a result of the elevation change, the roadway slope varies between one and eight percent.

Residents along Clubhouse Drive have voiced their concerns of excessive vehicle speeds throughout the length of the loop road with specific concerns from Stone Temple Drive to the western gate. According to Kocal Management, past speed survey data collection confirmed vehicles were exceeding the posted speed limit.

TRAFFIC DATA

To assess the magnitude of vehicle speeds and traffic volumes on Clubhouse Drive, Fehr & Peers conducted 48-hour vehicle speed and volume surveys with pneumatic hoses. The counts were conducted at four locations along Clubhouse Drive during the week of May 1, 2006. Average daily traffic volumes and vehicle speeds are summarized in Table 1. Vehicle speeds are shown in terms of the median speed and 85th percentile speed. The median speed is the speed at which 50% of drivers are traveling at or below while the 85th percentile speed is the speed at which 85% of the traffic is traveling at or below. The California Vehicle Code establishes speed limits on public roadways based on the 85th percentile speed.

Figure 1 graphically illustrates the traffic speed and volume data.

TABLE 1
AVERAGE DAILY TRAFFIC AND VEHICLE SPEEDS

Roadway Segment	Average Daily Traffic (ADT)	Median Vehicle Speeds - mph (50th Percentile)			85th Percentile Vehicle Speeds - mph		
		In / Uphill	Out / Downhill	Average	In / Uphill	Out / Downhill	Average
Clubhouse Drive West							
Gate to Clubview Court	1,192	21	*27*	24	*28*	***32***	***31***
Chip Court to Heather Court	648	23	23	23	*29*	*29*	*29*
Clubhouse Drive East							
Gate to Mariella Drive	1,025	22	*28*	*25*	*28*	***34***	***32***
North of Mariella Drive	645	21	22	22	*27*	*27*	*27*

Note: 48-hour speed surveys conducted during Week of May 1, 2006
Italicized text indicates speeds exceeds posted speed limit by 5 mph.
Bold italicized text indicates speeds exceeds posted speed limit by 10 mph.
Source: Fehr & Peers, 2006

As shown in Table 1, segments of Clubhouse Drive West and East experience an ADT less than 1,200 vehicles per day. For comparative purposes, some municipalities have unofficial standards for vehicle thresholds on residential streets of roughly 2,500 vehicles per day. Therefore, the traffic volumes on Clubhouse Drive are considered reasonable.

Table 1 also shows that the median and 85th percentile speeds exceed the posted 20 mile per hour speed limit. More detailed information can be derived from the raw data, such as traffic flow and vehicle speeds over the course of the day and percent of vehicles traveling in excess of 5 or 10 mile per hour over the posted limit. The following summarizes the magnitude of vehicle speeds.

- approximately 81 percent of all vehicles entering or exiting the neighborhood are traveling greater than 20 miles per hour
- 50 percent of vehicles are traveling greater than 25 miles per hour
- 20 percent of vehicles are traveling greater than 30 miles per hour

This additional information is contained in Attachment A.

RECOMMENDED TRAFFIC CALMING DEVICES

The goal of many municipality's traffic calming programs are to reduce vehicle speeds to within five mile per hour of the posted speed limit through the use of physical measures placed in the roadway. The recommendations below were selected according to criterion utilized in other Sacramento area municipalities.

The exact placement of each traffic calming device was chosen to minimize visibility from adjacent homes. Another factor in determining the placement of traffic calming measures is the spacing between slow points (i.e. speed between traffic calming devices intended to slow or stop motorists). In general, traffic calming devices should be placed between 300 and 600 feet from other slow-points. Devices placed at intervals of less that 300 feet can become a nuisance to drivers and measures placed greater than 600 feet decrease the ability to slow speeds to the target midpoint speed. The target midpoint speed chosen for this neighborhood is defined as five miles per hour above the posted speed limit based on common traffic calming practices implemented by other Sacramento-area jurisdictions.

Planning level cost estimates are also provided for each device. It is important to note that contractor costs vary depending on the amount of work to be performed and current material prices (i.e. increase in asphalt and concrete prices).

The location of devices is illustrated on Figure 2.

Speed Legends

Speed Legends are numerals painted on the roadway indicating the speed limit in mile per hour. Speed legends can accompany adjacent speed limit signs or can be used at key locations within a neighborhood. Speed legends cost approximately $75-$100 per location.

- Stencil a speed legend on the asphalt just beyond the existing speed limit sign between Woodhouse Court and Chip Court.
- Stencil a speed legend on the asphalt in both travel directions near the Mariella Drive (southern loop). These speed legends can be placed adjacent to each other or separated.

Speed Humps

Speed humps are rounded raised areas constructed out of asphalt that are placed across the roadway. They are generally 12 feet long (in the direction of travel), 3 to 3 ½ inches high and have a design speed of 15 to 20 miles per hour. Due to the slope of the roadway on Clubhouse Drive, the speed humps should be constructed with a sinusoidal profile. A sinusoidal profile has a gentle slope, is flatter at the edge of the pavement, and provides a smoother ride. Speed humps should be constructed the full width of the pavement leaving the drainage unimpeded. Speed humps cost approximately $1,500 - $2,000 per location.

- Install speed humps along the property lines between the following adjacent addresses:

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- 2591 and 2589 Clubhouse Drive West
- 2578 and 2576 Clubhouse Drive West
- 2505 and 2501 Clubhouse Drive West (180 feet downstream from the curb return of Stone Temple Drive
- 2373 and 2371 Clubhouse Drive East
- 2345 and 2343 Clubhouse Drive East
- 2330 and 2328 Clubhouse Drive East
- 2314 and 2312 Clubhouse Drive East

Narrowing Devices

Narrowing devices use raised islands and curb extensions to narrow the travel lane for motorists. Narrowing devices can be accented with stamp colored concrete, river rock, or landscaped with low-lying vegetation. Narrowing devices such as those recommended below range in cost depending on the material use, but generally cost between $3,000 and $5,500 per location.

- Install a center island narrowing at the golf cart crossing between Woodhouse Court and Chip Court. This center island narrowing should be constructed to allow golf cart travel through the existing golf cart crossing.

- Install a two-lane choker along the property line adjacent to the addresses of 2525 and 2521 Clubhouse Drive West.

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Emergency Response

A major concern associated with the installation of traffic calming devices is the potential delay in emergency response time. We have researched the changes in emergency response times with respect to specific traffic calming devices. Generally, traffic calming devices will cause some delay to emergency response time and the delay will vary based on the type of device, frequency, and spacing of the device used on the selected roadway.

More extensive studies were published in *Traffic Calming State-of-the-Practice* (ITE, 1999). These studies found that emergency response delays resulting from speed humps are also accompanied by a higher probability of damage to fire-rescue vehicles and injury to patients. Table 1 summarizes emergency response delays measured in various cities for speed humps.

Table 2
Emergency Response Delay

Device	City of Boulder, CO	City of Portland, OR
Speed Hump	2.8 to 4.7 seconds[1]	0 to 9.4 seconds[1]

Source: [1] *Traffic Calming State-of-the-Practice* (ITE, 1999)

Although Clubhouse Drive is a private roadway and not subject to the same requirements of public roadways in the City of Rocklin, the Rocklin Fire Department may raise concern regarding vertical devices. As an alternative, speed lumps may be used. Speed lumps are similar in design to speed humps but provide cutouts that allow the wheelbase of emergency vehicles (or buses) to pass through. The City of Sacramento Fire Department regularly permits placement of speed lumps on residential streets that serve as the Fire Department's primary response route. Below are two examples of a speed lump. The image on the left is of a speed lump constructed out of asphalt and the image to the right is of a speed cushion, which is a manufactured device constructed form recycled rubber. Because speed cushions are pre-manufactured, they have a more uniform shape than asphalt speed lumps and may be relocated if necessary.

Speed lumps cost approximately $2,000 per location while speed cushions $4,500 to $6,000 per location.

Use of speed humps on Clubhouse Drive are expected to delay emergency response vehicles by approximately 4.5 seconds per hump. Emergency response vehicles entering the community

from either the western or eastern gate and traveling to the peak of Clubhouse Drive will incur a total delay of 13.5 seconds and 18 seconds, respectively. Alternatively, the delay to emergency response vehicles can be reduced through the use of speed lumps. Since speed lumps are designed to accommodate the wheel base of emergency vehicles, the delay is expected to be negligible.

Expected Reduction in Speeds

Increased traffic safety is a primary objective associated with traffic calming devices. Implementing traffic calming measures has proven to reduce both the average speeds and collisions experienced on roadways that utilize them. The potential for speed reduction is based on the types of traffic calming devices selected and the spacing between devices. The following presents the expected reduction in speed for each of the recommended traffic calming devices followed by an estimation of the resulting speeds.

Speed Legend

The purpose of a speed legend is to increase driver awareness within the neighborhood. Speed legends do not physically require drivers to slow down compared to the other recommended traffic claming devices. Therefore, speed legends are not expected to have a measurable effect on speeds within the neighborhood.

Speed Humps

Speed humps have a profound effect on the reduction of both speeds and collisions on roadways. According to *Traffic Calming State of the Practice*[1], speed humps have the greatest impact on 85th percentile speeds, reducing them by an average of more than 7 mile per hour or 20 percent. Speed humps are also expected to reduce collisions by approximately 13 percent.

Narrowing Devices

Narrowing devices such as a, center island narrowing and two-lane choker, have less effect on the reduction of vehicles speeds in comparison to speed humps. Narrowing devices have shown a reduction in 85th percentile speeds by up to seven percent. However, narrowing devices have show to reduce collision on roadways by an average of 74 percent.

Resulting Speeds

The speed surveys contained in Table 1 indicates that portions of Clubhouse Drive West and East have 85th percentile speeds that are approximately seven to fourteen miles per hour greater than the posted speed limit of 20 mile per hour.

The proposed combination of speed humps and narrowing devices are estimated to reduce traffic speeds to within five miles per hour of the posted limit on all segments except on Clubhouse Drive West between Chip Court and Stone Temple Drive. The downhill length and slope of this segment (longer than a quarter mile and greater than a six percent grade) limits the use of speed humps to further reduce vehicle speeds. However, a reduction below the measured vehicle speeds (i.e. 29 miles per hour) is expected if implementation of the center island narrowing, speed legend, and two-lane choker on this segment occurs.

[1] *Traffic Calming State-of-the-Practice,* Institute of Transportation Engineers, 1999

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IMPLEMENTATION

In the event the Whitney Oaks Community Association elects to implement the recommended traffic calming measures, the following vendors/contractors may be able to serve you.

- To install speed legends, speed humps, or narrowing devices contact:
  - Florez Paving; Sam Florez (916) 452-3903
  - Biondi Paving; Neal Jensen (916) 383-5982
  - Martin Brothers Construction; (916) 852-1911
  - Vanguard Construction; Dominic Sposeto (510) 261-5700

Please note that it may be necessary to retain a civil engineer to develop plans that include drainage modifications and/or irrigation.

- To install speed cushions contact:
  - Lake Traffic Solutions; Art Lake (925) 930-9603

We hope you find this information helpful. Please do not hesitate to contact us if you have any questions.

Sincerely,

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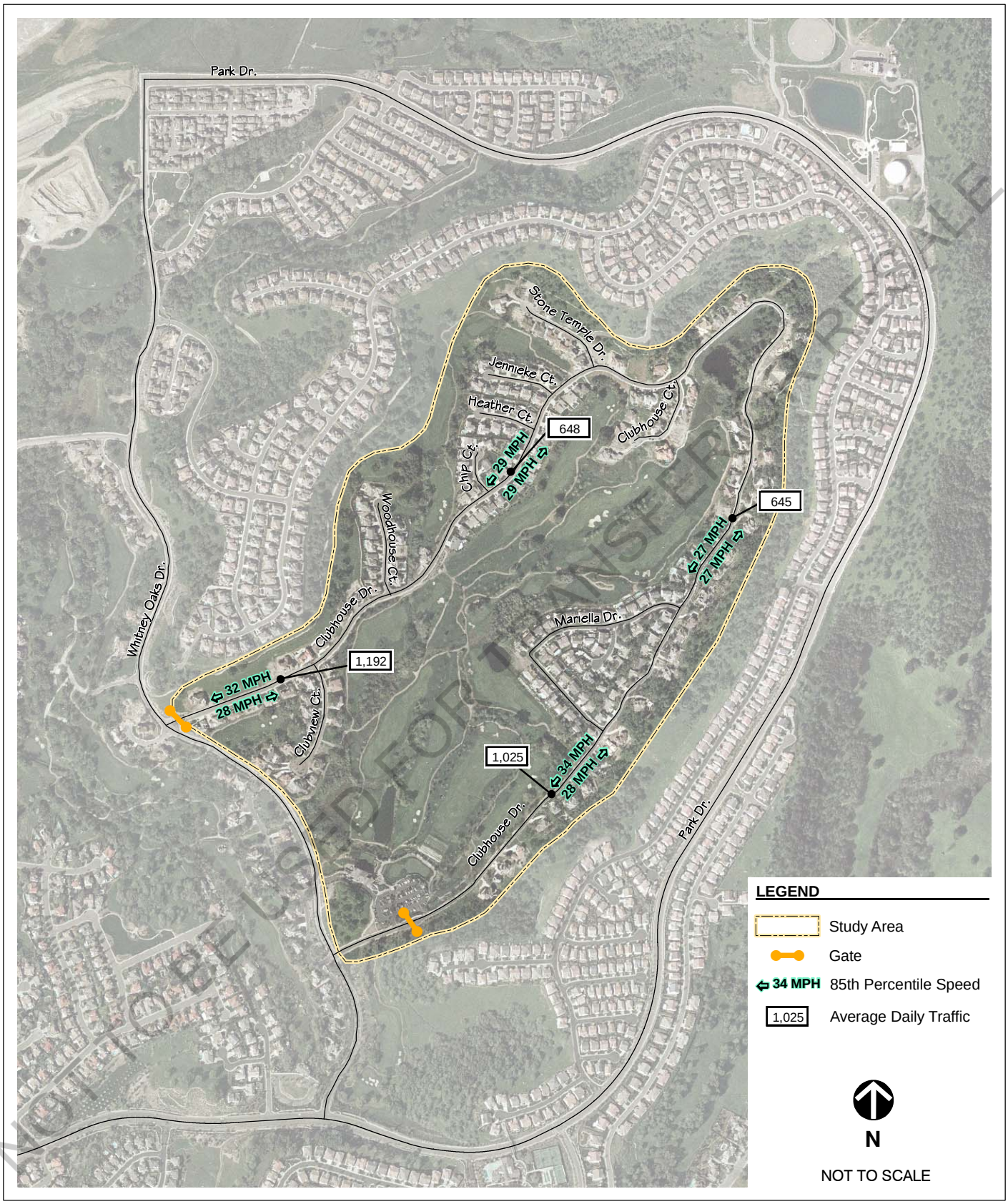
Aaron Hoyt
Transportation Planner

Jason Isaac
Senior Engineer



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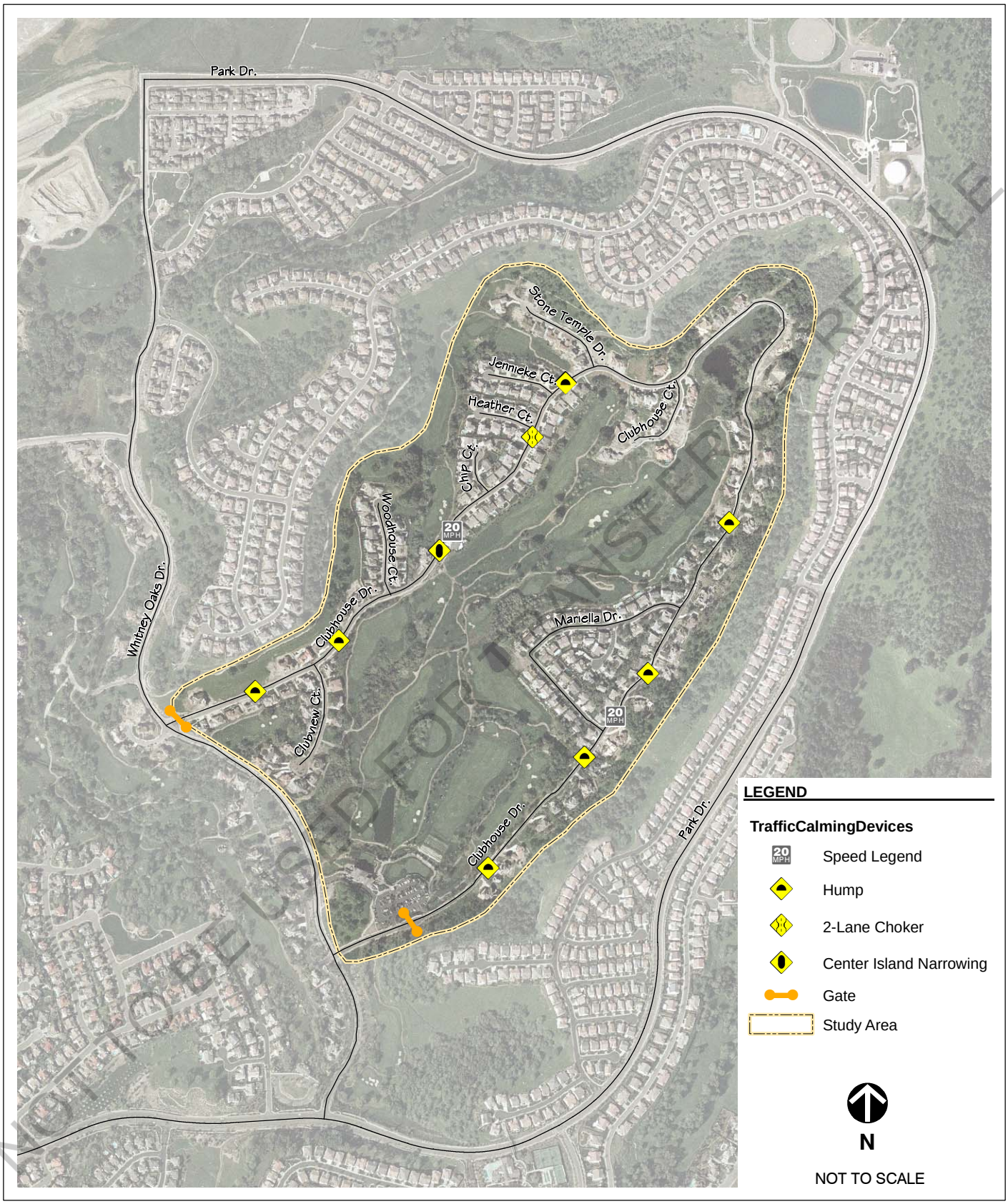
TRAFFIC SPEEDS AND VOLUMES

FIGURE 1



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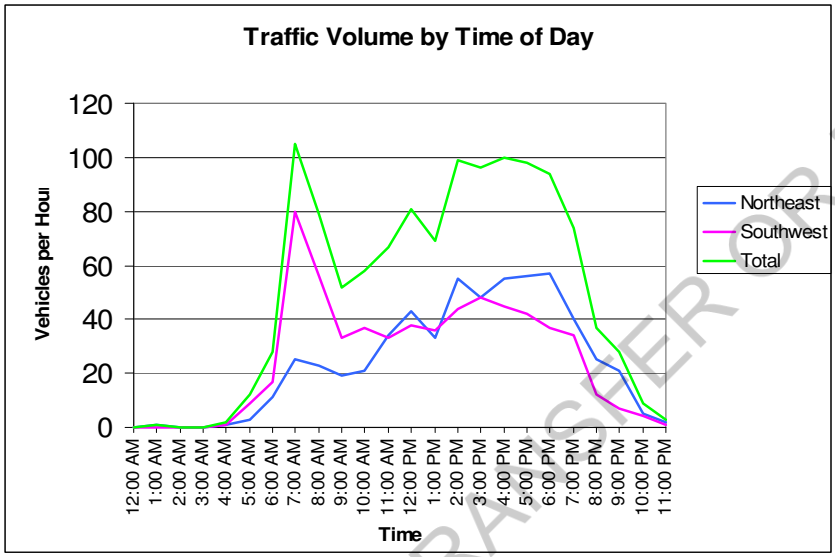
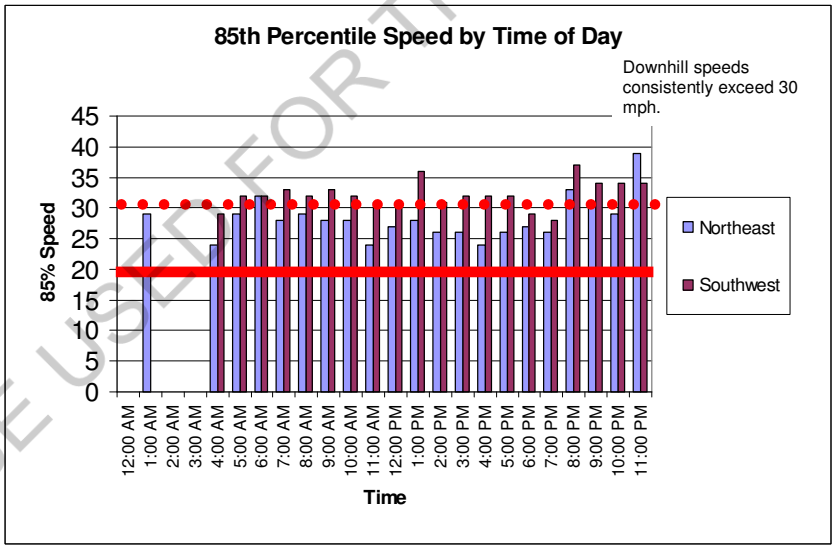
RECOMMENDED TRAFFIC CALMING DEVICES

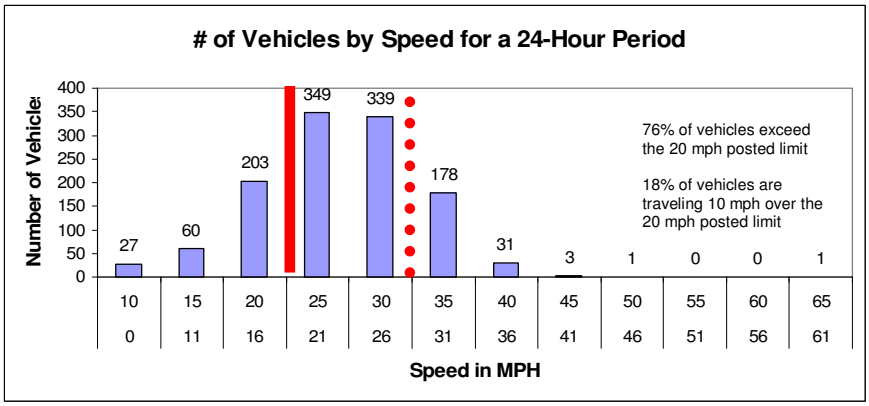
FIGURE 2

Attachment A

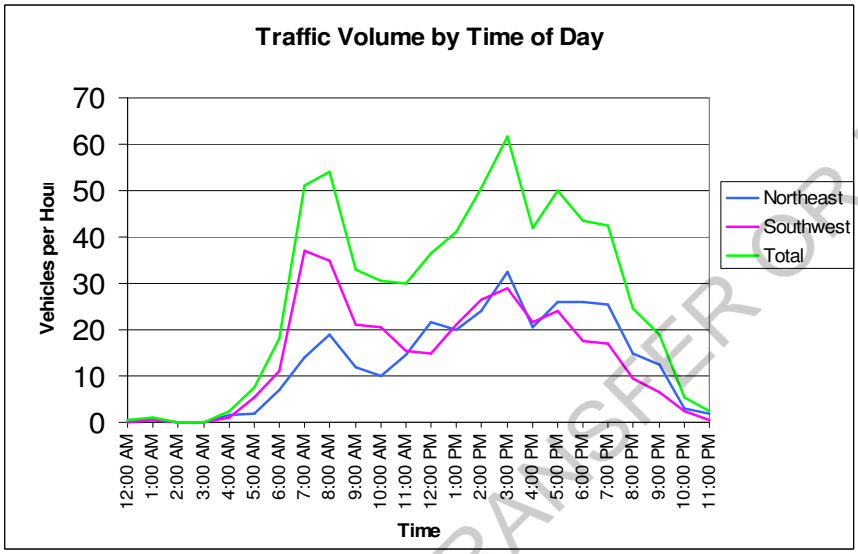
Clubhouse Drive West – South of Clubview Court

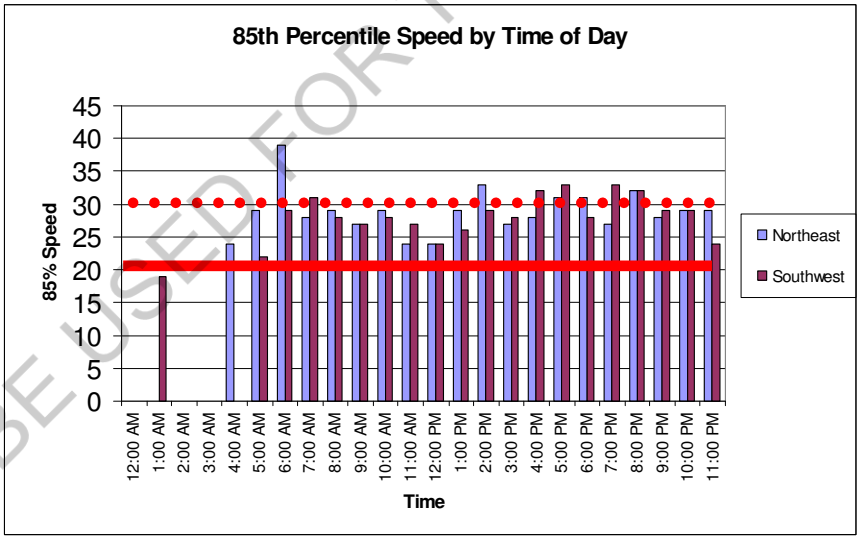


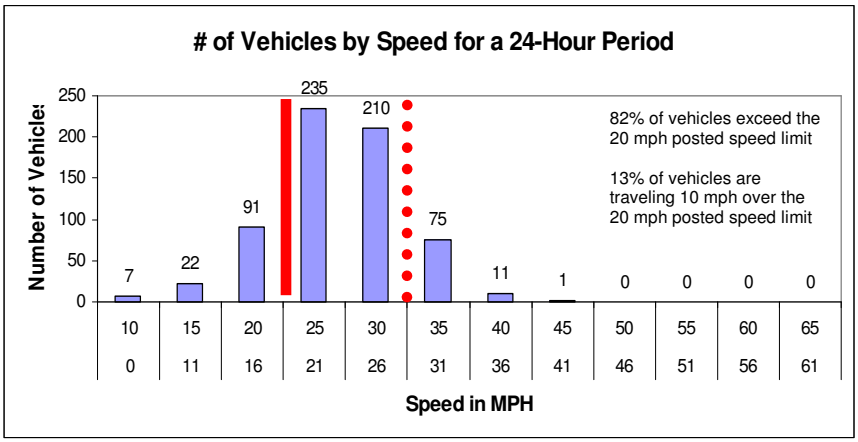




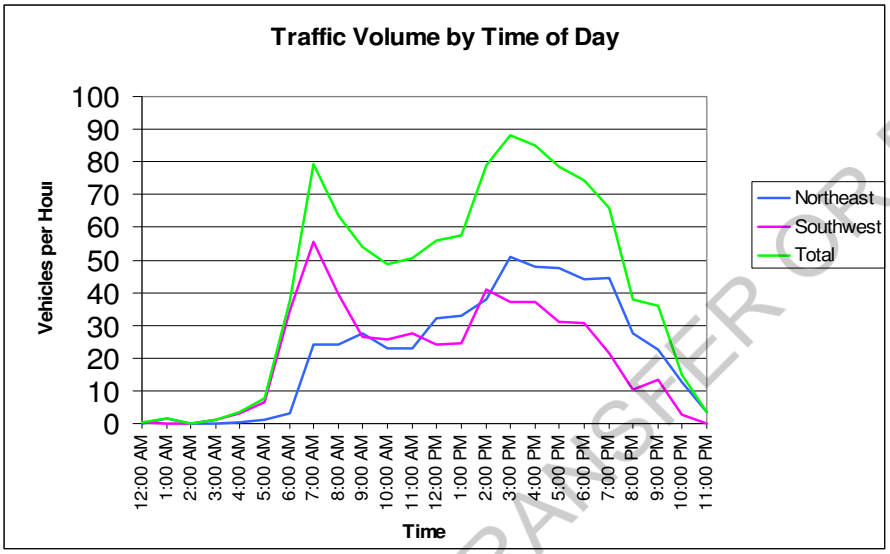
Clubhouse Drive West – Chip Court to Heather Court

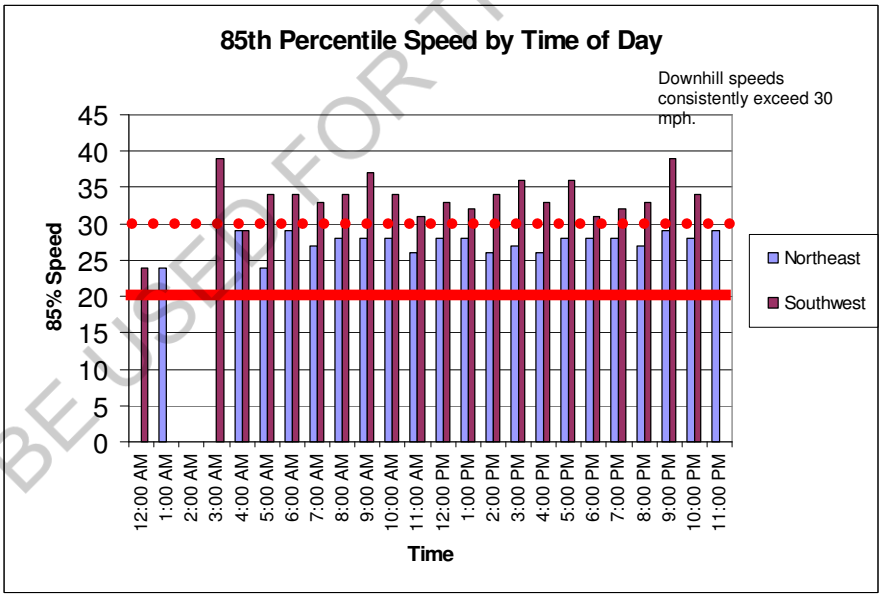


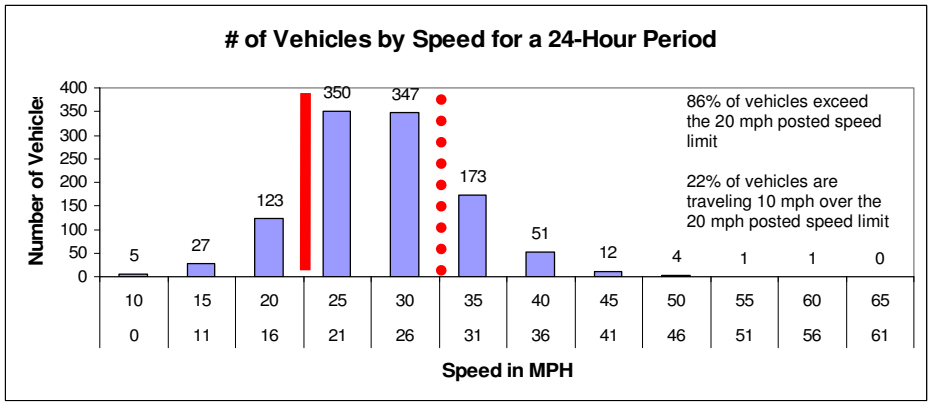




Clubhouse Drive East – South of Mariella Drive







Clubhouse Drive East – North of Mariella Drive