

RADAR SPEED SIGNS ON NEIGHBORHOOD STREETS:
AN EFFECTIVE TRAFFIC CALMING DEVICE?

KEVIN CHANG, MATTHEW NOLAN, AND NANCY L. NIHAN

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ABSTRACT

Local jurisdictions frequently respond to public concerns about speeding on neighborhood streets. When a speed study confirms that a significant percentage of vehicles are exceeding the posted speed limit, the traffic engineer carefully reviews the condition to determine if additional safety measures need to be implemented. Preserving roadway safety for both the motorized and non-motorized public alike who share the roadway is essential.

Each jurisdiction is likely to employ any number of solutions from its traffic safety toolbox. Additional signing, use of mobile radar speed display units, neighborhood speed watch programs, or targeted police enforcement may help discourage drivers from traveling at unacceptable speeds. Physical devices, such as traffic circles, speed humps, and chicanes, can also be considered, but will impact emergency vehicles by increasing their response times.

To balance increased driver awareness of travel speeds with vehicle accessibility, King County Department of Transportation installed four radar speed signs along 108th Avenue NE between NE 124th Street and Juanita-Woodinville Way NE. These radar speed signs, installed directly below the black-and-white posted speed limit signs, alerted each driver by indicating their actual travel speed. To evaluate the effectiveness of these signs, speed studies were conducted before, during, and after installation. This presentation will share the results from these studies, elaborate on installation and maintenance of this device, and draw conclusions as to whether or not these signs have been successful in calming neighborhood traffic.

BACKGROUND

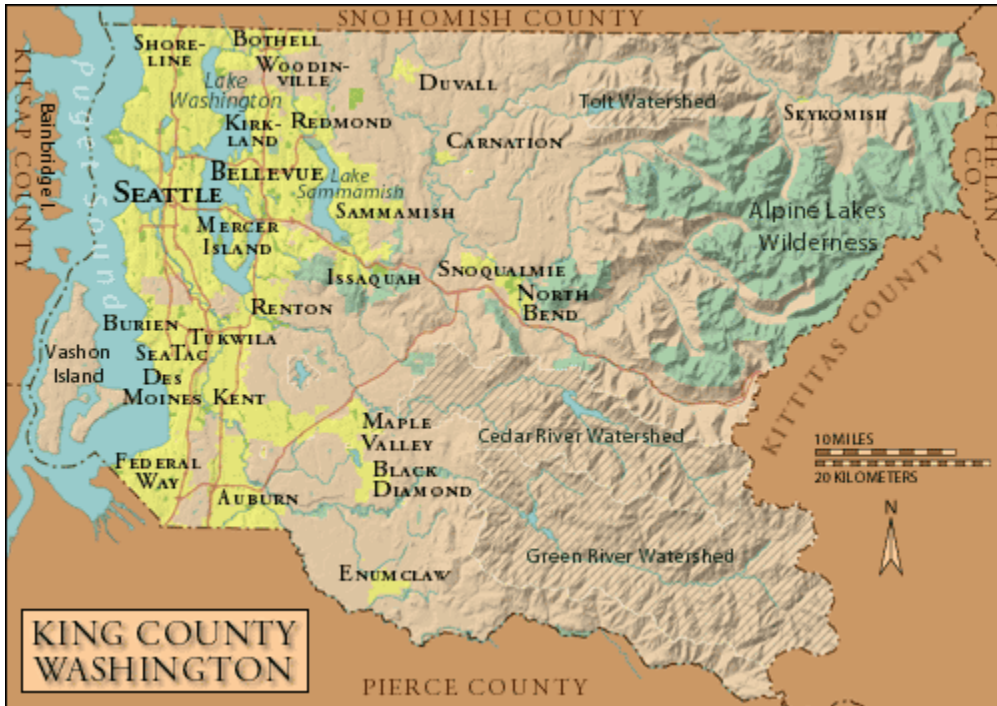


FIGURE 1 : KING COUNTY MAP

Population (2002) :	1,760,000 (total) 355,000 (unincorporated)
Land :	2,134 square miles (total) 1,768 square miles (unincorporated)
Managed Roadways:	1,794 miles of paved roadways 57 miles of unpaved roadways 760 miles of contract roadways

The variability in the geography of King County, so common in the Pacific Northwest, can create unique challenges for local traffic safety engineers. With a broad spectrum ranging from urban developments to more rural environments, flexibility is required during the planning and design stages of any traffic safety improvement so that the recommended solution will best meet the safety and user needs of a particular area. As a result of this wide array of landscape, countywide guidelines and protocol for traffic safety must occasionally be addressed on a case-

by-case basis. Staff engineers recognize the need to adapt and adjust to each individual community.

Because of this variability in needs, King County engineers utilize a wide-ranging “toolkit” for traffic safety. When citizens call requesting a response to speeding, sight distance, or other traffic-related concerns, staff engineers will conduct a field investigation, collect speed and volume data, and meet with concerned citizens to identify specific issues. If a measured problem is present, engineers may install additional signage, request traffic enforcement by the King County Sheriff’s Office, provide residents with use of a radar / readerboard vehicle, or work with neighborhoods and neighborhood associations to develop community-wide solutions identified and endorsed by the community. In the vicinity of 108th Avenue NE, an unincorporated King County neighborhood near Kirkland, Washington, radar speed signs (see Figure 2) were implemented as part of a King County Department of Transportation pilot project.



FIGURE 2 : RADAR SPEED SIGN

THE 108th AVENUE NE CORRIDOR

108th Avenue NE is a two-lane collector arterial with 10-foot wide travel lanes, a 3- to 6-foot wide paved shoulder, and a continuous 5- to 6-foot wide sidewalk along both sides of the street. The

roadway has a posted speed limit of 25 miles per hour (mph). The average daily traffic volume along the length of the corridor is approximately 2,700 vehicles on the north end to upwards of 4,900 vehicles on the south end. There are over ten local roads intersecting 108th Avenue NE that provide direct access into neighborhood communities. This relatively straight roadway has long sight lines with some vertical sight distance concerns. Helen Keller Elementary School and Edith Moulton Park are directly served by 108th Avenue NE, while Juanita High School is located at the southern terminus.

Prior to the installation of the radar speed signs, staff from the King County Department of Transportation's Road Services Division frequently responded to citizens concerned about traffic safety along this corridor. For traffic operations engineers, the documented complaints will sound quite familiar, with specific issues ranging from excessive traffic volumes and speeds, noise, and occasional drag racing, to questionable driving behavior particularly during high school dismissal times.

The installation of the radar speed signs was considered as a practical solution to balance neighborhood needs with mobility. The roadway was not a good candidate for an aggressive treatment such as physical devices since this roadway serves as an important response route for fire and other life safety vehicles. On the other hand, the passive approach of adding additional signage and increasing traffic enforcement had seen only limited benefit.

RADAR SPEED SIGN DETAILS

Four radar speed signs were installed along 108th Avenue NE (see Figure 3). In the northbound direction, signs were installed on the east side of the roadway just north of NE 134th Street and north of NE 140th Street. In the southbound direction, signs were installed on the west side of the roadway north of NE 142nd Street and north of NE 137th Place. Photos depicting these radar speed signs in operation at these locations are shown in Figures 4 to 7.

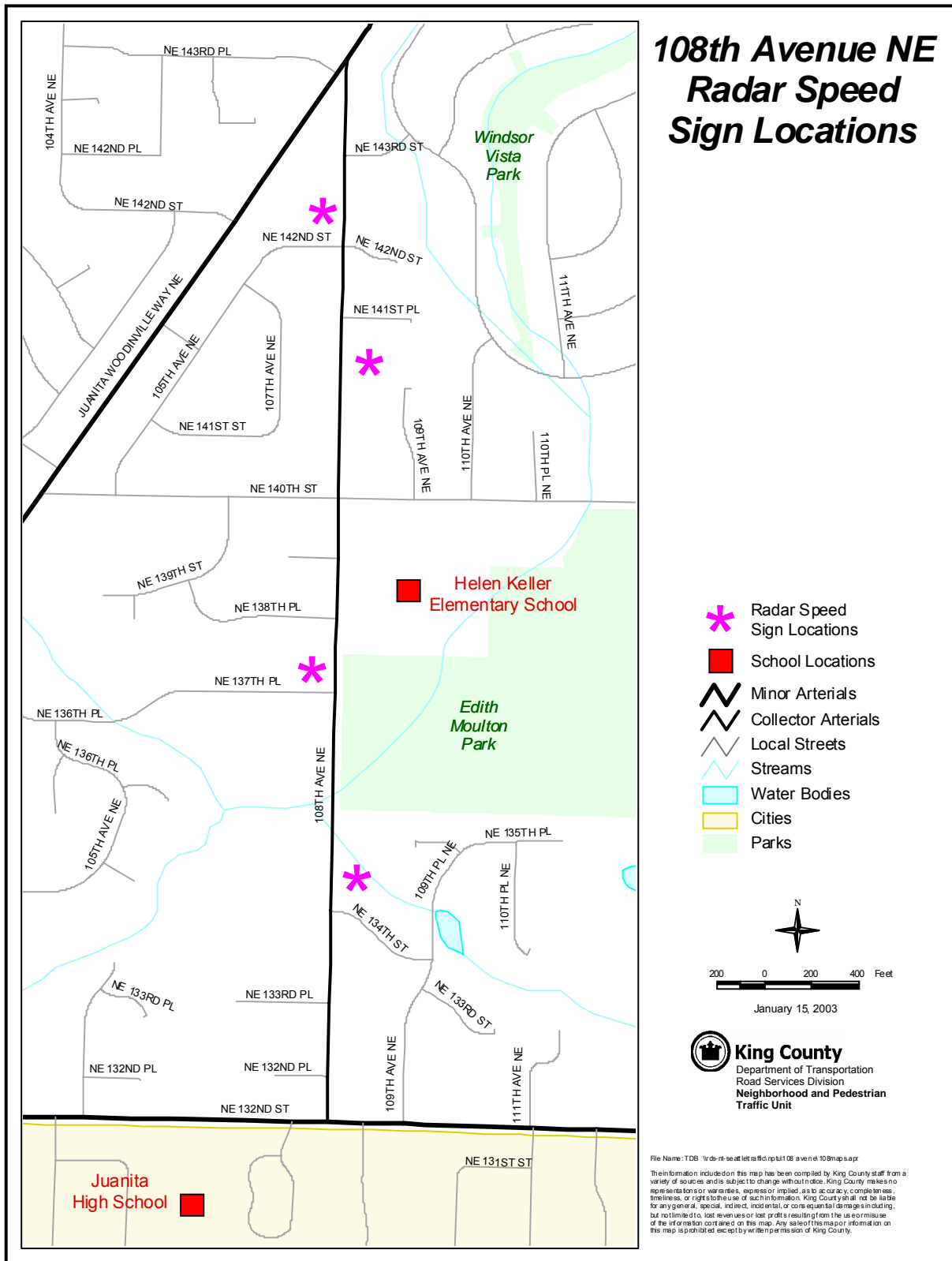


FIGURE 3 : 108th AVENUE NE RADAR SPEED SIGN LOCATIONS



FIGURE 4: 108th AVENUE NE, NORTH OF NE 134th STREET, LOOKING NORTH



FIGURE 5: 108th AVENUE NE, NORTH OF NE 140th STREET, LOOKING NORTH



FIGURE 6 : 108th AVENUE NE, NORTH OF NE 142nd PLACE, LOOKING SOUTH



FIGURE 7: 108th AVENUE NE, NORTH OF NE 137th PLACE, LOOKING SOUTH

The total cost for each installed radar speed sign, including materials, tax, and staff time for design, coordination with local utilities, outreach, and installation totaled approximately \$8,000. Minor fluctuations in cost were attributed to varying roadside conditions and coordination time required.

The sign features a 12-inch high fluorescent yellow-green readout and is the same overall size and style as the existing speed limit sign (24" x 30"). This size matches well with the residential character of the neighborhood. To draw additional driver attention, the display blinks when the vehicle speed exceeds the posted speed limit by five miles per hour. The sign can also be programmed to blank out the screen once a high speed threshold is reached. This feature discourages drivers from speeding excessively to test the capabilities of the sign or their own driving audacity.

DATA RESULTS AND ANALYSIS

To capture the before-and-after effects of this device, average speed and volume data were collected at four locations (see Figure 8) along the roadway corridor in April 2001, February 2002, and early June 2002 prior to installation of the radar speed signs. The signs were activated on June 14, 2002. Average speeds and volumes were then collected at the same locations in mid-June 2002, January 2003, and April 2004. Tables 1 to 4 summarize the deviations in traffic speeds and volumes before and after installation. While some of the newer radar speed signs are capable of collecting traffic data, all of the data collected on 108th Avenue NE used traditional rubber hose technology.

TABLE 1 : 108th AVENUE NE DIRECTIONAL VOLUME DATA (BEFORE)

	LOCATION	DATA TYPE	APR 2001	FEB 2002	JUN 2002
NB	north of NE 134th Street	Volume	2,935	2,484	2,712
	north of NE 140th Street	Volume	1,568	1,363	1,486
SB	north of NE 142nd Street	Volume	1,543	1,463	1,586
	north of NE 133rd Place	Volume	2,579	2,534	2,794

TABLE 2 : 108th AVENUE NE DIRECTIONAL VOLUME DATA (AFTER)

	LOCATION	DATA TYPE	JUN 2002	AUG 2002	JAN 2003	APR 2004
NB	north of NE 134th Street	Volume	2,363	2,337	2,332	2,342
	north of NE 140th Street	Volume	1,352	1,286	1,270	1,409
SB	north of NE 142nd Street	Volume	1,347	N / A	1,438	1,509
	north of NE 133rd Place	Volume	2,353	2,246	2,533	N / A

TABLE 3 : 108th AVENUE NE SPEED DATA (BEFORE)

	LOCATION	DATA TYPE	APR 2001	FEB 2002	JUN 2002
NB	north of NE 134th Street	Average Speed	30.6	29.9	30.4
		85%ile Speed	35.2	35.0	35.0
	north of NE 140th Street	Average Speed	21.9	27.6	27.0
		85%ile Speed	25.4	32.1	31.7
SB	north of NE 142nd Street	Average Speed	27.9	28.0	27.1
		85%ile Speed	32.2	32.4	31.6
	north of NE 133rd Place	Average Speed	30.5	30.9	30.7
		85%ile Speed	34.8	35.5	35.7

TABLE 4 : 108th AVENUE NE SPEED DATA (AFTER)

	LOCATION	DATA TYPE	JUN 2002	AUG 2002	JAN 2003	APR 2004
NB	north of NE 134th Street	Average Speed	28.7	30.2	28.1	28.2
		85%ile Speed	33.1	34.5	32.4	32.4
	north of NE 140th Street	Average Speed	26.3	25.9	26.2	25.4
		85%ile Speed	30.4	29.8	30.1	29.5
SB	north of NE 142nd Street	Average Speed	26.1	N / A	27.1	26.7
		85%ile Speed	30.0	N / A	30.8	30.4
	north of NE 133rd Place	Average Speed	30.4	31.8	31.4	N / A
		85%ile Speed	34.7	36.3	36.1	N / A

The comparative results of traffic volumes and speeds before and after the installation of the radar speed signs are summarized in Tables 5 and 6. In terms of roadway volumes, the installation of the signs resulted in an average volume decrease of up to 13.5%, but this decrease was statistically significant only at the NE 133rd Place location at the 95% confidence level. While the original intent of the signs was not to discourage drivers from traveling along 108th Avenue NE, the results suggest the possibility of some drivers viewing the signs as a nuisance and electing to use an alternative route.

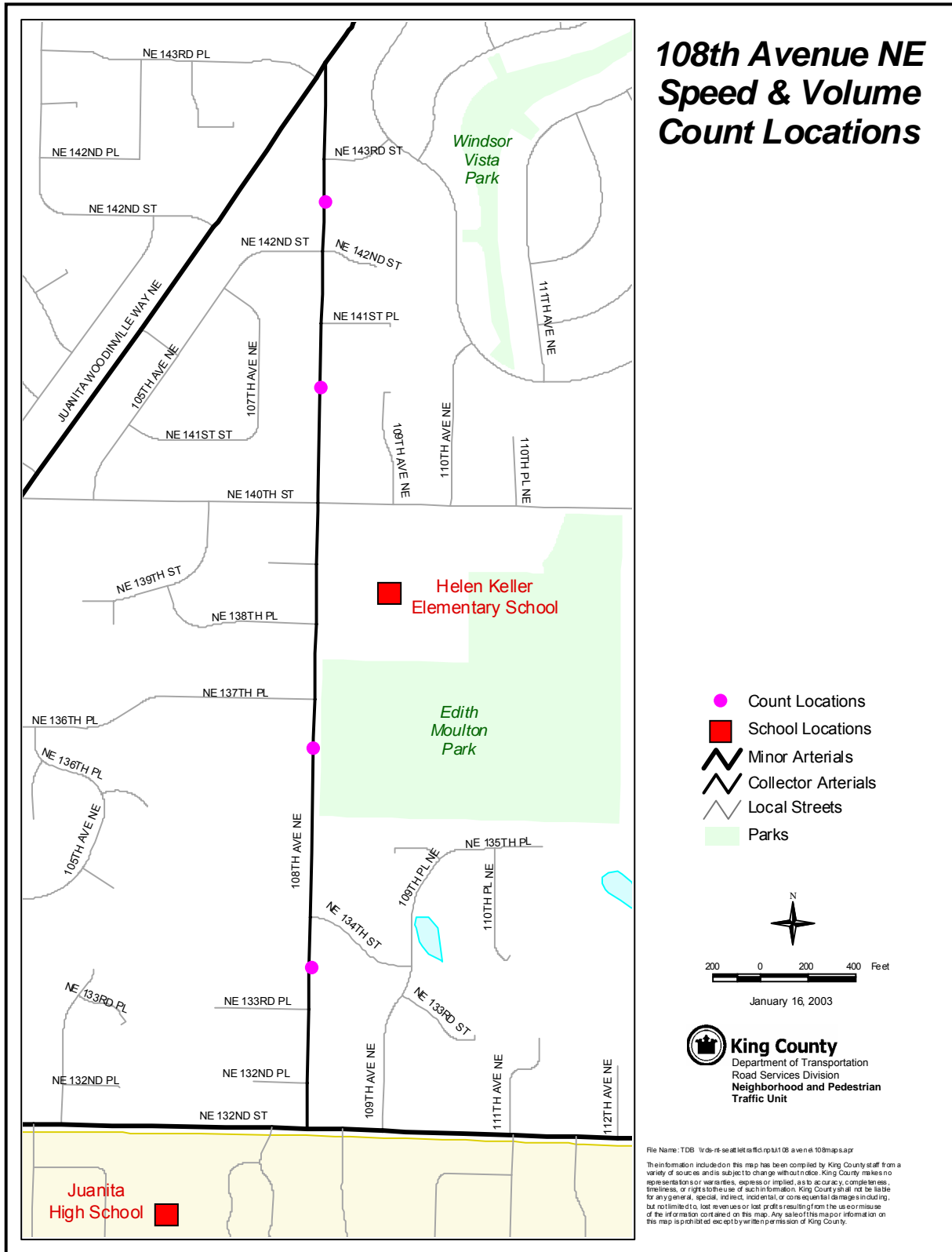


FIGURE 8 : 108th AVENUE NE VOLUME AND SPEED COUNT LOCATIONS

The data collection results did determine a statistically significant difference between the before and after traffic speeds at the 95% confidence level. Traffic speeds decreased at three of the four locations, ranging from 4.26% to 7.15%, or 1.19 miles per hour (mph) to 2.21 mph. While this difference may seem incremental, the results indicated a change in driver behavior, particularly noteworthy given the fact that there were no modifications to the existing geometrics of the roadway.

At the NE 140th Street location, northbound traffic showed a statistically significant increase of 1.99%, or 0.51 mph. Because of this sign's close proximity to Helen Keller Elementary School, this location had the lowest average speed of the four locations prior to installation. It can be speculated that drivers were already respecting the rules of the road, and suggests that these signs may be better suited for locations with higher average speeds from the outset.

The January 2003 and April 2004 data seem to indicate that at these measurement locations lower speeds have been sustained. This is an extremely important finding. In order for this device to be effective it must satisfy this condition. The intent of these signs was not to simply incorporate developing technology at a "trouble spot" in hopes of drawing a short-term reaction. Rather, enabling drivers to permanently change their driving behavior – for the sake of neighborhood traffic safety – will hopefully bear much more profound results and make these radar speed signs a worthwhile investment in the long run.

TABLE 5 : 108th AVENUE NE VOLUME DATA SUMMARY

	BEFORE		AFTER		RESULTS	
	Volume	σ	Volume	σ	t	% change
NE 133rd Place NB	2710	225.5	2344	13.6	3.351	-13.5%
NE 140th Street NB	1472	103.2	1329	63.9	2.286	-9.7%
NE 142nd Street SB	1531	62.4	1431	81.2	1.691	-6.5%
NE 134th Street SB	2636	139.0	2377	145.0	2.233	-9.8%

TABLE 6 : 108th AVENUE NE SPEED DATA SUMMARY

		BEFORE			AFTER			RESULTS	
		Speed	σ	Sample Size	Speed	σ	Sample Size	z	% change
NE 133rd Place	NB	30.89	4.71	15424	28.68	4.64	24890	46.0489	-7.15%
NE 140th Street	NB	25.67	5.18	8790	26.18	4.63	18618	-7.8657	1.99%
NE 142nd Street	SB	27.93	4.69	9143	26.74	4.45	15558	19.6203	-4.26%
NE 134th Street	SB	31.56	6.41	15901	30.00	4.66	33606	27.4480	-4.96%

NEIGHBORHOOD INVOLVEMENT

Based on the experiences on 108th Avenue NE, King County has developed a process of implementation for future neighborhoods. Transportation engineering professionals recognize that complaints by neighborhood residents can stem from years of frustration over the perceived neglect of a public agency to listen and understand the nature of the complaint. The following discussion outlines this process for other potential radar speed sign candidate locations.

Prior to considering radar speed signs or any other community-wide solutions, County staff will host a neighborhood meeting to discuss the existing conditions with interested parties and identify possible solutions. If radar speed signs are preferred, an on-site investigation will be conducted to determine a physical range along the roadway where the signs would best meet the needs of the traveling public. Once that area has been determined, a map identifying that area along with a petition form is distributed to either the neighborhood liaison or community association contact. It then becomes their responsibility to have the homeowners who live within that range agree to the installation of the radar speed signs. Homeowners who may have the sign installed on their property or property line must recognize that there are obvious tradeoffs. The visual obstruction, along with any glare of the sign at night, must be explained as potential negative factors.

After the petition is signed and returned, County staff will then coordinate with the local utility company to establish underground or overhead power to the proposed sign locations. The signs are installed after power is made available. Careful monitoring during the initial weeks of

operation ensure that each sign is operating as desired and that all malfunctions are addressed in a timely manner.

LESSONS LEARNED

Traffic safety issues require any traffic engineer to consider many elements, including the raw data results as well as the concerns of neighbors to identify and implement necessary treatments which balance roadway functionality with neighborhood traffic and pedestrian safety needs. Along 108th Avenue NE, a pilot project using radar speed signs was implemented. While the data suggests a general decrease in volumes and speeds, the qualitative sentiment from the community seems to indicate that a convincing traffic safety balance was achieved. This sentiment has immeasurable value. The community recognized that the occasional speeder will remain, but the solution implemented achieved the overall goal of improving livability. The neighborhood involvement factor, including outreach, education, input, and development of a mutually acceptable solution, established the framework of a consensus process and resulted in a solution that was acceptable and endorsed by any public agency's loudest critic – its community and tax-paying citizens who demand and expect the best services possible.

King County has not experienced any significant vandalism or maintenance issues to date regarding these radar speed signs. As mentioned earlier, King County also offers its citizens the use of a radar readerboard trailer. The roadside location of the trailer made this particular treatment a regular target. The height and mounting of the radar speed sign as well as its permanency appears to have deterred vandals. Follow-up maintenance of the signs has been minimal. Aside from some initial adjustments expected for a new device and minor start-up programming complications, there have been no major issues or periods of downtime.

The Institute of Transportation Engineers, in its 1999 Traffic Calming – State of the Practice report, defined “traffic calming” as “the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users; traffic calming measures are intended to be self-enforcing.” Based on this definition, the authors contend that radar speed signs do represent a form of traffic calming, and that these signs have shown to be an effective device with sustained traffic safety benefits.

Kevin N. Chang, P.E.
Supervising Engineer, Neighborhood Traffic and Pedestrian Safety Unit

King County Department of Transportation
201 S. Jackson Street
MailStop KSC-TR-0222
Seattle, WA 98104-3856

W (206) 263-6131; F (206) 296-0176
kevin.chang@metrokc.gov