Complete Streets 101

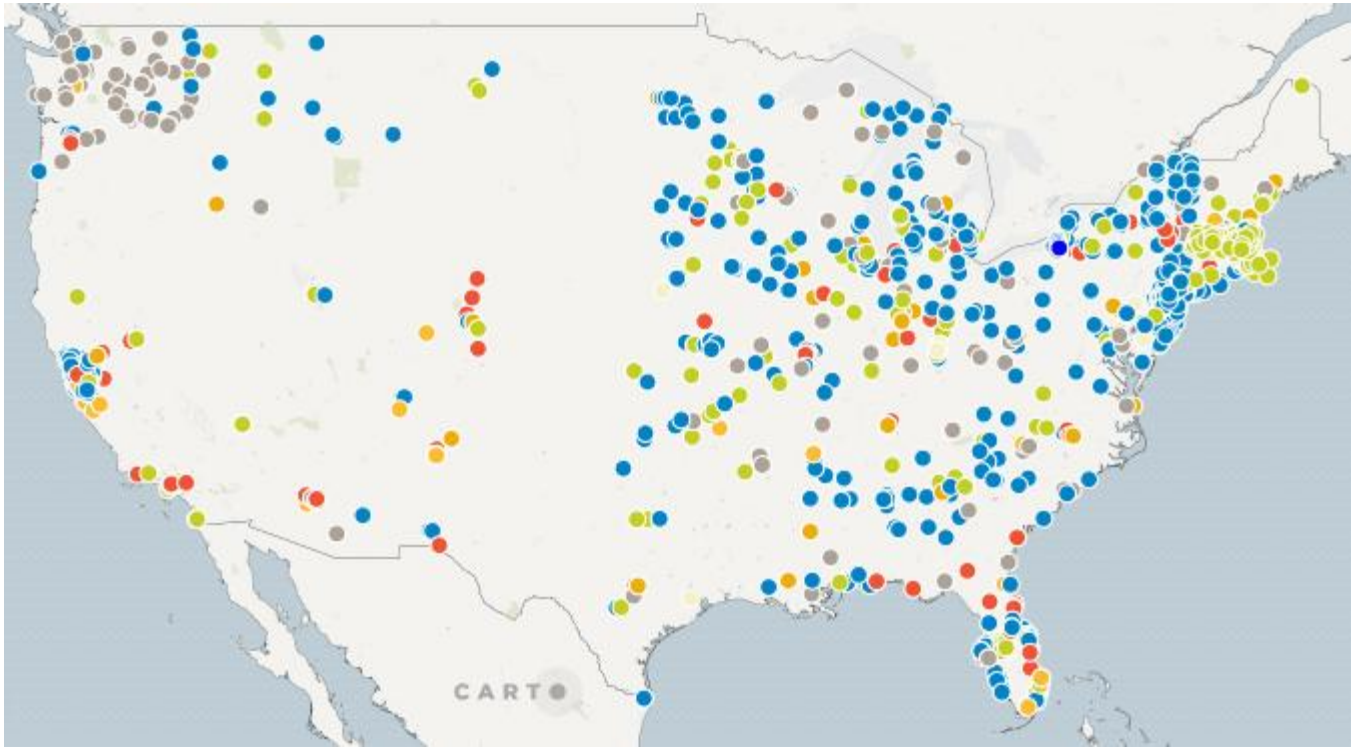
City-County Carjacking and Reckless Driving Task Force

Monday, April 15, 2019

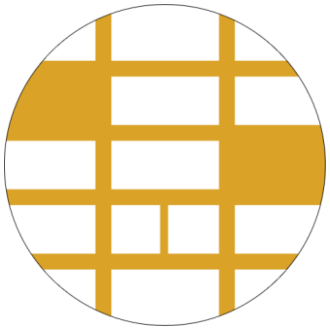
Mike Amsden, AICP – Multimodal Transportation Manager

What are Complete Streets?

Complete Streets are streets for everyone.
They are designed and operated to enable safe access for people of all ages and abilities, including people walking, biking, taking transit, and driving.

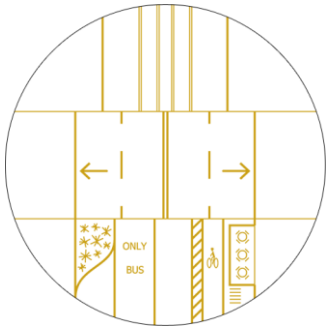


Why Complete Streets?

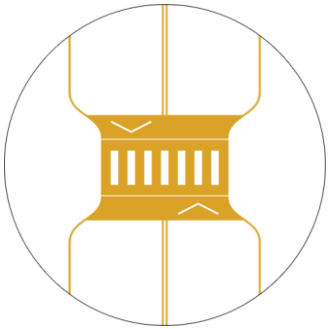


Streets are Public Places

Great Streets are Great for Business



Streets Can Be Changed



Streets Provide Access

Streets are Ecosystems

Streets Foster Community Identity

Milwaukee's Complete Streets Policy

*"The City of Milwaukee is committed to fostering a **livable city** through the creation of Complete Streets that improve access to **neighborhoods**, prioritize the **safety and health** of residents and visitors, support **economic growth**, improve **access to education and jobs**, enhance **urban design**, encourage **physical activity**, and reduce negative **environmental impacts** throughout the city…"*

Milwaukee's Complete Streets Policy

Award Winning!

*"The City of Milw… …ing a **livable city** through the crea… …mprove access to **neighborhood**… …f residents and visitors, support **econ**… …**ccess to education and jobs**, enhance **urban desig**… …**ysical activity**, and reduce negative **environmental impacts** throughout the city…"*

Why Complete Streets?

Achieve broader City goals

- A safe, reliable, comprehensive transportation network is a right
- Speeding and reckless driving leads to crashes
- A comprehensive, equitable approach can address disparities
- Enhance community connectedness, promote healthy neighborhoods

City Budget Priorities

- Provide safety and stability for all Milwaukee neighborhoods
- Increase economic opportunity and family supporting employment for all residents
- Preserve and leverage the City's environmental and physical assets

Community Support

AARP Wisconsin

American Heart Association

Black Girls Do Bike

Children's Hospital of Wisconsin

Congress for New Urbanism – Wisconsin

Jane's Walk MKE

Layton Boulevard West Neighbors

LISC Milwaukee

Murray Hill Neighborhood Association

Northwest Side Community Development Corporation

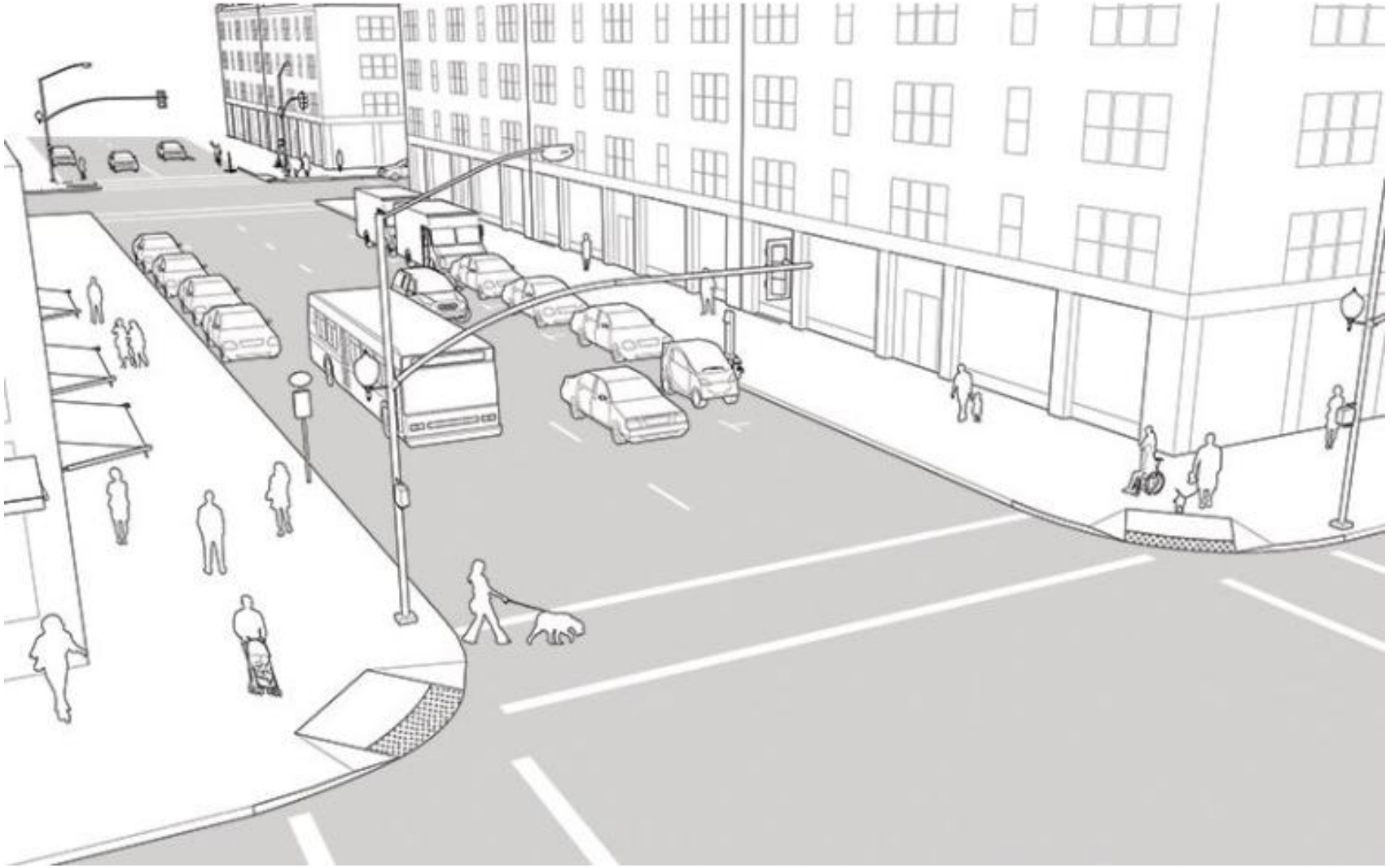
Safe and Healthy Streets Milwaukee

Sixteenth Street Community Health Centers

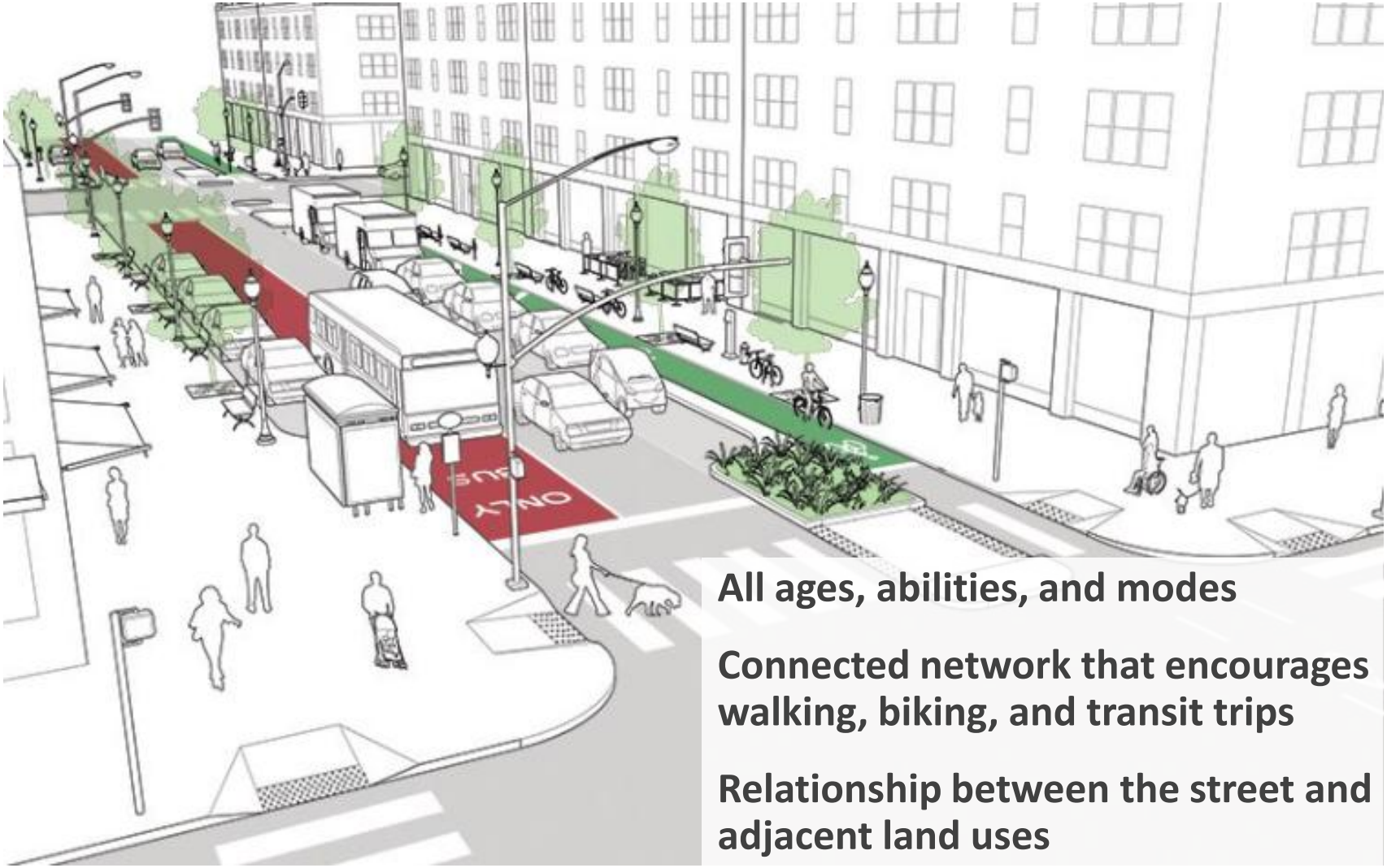
Wisconsin Bike Fed

ZIP MKE

Milwaukee's Complete Streets Policy



Milwaukee's Complete Streets Policy



All ages, abilities, and modes

Connected network that encourages walking, biking, and transit trips

Relationship between the street and adjacent land uses

Milwaukee's Complete Streets Policy

Universal and equitable investment in underserved neighborhoods

Robust and meaningful community engagement

Modal Hierarchy

"Above all, safety is imperative, with pedestrian safety having the highest priority followed by the next most vulnerable users."

South 5th Street Reconstruction

Kilbourn Avenue

Kilbourn Avenue

Westlawn Gardens

Complete Streets Committee Members

Department of Public Works
- Street design
- Street maintenance

Department of City Development
- Planning and zoning
- Land use context

Department of Neighborhood Services
- Zoning enforcement
- Plan review

Department of Administration – Budget and Management
- Budget priorities
- ADA compliance

Committee Chairs
- Citywide policy

Health Department
- Active communities
- Traffic safety

Police Department
- Enforcement
- Community engagement

Housing Authority
- Community engagement
- Community design

Employ Milwaukee
- Access to jobs
- Economic development

Bike Ped Task Force
- Resident voice

Committee Responsibilities

"The committee shall prioritize, assign and monitor various actions to support implementation of the city's complete streets policy, including but not limited to…"

- Review and recommend policies, procedures, plans, regulations and other processes that support the complete streets policy
- Review / update as needed design standards to ensure that they reflect the best available design standards and guidelines related to the complete streets policy.
- Recommend project evaluation and performance criteria
- ***Identify ways to provide education and enforcement on proper road use by all***
- Seek input from neighborhood associations, business improvement districts, neighborhood improvement districts and other neighborhood groups concerning transportation projects
- Conduct an annual Complete Streets Report

Questions?

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B. Figure 2 (jpg)

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Summary:

Law enforcement agencies are constantly challenged with negotiating a variety of pressing issues while striving to maintain high ethical, moral, legal, and professional standards. Of utmost importance is the principle to protect the public from harm. Many agencies have experienced competing calls for service that have driven prioritization to threats to life and safety, thus reducing attention to property crimes, including auto theft.

Document Text:

The Police Chief
July 2016

Motor Vehicle Theft: A Relationship to Other Crimes

Robert D. Force, Director, Colorado Auto Theft Prevention Authority

Law enforcement agencies are constantly challenged with negotiating a variety of pressing issues while striving to maintain high ethical, moral, legal, and professional standards. Of utmost importance is the principle to protect the public from harm. Many agencies have experienced competing calls for service that have driven prioritization to threats to life and safety, thus reducing attention to property crimes, including auto theft. Additionally, economic stressors and public concern priorities have pressured many law enforcement agencies to generalize investigative services, which makes officers' developing the level of expertise, legacy knowledge, and specialization needed to fully combat auto thefts and related criminal activities a challenge.

With these challenges in mind, an officer's initial thought of auto theft may normally, if erroneously, be that "it's just a property crime," whereby the owner's economic loss may be recuperated or lessened by an insurance claim. However, auto theft is often related to a mode of transportation and a mechanism to commit other crimes, including violent crimes. This has been the case since the first known bank robbery using a motor car in the United States, which occurred in California on August 19, 1909. The following account of it was published in a Rich Hill, Montana, newspaper, The Tribune:

Driving up to the Valley bank of Santa Clara in a hired automobile two youths covered Cashier Birge and his assistants with shot guns backed them against the wall and, after securing $7,000, fled in the machine.

Seven miles away, after they had been chased by police and a posse of citizens also in automobiles, the youthful bandits were captured. The chauffeur of their car having purposely caused a breakdown, thus compelling the

robbers to take to their heels. The money was recovered and the youths were put in jail.[1]

Moving forward to modern times, in 2014, an estimated 689,527 motor vehicle thefts occurred in the United States, for an economic loss totaling more than $4.5 billion. However, often, a motor vehicle theft event (including the report of a stolen vehicle to when it is recovered) is perceived as a low-priority call for service due to the historical classification of a motor vehicle theft as a property crime. The low prioritization of auto theft often impacts law enforcement's capabilities to prevent, identify, investigate, and interdict auto theft offenders for the theft or their involvement with other criminal events.

Historical Context of Auto Theft

Auto theft is often viewed with the historical perception that it is primarily a property crime. Historically, auto theft victims were expected to turn to their insurance agencies for recovery of the property loss, as the effort to expend law enforcement personnel and resources on a vehicle theft event did not have a high value of return. Offenders were often low-level, opportunistic offenders with minimal histories of criminal activity. There were occasional cases in which the vehicle theft was connected to large-scale, complex, violent crime investigations, but it seemed that these cases were few and far between. However, history also shows some vehicle thefts connected to notorious criminal cases, such as the myriad of crimes committed by Charles Manson and the Manson family, or, perhaps, the most famous getaway car, a gray 1934 Ford V-8, stolen by Clyde Barrow and Bonnie Parker and used on a multi-state, 2,500-mile crime spree (leaving nine corpses) before their luck ran out at a roadblock in Louisiana.[2]

During the 1980s, the high incidence of auto theft gained attention and U.S. federal laws were passed in an effort to reduce auto theft. In 1984, the U.S. Congress passed the Motor Vehicle Theft Law Enforcement Act in order to facilitate the tracing and recovery of stolen motor vehicles and parts from stolen vehicles.[3] As a result of the 1984 act, manufacturers of designated high-theft passenger car lines were required by the U.S. Department of Transportation to mark the vehicle identification number (VIN) on the engine, transmission, and 12 major vehicle body parts. The marking of vehicle parts serves a dual purpose: marked vehicles or parts make it easier for law enforcement to identify stolen vehicles or parts -- and the markings deter professional auto thieves because "they will have difficulty in marketing stolen marked parts and are more likely to get caught if they steal cars with marked parts." The manufacturers of those car lines designated as high-theft began the practice of parts marking with the model year 1987.[4]

Despite these steps, motor vehicle theft continued to be a large problem in the early 1990s. By 1990, thefts had increased to 1,270,000 from 830,000 in 1984, leading to the enactment of the Anti Car Theft Act of 1992.[5] The 1992 act enhanced federal penalties for auto thefts; authorized a grant program to help law enforcement agencies concerned with auto theft; implemented improved motor vehicle titling, registration, and salvage processes; expanded the Theft Prevention Standard (parts marking requirement) to more car lines and vehicle types; established rules regarding salvage or junk vehicles; and permitted random customs inspections. In addition, the legislation required that a stolen parts information system be maintained by the U.S. attorney general, and dealing in stolen marked parts became a federal crime.[6] During the 1990s, several U.S. states also began implementing auto theft prevention authorities and centralizing education, prevention, enforcement, training, and prosecutions of auto theft, as have some Canadian provinces and Australian states.[7]

As can be seen in Figures 1 and 2, vehicle theft rates were almost twice as high in the 1990s than in 2014. Many of the pre-2000 vehicles were easy targets for theft as the lock and ignition systems were easily overcome. Many of the low-level, opportunistic offenders were thwarted as technological theft prevention advances were implemented by manufacturers and law enforcement became more attentive to vehicle theft.[Editor's Note: Click on the links above to view Figures 1 and 2.]

According to the National Crime Information Bureau's Hot Wheels 2014, about 60 percent of the top 10 vehicle make and model thefts are vehicles from 1989 through 1999.[8] There are still many of the older pre-2000 vehicles on the road today that are preyed upon by opportunistic thieves. However, casual car theft, such as that committed by joyriding juveniles, still exists, but it has become a lesser part of the auto theft problem. Increasingly, car theft is a sophisticated criminal enterprise that involves title fraud, vehicle identification cloning, and stripping cars for parts in "chop shops." The selling of stolen vehicles and their parts on both the domestic and international black markets is a profitable business.[9]

Auto Theft Connection to Other Crimes

In today's environment, motor vehicle theft is typically not an isolated property crime, but rather a crime associated with numerous victims and the commission of other crimes.

INTERPOL recognizes the complex environment in which motor vehicle theft is a highly organized criminal activity affecting all regions of the world, with clear links to organized crime and terrorism. Vehicles are not only stolen for their own sake, but they are also trafficked to finance other crimes -- such as terrorism in which they can be used as bomb carriers -- or in the perpetration of other crimes.

The INTERPOL Stolen Motor Vehicle (SMV) database is a vital tool in the fight against international vehicle theft and trafficking. The SMV allows INTERPOL member countries to run a check against a suspicious vehicle and find out instantly whether it has been reported as stolen. An international database of this nature is crucial as vehicles are often trafficked across national borders, sometimes ending up thousands of miles away from the location from which they were stolen. In 2015, around 123,000 motor vehicles worldwide were identified as stolen in the SMV database.[10]

Law enforcement's reports and investigations of auto theft should take the ability of the offender(s) to use the stolen vehicle in transitioning to other crimes into consideration, as offenders may use the stolen vehicle to preempt, complete, or otherwise conduct organized white collar crime or other crimes against persons (e.g., bank robberies, burglaries, drug trafficking, human trafficking). It is commonplace to see the theft of a motor vehicle connected to a violent crime such as car-jacking, robbery, shooting, home invasion, and so forth. These violent events also lead to increased hazards for responding officers and the public when they involve vehicles due to the dangers caused by offenders driving recklessly when going to or attempting escape from violent crime scenes. These hazards can escalate to vehicle pursuits or dangerous confrontations with officers, resulting in shootings or loss of life.

The crime of auto theft often provides a mode of transportation or mechanism to further other crime, including violent crime and organized crime, as demonstrated by the following examples.

* In a six-month period (January 2015-July 2015), the Denver Metropolitan Area experienced 46 bank robberies; 48 percent (22) of these robberies are known to involve the use of a stolen vehicle.[11]

* During a two-year period (2013-2014), a Colorado crime ring, involving 16 known suspects, used 24 known stolen vehicles to commit at least 125 other crimes, including credit card fraud, theft, narcotics trafficking, and burglary. These crimes impacted more than 58 victims and involved 16 jurisdictions. The known offenders' ages ranged from 20 to 62 years old.[12]

* During the takedown of a major international auto theft and drug trafficking ring with ties to the Sinaloa drug cartel in 2014, 22 people were arrested in New Mexico. The case involved a large-scale car theft scheme that involved shipping stolen luxury vehicles from New Mexico to Mexico in exchange for methamphetamine and heroin. "During the takedown, agents and officers seized seven firearms, including a sawed-off shotgun and a stolen weapon, as well as various amounts of methamphetamine, heroin, and cocaine."[13]

* In October 2015, 21 people were charged by the New Jersey attorney general following the takedown of a major international carjacking and stolen car trafficking ring. The ring stole luxury cars in New York and New Jersey and shipped them to West Africa and other places where they could be resold. Three members of the ring remain at large. The 16-month investigation by 17 federal, state, and local agencies led to the recovery of 90 stolen cars worth more than $4 million.[14]

Current Auto Theft Reduction Efforts

Since 2010, auto theft reduction efforts have been at an all-time low -- even though it is now commonplace to see auto thefts associated with violent crimes, pattern criminal activities, and organized crime. Law enforcement efforts to reduce auto thefts must address the lucrative business of criminal organizations that would rival most of the successful legitimate businesses in the United States. Criminal enterprising associated with auto theft has provided an enormous profit that provides the means to perform sophisticated illegitimate business schemes such as gangs, cartels, organized crime, drug trafficking, and human trafficking. The modern auto theft offender is often associated with a plethora of violent crimes, including robberies, home invasions, burglaries, fraud, assaults, batteries, and endangerment -- all of which pose a severe threat to law enforcement and the public. Arguably, these criminal behaviors have always been engaged with the crime of auto theft; however, they appear to be more common as low-level criminals have been thwarted by previous enforcement efforts, legislation, and manufacturers' enhanced systems.

Colorado Auto Theft Study

In November 2015, the Colorado Auto Theft Prevention Authority facilitated a study with the Colorado Auto Theft Intelligence Coordination Center to determine the relationship of auto theft to other crimes.[15] The motivation behind this study was to determine the role of auto theft and the criminals who perpetrate it in the furtherance of other criminal acts. As previously stated, the common mind-set views auto theft as solely a property crime, with many victims being compensated for their losses through their respective automobile insurance policies. Although most law enforcement agencies recognize that there is an economic impact associated with auto theft occurrences, when compared to crimes against persons and other violent crimes, this impact is viewed as minimal. Ultimately, this can result in the law enforcement community prioritizing their efforts on the prevention and investigation of higher-profile crimes with a clear, direct public safety nexus and increased economic impact. The goal of this initial study was to determine if and to what level the crime of auto theft is involved in these higher-priority crimes.

There were challenges in the collection of the data needed to determine this association. The lack of uniform and standardized data collection and disparate record management systems limited the amount of viable data available for use in this study. Despite these challenges, this study was able to identify several reliable data sources and, through the analysis of these data, was able to convey that the crime of auto theft is commonly associated with a vast array of other crimes.[16] The study produced the following findings:

* In total, there were 22,763 motor vehicle thefts in Colorado from January 1, 2013, to December 31, 2014. Approximately 10 percent (2,392) of these thefts resulted in felony charges being filed within the Colorado court system. Of these filings, 97 percent of those charged with motor vehicle theft were also charged with additional crimes.

* Auto theft offenders were identified with such associated crimes as arson, drug trafficking, controlled substance violations, kidnapping, financial fraud, burglary, robbery, weapons violations, and criminal mischief (e.g., carjacking, assault, and battery).

* A majority of auto theft offenders have multiple charges for other crimes. These other crimes include robbery, burglary, assault, drug abuse, menacing, escape, fraud, forgery, and disturbance of public peace. Many of the auto theft offenders are believed to be recidivists, and, as such, many of them may be expected to be actively involved in other hierarchical crimes.[17]

These findings emphasize that those who perpetrate the crime of auto theft also have the propensity to commit other crimes -- including crimes that have a higher priority within the law enforcement community than auto theft. At this time, the role of auto theft in the furtherance of these crimes cannot be determined with a high statistical level of confidence due to the limited data available for study. However, through interviews with investigators and analyses of filed cases, it can be inferred that many thefts of motor vehicles are motivated by the ambition to commit another crimes involving persons, drugs, or other property.

Technological advances have also impacted the effect of vehicle theft and vehicle crimes. These advancements have been leveraged by the criminal element in the use of the Internet, cellphones, computer technology, and cyber technology. Stolen vehicles can be transacted; vehicle and title fraud, identity theft, and scams can be performed; and cyber technology can be leveraged to commit vehicle crimes (e.g., odometer roll-back). In essence, it seems that today's vehicle thief has a higher level of sophistication and intelligence than those thieves encountered pre-2000s. Technological advances have afforded current vehicle thieves the ability to surpass geographical boundaries and access criminal networks on a global level -- and do so with minimal intervention by law enforcement. Compounding the difficulty to interdict these multifaceted criminal ventures is their use of Internet services to capitalize on selling stolen vehicles or their parts, with minimal fear of being caught.

Conclusion

States and agencies deploying auto theft task forces have a strong documented history demonstrating that auto theft is a transformational crime associated with a wide array of criminal activities, as discussed herein. Those in the field of auto theft prevention understand this issue, such as the International Association of Auto Theft Investigators, auto theft prevention authorities, and the IACP Vehicle Crimes Committee. However, there are law enforcement administrators and prosecutors who still consider auto theft as a victimless, nonviolent property crime.

The Colorado Auto Theft Prevention Authority's study determined that motor vehicle theft is not an isolated property crime, but rather a crime incurring numerous victims and motivated by the furtherance of other "higher-priority" crimes. As pointed out in The Colorado Auto Theft Annual Report-2012,"In many cases, the crime of auto theft is considered a transitional crime as offenders use the crime of auto theft to preempt, complete, or

otherwise conduct organized white collar crime and/or other crimes against persons (e.g., bank robberies, burglaries, drug trafficking, and human trafficking)."[18]

Law enforcement executives should be encouraged to elevate the prioritization of vehicle theft events (report incident to the recovery incident) in order to

* increase forensic evidence collection (e.g., DNA, fingerprints, and hair) that can be used to identify and substantiate individuals who may be involved with other crimes;

* increase the ability of law enforcement and prosecutors to establish the criminal predicates of offenders engaged in a pattern or series of criminal behavior beyond property crime; and

* elevate intelligence and information gathering to associate criminal enterprises engaged in pattern or organized crimes such as home invasions, burglaries, robberies, drug cartels, identity theft, homicide, and arson.

Robert D. Force is a member of the IACP Vehicle Crimes Committee and the director of the Colorado Auto Theft Prevention Authority, a business unit assigned to the Colorado State Patrol. Mr. Force retired in 2003 as an assistant chief of police from the Rio Rancho, New Mexico, Police Department and has worked in the law enforcement field for the past 36 years. Mr. Force is a graduate from the FBI National Academy (202nd class) and the NW School of Police Staff and Command (63rd class) and holds bachelor's degrees in criminal justice and law & society from New Mexico State University.

ABOUT THE IACP VEHICLE CRIMES COMMITTEE

The IACP Vehicle Crimes Committee studies, considers, and determines the various methods and means by which vehicle crimes are committed, including the make and type of vehicles most commonly stolen; surveys, investigates, and evaluates the techniques and methods employed by the police and other agencies in solving and reducing the incidence of vehicle crimes cases; and reports to the IACP for the dissemination to all interested agencies all pertinent information and recommendations that will reduce the incidence of this major crime.

Notes:

1 Library of Congress, "The Rich Hill Tribune, August 19, 1909," Image 6, Chronicling America, http://chroniclingamerica.loc.gov/lccn/sn90061663/1909-08-19/ (accessed May 24, 2016).

2 "In the beginning of each respective investigation, the inter-agency communication was lacking. Because of this, the murder investigations led to separate dead ends. Luckily, the continuing criminal activity in the Manson family aided police authorities in apprehending more than a dozen individuals. While the Manson family was in Death Valley digging into the ground for the 'Bottomless Pit,' they burned machinery belonging to the Death Valley National Monument. Burning the machinery led to the raiding of the Death Valley ranches by police authorities. During the raid, police found multiple stolen vehicles and made multiple arrests." Crime Museum, "Charles Manson and the Manson Family," Crime Library, http://www.crimemuseum.org/crime-library/charles-manson-and-the-manson-family (accessed May 24, 2016).

3 Motor Vehicle Theft Law Enforcement Act of 1984, Pub. L. 98-547 (1984).

4 Federal Motor Vehicle Theft Prevention Standard, 49 CFR 541; National Highway Traffic Safety Administration (NHTSA), Auto Theft and Recovery: Effects of the Anti Car Theft Act of 1992 and the Motor Vehicle Theft Law Enforcement Act of 1984, July 1998, http://www.nhtsa.gov/cars/rules/regrev/evaluate/808761.html (accessed May 24, 2016).

5 NHTSA, Auto Theft and Recovery; Anti Car Theft Act of 1992, Pub. L. 102-519 (1992).

6 Ibid.

7 International Association of Auto Theft Investigators, Auto Theft Prevention Authorities, "Combat Auto Theft," http://combatautotheft.org/Home_Page.html (accessed May 24, 2016).

8 Of the reported 233,140 top 10 vehicle thefts in each state, 136,410 were model years prior to 2000. National Insurance Crime Bureau, "2014 Top 10 Vehicle Make/Model Thefts," Hot Wheels 2014, https://www.nicb.org/newsroom/nicb_campaigns/hot%E2%80%93wheels/hot-wheels-2014 (accessed May 24, 2016).

9 Donna Lyons and Anne Teigen, Auto Theft Prevention (Denver, CO: National Conference of State Legislatures, 2008), 5, https://www.ncsl.org/print/cj/autotheftreport.pdf (accessed May 24, 2016).

10 Interpol, "Vehicle Crimes," http://www.interpol.int/Crime-areas/Vehicle-crime/Vehicle-crime (accessed May 24, 2016).

11 Mike Becker, Denver Metropolitan Auto Theft Team Report to the Colorado Automobile Theft Prevention Authority (2016).

12 Ibid.

13 U.S. Immigration and Customs Enforcement (ICE), "22 Arrested in New Mexico for Operating International Car Theft Ring Connected to Sinaloa Drug Cartel," news release, June 25, 2014, http://www.ice.gov/news/releases/22-arrested-new-mexico-operating-international-car-theft-ring-connected-sinaloa-drug (accessed May 24, 2016).

14 ICE, "21 Charged in $4 Million Takedown of International Car Theft Ring," news release, October 28, 2015), https://www.ice.gov/news/releases/21-charged-4-million-takedown-international-car-theft-ring#wcm-survey-target-id (accessed May 24, 2016).

15 The Colorado Auto Theft Intelligence Coordination Center (ATICC) is housed in the Colorado Information Analysis Center (CIAC) and purposed to collect, centralize, analyze, and disseminate law enforcement information on the incidence of statewide auto theft. Scott Casey, Auto Theft and Its Connection and Role in the Furtherance in Other Crimes -- Colorado Case Studies 2013-2015, report to the Colorado Automobile Theft Prevention Authority (Colorado Auto Theft Intelligence Coordination Center, 2015).

16 Ibid.

17 Ibid.

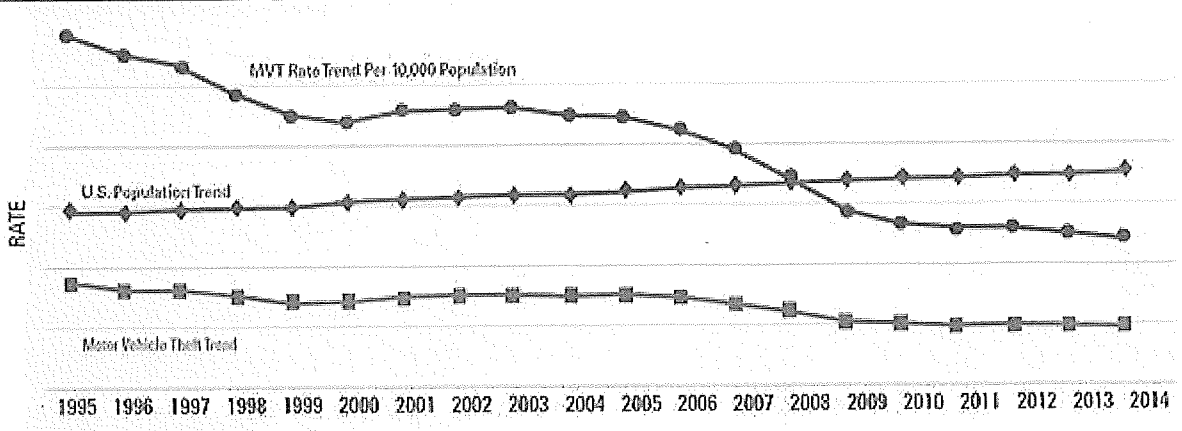
18 Colorado Auto Theft Intelligence Coordination Center, Colorado Auto Theft Annual Report-2012 (2013), 2, http://lockdownyourcar.org/wp-content/uploads/2013/06/2012-ATICC-Annual-Report-020712.pdf (accessed May 25, 2016).

Contact Information:

International Association of Chiefs of Police
515 North Washington Street
Alexandria, VA 22314-2357
Phone: (703) 836-6767
Fax: (703) 836-4543

Figure 1: U.S. Motor Vehicle Theft | 1995–2014			
Year	Population†	Thefts	Rate‡
1995	262,803,276	1,472,441	560.3
1996	265,228,572	1,394,238	525.7
1997	267,783,607	1,354,189	505.7
1998	270,248,003	1,242,781	459.9
1999	272,690,813	1,152,075	422.5
2000	281,421,906	1,160,002	412.2
2001	285,317,559	1,228,391	430.5
2002	287,973,924	1,246,646	432.9
2003	290,788,976	1,261,226	433.7
2004	293,656,842	1,237,851	421.5
2005	296,507,061	1,235,859	416.8
2006	299,398,484	1,198,245	400.2
2007	301,621,157	1,100,472	364.9
2008	304,059,724	959,059	315.4
2009	307,006,550	795,652	259.2
2010	309,330,219	739,565	239.1
2011	311,587,816	716,508	230.0
2012	313,873,685	723,186	230.4
2013§	316,497,531	700,288	221.3
2014	318,857,056	689,527	216.2

Figure 2: U.S. Motor Vehicle Theft Rates | 1995–2014



Source: FBI UCR Crime in the United States

Street Racing | Print Full Guide

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The Problem of Street Racing

The guide begins by describing the problem of street racing and reviewing factors that contribute to it. The guide then identifies a series of questions that might assist you in analyzing your local street racing problem. Finally, the guide reviews responses to the problem and what is known about these from evaluative research and police practice.

While street racing and cruising share some common characteristics, there are important differences between the two activities and those who participate in them. Cruising typically involves an older crowd, and is a highly public and largely nostalgic event that is often confined to downtown areas. Cruising can also provide an economic boost to the community. Street racing typically involves a younger crowd that conducts its activities in an underground fashion to avoid police attention and presents significant risks of serious personal injury.

Related Problems

Police must also address other problems related to street racing, which are not directly addressed in this guide . Other problems that may call for separate analysis and responses include:

- auto theft,
- assaults (including assaults in retaliation for failure to pay racing bets[1]),
- cruising,
- curfew violations,
- drunken driving and driving under the influence of drugs,
- gang-related activity,
- insurance fraud (relating to racers betting on outcomes),
- illegal vehicle modification (e.g., smog control alteration),
- illicit gambling ,
- noise complaints,
- public intoxication/urination and other public order offenses,
- theft and fencing of auto parts,
- thefts from autos,
- trespassing, and
- vandalism and littering.

The American street-racing tradition dates back to the 1950s, and has long been a staple of Hollywood movies, including films such as Rebel Without a Cause (1955), American Graffiti (1973), and Grease (1978). But no movie did more to boost the popularity of street racing than the 2001 surprise hit, The Fast and the Furious, which grossed nearly $80 million in its first 10 days in theaters and includes

spectacular racing scenes and daring stunts (including one where a car swerves back and forth beneath a speeding tractor-trailer).2 Although the movie studio issued public service announcements that encouraged safe and legal driving, the film likely provided fresh inspiration to street racers.

The street racing population consists of several distinct demographic groupings. One is estimated to be between 18 and 24 years of age, generally living at home and typically having little income.3 Another group involves predominantly older (25 to 40 years of age) white males who engage in building and racing the older types of muscle cars: Corvettes, Camaros, Mustangs, and so on. Asian and Hispanic males of a wide range of ages and driving later model imported carssuch as Hondas, Acuras, Mitsubishis, and Nissansare another group.4 Presently, the latter group dominates the street racing scene.5

Many street racers spend large amounts of money upgrading their cars performance. *Credit: quebecstreetracing.org*

Police suspect that many racers engage in illegal activities in order to finance their hobby; some agencies report that stolen vehicles have been stripped of parts that were later recovered from street racing vehicles.6

Whether by lawful or unlawful means, many racers feel they must devote huge sums of money to soup up their race cars; a major upgrade, with supercharger blowers, nitrous oxide systems, and other high-performance equipment can easily exceed $10,000.7For many racers, getting the maximum performance out of their cars is very important to them and they will expend a tremendous amount of time, money, and effort toward that end.8

How dangerous is street racing? Data are difficult to obtain, because neither the federal government nor the insurance industry tracks related casualties, nor is software yet available for creating a database of street racing.9 However, measures are being taken in some jurisdictions to address this shortcoming and are discussed below. One unofficial estimate, derived from examining news reports and police data from 10 major cities and extrapolating on the basis of national population figures, is that at least 50 people die each year as a result of street racing.10 Although related deaths are difficult to quantify, media reports confirm that street racing takes its toll on innocent people as well as street racers, passengers, and onlookers.

At the root of the problem is the fact that youths have always had, according to one scholar, a profound need for speed.11 This love of speed is not restricted to the youth of the United States; indeed, the problem has reached serious levels in Canada, Australia, Germany, England, France, New Zealand, and Turkey.12 In Canada, where

a Royal Canadian Mounted Police officer was killed by a racer in 200213 and another 18 people died in the Toronto area in street racing incidents during a four-year period,14 a new law was introduced in which street racing is an aggravating factor when sentencing persons convicted of dangerously or negligently operating a motor vehicle.15 In Vancouver, British Columbia, street racing can include an activity known as a hat race, also known as a kamikaze or cannonball run, in which drivers put money in a hat; the money is taken to an undisclosed location from which a call is made, informing the drivers where the cash awaits. The first driver to get there wins all the money. Pedestrians have been killed during such races.16

Race starters and observers are often positioned very close to the racing vehicles, putting themselves at considerable risk of injury. *Credit SDStreetracing.com*

Today in the United States, the racing tradition replays itself during every weekend in thousands of communities in the nation. The primary difference today is that street races are extraordinarily brazen and elaborately orchestrated functions, involving flaggers; timekeepers; lookouts armed with computers mounted in their cars, cell phones, police scanners, two-way radios, and walkie-talkies; and websites that announce race locations and even calculate the odds of getting caught by the police.17 Some websites even provide recaps of the previous nights races, complete with ratings of police presence, crowd size, and a link to the police agency so the curious can see if a warrant has been issued for their arrest.18

Street races typically involve racers and spectators meeting at a popular gathering place, often on a relatively remote street in an industrial area. Here they decide where to race; they then convoy to the site, where a one-eighth or one-quarter mile track is marked off. Cars line up at the starting line, where a starter stands between them and drops his or her hands to begin the race. Several hundred spectators may be watching. Unlike racetracks that allow spectators to observe races in a safe, closed environment, these illegal street races encourage spectators to stand near possibly inexperienced drivers and poorly maintained vehiclesa combination that can be deadly for onlookers standing a few feet away from vehicles racing at highway speed.19 Other peripheral activities may be involved as well. For example, racers and spectators engage in what are termed sideshows, such as using vehicles and onlookers to block off an intersection and thus backing up regular vehicular traffic for considerable distances and preventing the police from arriving at the scene; then the racers at the intersection engage in 360 burnouts, races, and so on.20 Racers also participate in what is termed the centipede, where they form a convoy of vehicles and play follow-the-leader, darting in and around normal traffic at high speeds. Or, they may speed around corners to see how far they can slide their tires.

Street racing can also be unorganized and sporadic in nature, involving impromptu, one-time races between persons who do not know one another; the police generally have little means for dealing with these types of racers other than utilizing the media to make it very clear that, if caught, the violators will be severely prosecuted.[21]

The specific harms caused by street racing include:

- vehicle crashes (deaths and injuries to drivers, passengers, onlookers, or innocent bystanders; and property damage);
- noise (from racing vehicles and crowds);
- vandalism and litter at racing locations (including businesses where racers commonly gather);
- loss of commercial revenue (if racing crowds obstruct or intimidate potential customers); and
- excess wear and tear on public streets (painted street markings commonly are damaged by the burning rubber of vehicle tires).[22]

Crashes caused by street racing are often spectacular and cause serious injury and property damage. *Credit: Marion (Ind.) Chronicle-Tribune*

Retaliatory offenses may also occur, such as when citizens try to deal with the problem themselves by placing nails on the ground where racers congregate or vandalizing racers cars, for example.

Factors Contributing to Street Racing

Understanding the factors that contribute to your problem will help you frame your own local analysis questions, determine good effectiveness measures, recognize key intervention points, and select appropriate responses.

There are several reasons why street racing can become, or remain over time, a popular pastime in a community:

- It provides an unsupervised activity and environment.
- It attracts people who are too young for bars or other adult-only activities (especially in cities having a dearth of alternatives for their youth).
- It affords a means of socializing with friends.
- It provides a means of showing off ones motor vehicle and driving ability.
- It provides drivers, passengers, and onlookers the exhilaration of speed.[23]

Roadway location and design can also contribute to street racing. For example, a roadway located in a remote, perhaps industrial, area that is straight, wide, and close to arterial streets (for quick getaways from the police) will be favored by street

racers.24 The existence of car clubs and/or gangs in an area can also create or exacerbate a communitys street racing problems.25

The information provided above is only a generalized description of street racing. You must combine the basic facts with a more specific understanding of your local problem. Analyzing the local problem carefully will help you design a more effective response strategy.

Asking the Right Questions

Data Gathering and Analysis

A shortcoming at present is the lack of dedicated coding and analysis of street racing data in most police agencies. No software presently exists for the identification and analysis of racing offenses, and agencies must typically hand search their records for higher-level analyses. Others have a dedicated calls-for-service code specifically for racing issues that the officers can use for reporting and communications personnel can query. A problem that can arise with such coding, however, is that it may fail to include other offenses that flow from, or arise out of, illegal racing (auto thefts, other thefts, assaults, trespassing, and so on), or to provide information about groups that gather at retail parking lots. At a minimum, the crime analysis unit or communications section should be contacted to determine how many personnel hours are spent at racing locations, including days of the week and times of day. Furthermore, the agency is advised to create at least a rudimentary database or modify existing records management systems so that street racing-related activity (including crimes, disturbances, traffic and pedestrian stops, vehicle and pedestrian traffic congestion, traffic crashes, arrests, etc.) can be tracked.If such a database does not exist, you may have to manually search through individual complaint records and police reports to determine which are related to street racing.

California Agencies Efforts to Obtain Racing Data

Police in California have been attempting for years to convince the state to alter its accident investigation form to include coding for street racing. Once the procedure is developed statewide, agencies will be able to obtain reliable data. Until the new form is developed, the California Highway Patrol has disseminated a training memo instructing local officers where to include a racing-related notation. The key for California agencies, and eventually for other agencies nationwide, will be to provide officers with necessary training. Most officers are unfamiliar with street racing codes, rules, and laws; therefore, as the ability is expanded for agencies to track racing incidents, if the responding or investigating officer is not properly trained, a concern is that the proper boxes on the form will not be completed. The San Diego Police Department presently offers training in this regard; thus far, about 2,000 officers have been trained in how to determine when a racing relationship exists with a reported incident.26

In Milpitas, California, each time an officer is either dispatched to any type of call for service or initiates any activity (e.g., traffic or pedestrian stops, arrests, citation, accepting a report of a crime, etc.), at the conclusion of that activity, the officer is required to provide the communications division with a classification code that

identifies the specific type of activity. As with all other offenses, a specific classification was simply developed that includes street racing incidents. Race-related traffic enforcement stops; disturbances of any kind involving racers; crimes in which racers are listed as suspects; or other circumstances in which individuals are actively racing at, loitering about, or traversing to and from common racing venues are examples of such classifications.27

Tracking Racing Websites

Several race-related websites exist that may be used by the police to track racers activities as well as provide useful information to racers. For example, Streetracing.com provides racing and club news, articles, events, calendars, chatrooms, message boards, auctions, and other information for many cities and states. The Specialty Equipment Market Association (SEMA) is a 5,000-member trade organization for the aftermarket industry; although SEMA often mounts strong opposition to police efforts and proposed racing legislation, it may offer another avenue to reach racers through the retailers who sell parts.28 Others, such as RaceLegal.com and the National Hot Rod Associations NHRA.com, focus more on encouraging legal racing, and attempt to educate their readers about related laws and statistics (e.g., numbers of illegal racers who were recently killed, injured, cited, arrested, or who had vehicles seized or licenses revoked).

The following are some critical questions you should ask in analyzing your particular street racing problem, even if the answers are not always readily available. Your answers to these and other questions will help you choose the most appropriate set of responses later on.

Incidents

- What is the level of calls for service and complaints attributable to street racing in the area? What, specifically, is the nature of these calls and complaints?
- How many vehicle crashes are related to street racing?
- How, specifically, does street racing contribute to these crashes? Racing vehicles crash into one another? Into stationary objects or pedestrians adjacent to the roadway? Into non-participating vehicles?
- What percentage of these crashes involves fatalities, personal injuries, and property damage? Hit-and-run accidents?
- Are younger, less experienced drivers more likely to be involved in vehicle crashes?
- How many passengers are typically in racing vehicles?
- Is traffic congestion caused by street racing impeding emergency traffic (e.g., ambulance and fire vehicles)?
- Do business owners report decreasing revenues as a direct result of racers and spectators gathering on their premises?
- Have there been any local occurrences (e.g., the closure of a local legitimate drag strip) or issues that may have resulted in increasing street racing incidents?
- Have there been reports of retaliatory offenses against street racers?

Victims

- Who is harmed by street racing (e.g., street racers, passengers, onlookers,

innocent motorists, innocent bystanders, business owners, residents)?
- What is known about the victims of street racing-related incidents (e.g., demographics, their involvement in street racing)?
- How many people have been killed or injured as a result of street racing? What is the nature and seriousness of those injuries? (You may want to examine hospital emergency room records because not all crash-related or assault injuries are reported to police.)
- What is the publics opinion of street racing? Do people want street racing stopped or merely controlled in a legal setting? (Public opinion may be expressed in letters to the editor, surveys, meetings, informal conversations, formal complaints, and so forth.)

Offenders

- What is known about street racers, their passengers, and onlookers? (Age, ethnicity, group affiliation?)
- If there are organized groups involved in street racing, are they criminal gangs? Are there tensions and confrontations between various groups involved in street racing?
- Why do street racers say they race (e.g., lack of alternative activities, for social reasons, to show off their cars, for the thrill of speed, etc.)?
- Do the participants include unsupervised youths who are on the streets in violation of a curfew?
- Where do the racers live? Are they local or from out of town?
- What percentage of persons cited or arrested for street racing are repeat offenders?
- Who are the worst offenders?
- Are street racers operating unsafe vehicles or vehicles that have undergone major modifications in order to maximize their speed?

Locations/Times

- What is the nature of the area where street racing occurs (commercial, industrial, residential, open highway, etc.)?
- How much pedestrian traffic is there in the area where street racing occurs? What other special hazards are there in the area where street racing occurs?
- Where are traffic crashes occurring that appear to be related to street racing?
- Where is the major street racing-related traffic volume in the city?
- Where are the hot spots, and how many related offenses have occurred (such as disturbances; assaults; and weapons, liquor, drug, curfew, noise, vandalism, littering, trespassing, graffiti, and traffic violations)?
- Where are the preliminary gathering places for racers and spectators?
- In which area(s) does street racing occur? What are the means of ingress and egress into the area? Does the racing occur in residential or industrial areas? On public streets, or state or federal highways? Privately owned roadways?
- Is the racing concentrated in business areas, or residential areas, or both?
- Why are the most concentrated racing locations attractive to street racers?
- Is adequate lighting in these areas?
- When does street racing typically occur (time of day, day of week, time of month or year, during certain holidays or special events)?

Current Responses

- Are there adequate state and local laws for meeting the needs of the police in addressing street racing problems?
- Have stakeholders been identified and partnerships forged for dealing with the problem?
- Do adequate resources exist for dealing with the problem?

Measuring Your Effectiveness

Measurement allows you to determine to what degree your efforts have succeeded, and suggests how you might modify your responses if they are not producing the intended results. You should take measures of your problem *before* you implement responses, to determine how serious the problem is, and *after* you implement them, to determine whether they have been effective. All measures should be taken in both the target area and the surrounding area. (For more detailed guidance on measuring effectiveness, see the companion guide to this series, *Assessing Responses to Problems: An Introductory Guide for Police Problem-Solvers.*)

The following are potentially useful measures of the effectiveness of responses to street racing:

- reduced numbers of various street racing-related offenses;
- reduced numbers of calls for service concerning street racing, both in the racing area and across the jurisdiction;
- reduced numbers of racers and spectators, if any, who are returning to their old racing spots;
- reduced number and severity of injuries attributable to street racing;
- reduced numbers of juveniles in violation of existing curfew and other laws;
- increased satisfaction of complainants; and
- increased profitability of businesses previously harmed by street racing.

You should be alert to the possibility that your responses to street racing might displace racers and related offenses, either geographically or to other types of crimes. This might not be all bad if the displacement results in less overall harm. Crime and call-for-service data as well as websites should be monitored both locally and in other jurisdictions to determine whether racers are merely taking their activities to other venues.

Your analysis of your local problem should give you a better understanding of the factors contributing to it. Once you have analyzed your local problem and established a baseline for measuring effectiveness, you should consider possible responses to address the problem.

The following response strategies provide a foundation of ideas for addressing your particular problem. These strategies are drawn from a variety of research studies and police reports. There is little published research about street racing; most of what is known is drawn from police practice. Several of these strategies may apply to your communitys problem. It is critical that you tailor responses to local circumstances, and that you can justify each response based on reliable analysis. In most cases, an effective strategy will involve implementing several different responses. Law enforcement responses alone are seldom effective in reducing or solving the problem. Do not limit yourself to considering what police can do: give careful consideration to who in your community shares responsibility for the problem and can help police better respond to it.

General Considerations for an Effective Strategy

1. **Enlisting community support for addressing the problem.** Broad-based coalitions that incorporate the interests of the community are recommended. A combined effort will maximize the effects of responses and enhance the likelihood of success. The involvement and support of public officials, citizens, and business owners will be essential for the success of most, if not all, of the specific responses listed below.

   Enlisting community support might include using members of a police Explorer post, citizens police academy, senior citizens groups, merchant association, and so on to report racers activities to police.29 Community support might also come from those who provide racers with their equipment, including shops selling high-performance car parts, and who are at risk for being burglarized for these parts. Although these shop owners may not wish to cooperate, if so inclined, they can be of considerable assistance in informing the police about racers illegal activities.

2. **Educating and warning street racers.** Street racers can be informed about the dangers and legal consequences of racing,as well as police enforcement intentions. Among the media you can use are street racing websites (on which they commonly announce past and future events, host chat rooms, and have message boards), police agency websites, newspapers, television, radio, and personal contacts with street racers. A publicity campaign about the problem and enforcement actions has been central to many efforts to combat street racing problems. Performance shop owners also might be asked to provide customers information about existing laws and potential penalties for racing.
3. **Conducting surveillance of the street racing scene.** Street racers can be quite sophisticated in their efforts to avoid detection by police. Unmarked police vehicles, plainclothes officers, and video equipment may be covertly used to observe racers movements and methods and to determine the problems they create, where they live, the kinds of cars they drive, license plate numbers, and so on. This allows for pre-race intervention, access to race areas to be closed off, and participants to later be charged. Racers use of police scanners can be thwarted by using radio code words, in-car computers, and specially programmed cell phones. For example, one police agency programmed some cellular phones with a group-talk feature so that the officers and dispatchers could communicate effectively without using the police radio frequency when dealing with racer issues.30 Marked units and uniformed personnel can then be called in to assist with any arrests. During undercover surveillances, police can videotape illegal street races and participants; later, crime reports can be written for each race and used to prepare arrest warrants for drivers and court orders for vehicle seizures.31 Street racing websites can also be monitored for tracking racers activities and communication.
4. **Encouraging others to exercise informal control over street racing participants.** You may identify certain groups, organizations, or individuals who have the potential to exert significant influence over the behavior of street racing participants. For example, if street racing participants are high school students, school administrators might be persuaded to suspend or revoke the parking privileges of students identified as participants in or spectators of street racing incidents. Insurance companies, which also have an interest in the problem, may be persuaded not to pay claims for damages if the claimant was

participating in racing. Parents of street racing participants, properly educated about the dangers of street racing, may be encouraged to get more involved in controlling their childrens behavior.

Specific Responses to Street Racing

Enforcement

5. **Enforcing ordinances and statutes**. You should review existing ordinances and statutes to determine whether police have adequate enforcement authority. Laws likely to be enforced against drivers include racing/reckless driving, driving under the influence of alcohol or drugs, and driving with suspended/revoked licenses. In some jurisdictions police officers and vehicle emission enforcement agents jointly conduct smog equipment inspections on street racing vehicles, issue the owner a citation if the equipment was disconnected or modified, and even order the vehicle removed from the street until it is brought into compliance with the law.32 Officers might also attempt to identify people in the emissions testing industry who issue fraudulent emission certificates for the illegally modified vehicles.33 Drivers should be checked for proof of insurance and vehicle registration. Officers can work with automotive experts to identify street racing vehicles that have been illegally enhanced or altered, or have mechanical defects. Enforcement against non-drivers might include violations for trespassing on private property of adjacent businesses, obstructing traffic (if standing in the roadway), or aiding in a speed contest (for people acting as starters for races). Dedicated race patrol teams may be necessary for concentrated enforcement during peak racing times.34Enforcement of curfew laws might also reduce the numbers of juveniles present at racing venues.

   Following are some examples of how many police agencies have been aided with newly enacted ordinances and statutes in their attempts to prevent and address street racing:

   - In California, a conviction for engaging in a speed contest (defined as a motor vehicle racing against another vehicle or being timed by a clock or other device) consists of a fine up to $1,000 plus penalty assessments, up to 90 days in jail, or both. The perpetrators license may be suspended or restricted for up to six months, and a police officer may impound a vehicle when the driver is arrested for engaging in a speed contest, for reckless driving, or for demonstrating exhibit of speed (for example, peeling or screeching of tires due to hard acceleration). A vehicle can be impounded for up to 30 days, and it costs the offender $1,500 to retrieve it. Persons who aid or abet any speed contest (such as a person who flags the start of the race or places a barricade on the highway) can be charged with a misdemeanor.35
   - The State of Texas enacted harsher penalties for street racing in 2003. The new law made street racing a more serious violation, punishable by up to six months in jail and a $2,000 fine for both drivers and passengers; and up to a $4,000 fine and one year in jail if the driver was intoxicated, had an open container of alcohol in the vehicle, or had previously been convicted of the same offense. Spectators can be cited and fined up to $500 as well.

- Street racers can be charged with engaging in a speed contest and reckless driving, fined up to $1,000, and sentenced to six months in jail in Reno, Nevada. Spectators within 200 feet of an illegal street race can also be arrested and fined up to $200. The drivers vehicle can be impounded and storage fees assessed at $50 per day.36
- The City of Fremont, California banned all traffic between 10 PM and 6 AM on 10 roads popular with street racers and allowed police to impound the vehicles of both drivers and spectators.37
- The City of Santee, California made it unlawful for any individual to be a spectator (within 200 feet) at an illegal speed contest, or where preparations are being made for an illegal speed contest; violators are subject to fines of up to $1,000 and six months in jail.

6. Impounding and/or forfeiting vehicles used for street racing. Vehicles may be impounded and a fee assessed in order for the owner to retrieve the vehicle under an ordinance when the driver is arrested for engaging in a speed contest, for reckless driving, or for demonstrating exhibit of speed (e.g., peeling or screeching of tires due to hard acceleration). A vehicle forfeiture ordinance may be enacted to declare a vehicle a nuisance and it can be permanently seized if it was used in a race or exhibition of speed and the driver has a prior conviction for certain serious driving offenses (such as reckless driving or evading officers).
   - The City of San Diego was among the first to pass a vehicle forfeiture ordinance, in 2003. A vehicle will be declared a nuisance and permanently seized if it was used in a race or exhibition of speed and the driver has a prior conviction for certain serious driving offenses (such as reckless driving or evading officers).38
   - The City Council of Los Angeles soon followed San Diegos example, also approving vehicle-forfeiture legislation. The vehicles are auctioned off and the money deposited into the citys general fund. Furthermore, police in both the City of Los Angeles and Los Angeles County can arrest spectators on a misdemeanor. In July 2003, the first man to be convicted under the Los Angeles law was sentenced to 18 months probation and 10 days community service.39 The city uses state Bureau of Automotive Repair investigators to inspect vehicles suspected of being illegally modified by their owners; a city ordinance prohibits disconnection, modification, or alteration of pollution control devices, and cited drivers must return their vehicles to their original factory specifications.40
   - The City of Stockton, California, also targeted offenders vehicles rather than the drivers, relying on the aforementioned state statute allowing the police to seize for 30 days vehicles that were used in reckless driving incidents.41
7. **Encouraging private businesses to adopt measures that will help address the problem.** Owners and managers of popular street racing gathering places (where street racers meet and plan their activities, show off their cars, socialize, and the problems begin to occur) must be enlisted in efforts to discourage street racing activity. Among the helpful measures are: posting no trespassing signs and authorizing police to enforce them, limiting after-hours access, employing private security during weekends, and closing earlier.
8. **Closing streets and/or altering or restricting traffic flow and parking.** Some jurisdictions have installed speed humps, barricades, k-railing (concrete barricades), and freeway message signs and billboards (both permanent and temporary) to control, warn, and inform racers;42 others

authorize police to erect barricades and close streets when racing becomes a problem.[43] Such latitude affords police the ability to move quickly to deal with problems as they develop. Parking can be prohibited on public properties and roadways in the race area to discourage spectators from congregating along roadsides during prime racing hours; offenders vehicles can be towed.

Providing a Safe Alternative

9. **Creating or encouraging racers legal alternatives, such as relocating to a legal racing area**. Several cities and counties have successfully addressed their illegal street racing problem by creating, either on their own or in collaboration with other organizations, a legal racing venue. This is intended to divert people to a safer racing environment, which allows racers to experience some of the positive aspects of legal drag racingthe fun, camaraderie, and excitement. Police can either align with an existing national program (for example, Beat the Heat, Racers Against Street Racing, the National Hot Rod Association) that encourages safe, legal, on-track racing, or implement their own local program. Participant rules should be in place, such as racers must possess a valid drivers license and vehicle insurance, submit to vehicle safety inspections, and refrain from any use of alcohol at the event.[44]

Legal, track-based alternatives to street racing are becoming more numerous. Among them is Project X, a program initiated in 1997 to bridge the gap between police officers and high school aged street racers. *Credit: Novato (Calif.) Police Department*

Following are examples of such efforts:

- Beat the Heat is a national Cops and Kids community policing drag race program, which involves police officers in 30 states and two Canadian provinces. As an example, a police officer in Wewoka, Oklahoma (population 4,000) initiated the program. The officer races local men and women in his 1972 Chevrolet Camaro (with a 545-horsepower engine) at a local track. Teens can serve as honorary pit crew members for the Camaro.[45] The program originated in 1984 with the Jacksonville, Florida, Sheriffs Department and has grown rapidly; in 1999, more than 1 million young people were given the message that they should go to tracks to race their cars instead of racing in the street.[46]
- Concerned about illegal street racing and the dearth of legal racing venues, automobile manufacturers, police officials, racetrack owners, racers, automobile parts manufacturers, and the media met in California in early 2001 and formed Racers Against Street Racing (RASR); this organization is becoming a countrywide phenomenon that is being tested in drivers education classrooms and consists of a curriculum and video.

RASR addresses the realities of street racing, and informs students about local street racing laws and legal alternatives in local areas.47
- An officer in Redding, California obtained $4,000 from local businesses to help start a racing program, Street Legal Drags, at a local drag strip in mid-2002. Soon there were more than 200 cars (drivers paying $10 to race) and more than 2,500 spectators (assessed $5 per carload). Signs are posted informing racers how to register their vehicles, proceed to the starting line, and leave the track after the race. The Redding police website explains the program and provides detailed instructions for participants. Participants must have a registered, insured, safety-inspected vehicle and a valid drivers license; and no alcohol is allowed on the premises.48
- Las Vegas , Nevada has Midnight Mayhem, Friday night amateur drag races from 10:00 PM to 2:00 AM at the local speedways drag strip. The cost is $10 for drivers and $5 for spectators, and each nights activities include music, car shows, and other events for the 2,500 spectators and 400 drivers.49

Responses With Limited Effectiveness

10. **Installing speed bumps.** The installation of speed bumps can reduce or halt street racing, but they are hazardous to emergency vehicles and large trucks. Speed *humps*, on the other hand, which are more gradual than speed *bumps*, permit vehicles to cross them safely at the speed limit and create less risk to trucks and emergency vehicles.
11. **Arresting and charging spectators as race participants.** Arresting participants for unlawful assembly or curfew violations can be ineffective if a local court rules that street race spectators are not participants.
12. **Citing and releasing racers.** Issuing citations to racers or spectators may be ineffective and a weak deterrent, because many such individuals believe that a citation is just part of doing business. Furthermore, some parents disagree with laws intended to curb racing and believe that their children should be allowed to observe such activities and will simply pay the fine for the youth.50
13. **Deploying decoy police vehicles.** Placing phantom carsunoccupied marked police carsin racing areas to create the appearance of a police presence will generally not be effective, and the vehicles may be vandalized.51

The table below summarizes the responses to street racing, the mechanism by which they are intended to work, the conditions under which they ought to work best, and some factors you should consider before implementing a particular response. It is critical that you tailor responses to local circumstances, and that you can justify each response based on reliable analysis. In most cases, an effective strategy will involve implementing several different responses. Law enforcement responses alone are seldom effective in reducing or solving the problem.

General Considerations for an Effective Strategy

#	Response	How It Works	Works Best If...	Considerations
1	Enlisting community support for addressing the problem	Maximizes the community efforts by involving people as stakeholders	public officials, government agencies, insurance companies, business owners (including	Involvement of such individuals and entities are key to the success of responses that are employed

			car parts stores), and citizens are involved in the effort	
2	Educating and warning street racers	Informs the street racers about the nature and extent of the problem from the community, police, legal, and safety perspectives	the racers are informed of new and existing racing laws and enforcement actions to be taken, and then begin to fear arrest	Street racing and police agency websites, newspapers, television, radio, and personal contacts with street racers may be used
3	Conducting surveillance of the street racing scene	Allows police to take preventive action to discourage street racing and to apprehend violators by providing them with knowledge about street racing times, locations, and offenders	illegal races are prevented and access to race areas are blocked	Officers may encounter staffing shortages for large-scale operations; if racers become aware of police tactics, it will become more difficult to infiltrate the crowds
4	Encouraging others to exercise informal control over street racing participants	Persuades street racing participants to cease or curtail racing activity through informal social control	street racing participants respect the opinions of those seeking to control their behavior and/or fear the consequences of failing to heed informal warnings	Street racing participants who feel marginalized from society are unlikely to respond to informal social control methods

Specific Responses to Problems of Street Racing

#	Response	How It Works	Works Best If...	Considerations
5	Enforcing ordinances and statutes	Deters offenders through threat of fines, incarceration, or seizure of vehicles	enforcement is sufficiently certain that offenders believe they are likely to be apprehended; prosecutors are willing to prosecute and judges impose sufficient sanctions	Can be labor intensive and time consuming; creates risks of high-speed chases
6	Impounding and/or forfeiting vehicles used for street racing	Deters speed racers through threat of loss of valuable property and means to race	the ordinance is widely publicized to deter illegal racing, and an impound fee is assessed in order for the driver to reclaim the vehicle	Ordinances must be enacted providing for impounding or seizing vehicles; city prosecutors and other public officials must first support this approach

7	Encouraging private businesses to adopt measures that will help address the problem	Deters racers and spectators from gathering to plan their activities and engaging in crime and disorder	such measures as posting no trespassing signs, controlling access to the parking lot, hiring private security, and closing the business early can be used	Can be costly for business owners, both in terms of outlay (e.g., to hire private security personnel) and in lost revenues if closing early
8	Closing streets and/or restricting traffic flow and parking	Prevents racers from using preferred roads; discourages spectators from gathering along roads	there are limited alternative streets on which to race	May disrupt other legitimate use of the roadway; may displace racing to other more dangerous roads
9	Creating and/or encouraging racers relocation to a legal racing area	Diverts street racers to a safe, sanctioned location	street racers are willing to race at legal racing venue; private enterprise is willing to fund and staff the racing venue	Legal liability and safety issues must be addressed

Responses With Limited Effectiveness

#	Response	How It Works	Works Best If...	Considerations
10	Installing speed bumps			Speed bumps, as opposed to speed humps, can damage the undercarriages of large vehicles and interfere with emergency vehicle responses
11	Arresting and charging spectators as race participants			Defining spectators as participants may not withstand legal challenge
12	Citing and releasing racers			Fines may be inadequate to deter persons heavily committed to racing
13	Deploying decoy police vehicles			Police vehicles vulnerable to vandalism

[1] Ontario Police Department (2000).

[2] Orwall (2001).

[3] Lau (2002); also see Ontario Police Department (2000), where the problem primarily involved young adults.

[4] Wilkinson (1996).

[5] Clar (2003); also see San Diego Police Department (2003) and Stockton Police Department (2003).

[6] Lowery (2003).

[7] Wilkens (2003b).

[8] Leigh (1995).

[9] San Diego Police Department (2003).

[10] Neil (1999).

[11] Wilkens (2003a), quoting Stephen Bender.

[12] Wilkens (2003a).

[13] CBC News (2002).

[14] Toronto.cbc.ca (2002).

[15] CBC News (2003).

[16] Rendon (2001).

[17] Wilkens (2003a).

[18] Dobner (2001).

[19] Lau (2002).

[20] San Diego Police Department (2003).

[21] Sloan (2004).

[22] Ontario Police Department (2000)

[23] Lau (2002).

[24] Stockton Police Department (2003).

[25] Wilkinson (1996)

[26] Sloan (2004).

[27] Pangelinan (2004).

[28] Stokes (2003). [Full Text]

[29] Milpitas Police Department (2002).

[30] Pangelinan (2004).

[31] Stockton Police Department (2003).

[32] Wilkinson (1996).

[33] San Diego Police Department (2003).

[34] Lowery (2003).

[35] Clar (2003).

[36] Reno Police Department (2003).

[37] Squatriglia & Nevius (2003).

[38] Velasquez (2003).

[39] Munoz (2003).

[40] Los Angeles Police Department (2001).

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[43] Reno Police Department (2003); also see Ontario Police Department (2000) for passage and successful use of a new street-closure ordinance. See, for example, Wilkens (2003a), concerning a university professor who founded a nonprofit group that sponsors legal racing at San Diegos Qualcomm Stadium.

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Important!

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What This Guide Does and Does Not Cover

This guide begins by describing the problem of aggressive driving and reviewing factors that increase its risks. It then identifies a series of questions to help you analyze your local aggressive-driving problem. Finally, it reviews responses to the problem and what is known about these from evaluative research and police practice.

Aggressive driving includes what is commonly referred to as *road rage*, which involves assault motivated by driver anger. This guide covers aggressive driving and the driving-related triggers for road rage. Aggressive driving has gained widespread public attention over the past 20 years largely due to highly publicized crashes and crimes associated with road rage.

Aggressive driving is but one aspect of the larger set of problems related to impaired, dangerous, and irresponsible vehicle use. This guide is limited to addressing the particular harms aggressive driving creates. Related problems not directly addressed in this guide, each of which requires separate analysis, include:

- drunken and impaired driving,
- reckless driving,
- joyriding,
- speeding,
- street racing,
- unlicensed driving,
- hit-and-run crashes,
- red-signal and stop-sign violations, and
- inattentive driving.

Other guides in this seriesall of which are listed at the end of this guidecover some of these related problems. For the most up-to-date listing of current and future guides, see www.popcenter.org.

General Description of the Problem

Aggressive driving refers to dangerous driving that disregards safety and courtesy. The U.S. National Highway Traffic Safety Administration defines aggressive driving as occurring "when individuals commit a combination of moving traffic offenses so as to endanger other persons or property."[1] Driving behaviors that commonly constitute aggressive driving include:

- speeding,
- racing,
- frequently changing lanes,
- cutting off other drivers,

- failing to signal,
- running red lights,
- failing to yield,
- tailgating,
- slowing rapidly to discourage a tailgater, and
- boxing other cars in and using other intimidation maneuvers.2

In addition, aggressive drivers may further try to intimidate their victims by shouting or making obscene gestures at them. Several different legislatively-defined driving offenses are similar in some ways to aggressive driving. While statutory definitions vary from state to state, they include the following:

Careless, inattentive, distracted, or negligent driving involves failing to exercise normal care, or endangering people or property, while driving a vehicle. Many states are adding to their statutes specific language prohibiting use of certain technologies while driving. Some states include negligent driving under reckless or impaired driving statutes so that defendants plead to the lesser negligent-driving charge to avoid the more serious charge.

Reckless driving is a more serious form of careless or negligent driving. It is variously defined as creating a substantial or unjustifiable risk of harm, a conscious or wanton disregard of safety, and/or a gross deviation from reasonable behavior in the situation.

Aggressive driving addresses many of the same behaviors covered by reckless driving statutes, but adds a notion of a pattern of behaviors occurring over a short period and/or intention. As intention is difficult to prove, states with statutes that require the standard of intention be met often see aggressive driving charged as reckless driving. Driving behaviors included in the definition of aggressive driving could result from aggression, selfishness, or competition.

As many of the behaviors that constitute aggressive driving could also occur in the absence of aggression (if a driver is inattentive, for example), some state legislatures use a threshold of three or more potentially aggressive driving behaviors committed in a sequence or over a short period in their statutory definitions. Aggressive driving definitions should cover hostile, competitive, and selfishly motivated driving behaviors.

Road rage is a more extreme form of aggression that involves criminal intimidation and/or violence precipitated by driving activities. Road rage involves an intent to harm, can involve use of the vehicle as a weapon, or can take place outside the vehicle(s) involved.

Driving provokes anger more often than other activities.3 Driving is a goal-oriented activity, the purpose being to get from point A to point B expeditiously; yet people easily and frequently thwart driving goals. Driving is also a stressful activity that exposes drivers and passengers to potentially significant dangers. Incivility amongst drivers is common4 and reliably provokes anger in its recipients. For all these reasons, drivers report frequently feeling angry.5

Anger may, but usually does not, lead to aggressive driving or road rage. Situational, cultural, and individual factors combine to cause angry drivers to behave aggressively behind the wheel.

Prevalence of Aggressive Driving

Two-thirds of traffic fatalities involve behaviors commonly associated with aggressive driving, such as speeding, running red lights, and improperly changing lanes.6 One-third of all traffic injuries result from aggressive driving.7 Speeding, a common element in aggressive driving, contributes to about one-third of fatal crashes.8

Several studies have shown that somewhere between 20 percent and 35 percent of drivers have honked their horns, yelled, obscenely gestured, and cursed at other drivers. Estimates indicate that from 6 percent to 28 percent of drivers have tailgated or blocked other drivers' vehicles.9 These behaviors can be part of a pattern of acts that constitute aggressive driving, and they can also provoke anger that could lead to aggressive driving in others.

Research findings are mixed on whether aggressive driving is more prevalent today than in the past. What *is* known is that aggressive driving occurs frequently and is a significant contributor to injury and fatality collisions. While the violent and assaultive acts that constitute road rage are rare, they deserve police attention.

Harms Caused by Aggressive Driving

Car crashes are the leading cause of accidental death and injury in the United States and the leading cause of all deaths amongst young people.10 Aggressive driving is responsible for a significant proportion of all car crashes. Aggressive drivers kill two to four times more people than drunken drivers.11 Aggressive driving creates an atmosphere of incivility on the roads, heightening driving anxiety and triggering more driving anger.

Factors Contributing to Aggressive Driving

Understanding the factors that contribute to your problem will help you frame your own local analysis questions, determine good effectiveness measures, recognize key intervention points, and select appropriate responses.

Frustration and Anger

Frustration at being slowed or thwarted from a driving goal can easily lead to anger.12 Frustration can also lead to selfish or competitive aggressive behaviorbehavior designed to achieve personal driving goals at the expense of others or the common good.

Frustration and anger do not, however, always result in aggression. Driving aggression occurs when a mix of personal, situational, environmental, and cultural factors combine to reduce the inhibitions most drivers feel against acting aggressively. Personal factors such as antisocial and competitive tendencies can make a driver prone to aggression, but aggression is unlikely to result absent other contributing factors. Environmental factors such as the anonymity cars provide, situational factors such as feeling urgent about meeting driving goals, and cultural factors such as approval for placing personal goals over the common good can all contribute to lower the qualms drivers would otherwise have against aggressive

behavior.

Demographics

Research suggests that the single largest group of aggressive American drivers is poorly educated white men under 30 years old who drive high-performance vehicles.13 There is a strong correlation between such young white men and violent crimes, serious traffic offenses, license suspensions, and minor moving violations. These young white men also appear to be the most likely group to engage in more extreme road rage behaviors.14 They may be more prone to have antisocial, hostile personalities (as described in the next section). In general, younger people tend to lack the impulse control gained with age, and men tend toward more aggressive behavior than women.

Because members of this group so often break traffic laws, they will be disproportionately represented in any traffic enforcement effort. Accordingly, police officers will contact the most dangerous drivers by enforcing the entire range of moving violations.15

While young white men are the largest single group of aggressive drivers, there is no single definitive profile of aggressive-driving perpetrators.16 Otherwise law-abiding citizens commit many aggressive driving acts.17

Personality or Individual Traits

There appear to be two primary personality types prone to becoming aggressive behind the wheel. One is an antisocial, hostile personality; the other, a competitive one.18 Antisocial drivers are associated with the young white male group. There is significant overlap between the factors associated with antisocial driving and those associated with criminal behavior.19 These include:

- impulsiveness,
- sensation-seeking,
- unrealistic thinking (underestimating risks and overrating abilities to handle problems),
- poor problem-solving skills,
- egocentricity (lacking concern for others' well-being), and
- values (caring only about oneself).20

This antisocial group of drivers is prone to hostile aggression in and out of their vehicles. Antisocial drivers have high rates of accidents and violations and are many times more likely than the general driving population to have criminal histories.21

Retaliation and revenge are common motives for antisocial drivers who feel disrespected, slighted, infringed-upon, or endangered. This same motive is common in domestic violence, gang violence, theft, and arson.22 Seemingly trivial events such as perceived insults to drivers' self-image or safety most often provoke driving anger. These triggering events tap into a deep well of anger already present in the antisocial driver.

Triggering incidents can include frustrations such as slow, hesitant, or distracted drivers; scares such as near-collisions; offensive behaviors such as rude gestures; and territorial encroachments such as competing for a parking space or failure to yield.23

These acts are not intrinsically aggression-inducing; it is the way a person interprets them and how the person reacts to that interpretation that causes the acts to trigger aggression.[24]

The second group of aggressive drivers appears prone to socially approved forms of aggression such as competition, which can easily be translated into aggressive driving behaviors. Competitive drivers dislike being passed, enjoy the thrill of speeding, and lack the internal controls to override their competitiveness on the road. Research has shown that both the antisocial and the competitive drivers have significantly more accidents and traffic violations than the general driving public.[25]

Environmental Conditions

A tendency toward aggression or competitiveness is not sufficient to cause aggressive driving. Environmental, situational, or cultural factors must come into play before someone with such tendencies will be triggered to drive aggressively.

The car's and the road's physical environment can either facilitate or inhibit the expression of aggression while driving. Manipulating environmental conditions can inhibit antisocial and competitive drivers from driving aggressively.

The lack of negative reinforcement (citations) for aggressive driving can also contribute to a driver's likelihood to engage in it. Given the high number of aggressive driving actions and the relatively low number of police officers, the probability of officers' detecting any particular aggressive driving action is rather low.[26]

Street design can facilitate or inhibit speeding. For example, drivers are likely to speed on wide streets with long, straight stretches.[27] Conversely, traffic-calming devices compel drivers to slow down and exercise skill and attention to the road.

Road conditions can increase driver frustration. Bottlenecks, lack of signs indicating the source of unexpected congestion, short green-light intervals, confusing intersections (such as roundabouts), and stretches of uncoordinated traffic lights can trigger aggression.

The social environment also influences driving behavior. Driving is a social activity, and good driving depends on accurate interpretation of social cues, without which drivers are unable to judge what others are likely to do. Antisocial drivers may be unable to accurately anticipate others' moves on the road.

Paradoxically, while driving is a social activity, drivers are isolated from each other. This isolation lessens the impact of cultural norms that prevent uncivil behavior in other social settings.[28] Anonymity is the most significant social factor mediating aggressive driving. A driver in a convertible is more likely to feel constrained by social conventions concerning driving behavior than is a driver in an enclosed vehicle with darkly tinted windows.

Situational Factors

Technologies such as mobile phones and e-mail devices have combined with economic pressures to compress many drivers' conception of time, creating intense pressure to make every minute productive. Commuting time, for many drivers, is the

last frontier of unexploited time, and the perception that commuting time is lost or wasted time contributes to aggressive efforts to shorten commutes.[29] Time pressure or urgency to achieve a driving goalsuch as getting to work or home quicklycombines with frustrating factors such as congestion to trigger aggression in antisocial and competitive drivers.[30]

There is a wide variety of situational variables that can create or promote situational aggression. For example, heat, noise, or other annoying environmental conditions can make drivers irritable and increase the likelihood that a driver will resort to violence when feeling irritated or threatened on the road.[31] These conditions can goad drivers who tend to have aggression issues toward violent responses to provocative events.[32]

The most significant triggering events for road rage are relatively minor. They include aggressive tailgating (62% of cases), headlight flashing (60% of cases), deliberately obstructing other vehicles (21% of cases), and verbally abusing other drivers (16% of cases).[33] In short, aggressive driving begets aggressive driving.

Antisocial and competitive drivers don't commit *all* aggressive driving acts. Ordinary people in extreme situations, including impaired, stressed, and time-pressured drivers, commit some of them.

There is significant overlap between aggressive and violent drivers and their victims. One study found that road rage offenders were more than five times as likely as the general population to have been past victims of a road rage incident.[34] Vigilantism constitutes a common form of retaliatory road rage, where an otherwise responsible driver decides to teach an aggressive driver a lesson by returning the aggression.

In the absence of intensive enforcement of driving laws, victims of aggressive driving sometimes dangerously overreact. Drivers who would express their frustration in less harmful ways in other situations find they have no outlet for expressing anger while driving except by engaging in aggressive driving themselves. It is equally difficult for drivers who frustrate or inconvenience othersintentionally or notto communicate remorse while driving, which, if they could, might well defuse other drivers' aggression.[35]

One common aggressive driving trigger does not even occur on the road. Parking rage can arise in busy parking lots or those with cramped spaces. Parking tends to trigger territorial and competitive behavior, which can lead to confrontations.[36] Anecdotal evidence indicates that the general driving public is most likely to engage in aggressive driving in parking lots.[37]

Cultural Factors

Culture influences aggressive behavior by shaping how the aggressor interprets triggering events and by influencing whether the aggressor believes a violent response is culturally acceptable in a given situation. To the extent the culture values convenience, individuality over the common good, primacy of cars over bicycles, fast-paced lifestyles, and competition, it promotes aggressive driving.

Some researchers have characterized American culture as contentious, argumentative, and disrespectful,[38] and the American media as portraying aggressive driving in a positive light, thereby creating aggressive role models. Risky-

driver role models create cultural norms accepting of dangerous and threatening driving behavior.[39] Currently, mainstream society does not stigmatize vehicle crimes in the same way as other crimes. Popular media portray aggressive driving as cool, thereby implying social approval, especially to young drivers.

Multiple Causes

While each of the above factors contributes to aggressive driving, none alone explains it. A complex dynamic operates whereby individual traits, situational circumstances, car- and road-related factors, and cultural influences all interrelate to build up to aggressive action or excessive risk-taking while driving. Sitting in traffic on a very hot day with no air-conditioning might be irritating, for example, but in the absence of a triggering event that taps into an antisocial outlook or competitive instinct, aggressive acts are unlikely to occur. Being cut off in traffic is a potential trigger, but without latent aggression and a stressful or irritating environment, aggressive driving is again unlikely to occur.

Effective responses to aggressive driving will take into account the preceding general information about the dynamics and contributing factors to it, as well as a specific understanding of your local problem. An analysis of the local problem will shape the most effective response possible in your jurisdiction.

Responses tend to work best when based on sound data about problem behaviors, locations, times of day, physical features, and offender characteristics in your locale.

Stakeholders

In addition to criminal justice agencies, the following groups have an interest in the aggressive driving problem, and you should consider them for the contribution they might make to gathering information about the problem and responding to it.

Elected officials can gauge public concern about the problem and enact legislation to address it.

The media can call attention to aggressive driving issues and how to avoid becoming a victim or a perpetrator.

State and local motor vehicle and highway safety departments may have conducted their own studies of the problem and can identify and mitigate the physical environmental factors that contribute to aggressive driving.

Transportation safety advocates may also have conducted studies of the problem and can raise awareness about aggressive driving, and work with states and localities to reduce the factors that contribute to it.

Private businesses, including business associations, have a stake in ensuring employees can commute to their jobs safely and efficiently. They can partner with states and localities in addressing aggressive driving issues and disseminating information to employers, especially to businesses that have vehicle fleets.

Private businesses, including cellular phone and data companies, which keep records on electronic device use, can be partners in providing evidence after violations.

Motor vehicle insurance companies benefit financially when traffic collisions are reduced. They can partner with police to fund research on aggressive driving, develop community education materials, and include information on aggressive driving in their publications.

Road construction contractors can work with police to design road construction sites and traffic detours to minimize traffic disruptions and optimize safety.

Auto clubs can educate members about ways to avoid being either a victim or a perpetrator of aggressive driving.

Victims' advocacy organizations can collect data on aggressive driving victimization for use in assessing the extent and severity of a locale's problem.

Public health agencies' and hospitals' injury prevention staff can conduct research on the prevalence of aggressive driving, its contribution to injuries, and the injuries' social and cost impacts. These data can support police problem-solving efforts.

Asking the Right Questions

The following are some critical questions you should ask in analyzing your particular problem of aggressive driving, even if the answers are not always readily available. Your answers to these and other questions will help you choose the most appropriate set of responses later on. The various entities with a stake in the problem and its solution can help you collect some of these data, as not all of the information will be readily available to police.

If you rely solely on traffic crash and citation data, recognize that you will not have a complete picture of the problem, as much aggressive driving goes undetected, unenforced, or unreported.

Incidents

- How many aggressive driving incidents occur in your jurisdiction? How many do other motorists report to police? How many do police discover during a vehicle crash investigation? How many unreported incidents are estimated to occur? (You would need to conduct a survey of motorists to obtain this information.)
- What harms do you know aggressive driving is causing in your jurisdiction? Vehicle crashes? Injuries? Psychological trauma (e.g., fear)?
- Who brings the incidents to police attention? Are they mostly on-views, technology-initiated, citizen-reported, or some combination?
- What are the most prevalent and/or most dangerous aggressive driving behaviors in your jurisdiction?
- What types of events trigger the aggressive driving incidents?
- How concerned is the community about aggressive driving?

Offenders

- Are there certain driver profiles that stand out in your jurisdiction (e.g., the antisocial or competitive drivers described earlier)?
- What do aggressive drivers say about their motivations for driving

aggressively?
- What proportion of cited aggressive drivers are repeat offenders?

Victims/Complainants

- Are most victims/complainants also engaging in aggressive driving behaviors before documented incidents?
- Are most victims/complainants engaging in nonaggressive behaviors that typically irritate other drivers (e.g., driving slowly in the left lane)?
- What do you know about the demographics of victims/complainants (e.g., age, gender, race, and ethnicity)?
- Are there any tensions among different demographic groups contributing to the aggressive driving complaints?

Locations/Times

- Where do aggressive driving incidents typically occur?
- Are there environmental factors at hot spots that contribute to the incidence of aggressive driving (e.g., road construction, confusing intersections, congested roads)?
- Are there situational factors related to the location that contribute to the incidence of aggressive driving?
- Are most incidents on freeways, arterials, collectors, or residential streets?
- When do most incidents occur (time of day, day of week, special occasions, seasons)? What is it about these times that contribute to aggressive driving?

Current Responses

- How do police respond to aggressive driving complaints?
- To what extent do police officers actively look for and intervene in aggressive driving?
- How many citations/arrests do police issue/make for aggressive driving offenses?
- What penalties or other sentences are typically imposed on those convicted for aggressive driving offenses?

Measuring Your Effectiveness

Measurement allows you to determine to what degree your efforts have succeeded, and suggests how you might modify your responses if they are not producing the intended results.

You should take measures of your problem *before* you implement responses, to determine how serious the problem is, and *after* you implement them, to determine whether they have been effective. You should take all measures in both the target area and the surrounding area. For more detailed guidance on measuring effectiveness, see the Problem-Solving Tools Guide No. 1, *Assessing Responses to Problems: An Introductory Guide for Police Problem-Solvers.*

The following are potentially useful measures of the effectiveness of responses to aggressive driving:

- reduced number of crashes in which aggressive driving is a contributing/causal factor, broken down by property damage only, injury, and fatality;
- reduced severity of injuries;
- reduced number of citizen reports and requests for police response (these may increase initially if citizens are encouraged to report aggressive driving more often); and
- improved driver perceptions of safety.

Your analysis of your local problem should give you a better understanding of the factors contributing to it. Once you have analyzed your local problem and established a baseline for measuring effectiveness, you should consider possible responses to address the problem.

The following response strategies provide a foundation of ideas for addressing your particular problem. These strategies are drawn from a variety of research studies and police reports. Several of these strategies may apply to your community's problem.

It is critical that you tailor responses to local circumstances, and that you can justify each response based on reliable analysis. In most cases, an effective strategy will involve implementing several different responses. Law enforcement responses alone are seldom effective in reducing or solving the problem.

Do not limit yourself to considering what police can do: carefully consider whether others in your community share responsibility for the problem and can help police better respond to it. In some cases, you made need to shift the responsibility of responding toward those who have the capacity to implement more-effective responses. (For more-detailed information on shifting and sharing responsibility, see Response Guide No. 3, *Shifting and Sharing Responsibility for Public Safety Problems*).

General Considerations for an Effective Response Strategy

There are several response strategies that can effectively address aggressive driving, including enforcement, legislation, environmental and situational factors, public education, and judicial responses. A comprehensive strategy that blends tactics from each of these components and that addresses psychological, environmental, situational, and cultural factors is most likely to be effective.

A comprehensive aggressive driving intervention should focus on reducing the likelihood that drivers will act aggressively and the aspects of the driving environment that precipitate aggressive behavior. A focus on drivers can occur at the individual or aggregate level. At the individual level, enforcement and sanctions can modify the behavior of identified aggressive drivers. At the aggregate level, data analysis can identify hot spots for targeted saturation and emphasis enforcement, and public education can impact group behavior. A focus on the driving environment can lead to interventions that mitigate the physical and social environments and situational stressors that contribute to aggressive driving.

Specific Responses To Reduce Aggressive Driving

Enforcing Traffic Laws

Traffic enforcement to address aggressive driving has three primary goals:

- to deter the cited driver from driving aggressively again in the future,
- to deter other drivers who learn about police enforcement from driving aggressively, and
- to remove aggressive drivers from the roads while they are angry and most dangerous.

Deterrence is advanced through significant fines or other consequences such as jail time, and through high-visibility enforcement.

Enforcement provides only partial deterrence to aggressive driving because of police staffing limitations. Most of the time, police do not catch drivers who violate the law. Risk-inclined drivers are less likely than the general driving population to accurately gauge the likelihood of being caught.

If you are considering emphasizing aggressive driving enforcement, you should narrowly define the scope of the intervention, deciding which observable behaviors and sites you should target, what the ticketing threshold will be, what information you will collect, what type of enforcement you will deploy, what deployment schedule you should use, and what planned project to implement.

You should also consider what types of partners should be involved; whether you will undertake efforts to educate the general public as part of the project; what type of education and sanctions will be in place for offenders; and whether construction, weather, or other situational variables are likely to affect the project.

Geographic Information System or GIS mapping of aggressive driving hot spots can help you target your efforts where the need is greatest. You can identify hot spots based on information such as traffic or speed survey findings, collision and fatality data, and citation data. You can compare aggressive driving or road rage hot spots with felony and drug crime hot spots to increase the value of hot-spot enforcement.

1. Deploying surveillance technologies. Surveillance technologies can increase the pervasiveness of enforcement, creating greater saturation and increasing both the likelihood of apprehending offenders and their perception of that likelihood. This increased saturation enhances deterrence.

You can use surveillance technologies for automatic enforcement through mailed citations. They also help you collect data about aggressive driving behaviors such as speeding and running red lights.

There is a variety of surveillance technologies you can use to apprehend and deter aggressive drivers, such as the following:

- Red-light photo-enforcement cameras.
- Automatic number-plate recognition technology in aggressive-driving hot spots.
- Closed circuit television or CCTV at aggressive-driving hot spots, construction zones, or high-collision intersections that can detect unusual traffic patterns and illegal maneuvers and capture license plate data for automatic enforcement or mailed warnings.

- Video-equipped patrol cars recording drivers' behavior and police stops.
- Video-equipped unmarked cars to follow aggressive drivers before marked-car vehicle stops.
- Tailgating detection devices for fleet vehicles.
- Road sensors and cameras working in concert to detect illegal passing.
- Helicopter-mounted cameras that can download clear license plate number photos into patrol vehicles.
- Electronic speed displays attached to speed-limit signs.
- Crash reconstruction software that allows investigators to clear congested roads quickly.
- Downstream lights that allow traffic enforcement officers to cite red-light runners without being physically present in dangerous intersections.
- Telephone-reporting hotlines connected with police follow-up procedures such as keeping a database for use in future investigations, mailing citations, mailing warnings, or mailing anger-management or aggressive-driving-avoidance tip cards.
- Data from vehicles equipped with event data recorders (EDR) could be subpoenaed to support aggressive driving investigations and prosecutions. Data typically recorded include whether the driver was speeding, whether the driver was pressing the brakes, and whether the driver was wearing a seatbelt. Some jurisdictions, including that of the Pennsylvania State Police, access data from vehicle EDR when investigating crashes.

The purpose of electronic surveillance is both to facilitate detection and apprehension, and to promote self-monitoring of driving behavior. Cameras have succeeded in achieving substantial reductions in speeding, and red-light cameras have succeeded in reducing infractions, injuries, and fatalities.40 Nonetheless, visibility would have to be very high, or surveillance widespread, for enforcement alone to impact risk-inclined drivers. Antisocial drivers, especially, are likely to be difficult to influence with negative reinforcement because they tend to overestimate the benefits and underestimate the risks of their aggressive driving behaviors.

You should consult your state codes to ensure that camera- and mail-based ticketing is permitted, and laws should be amended, as necessary, before enforcement programs' initiation.41 If your jurisdiction decides to use electronic surveillance and enforcement, you should first gauge public support for using such technology. Publicizing the contemplated use of surveillance technology allows you to assess the public's reaction before implementation. You might also consider issuing warnings for a set period before issuing citations. An evaluation program should be designed before police issue citations.42

Non-technology-based surveillance, such as when police monitor aggressive driving from aircraft, highway overpasses, and unmarked cars, is also used around the country to apprehend and deter aggressive driving. Some types work well with technology-based enforcement.

2. Conducting high-visibility enforcement. High-visibility enforcement has the effect of calming the driving behavior of a greater number of motorists than those police actually stop. Using marked vehicles can increase visibility, as well as adding magnetic "aggressive driving patrol" signs to enforcement vehicles.

Example of high-visibility aggressive driving enforcement. *Source: Pennsylvania Department of Transportation.*

3. Conducting "centipede" enforcement. In centipede enforcement, six or more speed enforcement cars are placed approximately two miles apart to stop speeding drivers who think it is safe to speed up after passing a police officer who has pulled another driver over. Centipede enforcement is useful for apprehending aggressive drivers by distinguishing them from motorists who maintain lower speeds after they pass the initial visible enforcement officer.

4. Conducting enforcement crackdowns. Aggressive driving enforcement crackdowns, properly timed and executed, can be effective.

For example, saturation police patrols on congested streets or around aggressive driving hot spots focus enforcement geographically. In addition to enforcing actual aggressive driving violations, enforcing precursors or actions that commonly trigger aggressive drivingsuch as blocking intersections during rush hour, failing to yield the right-of-way, and abruptly changing lanescan also help reduce aggressive driving.

5. Referring habitual aggressive drivers to state licensing agencies. Where police officers have ready access to motorists' driving histories, they can determine whether the current aggressive driving violation reflects a pattern of similar driving. If so, the officer might then refer the driver to the state licensing agency for consideration of a license suspension or revocation.

6. Checking records of portable electronic device use. If officers suspect that aggressive driving occurred in conjunction with the driver's use of a cell phone, personal digital assistant, or other distracting technologies, they should check those devices' electronic records to verify their time of use and, perhaps, the nature of the communication. Enhanced penalties may apply.

Enhancing Legislation and Regulation

Efforts to address aggressive driving should include a review of your jurisdiction's current regulatory environment. This will help determine whether police agencies have legislative authority to address aggressive driving effectively.

A robust aggressive-driving regulatory environment would include the following:

- A statutory definition of aggressive driving exists and does not require that intent to harm be proved, but rather is based on objective driving behaviors. Intent to harm is difficult to prove in court.
- Criminal statutes and sentencing guidance provide for enhanced penalties for violence arising from road incidents.
- A range of judicial sanctions exist for aggressive driving, including fines; jail time; license suspensions and revocations; vehicle confiscation, booting, or impounding; anger management treatment; probation; and enhanced penalties for repeat violators.
- Police are authorized to cite drivers on the basis of camera, laser, and other technological evidence.
- Police are authorized to use unmarked vehicles for traffic enforcement.
- Police are authorized to work in teams in which the officer issuing the citation is not the same officer who witnessed the incident.

7. Defining and prohibiting aggressive driving in the state vehicle code. At a minimum, aggressive driving should be defined in the state traffic code and sanctions prescribed. States and localities vary widely in terms of whether they have aggressive driving laws in place and how they define aggressive driving. Arizona, Nevada, and Delaware developed aggressive driving prohibitions in the late 1990s, and other states have since followed suit. Arizona defines aggressive driving as the co-occurrence of speeding and two other traffic violations that create an immediate danger to another. The law includes a list of violations that meet the terms of the definition, including failing to obey a traffic signal, passing on the shoulder, unsafely changing lanes, tailgating, or failing to yield. Other parts of the state's traffic code separately define each of these violations.

8. Restricting window tinting. Window tinting increases driver anonymity, thus lowering inhibitions to aggressive driving. Restricting the level of front window tinting reduces driver anonymity. Some states regulate the percentage of light that window tinting can block. Rules vary widely by state.

9. Requiring Intelligent Speed Adaptation systems in large vehicle fleets. Intelligent Speed Adaptation systems can be installed in vehicles to notify drivers and/or automatically slow vehicles when drivers exceed speed limits. While private vehicle owners may not choose to use such technology, these systems could help improve professional drivers' driving habits when the entire fleet uses them.

Removing or Modifying Environmental and Situational Triggers

Certain environmental changes are known to reduce aggressive driving. For example, more efficient use of existing road capacity can improve traffic flow, better aligning natural human behavior with desired driving behavior. Engineering efforts such as coordinated signals, high-occupancy vehicle (HOV) lanes, shoulders converted into merge lanes, and similar measures can improve traffic flow. Non-road efforts, such as telecommuting and flexible work schedules, can also increase road-use

efficiency.43

Environmental and situational responses are varied, and can include strategies that address vehicles' features, traffic signals' operation, road features, signs, and other means for providing additional information to drivers and traffic-calming techniques. Many of the following environmental strategies reflect Crime Prevention Through Environmental Design (CPTED) principles, or what traffic engineers call *ergonomic strategies.*

10. Timing traffic signals to reduce aggressive driving triggers. Traffic-signal timing can influence driver frustration and anger and can facilitate safe and nonfrustrating driving.44 Ensuring adequate green signal times to reduce driver waits and frustration, eliminating excessively long red signals, ensuring appropriate signal-change intervals, and coordinating or synchronizing traffic signals all permit traffic to flow more smoothly and irritate drivers less.

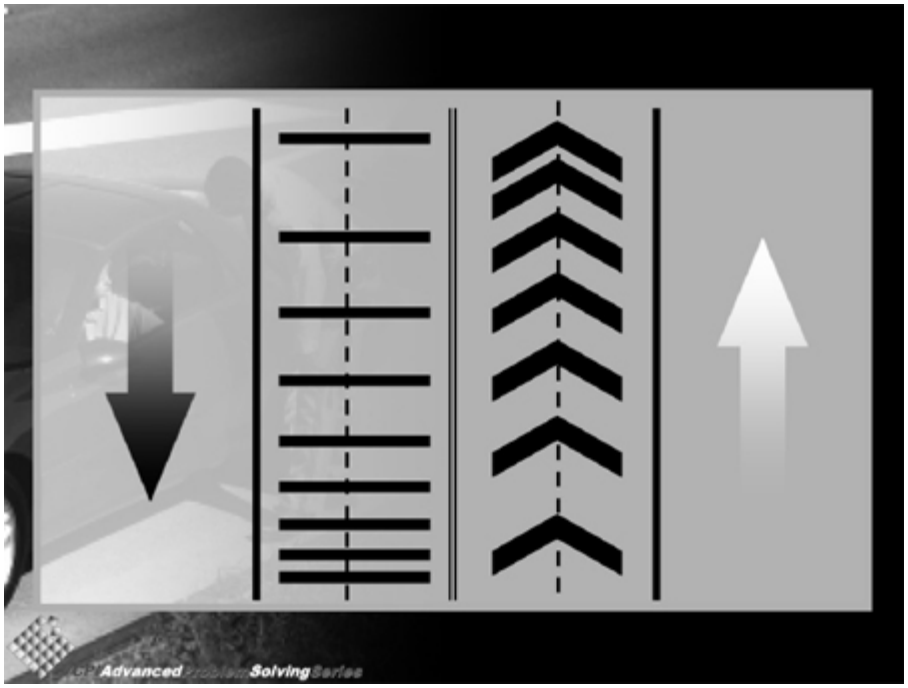
11. Enhancing traffic-signal and street-sign visibility. Low traffic-signal visibility puts drivers in the position of having to make last-second driving decisions, which could increase driver errors and violations. Easy-to-see signal housings and signs that provide advance warning about approaching signals on roads with high speeds and/or short sight distances can enhance traffic-signal visibility. Sufficient signal brightness is also important to help drivers clear intersections quickly. Clear and highly visible street signs help drivers find their way and also reduce last-second driving decisions.

12. Improving drivers' commute information in congested areas. The more drivers know about what to expect on their commutes, the better prepared they are to handle delays calmly. Information can reduce driver frustration in situations where congestion and time urgency could combine to trigger aggression. There are many ways that transportation departments have enhanced drivers' information about their driving environment on freeways. Such tactics include signs that inform drivers of traffic delays, their causes, alternate routes, and estimated arrival times to urban centers. Added information gives drivers a sense of control and the option to choose alternate routes.

Providing drivers with more information about their commutes can help them to handle delays calmly. *Source: Pennsylvania Department of Transportation.*

13. Clarifying appropriate merging zones. Clarifying where drivers should merge can reduce all drivers' frustration. This can be achieved by using signs and painted indications on the road, for example, an arrow with the words "Merge Here" painted nearby. Merging can be encouraged late or early, as long as all drivers have the same idea about the point at which they should start merging. From a traffic-flow perspective, appropriate merging involves cars' using all lanes and merging at a fair speed rather than forming a single queue early and coming to a near stop.

14. Providing speed and distance indicators in areas where speeding or tailgating is common. When drivers are reminded of the law and their own driving behavior, they often monitor themselves and self-enforce driving rules. Police widely use digital speed-limit signs that indicate the legal limit and the speed of the approaching driver to remind drivers to slow down in areas where speeding is common. Similarly, painted dots on the road can indicate appropriate driving distance for the road's speed. Based on road speed limits and safe following distances, painted indicators can help drivers gauge their distance from the car ahead and remind them that safe following distances are important. Painted chevrons create the illusion of a narrowing roadway, thereby reducing driving speeds.45



The use of painted chevrons has been successful at reducing driving speeds. *Source: Virginia Community Policing Institute.*

15. Using traffic-calming features in neighborhoods where speeding is common. Traffic calming describes a wide range of road and environmental design changes that either make it more difficult for a vehicle to speed or make drivers believe they should slow down for safety. Some commonly used physical features include flat-topped speed bumps that double as crosswalks, traffic circles, radar speed signs, and road markings. Visual cues include street trees and streetlights. Tested traffic-calming approaches create self-enforcing behavior in drivers.

16. Maximizing the use of existing roads. In already congested areas, adding

road capacity is not feasible, for either lack of funding or space. You can use existing road capacity more effectively, however. Measures such as coordinating traffic-signal timing, using HOV lanes and promoting nontraditional work hours and arrangements all reduce congestion without requiring added road capacity.

17. Modifying physical road features. Sometimes modifying existing road features can reduce triggers for aggressive driving. By converting shoulders to merge lanes, congestion at peak traffic times can be somewhat mitigated. Creating right-sized freeway entrance and exit ramps that allow for effective merging can also reduce congestion. Converting shoulders into well-designed bus and bike lanes encourages alternatives to vehicle use. Limiting road construction and repair work to off-peak hours also reduces congestion and removes an aggressive driving trigger.

Educating Drivers

In public health matters such as road safety, primary prevention is generally considered the most effective approach to reducing injury. Although a small percentage of drivers are responsible for most traffic incidents, a primary prevention approach gets the prevention message out to all drivers.

Deterrence is heightened when society stigmatizes the behavior in question. Potentially aggressive drivers weigh the likelihood of negative consequences such as fines, increased insurance, vehicle damage, injury, and social stigma against the rewards of breaking traffic laws, namely enjoyment and efficient mobility. Antisocial drivers are partially immune to the deterrent effects of most negative consequences because they underestimate their personal risk, but both antisocial and competitive drivers are interested in maintaining their image, thus making them susceptible to social stigma's influence.

According to an advertising executive, "We need to raise the salience of the embarrassment thattheir failure to contain their rage on the road will make them appear foolish and pathetic. The most powerful deterrent to road rage will be the damage it might do to [an aggressive driver's] image.... If people who are prone to road rage are to maintain their cool, it will be because, by doing so, they can avoid social disapproval."46

18. Stigmatizing aggressive driving through public information campaigns. The most promising education approach for educating antisocial drivers involves stigmatizing aggressive driving behaviors in much the same way advertising campaigns transformed social perceptions of drunken driving.47 Such a campaign targeting the young white male demographic from which most antisocial drivers are drawn is more likely to reduce aggressive driving than a general prevention campaign.

19. Addressing aggressive driving in drivers' education curricula. Mandatory aggressive driving components in driver's education can instruct young people, who are more at risk for aggressive driving, in the triggers, dangers, and consequences of such behavior.48 Virginia includes information about avoiding aggressive driving behaviors in its mandatory drivers' education curriculum.

20. Providing primary education on avoiding aggressive drivers. The general public could likely benefit from education about how to avoid becoming the victim or aggressor in a driving violence or aggressive driving incident.49 Education-

based responses include the following:

- a media and public outreach campaign to stigmatize aggressive driving behaviors;
- a media campaign promoting safe parking-lot etiquette;
- road signs with public education messages, for example, signs reminding slower traffic to keep right, clear street signs to help drivers find their way, and signs that inform drivers about their obligation to share the road with cyclists in areas where bicycling is common;
- officers' providing educational materials to cited drivers; and
- educational programs for new, young drivers, focused on the social aspects of driving and avoiding aggressive driving offending and victimization.

21. Training professional drivers in aggressive driving prevention. Professional drivers, such as those who drive large trucks, taxis, and buses, should receive special training concerning general driving attitudes and avoiding aggressive behaviors as a condition of their employment.[50] Company policies against aggressive driving behaviors, vehicle monitoring and regulating devices, and surveillance of drivers' behavior can complement training.

22. Encouraging employer monitoring of professional drivers' driving. Commercial fleets that used "How's my driving?" bumper stickers reduced crashes between 20 percent and 53 percent.[51] Some companies have hired trained safety consultants with law enforcement or fleet management experience to report to the company on their commercial drivers' driving behavior. Such consultants can surveil drivers' behavior patterns in a variety of situations and provide credible, professional feedback to employers.

Enhancing the Consequences of Aggressive Driving

23. Requiring anger management treatment for aggressive drivers. Anger management treatment may be beneficial to aggressive drivers, risky drivers, impaired drivers, and drivers convicted of violent offenses. Cognitive-behavioral therapy for anger management has proved effective in reducing anger.[52] Court referral to anger management treatment has been demonstrated effective in reducing aggressive driving.[53] Traffic court judges in some states can refer aggressive driving offenders to anger management treatment or traffic safety education, in addition to imposing fines and jail time. Both the Maryland and Virginia suburbs of Washington, D.C., have anger management treatment options available to traffic court judges. The National Center for State Courts examined these programs, but an insufficient number of referrals took place to support a program outcome evaluation.

Many jurisdictions already have post-conviction programs to address impaired drivers' needs. These programs are often required as a condition of license reinstatement. One researcher concluded, "Currently, available evidence provides strong support that these programs can reduce subsequent recidivism and collisions and may provide additional health and social benefits as well."[54] Court-based anger management programs require provider training and certification and eligibility guideline checklists for judges to use in making referrals.

Courts could also require that aggressive drivers with alcohol and/or mental health issues seek treatment for those problems as part of their diversion or sentence.[55] Judges must be trained and willing to make referrals, and police officers must be

trained to write citations in a way that will indicate to judges that the defendant is a candidate for referral to anger management for aggressive driving.

Courts may not have sufficient numbers of eligible offenders to keep treatment programs open if only aggressive driving offenders are eligible. Because reckless and aggressive driving are interrelated and involve some of the same behaviors, it may make most sense to have both be eligible offenses, although reckless drivers should not be automatically referred, as they may not have anger management problems.

Drivers identified by courts in other matters as having anger control issues such as intermittent explosive disorder, or other indicators that a person is highly vulnerable to acting aggressively, could be referred to state licensing agencies for license restrictions or additional education requirements. License restrictions are commonly used for physical and mental health issues that could impact driving safety. While treatment for convicted aggressive driving offenders has been successfully piloted, treatment for persons not yet charged with aggressive driving has not been evaluated.

24. Requiring vehicle-based monitoring systems to enforce driving restrictions. Judges can also impose certain driving restrictions on aggressive drivers. Vehicle-based monitoring systems can include ignition locks and intelligent speed adaptation systems that report supervised drivers' speeding to the court.

Responses With Limited Effectiveness

25. Discouraging aggressive driving through general publicity campaigns. General publicity campaigns designed to alter drivers' attitudes toward aggressive driving have failed to reduce collisions.56 Aggressive drivers tend to be those who underestimate their risk of apprehension and overestimate their driving skill. They respond to trivial triggers that activate reservoirs of latent anger. Such drivers are unlikely to be swayed by logic and reason.

The table below summarizes the responses to aggressive driving, the means by which they are intended to work, the conditions under which they should work best, and some factors you should consider before implementing a particular response. It is critical that you tailor responses to local circumstances, and that you can justify each response based on reliable analysis. In most cases, an effective strategy will involve implementing several different responses. Law enforcement responses alone are seldom effective in reducing or solving the problem.

#	Response	How It Works	Works Best If	Considerations
Improving Opportunities for Secure but Convenient Storage				
Enforcing Traffic Laws				
1	Deploying surveillance technologies	It increases the probability of detection	...the problem is well-defined, the response is based on analysis of incident and hot- spot data, environmental issues have already been addressed, and the public is notified	Surveillance systems require staff to install and maintain them, officer and staff training in use of equipment and data interpretation, and coordination with your jurisdiction's transportation

			and educated before enforcement occurs	department
2	Conducting high- visibility enforcement	It increases the probability of detection and deters aggressive driving	...it is done in aggressive driving hot spots and in conjunction with other awareness-raising techniques	It should take place intensively or frequently, both resource-intensive propositions
3	Conducting "centipede" enforcement	It increases the probability of detection	...drivers are generally aware of the enforcement effort, but cannot predict exactly when and where it will occur	It is staff-intensive; it works only as long as drivers continue to be surprised
4	Conducting enforcement crackdowns	It increases the probability of detection and/or the consequences to the driver	...locations are selected based on analysis of crime and GIS data	It can be staff-intensive and sometimes practical only on an overtime basis; experienced personnel can be more efficient in detecting aggressive driving
5	Referring habitual aggressive drivers to state licensing agencies	It deters aggressive drivers by restricting their driving privileges	...officers can readily access driving records	Providing access to new data systems can be complex, time-consuming, and costly; drivers may disregard licensing restrictions
6	Checking records of portable electronic device use	It increases the probability of linking crashes to aggressive driving behaviors	...enhanced penalties apply to driving offenses that occur while drivers are using portable electronic devices	Checking device records may be burdensome, so this response should be used when called for by the severity of the offense and/or when a link to distracting technology is clear
#	**Response**	**How It Works**	**Works Best If**	**Considerations**
Enhancing Legislation and Regulation				
7	Defining and prohibiting aggressive driving in the state vehicle code	It clarifies for drivers and police officers what constitutes aggressive driving and provides for appropriate penalties	...the statute is based on observable behaviors and not on proving driver intent, and police enforcement is robust	It may require new legislation
8	Restricting window tinting	It removes driver anonymity and thereby deters	...the law restricts tinting of both front and side windows	After-market window tinting combines with factory tinting, so the law must address the

		aggressive driving		percentage of light transmitted inside the vehicle after both types of tinting are applied
9	Requiring Intelligent Speed Adaptation systems in large vehicle fleets	It physically restricts vehicles from reaching excessively high speeds	...it is limited to large vehicle fleets where one organization owns the vehicles and employs the drivers	Regulatory requirements impose a cost burden on private-sector businesses
#	**Response**	**How It Works**	**Works Best If**	**Considerations**
Removing or Modifying Environmental and Situational Triggers				
10	Timing traffic signals to reduce aggressive driving triggers	It reduces drivers' frustration	...it is part of an overall effort to reduce environmental triggers of aggressive driving	Traffic engineers must carry it out
11	Enhancing traffic- signal and street- sign visibility	It reduces drivers' frustration	...it is part of a local transportation department's capital improvement plan or annual survey process	It requires equipment purchase, installation, and maintenance funding
12	Improving drivers' commute information in congested areas	It reduces drivers' frustration	...it is focused on areas with congested commute routes	It may require state transportation departments' cooperation
13	Clarifying appropriate merging zones	It clarifies driving expectations and thereby reduces drivers' frustration	...drivers understand and comply with merging directives	It is relatively inexpensive to implement; it would benefit from media exposure for public education
14	Providing speed and distance indicators in areas where speeding or tailgating is common	It reminds drivers to drive safely	...indicators are installed in areas where speeding and tailgating are common	It is relatively inexpensive; it works to raise drivers' internal controls, so it likely will reduce aggressive driving behaviors in average drivers; it is less likely to affect committed aggressive drivers
15	Using traffic-calming features in neighborhoods where speeding is common	It makes it more difficult and risky to speed	...the features are placed in residential neighborhoods and areas where a cohesive physical and visual	It is in the purview of neighborhood planners and traffic engineers rather than police, and it is easier to integrate seamlessly when

			environment exists or can be created	neighborhoods are initially designed.
16	Maximizing the use of existing roads	It reduces drivers' frustration due to traffic congestion	...it is part of a comprehensive traffic-flow strategy	Some of these strategies have large policy implications, such as promoting telecommuting and flexible work schedules; it may require the cooperation of government and corporate leaders
17	Modifying physical road features	It reduces drivers' frustration	...road features are well-designed such that they reduce rather than increase drivers' frustration	Some physical features are very expensive to alter; it should be considered for both new and existing roads
#	**Response**	**How It Works**	**Works Best If**	**Considerations**
Educating Drivers				
18	Stigmatizing aggressive driving through public information campaigns	It deters aggressive driving through informal social pressure	...a coordinated, long-term campaign can be funded and implemented, and messages are carefully aimed at specific driver groups and are compelling to target audiences	Media campaigns are expensive and require professional advertising or marketing services; a long-term effort is likely needed
19	Addressing aggressive driving in drivers' education curricula	It deters aggressive driving through early education	... it is undertaken during a routine update to drivers' education curricula	It requires cooperation from state licensing agencies and public and private driving schools
20	Providing primary education on avoiding aggressive drivers	It reduces the likelihood of provoking angry drivers to drive aggressively	...it is part of a coordinated, long-term campaign	Primary education can be expensive and requires the participation of professional advertising and public health specialists
21	Training professional drivers in aggressive driving prevention	It deters aggressive driving through education	...a trainer knowledgeable in aggressive driving prevention conducts the training	It might be made mandatory or offered for free or at a discounted charge
22	Encouraging employer monitoring of	It deters aggressive driving by	...employers are committed to enforcing	It requires the cooperation of company executives and fleet

	professional drivers' driving	increasing the probability of detection and the resulting consequences	companies' driving rules, and fleet insurance rates are reduced by having such programs in place	managers
#	**Response**	**How It Works**	**Works Best If**	**Considerations**
Enhancing the Consequences of Aggressive Driving				
23	Requiring anger management treatment for aggressive drivers	It reduces drivers' aggressive reactions to frustration	...judges and prosecutors support treatment options, effective treatment programs are available in the jurisdiction, and eligible defendants are selected	To reach a critical mass of defendants to justify a treatment contract, program designers may wish to develop referral criteria that consider other offenses, such as reckless and impaired driving, and some nondriving offenses in which anger is a significant contributing factor
24	Requiring vehicle-based monitoring systems to enforce driving restrictions	Systems lock ignitions and report drivers' speeding to the courts	All parties involved agree to their use	They may be expensive to install
#	**Response**	**How It Works**	**Works Best If**	**Considerations**
Responses With Limited Effectiveness				
25	Discouraging aggressive driving through general publicity campaigns	Print, radio, Internet and television media can all be employed	Used in conjunction with responses targeted at those most likely to offend	Aggressive drivers tend to underestimate the risk of apprehension and overestimate their driving skills; they are also less likely to be swayed by logic and reason

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[2] James and Nahl (2000).

[3] James and Nahl (2000).

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[12] Dollard et al. (1939), referenced in Millar (2007).

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[14] Joint (1995); Smart and Mann (2002); Wells-Parker et al. (2002).

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[26] Ross and Antonowicz (2004).

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[31] Parliament of Victoria Drug and Crime Prevention Committee, Australia (2005).

[32] Parliament of Victoria Drug and Crime Prevention Committee, Australia (2005).

[33] Galovski, Marla, and Blanchard. (2006).

[34] Asbridge, Smart, and Mann (2003).

[35] Strahilevitz (2006).

[36] James and Nahl (2008).

[37] James and Nahl (2008).

[38] Tannen (1998).

[39] James and Nahl (2008).

[40] National Highway Traffic Safety Administration (2006).

[41] Parliamentary Advisory Council for Transport Safety (2005).

[42] National Campaign to Stop Red Light Running (2002).

[43] Asbridge, Smart, and Mann (2006).

[44] Shinar (1998).

[45] Stetenfeld (2003).

[46] Crimmins and Callahan (2003).

[47] Crimmins and Callahan (2003).

[48] Shinar (1998).

[49] National Highway Traffic Safety Administration (2004).

[50] National Highway Traffic Safety Administration (2006).

[51] Strahilevitz (2006).

[52] Deffenbacher (2002); Beck and Fernandez (1998).

[53] Asbridge, Smart, and Mann (2006).

[54] Galovski, Marla, and Blanchard (2006).

[55] Flango, Cullen, and Keith (2003).

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Important!

The quality and focus of these submissions vary considerably. With the exception of those submissions selected as winners or finalists, these documents are unedited and are reproduced in the condition in which they were submitted. They may nevertheless contain useful information or may report innovative projects.

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Project ADVANCE (Aggressive Driving Video and Non-Contact Enforcement, Maryland State Police, 2001

Safe Streets in 1997, Albuquerque Police Department, 1997

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APRIL 2019

SPEED REDUCTION FEASIBILITY STUDY

PREPARED FOR:
METRO NASHVILLE PUBLIC WORKS

1101 17TH AVENUE SOUTH
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SPEED REDUCTION FEASIBILITY STUDY
NASHVILLE, TENNESSEE

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EXECUTIVE SUMMARY

In response to Substitute Bill BL2019-1492, this speed limit reduction feasibility study analyzes the reduction of vehicular speed limits (30 mph to 25 mph) on all locally classified streets. The goal for the speed limit reduction is to increase safety for all roadway users – motorized and non-motorized users alike. An implementation strategy for accomplishing this task is provided along with potential issues and concerns, as well as possible countermeasures.

The recommended implementation strategy is as follows:

- Speed limit reduction (30 mph to 25 mph) would apply to all locally classified streets with the Urban Services District; any exceptions to this would be presented to and decided by the Traffic & Parking Commission following its typical procedures.
- A reduction requires all existing 30 mph speed limit sign faces be replaced. Metro Public Works' speed limit sign inventory (with geocoded locations) will be updated, while also noting existing speed limit pavement marking locations, using Metro Public Work's photolog.
- Conservatively, the sign face replacement process would occur over the course of one (1) year with the project divided into four relatively equal phases. The phases may be generally categorized by council districts. The most central, urbanized districts will be implemented first, and then expanding outward from there. The opinion of probable cost is approximately $750,000 to $1,000,000.
- Countermeasures for addressing potential issues and concerns with the speed limit reduction are detailed in this report. They fall within three general categories – education, engineering, and enforcement. The education component will likely be the most effective before, during, and immediately following construction in supporting this broad scale change. Countermeasures should be periodically monitored and evaluated in order to refine the mix of strategies as to maximize resources and associated impacts on safety.
- A task force focused on improving roadway safety should be considered to identify a specific countermeasure strategy tailored to meet Nashville-Davidson County's dynamic needs. This task force could also provide important analyses of, and guidance on, the evolution of this strategy.

1. INTRODUCTION

Substitute Bill BL2019-1492 passed its second reading at the Metropolitan Council of Nashville's ("Council") February 19, 2019 meeting. This bill directs Metro Nashville Public Works ("MPW") to complete an analysis for the reduction of vehicular speed limits on local streets, per the Major and Collector Street Plan of Nashville and Davidson County recommended in the 2016 WalkNBike Strategic Plan, and to submit a feasibility report with implementation recommendations to Council within a 30-day period.

This report seeks to provide general background information on the greater conversation of speed limit reductions occurring in communities across the country, which is often carried out as part of a larger Vision Zero strategy. High-level summaries of both aspirational and peer cities who have carried out speed limit reductions are provided to build an understanding of the strategies associated with achieving safe streets for all users. Potential issues and concerns for a similar reduction effort in Nashville-Davidson County are highlighted, along with a list of potential countermeasures that could help to achieve better speed limit compliance. Finally, a high-level implementation strategy for rolling out an extensive speed limit reduction on locally classified streets is provided. Scheduling, phasing, and an opinion of probable cost are included.

2. STUDY BACKGROUND AND FOUNDATION

Throughout the country there is a paradigm shift currently occurring for one of the most prevalent assets a municipality invests in, its roadways. The transportation network underlies every aspect of a citizens' life, from their ability to access goods and services, to their quality-of-life, health, and safety. Historically, ease of mobility for vehicles has been the dominant focus and drive of roadway designs, as well as the structure of a community's transportation network; however, negative impacts on the safety and comfort of pedestrians, bicyclists, and other non-motorized users of roadways and neighborhood streets, has resulted in a fundamental shift in the approach to traffic safety.

Vision Zero, an international strategy for eliminating traffic deaths and severe injuries on roadways, seeks to increase the safety for all roadway users, equally, as opposed to an auto-driven approach. It also deems the preservation of human beings' lives as well as their quality-of-life as community priorities worthy of investments. The strategy employs a "safe systems" approach to transportation planning, design, and implementation. It assumes drivers will inevitably make mistakes, even when trying to avoid from doing so. Therefore, roadway designs should reflect this fact with appropriate safety features, such as lower speed limits (which increases driver reaction times, reduces vehicle-stopping distances, and can increase sight distance), to prevent serious and fatal crashes when these mistakes do occur. This approach differs from the traditional approach in the manner it identifies the problem, causes, responsible party, planning approach, and ultimate safety goal. The traditional method finds blame in the individual road users due to human error when an accident occurs, whereas the Vision Zero approach identifies faults in the system design and places a higher priority on fatalities and serious injuries than overall crash frequency. Speed management is a major tenant to Vision Zero's safe systems approach.

Jurisdictions around the world and even inter-jurisdictional departments have recognized, adopted, and implemented Vision Zero differently. Metro Public Works does not currently have staffing, programming, or funding specifically designated as Vision Zero. However, the intent and methods of Vision Zero are strived for in MPW's everyday safety focus, as well as special projects like roundabout construction, neighborhood traffic calming, and this speed limit reduction effort.

The Metropolitan Government of Nashville and Davidson County's ("Metro") 2017-2020 Transportation 3-Year Action Plan, *Moving the Music City*, is a guiding document for near-term action regarding increasing the safety of city streets, as well as increasing the options and viability of non-motorized travel. The Plan outlines dozens of near-term initiatives for achieving a variety of mobility goals, which are all underlined by the City's first priority, public safety. Vision Zero is one of the four overarching mobility goals. Nine actions/initiatives for improving safety on Nashville's streets are detailed, including creating safer neighborhoods. MPW is tasked with several actions in working towards this goal. This includes the implementation of Walking District pilots and "adding 'quick build' walkways to its

community-driven Traffic Calming Program", which MPW has accomplished and continues to build upon. Additional efforts in working towards safer, more multimodal streets are highlighted on the following two pages.

HIGHLIGHT: EXAMPLES OF ADDITIONAL RECENT TRAFFIC CALMING EFFORTS IN NASHVILLE-DAVIDSON COUNTY IN SUPPORT OF CITY MOBILITY GOALS

Achieving slow, safe streets takes strategies from all angles. Discussed in the speeding countermeasure section, an approach that includes education, engineering, and enforcement is necessary for success. Examples of efforts with Nashville-Davidson County that have occurred relatively recently, include:

Metro Neighborhood Traffic Calming Program (MPW)

In addition to a walk/bike pathway reappropriated from excess pavement width in South Nashville, the Metro Neighborhood Traffic Calming Program has successfully implemented, or is currently in the neighborhood action process of constructing, more robust traffic calming measures, including four neighborhood traffic circles and series of speed cushions on two higher-volume neighborhood streets.

Last month, eight neighborhoods were selected for additional traffic calming analysis following the conclusion of the Program's first open application submittal period, which will occur twice a year (in January and July). For the 60+ requesting neighborhoods, the Program's new prioritization strategy was used to rank requests based on greatest need. Data points include crash history, vehicle speeds and volumes, availability of non-motorized infrastructure, and nearby destinations. Neighborhoods have already begun coordinating with MPW staff to set up design meetings with residents.

Implementation of WalkNBike Bikeway Network (MPW, Metro Planning Department)

In the past two years, planners and engineers have teamed up to provide a neighborhood-based design approach to the implementation of Nashville-Davidson County's envisioned bikeway network. Part of bike lanes' ability to increase roadway safety for all users has to do with slowing vehicle speeds; therefore, traffic calming elements are important aspects to the success of a bike facility. In 2017, 10th Avenue South was restriped to utilize excess pavement width in order to incorporate parking-protected bike lanes on a two-lane roadway. A "floating bus island" was constructed to improve safety for transit users, as well as help to physically narrow the originally wide roadway.

The bikeways teams (MPW and Metro Planning Department) have recently partnered with The Nations Neighborhood Association to identify locations for the construction of potential neighborhood traffic circles at key locations to enhance the envisioned neighborhood greenway facility that will provide a low-stress connection throughout the neighborhood.

Grassroots Advocacy, Tactical Urbanism, and Community Education (TURBO Nashville, Walk Bike Nashville)

Non-governmental agencies, non-profits, and other interest groups have been working at the grassroots level for many years to increase safety for all users on Nashville-Davidson County's streets. TURBO Nashville (an initiative of the Nashville Civic Design Center) and Walk Bike Nashville are two organizations that have been working on traffic calming through the lens of community education as well as tactical urbanism, where temporary and permanent traffic calming measures have been deployed in various neighborhoods to demonstrate and measure improvements to safety.

Originally emerging from a grassroots neighborhood initiative, Walking District pilots, which included the original neighborhood (Hillsboro-West End, also known as "HWEN"), were established in three neighborhoods in 2017. The additional two neighborhoods were selected based on a variety of elements, including the structure of the roadway network (grid-like pattern versus curvilinear, suburban-style subdivision streets), traffic patterns, demographics, development patterns, and availability of pedestrian accommodations. The goal was to test the success of speed limit reductions combined with minor signage and pavement marking improvements. Collector roadway speed limits were reduced from 30 or 35 mph to 25 mph, while locally classified streets were reduced from 30 mph to 20 mph. The study included pre- and post-data collection and observations to evaluate the impacts in driving behaviors. At a general high-level, results showed improvements in average speeds, although 85th percentile speeds (a metric often used for understanding speed limit compliance in traffic engineering) remained statistically unchanged. Essentially, the majority of drivers that typically drive in a prudent manner slowed their speeds; however, the behavior of the few that choose to drive recklessly and disobey laws did not change. A follow-up resident survey showed overall positive feedback, but there was a desire for additional engineering and enforcement countermeasures to further reduce vehicular speeds as well as other reckless driving behaviors (distracted driving, not yielding to pedestrians, rolling through stop signs, etc.). Ultimately, the study recommends a speed limit reduction on all locally classified neighborhood streets in Nashville-Davidson County, to 25 mph instead of 20 mph, among other action items. This is due, largely in part, to the suburban-style development patterns that dominate Nashville-Davidson County and the unlikeliness of achieving 20 mph operating speeds in a large portion of neighborhoods. Recent speed and volume data from the Walking Districts is highlighted on the following page.

An additional action outlined in the 3-Year Plan is for city agencies to "review Metro's speed limit policy for all municipal streets and for local residential streets". BL2019-1492 addresses this action, in part; by requesting a feasibility analysis of the reduction in posted speed limits for all locally classified streets in Nashville-Davidson County, as well as an implementation strategy should the change be codified.

HIGHLIGHT: RECENT WALKING DISTRICT DATA COLLECTION

Shifting driving behaviors at a large scale, particularly as it relates to speeding, can take years before sizable benefits are experienced, especially when the American culture is so deeply engrained around the automobile. Speed and volume data was collected on sample local streets (posted at 20 mph) from each Walking District ("WD") in mid-March 2019 to test speed limit reduction impacts. Follow-up data was originally collected 1-2 months following implementation of the new Walking District measures, which are also provided in the table below.

CHANGES IN WEIGHTED AVERAGE SPEEDS (BOTH DIRECTIONS)

	"BEFORE" WD (2016/2017)	"AFTER" WD (2017/2018)	***DIFFERENCE (2016/2017 to 2017/ 2018)***	2019	***DIFFERENCE (2017/2018 to 2019)***	***OVERALL DIFFERENCE (2016/2017 to 2019)***
Cleveland Park						
N. 2nd St.	26.7 mph	23.4 mph	***-3.3 mph***	26.2 mph	***+2.8 mph***	***-0.5 mph***
N. 6th St.	24.7 mph	25.0 mph	***+0.3 mph***	26.4 mph	***+1.4 mph***	***+1.7 mph***
Hillsboro-West End						
W. Linden Ave.	24.9 mph	24.6 mph	***-0.3 mph***	23.7 mph	***-0.9 mph***	***-1.2 mph***
Bernard Ave.	26.0 mph	27.2 mph	***+1.2 mph***	25.4 mph	***-1.8 mph***	***-0.6 mph***
Una Antioch						
Piccadilly Row	31.2 mph	30.1 mph	***-1.1 mph***	31.0 mph	***+0.9 mph***	***-0.2 mph***

Results on these randomly selected Walking District streets show initial increases and reductions in the weighted average speeds directly following implementation. Roughly a year to two following the Pilot Program, speed and volume results (when comparing weighted averages between 2019 and "after" conditions) showed continued improvement on the streets within HWEN. The other three streets showed an upwards tick in averages; however, overall reductions were still maintained between 2019 and "before" conditions, except for N. 6th Street in Cleveland Park. Continued monitoring of impacts, positive and negative, should be considered, especially in terms of crash experience. Isolating contributing/detracting environmental factors can help Nashville-Davidson County tailor their strategies towards increasing compliance in a variety of neighborhood settings.

3. ASPIRATION AND PEER CITY EXPERIENCES WITH SPEED LIMIT REDUCTIONS

3.1 Aspirational City Methodologies and Experiences

Cities are hotbeds for innovative approaches to urban living, including roadway designs that better accommodate all modes of travel while increasing the overall comfort of public spaces. This section includes information on aspirational cities (New York City, New York and Portland, Oregon) and their multi-pronged approaches to increasing roadway safety. The information is intended to generate ideas for potential similar approaches in Nashville-Davidson County, as well as to establish an understanding that a comprehensive approach is necessary to success.

New York City, New York

New York City was the first American city to adopt the Vision Zero program in 2014 with the goal of providing safer streets for all road users through education, law enforcement, public dialogue, street design, and legislation. When analyzing fatal traffic crashes, speeding is often classified as a leading cause. Thus, the City has implemented a multitude of diverse efforts focused on encouraging drivers to reduce their vehicular speeds, including a reduction in default speed limit to 25 mph in November of 2014[1]. Some key additional efforts are as follows:

EDUCATION

- From 2014 through 2018, 1,484 schools and 356 senior centers were visited by the City's Vision Zero team to provide safety education for residents of designated priority locations[2].
- "Street teams" of City staff target all roadway users in areas with informational flyers and general discussions with people regarding roadway safety. Police provide on-foot patrol during the typical weeklong duration of the educational outreach. The week is followed up with a period of targeted enforcement of the most common moving violations, which lead to modal conflicts.
- The Taxi and Limousine Commission (TLC) uses outreach and education to promote safety among the many for-hire drivers by incorporating Vision Zero content into the permitting process and taxi school curriculum[3].

ENGINEERING

- In 2017, 390 speed humps were installed, doubling the installation pace from years prior to Vision Zero[4].
- From 2014 through 2018, 461 Safety Engineering Projects were completed. These include a myriad of design strategies aimed at

[1] "Automated Speed Enforcement Program Report, 2014-2017." *NYC DOT.* 2017.
[2] "Borough Pedestrian Safety Action Plans – Vision Zero Update." *NYC DOT.* Feb., 2019.
[3] "TLC Vision Zero Outreach." *NYC Taxi & Limousine Commission.* 2019.
[4] "Automated Speed Enforcement Program Report, 2014-2017." *NYC DOT.* 2017.

discouraging speeding, such as narrowing travel lanes that had excess pavement width, road diets, median installations, and the reassignment of traffic lanes to accommodate pedestrian, bicycle, or parking facilities[5].

ENFORCEMENT

- Speeding summonses issues by the New York Police Department (NYPD) increased significantly (over 93%) from years preceding Vision Zero to 2017[6].
- Speed cameras were installed near 140 school areas to penalize drivers whose speeds exceed the posted school-zone speed limit by more than 10 mph during school hours with a $50 Notice of Liability[7].
    - From 2014 through 2018, over 5 million automated speed camera violations were issued citywide. Although there are several legislative restrictions for when and where speed cameras can be used, school speed zones with speed cameras saw a 17% decline in the number of severe injuries in crashes after the activation of the cameras.
    - State Law allows the City use speed cameras strictly for enforcement on streets abutting a school property within 1,320 feet of the school during the school hours and extracurricular school activities. Enforcement via speed cameras is also permitted within an hour prior to and after school hours and 30 minutes prior to and after extracurricular activities. NY State Law prohibits the use of speed cameras outside of the precise aforementioned guidelines. The City would like to see changes in legislation so that speed cameras can be used outside of school hours and be deployed in high-crash areas that do not necessarily abut a school.

Portland, Oregon

The City of Portland adopted the Vision Zero program in 2015, after which a High Crash Network (HCN) consisting of 30 high crash streets and 30 high crash intersections was identified. Although the HCN encompasses only 8% of Portland's streets, 57% of the City's fatal crashes occur within this designated network[8].

Through its Vision Zero initiatives, City staff analyzed several data sets related to traffic crashes and concluded that most fatalities occur on streets with higher

[5] "Borough Pedestrian Safety Action Plans – Vision Zero Update." *NYC DOT.* Feb., 2019.
[6] "Automated Speed Enforcement Program Report, 2014-2017." *NYC DOT.* 2017.
[7] Ibid.
[8] "Taming Speed for Safety – A Defining Approach and Leadership from Portland, Oregon." *Vision Zero Network*. 2018.

speed limits (35-45 mph). This finding encouraged the Portland Bureau of Transportation (PBOT) to prioritize speed reduction efforts through the following Vision Zero Action Plan strategies:

RESEARCH[9]

- To determine appropriate speed limits on non-arterial roads, which account for 94% of Portland's streets network, the City of Portland developed a unique strategy that varies greatly from the widely utilized 85th percentile methodology. In 2016, the Oregon Department of Transportation (ODOT) granted Portland the ability to use a speed-setting methodology that consists of a Simplified Decision Matrix. Through this matrix, City Staff can determine which roadway design features are necessary to ensure the safety of different road users when vehicles are traveling at varying speeds. The concept of setting speed limits based on a roadway's 85th percentile speed was developed based on studies from the 1960s conducted on rural roads, which differ significantly from urban roads that accommodate a diverse mix of road users. Thus, the 85th percentile speed-setting practice does not take into consideration key safety concerns that seem irrelevant for rural roads but are important to account for in an urban setting. With this, PBOT hopes its Simplified Decision Matrix can help the City set safer speed limits citywide. PBOT's Simplified Decision Matrix is presented below in Figure 1.

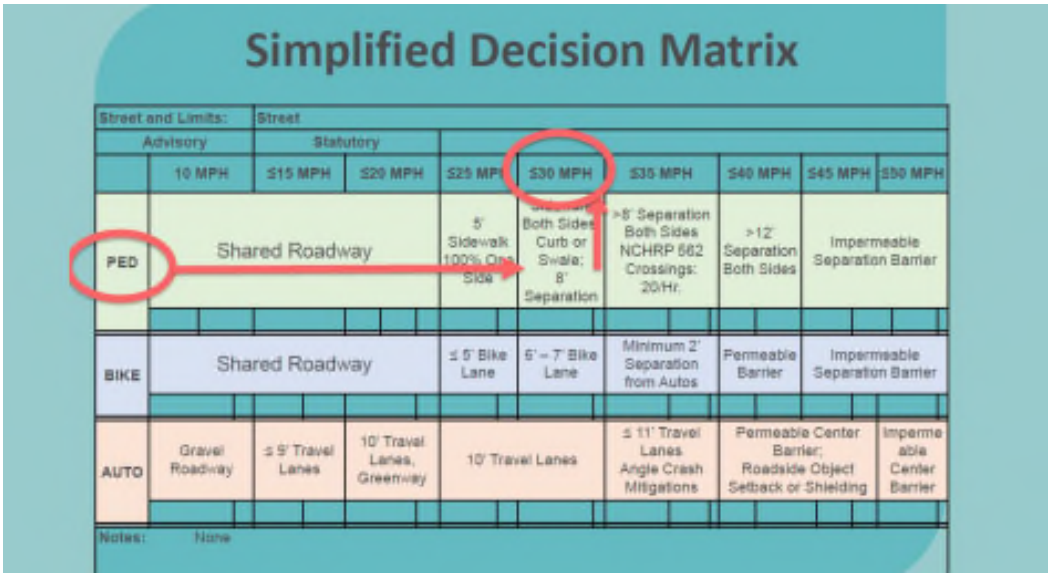


Figure 1: PBOT's Simplified Decision Matrix

[9] Ibid.

In order to receive approval to reduce a street's posted speed limit, PBOT presents a speed zone investigation to Oregon Department of Transportation (ODOT) with an analysis of the following factors:

- Adjacent land uses; street widths; average daily traffic volume; total number of fatal and injury crashes in a certain time period; number of crashes per mile in a certain time period; detailed description of available pedestrian, bicycle, and vehicle facilities.

From this investigation, a recommendation for a 20 mph posted speed limit can be made to reduce the risk of fatality for a pedestrian or bicyclist hit by a vehicle to 10%, versus a fatality risk of 40% found for vehicles driving at 30 mph.

EDUCATION[10]

- A communication campaign for public outreach was established in Spring 2018.
- A messaging campaign was initiated to support safe speeds and build public awareness of Vision Zero.
- Education on traffic safety cameras was distributed to nearby residents and businesses prior to launching this safety initiative.

ENGINEERING

- The City of Portland decreased posted speed limits to 20 mph on residential local roadways in April 2018[11].
- Signage was installed based on a priority system to promote connectivity between two, or more, higher classification streets. Priority was also given to locations neighboring bus stops, school, and parks.
- Enhancements to street design, such as traditional bike lanes, protected bike lanes, and raised curbs, were considered. Under its strategy of enhancing street design in order to discourage speeding, PBOT has developed a prioritization process that allows for efforts to focus on Portland's High Crash Network, with special attention paid to communities identified based on a list of 10 equity indicators. The indicators are as follows[12]:
  - Low-income households; people with disabilities; low English proficiency persons; youth; older adults; affordable housing; lower paying jobs; poor vehicle access; access to services.

[10] "20 mph Residential Speed Limits." *PBOT's City Council Presentation.* 2018.
[11] "Residential Speed Limit Reduction." *PBOT.* 2019.
[12] "Taming Speed for Safety – A Defining Approach and Leadership from Portland, Oregon." *Vision Zero Network*. 2018.

- In order to prioritize the allocation of project funding, the City identifies intersections within its HCN considered highly unsafe and cross-references the identified intersections with communities in need, as determined through the equity indicators aforementioned[13].
- Future plans include evaluating the impact of the reduced 20 mph speed limit on public safety.

ENFORCEMENT

- Safety cameras were installed on streets with high injury rates. After an initial evaluation in 2017 prior to the reduction in posted speed, at three study intersections speeding was reduced 47 percent, 68 percent, and 61 percent after installation of speed safety cameras[14].

3.2 Peer City Methodologies and Experiences

The cities of Charlotte, North Carolina, Wheaton, Illinois, Decatur, Georgia, and Lexington, Kentucky were selected as somewhat similar (peer) cities to Nashville, Tennessee that have implemented a large-scale speed reduction strategy. Cities were selected based on general similarities in their transportation networks and/or commuting characteristics with that of Nashville-Davidson County. The goal was to include networks that reflect the spectrum of roadway contexts and neighborhood structures in Nashville. Availability of information and data (regarding speed reductions) on municipal websites was a limiting factor in peer city selection. Therefore, size and demographics vary among these communities as compared to Nashville.

- Charlotte, NC – Medium-Sized City – Population: 859,035 (2017) – Network Characteristics: historic center with grid-like street pattern, suburban-style commuting corridors with subdivision cul-de-sacs further out from downtown core
- Wheaton, IL – Suburb of Chicago – Population: 53,373 (2017) – Network Characteristics: small historic center with grid-like street pattern, largely suburban-style commuting corridors with subdivision cul-de-sacs, access to commuter rail
- Decatur, Georgia – Suburb of Atlanta – Population: 23,832 (2017) – Network Characteristics: commercial center, largely suburban-style commuting corridors with subdivision cul-de-sacs, access to commuter rail
- Lexington, Kentucky – Small-Sized City – Population: 321,959 (2017) – Network Characteristics: historic center with grid-like street pattern, suburban-style commuting corridors with subdivision cul-de-sacs further out from downtown core

[13] Ibid.
[14] Ibid.

Relevant information is provided below to gain insight on similar speed reduction efforts and traffic calming practices throughout the country.

Charlotte, North Carolina

Following the global Vision Zero initiative, Charlotte strives to eliminate all pedestrian deaths on its city streets by 2030. A myriad of actions are required to achieve this goal considering that 27 pedestrian fatalities were reported in 2017[15]. Approximately 80% of these pedestrian deaths occurred on arterial roads with two or four lanes of travel and speed limits of 35 mph or 45 mph[16].

As one of its Vision Zero efforts, Charlotte's City Council approved a set of measures aimed at facilitating the process that neighborhoods must follow to apply for traffic calming measures and to request that the posted speed limits on neighborhood streets be reduced to 25 mph in November 2018. The set of approved measures includes the following changes[17]:

EDUCATION

- Assistance is provided to "distressed neighborhoods" (i.e., low income) so that signatures required for traffic-calming petitions can be successfully collected.

ENGINEERING

- The installation of a speed hump can be requested for streets with a minimum of 600 vehicles per day.
- The installation of a stop sign can be requested based on traffic counts from both the major and the minor streets adding up to a minimum of 600 vehicles per day, as opposed to solely counting major street traffic.
- The installation of both a speed hump and a stop sign can be requested with a minimum of 1,500 vehicles per day.
- Upon the request of individual neighborhoods, the current citywide speed limit of 35 mph, unless otherwise posted, can be lowered to 25 mph.

Wheaton, Illinois

As part of its efforts to enhance public safety, the Wheaton City Council approved the reduction of the speed limit on residential streets from 30 mph to 25 mph in July 2018. A speed limit of 30 mph was maintained on residential streets considered major collectors through which more than 6,000 vehicles travel per

[15] "A record 27 pedestrians died in Charlotte last year. This year could be worse." *Charlotte Observer*. 16 Nov., 2018.
[16] Ibid.
[17] "Charlotte Neighborhood Traffic Calming Program: Policy Updates." *Charlotte, NC TAP Committee Presentation*. 24 Sept., 2018.

day[18]. The following initiatives were conducted in association with the speed reduction:

RESEARCH

- The decision to maintain the 30-mph speed limit on some roadways was made following completion of a traffic study on collector roads[19]. For the study, traffic data was collected along Wheaton's collector street system to determine whether the procedure used to classify the city's roadways should be modified and if reducing the speed limit on collector streets would be appropriate from a traffic engineering perspective. The study concluded that instead of having three roadway classifications – local roads, collectors, and arterials – the city should have five classifications to differentiate minor collectors and arterials from major collectors and arterials. This recommendation stemmed from the high range of traffic volumes recorded on the city's collectors, which varied from 1,000 to over 10,000 vehicles per day. In terms of speed data collection, the study concluded that the 85th percentile speed on several streets surpassed the posted speed limit by more than five mph. Most of the streets where high 85th percentile speeds were recorded are characterized by physical conditions that tend to encourage drivers to drive faster. Such conditions include long stretches of uninterrupted flow, wide travel lanes, limited access, and no/limited on-street parking.

EDUCATION

- In order to increase awareness about the speed limit change, residents were welcome to obtain "Drive 25" yard signs and car magnets at city hall.
- A strong communication campaign was implemented, accompanied by a grace period in which officers only issued warnings.

ENGINEERING

- Portable Dynamic Message Signs (DMS) and street signs were installed to raise awareness.
- Speed limit change as a result of a citywide plan to improve public safety that included several sidewalk-widening projects.

ENFORCEMENT

- Law enforcement began enforcement of the speed limit upon erection of the new speed limit signs. As a suburb of Chicago with a population of approximately 52,000 people (~11.5 square miles)), the implementation of new speed limit signs in Wheaton was carried

[18] "New Residential Speed Limit." *City of Wheaton, Illinois-Transportation & Parking Department*. 2018.
[19] "Collector Roads Traffic Study & Residential Street Speed Limit." *City of Wheaton, Illinois*. 2018.

out during the few weeks following Council's approval of the speed limit reduction in July of 2018. The reduced speed limit took effect on August 1, 2018[20].

Decatur, Georgia

In April of 2018, the Decatur City Commission approved the request to create Residential District Speed Zones (RDSZ) to facilitate the issue of speeding tickets in certain areas. This included the following enforcement initiatives[21]:

ENFORCEMENT

- Although no changes were made to the posted speed limits across the city, police officers were granted permission to write a speeding ticket to any driver traveling at 1 mph above the posted speed limit on any of the 16 areas designated RDSZ.
    - Prior to this change, officers were only allowed to ticket drivers traveling at more than 11 mph above the posted speed limit.
    - The streets encompassed by the established RDSZ are traffic generator roadways known for connecting to high-volume street and being in close proximity to schools. Thus, the RDSZ streets carry high traffic volumes during peak hours.

Lexington, Kentucky

In February of 2016, the Urban County Council unanimously decided to reduce the posted speed limit on 21 downtown streets from 35 mph to 25 mph based on high crash rates (72% occurring downtown) and an increase in pedestrian crashes[22]. The goal of the legislation was to encourage more multi-modal trips in the downtown area. Following this legislation, University of Kentucky agreed to lower posted speeds on their local roadways as well. Speed limits on state roadways, however, were not altered. The following measures were taken to implement the reduction in speed:

EDUCATION

- Public service announcements were made to emphasize the threat of higher speeds to pedestrian safety. These announcements were aired on local television to encourage speeds of under 25 mph in the downtown area and residential neighborhoods.

[20] "Speed Limit Lowered for Wheaton Neighborhoods". City of Wheaton, Illinois-Traffic & Parking Department. 2018.
[21] "Decatur adding 16 streets to 'Residential District Speed Zones'." *Atlanta. News. Now.* 9 Apr., 2018.
[22] "Speed limit will drop from 35 mph to 35 mph on some downtown Lexington streets in spring." *Lexington Herald Leader*. 4 Feb., 2016.

- A social media campaign was implemented with funding by donations made to Kentucky's "Share the Road" campaign established by the Kentucky Bicycle and Bikeway Commission.

ENGINEERING

- To decrease speeds, 158 speed limit signs were installed at a cost of $5,900[23].

ENFORCEMENT

- The local police department assisted with raising driver awareness by issuing warning citations in the downtown area during the early stages of implementation.

[23] "Speed limits on dozens of downtown Lexington streets could lower from 35 to 25 mph." *Lexington Herald Leader.* 17 Nov., 2015.

4. SPEED LIMIT REDUCTION FEASIBILITY FOR NASHVILLE-DAVIDSON COUNTY

There is often a relationship between posted speed limits and roadway functional classifications. Typically, arterials have higher posted speeds, while locals have lower speeds. The lower speeds provide safety benefits for both motorized and non-motorized users.

4.1 Proposed Scope of Speed Limit Reduction

Roadways are classified based on the function they provide within the overall network, meaning how they serve the flow of trips within that network, as well as the type and number of accesses it provides to individual adjacent properties. The traditional functional classification hierarchy breaks the roadway network down into three categories based on the level of mobility and accessibility the roadway provides:

- Arterials (high level of mobility, typically lower level of access)
- Collectors (balance of mobility and accessibility)
- Locals (low level of mobility, high level of access)

Comprehensive transportation planning uses functional classification to determine the most logical and efficient manner for funneling traffic within the roadway network. For roadway designers, functional classification dictates a roadway's design, particularly its design speed. Community planners work to tie community transportation (mobility, accessibility) and land use/development (livability) goals together during key stages in the developmental process, largely by 'right-sizing' roadway designs according to their existing and future land context, not just their function within the roadway network.

The scope of the potential speed limit reduction for Nashville-Davidson County includes locally classified streets per the Major and Collector Street Plan (MCSP) of Nashville and Davidson County recommended in the 2016 WalkNBike Strategic Plan. The MCSP maps "the vision for Nashville's major and collector streets and ensuring that this vision is fully integrated with the city's land use, mass transit, and bicycle and pedestrian planning efforts". The Plan's guidance for the planning, construction and redevelopment of these roadways expands upon the traditional functional classification system by incorporating considerations for existing and future adjacent land use character (i.e., context) into design elements. The three street context types used in the MCSP include residential, mixed use, and industrial, while the roadway functional design types, include:

- Arterial-Parkway
- Arterial-Boulevard
- Collector-Avenue

Although design guidance is not explicitly tailored in the MCSP for the following roadway types, it does acknowledge the importance of these roadways and how

design principles contained within the MCSP can be relevant for the efficiency, safety, and comfort of these facilities:

- Locals
- Access-Controlled Facilities, such as Interstates and Expressways

Local streets, the lowest order of the functional classification hierarchy, make up the majority of roadway miles in Nashville-Davidson County, and provide a variety of roles in varying contexts across the city. These contexts, such as residential, mixed-use, and industrial, are generally aligned with the street contexts outlined in the MCSP. Although local streets are typically two lanes, widths of local streets vary widely. Within urban contexts, widths are typically narrower, while in suburban areas, particularly within subdivisions, streets can be very wide. The fundamental function of a local street is to provide direct access to individual properties. Many of Nashville's local streets also operate as residential neighborhood streets meaning they provide important public spaces to pedestrians and playing children. Reckless driver behaviors (including speeding, whether perceived or real) negatively impact the safety and comfort of residents and other users of these streets, and ultimately, the livability of Nashville. Given the Nashville area's continued urbanization, and subsequent vehicular traffic pressure on these public spaces and the users traveling them, special attention has turned to one of our community's largest assets – local streets.

Locally classified streets within Nashville-Davidson County's Urban Services District (USD) are recommended to be the initial focus for the potential speed limit reduction. The USD encompasses what was once the City of Nashville's historic municipal limits prior to city-county government consolidation in 1963, and now includes areas such as Antioch and Donelson to the southeast and east of Nashville's core. USD boundaries were chosen for the speed limit reduction strategy based on higher density levels (population and built environment), historic street patterns and designs, as well as the greater expectation for pedestrians and bicyclists (i.e., increased chances for conflicts between non-motorized and motorized users). Higher density levels translate to higher traffic volumes in many locations. Historic street patterns and designs means more grid-like streets, narrower roadways, greater utilization of on-street parking, and higher levels of curbside activities, all of which contribute to "self-enforcement" of low operating speeds. Narrower environments create less opportunity for drivers to avoid collisions, and when combined with increased uncertainty along a roadway's curbside, such as on-street parallel-parked vehicle doors opening or a pedestrian stepping out into the roadway, most drivers tend to slow their speeds. Germantown, one of Nashville's densest neighborhoods, is a great example when thinking about this concept, especially the corridors of 4th Avenue North, 5th Avenue North (although a collector), and 6th Avenue North.

The General Services District (GSD) is not recommended for a district-wide speed limit reduction on local streets given the spectrum of contexts these streets serve in more rural, undeveloped areas of Nashville-Davidson County. Many local

roadways within the GSD (beyond subdivision developments) are narrow, winding country roads. In these locations, the ability to support a reduced speed limit with enforcement or engineering countermeasures is reduced. Reduction of speeds on streets within the GSD could become a second phase of implementation, after evaluation of the USD process.

Streets on which a 25 mph may not be suitable would be handled on a case-by-case basis through presentation to the Traffic & Parking Commission. This is the process currently used for the changing of any speed limit.

It should be noted that a speed reduction would not resolve all traffic concerns on locally classified roads, such as the need for traffic calming. The existing Traffic Calming Program plays an important role in supporting the speed reduction, especially on local streets experiencing higher volumes of speeding traffic. Furthermore, while this study does not evaluate roads classified as collectors, some collectors share similar characteristics, such as design and context, with local roads. In these locations, a speed limit reduction should be evaluated. The goal in these evaluations is to find an appropriate balance between the mobility, safety, and livability of the street.

4.2 Potential Issues & Concerns

Potential issues or concerns associated with a broad-sweeping speed limit reduction are outlined in this section. For elected officials and municipal departments, cost and logistical details are a concern when talking about the replacement of more than 2,800 sign faces; however, the success of this project relies on more than just the logistics of a smooth installation. Without some degree of education, engineering, and enforcement, the concerns listed in this section may endure. Measures to prevent and counteract these follow. A proposed implementation strategy along with an engineer's opinion of probable cost is included later in this study. Potential issues and concerns during and after implementation are as follows:

- Driver awareness of newly-reduced speed limits. This includes residents that live on the street or in the area, Nashville-Davidson County residents that do not live within the USD (whose neighborhood streets did not have a speed limit reduction), and commuters from adjacent municipalities and counties.
- Driver confusion when in an area with newly-reduced speed limits but on a street with no posted speed limit sign.
- Perception of reduced mobility for residents (i.e., ability to move through neighborhood quickly).
- People may not adhere to newly-reduced speed limit signs, especially on roadways in suburban areas where street widths are very wide and on-street parking is limited. Nashville also has a number of hilly

neighborhoods, which creates an additional hurdle for compliance, even for the most well intentioned drivers.
- Some residents will expect immediate adherence to and enforcement of new speed limits. A sweeping change could put a strain on the enforcement body's resources as a large percentage of road miles in the USD are local residential streets.
- Resident's perception of speeding in neighborhoods may not change. Traffic Calming will likely become more important to these residents.

Countermeasure Toolbox

Potential measures to counter the issues and concerns discussed above are highlighted in this section. They are arranged by the traditional traffic engineering approach to roadway safety – the three 'E's', Education, Engineering, and Enforcement. Measures from each category should be implemented in tandem with each other, as each plays its own unique role in achieving slow speed streets, changing cultural norms surrounding mobility and livability, and providing safe roadways for all users. Cities that have experienced measurable improvements in their roadway safety have all employed multi-pronged approaches. When speaking of successes, these cities emphasize the importance of approaching roadway safety from all angles.

EDUCATION

The education component should not be overlooked nor undervalued in the process of achieving safe streets. Engineering and enforcement countermeasures are costly to a community, and are not practical for every mile of each local street within Nashville. Education plays a critical role in shifting the American cultural paradigm around travel – from an auto-oriented one to one that considers all users of the roadway as equally-valuable and important. Those with potential application specific to this effort during/following implementation are provided below:

- *"Off-Site" Awareness/Education*
    - Media Blitz – using traditional and non-traditional methods to convey the message of changes prior to, during, and after implementation. These may include:
        - Approach local TV news channels and newspapers for message dissemination.
        - Make strategic social media posts using venues such as NextDoor, Twitter, Facebook, Instagram, etc.
        - Include message in monthly councilmember newsletters for several months following implementation.
        - Incorporate announcement in monthly council district and other neighborhood meetings held by councilmembers.
        - Utilize neighborhood associations, especially those that have been previously involved with the Traffic Calming Program, to

disseminate the message and even tailor neighborhood-specific messaging strategies for maximum effectiveness.
        - Deliver message using high visibility locations/venues. This could be accomplished through methods such as flyers/handouts/notices, yard signs, or small mobile exhibits that could be moved to a variety of community venues and events as the speed limit reduction progresses across the city. Examples include notices placed within utility bills, flyers placed at Vehicle Registration Offices, or yard signs placed at Vehicle Emissions Testing Locations or in school receiving/pick-up lines.
        - Place a detailed map of newly posted 25 mph streets on the MPW website for public dissemination.
    - Tailor message delivery for those that drive the streets of Nashville as their profession. These could include Metro Nashville School bus drivers, MTA Bus Drivers, Campus Transportation Drivers (such as Vanderbilt University), MPW fleet drivers, the Post Office, for-hire companies, rideshares, and delivery companies (such as FedEx, Amazon, and Uber Eats). While more resource-intensive, consider alerting the larger construction companies that are redeveloping Nashville's neighborhood streets. Some neighborhoods have expressed concern over construction-related driver behaviors through the Traffic Calming Program.
    - Establish a 'Pace Car' Pledge for residents to sign stating they will obey the newly posted speeds, even if vehicles stack up behind them, effectively creating a "mobile speed bump" for trailing traffic. Similar pledges in other cities also include language on the driver committing to being more aware of and courteous to non-motorized users. This type of grassroots strategy helps to target speeding from the ground up as opposed from the top down, creating greater momentum for a cultural shift in how our neighborhoods and living spaces are viewed and treated by vehicular drivers in Nashville.
    - Perform surveys to gauge public perception of the Traffic Calming Program and enforcement. Determine public awareness of the reduced posted speed and develop education programs that target specific audiences deemed less aware of these changes. Validate the effectiveness of public outreach campaigns by surveying public awareness of specific marketing strategies.
    - Update Google Map/Waze data with newly-posted speed limits, if possible.

- *"On-Site" Awareness/Education*
    - Place portable DMS at higher-volume entrances to neighborhoods in more suburban areas or generally place along key collector/arterial roadways in urban areas where traffic has numerous opportunities to travel into and through a neighborhood.

- Provide the opportunity for yard signs to be purchased or borrowed for residents interested in reinforcing the new speeds.

ENGINEERING

Engineering countermeasures implemented on streets can facilitate reduced speeds by physically and visually narrowing roadways, as well as providing horizontal or vertical deflection that physically alters driver behaviors (such as speed cushions or striping patterns (i.e., chicanes)). Countermeasures can also include incorporating space for safer bicycle and pedestrian movements. 'Right-sizing' existing streets aids in the ability of a roadway to self-enforce a lower speed limit. While engineering countermeasures and additional roadway design retrofits are outside the scope of this study, these measures are an important component in achieving slow speeds and safety goals. The Traffic Calming Program should continue to be funded in order to complete the detailed analyses and identification of appropriate engineering countermeasures at a more granular level.

In the design and approval process of new neighborhood developments, design speeds and other design elements should be evaluated for consistency and should consider countermeasures to facilitate low speeds.

ENFORCEMENT

Enforcement of newly posted speeds plays a part in the success of a sweeping speed limit reduction; however, it should not be considered as a panacea to stop speeding, nor is there a desire for it to be. With thoughtful preparation and implementation, this program can succeed without a significant enhancement in enforcement from Metro Nashville Police Department (MNPD). MPW and the MNPD should coordinate engineering and enforcement efforts through the Traffic Calming Program regarding roadways that have limited engineering countermeasure options or vice versa, limited options for safe, effective enforcement. Overlap in strategies can help target the most effective combination of countermeasures or design standard revisions for these especially troublesome streets.

By identifying the boundary of the speed limit change as the USD, MNPD officers will have a clear understanding of the speed limit, allowing for consistent enforcement. The intent of the proposed strategy is to limit driver and officer confusion both during and after the construction period.

Potential strategies to assist law enforcement include:

- An initial warning period (~1 month), similar to the approach used for the Walking Districts, could be implemented as residents become acclimated to driving at a reduced speed.

- Data regarding vehicle speeds and volumes is critical for making informed investment decisions. Data sharing coordination between MPW (Traffic Calming, Bikeways, and Traffic Engineering), MNPD, and the Metro Planning Department regarding recently collected data sets (speed and volume) could be beneficial for maximizing our existing resources efforts.
- Some communities have employed 'Neighborhood Speed Watch' programs in an effort to provide self-enforcement within their community (as well as an important education opportunity). These programs provide local residents with speed-reader boards or radar units from their local law enforcement agency or transportation department. Participants monitor passing vehicle speeds and report the speed, date, time, and license plate of each speeding incident. With this data, local law enforcement may send warning letters to offenders, or they may deploy their own enforcement team to address high-frequency speeding locations.

Evaluating the success of education, engineering, and enforcement efforts is a critical component in achieving safe streets and other community mobility goals. Collecting, analyzing, and sharing data allows for strategies and actions to be continually revaluated and refined. This allows limited resources to be allocated to where the greatest need is and where efforts will have the most significant impact on improving safety. Successful cities across the country underscore the importance of data collection, the quality of data (ensuring that collected data points adequately inform desired safety goals, such as what/how information is included in crash reports), and finally, the continual evaluation of that data to properly refine education, engineering, and enforcement strategies.

5. SPEED LIMIT REDUCTION IMPLEMENTATION

5.1 Implementation Plan

INVENTORY

Implementation of any citywide speed limit reduction should be thoughtfully planned and implemented. The foundation of this process is a current and accurate, geocoded sign inventory. A speed limit sign inventory was completed by MPW several years ago; however, an update will be required prior to any implementation. The updated inventory should include all speed limit sign and marking locations within the USD.

PLANS AND PROCESS

Following the inventory update, a basic plans package should be prepared for contractors. The plans package should include details for each replacement scenario, quantities, and plan sheets indicating geo-located signage and pavement marking replacement locations. The plan set should be acceptable for bidding.

The design plans should reflect implementation on all locally classified streets within the USD. Implementation is recommended to include the replacement of all existing 30 MPH speed limit sign faces within the USD. Replacement signs should read 25 MPH. All existing 20 MPH or 25 MPH speed limit signs should remain.

Furthermore, all damaged sign posts should be replaced, and relocation should be considered, as identified in the signage inventory. Moreover, existing 30 mph speed limit pavements markings should be removed and replaced. In limited instances, additional speed limit pavement markings may be recommended.

Locations requiring post replacement or relocation should be identified separately. An additional 72 hours will be required for TN One Call in these locations.

Additional Considerations:

- The MUTCD identifies retroreflective sign posts as an option on speed limit signs. These should be considered for select locations.
- In well-defined neighborhoods, consider removal of redundant speed limit signs.

CONSTRUCTION

During construction, existing 30 mph speed limit pavement markings should be eradicated in advance of any sign replacement. This will reduce driver confusion during the transition.

The replacement of speed limit pavement markings (if re-installed at all) may follow at any time after sign replacement is complete. This phasing will allow flexibility for the striping contractor, whose schedule requires flexibility due to weather fluctuations.

5.2 Schedule, Phasing, and Next Steps

SCHEDULE AND PHASING

The previous speed limit sign inventory indicates approximately 2,800 speed limit signs are present on local streets within the Metro Nashville USD (excluding those located within Walking Districts, as these will not change). Conservatively, an anticipated construction timeline for this project would be approximately one (1) year.

The sign inventory and plans preparation process will require additional time. It is estimated that the inventory and design process will take four to six months.

Based on a one-year construction timeframe, it is recommended the project be divided into four relatively equal phases. The phases may be generally categorized by council district. It is recommended that the most central, urbanized districts be implemented first. These districts have environments that are the most conducive for self-enforcing speed limits given characteristics of the built environment, as well as having the greatest need given high volumes of vehicles, pedestrians, bicyclists, and other non-motorized users. The momentum gained within these neighborhoods will help to increase the likelihood for neighborhoods later in the implementation stages to comply with speed limit changes.

Following the updated signage inventory, this recommended phasing below may be revised:

Phase 1:

1. District 2
2. District 5
3. District 6
4. District 17
5. District 18
6. District 19
7. District 21

Phase 2:

1. District 7
2. District 8
3. District 9
4. District 13
5. District 14
6. District 15
7. District 29

Phase 3:

1. District 16
2. District 26
3. District 28
4. District 30
5. District 31*
6. District 32
7. District 33

Phase 4:

1. District 1*
2. District 3*
3. District 4*
4. District 20
5. District 22*
6. District 23
7. District 24
8. District 25
9. District 27
10. District 34*

* Very small portion of this District is located within the USD

NEXT STEPS

As part of the Vision Zero effort, many cities have established a task force or committee comprised of a spectrum of stakeholders in order to approach safety from the most holistic approach possible while ensuring strategies are equitable. These task forces typically include representatives from a variety of sectors, including transportation, public health, police, fire, policy makers, and advocate groups.

Most often, these task forces are charged with the development of a Vision Zero Action Plan or similar near-term (5-year) guiding document. These plans present the goals of the community in terms of creating safer streets, outlines the near-term and long-term steps needed to achieve those goals, and details who is responsible for each step in working towards accomplishing those goals.

These task forces also typically play an active role in monitoring progress towards achieving goals outlined in the near-term action plan as well as providing direction to the municipality in further implementation of action items. This provides flexibility for the municipality to appropriately respond to and refine strategies based on data outcomes, as they become known. A similar task force in Nashville, whether specifically tailored towards Vision Zero or not, could provide a venue for several of the countermeasures discussed in Section 4, such as the sharing of data between MPW and MNPD.

National practice points to the need for a multi-faceted approach (education, engineering, and enforcement) in addressing the complexities associated with roadway safety and shifting cultural attitudes towards driving behaviors. While this study envisions a specific strategy of countermeasures to be identified by a group of representatives (ideally, a task force), specific countermeasures discussed in Section 4 that could be beneficial as part of a multi-pronged approach towards improving roadway safety in Nashville, include:

- Education – carry out a media blitz, “on-site” awareness campaigns, and establish a Pace Car Program.
- Engineering – continue to fund the Traffic Calming Program to evaluate roadways at a granular level and construct engineering countermeasures.

- Enforcement – the concept of enforcement is not limited to ticketing. Data sharing, education of the new speed limit by the police, and a Neighborhood Speed Watch Program are examples of enhanced enforcement that could have beneficial application in Nashville. The community should look to the experiences and creative strategies applied in Vision Zero cities to identify an appropriate enforcement strategy that does not unduly burden any specific populations, particularly those traditionally underserved.

The strategy should be rooted upon a strong foundation of data, and should be periodically monitored, to evaluate progress on meeting safety goals, while allowing Nashville-Davidson County to tailor its strategy accordingly.

5.3 Opinion of Costs

Without a current and accurate sign inventory, an engineer's opinion of probable cost must be based on general assumptions. Using the approximately 2,800 signs in the previous inventory as a base for assumptions, the estimated cost is approximately $750,000 to $1,000,000. Included in this opinion is the update to the signage inventory, four sets of design plans (one per phase), construction, construction engineering and inspection, an educational rollout, and a contingency.

6. CONCLUSION

In conclusion, the goal of the speed limit reduction on local streets within the USD is to increase safety for all roadway users. A slower operating speed for vehicles increases driver reaction times, reduces vehicle-stopping distances, and can increase sight distance, in turn, reducing the number and severity of collisions. This is especially true for our roadway's most vulnerable users – pedestrians, bicyclists, and other non-motorized users. The speed limit reduction implementation strategy is an important step in achieving the City's greater transportation, safety, and mobility goals as the region continues to grow and evolve.

The recommended implementation strategy is as follows:

- Speed limit reduction (30 mph to 25 mph) would apply to all locally classified streets with the Urban Services District (USD); however, a district-wide reduction in the GSD is not recommended. Neighborhoods and pockets of residential streets in the GSD could petition, however, to be included within the reduction.
- A reduction requires all existing 30 mph speed limit sign faces be replaced. Metro Public Works' speed limit sign inventory (with geocoded locations) will be updated, while also noting existing speed limit pavement marking locations, using MPW's photolog.
- Conservatively, the sign face replacement process would occur over the course of one (1) year with the project divided into four relatively equal phases. The phases may be generally categorized by council districts. The most central, urbanized districts will be implemented first, and then expanding outward from there. The opinion of probable cost is approximately $750,000 to $1,000,000.
- Countermeasures for addressing potential issues and concerns with the speed limit reduction are detailed in this report. They fall within three general categories – education, engineering, and enforcement. The education component will likely be the most effective before, during, and immediately following construction in supporting this broad scale change. Countermeasure strategies should be periodically monitored and evaluated in order to maximize resources and associated impacts on safety.
- A task force focused on improving roadway safety should be considered to identify a specific countermeasure strategy tailored to meet Nashville-Davidson County's dynamic needs. This task force could also provide important analyses of, and guidance on, the evolution of this strategy.

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

PACE CAR PROGRAM

COLUMBUS PACE CAR

The **"Columbus Pace Car Program"** is a resident-based program designed to fight speeding on residential streets through education and awareness.

City of Columbus residents can contact the city or download the forms below to take the pledge to drive the speed limit in their neighborhoods and to obey all stop signs and red lights.

Those taking the pledge will receive a decal that identifies them as a motorist who has taken the pledge to become a **Columbus Pace Car.** Motorists can proudly display this decal in their car's rear window.

If 60 percent of a neighborhood's residents take the pledge, that neighborhood can receive a sign to be displayed on the street in the neighborhood that identifies the neighborhood as a **Pace Car Neighborhood.**

"This is about empowering people to take charge of their neighborhoods and to impress on our neighbors and friends the importance of observing the speed limits on our streets," said Mayor Ginther.

Residents can email pacecar@columbus.gov or call (614) 645-3111 to request the forms to make the **Columbus Pace Car Pledge.** The forms can also be downloaded here or filled out online here. Please note that you must be a resident within the City of Columbus to participate.

For more information see the Columbus Pace Car Program Frequently Asked Questions.

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

PACE CAR PROGRAM

Pace Car F.A.Q.

WHAT IS A NEIGHBORHOOD PACE CAR?

A Pace Car is a car whose driver has signed a pledge to obey all City of Columbus traffic laws, posted speed limits, and to be courteous of other road users. A Pace Car driver takes into consideration the impact of his or her choices on others when driving.

HOW CAN I BECOME A PACE CAR DRIVER?

You must be a Columbus resident to participate. Just fill out the registration form and pledge either online or by mail – there is no program fee. We'll send you a vinyl static cling decal. Display the decal in the rear window of your car to let others know that you obey all local traffic laws and posted speed limits.

WE HAVE MULTIPLE CARS. CAN I GET MULTIPLE DECALS?

If there is another driver in the house, we can give you an extra pledge form so they can sign it. Each signed pledge will receive a decal and there is a limit of one pledge per person. We want to make sure there's a Pace Car driver in front of every decal on the road!

CAN I HAVE EXTRA PLEDGE FORMS FOR MY NEIGHBORS?

Absolutely! Contact us at ***pacecar@columbus.gov*** *and we'll be happy to send pledge forms to your neighborhood or community group.*

DO PACE CAR STICKERS PROVOKE "ROAD RAGE"?

Road rage certainly contributes to the atmosphere of fear on our streets. The idea is that the Pace Car sticker will "legitimize" driving within the speed limit - that it's a matter of safety and consideration for others, not timidity or cluelessness. It's about

education and awareness. Many people who sign up to the Pace Car Program already act as unofficial Pace Cars in that they are people who generally follow the appropriate traffic laws. It's been reported in other Pace Car communities that incidents of road rage decrease when they badge their car as a Pace Car. Instead of the driver behind thinking they are stuck behind someone who "doesn't know how to drive," the Pace Car sticker lets them know that there is a purpose for why the car is being driven within the speed limit. Remember, changing behavior takes time! If for any reason you do find yourself the victim of road rage (whether as a Pace Car participant or not), do not engage in or respond to any aggressive behavior. If the situation escalates, please contact Columbus police.

IS THIS PROGRAM COSTING A LOT OF MY TAX MONEY?

Since the Pace Car program relies on personal responsibility, self-discipline, and volunteerism,it's not very costly to implement. The cost of printing vinyl decals and other materials is a small fraction of the cost of one speed hump or other traffic calming installation.

WHAT OTHER CITIES HAVE STARTED PACE CAR PROGRAMS?

- *Boise, ID*
- *Salt Lake City, UT*
- *Mesa and Tempe, AZ*
- *Boulder, CO*
- *Atlanta, GA*
- *Bellingham, WA*
- *Minneapolis-St. Paul, MN*
- *Missoula, MT*

HOW DO I SIGN UP?

To become a pace car driver you pledge to:

"… drive within City of Columbus speed limits; stop at all stop signs, red lights, and for pedestrians in crosswalks; give myself enough travel time so that I'm not sacrificing safety or courtesy; reduce overall car usage; not text while driving; be courteous to, and share the road with bicyclists, pedestrians, and other drivers; and to display the Columbus Pace Car Program decal in my vehicle."

To take the pledge:
Email ***pacecar@columbus.gov*** or call (614) 645-3111 to request the forms to make the Columbus Pace Car Pledge; the forms can also be downloaded ***here*** or filled out online ***here***.

The Columbus Division of Police works hard to enforce speed limits to keep neighborhood streets safe, but every motorist must do their part by slowing down to save lives. Columbus neighborhoods, particularly those with speeding and traffic congestion issues, are encouraged to participate in the Pace Car Program. An ongoing, collaborative effort between residents and the City in a targeted area is the most effective way to reduce speeding in our neighborhoods.

If 60% of the residents in a targeted neighborhood commit to participate in the Pace Car Program, the City of Columbus will recognize the community's effort. A Neighborhood Pace Car sign, as shown below, will be installed to recognize the neighborhood's commitment to speed reduction and a safer neighborhood for everyone.

Mail your completed pledge form to:

City of Columbus
Department of Public Service
ATTN: Pace Car Program
50 West Gay Street
Columbus, Ohio 43215

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

DEPARTMENT OF
PUBLIC SERVICE

City of Columbus

Pace Car Program

What is the Pace Car Program?

Every motorist has a responsibility to slow down and help make Columbus streets safer for pedestrians, bicyclists and other motorists. That's why the City of Columbus Pace Car Program is a resident-based traffic calming initiative coordinated by the Division of Traffic Management within the Department of Public Service. Modeled after similar programs in other U.S. cities, the goal of the Pace Car program is to make Columbus streets safer by encouraging residents to promote motorist responsibility and roadway safety through an educational and awareness campaign.

Residents and neighborhood groups participate in the Pace Car Program by pledging to:

- Drive within the posted speed limit of City streets, especially in residential areas and school zones
- Stop at all stop signs and red lights
- Stop for pedestrians at marked and unmarked crossings
- Allow for enough travel time so as not to sacrifice safety or courtesy
- Reduce vehicle usage and explore alternative methods of transportation to help improve air quality and lessen traffic congestion
- Not text while driving
- Share the road safely with all users including bicyclists and pedestrians of all ages and abilities
- Display the Columbus Pace Car Program sticker in your vehicle

Majority of speeders are our own neighbors. Pace Car participants set an example when they drive at the speed limit, literally setting the pace for other vehicles behind them.

Residents who commit to the Pace Car Pledge agree to uphold their pledge to drive safely and display a Columbus Pace Car vinyl decal in their vehicle's rear window. This decal alerts other motorists to be aware of, and obey the speed limit. The decal also reminds the driver of the Pace Car Pledge.

Display the official Pace Car decal in your vehicle's rear window!

Want more information on the Pace Car Program?
Visit www.columbus.gov or email pacecar@columbus.gov

Join the Columbus Pace Car Program and play a significant role in creating safer streets for pedestrians, bicyclists and others, enhancing your neighborhood's and the City's overall quality of life.

Simply fill out the pledge form:

Name _____

Address _____

_____

Email _____

I pledge to drive within City of Columbus speed limits; stop at all stop signs, red lights, and for pedestrians in crosswalks; give myself enough travel time so that I'm not sacrificing safety or courtesy; reduce overall car usage; not text while driving; be courteous to and share the road with bicyclists, pedestrians, and other drivers; and to display the Columbus Pace Car Program decal in my vehicle.

Signature _____

Send in your completed form to the address on the back to receive your Pace Car decal via postal mail.

The Salt Lake City Neighborhood PACE CAR Program

Setting a pace for others to follow !

Welcome to the Neighborhood Pace Car Program!

The Neighborhood Pace Car program is an idea originating in Boise, Idaho in June of 2000. We think this is a great program that will work well in Salt Lake City, This brochure is designed to introduce new folks to the ideas behind pace cars and more fully explain the nuances of the program to folks who have already signed the pledge. We hope that this information will begin to answer questions you may have about how to be a pace car driver and that it will provide you the information that you need to get involved or stay involved in the program. *All it takes to get involved in the Pace Car Program is to sign the pledge!* (included with this newsletter) - the hard part comes later; when you begin to implement that pledge into your driving habits and lifestyle.

The Neighborhood Pace Car Program is an exciting new citizen-based initiative that promises to slow traffic and reduce car use dramatically. Born in Boise, Idaho with the assistance of Australian traffic-reduction expert, David Engwicht, the idea is ingenious and simple;

It uses cars to calm cars, merely by encouraging motorists to abide by existing laws.

Engwicht says of the program, "I have been working for the past five years with cities world-wide to develop a process that would enable residents to solve traffic problems in their home street themselves. We have tried many ideas, but I am convinced that this is what we have all been searching for. It is a stroke of genius. Boise is destined to be celebrated in history as the birthplace of the *Neighborhood Pace Car*, the program that bought back a vibrant street life and sense of community."

The method is very simple. In exchange for pledging to drive as carefully through other neighborhoods as they would like others to drive through theirs and to minimize their own car use, drivers will earn the right to display a Neighborhood Pace Car sticker on both the front and back of their car. Rather than relying on a government fix or a slab of concrete in the road to slow down other motorists, Pace Car drivers act as a traffic calming device every time they drive on a neighborhood street. Rather than asking the highway district to widen roads and "fix" congestion and air quality problems, residents will each be doing their own part by reducing their own car use.

The beauty of the idea is that it puts the responsibility to drive responsibly back on us – the motorists – instead of on our government the police or the traffic engineers. It doesn't require physical traffic calming structures such as speed bumps and chicanes. This not only saves money, but also is easier for emergency vehicles.

Ultimately, this program may change our relationship with our car; from one of looking on it as a device to use whenever we're in a hurry as we rush from one task to another, to one of looking at our car as just one means, among many, to get from one place to another.

The Neighborhood Pace Car Story
A Street, its residents, and some

by David Engwicht

In 1987, I headed up a 'freeway' fight in Brisbane, Australia. Route 20 was to be ploughed right through our community. I had no background in transport or urban design, but was determined that we must not simply move the problem into someone else's back yard. Instead we hunted the world for long-term, sustainable solutions. I also argued strongly that we must take responsibility as a community for our part in the problem. The result, a year later, was the book *Traffic Calming* which took Australia and North America by storm.

I quickly became disillusioned by the way traffic calming was implemented and stripped of its social and cultural change elements. After writing another book to try and correct this, I began working on an alternative to traffic calming that would allow residents to solve traffic problems *themselves* – without needing the intervention of the city or highway department.

Now we need to go back in time to explain the next part of the story. I first visited Boise in 1998 to talk with the city about the Traffic Reduction Kit. Boise was in the middle of a very heated debate about traffic calming, in particular their first experimental roundabout. For some reason I sensed that Boise was the place where a traffic revolution would be born. I said to my hosts, "If it can happen in Boise it can happen anywhere." I promised to come back.

Eighteen months later, on a tour to promote the book *Street Reclaiming*, I did come back to Boise. Two significant things happened on this visit. Anne Hausrauth was on the Boise City Council, but was about to finish her term. She also had a traffic problem in her home street. She decided to be the first to implement the street reclaiming ideas in my book in a systematic way. Over the next six months, until significant restrictions were placed on her by the City, she worked with her neighbors and proved that the techniques worked.

The second significant event was a public meeting for the residents of Northview Street – site of the first experimental roundabout -- a street that had suffered a significant increase in traffic due to road improvements and nearby residents who were looking for a quick cut-through route. I was nearly lynched at a public meeting by the residents because I dared to argue that *they* must find ways of taking their street back and not simply blame the City, Highway District, and other drivers for their problems.

At the end of the meeting, after almost everyone had gone, I saw a woman talking to the organizers of the meeting. She was upset and crying. I stood on the edge and listened. Her parents had lived in this street. She had grown up in this street. When she married she built a house at the front of her parents house so she could stay in this street. But as the traffic had increased she had watched the street go to the dogs. It was a familiar tale. Then she told how she had been a victim of violent crime in her own home, the perpetrator someone from one of the adjacent run down rental properties.

Driving home I asked my host about this woman. I discovered her name was Lisa Reece and that she had headed up the community fight against the changes that had moved the extra traffic into their street. I was so moved by her story that I asked my host if he would ring Lisa the next day and promise her that I would return to Boise to do an experimental street reclaiming on Northview.

Six months later I returned to fulfill my promise. But I was told the residents were still too angry to work with me on an experimental street reclaiming. Lisa suggested that I may like to meet some of the residents over apple pie instead.

I arrived at the gathering to find about 20 very angry residents. That day the Highway District had again made decision that would put another 4000 vehicles per day onto Northview. One resident was the middle of the road and they will have to carry me away". I listened to this outpouring of anger for about half and hour, then Lisa spoke.

"When David was here 6 months ago, like you I was angry when he suggested *we* must find a way of solving this problem ourselves. I began thinking about what I could do. I wasn't prepared to do the things he suggested on his earlier visit, like letting my kids play on the sidewalk or even take my chair out onto the sidewalk. In the end I decided the only thing I could do to take back some control was to get in my car during peak traffic times and drive up and down my street at the speed limit and stop to let my neighbors out of their driveways. If there are no cars on the street, I wait for them at the corner and escort them down the street."

Almost everyone at the meeting responded that they would join Lisa in this strategy. As I listened I remembered that I had made a similar decision 12 years earlier during the freeway fight because of a realization that my own car use was impacting the neighborhoods through which I drove. I have met many other people since that had made the same commitment. Immediately I recognized the seeds of a great idea.

"It is no use having these drivers think they are just stuck behind some slow-coach," I said. "They need to know they are behind another one of these vehicles that acts as an escort. We need some kind of emblem on the back of the car. And we need you to not only be an escort vehicle in *your* street but in *everyone's* street. And we need to get people on the other side of town to reciprocate with you and be an escort vehicle in your street. That way you won't need to drive up and down the street needlessly. The whole city will be calmed to the speed limit."

I could not sleep that night. This was the simple 'entry-point' I had been searching the past five years for. It contained all the elements of the original Traffic Reduction Kit (taking personal responsibility, inter-street treaty, etc.) but was so such more eloquent. *It used the devil to tame the devil!* At the same time it gave a name and purpose to the strategies that my hosts in Boise had been working on themselves since my first visit.

The next morning I had breakfast with a number of people including the head of the Chamber of Commerce. He could see a lot of sense in businesses supporting the scheme and having their company vehicles become pace cars. It also just happened that this day was the second day of a two day course I was conducting on finding solutions to traffic problems. At the course we had members of the city council, city engineers, planners, highway commissioners, community police, fire department people and concerned residents. The second day of the course was supposed to focus on developing some new solutions for Boise. I mentioned what had transpired overnight and immediately the group chose to work on developing this "escort car" idea further. It was a city official who suggested we call it the Pace Car Program. The participants came up with bumper sticker suggestions and designed the overall structure of the program.

Over the next three days we had working groups develop the pledge, design the Pace Car logo, etc. Within four days of conceiving the idea we had 200 residents who had signed the pledge and were ready to launch the program officially.

I am therefore not the inventor of the Pace Car. Nor is Lisa or the 70 other people in the workshops who developed the ideas and added their own bit of genius. It only seems fitting that this community-based strategy was conceived and born out of an experience of community—people working together to build a new future in the here and now. It is a story of compassion and the creative potential in us all.

Maintaining the "Spirit" of the Pace Car Program –

What does the Pledge really mean?

If the Pace Car program is going to be successful, we all must do our part to maintain the integrity of the program. All of the elements in the pledge are essential and must be preserved if the program is to work properly.

Accepting personal responsibility – striking a better balance

One problem with traditional approaches to managing traffic (such as traffic calming) is that we have been able to externalize the blame for traffic problems. While traffic on our street may be exacerbated by drivers cutting-through, or out-of-neighborhood drivers using our street to get to work, it is also true that our own car use erodes the quality of life for residents whose streets we drive down. Almost everyone in the city would like less and slower traffic in their home street. Finding a way of giving **all** residents a better quality-of-life by reducing the impacts of traffic in **all** streets is a community-based solution that can only start with people accepting the responsibility for the contribution they make to the overall problem.

The Pledge therefore starts with the words "Recognizing that my car use impacts the livability of other residents streets, just as theirs impacts mine, I hereby pledge to…". The pledge is a kind of treaty between neighborhoods; we will act as a guest in your neighborhood if you act as a guest in ours. However, the pledge is also a treaty between our own paradoxical desires. We all have a desire to travel – to move, explore and discover (the 'hunter-gatherer' that still lives in our psyche). We also have a desire for home or to 'reside' – to put our roots down and feel nurtured and grounded (the 'gardener' that still lives in our psyche). However, excessive movement (particularly in automobiles) ultimately destroys our home environment. We must find a better balance between these paradoxical desires so we can maximize *both* our ability to move *and* our ability to have a quality residential environment.

The central core of this program is accepting responsibility for our part in the overall imbalance between 'movement' and 'home' and finding a better balance.

Working together – building community one car at a time

The city, by very definition, is a *cooperative* enterprise. We agree to cooperate with other residents because, working together, we can all get more out of the cooperative enterprise than we put in. The city was founded on notions of *citizenship* – the idea that as members of the cooperative enterprise we must pull our weight in creating the kind of environment in which we get back more than we put in. The Pace Car Program is built on the notion of good citizenship. One Pace Car can do very little on its own. But using the simple approach of "you scratch my back, I'll scratch yours", a movement is born that can make the whole city a much more enjoyable place to live.

1. Slowing down – calming the entire city

Slowing down will help in a number of ways. The most noticeable is the simple reduction of noise and intrusion that traffic creates in a neighborhood when it moves slower. Slower traffic is safer – not just for pedestrians, cyclists and residents, but also for other drivers. Driving within the speed limit will help you focus on the communities you drive through – not just on getting to your destination. As our cities sped up, we forgot how to enjoy the unplanned encounters which were such a rich part of traditional city life: Stopping to watch a group of children play in the street; chatting with an elderly person and hearing their story; watching a bird build a nest; watching people walk past; meeting an eccentric who makes us laugh; exchanging neighborhood news with neighbors we meet when walking to the store. If we are to enjoy a rich community life, then we must slow down and reclaim our streets for these community-building activities.

2. Reducing car use – tackling the root problem

The problem of traffic in our home street relates to both *speed* and *quantity*. To tackle the root causes of traffic problems we must tackle both. Also, reducing the amount of traffic on the roads will do more than make your home street more livable. Most people can reduce their car use significantly by organizing it more efficiently. Strategies such as: saving trips by combining them; walking or biking when possible; car-pooling or ride sharing; using services closer to home and using public transportation when convenient all contribute to reducing the quantity of traffic. The tangible rewards are a saving in time and money. Rewards that are less easily quantified can include a more relaxed pace of life and a quieter more friendly neighborhood street.

3. Being courteous – creating a better walk and cycle environment

By reducing your speed, stopping to let pedestrians cross, and by giving way to cyclists, you are helping to create an environment in which it is safer for everyone to walk and cycle. Eventually this will help reduce overall traffic levels and help create a more vibrant street life. However, the benefits go much deeper. For example, under current conditions, many parents will not allow their children to walk to school because they perceive it to be too dangerous. This puts extra traffic on our streets and robs our children of independent mobility. Many psychologists and health professionals are worried about the impacts this trend is having on the well-being of our children with a large percentage of children not getting enough exercise to maintain minimum health levels. By creating a more courteous and safe street environment, parents can begin to regain their confidence and allow their children to walk and cycle again. There are many other people in our community who will enjoy greater levels of independent mobility by creating a more courteous street environment – those with disabilities, those who chose not to own a car, and those who are elderly.

4. Humor – humanizing the street environment

David Engwicth stated "that as a cyclist, I have been the victim of road rage. Some time back I put some red devil horns on the sides of my bike helmet. The effect was amazing. Motorists rolled their windows down to talk with me. People smiled and waved. Kids pulled faces. Over the past two years, I reckon I have sent about 10,000 to work a little happier because of the horns on my bike helmet. But also I have had no incidents of road rage. Humor breaks tension and puts us in a better frame of mind. Studies show that people are more likely to do nice things for other people and to be far more creative when they are in a good mood. Humor changes the mood of the streets to something more festive and celebratory."

Continued Page 4

What does the Pledge really mean? *Continued*

5. Street Reclaiming – creating a vibrant street life

As traffic volume and speed has increased we have retreated from our streets – intimidated psychologically. Children once met at the sidewalk to play games. As traffic increased these activities moved to front yards and porches. In really busy streets, some people have even retreated from their front rooms, using them as a 'buffer zone' to the street. In some streets, residents don't even park in the street anymore, which encourages the traffic to go even faster.

It is not enough to simply reduce traffic volume and speed. This may stop the erosion of neighborhood life, but it may not give us back what we have lost. To do this we must reverse the process of erosion by reclaiming our streets.. Street reclaiming is to reclaim your street as an extension of your property in which a rich community life can be nurtured. There are two ways you can reclaim your street. You can reclaim your street by moving everyday activities near the street or by changing your street from one that feels like a 'corridor' into one that feels like an 'outdoor living room'. Street reclaiming sends a message to motorists that the street is a *shared* space and a space in which they should be acting as your guest.

6. Celebration – live today as you want to live tomorrow

Let's face it, it the past most attempts at creating a better world have been hard work. We spend so much time trying to create a better world that we never have time to actually enjoy it! One wise person once said that we must live today as we want to live tomorrow. The methods we choose to create a better world should be that better world in seed form. If we want our streets back for community building activities, then the methods we choose must build the community we will enjoy tomorrow. There is something incredibly powerful about creating a better world through fun and celebration rather than sheer hard work.

Maintaining integrity of the program

This program is built on residents taking responsibility for the problems that all drivers create. Its success rests with resident initiative, otherwise it runs the risk of returning to the situation of everyone blaming everyone else for the problem.

If you would like to become a pace car driver you can signup on the web at http://www.ci.slc.ut.us/transportation/pacecar.htm. We can be reach directly at 535-6630 or you can write to us at The Neighborhood Pace Car Program 349 South 200 East Suite 450 Salt Lake City, Utah 84111. Remember safe driving begins with you!

The Neighborhood Pace Car Program

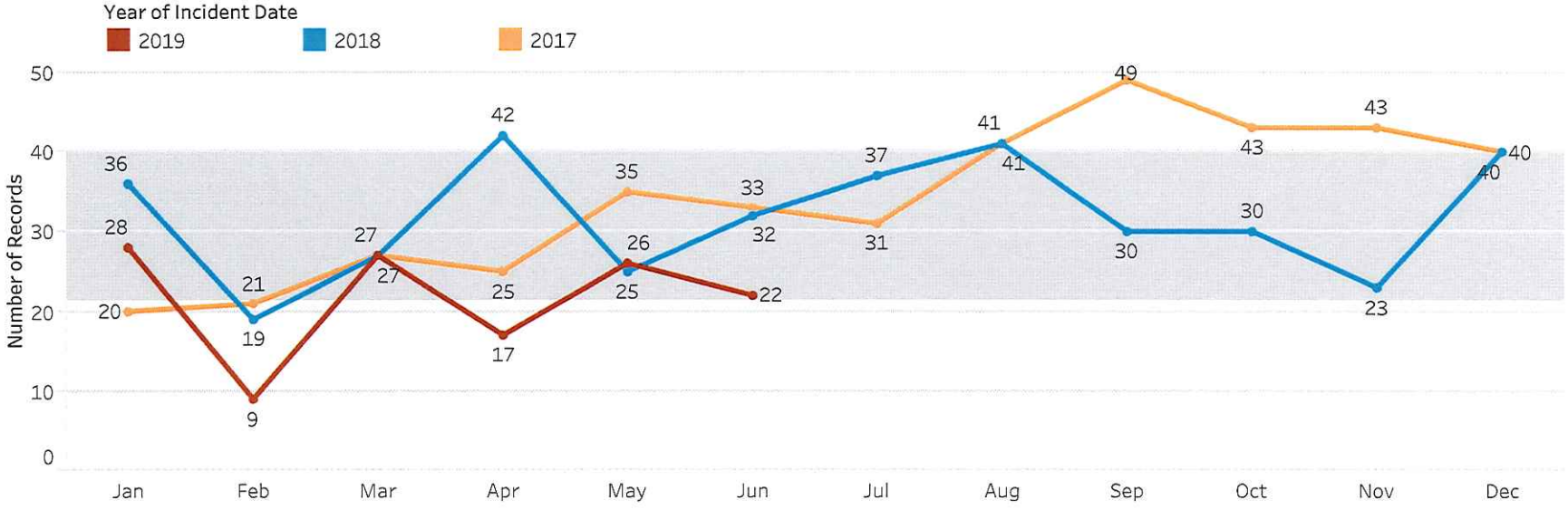
Daily Carjacking Summary

Year-to-Date

District	2017 YTD	2018 YTD	2019 YTD	2017-2019 % Change	2018-2019 % Change
D1	8	5	4	-50%	-20%
D2	23	29	12	-48%	-59%
D3	29	30	32	10%	7%
D4	24	37	22	-8%	-41%
D5	22	28	25	14%	-11%
D6	9	14	9	0%	-36%
D7	34	30	25	-26%	-17%
Total	149	173	129	-13%	-25%

Six Week Comparison

District	6-Week 5/13/2019 - 6/2/2019	3-Week 6/3/2019 - 6/23/2019	% Change
D1	1	1	0%
D2	2	0	-100%
D3	8	1	-88%
D4	2	4	100%
D5	2	7	250%
D6	1	2	100%
D7	6	5	-17%
Total	22	20	-9%



Data Source:
OMAP Carjacking database, counting distinct incidents.

Last Updated On: 6/24/2019 11:35:19 AM

Pay Period ending: 6/15/2019

REPORT

RDRI Weekly Activity-All agencies/participants (June 2 - June 15)

To: Michael Brunson
Assistant Chief of Police
Sir:

Citations	MPD	MCSO	WSP	RHPD	GFPD	FPD	SWPD	Tosa PD	WMPD	WA PD	OCPD	GLPD	SFPD	WBPD
Speed (under 20)	112	2	0	8	3	1			4	6		0		3
Speed (over 20)	57	4	4	2	6	0			0	1		0		0
Registration	11	1	5	0	2	0			2	0		0		1
Fail to yield	1	0	1	0	0	0			0	0		0		1
DOS sign	2	2	0	0	0	0			1	0		0		0
DOS signal	0	0	0	0	0	0			0	0		0		0
Equipment	1	0	1	0	0	0			0	0		0		0
License, city	37	3	0	0	1	0			3	1		7		0
License, state	0	7	8	0	2	0			0	1		0		0
Ped violation	0	0	0	0	0	0			0	0		0		0
Seat belt	1	4	7	0	4	0			2	0		0		0
Child belt	0	0	0	0	0	0			0	0		0		0
Unsafe Lane Deviation	0	0	0	0	0	0			0	0		0		0
Illegal Passing	0	0	0	0	0	0			0	0		0		0
Insurance	3	0	4	2	4	0			3	0		1		0
UTC/other	15	0	3	0	3	0			2	0		0		0
Citation - Reckless driving	1	0	1	0	0	0			0	0		0		0
Totals:	241	23	34	12	25	1	0	0	17	9	0	8	0	5

Pursuits	0	0	0	0	0	0			0	0		1		0
Non-Pursuits	0	0	1	0	0	0			0	0		0		0
Municipal arrest	0	0	0	0	1	0			0	0		1		0
State arrest	0	0	4	0	0	0			0	1		0		0
OWI - city	0	0	0	0	0	0			0	0		0		0
OWI - state	0	0	0	0	0	0			0	0		0		0
PDO - crash	0	0	0	0	0	0			0	0		0		0
PI - crash	1	0	0	0	0	0			0	0		0		0
Tows	3	0	0	0	0	0			0	0		0		0
Parking citations	0	0	0	0	0	0			0	0		0		0
Assignments	2	1	0	0	0	0			0	0		0		0
Warnings	41	2	41	5	21	6			2	1		3		2
Other:			3											
Totals - Other:	**47**	**3**	**49**	**5**	**22**	**6**	**0**	**0**	**2**	**2**	**0**	**5**	**0**	**2**
Total Stops	**227**	**27**	**30**	**10**	**25**	**7**	**0**	**0**	**14**	**12**	**0**	**2**	**0**	**7**
# of deployment days	3	2	3	1	1	1	0	0	1	1	0	1	0	1

REPORT

2019 RDRI Weekly Activity-All agencies/participants year to date

To: Michael Brunson
Assistant Chief of Police
Sir:

Citations	MPD	MCSO	WSP	RHPD	GFPD	FPD	SWPD	Tosa PD	WMPD	WA PD	OCPD	GLPD	SFPD	WBPD
Speed (under 20)	275	9	13	16	7	1	1	9	4	14	2	3	1	3
Speed (over 20)	174	16	26	7	9	0	2	16	1	2	1	9	1	0
Registration	37	3	11	0	2	3	0	0	2	0	0	0	1	1
Fail to yield	1	1	1	0	0	0	0	0	1	0	0	0	0	1
DOS sign	6	3	0	0	1	0	0	0	6	0	0	1	0	0
DOS signal	0	2	0	0	0	1	0	0	0	0	0	0	0	0
Equipment	3	3	2	0	0	0	0	0	1	0	0	0	0	0
License, city	103	15	0	4	6	0	0	1	6	4	2	10	0	0
License, state	0	13	20	0	2	1	0	1	0	1	0	0	0	0
Ped violation	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seat belt	7	9	29	0	7	6	0	1	2	0	0	0	0	0
Child belt	1	2	2	0	1	0	0	0	0	0	0	0	0	0
Unsafe Lane Deviation	0	1	1	1	1	0	0	1	1	0	0	0	0	0
Illegal Passing	2	1	0	0	0	0	0	2	0	0	1	0	0	0
Insurance	24	4	21	4	6	5	1	4	4	1	2	2	0	0
UTC/other	21	5	3	0	5	0	0	0	5	0	0	0	0	0
Citation - Reckless driving	5	0	1	0	0	0	0	0	0	0	0	0	0	0
Totals:	**659**	**87**	**130**	**32**	**47**	**17**	**4**	**35**	**33**	**22**	**8**	**25**	**3**	**5**

Pursuits	0	1	0	0	1	0	0	0	0	0	0	1	0	0
Non-Pursuits	4	0	2	0	0	0	0	0	0	0	0	0	0	0
Municipal arrest	1	2	0	1	2	0	0	0	0	0	0	1	0	0
State arrest	0	1	9	0	0	0	0	0	0	1	0	1	1	0
OWI - city	0	0	0	0	0	1	0	1	1	0	0	0	0	0
OWI - state	0	0	2	0	0	0	0	0	0	0	0	0	0	0
PDO - crash	0	0	0	0	0	0	0	0	1	0	0	0	0	0
PI - crash	1	0	0	0	0	0	0	0	1	0	0	0	0	0
Tows	3	2	2	0	0	0	0	0	0	0	0	0	1	0
Parking citations	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Assignments	2	7	0	0	0	0	0	0	0	0	0	0	0	0
Warnings	99	12	141	18	31	9	2	2	3	1	2	3	1	2
Other:											2			
Totals - Other:	**110**	**25**	**156**	**19**	**34**	**10**	**2**	**3**	**6**	**2**	**4**	**6**	**3**	**2**
Total Stops	**586**	**90**	**117**	**25**	**49**	**21**	**4**	**33**	**24**	**22**	**9**	**15**	**3**	**7**
# of deployment days	11	9	11	3	3	2	1	2	2	2	1	2	1	1

The Benefits of Retiming Traffic Signals

SIGNAL RETIMING IS ONE OF THE MOST COST EFFECTIVE WAYS TO IMPROVE TRAFFIC FLOW ALONG A CORRIDOR. TRAFFIC SIGNAL RETIMING CAN SIGNIFICANTLY REDUCE DELAYS AND STOPS EXPERIENCED BY MOTORISTS, WHICH CAN IMPROVE SAFETY AND REDUCE FUEL CONSUMPTION AND EMISSIONS. TYPICALLY, THE BENEFIT TO COST RATIO FOR SIGNAL RETIMING IS ABOUT 40:1.

BY SRINIVASA SUNKARI, P.E.

WHAT IS SIGNAL RETIMING?

Signal retiming is a process that optimizes the operation of signalized intersections through a variety of low-cost improvements, including the development and implementation of new signal timing parameters, phasing sequences, improved control strategies and, occasionally, minor roadway improvements.

The signal timing process often includes the training of engineering and maintenance staff to use existing signal control equipment more efficiently and to support new technologies as they become available for implementation.

Each traffic signal operates under a unique set of timing parameters. These parameters include minimum and maximum green durations, pedestrian indication requirements, gap and extension times, overlaps and phase change intervals (yellow change plus red clearance). A fixed-time signal also must have fixed cycle and split lengths that accurately balance average demand over a period of time.

When signals are operated within a coordinated system, additional parameters are used: cycle (the time needed to serve all phases); offset (the time from a reference point, such as the start of green or yellow of the coordinated phase at one intersection, to the same reference point at the other intersections); and split (the time allowed for each movement or phase—their total is the cycle length).

The offset is used to allow vehicles moving at the proper speed to advance from intersection to intersection without stopping. This process is called progressive movement.

As traffic patterns change over days, weeks and times of year (such as holidays), it is appropriate to modify signal timing parameters. This often includes the development of different timing parameters for morning and evening peak periods, midday off-peak periods, weekends and nights.

Signal retiming is oriented toward optimizing a controller unit's response to the demands of roadway users, including all types of motor vehicles, bicycles and pedestrians. Signal timing strategies include the minimization of stops, delays, fuel consumption and air pollution emissions and the maximization of progressive movement through a system.

Occasionally, the signal retiming process includes the reconfiguration of a signal's operation. This can include a change in the sequence of movements used at an intersection or the addition of signal displays and intervals (phases) to accommodate specific demands or movements, such as left-turn signals. Left-turn movements sometimes are programmed to follow the opposing through movement and accommodate the different arrival times of through movements along a coordinated arterial.

As technology continues to change in the traffic control field, it is important to upgrade existing traffic signal control hardware and accommodate enhanced signal operations. It also is possible to associate minor roadway improvements with the signal retiming effort to improve traffic operations.

For example, the provision of an additional left-turn lane, the extension of a right-turn lane, or the addition of right- and left-turn overlaps to allow for the accommodation of additional vehicle demand often are important.

Finally, training activities should be included as part of the signal retiming effort. Advancements in control technology, signal optimization programs and other traffic engineering tools are important.

WHY IS SIGNAL RETIMING CONDUCTED?

Traffic signal retiming is one of the most cost effective ways to improve traffic movement and make streets safer. Signal retiming is needed as much as patching potholes, removing snow and

restriping pavement lines and markings. Following is a summary of the various reasons signal retiming is conducted:

- By coordinating or sequencing signals in relation to each other, platoons, queues, or groups of vehicles can travel through a series of signals with minimal or no stopping.
- The delay time on the approach to an intersection can be reduced by balancing the green time to reduce delay at that intersection.
- With developments such as the addition of new homes or stores, traffic increases and creates a need to adjust the timing of affected traffic signals.
- The diversion of traffic off a freeway or interstate due to an incident (an accident or event) associated with a computerized signal system can be accommodated.
- Motorist frustration caused by excessive delays or stops can be reduced by adjusting timing to reduce stops and delays and provide coordinated flow through groups of signals.
- Emissions and fuel consumption can be reduced by optimizing signal timing and coordinating traffic flow.
- Emergency vehicles, buses and commercial vehicles can save time.
- The number of severe collisions on city streets can be reduced by producing smoother traffic flow and fewer stops.
- The need for costly reconstruction can be postponed or eliminated by providing improved flow using existing resources in a more cost efficient manner.
- Changes in traffic flow for different times of day or days of the week can be accommodated.
- Signal retiming should be conducted during a reconstruction project when a lane closure or traffic detour causes a significant change in demand or capacity.
- Signal retiming is a cost effective method to improve traffic operation. It can produce benefit to cost ratios as high as 40:1.

HOW IS SIGNAL RETIMING CONDUCTED?

Signal retiming determines the timing to be entered in a controller using a series of calculations performed by a traffic engineer. The method for conducting signal retiming can be summarized as follows:

- An inventory of the system is conducted to determine geometric conditions and other pertinent information and to gather field observations of current traffic conditions during peak traffic periods.
- Traffic and pedestrian volume data are collected. Traffic counts include all turning and through movements as well as a classification of vehicles and the number of pedestrians using each crosswalk for each 15-minute interval of the study period. Travel time data also are collected for travel from one end of the system to the other, to identify current operating conditions.
- A collision history and analysis are prepared. Collision records for the past three years are obtained. An analysis is conducted by preparing a collision diagram and causation, collision types and remedy tables to determine if a change in signal operation is likely to provide safer operation.
- Collected data are processed and analyzed using capacity analysis, traffic signal timing optimization and simulation software programs. The model is calibrated using existing timing and the variables are adjusted to determine optimum signal timing.
- Improved coordination offsets through a series or group of signals are determined using signal coordination software programs such as SYNCHRO or PASSER II. The results also may be tested using simulation software programs such as CORSIM.
- The new timing is implemented at the intersection(s).
- The new timing is evaluated in the field during various critical time periods and final adjustments are made. Travel time and delay studies are conducted when the final timing plans are in place. Before-and-after studies are conducted through the groups of signals to determine and document the improvement in traffic flow.
- The process is repeated every three to five years, or more frequently based on changing conditions, to assure the continued optimum flow of traffic.

WHO RETIMES TRAFFIC SIGNALS?

Typically, the ultimate responsibility for signal retiming falls to the agency responsible for the operation of the roadways where signals are located.

On state highways, state departments of transportation (DOT) usually have responsibility for the timing and operation of signal equipment and are tasked with the goal of providing optimal traffic flow. In their timing efforts, the state highway systems usually have priority.

Local counties and municipalities that have responsibility for the operation of signals within their jurisdictions also may time traffic signals. Usually, this is performed within an agency's public works or traffic engineering department, depending on the depth of staff available within the agency.

In today's environment of limited public resources and reduced staffing, many agencies are using the services of consulting engineers to perform signal timing projects. This is particularly applicable to periodic timing applications funded by grants or special funding opportunities.

Political bodies, planning organizations and other advisory committees help drive the signal timing process indirectly by authorizing funding for signal timing studies and related improvements.

In addition, the public is involved as a user and as an affected party. Signal timing complaints and requests often are received from the motoring public with requests to update studies or make signal timing improvements.

WHAT ARE THE CONSTRAINTS OF OPTIMIZING AND OPERATING TRAFFIC SIGNALS?

Many factors limit the extent to which intersection efficiency can be improved with the optimization of signal timing. Although they are interrelated, these factors, or constraints, can be broken into three general categories: institutional, physical and temporal.

Institutional constraints on signal timing optimization pertain to the allocation of resources within an organization or agency and the relationship agencies have across jurisdictional boundaries. Competing budgetary demands within an agency may mean that insufficient resources (in terms of staff time and/or outsourcing

contracts) are available to perform the data collection, analysis and implementation necessary for proper signal operation, timing and maintenance.

In arterial environments where multiple agencies are involved, a lack of cooperative working arrangements may produce inconsistent operation. Separate agencies also may place different priorities on signal control or may face equipment incompatibilities that limit the extent to which signal interconnection can be accomplished.

Across and within agencies, a local political climate may exist that does not favor optimal signal and arterial operation. For example, an agency may be willing to accept non-optimal signal operation to increase real and/or perceived safety along an arterial corridor.

Physical constraints are geometric barriers to more efficient signal operation. The more obvious examples of physical barriers include turn pockets of insufficient length, a lack of necessary turn pockets, or too few primary lanes for servicing traffic demand (lack of capacity). In such cases, green time allocation at a signal may be used to attempt to compensate for the limiting geometric feature(s).

Irregular and/or close signal spacing also have a detrimental effect on signal efficiency, in that poor spacing places artificial restrictions on the amount of green time available for a platoon of vehicles to move from one intersection to the next without stopping. Also, mid-block access points may contribute enough traffic to the arterial to interfere with progression between intersections.

Temporal (time) constraints are related to a signal's inability to consistently provide adequate green time for traffic demand, given competing simultaneous demands from vehicles and pedestrians.

This situation occurs when there is too much traffic for an intersection to physically process, when demand patterns vary to the extent that signal equipment cannot be programmed realistically to accommodate the broad range of hourly/daily/weekly/monthly traffic fluctuations, or when too many conflicting movements require excessive green time (for example, heavy left-turn movements and through movements from multiple approaches at one intersection).

Time constraints also can be imposed by pedestrian signal demands that, with relatively long clearance intervals, may be more demanding of intersection green time than vehicular approaches to an intersection. In addition, the increasing use of emergency vehicle and transit priority and the high-level demand of railroad preemption may mean that green time must be diverted for priority and safety reasons, regardless of capacity conditions at an intersection. Vehicles leaving factories, schools, or other large traffic generators at the same time also can impact traffic severely at a nearby intersection.

HOW OFTEN SHOULD SIGNAL RETIMING BE CONDUCTED?

Signal timing is effective only as long as the traffic patterns that were used to generate the signal timing are reasonably constant. Traffic patterns change over time; developments in surrounding areas also can cause a significant change in traffic patterns.

Existing signal timing cannot operate efficiently with newer traffic patterns. Signal timing should be fine-tuned to operate better. For traffic signals to operate efficiently, the complete retiming of a traffic signal or system often is necessary.

Traffic engineers should review traffic signal and system performance continuously. Ideally, signal timing should be reviewed every year to evaluate effectiveness and efficiency. If necessary, a thorough signal retiming should be conducted. At a minimum, an operating agency should budget to retime traffic signals at least every three years, especially in developing areas and/or areas with sustained growth.

WHAT IS THE COST OF RETIMING TRAFFIC SIGNALS?

Signal retiming often is postponed or ignored due to an agency's financial or staffing constraints. Given the need for field data collection, data analysis, signal timing optimization, testing and implementation, the overall signal timing process can be expensive and time consuming. However, as discussed earlier, retiming traffic signals is necessary to maintain efficient traffic operations.

Estimates of the time required vary according to available expertise and equipment. On average, it is estimated that generating four timing plans (for a.m. peak, noon peak, p.m. peak and off-peak conditions) takes 25 to 30 hours per intersection.

The cost of signal retiming is roughly $2,500 per intersection, including the four typical timing plans. However, a recent signal retiming study in the Washington, DC, USA, area was completed at an average cost of $3,500 per intersection.

WHAT ARE THE BENEFITS OF RETIMING TRAFFIC SIGNALS?

Signal retiming has significant benefits for the traveling public. One of the direct benefits is the reduced delay experienced by motorists. Delay savings are more apparent for motorists traveling along coordinated signalized arterials. Motorists experience fewer stops and reduced fuel consumption.

Apart from the direct benefits, there also is a general public perception of reduced delay during travel. A side benefit may be reduced motorist frustration and improved safety.

Improving signal timing also has other indirect benefits. Reduced fuel consumption reduces emissions and, hence, improves air quality. Efficient signal timing also minimizes diversion of traffic to local and residential neighborhoods, potentially improving safety and traffic conditions in those areas. Improved traffic flow also reduces pavement wear and tear, minimizing the maintenance requirements of the public works department.

Finally, signal retiming efforts are opportunities for operating agencies to conduct quality control checks on controller settings for pedestrian, preemption and priority requirements.

Figure 1 gives a good illustration of the savings in user costs if traffic signals are retimed. The figure demonstrates that retiming traffic signals at periodic intervals provides significant savings in user costs in the form of reduced delays, stops, fuel consumption and other measures of effectiveness.

EXAMPLES OF SUCCESSFUL RETIMING PROJECTS

- Since summer 2002, the Maryland DOT has retimed about 215 signals in the Washington, DC, USA, suburbs and an additional 30 signals on

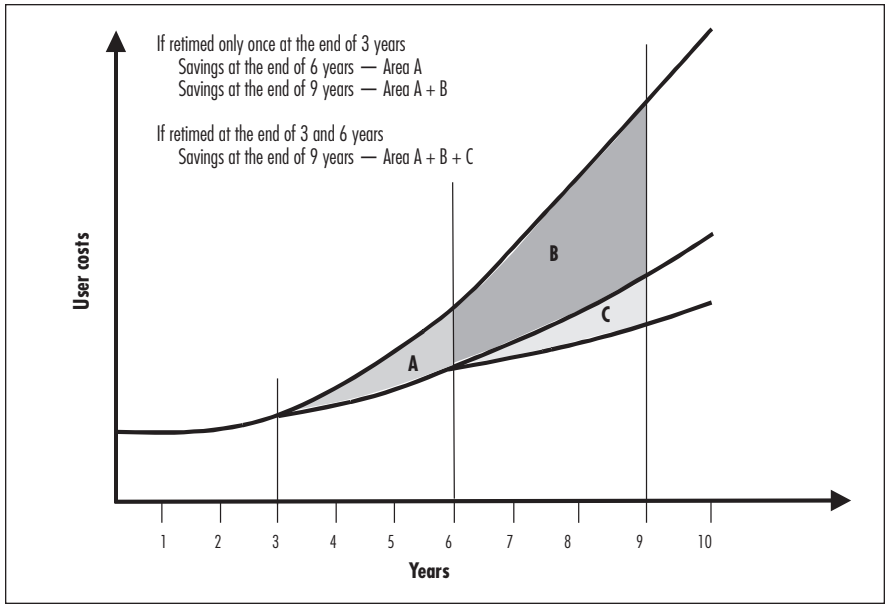


Figure 1. Savings in user costs due to signal retiming.

the Route 650 (New Hampshire Avenue) corridor between Montgomery County, MD, USA and the District of Columbia. An analysis has shown that delays on these roads shrunk by about 13 percent and vehicles made 10 percent fewer stops at red lights. Fuel consumption also dropped by about 2 percent.

- Adjusting signal timing in Lexington, KY, USA, by responding to real-time traffic data reduced stop-and-go traffic delays by about 40 percent and accidents by 31 percent.
- According to the Institute of Transportation Engineers (ITE), traffic signal improvements reduce travel time by 8 to 25 percent. The reduction in travel time also reduces fuel consumption and emissions.
- The Fuel Efficient Traffic Signal Management Program in California demonstrated a benefit to cost ratio of 58:1. The program retimed 3,172 signals, resulting in 15-percent savings in delays, 8.6-percent savings in fuel consumption, 16-percent savings in stops and 7.2-percent savings in travel time (1988).
- The Traffic Light Synchronization (TLS) Program in Texas showed a benefit to cost ratio of 62:1. By retiming traffic signals with the TLS program, Abilene, TX, experienced reductions of 14 percent in travel time and 37 percent in delays. Overall, the program resulted in a 24.6-percent reduction in delays, a 9.1-percent reduction in fuel consumption and a 14.2-percent reduction in stops (1992).
- In Kitchener-Waterloo, Canada, 89 intersections that included arterials in commuter and commercial routes and central business district areas were retimed. The project demonstrated savings of 10 percent in travel time, 27 percent in delays and 20 percent in stops (1996).
- In another project in Burlington, Canada, which contained 62 intersections, 7-percent savings in travel time, 11-percent savings in stops and 6-percent savings in fuel consumption were observed. The project demonstrated an annual savings of $1.06 million for delays and fuel consumption alone. Based on total savings, the payback period for this project was just 13 days (2001).
- On U.S. 1 in St. Augustine, FL, USA, retiming traffic signals at a 11-intersection arterial reduced average arterial delay by 36 percent, arterial stops by 49 percent and arterial travel time by 10 percent, resulting in estimated annual fuel savings of 26,000 gallons and overall annual cost savings of $1.1 million (2001).
- On RS 26 in Gainesville, FL, retiming traffic signals at an eight-intersection arterial reduced average arterial delay by 94 percent and arterial stops by 77 percent, resulting in estimated annual fuel savings of 3,300 gallons and overall annual cost savings of $93,000 (2001).
- On San Jose Boulevard in Jacksonville, FL, retiming traffic signals at a 25-intersection section reduced average arterial delay by 35 percent, arterial stops by 39 percent and arterial travel time by 7 percent, resulting in estimated annual fuel savings of 65,000 gallons and overall annual cost savings of $2.5 million (2001).

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Using Traffic Signal Control to Limit Speeding Opportunities on Bidirectional Urban Arterials

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Abstract

Although controlling speed on urban arterials is important for safety, conventional traffic calming techniques cannot usually be applied on arterials, and many jurisdictions prohibit automated speed enforcement. Moreover, unlike unidirectional arterials, bidirectional arterials with short intersection spacing are not amenable to green waves that can remove the incentive to speed. This research explores the ways that traffic signal coordination creates – or limits – speeding opportunities on bidirectional arterials. Two measures of speeding opportunity are proposed: number of unconstrained vehicles, meaning vehicles arriving at a stopline on green and with no vehicle less than 5 s ahead of them, and number of speeders in a traffic microsimulation in which 20% of the vehicles have been assigned a desired speed in the "speeding" range. Theoretical analysis, confirmed by two case studies, show how speeding opportunities are related to degree of saturation, cycle length, specified progression speed (as in input to signal timing software), intersection spacing, and recall settings. The important role of clusters of intersections with near-simultaneous greens, a byproduct of bidirectional coordination with short intersection spacing, is examined. Clusters with many intersections are shown to create a strong speeding incentive, and cluster size can be reduced by lowering the cycle length and the progression speed. Case studies show it is sometimes possible to substantially reduce speeding opportunities with little or no increase in vehicular delay by lowering cycle length, lowering progression speed, dividing an arterial into smaller "coordination zones" with each zone having its own cycle length, and by abandoning coordination altogether.

In an effort to improve traffic safety and livability, many cities, often under the banner of Vision Zero (*1*), are paying increasing attention to speed control. According to NHTSA, 28% of the traffic fatalities in the United States between 2005 and 2014 were speeding related (*2*). Speeding on multimode roads (arterials, collectors, and locals) account for 83% of speeding-related fatalities (*3*). On urban roads, speeding is particularly dangerous due to the prevalence of vulnerable pedestrians and cyclists. In addition, by discouraging walking and cycling, speeding reduces livability and contributes to auto dependence with its negative effects on public health, congestion, energy resources, and climate.

The default method of speed control is setting and enforcing speed limits. Recently, for example, New York, Boston, and several other cities lowered their default speed limits from 30 to 25 mph. However, enforcement on urban roads is very difficult to accomplish by conventional methods. Speed cameras offer an effective solution if widely deployed, but they are politically controversial and are forbidden in many states. Without intense enforcement, drivers tend to ignore speed limits, choosing a speed at which they feel safe based on road geometry and other factors of the road environment such as intersection frequency (*4*).

Road geometry can be very effective at controlling speed, and is the basis for traffic calming devices such as speed humps, chicanes, and neighborhood traffic circles (*5*). However, these methods are unsuitable for arterials for several reasons including emergency vehicle response, bus service, and a desire to offer attractive speeds in order to discourage travel on local streets. And while the concept of "design speed" can be used to control speed on curvy roads, there is no such effect on most urban arterials because they have little curvature.

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Where traffic volumes can be carried with a single lane per direction plus turning lanes, road diets have been highly effective at reducing speed (*6*), because with a single lane per direction, would-be speeders become impeded by vehicles ahead of them. But how can speed be controlled on multilane arterials?

It has long been recognized that on one-way arterials with close intersection spacing, traffic signals timed to offer a green wave can control speed by eliminating the incentive to go any faster than the progression speed. However, on two-way arterials, it is impossible to offer green waves in both directions when intersection spacing is short (*7*), as it is often on urban arterials. In fact, some believe that traffic signals contribute to the speeding problem by giving drivers an incentive to beat the red light when they see a signal that has been green for a while, or has just turned yellow (*8*). In practice, traffic signal timing is applied mainly to regulate conflicts, increase capacity, and decrease delay, with little or no attention given to speed control.

Research Objective and Measures of Speeding Opportunity

Though it may be impossible to provide green waves that positively control speed as easily on two-way arterials as on one-way roads, traffic signal timing may nevertheless play an important role in creating or limiting speeding opportunities. The objective of this research is to see how traffic signal timing on two-way urban arterials with short intersection spacing affects speeding opportunities, and to explore ways in which signal timing can reduce speeding opportunities without substantially increasing delay.

To speed, drivers must have both the desire and the opportunity. Absent constraining geometry or a strong threat of legal enforcement, it is natural for a substantial fraction of drivers to have the desire to speed, and so we focus on speeding opportunities. Stoplines are chosen as points of speed measurement, because intersections have the greatest potential for conflict with other road users (*9–11*). At a stopline, approaching drivers have an opportunity to speed if the signal is green and they are not impeded by a vehicle ahead of them.

Two measures of speeding opportunity are proposed:

- **Number (or fraction) of unconstrained vehicles:** A vehicle is considered unconstrained if it arrives at the stopline while the signal is green and its headway with respect to the vehicle ahead of it in the same lane is greater than 5 s. This quantity can be measured both in the field and using traffic simulation.
- **Number (or fraction) of speeding vehicles:** For traffic microsimulation, this quantity is heavily influenced by the use of a "desired speed" setting chosen by the user. To standardize this measure for microsimulation analysis, we propose assigning to 20% of the vehicles a desired speed within the range considered to be "speeding," and assigning to the remainder a desired speed not considered "speeding." In microsimulation, if the vehicles assigned a high desired speed have the opportunity to speed, they will.

The first measure does not account for speeding opportunities that arise when the vehicle ahead, though less than 5 s away, is speeding, nor does it account for speeders who may be decelerating as they close in on a slower vehicle. The second measure does not have these weaknesses, but suffers from having an arbitrary fraction of vehicles desiring to speed, and therefore cannot be expected to give a measurement that corresponds directly to a field measurement unless calibrated to match the fraction of motorists desiring to speed (a task we did not attempt).

Speeding Incentives and Opportunities with Two-Way Coordination

On a two-way arterial, ideal intersection spacing is when travel time between adjacent intersections equals half the cycle length, in which case two-way coordination can provide the same green waves as are possible with one-way coordination, and therefore they can provide a means of positive speed control. Offsets follow the "half-cycle alternate" pattern, with each intersection offset half a cycle from its neighbor, as shown in Figure 1*a*. Small adjustments to offsets can also be made to favor one direction over another. As travel time is segment length divided by progression speed, the progression speed for ideal two-way coordination is:

$$vProgression = \frac{S}{C/2} \tag{1}$$

where

$vProgression$ = progression speed,
S = segment length or intersection spacing, and
C = cycle length.

Using lead-lag phasing, deviations from ideal spacing equal to half the split of a left-turn phase can also produce ideal bidirectional green waves (*7*), also shown in Figure 1*a*.

With ideal spacing and a progression speed at or below the target speed, there is no incentive or opportunity for the platoon leader to speed. In fact, it may be better to set the progression speed a bit lower than the

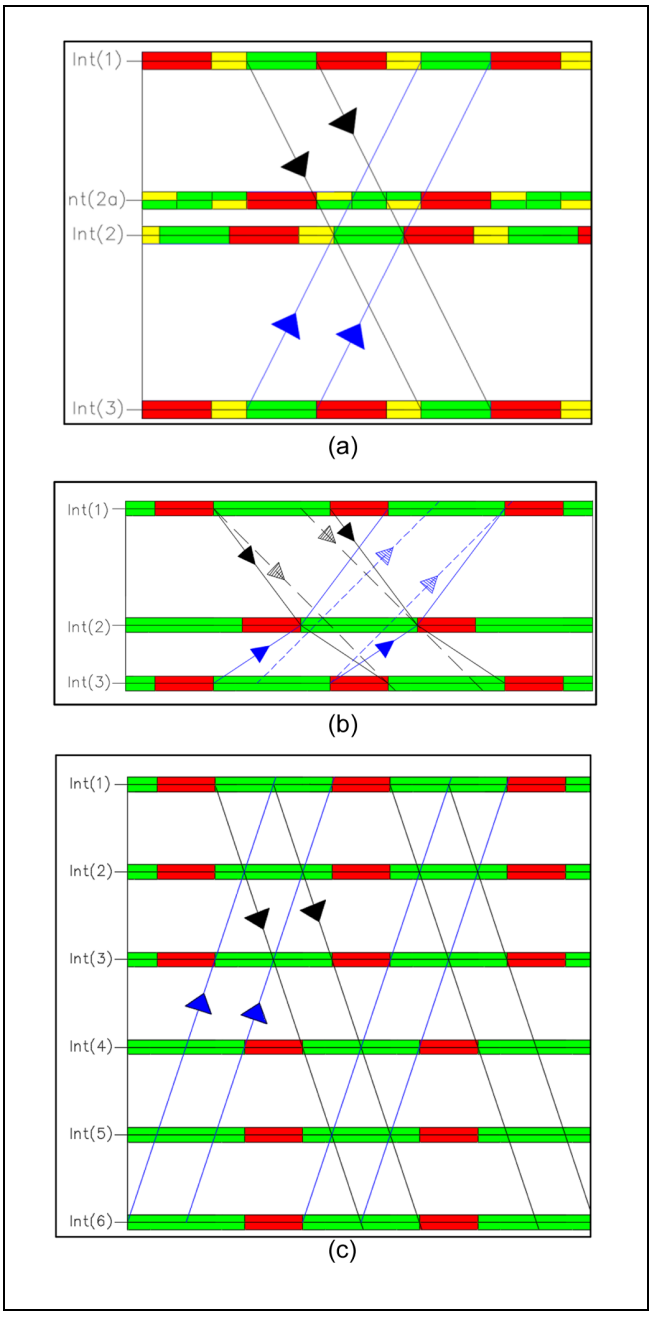

Figure 1. Coordination diagrams for a bidirectional arterial: (*a*) ideal two-way coordination, with lead-lag phasing at 2a. Yellow represents the main street's left-turn phases; (*b*) distorted progression envelope due to non-ideal intersection spacing; and (*c*) bidirectional coordination with clusters of three intersections.

target speed. Denney, Curtis, and Head (*12*) have shown how "holes" in the platoon form as vehicles turn off. A slightly depressed progression speed will slow the platoon leaders down enough to fill these holes, resulting in better capacity utilization; if progression speed is not depressed, vehicles following a hole may speed up to fill them.

Unfortunately, the conditions for ideal spacing cannot be met on most urban arterials. For example, for $C = 90$ s and *vProgression* = 40 ft/s or 27 mph, ideal segment length is 1,800 ft, far greater than signal spacing on many urban arterials. If S were actually 600 ft, then, holding C at 90 s, *vProgression* for ideal two-way progression would be 9 mph, a speed that is impractically low.

Degree of Saturation

When the degree of saturation is high, the platoon will fill almost the entire green period, and so nearly all vehicles will be constrained from speeding. With a low degree of saturation, the green interval will continue well beyond the time needed to clear the platoon, and vehicles approaching during that little-used part of the green will not be constrained.

In conventional practice, a low degree of saturation at many intersections is common, even during peak periods. One reason is the requirement of a common cycle length, typically set to meet the needs of an arterial's busiest or most complicated intersection. Intersections with less cross-street traffic or fewer phases end up with a cycle length far longer than they need, with long periods of unsaturated green that create speeding opportunities. Using smaller coordination zones could help diminish this phenomenon.

Non-Ideal Intersection Spacing

Where signal spacing is not ideal, as is the case for most urban arterials, optimal offsets still follow half-cycle synchronization, meaning every intersection's offset is either 0 or $C/2$, with offsets measured from the center of green averaged over the two directions (*13*). However, progression envelopes become distorted, with high progression speed on some segments and low progression speed on others, as illustrated in Figure 1*b*. Segments with high speed progression offer obvious speeding opportunities.

Unequal Green Intervals

Progression envelopes can likewise be distorted, creating associated speeding opportunities, when green intervals at successive intersections are unequal in length. Unequal green intervals are common; intersections where the cross-street demands are light typically give longer green periods to the arterial street. With coordinated-actuated control, arterial green intervals are random as slack time not needed by cross-street and left-turn phases is used to extend the arterial phases. Severe inequality can result where pedestrian phases, concurrent with the cross-street phase but requiring far more time, are pushbutton-actuated.

Short Segments and Intersection Clusters

On many urban arterials, intersection spacing is far too short to apply the ideal two-way progression paradigm,

as discussed earlier. The standard solution, applied implicitly by signal timing software, is to cluster intersections together, with simultaneous green within each cluster, such that the travel time between adjacent clusters, measured between cluster centers, roughly equals $C/2$. Returning to the original example, if $C = 90$ s and $vProgression = 40$ ft/s, it was shown that ideal intersection spacing is 1,800 ft. If intersection spacing is actually 600 ft, then by forming clusters of three intersections, cluster spacing can be 1,800 ft, with two-way coordination as illustrated in Figure 1*c*.

If n = cluster size (i.e., number of intersections in a cluster), then cluster size for a given cycle length, progression speed, and intersection spacing is given by:

$$n = \frac{vProgression^{*}\, C/2}{S} \tag{2}$$

Common traffic signal timing software does not formally identify clusters, but clusters are apparent in their solutions. (Because of left-turn treatments and offset adjustments made to favor the peak direction, clusters with simultaneous green are not always obvious; to spot them, analysts should compare the middle of green, taking an average between the two directions.) Clusters of five or more intersections are not unusual; for example, if $C = 120$, $S = 600$ ft, and $vProgression = 50$ ft/s, n will equal 5.

In practice, Equation 2 will be rounded to an integer, because clusters must be made up of an integer number of intersections. The necessity of rounding means that small changes in *vProgression* may leave the optimal (rounded) cluster size unchanged, which in turn is likely to leave other signal timing parameters unchanged, because offsets are based on clusters and splits are largely independent of both clustering and progression speed. For example, if $C = 90$ s and $S = 600$ ft, changing *vProgression* from 30 mph (44 ft/s) to 25 mph (36.7 ft/s) when applying signal timing software is likely to leave the signal timing plan unchanged, as the ideal cluster size for the two cases (3.3 and 2.75) both round to 3.

The simultaneous green offered within a cluster (see Figure 1*c*) creates obvious speeding opportunities, especially with a large cluster size. Within a cluster, drivers may see several green lights ahead of them, giving them an incentive to go as fast as possible knowing that those green lights may not last long. (Lead-lag phasing can be used to smooth the transition between clusters, reducing—but not eliminating—this effect.)

Hypotheses

Based on the preceding analysis of the nature of two-way arterial coordination, the following hypotheses can be advanced:

H_1: Speeding opportunities tend to be greater with lower degrees of saturation, which involve longer periods of unsaturated green.

H_2: Large clusters of intersections with simultaneous green create many speeding opportunities, and arise when a combination of long cycle length and high progression speed make intersection spacing short, relative to the ideal.

H_3: Changes in progression speed that are too small to change rounded cluster size are likely to have little or no effect on optimal signal timing parameters and performance measures such as delay and speeding opportunities.

H_4: Shortening cycle lengths is particularly effective at limiting speeding opportunities because it both lowers the size of intersection clusters with simultaneous green and increases degree of saturation.

H_5: Compared with conventional arterial coordination, it may be possible to substantially reduce speeding opportunities with little or no increase in vehicular or pedestrian delay.

Study Site 1: Massachusetts Avenue

To test the effects of signal timing parameters on speeding opportunities, two corridors in Boston, Massachusetts were studied; both are sketched in Figure 2. The first is a 0.9 mi stretch of Massachusetts Avenue (Mass. Ave.), a 4-lane arterial, between St. Botolph Street and Melnea Cass Boulevard. This stretch involves nine traffic signals, with intersection spacing averaging 660 ft, with signal timing at the two extreme intersections held constant as a boundary condition. At the time of the study, the traffic signals ran coordinated-actuated with a common cycle of 120 s, except at the Southwest Corridor pedestrian crossing, 300 ft south of St. Botoloph Street, where the cycle length was 60 s. As a rule, the intersections have arterial left-turn phases.

A simulation model of the corridor was constructed using VISSIM, using its RBC module for signal control. The period studied was the a.m. peak hour, using traffic volume data supplied by the city of Boston in which the busiest northbound and southbound segments carry 1,317 and 877 vph, respectively. Each simulation run includes a 15-min warm up period, and reported results are averages of five simulation runs. Measures of performance included average network delay (average delay to all vehicles), corridor delay (average delay to vehicles running the full length of the corridor, averaged between the two directions), number of unconstrained arrivals summed over all of the Mass. Ave. stoplines, and average cycle length as a proxy for average pedestrian delay.

Three alternatives were evaluated: coordinated-actuated control (the scheme currently operated, with

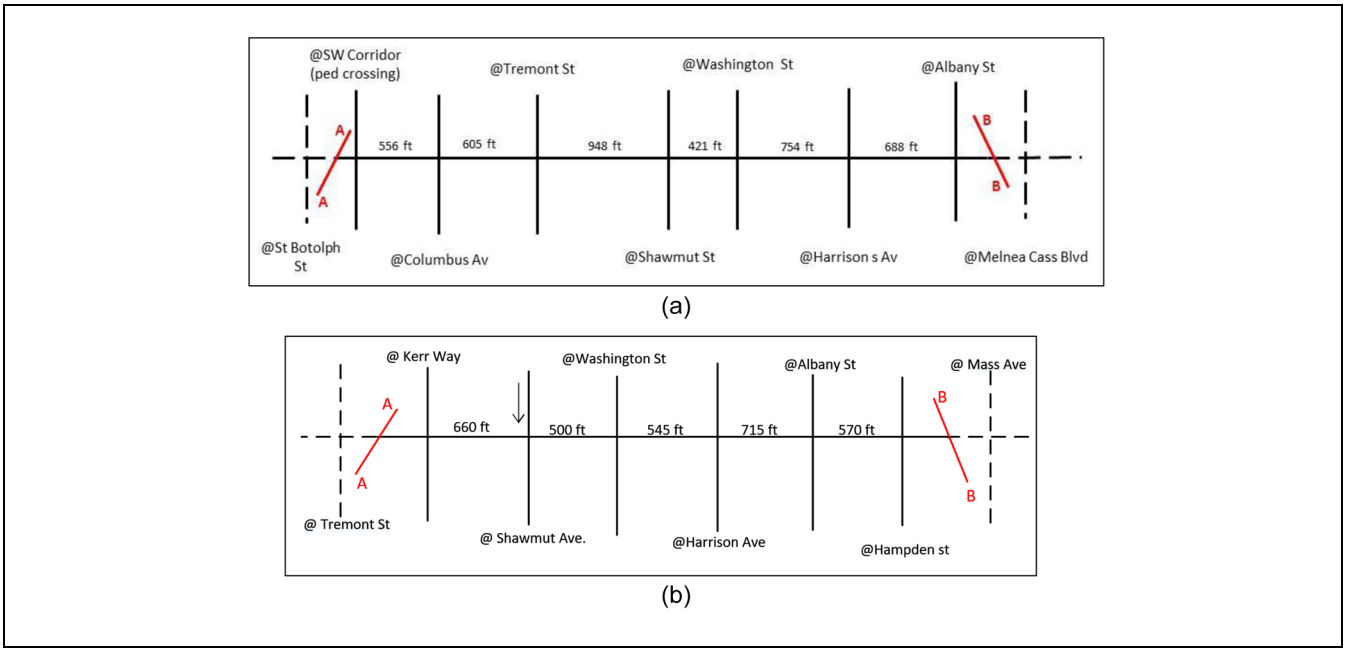

Figure 2. Study Corridors: (*a*) Massachusetts Avenue and (*b*) Melnea Cass Boulevard.

Table 1. Results for Three Signal Timing Plans (Massachusetts Avenue)

Signal timing plan	Average cycle length (s)	Corridor delay (s)	Average network delay (s)	Unconstrained arrivals per h
Coordinated-actuated	113	65	55	2,283
Actuated	78	135	61	798
Zonal coordinated	76	110	48	1,431

timings reoptimized), fully actuated control, and a "zonal coordination" plan. In the zonal coordination alternative, the Southwest Corridor pedestrian crossing ran fully actuated (with pedestrian recall), and the remaining six interior intersections were grouped into three zones of two intersections each, with coordinated-actuated control within each zone, but no coordination between them. Timing plans for the three zones were determined using Synchro, with small manual adjustments, which resulted in cycle lengths of 65 s for the middle zone and 80 s for the other two zones. Segments between zones were at least 750-ft long, long enough to avoid queue interactions.

Key results are shown in Table 1. Coordinated-actuated control, with its long signal cycle and long green periods, has the most speeding opportunities, while also offering the lowest corridor delay. Fully actuated control has the fewest speeding opportunities, but has the longest vehicular delays. The zonal coordination plan has an intermediate number of speeding opportunities, and although its corridor delay is greater than the unzoned coordination plan, it lowers delay so much for crossing traffic and turning traffic that it achieves the lowest average delay for all vehicles.

These results support both hypotheses H_4 and H_5. The two alternatives with substantially shorter cycle lengths allow substantially fewer speeding opportunities. And by placing less emphasis on corridor delay, one alternative (zonal coordination) was found that reduces speeding opportunities by 37% while simultaneously lowering average vehicular delay; another (full actuation) was found that reduces speeding opportunities by 65% while increasing average vehicular delay by only 11%, or 6 s per vehicle (albeit while increasing average corridor delay substantially).

Field Test Confirmation

A field test was undertaken to confirm the ability of the simulation software to model vehicular movements in a way that accurately represents unconstrained arrivals. The southbound approach to the intersection at Tremont Street was observed from 7:30 to 8:30 a.m. on a weekday, videoing the approach and the replaying the video to

manually count vehicles and classify them as unconstrained or not. The total number of arriving vehicles was about 10% greater in the field study than in the simulation (807 versus 729).

The fraction of arrivals classified as unconstrained was 21.7% in the field study, versus 21.8% in the simulation study. This result confirms the validity of the simulation model for measuring unconstrained arrivals.

Study Site 2: Melnea Cass Boulevard

The second study site is a 0.87-mi stretch of Melnea Cass Boulevard (MCB), a 4-lane arterial, between Tremont Street and Mass. Ave. In the simulation model, control at the extreme intersections was left unchanged in order to provide consistent boundary conditions, leaving six interior intersections, as shown in Figure 2*b*. Intersection spacing averages 600 ft.

Currently, the traffic signals run coordinated-actuated with a common cycle of 120 s in the p.m. peak, with a cluster of five intersections (Kerr Way through Albany Street) whose green is essentially simultaneous. This large cluster means that drivers can see green signals for several intersections ahead of them, giving them a strong incentive to speed to try to get through as many intersections as possible before the green ends. Speeding is a common complaint.

The current layout has left-turn lanes on MCB for only some of the intersections, and has protected plus permitted left-turns throughout. In all of the alternatives studied including the base case, the missing left-turn lanes were added and left turns from MCB are protected only. These changes were made to permit a comparison for operation in the near future when the street is rebuilt with a full set of left-turn lanes and with protected lefts.

The corridor was modeled using VISSIM, using its RBC module for signal control. Two different volumes were assigned to the network: p.m. peak hour, using traffic volumes obtained from the city of Boston, and off-peak, defined as 50% of p.m. peak volumes. Each simulation run covers 60 min following a 15-min warm-up period, and results are averages from five simulation runs. Eighty percent of the vehicles were assigned to a class whose desired speed varies from 28 mph to 32 mph, and 20% to a class with desired speed between 38 mph and 42 mph. Performance measures included average vehicular delay, corridor travel time, unconstrained arrivals at all of MCB's interior stoplines, and number of speeders at all of MCB's stoplines. Delay is measured compared with desired speed, which had the same distribution in all alternatives. Speeders were defined as vehicles with speed exceeding 35 mph.

All of the control alternatives tested use coordinated-actuated control, with timing parameters determined using Synchro. The minimum split of through movements is sufficient for concurrent pedestrian crossings. An initial set of tests with and without lead-lag phasing allowed showed that lead-lag phasing resulted in significantly less delay, with little difference in speeding opportunities, and so all of the control alternatives allow lead-lag phasing.

Cycle Length, Progression Speed, and Cluster Size

As discussed earlier, two-way coordination creates a relationship between progression speed *vProgression*, cycle length *C*, and cluster size *n*, whose unrounded value is given by Equation 2. For MCB with its average intersection spacing of 600 ft, Table 2 shows the values of unrounded *n* that correspond to different choices of *vProgression* and *C*; bold formatting is used to indicate combinations expected to result in the same rounded value of *n*, assuming a bias in rounding in which fractional values above 0.4 are rounded up.

Impact of Volume, Cycle Length, Progression Speed, and Degree of Recall

Table 3 shows the performance measures for two sets of volumes (peak and off-peak), a variety of cycle lengths between 70 and 120 s, and a variety of progression speeds between 15 and 35 mph. Corridor travel time was measured but is not reported for conciseness because it was so strongly correlated with network delay (correlation coefficient 0.99 off-peak, 0.96 peak).

An important methodological finding is that the two measures of speeding opportunity proposed are strongly correlated, with correlation coefficient 0.97 off-peak and 0.98 peak. The overall average ratio of speeders to unconstrained vehicles is 0.23 off-peak and 0.19 in the peak, close to the specified fraction (0.20) of drivers whose desired speed lies in the "speeding" range. This finding confirms that unconstrained vehicles is a good measure of speeding opportunity; it also suggests that

Table 2. Implied Cluster Size as a Function of Cycle Length and Progression Speed When Intersection Spacing Is 600 ft

	Cycle length (s)			
Progression speed (mph)	70	80	100	120
15	1.3	**1.5**	**1.8**	**2.2**
20	**1.7**	**2.0**	2.4	2.9
25	**2.1**	2.4	3.1	**3.7**
30	2.6	**2.9**	**3.7**	**4.4**
35	3.0	**3.4**	**4.3**	5.1

Note: Bold indicates cells with a common rounded cluster size.

Table 3. Timing Plan Performance for Different Cycle Lengths and Progression Speeds

				Off-peak			Peak		
Cycle length (s)	Progression speed (mph)	Ideal cluster size	Pedestrian delay (s)	Vehicular delay (s)	% unconstrained vehicles	% speeders	Vehicular delay (s)	% unconstrained vehicles	% speeders
70	15	1.3	28	57	12%	2.7%			
	20	1.7	28	33	16%	4.1%			
	25	2.1	28	32	16%	4.1%			
	30	2.6	28	31	22%	5.5%			
	35	3.0	28	33	22%	5.4%			
80	15	1.5	33	54	16%	3.6%	80	9%	1.2%
	20	2.0	33	44	17%	3.7%	46	10%	1.8%
	25	2.4	33	36	22%	5.2%	45	10%	2.1%
	30	2.9	33	30	24%	5.7%	43	11%	2.3%
	35	3.4	33	41	24%	5.7%	50	14%	2.8%
100	15	1.8	43	46	23%	4.7%	57	12%	2.1%
	20	2.4	43	38	23%	4.7%	45	15%	2.9%
	25	3.1	43	37	25%	4.9%	43	15%	3.0%
	30	3.7	43	33	28%	6.0%	43	16%	3.3%
	35	4.3	43	35	32%	7.0%	58	16%	3.3%
120	15	2.2	53	62	23%	5.2%	74	12%	2.1%
	20	2.9	53	48	25%	5.5%	54	15%	3.2%
	25	3.7	53	35	35%	8.5%	54	17%	3.5%
	30	4.4	53	35	36%	8.6%	49	20%	4.0%
	35	5.1	53	35	36%	8.3%	49	20%	4.0%

either of the proposed measures of speeding opportunity can be used with similar fidelity.

Looking at differences in performance, one obvious result is that speeding opportunities are far greater with off-peak volumes than peak volumes, confirming hypothesis H_1.

Another is that speeding opportunities tend to increase with cycle length, illustrated in Figure 3 and confirming hypothesis H_4. Capacity analysis shows that the minimum common cycle that provides sufficient capacity and satisfied pedestrian minima is 70 s for off-peak and 80 s for peak volumes; increasing cycle length beyond that minimum, especially with the low degree of saturation prevalent in the off-peak, substantially increases speeding opportunity.

The impact of changes in progression speed tends to be stepped, as illustrated in Figure 4 for the case of off-peak volumes and $C = 70$ s. In most cases, it makes a difference only when the change in progression speed is enough to alter cluster size, confirming hypothesis H_3.

Figure 4 also shows how three recall options – no ped recall (pedestrians use a pushbutton), ped recall (pedestrian phase is called automatically, our default option), and maximum recall (same as pre-timed operation) – affect speeding opportunities. When not in pre-timed mode, fixed forceoff (as opposed to floating forceoff) is applied to non-coordinated phases, consistent with local practice. Weaker recall settings randomly start arterial phases early, creating additional speeding opportunities that are evident in the results. However, stronger recall settings tend to give more unsaturated green time to cross streets, which may create speeding opportunities there, and so it would be unwise to conclude anything about what are the best recall settings for speed control without studying speeding on the cross streets as well as the arterial.

With regard to hypothesis H_2, Table 3 shows a clear trend of speeding opportunities increasing with cluster size. For the off-peak, the case with the smallest values of n has only 12% unconstrained vehicles, versus 36% for the case with the largest n. This confirms the hypothesis that large clusters of intersections with roughly simultaneous green create speeding opportunities.

Table 3 also shows the vehicular delay, pedestrian delay, and corridor travel time for each signal timing alternative. Corridor travel time is so strongly correlated with vehicular delay in this case study that it is not further discussed. Pedestrian delay is likewise strongly correlated with cycle length. Note that vehicular delay was measured using VISSIM and is based on desired speed, which follows the same distribution with an average value of 32 mph in every alternative, regardless of the progression speed used to select signal timing settings.

Because average desired speed is 32 mph, one might expect that the least delay occurs when signal timing has been optimized for a speed of 30 or 35 mph. Indeed,

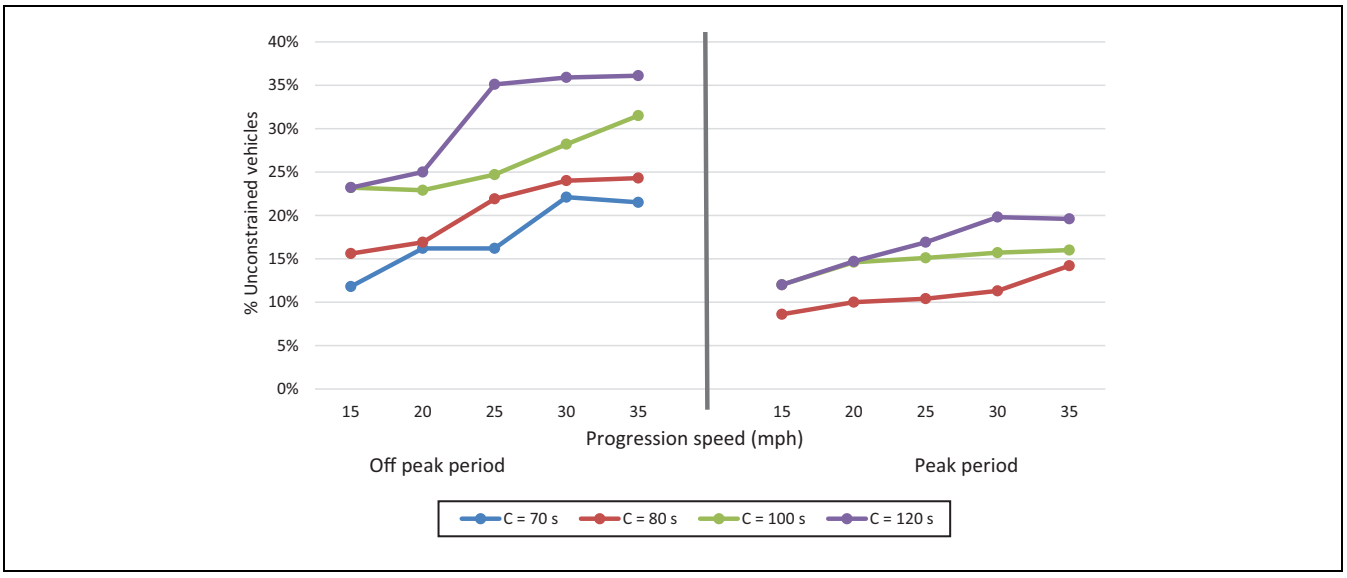

Figure 3. Unconstrained vehicles as a function of cycle length, specified progression speed, and traffic volume.

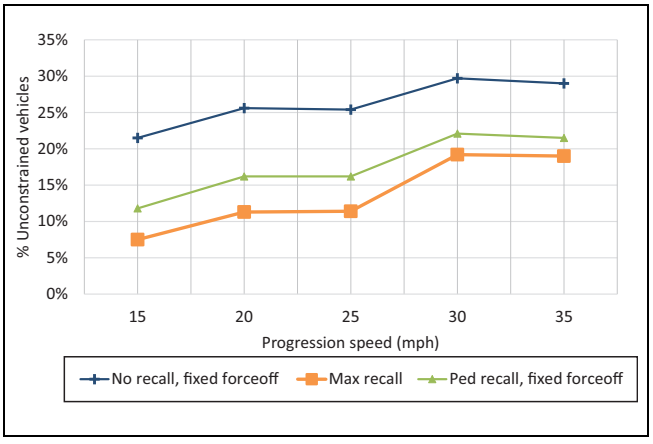

Figure 4. Unconstrained vehicles versus progression speed (off-peak volumes, cycle length = 70 s).

progression at 30 mph gives consistently low-delay results; in contrast, progression at 35 mph clearly tends toward greater delay. This confirms the beneficial effect mentioned earlier of a progression speed slightly below the average speed. Solutions with a progression speed of 15 mph have a large average delay, but most of those with progression speeds of 20 and 25 mph perform well with respect to vehicular delay.

Figure 5 illustrates the tradeoff between average vehicle delay and unconstrained vehicles for all the solutions in Table 3. One can see that for both off-peak and peak, Synchro's recommended timing plan based on default parameters performs well in relation to vehicular delay, but has considerably more speeding opportunities. Off-peak, reducing progression speed from 30 to 25 mph cuts speeding opportunities by 27% while increasing vehicular delay by only 5% (and leaving pedestrian delay unaffected); in the peak, reducing the cycle length from 100 to 80 s cuts speeding opportunities by 28% without any change in vehicular delay (and with a 23% decrease in pedestrian delay).

Conclusion and Further Research

An increasing number of cities recognize that controlling vehicle speeds in vital for improving safety and livability. This research has explored the potential for doing so using traffic signal settings on multilane, two-way urban arterials with close intersection spacing.

The number of unconstrained vehicles, measured at stoplines, was found to be a valid measure of speeding opportunities. A field measurement confirmed that this measure could be reliably measured by traffic microsimulation, and simulation study confirmed that it is strongly correlated with the number of speeding vehicles in a setting in which 20% of all vehicles were specified as having a desired speed in the "speeding" range.

Both case studies found that compared with conventional arterial coordination, it was possible to substantially reduce speeding opportunities with little or no increase in vehicular delay. Case study experiments confirmed that with standard arterial coordination, speeding opportunities increased with longer cycles, lower degree of saturation, and closer intersection spacing. Speeding opportunities are related to cluster size, that is, the number of consecutive intersections with simultaneous offsets, which is inversely proportional to effective intersection spacing (travel time between neighboring intersections measured in number of cycles). Shortening cycle length is particularly effective at limiting speeding

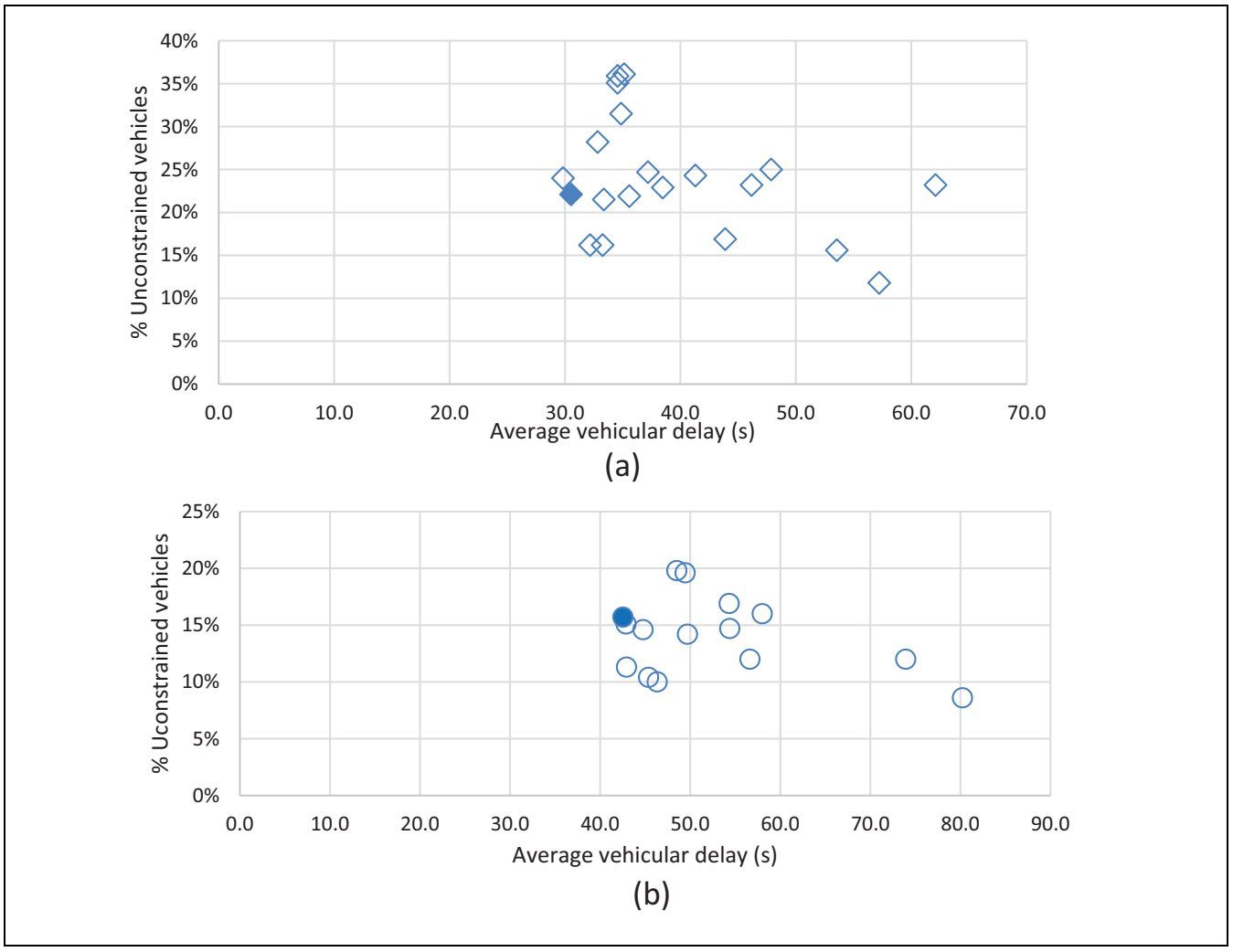

Figure 5. Delay vs. speeding opportunities for timing plans with different cycle length and progression speed. Solid markers indicate timing plans recommended by Synchro: (*a*) off-peak; and (*b*) peak.

opportunities because it both increases effective intersection spacing and reduces periods of unsaturated green; it also has the side benefit of lowering pedestrian delay.

Lowering progression speed – an input to signal timing software – can also reduce speeding opportunities, because it increases effective intersection spacing. However, small changes in progression speed can have no effect at all if they do not lead to a decrease in cluster size. Recall and minimum green parameters that make the length of the arterial through phases less variable also help reduce speeding opportunities.

Abandoning coordination altogether has the strongest effect on reducing speeding opportunities, but the delays and queue interactions this could lead to may be unacceptable. Short of that, breaking an arterial into small coordination zones, with coordination within each zone but each zone free to have its own cycle length, was found in one case study to sharply reduce speeding opportunities without increasing network delay. Adaptive control methods that achieve a degree of coordination without imposing a common cycle, such as self-organizing control (*14*), may also be effective at limiting speeding opportunities while maintaining a good level of service; that question is left for further research.

Author Contributions

The authors confirm contribution to the paper as follows: study conception and design: PF, AH; data collection: AH, JL, WH; analysis and interpretation of results: PF, AH, BC; draft manuscript preparation: PF, AH, JL, WH. All authors reviewed the results and approved the final version of the manuscript.

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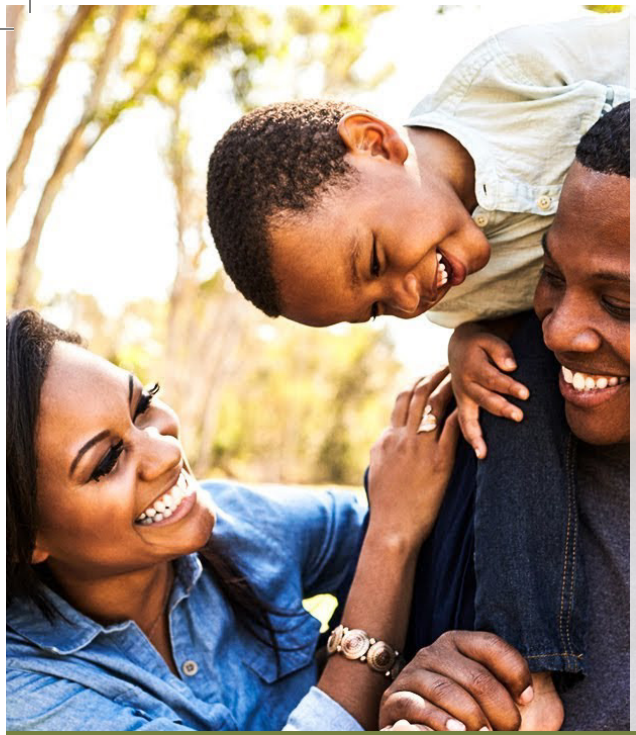

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SAY SOMETHING

Near West Side Partners, The Milwaukee Police Department encourages you to do your part to increase safety in our neighborhood. During your daily routine, take note of something that doesn't seem quite right, and say something.

To report suspicious activity, contact The Milwaukee Police Department and describe specifically what you observed, including: who or what you saw, when you saw it, where it occurred, and why it's suspicious.

Milwaukee Police Department
Emergency | 911
Non Emergency | 414.933.4444

Near West Side Partners Outreach & Safety Specialist
414. 349.3400
outreach@nearwestsidepartners.org

Near West Side Community Prosecutor
414.935.7033 or Catelin.Ringersma@da.wi.gov

Learn more at nearwestsidemke.org/safety

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FACEBOOK CAMPAIGN - BE SAFE DRIVE SAFE

Mueller Communications
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FACEBOOK

BE SAFE DRIVE SAFE VIDEOS

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GOAL:

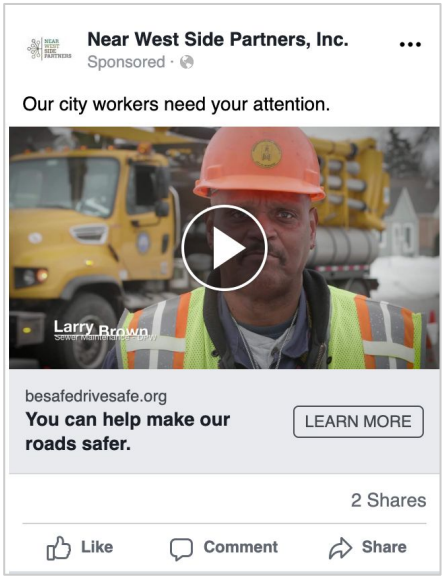
Increase awareness in the Milwaukee community by spreading a compelling message about safe driving through videos featuring Department of Public Works employees and local law enforcement officials.

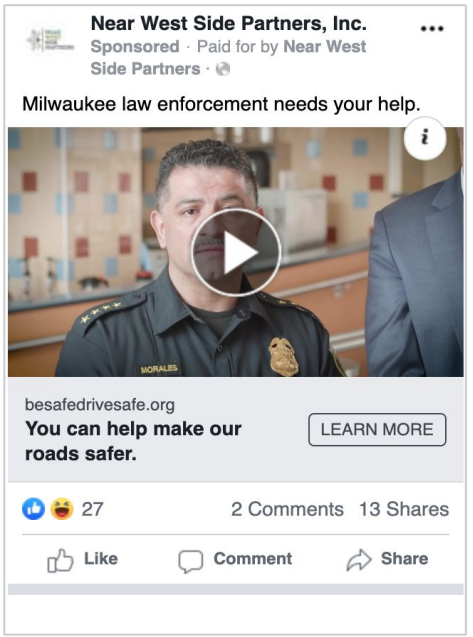
STRATEGY:

Promote two videos over the course of three months, from April 19 - July 19, targeting the entire city of Milwaukee.

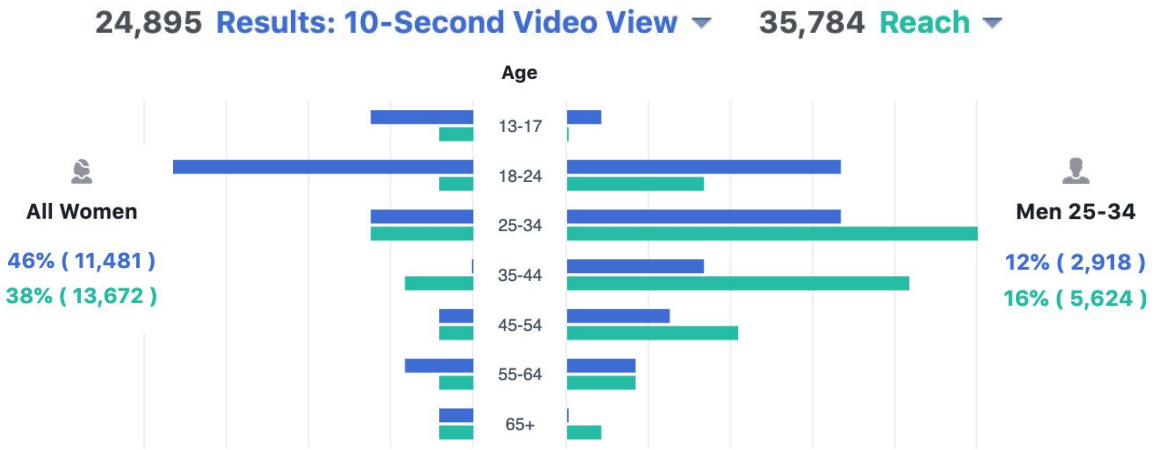
TAKEAWAYS TO DATE (7/1):

- **35,784 people** in our target audience have **viewed the ad an average of 2.56 times**
- **461 Link Clicks**
- **24,895 10-Second Video Views**
- **17,788 Users Viewed to Completion**
- **Average Video Percentage Watched: 35%**
- **Strong amount of video views from the 18 - 34 year old demographic.**
- **Males ages 18 - 44 account for the majority of post/video reach, as well as the most 10-second video views.**
- To date, the **DPW Video** was viewed the most with **19,167 10-second views**, and was **watched an average of 21 seconds**.
- The **LEO video** wasn't viewed nearly as much, but drove the most engagement with **85% of all link clicks**.





DEMOGRAPHICS



Watching 10 seconds of a video lifts ad recall by 74% and brand awareness by 65%

NEAR WEST SIDE PARTNERS

November 19, 2019

Re: Efforts to Address Reckless Driving in the City of Milwaukee

Dear Alderman Murphy,

Thank you for the opportunity to share the efforts Near West Side Partners (NWSP) has taken to address reckless driving in the city of Milwaukee. Near West Side residents have identified reckless driving as one of the top issues facing our neighborhood and NWSP continues to look for ways to make a positive impact in the area. Efforts to-date include:

Drive Safe Yard Sign Campaign
In 2017, in response to a request from a Martin Drive neighbor, NWSP printed and distributed 100 yard signs with a message urging drivers to "*Be Safe, Drive Safe*". In 2018 NWSP distributed another 50 yard signs asking drivers to "*Please Slow Down*". These signs were distributed throughout the Near West Side with a special focus on heavily trafficed corridors, including Highland Blouevard and State Street.

Be Safe, Drive Safe Social Media Campaign
In 2019, NWSP partnered with the City of Milwaukee, the Milwaukee Police Department, Milwaukee County District Attorney's Office, and the Milwaukee County Sherriff's Office to create an anti-reckless driving social media campaign. The campaign included video messages from Captain Morales, Sheriff Lucas, District Attorney Chisholm, and DPW employees that were shared through Facebook and linked to a website with tips on how to deter reckless driving in the community. Over 35,000 people viewed the ad on Facebook, with men ages 18 - 44 accounting for the majority of post and video views. The video featuring DPW employees was viewed most, gathering over 19,000 unique views.

Traffic Calming and Commercial Corridor Safety Measures
Near West Side Business Improvement District #10 (BID 10) has proposed a plan to enhance streetscaping and improve saftey along commercial corridors in the Near West Side. The plan includes temporary traffic calming measures that were developed with support from the Department of Public Works and feature painted curb bump-outs, plastic lane deliniators, and heavy-duty planters that will be placed in the parking lanes of intersections with high rates of traffic accidents. The plan also includes funding for security cameras that would be used to support accident investigations and other safety-related issues at 14 intersections throughout the Near West Side. BID 10 is working closely with the City's Commercial Corridor Team to finalize approval for financing and debt service, and hope to implement the plan in early 2020.

Near West Side Partners thanks you and your colleagues for your efforts to address reckless driving in the community and looks forward to opportunities to support and partner to find solutions that will have a lasting effect.

Sincerely,

Keith Stanley
Executive Director
Near West Side Partners

NEAR WEST SIDE PARTNERS, INC.
624 North 24th Street, First Floor | Milwaukee, WI 53233-2044 | 414 933 0640 | NearWestSideMKE.org

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Assistant City Attorneys

December 13, 2019

Alderman Michael J. Murphy
City Hall, Room 205
200 East Wells Street
Milwaukee, WI 53202

Re: Request for Legal Opinion on the City's Authority to Impound Vehicles Without Registration or Insurance

Dear Alderman Murphy:

You inquired whether unregistered and/or uninsured vehicles may be impounded. It is our opinion that unregistered vehicles may be impounded, but uninsured vehicles may not.

As noted in the City Attorney Opinion dated March 22, 2016, the City is generally authorized to tow vehicles that violate prohibitions on stopping, standing or parking and to remove the vehicle to a private or public storage lot pursuant to state-enabling legislation found in Wis. Stat. § 349.13(3). This statute was adopted by the City through Milwaukee Code of Ordinances (MCO) Section 101-25.

Furthermore, effective May 5, 2019, the City is specifically authorized to tow unregistered vehicles pursuant to Wis. Stat. § 341.65(2)(b) (adopted by MCO 101-24.7), which states:

> Any municipal or university police officer, sheriff's deputy, county traffic patrolman, state traffic officer, conservation warden, parking enforcer, or other person authorized under par. (c) who discovers any unregistered motor vehicle located upon any highway may cause the motor vehicle to be immobilized with an immobilization device or removed to a suitable place of impoundment.

MILWAUKEE

Under the statute, an "unregistered motor vehicle" means any motor vehicle that is not displaying valid registration plates, a temporary operation plate, or other evidence of registration as provided under Wis. Stat. § 341.18(1) for the vehicle's current registration period or for a registration period that expired within the last 31 days. Such a vehicle cannot be legally operated or parked within the City. Therefore, if during the course of a traffic stop, a police officer determines that a vehicle is unregistered (as defined above), the vehicle may be lawfully towed.

In contrast, there is currently no statutory basis for impoundment of uninsured vehicles. As noted above, under Wis. Stat. § 349.13(3) the City has been granted general authority to tow vehicles whenever any traffic officer finds a vehicle standing upon a highway in violation of the rules of the road imposed under ch. 346 – specifically moving violations and parking restrictions. This authority, currently, does not extend to the motor vehicle liability insurance requirement imposed by Wis. Stat. § 344.62.

Additionally, we are concerned that towing a properly registered and parked vehicle because it was not insured would be procedurally problematic. Upon our information and belief, there is no way for the Milwaukee Police Department (MPD) or the Department of Public Works (DPW) to determine if an unoccupied parked vehicle is properly insured. It would seem that an "insurance tow" could only occur after a traffic stop by police and an owner admission that the vehicle was uninsured. Otherwise, a driver could claim to have insurance but not have proof in the car (proof that could be available for court if a citation is issued), or a driver could have an insurance card for a lapsed policy that no longer provides coverage.

This kind of scenario puts police officers in the difficult position of having to trust paperwork or a phone call to a private insurance company to determine compliance with the law in deciding whether to seize a valuable piece of private property. In other words, an "insurance check" through private insurance companies to confirm coverage would be substantially more complex and less reliable than checking with the Department of Transportation-Department of Motor Vehicles (a governmental entity charged with keeping public records of registration) to confirm vehicle registration.

Please contact this office if you have any further questions concerning this matter.

Very truly yours,

GRANT F. LANGLEY
City Attorney

KIMBERLY A. PRESCOTT
Assistant City Attorney

/KAP

1033-2019-2035:26585

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March 22, 2016

Mr. Ghassan Korban
Commissioner of Public Works
841 N. Broadway
Milwaukee, WI 53202

Re: **Proof of Ownership Requirements for Satellite Tow Lots and Relocation to On-Street Parking**

Dear Commissioner Korban:

By letter dated February 24, 2016, you requested an opinion regarding what proof of ownership would be required for a person to retrieve a vehicle from a satellite tow lot or from on-street parking space after a vehicle has been relocated. Furthermore, you inquired as to whether the proof of ownership requirements could be different than the current procedures at the City Tow (Impound) Lot.

The City is permitted to tow abandoned and illegally parked vehicles and remove them to a private or public storage lot pursuant to state-enabling legislation found in §§ 349.13(3) and 342.40, Wis. Stats.

Wis. Stat. § 349.13(3) states:

> Whenever any traffic officer finds a vehicle standing upon a highway in violation of a prohibition, limitation or restriction on stopping, standing or parking imposed under ch. 346 or this section, or a disabled vehicle that obstructs the roadway of a freeway or expressway, as defined in s. 346.57 (1) (ag), the traffic officer is authorized to move the vehicle or to require the operator in charge thereof to move the vehicle to a position where parking is permitted or to either private or public parking or storage premises. The removal may be performed by, or under the direction of, the traffic officer or may be contracted for by local authorities. Any charges for removal shall be regulated by local ordinance. The operator or owner of the vehicle removed shall pay the reasonable charges for moving or towing or any storage involved based upon the ordinance.

This statute was implemented by the City through Milwaukee Code of Ordinances (MCO) Section 101-25. As currently written, MCO 101-25-1 requires that a

towed vehicle must be removed to a secure impound lot. Based on this provision, and absent an exigent circumstance, the code currently prohibits simply relocating the vehicle to a legal on-street parking space.

What proof of ownership would be required for a person to retrieve his or her vehicle from a satellite tow lot?

Wis. Stats §340.01 (42) defines an owner as "a person who holds the legal title of a vehicle, except that if legal title is held by a secured party with the immediate right of possession of the vehicle vested in the debtor, the debtor is the owner..." Milwaukee Code of Ordinances section 101-25-1 provides that the vehicle may be released to its owner after vehicle reclamation charges are paid "at the storage facility" and after "proper identification" is presented.

The City is subject to liability if a vehicle is released to the wrong individual. Therefore, anyone appearing at the lot to obtain a vehicle must have some reliable documentation of his or her right to the vehicle, either by proof of ownership, lien rights or a document that indicates the owners consent to the release. It is our understanding that the City's current tow lot policy requires an owner present proper identification and proof of ownership in the form of a current title or registration when claiming a vehicle at the tow lot. If a vehicle owner does not have a current title or registration on their person, the tow lot can retrieve such documentation from the vehicle or verify ownership by looking up the vehicle registration through the Department of Transportation.

If the Department of Public Works (DPW) would like to set up satellite tow lots in order to have more convenient locations for owners to retrieve their towed vehicles during permitted special events or due to a snow event, there is nothing in MCO ch. 101 that prohibits DPW from establishing additional secured impound lots. However, it would seem that a policy setting the proof of ownership requirements should remain the same regardless of whether the vehicle was towed to the main City tow lot or to a satellite location. We cannot imagine a situation that could logically require different sets of ownership proof depending on where the secured lot is found. Given the potential liability concern of releasing a vehicle to someone not entitled to it, it would seem that either the City requires proof of ownership before releasing the vehicle or it does not.

What proof of ownership would be required for a person to retrieve his or her vehicle from an on-street parking space after the vehicle has been relocated?

As addressed above, the current code provisions found in MCO 101-25-1 only allow the removal of a towed vehicle to a secure impound lot. However, in the event the code is amended to allow removal to a legal on-street location, it would seem proof of ownership would be unnecessary because the vehicle owner, or any person in possession of the vehicle keys, could simply access the vehicle and

drive it off. This situation would obviously not require any proof of ownership (but for the possession of the vehicle keys). However, the City would have to adopt a new process to secure payment of the towing fee after the vehicle is recovered by the owner or driver.

In summary, it is the opinion of our office that the proof of ownership requirements should remain the same regardless of whether a vehicle was towed to the main City tow lot or to a secured satellite location. Furthermore, the MCO 101-25-1 requires the removal of towed vehicles to a secure lot and does not make any provision for simply relocating a vehicle to a legal on-street parking space.

Very truly yours,

GRANT E. LANGLEY
City Attorney

JARELY M. RUIZ
Assistant City Attorney

1047-2016-455:226574

Coalition for Safe Driving MKE

December 18, 2019

Re: Request for Convening a Gathering of Community-Wide Stakeholders

Dear Members of the City-County Carjacking and Reckless Driving Task Force:

A group of concerned citizens and community organizations have come together to address the significant dilemma of reckless driving in Milwaukee County. The coalition is an outgrowth of the Community Advisory Council that once served MPS Drive. The Coalition participants have been involved in discussing reckless driving and working with community groups; we would like to join the Task Force's efforts on finding solutions for this community-wide concern.

Many of us were present at the public hearings at South Division and Rufus King High Schools. The number of citizens that were in attendance was astounding. It is certainly a recognition that the issue is one that impacts many of us; people want to voice their concerns and make recommendations to promote safe driving. They want to feel that elected leaders in the community are taking seriously their concerns and that they are being protected from erratic and dangerous drivers.

Our request of the Task Force is to convene a gathering of the stakeholders to discuss this topic. We note that there are only two community members on the Task Force and there are important constituents who are not part of the discussion. In particular, the Wisconsin Department of Transportation, the State and County level of the Department of Public Works and many others with a vested interest in this problem were not included in the conversations. We assert that there are important participants who should be at the table as decisions are being made about traffic control in Milwaukee County.

In addition to the above noted offices, we urge a convening of the following groups to be a part of the discussion to ensure that all voices are heard and that the recommendations of the Task Force are comprehensive and inclusive. Some of the constituent groups we advocate to be more directly involved include:

- First Responders
- Hospitals
- Youth and young adults
- Youth-serving Organizations
- Users of the road – Bicyclists, pedestrians, truck drivers, bus drivers, motorists, etc.
- Milwaukee Public Schools
- Individuals who have had their driver's license suspended
- Individuals directly impacted by reckless driving (victims, family members, offenders, etc.)
- Insurance Companies
- Artists and creative artists – music, spoken word, etc.
- Media
- Potential funders
- Researchers

- Psychologists, Physicians
- Neighborhood Associations

The issue is complex and requires engagement on many fronts. The resolution can't and won't fully be solved by law enforcement and in the courts. We need new ideas and **creative measures** to offset what has become an epidemic and public health concern in our community.

We have begun to brainstorm amongst ourselves and have some ideas we'd like to share with you for consideration. They include:

- Adding content about safe driving to the middle and high school Health curriculum
- Providing more money to invest in Driver Education
- Educating the community on implications of understanding the rules of the road, holding a valid driver's license and related topics
- Improving police community relations, especially on the north side of Milwaukee
- Tutoring programs for driver's education for adults
- Creating amnesty opportunity for driver's license suspension for non-driving offenses
- Engineering – looking at implementation of Complete Streets
- Employing an intensive community campaign around safe driving
    - Education about safe driving and road etiquette
    - Flooding radio and television with public service announcements
    - Printed media
    - Social media
    - Canvassing neighborhoods and shopping areas/malls
    - Documentaries designed by youth to get the attention of their peers
    - Neighborhood meetings

Our community needs the collaboration of a multitude of voices to ensure we are being inclusive. And, we need to be willing to address the underlying reasons for this behavior as well as implement consequences for those who break the law.

We recognize that the Task Force has been working hard to address this issue. It is a huge undertaking. The outcry and attendance of citizens at Rufus King was a call for action: the community wants to be involved and contribute to making our streets safe. We all desire to be safe on the streets and want to be part of the process.

We appreciate all of the work done thus far and request that you respond to our letter at our email address – coalitionforsafedrivingmke@gmail.com by January 7, 2020. We look forward to hearing from you and working with the Task Force to address this very important issue.

Committed to safe driving in Milwaukee County,
The Coalition for Safe Driving MKE

cc – Mayor Thomas Barrett
Milwaukee Common Council Members:
Ald. Ashanti Hamilton
Ald. Cavalier Johnson
Ald. Nicholas Kovac
Ald. Robert Bauman

Ald. Nikiya Dodd
Ald. Milele Coggs
Ald. Khalif Rainey
Ald. Robert Donovan
Ald. Mark Borkowski
Ald. Jose Perez
Ald. Scott Spiker
Ald. Anthony Zielinski
Ald. Russell W. Stamper, II
Milwaukee Police Chief Alfonso Morales
Milwaukee County Sheriff Earnell Lucas
Joseph L. Davis, Wisconsin Department of Transportation Bureau of Transportation Safety
Milwaukee County Executive Chris Abele

MEMORANDUM

LEGISLATIVE REFERENCE BUREAU

WWW.MILWAUKEE.GOV/LRB

To: Ald. Michael J. Murphy

From: Tea Norfolk, Legislative Fiscal Analyst – Lead

Date: January 9, 2020

Subject: Carjacking and Reckless Driving: UWM Planning Policy Analysis Student Reports

This memo summarizes the December 12, 2019, recommendations provided by graduate students of the University of Wisconsin – Milwaukee Planning Policy Analysis class. The students worked in three groups of four students each. Each group made four recommendations, which they analyzed by criteria set by each group. Each group then selected a top recommendation for its group. In total, the students made 12 distinct recommendations. The recommendations are set forth below, with each group's top recommendation underlined.

Forrest Elliott, John Hennessy, Joe Krivichi, and Jessica Pittner recommended the following, each of which they analyzed for effectiveness, cost, equity, and flexibility:

1. **Adopt youth education policy changes.**

   This recommendation includes three parts: (1) Lobby the State to adopt a more stringent graduated driver's license statute to match all points in the standard set by the National Highway Traffic Safety Administration. (2) Expand the Milwaukee Public School Drive initiative to make it free and available to all students. (3) Push back the start time for all high schools in the Milwaukee Public Schools district to 8:40 a.m.

2. **Lobby the State for hands-free cell phone legislation.**

   Wisconsin currently has laws related to cell phone usage while driving, but this recommendation proposes introducing a bill that would prohibit all hand-held cell phone usage by drivers on Wisconsin roadways. This past October, a bi-partisan bill to prohibit hand-held cell phone use while driving was introduced, but its fate is uncertain.

3. **Install an automated speed enforcement system (ASES).**

   Automated enforcement systems, specifically red-light cameras, have been shown to increase rear-end crashes initially due to drivers slamming on their brakes, but studies also show that the presence of signage informing drivers of the cameras reduces the number of rear-end crashes. The use of an ASES by law enforcement is currently prohibited under Wisconsin State law. However, State Representative David Crowley has proposed new legislation that would allow an ASES pilot program in the city of Milwaukee. This recommendation proposes an ASES reckless driving fund where all revenue beyond operating and maintenance costs would be directed to engineering solutions, education, and enforcement measures within a half-mile radius of the high-crash-rate intersections where cameras are installed.

4. **Install rapid-flashing beacons and raised crosswalks.**

   Rapid-flashing beacons are flashing lights and signs triggered by a pedestrian button that are meant to alert drivers that a pedestrian intends to cross the street. Raised pedestrian crosswalks maintain continuity with the existing height of the sidewalk and impede excessive speed by automobiles. Based on data from the Federal Highway Administration, installing a raised crosswalk with rapid-flashing beacon signals will cost an average of $30,000 per crosswalk and reduce pedestrian crashes by about 45% at intersections where they are installed. Approximately 40 crosswalks could be improved within the city annually, with high-crash-rate intersections taking priority for improvement.

Tim Brown, Adam Kuh, Luis Reynoso, and Kong Thao recommended the following, each of which they analyzed for effectiveness, efficiency, equity, and legality:

1. **Conduct traffic safety checkpoints.**

   According to the Kentucky Injury Prevention and Research Center, traffic-safety checkpoints are an effective way to identify impaired drivers and remove them from the roadway. Officers at a checkpoint identify drivers who are drunk, drugged, drowsy, distracted, unlicensed, or driving on a suspended license, as well as drivers with active warrants or those who are driving uninsured or unregistered vehicles. The Centers for Disease Control and Prevention evaluated the effectiveness of checkpoints and found that they can reduce crashes caused by impaired drivers by 20%. Staffing a traffic safety checkpoint typically requires

at least five or six officers. However, Wisconsin Statute prohibits sobriety checkpoints, and the U.S. Supreme Court has ruled that police departments can implement traffic stops, such as sobriety checkpoints, only under limited circumstances.

2. **Construct chicanes at mid-blocks.**

   Chicanes are a series of two or three staggered curb bulbs placed on alternating sides of the street. This recommendations proposes placing two landscaped chicanes at both ends of ten intersections that experience the greatest frequency of traffic-related crashes, which would cost approximately $100,000 for each intersection to construct, bringing the total cost to $1 million. A study in Seattle found that 85th-percentile speeds were reduced by eight to 12 miles per hour for locations where chicanes were constructed. Research shows that chicanes reduce the number of traffic-related crashes. In the United Kingdom, for example, the overall reduction in crash frequency was 54%, while crashes where an individual was killed or seriously injured were reduced by 78%. This recommendation requires design that makes chicanes visible for drivers, especially at nighttime. The Wisconsin Department of Transportation actively promotes the construction of chicanes, stating that it is among the five best designs for promoting pedestrian travel.

3. **Mandate cognitive behavioral therapy as an alternative to incarceration.**

   In a survey conducted by researchers of 500 households in four states, participants favored paying about 20% more in annual taxes for rehabilitation compared to incarceration. Cognitive behavioral therapy (CBT) is a form of psychological treatment proven effective for a range of problems, including depression, anxiety disorders, alcohol and drug use problems, marital problems, eating disorders, and severe mental illness. In 2008, a study found that among 200 bus drivers at five different locations, those treated with CBT showed an average improvement of 21.15% in driver's attitudes and behavior compared to those that did not receive treatment. Another study found that criminals with a mental illness, particularly post-traumatic stress disorder (PTSD), were 1.4 times more likely to be rearrested for general crime, such as reckless driving, versus those without PTSD. There is approximately a 50% success rate for those with PTSD being treated with CBT. This proposal estimates that, over five years, the crash rate will likely decrease by 9% with the use of CBT.

4. **<u>Construct mini traffic circles at strategic intersections</u>.**
   Milwaukee's configuration of many long straight roads lends itself to speeding. Creating physical barriers, such as traffic circles, can prevent reckless driving behavior. Mini traffic circles have proven effected at reducing speeds and the number of crashes at intersections. The crash reduction is due not only to the speed reduction but also by limiting the number of conflict points through an intersection. A standard four-way intersection has 20 conflict points, which are locations within an intersection where a vehicle's path crosses another. At a traffic circle, there are only eight conflict points, resulting in a collision rate decrease of 82% on average. This recommendation notes that visibility should not be decreased, and warning signs will need to be installed ahead of the intersection in all directions traveled along with adequate lighting to help drivers navigate traffic circles at nighttime. Landscaping can act as a buffer that separates vehicular traffic from pedestrian traffic. Additionally, mini traffic circles should be deployed only on streets with one lane in each direction of travel. The recommendation further indicates that monitoring should be conducted to ensure that traffic circles are effective.

Alex Uebelacker, Cory Clark, Valarie Davis, and Vijaya Tamla Rai recommended the following, each of which they analyzed for effectiveness, efficiency, equity, and collaboration:

1. **Increase transit service.**

   This recommendation includes two parts: (1) construct enclosed bus shelters with improved amenities, and (2) use a flash-charging electric bus system in Bus Rapid Transit (BRT). According to the American Public Transportation Association, public transit passengers have less than 10% the per-mile crash rate as automobile occupants, and transit-oriented communities have less than 20% the total per-capita traffic fatality rates comparted to automobile-dependent communities. Providing better transit service will increase ridership while connecting more people to employment opportunities. The recommendation proposes piloting the program in Aldermanic District 7, which has had the highest traffic crash rate in the last five years. The proposed enclosed bus shelters and surrounding design includes stop signs, trash cans, spacious sidewalks with planting strips to separate them from the road, sidewalk benches, painted crosswalks, installation of Bublr bike stations and bicycle racks, public restrooms, and dedicated bus lanes. The recommendation also urges adding heat and closeable doors to the bus shelters. The recommendation is for flash-charging e-

buses, which cost approximately $750,000 per bus. Funding for the system would be a combination of grants and a local sales tax.

2. **Crowdsource reckless driving behavior.**

   This recommendation proposes crowdsourcing reckless driving behavior through privately-operated dash cams with license plate recognition. The dash cams would link to the user's private e-mail, providing recorded clips that the user could anonymously send to the police or post to a database. The recommendation creates an eight-officer Traffic Tech Police Unit within the Police Department to review footage and issue citations. Funding would come from insurance companies, which would be willing partners given the ability to use data for claims.

3. **Create an aggressive driving unit.**

   This recommendation proposes establishing a multi-agency law enforcement unit that would be comprised of officers selected from the Wisconsin State Patrol, Milwaukee County Sheriff's Office, Milwaukee Police Department, and each of the 18 municipal law enforcement agencies in Milwaukee County. Officers from these jurisdictions would be deputized by the Sheriff, granting them special deputy status.

4. **Redesign roads and enhance corridors for a road diet.**

   This recommendation proposes installing road-diet solutions and traffic-calming measures including traffic circles, roundabouts, lighting, curb extensions, bollards, and speed tables. This recommendation prioritizes Aldermanic District 7, including the West Fond Du Lac Avenue corridor. The State of Michigan conducted a study on cities and road diets, capturing data over the course of five years, and found an average reduction of 43% in crashes with implementing a road diet. In Iowa, the results were similarly positive: after implementing a road diet on 11 sites, there was a 60% reduction in fatal crashes and a 40% reduction in major injury crashes, particularly to age groups 25 and under and 65 and older.

Community Proposal for an Emergency Task Force Project for Metro Milw

- Greetings distinguished Representatives, Scholars, Constituents, Grass-roots Leaders and various community residents in Metro Milw. Thank you for taking out your time to review concerns and issues the great citizens of Milwaukee, Wisconsin would like to share with you at this time.
- America is facing major and serious changing times. Truth is taking the stage. All across America and the World, we see people of all walks of life embracing diversity, regardless of socio-economic statuses, gender, age or Faith. The American people want to look around and see the Democracy we serve in the U.S. Constitution which says, in part, "All men are created equal..." and that all men and women have the "God-given right to the pursuit of happiness.."
- This is also an amazing time in Milwaukee, Wisconsin. We have an incredible opportunity to take Milwaukee to the next level. We can not do that without addressing the issues that are facing Metro Milw. Distinguished ladies and gentlemen it is time we all seize this moment and change the National and Local Narratives about Metro Milw and answer the Call to Action.
- You are the best genius minds we have in Milwaukee, Wisconsin, who can come together with the residents of Milwaukee to seize this opportunity to:
  - Organize an Emergency Task Force Project
  - Ignite the Grass-roots in Metro Milw
  - Implement

The Call To Action

- This opportunity should not be brushed off as just another failed attempt, rather, it should be treated as a serious, innovative and Bold step taken toward legislative and supportive measures with Urgency; There's no greater way to respond to Urgency than with Now. Now is when Metro Milw see its City Officials, Representatives, Colleagues and Scholars join our ignited grass-roots efforts for positive change and positive representation in our communities, in our businesses, especially in the 'community resources' we already have in various neighborhoods. Now is the urgency in Metro Milw to also see positive changes takin place for gainful Employment and Mental Health Services in our various communities and our Educational System. Transparency; to create, build and implement changes necessary for the Metro Milw we know we are and want to see in Milwaukee, Wisconsin. We want to see the transparency for Change for the futures of our young, gifted and talented Black boys and Black girls, who are already aspiring to be great Political Leaders, Actors, Musicians, Entrepreneurs, Educators and Producers of various Arts and other positive endeavors.
- Finally, the Promise of results. It is with your instrumental role, your guidance, your knowledge, your skills, your influence, your genius minds we need to give our voices the platform needed to change the current narrative of Metro Milw. The Promise is that when political leaders and the citizens of this great City work together, lives will be changed for the better, revenue is positive and productive. People of Metro Milw will continue to thrive and succeed in their pursuit of happiness.
- Then the narrative will change from most segregated City in the Nation or most disparities in the Educational Gap in the Nation.

Where We Are Now

- Gleaned from various Town Hall Mtgs, random conversations with citizens in Metro Milw NW side, are the Issues that effect and impact Metro Milw (see slide 4: Issues that effect and impact Metro Milw.)
- We have identified many resources and unsung heroes in our neighboring communities doing positive things to combat the social, economic and educational issues effecting Metro Milw. (see slide 6: Grass-roots/community resources)
- We found that these neighborhood resources are in need of New legislative funding and innovative ideas such as:
- (1) Put the Spotlight on these community resources. Many residents are not aware of the positive benefits these neighborhood resources bring to their particular zip code
- (2) Strengthen, Enlarge and Expand its positive impact in our communities (for example: Add Mental Health Services inside CYD and MLK Health Clinics
- (3) Build 'network and accessibility' with surrounding neighboring community resources for the citizens within various zip codes. So 'any' resident inquiring these neighborhood resources will not go unhelp.

Issues that impact Metro Milw

- Reckless Driving
- Increased homicides
- Lack of Access and Opportunity to gainful employment
- Lack of access and opportunity to Mental Health Services
- Neighborhood businesses that attract criminal activities, these neighborhood businesses also lack curb appeal and maintenance.
- National Education Gap (why are we spending est $38,000/prisoner and only est $11,00/student in Milwaukee, Wisconsin?) Is this formula outdated? Does it truly serve the families expecting quality education for their children?
- City and State counter-productive systemic polices
- Low City and State legislative funding in underserved zip code areas
- Low Internship Programs throughout Metro Milw
- Lack of access and opportunity to advanced technology and education
- Underutilized resources

Recommendations gleaned from Town Hall Mtgs and local Community Mtgs

- Reckless Driving - recommendations submitted 11/25/2019

  for example:

  1. HS students can not obtain Driver's Lic, purchase a vehicle or auto insurance without 'certicate of completion'

  2. When vehicles are purchased in cash, implement some 'paperwork' that identifies/confirms the source of income, like a check stub and length at the job

- Mental Health Services held at various Community Resources and/or community Churches

  For example: Creates gainful employment, held and operates within select Comm Res and Churches

- Create a fee from Uber/Lift as this can also help transit/road constructions in Metro Milw
- Establish a Referendum of .01 cent to be applied for Educational/Technology Training/Services held in unused buildings throughout Metro Milw
- Community Service Centers for High School Students (in addition to being housed inside High Schools, this service can also be housed within Milw Boys/Girls Clubs

  For example: Restorative Justice operate inside select Boys/Girls Clubs

Con't on slide 6

Recommendations gleaned from Town Hall Mtgs and local Community Mtgs

- Create innovative ways to implement Internship Programs for youths 16-21y/o at local businesses, medical facilities and private business sectors in Metro Milw. As a result of these changes a special 'Tax Write-Off" can be evaluated for participating business owners
- Create and implement more 'paid' on the job training for youths (6 and 12 wk classes)
- For example: A.I. STEM, Coding …
- Expand Community Resources with more of what they're already doing to attract more residents from the community it serves.
- For example: implement Mental Health Services within MLK Health Clinics and CYD.
- Con't on slide 7

Recommendations gleaned from Town Hall Mtgs and local Community Mtgs

- Use participating Entrepreneurs in Metro Milw to conduct and hold classes from 'Entrepreneurship to Politics' to be held within their businesses for gainful hands-on experiences and knowledge for those who participate.
- (For example: Experience Fitness gym holds internship programs for HS students where they learn physical fitness and healthy eating. They also learn h how to be an entrepreneurs.)
- Renovate and utilize 'unused' buildings throughout Metro Milw communities.
- For example: These unused buildings has the potential to be used for our Youths to develop, showcase and produce their skills and gifts with technology. Other residents are welcome to utilize the services these renovations bring, such as updating resumes; writing a Master Thesis; developing a Spreadsheet for a business project, etc...
- For example: the Kujichagulia Lutheran Center on 42nd Capital can be renovated with the needed technology to attract our youths/adults who have skills to produce videos of Positive Metro Milw and the Positive things going on in Metro Milw,
- For example: Sherman Phoenix, year anniversary, a great success and positive hub of entrepreneurs in Metro Milw.

The AI CGI and Coding Technology has left the station. Are we ready for a future of such innovative technological changes?

Grass-Root Resources in Metro Milw

- Coffee Makes You Black
- Shindig Coffee
- Milw Urban League
- Jewish Center
- King Center
- City Net Jazz Café
- Rise and Grind
- Manhattan Mocha Café
- CYD
- MLK Health Clinics
- Well Community
- Urban Underground
- Boys/Girls of Greater Milw
- Number of local/Community Churches
- Milwaukee Libraries
- Umus/Maximus
- Ma'Ruf Youth Center
- 414 Life
- My Sister's Keeper/My Brother's Keeper
- Project Hope Youth Center
- House of Peace
- Rescue Mission
- Experience Fitness
- Planet Fitness

Conclusion

- Distinguished ladies and gentlemen, again, I want to thank you for taking out the time to read and review this Community Proposal for an Emergency Task Force Project for Metro Milw. The objective of this proposal is to ignite an attitude for CHANGE in Metro Milw, from the grass-roots to the businessmen/women to the scholars and various other great leaders in Milwaukee, Wisconsin. Milwaukee residents, young and old, are tired of the dismal National and Local reports, we want CHANGE and we want it now! We are better than this!
- Who will make up the Emergency Task Force Project? We have a list of respectable Leaders already living in Milwaukee, we'd like to make recommendations upon request.
- The Emergency Task Force Project (Make-up)
  - Genius minds
  - Innovators
  - Scholars/Professors (UWM,Marquette,MATC)
  - Educational Administrators
  - Citizens, young/old
  - Politicians/Common Council
  - Milw Policemen/women
  - Businessmen/women

My contact info:
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