Intersection Proven Safety Countermeasure

Technical Summary: Corridor Access Management

U.S. Department of Transportation
Federal Highway Administration

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Foreward

In 2012, the Federal Highway Administration, Office of Safety issued a "Guidance Memorandum on Promoting the Implementation of Proven Safety Countermeasures". This guidance took into consideration the latest safety research to advance a group of countermeasures proven highly effective at improving safety. The nine Proven Safety Countermeasures chosen for targeted implementation included Corridor Access Management, defined as "a set of techniques that State and local governments use to control access to highways, major arterials, and other roadways." This included all types of access, ranging from high volume, suburban signalized intersections to simple, unpaved rural driveways, along all classes of roads and highways open to public travel.

As a means to further promote and advance Corridor Access Management, this Technical Summary and a companion Executive Summary have been prepared to assist transportation professionals with decisions pertaining to Corridor Access Management, including planning, permitting, design, selection, and implementation. This document provides a substantive overview of important access-related issues: safety performance (i.e. crashes), effects on pedestrian and bicycle facilities, and community and business economic impacts. More information on Corridor Access Management can be found on the FHWA website at http://safety.fhwa.dot.gov.

This publication does not supersede any publication; and is a Final version.

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Managing access at the corridor level improves safety and business

Imagine a multilane urban/suburban roadway where traffic is heavy, yet moves well; accommodates drivers, pedestrians, and bicyclists; allows easy entry to and exit from businesses and other destinations; and has fewer crashes and other conflicts. Chances are this road is benefitting from Corridor Access Management (CAM), a strategy that seeks an appropriate balance between the safety and mobility of a roadway facility with the access needs of adjacent land uses.

While managing access at a single location may help improve safety and operations within an immediate vicinity, CAM has been shown to improve safety, mobility, accessibility, and even business along an entire stretch of roadway because it favorably impacts ALL properties along that corridor.

CAM preserves the flow of people and freight, and enables safe access to businesses and neighborhoods using a combination of policies and strategies, such as closing, consolidating, or improving driveways, median openings, and intersections; adding or redesigning medians; and planned spacing of intersections, median openings, and driveways. CAM may also employ the use of frontage roads to create a safer, more efficient system.

Studies conducted by State and local agencies, national organizations, and transportation trade associations consistently show that access management notably improves traffic flow and safety for travelers. In addition, strong evidence shows that CAM can ultimately improve business in many cases.

Exhibit 1: Washington State Department of Transportation (WSDOT) conducted an analysis of the crashes in the corridor before and after the measures were in place. The results of the analysis showed that implementing access management practices significantly reduced accident severity and societal costs. (Source: WSDOT)

Addressing the concerns about Corridor Access Management improvements with data

Business owners along a corridor may fear that access management improvements will disrupt or otherwise negatively impact their businesses, but several studies over many years have dispelled this myth. When surveyed after an access management project, most property owners do not report any long-term adverse effects on their property value or business. In fact, making the locations easier and safer to access can actually have positive effects. For example:

- A study of property values on Texas corridors with access management projects found that land values stayed the same or increased, with very few exceptions.[1]
- More than 70 percent of the businesses impacted by a project in Florida involving several median opening closures reported no change in property value, while 13 percent reported some increase in value.[2]
- A 2005 study of commercial property values along a major access management project in Minnesota found that property values depend more on the strength of the local economy and the general location of the property in the metropolitan area; changes in access seemed to have little or no effect on the value of parcels.[3]
- A study of Kansas properties impacted by access changes found that the majority were suitable for the same types of commercial uses after the access management project was completed. This was true even for businesses that had direct access before the project and access only via frontage roads after project completion.[4]
- A 1996 study of business vitality in five Iowa communities found that after CAM improvements total retail sales increased in all five communities, ranging from 5.5 percent to 346.2 percent.[5]

> "…poorly designed entrances and exits at shopping centers not only present a safety concern, but also cause congestion that can create a negative image of the center."
>
> —FHWA,
> Safe Access is Good for Business[7]

Recently, the North Carolina Department of Transportation (NCDOT) conducted a study in conjunction with its efforts to reduce collisions and increase capacity along strategic highway corridors across the State.[6] The NCDOT study examined different corridor access management techniques, including replacing two-way left-turn lanes with raised medians, closing median openings, and installing super streets. Prior to construction, comments from businesses along these corridors indicated a concern that the new designs would limit direct access to their properties and result in a negative economic impact. Many business owners contended that median-divided roadways limit the ability of potential patrons to access their businesses.

However, the study concluded that these same business owners later viewed the access management improvements in a more positive light than businesses on roadways where CAM techniques had not been implemented. The study compared revenues for businesses along corridors that had CAM treatments and those that did not. There was no evidence that CAM installations created negative economic impacts.

Reducing conflict points and improving safety

Conflict points. Corridor access management has been shown to improve safety by reducing, managing, and separating conflict points, which increases available response time for all roadway users, including pedestrians and bicyclists. Safety benefits have also been attributed to certain improvements in traffic flow. In particular, improved traffic operations can engender more consistent driver behavior and reduce aggressive actions, such as speeding, red light running, and failing to yield the right-of-way.

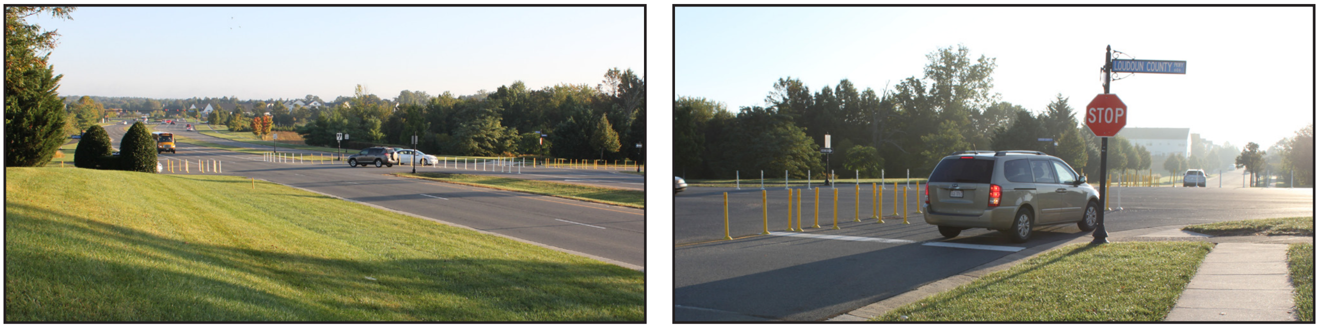

Exhibit 2: At this location, corridor access management measures were implemented to reduce crashes at median crossovers. Flexible post-mounted delineators were installed to restrict direct left turns from the side street. The photo on the left shows the main street and two vehicles in the median turning left onto the side street. The photo on the right shows how the delineators were placed to prevent vehicles from turning left through the median onto the main street. (Source: VHB)

Access points. The FHWA found that poorly designed entrances and exits at shopping centers not only present a safety concern, but also cause congestion that can create a negative image of the center.[8] A national study in the late 1990s looked at nearly 40,000 crashes and data from previous studies to determine the crash rate associated with adding access points to major roads. It found that an increase from 10 to 20 access points per mile on major arterial roads increases the crash rate by about 30 percent. The crash rate continues to rise as more access is permitted. This is why studies consistently show that well-managed arterials are often 40 to 50 percent safer than poorly managed routes.

Driveways. The Highway Safety Manual (HSM) also provides some measures for determining the effect of driveways on safety. The HSM contains models for estimating expected average crash frequency for specific roadway features. These models, called safety performance functions (SPF), are equations that estimate predicted average crash frequency as a function of traffic volume and other roadway characteristics. The HSM has models to estimate predicted average crash frequency for the following types of facilities:

- Rural two-lane, two-way roads (Chapter 10 in the HSM)
- Rural multilane highways (Chapter 11 in the HSM)
- Urban and suburban arterials (Chapter 12 in the HSM)

The HSM only has methods that model the safety effects of driveways for rural two-lane, two-way roads and urban and suburban arterials. For rural two-lane, two-way roads the base condition for driveway density is five driveways per mile. If driveway density is less than five driveways per mile, then the base condition applies and the predicted average crash frequency is not adjusted for driveway density. However, for driveway densities greater than five driveways per mile, the predicted average crash frequency will increase in accordance with the SPF in the HSM (Equation10-17).

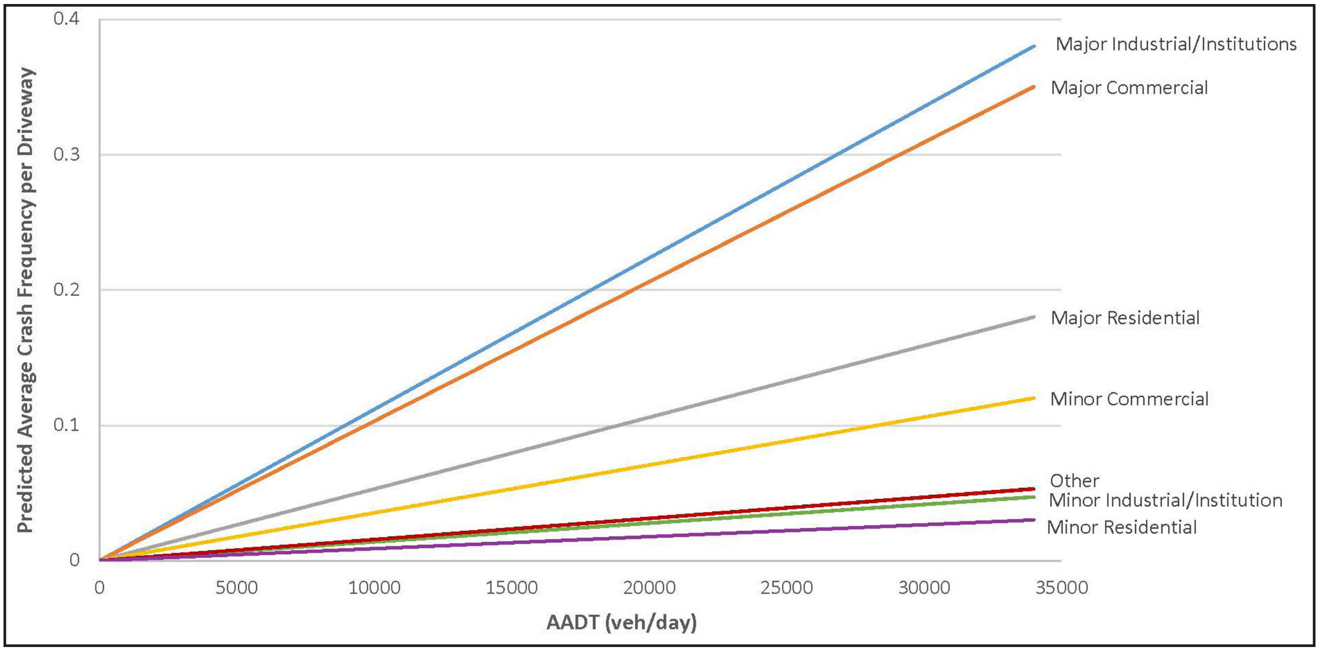

Exhibit 3: Graphical form of the SPF for Multiple Vehicle Driveway Related Collisions on Two-Lane Undivided Arterials. (Source: AASHTO Highway Safety Manual)

On urban and suburban arterials the frequency of driveway-related collisions on a roadway segment depends on the number and type of driveways. In general, higher driveway densities result in higher crash frequencies. The HSM reports that reducing the driveway density can reduce crashes by up to 31 percent (Table 13-58 in the HSM). The effect of driveway type on crash frequency is illustrated in Exhibit 3 where seven specific driveway types have been modeled for two-lane, undivided arterials.

Reducing crashes

A Kentucky Transportation Cabinet study showed that a strategic, comprehensive access management program can reduce total Statewide annual crashes by an estimated 20 to 50 percent.[9] Another study in Michigan reported a 61 percent reduction in the number of crashes when left turns were prohibited along a corridor and replaced with U-turn designs like those described in Exhibit 9.[10]

For more information on HSIP eligibility

Direct specific HSIP eligibility questions to the FHWA Division office in your State. A list of FHWA Division offices is available at www.fhwa.dot.gov/field.html.

And more information is available at http://safety.fhwa.dot.gov.

Medians and Super Streets

Medians. Medians are the areas located between opposing lanes of traffic. Medians separate various road users and can be open, meaning that they are defined with pavement markings, or channelized, meaning that it is physically raised through the use of curb.[11]

Exhibit 4: Raised median. (Source: VHB)

Median openings. Breaks in the median to allow for turning movements or intersections.

Exhibit 5: Flush median. (Source: VHB)

Super Streets. Also known as Restricted Crossing U-turns (RCUT), J-turns, and Reduced Conflict Intersections. Similar to left-over, or directional-median crossovers, this type of intersection prohibits left-turn and through movements from side street approaches.[12] Instead, drivers on the minor approach must turn right onto the main road and then make a U-turn maneuver at a one-way median opening after the intersection. Left turns from the main road approaches may be executed in a manner similar to left turns at conventional intersections or they could be removed, requiring drivers to utilize the median opening for a U-turn maneuver. This type of intersection is well-suited for use along arterials at intersections with comparatively lower volume roads.

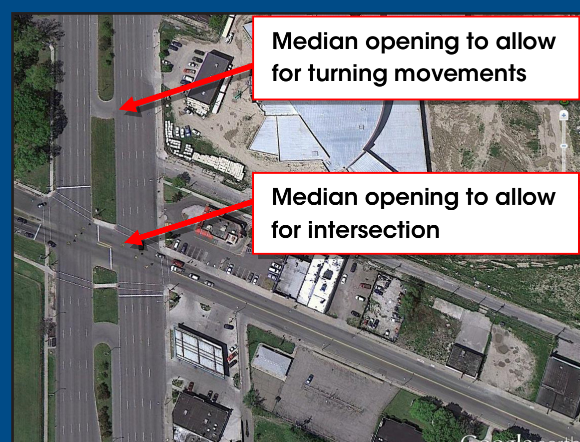

Exhibit 6: Example of median breaks along U-turn corridor on Woodward Avenue in Detroit, Michigan. (Source: Google Earth)

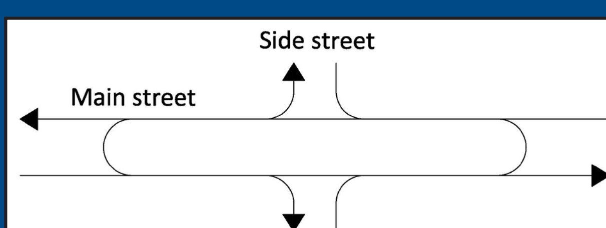

Exhibit 7: Basic super street intersection. (Source: FHWA)

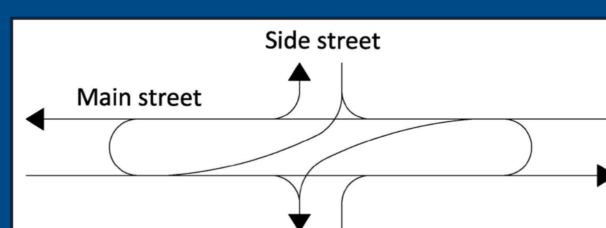

Exhibit 8: Super street intersection with left-turn movements. (Source: FHWA)

Offering a range of design options

CAM design options allow agencies to deploy flexible solutions for their unique environments. Common CAM techniques and their safety benefits include:

Relocation of Direct Left Turns. The restriction of direct left turns reduces conflicts and improves safety along corridors. Where direct left turns are restricted by raised medians or other channelizing devices, left turns would be performed indirectly as follows:

- Instead of direct left turns into access points along the mainline, motorists perform a U-turn at a designated location and then turn right.
- Instead of direct left turns out of access points along the mainline, motorists turn right and then perform a U-turn at a designated location.

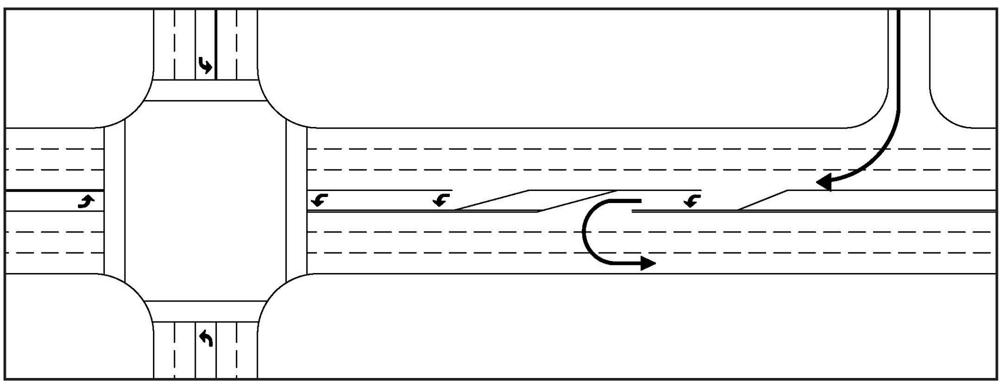

Exhibit 9: Example of method to relocate direct left turns.[13] (Source: FHWA)

Restricting left-hand turns reduces conflicts and improves safety along corridors.

- Making a U-turn at a median opening to get to the opposite side of a busy highway is approximately 25 percent safer than a direct left turn from a side street or other access point.[14]
- In a Florida study, the number of conflicts per hour was reduced by nearly 50 percent after replacing a direct left turn with a right turn followed by U-turn (RTUT) (Lu and Williams 2001, Page ii).[15]
- For indirect turn intersections, crashes were reduced by 20 percent on average and 35 percent if the indirect turn intersection was signalized (Gluck et al., 1999).
- The Highway Safety Manual[16] summarizes the crash reduction effects as follows:

  Total: 14 to 51 percent reduction

  PDO: 5 to 11 percent reduction

  Fatal/Injury: 31 to 36 percent reduction

  Rear-end: 9 to 16 percent reduction

  Right Angle: 33 to 36 percent reduction

  Sideswipe: None reported

Provision of Turn Lanes. When restricting direct left turns, it is necessary to provide adequate U-turn opportunities through median openings or designated left-turn lanes at intersections. Providing exclusive turn lanes is critical to the safety and operations of U-turn opportunities, but also helps to improve safety and operations for typical left- and right-turn maneuvers.

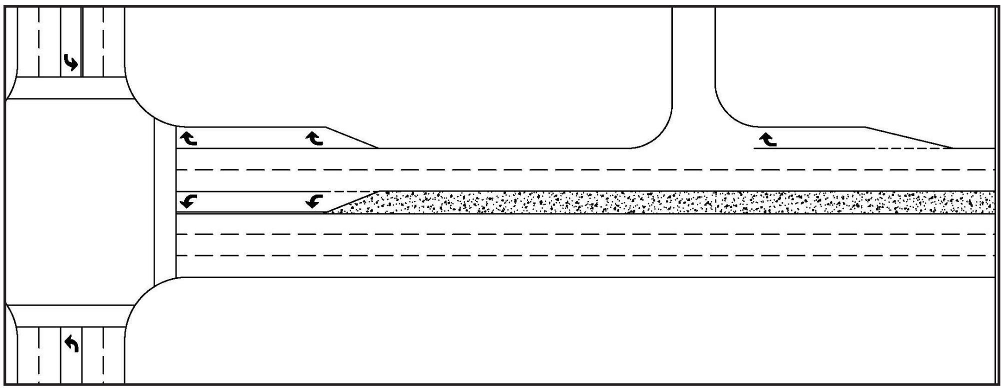

Exhibit 10: Example of exclusive turn lanes used to separate slower turning vehicles from through traffic. (Source: VHB)

Turn lanes help to separate the turning traffic from the through traffic along the mainline.

- Adding an exclusive left-turn lane results in a reduction in total crashes (7 to 44 percent) and fatal and injury crashes (6 to 55 percent) at rural and urban stop- and signal-controlled intersections.
- Adding an exclusive right-turn lane results in a reduction in total crashes (4 to 14 percent) and fatal and injury crashes (9 to 23 percent) at rural and urban stop- and signal-controlled intersections.[17]

Median Type. The type of median determines the type of turning movements that can be performed along a corridor and separates turning movements and opposing traffic. Median improvements include:

- A two-way left-turn lane (TWLTL) to provide lateral separation between opposing traffic, yet allow the full complement of turning movements (e.g., left turns into and out of access points). However, it offers no refuge for crossing pedestrians, and loses safety effectiveness as the number of through lanes increases along the roadway (e.g., from one through lane in each direction to two through lanes in each direction).
- A raised, non-traversable median to provide physical separation between opposing directions of traffic, but restrict left turns into and out of access points unless median openings are provided. A raised median implemented to manage access can also provide pedestrian refuge islands, both at intersections and at mid-block locations. These medians allow for a two-stage crossing, in which pedestrians cross one direction of traffic at a time, thus shortening crossing distances and reducing the complexity of the crossing task. This is especially true at transit stops, where pedestrians are regularly expected, but uncontrolled multilane crossings are common.

Exhibit 11: (top) undivided roadway; (middle) two-way left-turn lane; (bottom) raised median. (Source: VHB)

An undivided highway provides no separation between opposing traffic, does not restrict turning movements into and out of access points, and offers no refuge for pedestrians.

- Converting a TWLTL to a non-traversable median reduces total crashes by 15 to 57 percent[18] and reduces injury crashes by 33 to 48 percent.[19]
- Installing a TWLTL on an undivided roadway reduces crashes by 13 to 70 percent (Hallmark et al. 2008).[20]
- Installing a non-traversable median on an undivided roadway reduces crashes by 21 to 53 percent.[21]
- Raised medians are associated with a 45 percent reduction in pedestrian crashes and 78 percent reduction in pedestrian fatalities.[22]
- A study of corridor access management by Gross et al. (in press) reports that the installation of a non-traversable median reduces right-angle crashes along a corridor by 38 percent.

Signal Density. Signal density is defined as the number of signalized intersections per mile along a given corridor. More signals create more access points, which add conflict points and increase the potential for crashes and incidents involving pedestrians and bicyclists. For pedestrians, every signalized intersection represents at least four potential conflict points depending on the number of approaches and allowable movements. While crashes tend to increase with signal density, there is the potential to mitigate these crashes by interconnecting and coordinating the signals.

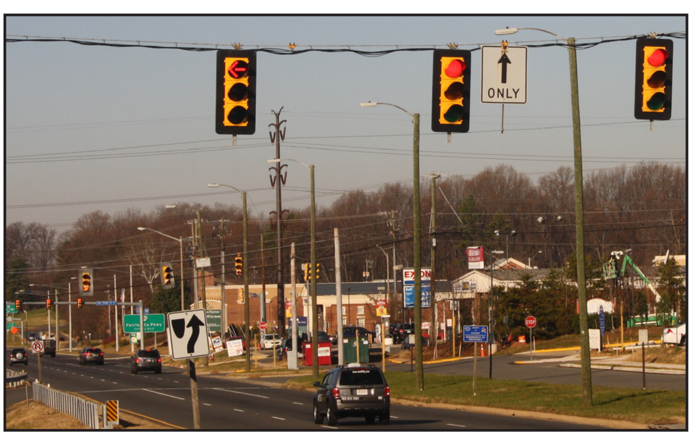

Exhibit 12: Example of closely spaced signals. (Source: VHB)

Increased signal density contributes to substantially higher crash rates.

A study of corridor access management by Gross et al. (in press) reports that total corridor crashes increase by 10 to 13 percent for each additional signal per mile depending on the adjacent land use (e.g., commercial, residential, or mixed use).

Unsignalized Access Density. Unsignalized access density is defined as the number of unsignalized access points per mile along a given corridor, and include driveways, unsignalized crossroads, and median openings. Crash rates and crash severity increase as the unsignalized access density increases. Again, because access points add conflict points, the potential for crashes and incidents involving pedestrians and bicyclists increases. The fewer access points per mile, the fewer potential conflicts for all roadway users.

Crash rates and crash severity increase as the unsignalized access density increases.

- Each additional access point per mile increases the crash rate by about 3 percent (Green Book, Section 2.5.5).
- A study of corridor access management by Gross et al. (in press) reports that total corridor crashes increase by approximately 5 percent for each additional unsignalized access point per mile.

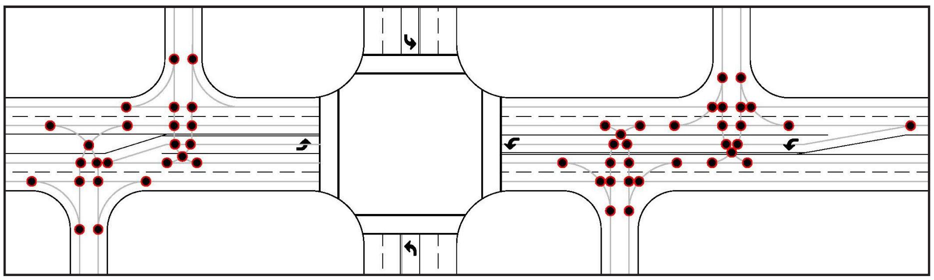

Exhibit 13: Diagram illustrating conflict points associated with unsignalized accesses.[23] (Source: FHWA)

Benefiting pedestrians and cyclists

Research indicates that several key access management techniques are just as valuable to pedestrians and bicyclists as they are to motorists. Each driveway represents four potential conflict points for pedestrians and bicyclists when all turning movements are permitted in and out of the location. This is critical because the presence of driveways is the primary reason for crashes involving pedestrians walking on the sidewalk. Techniques to reduce the number of conflict points or reduce exposure (i.e., crossing distance) for pedestrians walking on the sidewalk or bicyclists traveling in the roadway include:

- Reducing the number of driveways, particularly commercial driveways, within a given distance (per block or mile).
- Reducing the number of conflict points at driveways (e.g., converting driveways to right-in, right-out or installing a median that restricts left turns in and out of driveways.)
- Providing for greater distance between driveways.
- Providing a safe refuge for pedestrian crossings with raised medians.

Tools that assess conditions for pedestrians and bicyclists consider elements that are based on perceived safety. The TRB Highway Capacity Manual (HCM)[25] addresses measures that combine safety and operations for pedestrians and bicyclists. The various level-of-service (LOS) models emphasize the

Effects on Bicyclist Safety

Studies show that a motorist failing to yield mid-block at a driveway or alley to a bicyclist accounted for between 8.6 percent and 11.7 percent of all crashes involving a bicyclist and a motor vehicle.[24]

use of traveler perceptions of real-world conditions. These models have shown that corridor access and the presence of driveways play a critical role in perceived safety. For example, in the Urban Street LOS analysis methodology, the number of access points is considered a key input to the Bicycle Mode LOS model because of the potential for conflict between cyclists traveling on the street and vehicles entering or exiting streets and driveways. The Bicycle Segment LOS degrades steadily along a linear progression as the number of access points increases. Interestingly, the number of access points has a significant effect on the Segment LOS, which can exceed the influence of both the Bicycle Link LOS Score and Bicycle Intersection LOS Score.

Exhibit 14: A corridor with closely spaced driveways creates a challenging environment for pedestrians and bicyclists. Pedestrians with mobility restrictions may be particularly affected by driveways through sidewalks. These locations require careful design and construction to ensure they meet requirements under the American with Disabilities Act (ADA). (Source: VHB)

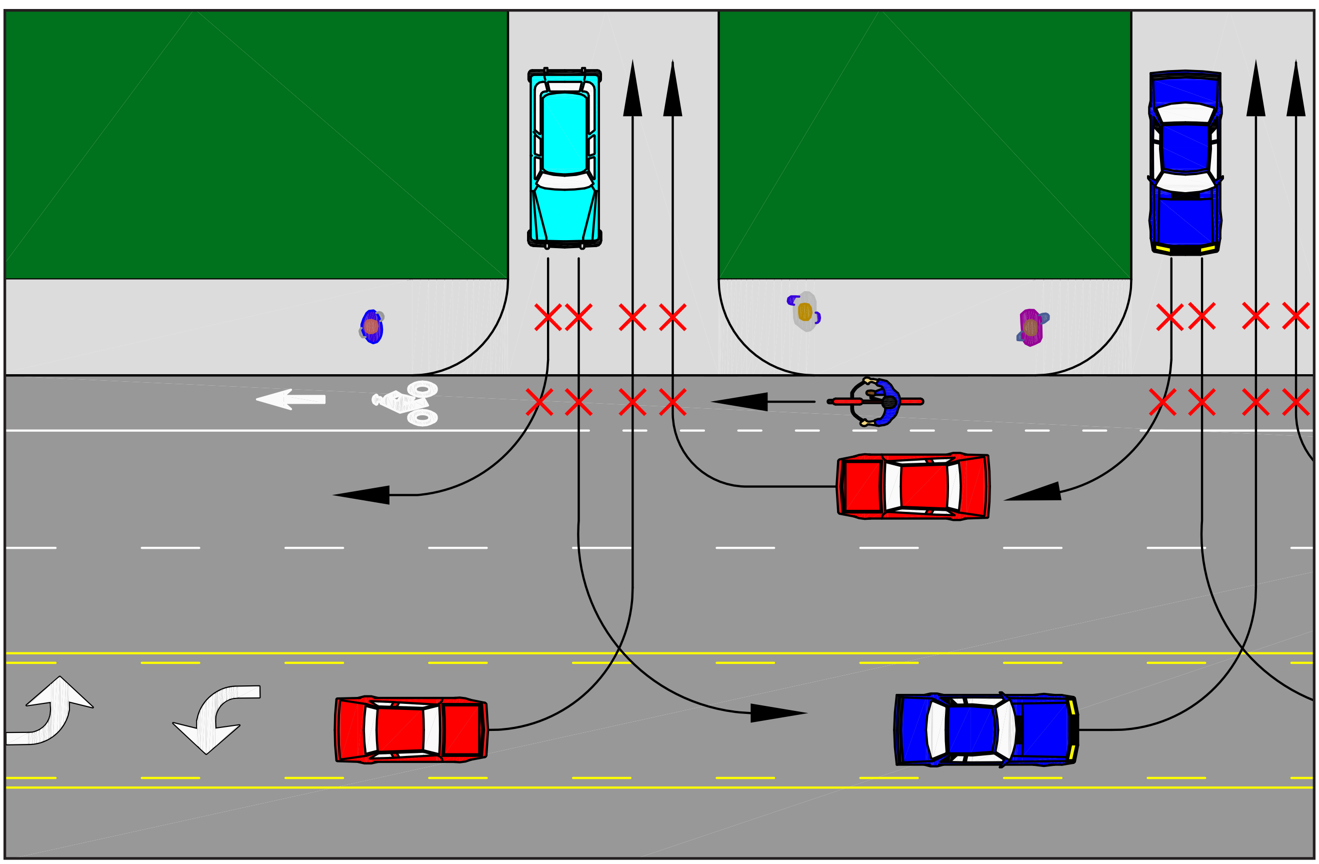

Exhibit 15: There are four potential conflicting maneuvers between motorists and pedestrians, as well as motorists and bicyclists, for each access point along a roadway with no median. The majority of crashes involving pedestrians or bicyclists are a result of these conflicts. (Source: FHWA)

Improving operations for all stakeholders

CAM treatments improve traffic operations by helping increase throughput, reduce trip times and delay, keep travel speeds consistent—which may also contribute to reduced fuel consumption and vehicle emissions—and deliver better quality of service for all road users. As a benefit to businesses, customers may travel farther to a destination if the trip time is reasonable and reliable, thus potentially increasing market share.

For instance, the TRB study Evaluating Alternative Operations Strategies to Improve Travel Time Reliability[26] shows that access management could reduce delay on Kentucky's surface street system by 46 million hours per year with the largest delay saving on the Urban Class I and II roadways.

- Urban Class I roads have high volumes and speeds, place a high priority on mobility and long distance travel through urban areas, and typically include principle arterials and multilane facilities that often have a median.
- Urban Class II roadways have moderate volumes and speeds, place a priority on mobility, are used for intra-city travel, and typically include minor arterials that are often multilane facilities.[27]

Incorporating Access Management as Emphasis Areas in SHSPs

Many States have included access management as an emphasis area strategy in their Strategic Highway Safety Plan to address intersection-related crashes. These States include:

- Nebraska
- Virginia
- Nevada
- Florida
- North Dakota
- Minnesota
- New York
- Pennsylvania
- Illinois
- Oklahoma

And the Texas Department of Transportation (TxDOT) Access Management Manual reports:[28]

- Inadequate access management can increase travel time and delay by as much as 40 to 60 percent. A 10 percent reduction in average travel speeds can cause a business to lose 20 percent of its market area.
- A four-lane divided major roadway with long, uniform signal spacing, directional openings between signals, and auxiliary lanes could accommodate a similar volume and similar quality of service as a six-lane divided roadway having traffic signals at ¼-mile intervals, unregulated access between the signals, and no auxiliary lanes.

Safety Fast Facts

- Access management could reduce total statewide annual crashes by more than 20 percent.[29]
- Access management could reduce total crashes by approximately 39 percent and rear-end and left-turn crashes by 41 percent and 42 percent, respectively.[30]
- Proper access control can reduce crashes by as much as 50 percent while capacity can be increased by 23 to 45 percent.[31]

Roundabouts. When deployed in a series, roundabouts can also improve operations and safety of a corridor. In Golden, Colorado, a series of four roundabouts and raised medians replaced four travel lanes and a two-way left-turn lane along Golden Road, a typical suburban arterial serving a strip commercial area. A report on the series of roundabouts found:[32]

- Replacing two traffic signals with four roundabouts resulted in slower average speeds but an improvement in travel times of 13 percent (from 78 seconds to 68 seconds).
- Delay experienced entering or exiting business accesses was cut by at least 50 percent, with a reduction in average delay from 28 seconds to 13 seconds and a reduction in maximum delay from 118 seconds to 40 seconds.
- Total crash rates for the corridor decreased by 88 percent after installation of the roundabouts, while injury crash rates decreased by 93 percent.
- Growth in sales tax revenues increased 60 percent.
- More than 75,000 square feet of retail/office space have been built since the roundabouts were constructed.

Access management programs in 90 cities in the US reduce delay by a total of 61 million hours.[33]

A study of two roundabout corridors described in NCHRP Report 772 Evaluating the Performance of Corridors with Roundabouts also found that crash frequency decreased on the corridors following the construction of roundabouts.[34] These findings are consistent with those reported elsewhere suggesting that this trend is likely to continue in a corridor context.

Exhibit 16: A series of roundabouts in Golden, Colorado. (Source: LSC Transportation Consultants, Inc.)

Innovative Intersection Corridors. Combining innovative intersection designs with raised medians in between can provide an effective means of improving traffic operations and enhancing safety within a corridor. One roundabout scenario—referred to as the "Dog-Bone" concept because of its geometric characteristics—converts all side streets and driveway access points within the segment to right-in/right-out configurations by prohibiting left turns. The roundabouts at the end of the raised median segment allow safe U-turn maneuvers for motorists traveling to and from the side streets.

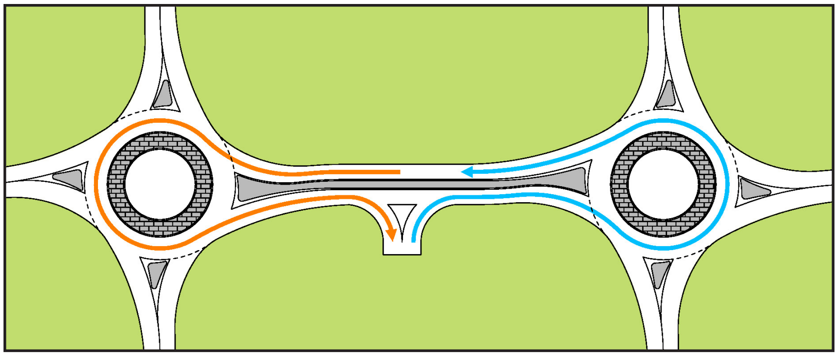

Exhibit 17: Example of the Dog-Bone concept. A single access point lies on the segment between the two roundabouts. A raised median separates the opposing through lanes on the mainline, which serves to prohibit all left turns between the roundabouts. The blue arrow illustrates the path for a vehicle seeking to turn left from the driveway, while the orange arrow shows the path of a vehicle wishing to turn left into the driveway. (Source: VHB)

The Dog-Bone Concept

The Dog-Bone concept would apply regardless of the number of access points and side streets located within the segment, with all U-turn maneuvers being safely accommodated by the roundabouts.

The same can be accomplished using median u-turns (MUT) and restricted crossing u-turns (RCUT). The MUT has been used for decades throughout the State of Michigan, and in particular along high-volume routes in the Detroit metropolitan region. The RCUT has been used successfully in North Carolina to achieve a balance between safety, operations, and access along the corridors.

Exhibit 18: Median U-turn (MUT) in Michigan. (Source: FHWA)

Overcoming potential challenges

Planning and implementing CAM improvements calls for careful policy making and pre-determined strategies for overcoming the inevitable challenges that arise with projects of this complexity, expense, and often controversy.

Setting Enabling Policy. A common challenge arises when State and municipal agencies have not yet established effective policies. Often, the mechanisms do not exist to deny permits for accesses that could potentially increase conflict points, and thus affect safety and mobility along a roadway. Agencies are encouraged to establish an access management policy that supports general corridor access management.

In North Carolina, the Wilmington Metropolitan Planning Organization employed two notable practices:

- A Public Involvement Policy that specified the process for public participation in transportation decision making.[35]

- A Memorandum of Understanding for Cooperative, Comprehensive, and Continuing Transportation Planning that links NCDOT programs with the comprehensive plans of several municipalities.[36]

The Iowa Department of Transportation utilized an Access Management Task Force composed of individuals from a variety of public and private organizations, including city, chamber of commerce, and DOT representatives.[37] After assessing the benefits and impacts of access management projects in Iowa, the task force developed an Access Management Handbook that highlights the importance of incorporating access management into comprehensive planning. For those communities without a comprehensive plan, the handbook provides guidelines for developing a successful access management program.

Identifying Funding. Paying for CAM improvements is a challenge, but there are options. Federal Highway Safety Improvement Program (HSIP) funds can be used for access management activities that address safety problems, such as changing median type, installing turn lanes, closing or relocating driveways and acquiring land. To qualify for HSIP funding, CAM improvements must (1) address a priority in a State's Strategic Highway Safety Plan (SHSP), (2) be identified through a data-driven process, and (3) contribute to a reduction of fatalities and serious injuries resulting from motor vehicle crashes.

Fayetteville, North Carolina, successfully applied for HSIP funding to implement median improvements in several corridors where many serious crashes had occurred. The HSIP projects met the funding criteria and were selected based on benefit-cost analysis.

Highway agencies in some localities have successfully partnered with other non-highway agencies and private developers to implement site-specific and corridor access improvements. For instance, CAM improvements in the town of LeRay, New York, resulted from a collaborative effort funded through various sources, including New York State Department of Transportation (NYSDOT), the Town of LeRay, developers, and a major business along the route.[38]

Managing Access During Construction. Reduced access due to poor construction phasing can lead to negative perceptions of access improvements in general and in safety issues. Maintaining good access during construction reassures both road users and businesses that the improvements will result in better safety and mobility. A strong emphasis on maintaining good access will also help create and sustain a positive relationship with the stakeholders affected most during the construction period.

Some localities utilize parallel, rear-access roads as a corridor access management strategy during construction. Designed to have little or no impact to the existing access points, rear-access roads can be existing roads that are improved or roads that are specifically constructed. If the rear-access road is improved or constructed before closing access along the front of the properties, then construction will have little impact on access. In some situations, access may be maintained along perpendicular side streets during construction.

Frequent communications with business owners during construction is key to helping identify problem areas and maintaining focus on a shared vision for improvements. Owners should be kept apprised of the overall construction schedule and ongoing construction activities. Routine meetings where owners can provide feedback may also help maintain a collaborative environment. Often, establishing agreements in writing with local business owners helps alleviate concerns.

Building Stakeholder Support. Change can lead to uncertainty, which in turn can result in hesitation and even outright resistance. Business owners may fear that construction and the improvements themselves will discourage customers from patronizing the businesses, negatively impacting revenue and economic viability. Residents of nearby neighborhoods may fear that their property values will go down or that safety will be compromised. Political leaders may resist supporting CAM strategies, fearing backlash from local businesses and voter constituencies.

State and local transportation agencies can successfully anticipate and meet these fears and garner support by first listening carefully to, and then staying in close communication with, the many stakeholders affected by CAM improvements.

Stakeholder Involvement Plan in Minnesota

A Minnesota DOT project of extensive improvements for a stretch of Highway 101 in Shakopee near Minneapolis called for an array of communications tactics to build stakeholder support. The project planners developed a Stakeholder Involvement Plan that included a number of mechanisms designed to build support among members of the public and businesses along the corridor. These mechanisms included:

- Creating a Corridor Advisory Committee
- Holding public informational meetings
- Conducting City Council workshops, construction staging workshops, and visual quality workshops
- Meeting with individual property owners
- Appointing a business liaison

Demonstrating Economic Benefits. To address misconceptions about economic impacts, agencies must be prepared to present data that link access management to economic improvements for the corridor. Studies conducted in Texas, Florida, Minnesota, Kansas, Iowa, and North Carolina described on page 2 of this technical summary are valuable resources. It may also be helpful to study the specific, local impact of the project that is the focus of the outreach.

Helping stakeholders share your vision

Visualization tools can enhance communication with multiple stakeholders by rendering a design, data, or other information in an easily understood visual format. One such tool is the Corridor Visualization Explorer (CVE),[39] which can facilitate planning and outreach and support the decision-making process by illustrating the effects of various access management strategies. Using sliding indicators to select corridor characteristics (such as number of lanes and signals per mile) and traffic conditions (number of vehicles per time period), the tool estimates the number of conflict points, delay time per vehicle, potential crashes, and economic impact of the modeled changes, based on various research findings.

The virtual, graphics-based nature of the CVE helps agencies communicate access management concepts to the public. The tools provide visual display of the effects of access management decisions on a corridor, facilitating a more engaging and collaborative relationship between the public and those organizations trying to employ CAM techniques. This helps set the stage for a more productive process.

Successful Stakeholder Involvement in Michigan

Michigan has had successful and positive experiences working with local businesses and stakeholders when implementing access management strategies. One example of their ability to garner support was on a particular rehabilitation project that had a high rate of access-related crashes. The Michigan Department of Transportation (MDOT) staff met one-on-one with individual property owners to review the crash data and physically demonstrate, using a can of spray paint, how access points could be re-designed and made safer. MDOT then monitored and compared the before-and-after crash data and were able to show a significant reduction in access-related crashes along the project corridor.

Another project was initiated by the planning commission of a township adjacent to a large urbanized area. The planning commission contacted MDOT to request assistance in creating a corridor access management plan and ordinance along a State highway that bisected the township. Township staff and planning commission members met frequently with local businesses, property owners and citizens to educate them about how the plan and ordinance would benefit their community. Crash information and access management concepts were shared with local businesses to explain how they could better protect their customers—allowing them to enter and leave the businesses more safely. The plan and ordinance were designed to implement changes in access over a period of time when changes in land use occur or when future road and utility projects create opportunities to implement the new design standards.

The key to Michigan's success in achieving stakeholder support for access management is to meet individually with property owners to explain the process, why changes are necessary, and to illustrate, physically or otherwise, the strategies that will be implemented.

—Tom Doyle, Program Manager, Michigan Department of Transportation

LADOTD and the CVE Tool

The Louisiana Department of Traffic and Development (LADOTD) sponsored a project to create a visualization prototype that can be used to improve how access management principles are conveyed to the public.[40]

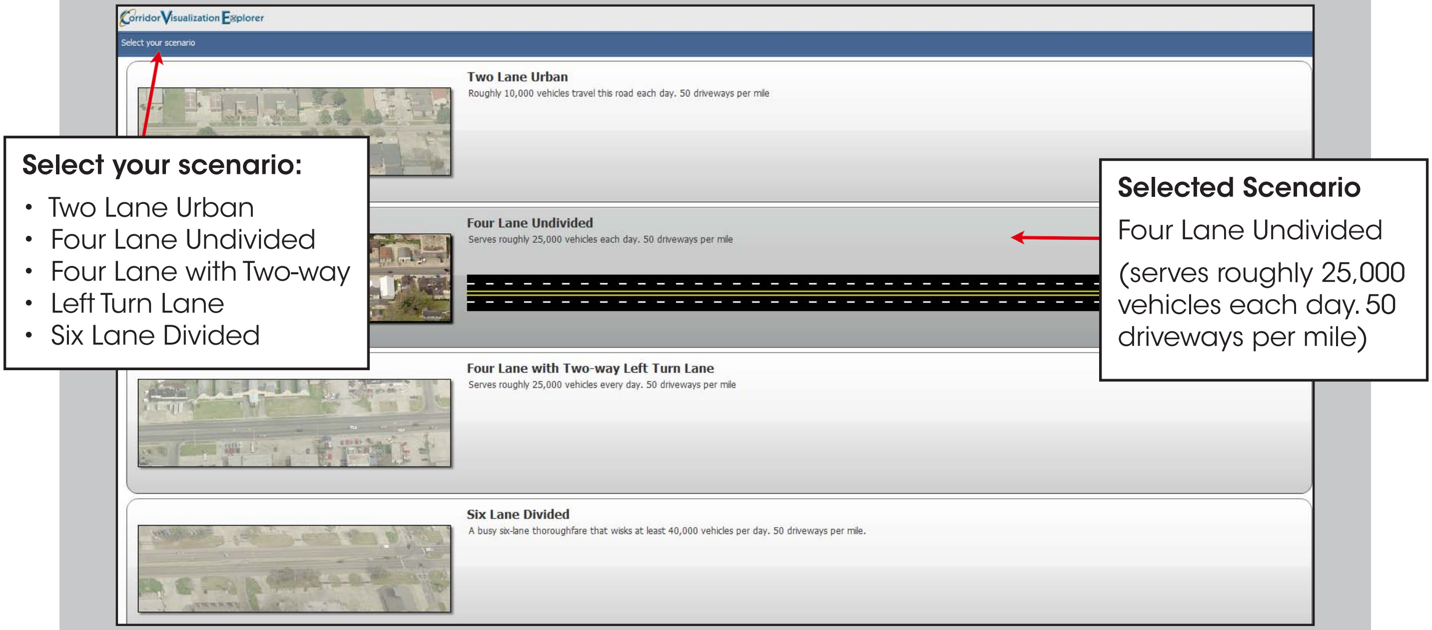

Exhibit 19: On the CVE Scenario Selection Screen, the user selects the basic roadway conditions. (Source: Teach America)

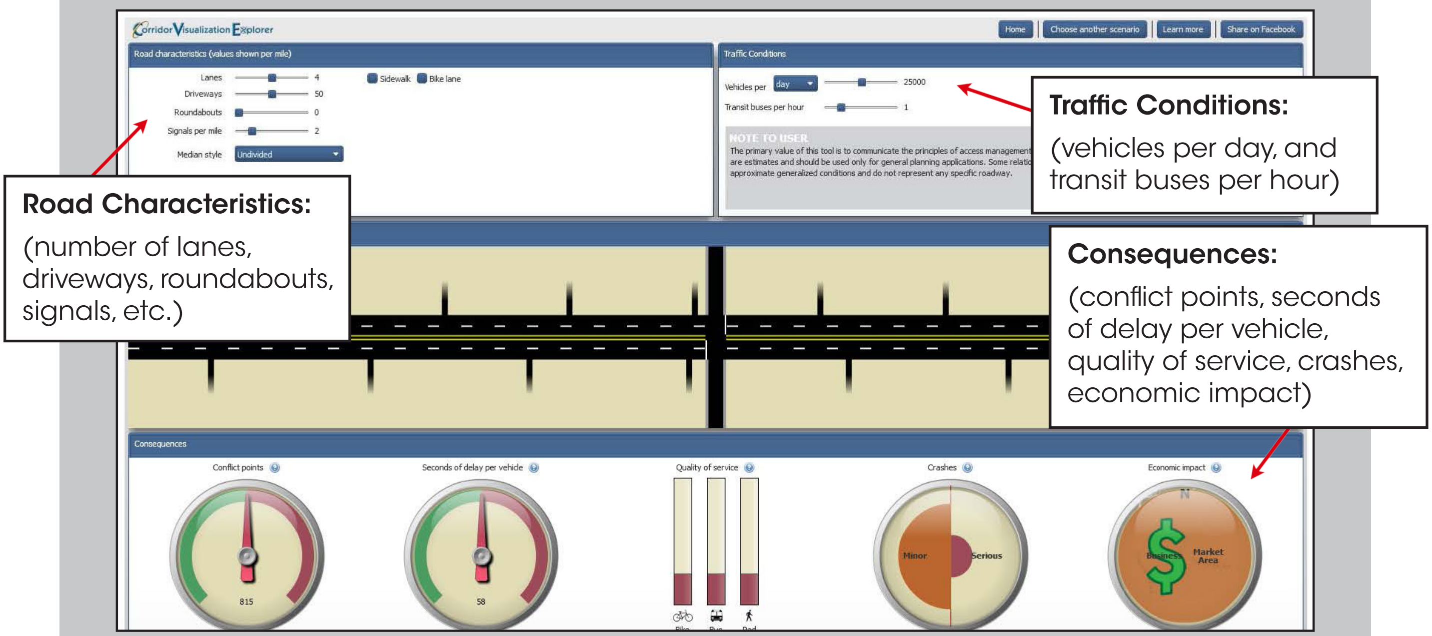

Exhibit 20: On the CVE Road Characteristics, Traffic Conditions and Consequences Screen, the user selects road and traffic conditions in the top pane. These are visualized in the middle pane. The effects of these decisions can be seen on the dials in the bottom pane, which also includes a note to the user. Dragging the cursor over the dials reveals explanations of the results. (Source: Teach America)

Highway 101 Case Study, Shakopee, Minnesota

CHARACTERISTICS: Highway 101 was originally a four-lane, undivided highway with shoulders, curbs, and gutters, unlimited accesses, and some historic and residential buildings. Highway 101 is a multi-functional transportation corridor that serves the region, as well as local business, residential, and recreational users.

FUNDING: The project was mainly funded with State Trunk Highway Turnback funds, along with some shared costs between the city and county.

APPROACH: For the first six to eight months after the project was initiated, officials met monthly to discuss issues and reach consensus on problems before discussing potential alternatives or solutions.

INITIAL OPTIONS: Officials considered using one-way pairs, four-lane divided corridor in a wider right-of-way, and reconstruction of existing corridor with access management.

ALTERNATIVES: Within the existing 80-foot right-of-way, the county supported a four-lane with median design, while city officials and businesses supported a five-lane undivided design. The county agreed to the five-lane undivided design, if city officials and businesses would support "aggressive access management."

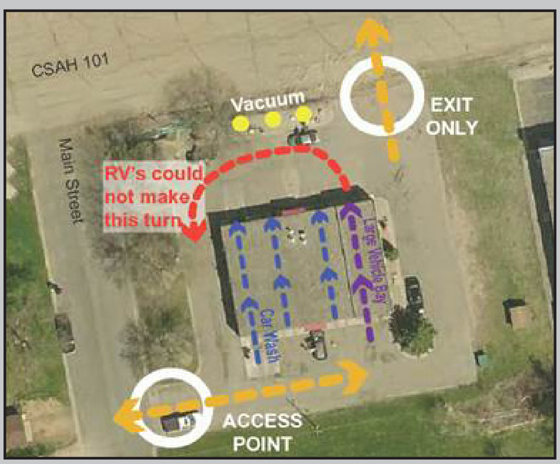

Exhibit 21: Car wash before CAM.

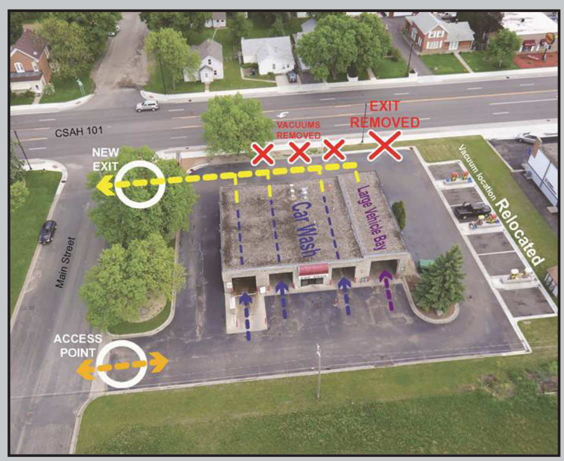

Exhibit 22: Car wash after CAM.

STAKEHOLDER INVOLVEMENT: In addition to the successful engagement of the business community early on, officials met with individual property owners about specific access conditions. Parcel-by-parcel, officials negotiated with property owners on access management. Questions raised included:

- How are existing accesses being used?
- How are customers entering and exiting the site?

- How are deliveries accessing the site?
- What else needs to change if site access changes?

Concept drawings and renderings of access management strategies were developed with business owner input.

POLICY/PREREQUISITES: According to Minnesota statute, property owners are entitled to compensation if 51 percent or more accesses are removed. Traditional right-of-way acquisition compensated for almost all access revisions.

The county offered to include site circulation mitigation in the project for properties where access was closed or revised. The offer was contingent upon the property owner granting a right-of-entry agreement or temporary easement at no cost to the county.

RESULT: Based on a decision-making process developed by staff, 26 of the 41 private property accesses were identified for potential closure. Through further investigation and negotiation with individual property owners, 20 of the 26 private property accesses were removed. Exhibits 21 through 24 show before and after images of some of the properties. Many of these property owners have recognized improved site access and circulation as a result of this approach. The Chamber of Commerce praised staff for its willingness to work with business owners and accommodate their interests in the planning, design, and construction of the project.

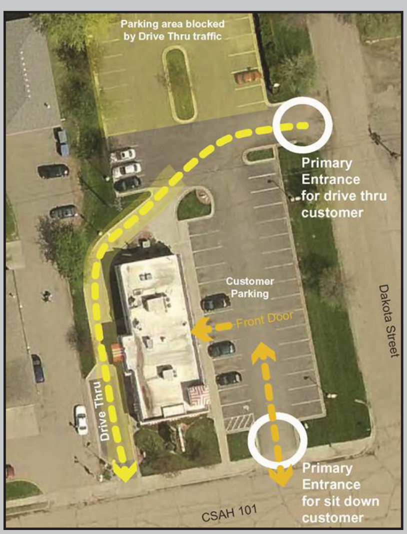

Exhibit 23: Fast food restaurant before CAM.

Exhibit 24: Fast food restaurant after CAM.

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