# Street and Intersection Pedestrian Safety Study

## City of Columbia, Missouri

DRAFT 06.11.2025



prepared by:

CBB TRANSPORTATION ENGINEERS+PLANNERS

# Table of Contents

## List of Figures



## List of Photographs

## Introduction

The City of Columbia has a compelling interest in enhancing the safety of pedestrians and motorists. Toward this end, the City has adopted a Vision Zero policy, which is a transportation policy goal and data-driven strategy to achieve zero traffic deaths or serious injuries.

The City of Columbia has retained CBB for traffic engineering and transportation planning services to investigate pedestrian safety issues in the City and provide recommendations for enhancing the safety of pedestrians and motorists within the City. To address these important issues, CBB investigated several elements affecting pedestrian safety and has developed recommendations for pedestrian activity regulations on and around certain roadways, medians, and islands located in the City.

The following report conclusively demonstrates that arterial roadways with higher speeds and traffic volumes present a heightened potential for dangers for both pedestrians and motorists. Additionally, at certain intersections, drivers only expect pedestrians to be in designated areas. To facilitate safety for pedestrians and motorists alike, pedestrians should only be allowed in the roadway when:

- They remain in designated pedestrian areas where motorists reasonably expect them to be located (e.g., sidewalks and crosswalks); or
- There is temporary traffic control set up to warn drivers that pedestrians will be present (e.g., maintenance or special events); or
- They are using particular roadways that sustain low traffic volumes and speeds and are designated as shared spaces for both motorists and pedestrians; or
- They are using a temporary pedestrian refuge as a part of the process of promptly crossing a road.

Special care should be given to regulating the use of medians and islands for pedestrian use in areas not specially designated for pedestrians. These intersections have the following characteristics:

- Speeds on one or more approaches of 35 mph or greater, or
- Traffic volumes greater than 15,000 vehicles per day on at least one roadway, or
- Median widths less than 6’ wide.

## Defining the Problem: Background on U.S. Pedestrian Safety

Collisions between vehicles and pedestrians are a significant concern in the US and around the world. This section provides data to help explain why pedestrian safety is important to agencies and organizations at all levels.

### National Statistics

The United States Department of Transportation (USDOT), Federal Highway Administration (FHWA), and the National Highway Traffic is Safety Association (NHTSA) report that pedestrian fatalities per year steadily decreased from the late 1970s to 2009 when the United States reached a low of 4,109 deaths. However, the number of pedestrian fatalities has increased since 2009, leading to a 5-year average of 6,502 pedestrian deaths per year during the 5 most recent years (2017 to 2021). During this period, pedestrians accounted for 16 or 17% of total traffic fatalities[1].

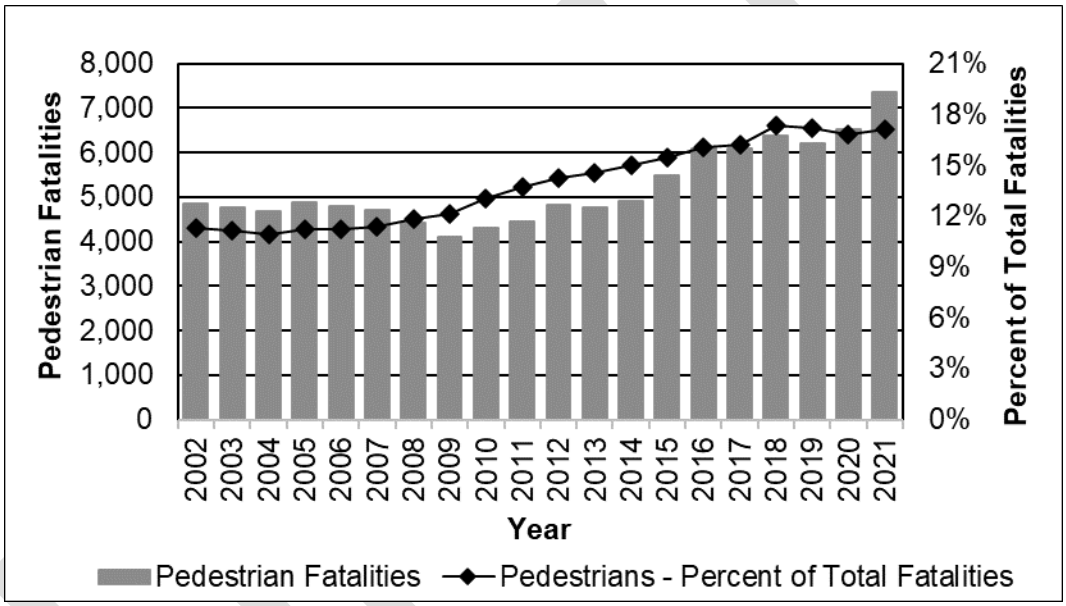



**Figure 1: Pedestrian Fatalities in Motor Vehicle Crashes in USA, 2002 to 2021 (NTHSA/NCSA)[1]**

NHTSA Traffic Safety Facts (publication 813590)[2] reports that in 2022, there were 7,522 pedestrians killed in traffic crashes, a 0.7% increase from the 7,470 pedestrian fatalities in 2021. This is the highest number of pedestrians killed in a single year since 1981 when 7,937 pedestrians died in traffic crashes. An estimated 67,336 pedestrians were injured in traffic crashes in 2022. In the same year, 85% of pedestrian fatalities occurred in urban areas and 16% of pedestrian deaths were the result of a collision with a vehicle at an intersection. On average, one pedestrian was killed every 70 minutes, and a pedestrian was injured every eight minutes in traffic crashes in 2022. Pedestrian deaths accounted for 18 percent of all traffic fatalities and 3 percent of all people injured in traffic crashes in 2022. In 2022, seventeen percent of the children 14 and

[1] https://www.nhtsa.gov/book/countermeasures-that-work/pedestrian-safety

[2] Federal Highway Administration -> Programs -> Safety -> Pedestrian and Bicyclist Safety -> Crash Facts -> Pedestrians: https://crashstats.nhtsa.dot.gov/Api/Public/Publication/813590

younger killed in traffic crashes were pedestrians. 78% of pedestrian fatalities occurred in the dark plus 2% at dusk and 2% at dawn in 2022. 2022 is the most current year for traffic safety facts produced by NHTSA at the time this report was completed.

**Missouri Statistics**

In participation with the FHWA, Missouri has developed the State's Strategic Highway Safety Plan, Show Me Zero: Driving Missouri Towards Safer Roads, in an effort to eliminate traffic fatalities and serious injuries on Missouri Roadways (2021-2025)[3]. The safety plan identifies pedestrians, bicyclists, teen drivers and older drivers as special road users. The plan identifies that progress to reduce pedestrian crashes will require increased responsibility and positive behaviors from both drivers and the non-motorized road users. On page 29, the safety plan indicates that over the last 10 years (2013-2022), the pedestrian and bicycle fatalities in Missouri have increased by 77% while other traffic fatalities increased by 40%.

Based on Missouri fatal crash data from the Fatality Analysis Reporting System (FARS), pedestrian fatalities in Missouri have steadily increased since 2009, leading to a 5-year average of 115 pedestrian deaths per year during the 5 most recent years (2018 to 2022). During this period, pedestrians accounted for 11.9% of total traffic fatalities in the state[4].

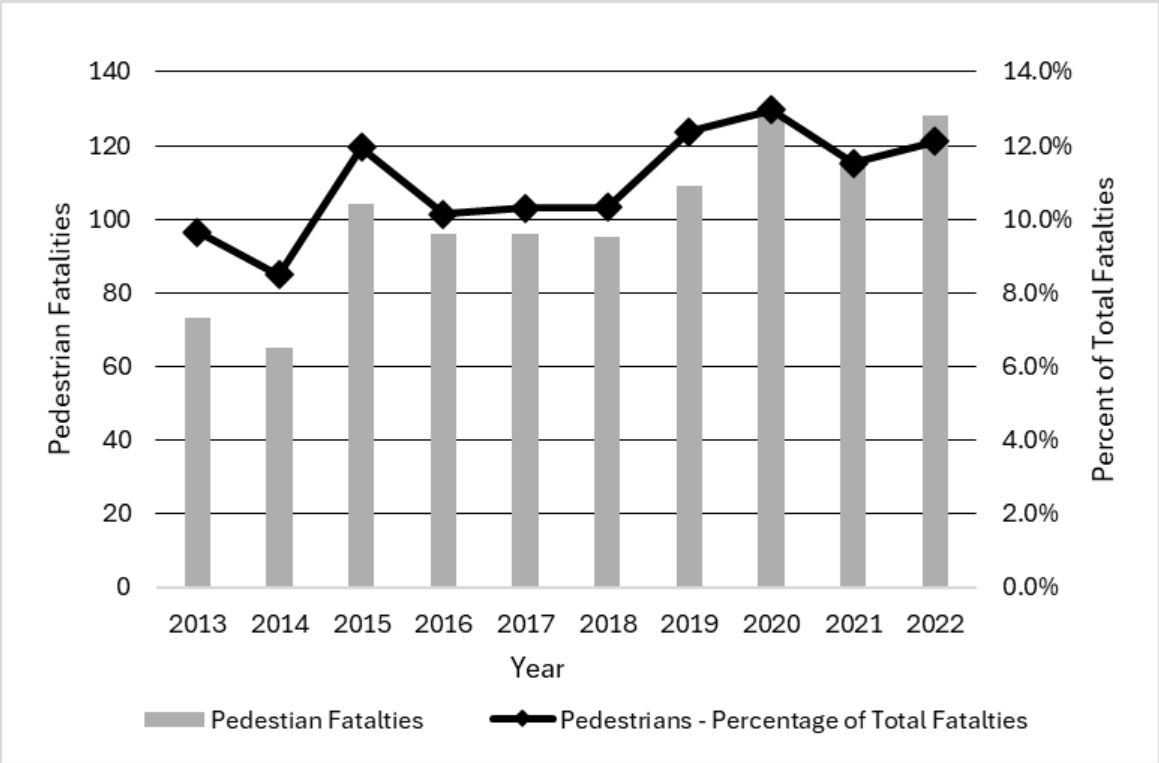



**Figure 2: Pedestrian Fatalities in Motor Vehicle Crashes in MO, 2013 to 2022 (NTHSA/NDAN)[4]**

[3] Missouri's Strategic Highway Safety Plan (Show Me Zero, Driving Missouri Towards Safer Roads) https://www.savemolives.com/mcrs/show-me-zero

[4] State Traffic Safety Information (STSI) for Missouri via the FARS database (https://cdan.dot.gov/STSI/stsi.htm)

In 2022, there were 128 pedestrians killed in traffic crashes in the state of Missouri, which is an increase from 117 pedestrian fatalities in 2021. Pedestrian deaths accounted for 12.1 percent of all traffic fatalities in the state of Missouri in 2022[5], which relates to about 2.5 pedestrians killed every week.

Based on pedestrian fatality data from 2022, the rate of pedestrian fatalities per 100,000 population in Missouri was 2.06, which is slightly below the national average rate of 2.26[6].

There were 1,288 pedestrian and bicycle involved traffic crashes that involved personal injury within the state of Missouri in 2023[7], which accounted for 3.7 percent of all traffic injury crashes in the state of Missouri in 2023, which relates to a pedestrian or bicycle injury every 7 hours.

**Boone County, Missouri Statistics**

Between 2019 and 2023, Boone County, Missouri, experienced 3.1% of the state's pedestrian fatal crashes[8]. Between 2019 and 2023, 20.4% of the fatal crashes in Boone County involved pedestrians which is above both the national (18.7%) and state (11.9%) averages.

**City of Columbia Statistics**

Between 2019 and 2023, the City of Columbia experienced 2.6% of all the pedestrian fatalities within the state of Missouri, which constituted 76% of Boone County's pedestrian fatalities[9]. During that same time, 32% of the fatal crashes in the City of Columbia were pedestrian-related, which is well above the national and state rates.

To better understand the City of Columbia's pedestrian crash issues, CBB reviewed crash data from MoDOT's Transportation Management System (TMS)[10], which includes all the traffic crashes that are reported. The pedestrian-involved crash data was analyzed in many ways including the severity level, the age of the pedestrians that were involved, the location of the crash (intersection versus segment), and the presence of medians at intersections. MoODT's TMS system has crash information available from 2015 to 2024 for the City of Columbia.



[5] State Traffic Safety Information (STSI) for Missouri via the FARS database (https://cdan.dot.gov/STSI/stsi.htm)
[6] https://www-fars.nhtsa.dot.gov/states/statespedestrians.aspx
[7] https://apps.mshp.dps.mo.gov/MSHPWeb/SAC/Compendium/TrafficCompendium.html# 2023-> Pedestrian and Pedalcycle-> 9.1
[8] https://www.mshp.dps.missouri.gov/MSHPWeb/SAC/Compendium/TrafficCompendium.html# -> Statewide crashes Analysis ->1.13-> Crashes by County, Crash Severity, and Personal Injury Severity (2019-2023)
[9] Pedestrian Fatality data from: https://www.savemolives.com/mcrs/pedestrians-other-roadway-users
[10] Crash data from MoDOT's Transportation Management System (TMS) https://www.modot.org/modatazone/safety

**Figure 3** shows the number of crashes involving pedestrians by severity within the City of Columbia City Limits from 2015 to 2024. The pedestrian crash trend shows a general increase in pedestrian-involved crashes but with a notable reduction in pedestrian crashes in 2020-2022. The reduction in pedestrian crashes during this timeframe is a direct impact of the COVID-19 stay at home orders which significantly reduced both pedestrian and traffic volume and exposure. By 2023, the pedestrian crash levels were similar to pre-COVID levels.

Overall, 93.6% of reported crashes involving a pedestrian resulted in an injury or fatality.

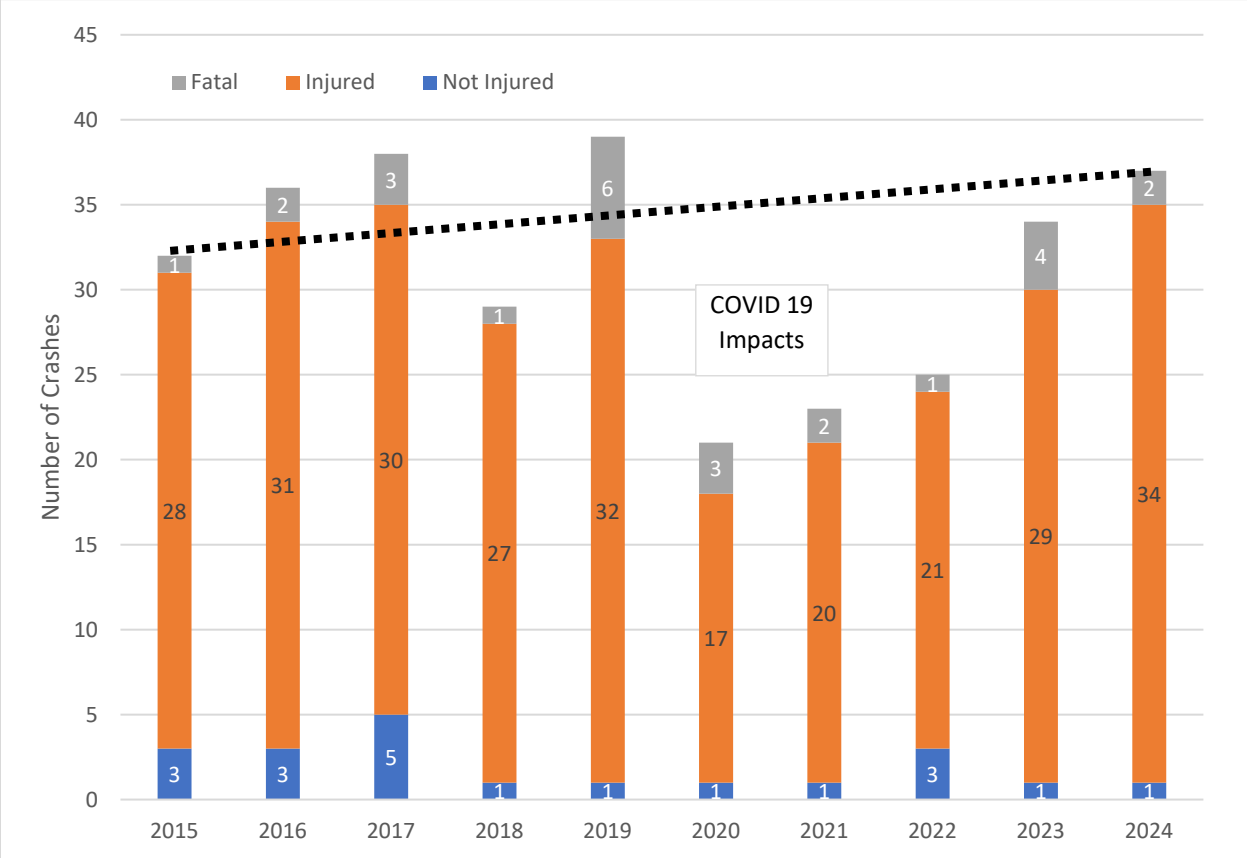



**Figure 3: Crashes involving pedestrians, by severity, in the City of Columbia (2015-2024)**

**Figure 4** shows the number of crashes, by age category, in the City of Columbia from 2015-2024. The figure shows that people under the age of 24 made up 39.2% of crashes involving pedestrians and people over the age of 65 made up 4.4% of the crashes.

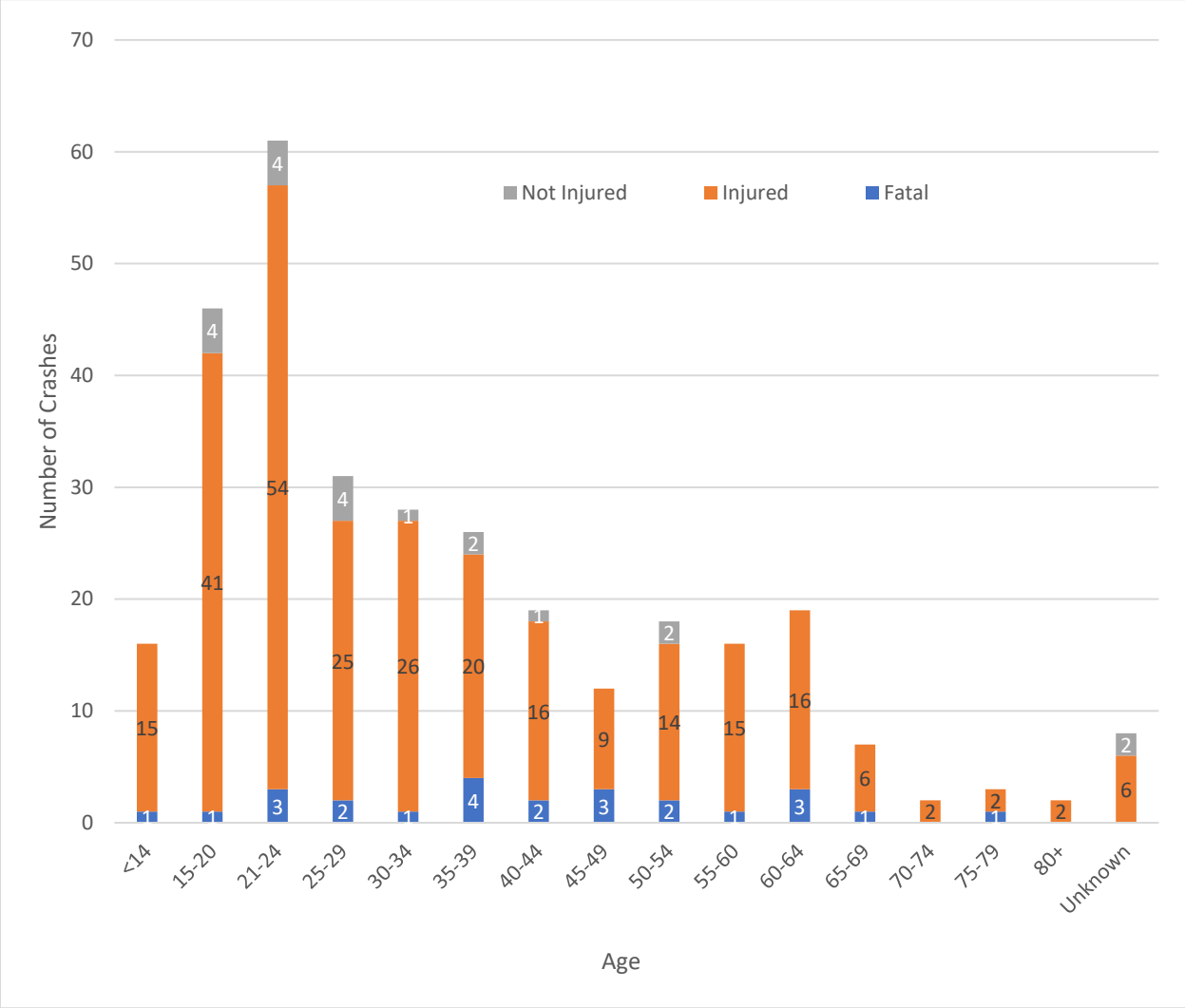



**Figure 4: Crashes involving pedestrians, by age range, in the City of Columbia (2015-2024)**

Approximately 40% of the City of Columbia's pedestrian fatalities occurred at intersections over the last 10 years. To have a larger dataset for pedestrian related crashes, the number of crashes involving pedestrians of any severity was grouped by intersection-related crashes and segment-related crashes is shown in **Figure 5**. Intersection-related crashes are crashes that occur at intersections and segment-related crashes are crashes that occur on road segments, between intersections. Overall, approximately 72% of the pedestrian involved crashes occurred at intersections, while only 28% occurred along segments.

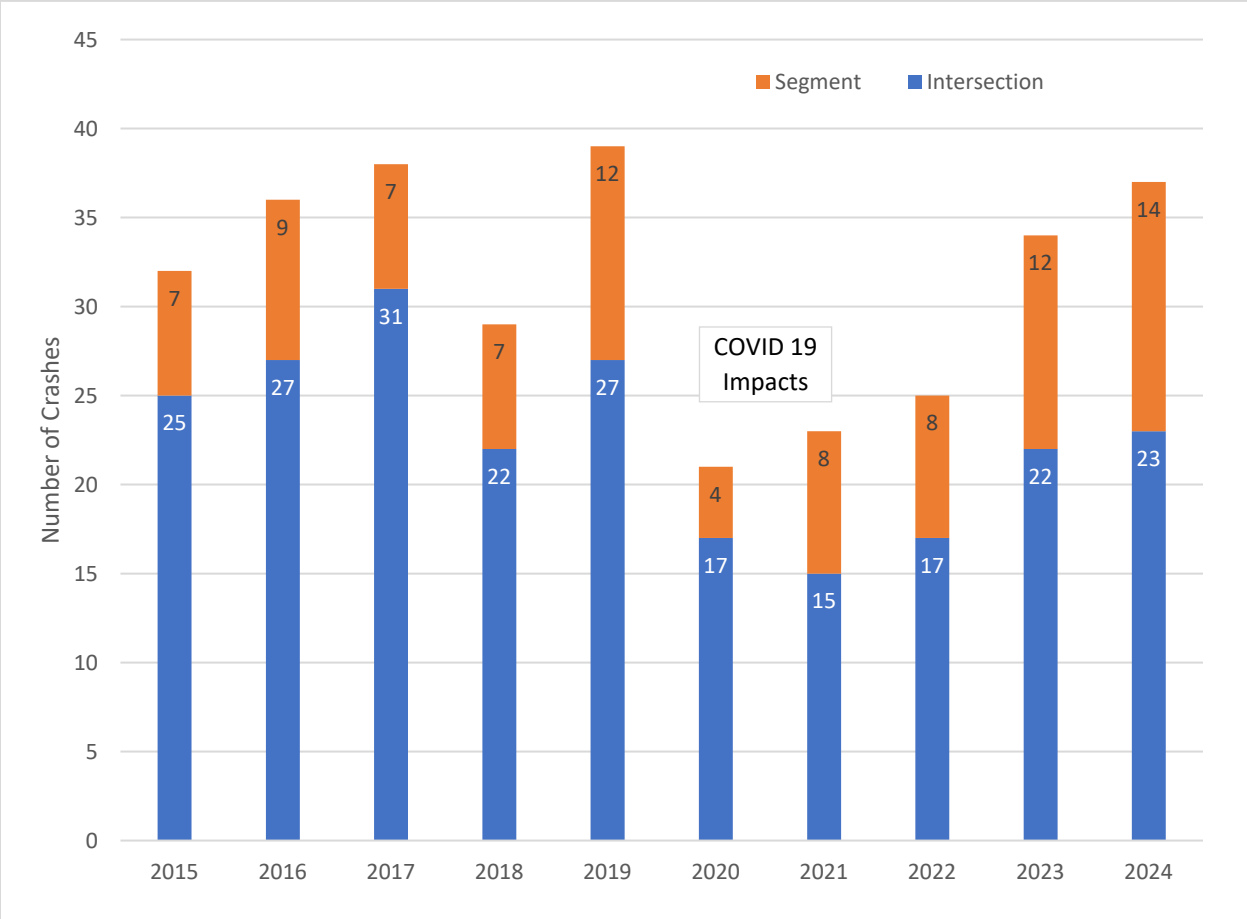



**Figure 5: All Crashes involving pedestrians, by location, in the City of Columbia (2015-2024)**

**Figure 6** documents the number of intersection-related crashes involving pedestrians in the City of Columbia as it relates to severity. Overall, 92% of crashes involving a pedestrian at an intersection resulted in an injury or fatality, while only 8% of the pedestrian related crashes at intersections did not involve an injury.

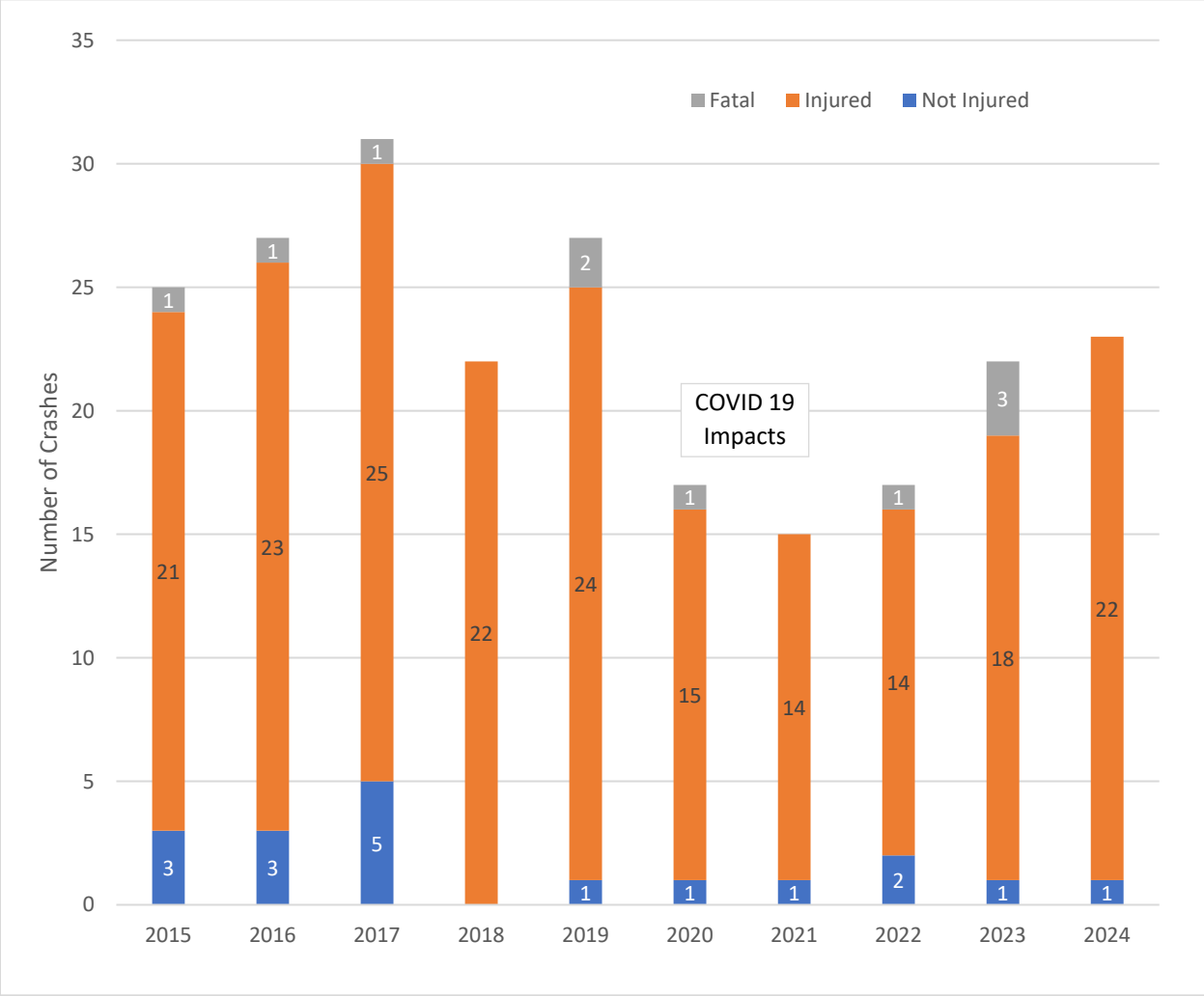



**Figure 6: Crashes involving pedestrians at intersections, by severity, in the City of Columbia (2015-2024)**

**Figure 7** documents the number of intersection-related crashes involving pedestrians in the City of Columbia as it relates to locations that have medians. Overall, 29.2% of crashes involving a pedestrian at an intersection were at intersections that had medians.

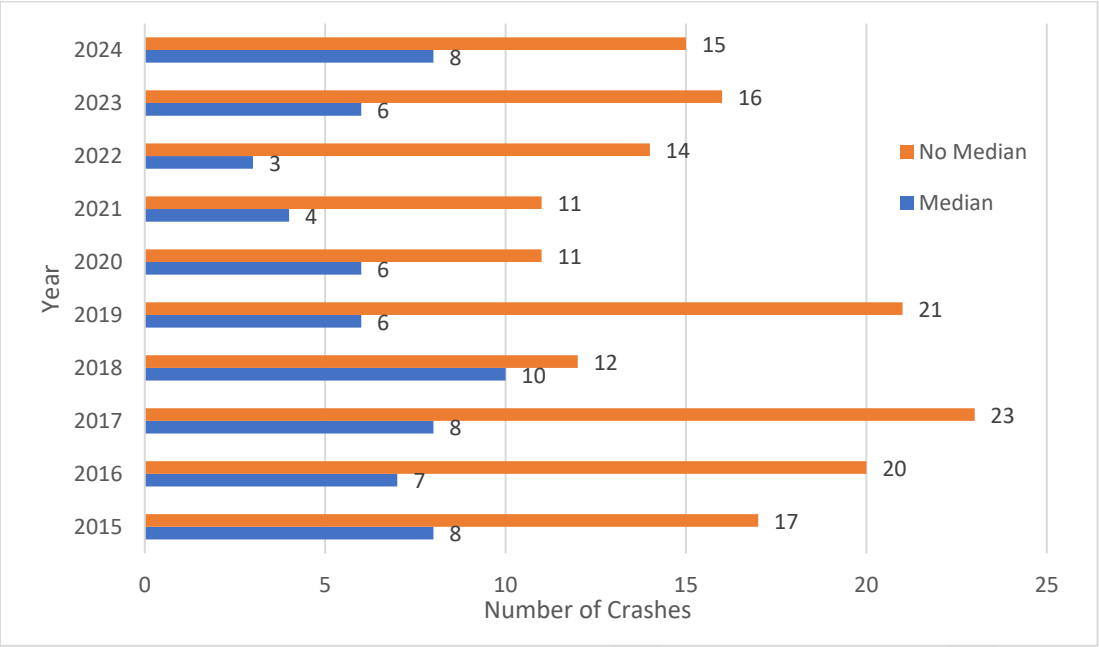



**Figure 7: Crashes involving pedestrians at intersections with medians, in the City of Columbia (2015-2024)**

When considering the pedestrian involved crashes at intersections, there are 15 intersections that had more than 3 pedestrian crashes in the past 10 years, 27 intersections that had 2 crashes and 114 intersections that had one pedestrian crash. **Table 1** below summarizes the 15 intersections that had 3 or more crashes and indicates the presence of medians.

**Table 1: Top Intersections with Pedestrian Involved Crashes (2015-2024)**

| Rank | Number of Pedestrian Involved Crashes | Presence of Medians | Location |
|---|---|---|---|
| 1 | 12 | Medians | College Avenue and University Avenue |
| 2 | 6 | Medians | College Avenue and Rollins Street |
| 3 | 5 | No Medians | Stadium Boulevard and Monk Drive/Champions Drive |
| 4 | 4 | Medians | Business Loop 70 and Providence Road (MO163) |
| 5 | 3 | Medians | Stadium Boulevard and Worley Street |
| | 3 | Medians | E. Broadway and Waugh Street |
| | 3 | No Medians | Hospital Drive and Hitt Street |
| | 3 | No Medians | S. Providence Road and E. Stewart Road |
| | 3 | No Medians | Rollins Street and Virginia Avenue |
| | 3 | No Medians | Hospital Drive and Monk Drive |
| | 3 | No Medians | E. Broadway and 9th Street |
| | 3 | No Medians | E. Broadway and 10th Street |
| | 3 | No Medians | Trimble Road and Brickton Road |
| | 3 | No Medians | S. Providence Road and Locust Street |
| | 3 | No Medians | University Avenue and Matthews Street |

**Driver Distractions**

With so many distractions on the road today, distracted driving is an important factor to evaluate. NHTSA has found that distracted driving caused 3,308 deaths in 2022, as well as 289,310 injuries[11]. The fatalities caused by distracted driving in 2022 is 8% of the total amount of fatalities nationwide. Distracted driving is defined as an action that diverts attention from driving. These distracted actions include anything that requires drivers to take their eyes off the road, take their hands off the wheel, or take their mind off driving[12]. Some common actions include texting, eating/drinking, using a navigation system, talking to someone in the vehicle, or anything that takes the driver's attention away from the task of driving.

Drivers interact with varying levels of stimuli that can lead to distraction and error. The Yerkes-Dodson Law explains how task performance peaks at a certain level of workload for every driver[13]. **Figure 8** shows a visual of the relationship between performance and workload as it relates to driving. The figure shows that drivers often underperform at low and high levels of workload. At low levels of workload, a driver may be bored or not have enough pressure to perform a task well. At high levels of workload, a driver may be experiencing too much pressure and stimuli to perform a task well. Optimal performance occurs in a middle range of workload when a driver is both alert and fairly calm. Distracted driving is shown in orange, to the right of the optimal performance range, which confirms the obvious – that distracted driving can cause drivers to make mistakes.

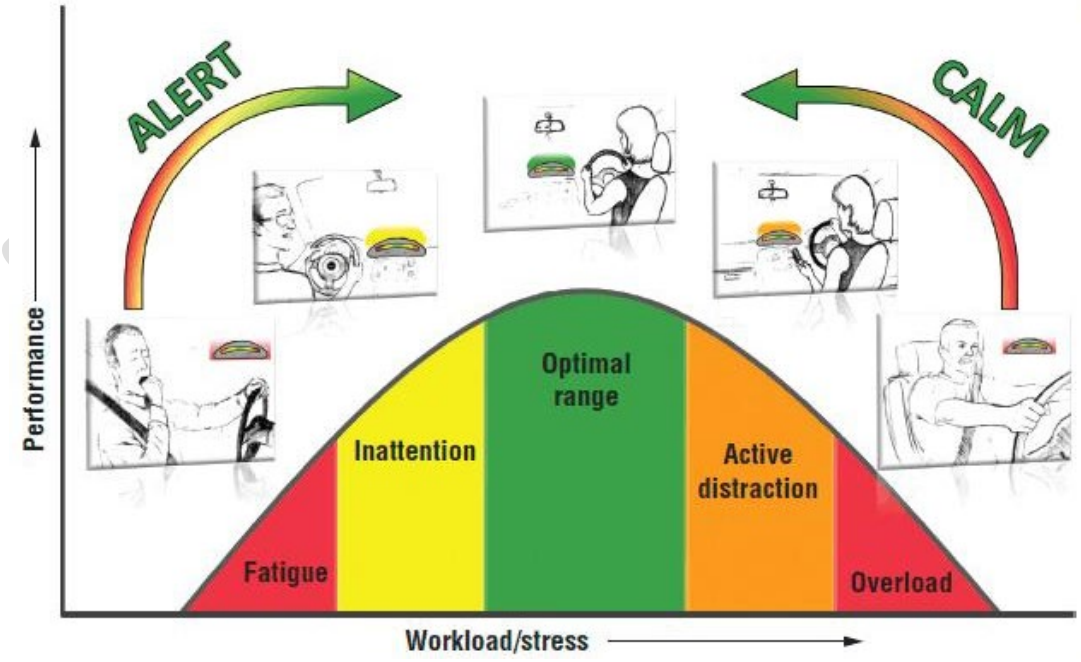



**Figure 8: Yerkes-Dodson Law of performance and stress**

[11] https://www.nhtsa.gov/risky-driving/distracted-driving
[12] https://www.cdc.gov/distracted-driving/about/
[13] https://www.linkedin.com/pulse/long-before-safety-distracted-driving-we-had-law-terry-penney

Described in more detail later in this report (Standards and Guidelines Section), roads are designed to optimize a driver's performance. Signs are placed according to the necessity of information a driver needs at the time. Signs are spaced so drivers have adequate time to perceive the information given on each sign. Information is often repeated in different forms with signs and pavement markings. Furthermore, drivers have an expectation as to what events will take place with each sign or pavement marking. If drivers see a pedestrian crossing warning sign, they are trained by experience to anticipate or expect a potential interaction with pedestrians.

Related to pedestrians, drivers expect pedestrians to be located in certain areas, including sidewalks and crosswalks. As discussed in this report, roadways and roadway traffic control devices are designed to inform drivers where interactions with pedestrians are likely to occur. If drivers interact with pedestrians outside of such designated areas (such as pedestrians in the medians waving signs, dancing in costumes to advertise for businesses, or entering the roadway to approach vehicles) it often leads to drivers being surprised or distracted which can result in driver error. Drivers not only work to perceive surrounding traffic control devices but also must pay attention to unexpected events. Erratic driver behavior caused by mis-located pedestrians on roadways can often be dangerous to both pedestrians and other road users.

## Organizations with Pedestrian Safety Initiatives

Pedestrian safety on roadways is an international concern. The efforts being undertaken by the City of Columbia to enhance pedestrian and motorist safety are a part of this larger national and global effort. One of the leading efforts to address traffic safety is the Vision Zero initiative. The Vision Zero initiative started in Sweden in 1997 and has since spread to many areas of the globe[14]. Vision Zero is a campaign that acknowledges that traffic-related fatalities and serious injuries are often preventable and works to eliminate both by establishing measurable strategies and accountability[15].

Improving pedestrian safety is a national and international priority to which several agencies and organizations are committed. A sample of prominent organizations working on this issue are discussed below.

### Vision Zero Network

The Vision Zero Network is a collaborative campaign with a goal of helping communities, solely in the U.S., to reach the Vision Zero objective[15]. The campaign started by launching a Vision Zero Focus Cities program in 2016. Ten cities were chosen to encourage the development of successful safety practices through collaboration and the sharing of data and ideas. The selected cities are Austin, Boston, Chicago, Fort Lauderdale, Los Angeles, New York, Portland, San Francisco, Seattle,

[14] https://safety.fhwa.dot.gov/tzd/
[15] http://visionzeronetwork.org/about/vision-zero-network/

and Washington, D.C. All cities have seen a significant reduction in fatal and serious injury crashes where they implemented safety practices with Vision Zero in mind[16].

**Federal Highway Administration (FHWA)**

The FHWA was founded in 1966; however, the organization's responsibilities were included in the Office of Road Inquiry, founded in 1893, which changed names several times over the years[17]. The FHWA mission is to improve safety and mobility on our nation's highways through national leadership, innovation and program delivery.

FHWA is working on similar efforts to Vision Zero, the Zero Deaths and Safe System initiative[18]. The Zero Deaths and Safe System initiative builds upon many of the same principles as Vision Zero, with an ambitious goal of eliminating traffic fatalities. The initiative involves knowing that humans make mistakes, and those mistakes can be mitigated through the design and management of roadways. The Safe Systems Approach is a guide to address roadway safety concerns and mitigate those risks. This approach is different from most since it focuses on mistakes from humans and their vulnerabilities. There are six principles, which include that "death and serious injuries are unacceptable, humans make mistakes, humans are vulnerable, responsibility is shared, safety is proactive, and redundancy is crucial". The five objectives of this approach are "safer people, safer roads, safer vehicles, safer speeds, and post-crash care"[19].

The FHWA is working to improve pedestrian safety and reduce pedestrian fatalities and injuries[20]. The administration produced the Safe Transportation for Every Pedestrian (STEP) initiative which promotes improvements in pedestrian crossing locations and crash reductions[21]. These improvements include road diets, pedestrian refuge islands, rectangular rapid flashing beacons, and more.

FHWA also has the Safe Streets and Roads for All (SS4A) Grant Program. This program is then carried out and enforced by state and local agencies, such as the Federal Highway Administration (FHWA) for state agencies and Metropolitan Planning Organizations (MPOs) for local agencies. These agencies are required by law to improve the safety for all road users, including pedestrians and bicyclists[22].

SS4A is a competitive grant program established under the Infrastructure Investment and Jobs Act, which provides five billion dollars in funds over the years 2022 to 2026. This grant program provides funds to support initiatives to prevent deaths and serious injuries that occur on roadways. Two types of grants can be funded, and they both revolve around action plans, which are the groundwork of SS4A. The planning and demonstration grants are used to create, finish,

[16] https://visionzeronetwork.org/where-we-invest-in-vision-zero-we-make-progress/
[17] https://www.fhwa.dot.gov/about/
[18] Zero Deaths and Safe System | FHWA
[19] What Is a Safe System Approach? | US Department of Transportation
[20] https://safety.fhwa.dot.gov/ped_bike/
[21] https://highways.dot.gov/safety/pedestrian-bicyclist/step
[22] Improving Safety for Walking, Biking, and Rolling | US Department of Transportation

or supplement an action plan. Implementation Grants are used to apply strategies that are part of an existing action plan.[23]

**Strategic Highway Safety Plan/Show-Me Zero**

The Missouri Coalition for Roadway Safety created a plan, in line with the Road to Zero initiative, to reduce fatalities and serious injuries on Missouri roads[24]. Formally called the Missouri Blueprint, the objective of the Strategic Highway Safety Plan or Show-Me Zero is to increase coordination, communication, and cooperation among state and local agencies, law enforcement, planning organizations, and other safety advocates in the state. The plan will serve Missouri from 2021-2025. The regional coalitions meet regularly to discuss concerns and review the countermeasures set in place to see how they can improve them further.

**Missouri Coalition for Roadway Safety**

The Missouri Coalition for Roadway Safety is an advocate group created in 2004 to develop the Strategic Highway Safety Plan[25]. The organization is made up of law enforcement, educators, emergency responders, and engineers, with a goal of creating safer roads in Missouri and reducing fatalities. The organization's website provides information about active campaigns, which includes a campaign for pedestrian safety awareness. This campaign provides information for drivers and pedestrians about road safety. The website also provides information on many driver safety topics, including bicycle and pedestrian safety tips.

**Missouri Bicycle and Pedestrian Federation**

The Missouri Bicycle and Pedestrian Federation is a statewide, non-profit organization that is working to improve the safety of the transportation network for bicycles and pedestrians. The organization was founded in 1994 and is working towards a reduction in crashes and fatalities and an increase in the number of walking and biking trips taken in Missouri. The organization promotes programs throughout the state that increase active transportation. One annual event includes meeting at the state capital and talking with legislators as well as biking along a planned route[26].

**National Highway Traffic Safety Administration (NHTSA)**

NHTSA is a government agency with a goal to "save lives, prevent injuries, and reduce economic costs due to road traffic crashes through education, research, safety standards, and enforcement."[27] The agency maintains a webpage specific to pedestrian safety that includes resources on safety tips, research on safety countermeasures, statistics on crashes, and much more.

[23] Safe Streets and Roads for All (SS4A) Grant Program | US Department of Transportation
[24] https://epg.modot.org/index.php?title=Category:907_Traffic_Safety
[25] https://savemolives.com/
[26] https://slcl.libguides.com/c.php?g=1382937&p=10230192
[27] https://www.nhtsa.gov/

**Federal Motor Carrier Safety Administration (FMCSA)**

The FMCSA is an agency formed in 2000 with a mission to prevent commercial vehicle fatalities and injuries[28]. This is approached through data analysis, enforcement, research and technology, and safety assistance. The agency provides safety information for pedestrians which includes safety tips and crash statistics. They also develop standards for testing and licensure for commercial vehicles.

**National Safety Council (NSC)**

The NSC works to eliminate preventable deaths through two strategic pillars: workplace and roadway[29]. The organization provides safety training, including workplace safety training and defensive driving training. Additionally, NCS leads the Road to Zero Coalition to eliminate traffic fatalities by 2050, as well as a number of initiatives to make the roads safer for you such as Check to Protect and the National Child Passenger Safety Board.

**Center for Disease Control and Prevention (CDC)**

The CDC works to protect the safety and security of Americans[30]. Part of this work involves responding to new health threats and promoting safe behaviors in communities and the environment.

**International Federation of Pedestrians (IFP)**

The International Federation of Pedestrians (IFP) is a network of non-profit organizations and individuals from around the world working for pedestrian safety[31]. The IFP's mission is to create a world that is safe and comfortable to walk in through promoting collaboration between members worldwide, formulating policy statements, working with international organizations, and bolstering local, national, and international initiatives. IFP's website provides links to many documents and sources, including WHO's Pedestrian Safety Manual.

**Association of Pedestrian and Bicycle Professionals (APBP)**

APBP was developed in 1994 at the ProBike Conference in Portland, Oregon. The organization works to create more walkable and bikeable places as a community of practitioners. The community shares its knowledge, support, and technical expertise to reach these goals[32].

**Recommendations from Safety-Conscious Agencies to Reduce Pedestrian Fatalities and Crashes**

Many of the foregoing organizations provide tips for pedestrians to reduce the risk of crashes. Many of these tips focus on driver awareness of the presence of pedestrians. Some of the more

[28] https://www.fmcsa.dot.gov/mission/about-us
[29] http://www.nsc.org/pages/home.aspx
[30] https://www.cdc.gov/
[31] http://pedestrians-int.org/en/
[32] https://www.apbp.org/about-apbp

pertinent and consistent recommendations are[33]:

- **Be predictable**. Follow the rules of the road and obey signs and signals.
- Walk on sidewalks whenever they are available.
- If there is no sidewalk, walk facing traffic and as far from traffic as possible.
- Keep alert at all times; don't be distracted by electronic devices that take your eyes (and ears) off the road.
- Cross streets at crosswalks or intersections or at pedestrian crossing facilities, such as pedestrian tunnels or bridges, whenever possible. This is where drivers expect pedestrians.
    - Look for cars in all directions – including those turning left or right.
    - At signalized intersections, follow "Walk" and "Don't Walk" signs and other traffic signals.
- If a crosswalk or intersection is not available, locate a well-lit area where you have the best view of traffic. Wait for a gap in traffic that allows you enough time to cross safely, and continue to watch for traffic as you cross.
- Never assume a driver sees you. Make eye contact with drivers as they approach you to make sure you are seen.
- Be visible at all times. Wear bright clothing during the day, and wear reflective materials or use a flashlight at night.
- Watch for cars entering or exiting driveways, or backing up in parking lots.
- Avoid alcohol and drugs when walking; they impair your abilities and judgment too.
- Be especially careful crossing multi-lane roads. The motorist in the first lane may stop for you, but motorist in other lanes ma not see you or may not realize then must stop. Check for traffic before moving across each lane.

## Standards and Guidelines

As discussed previously, reducing the number of pedestrian deaths and injuries is a major priority at all levels of government. Each time a pedestrian enters or is adjacent to the roadway, there is risk of contact with a vehicle. Because of these potential conflicts, great care is given to the design of intersections to manage these conflicts as safely as possible. Toward this end, guidelines and standards have been developed to address the safety of both pedestrians and motorists. This section first describes several of these manuals and guidelines followed by a short description of the relevance to pedestrians, organized by topic.

### Manuals and Guidebooks

*Manual on Uniform Traffic Control Devices (MUTCD)*

The MUTCD, published by the FHWA, provides standards for installing and maintaining traffic devices on all public streets, highways, bikeways, and private roads open to public travel. The

[33] NHTSA https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/811785.pdf
Missouri Bike Federation http://mobikefed.org/files/pedtips_pedlaws.pdf

MUTCD is the law that governs all traffic control devices which means that non-compliance can result in the loss of federal-aid funds.

The purpose of the MUTCD is to promote roadway safety and mobility to all road users by providing uniformity and effectiveness in the use of traffic control devices. The MUTCD dates back to as early as 1927 after the popularization of the automobile in the U.S. The MUTCD is available to download at http://mutcd.fhwa.dot.gov

An effective traffic control device should meet the five basic requirements outlined in the MUTCD:

- It should fulfill a need;
- Command attention;
- Convey clear, simple meaning;
- Command respect from road users; and
- Give adequate time for proper response.

Along with five basic requirements, the traffic control devices should also address four other factors: timing, expectancy, redundancy, and primacy.

***Timing*** is necessary to ensure necessary information is provided to a driver at a steady rate in order to lessen a driver's stress levels which, in turn, will minimize driver mistakes. For example, crosswalk warning signs are spaced out so a driver first perceives a pedestrian crosswalk warning sign and then sees the crosswalk alongside another crosswalk sign.

***Expectancy*** is related to creating expectation for drivers and notifying drivers when an event exceeds the "normal" driving events a driver is expecting. For example, an expectation has been established that pedestrians are often located in pedestrian facilities. The converse is also true, drivers do not necessarily expect to interact with pedestrians outside of pedestrian facilities.

***Redundancy*** means providing a driver with information in more than one form. For example, crosswalks are often marked with both signs and markings, per MUTCD standards.

Finally, ***primacy*** means communicating to a driver what piece of information is most important for a driver to perceive and react safely in an environment. For example, crosswalk warning signs are placed a distance ahead of crosswalks to alert drivers that they provide pertinent information.

*Americans with Disabilities Act (ADA)*

The Americans with Disabilities Act (ADA) became law in 1990[34]. This act prohibits certain types of discrimination and sets standards that ensure people with disabilities have the same opportunities as everyone else in everyday life. The ADA provides standards for accessible design

[34] https://www.ada.gov/ada_intro.htm

which are enforceable by Title II and Title III regulations[35]. These regulations can be found at http://www.ada.gov.

*A Policy on Geometric Design of Highways and Streets*

Published by AASHTO, *A Policy on Geometric Design of Highways and Streets*, otherwise known as the Green Book, provides guidance, design research, and best practices for highway and street design to highway engineers and designers.

*Roadside Design Guide*

The *Roadside Design Guide*, also published by AASHTO, provides roadside safety information and operating practices and is intended to be used as a resource document from which agencies can develop standards and practices[36].

*Guide for the Planning, Design, and Operation of Pedestrian Facilities*

AASHTO's *Guide for the Planning, Design, and Operation of Pedestrian Facilities*, provides a guide for planning and designing pedestrian facilities.

*Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*

Developed in 2010 by the Institute of Transportation Engineers (ITE) and the Congress for the New Urbanism, *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*, provides guidance to practitioners in planning and designing major urban thoroughfares for walkable communities. The objective of the guide is to enhance walkable communities by improving mobility choices and community character. Some of the topics in the guide include planning and developing context sensitive urban thoroughfares, travelway design guidelines, and intersection design guidelines.

*Urban Street Design Guide*

The *Urban Street Design Guide*, published by National Association of City Transportation Officials (NACTO), provides information on the design of city streets and public spaces[37]. The Urban Street Design Guide outlines three levels of guidance: critical features, recommended features, and optional features. Critical features are elements in which there is strong consensus of necessity, recommended features are elements in which there is a strong consensus of added value, and optional features are elements that may vary across cities and may add value, depending on the situation.

**Standards and Guidelines**

The above references are intended to provide standards and guidelines for roadway design which include pedestrian safety and pedestrian facilities. The MUTCD provides a standardization of traffic devices that aligns with the five basic requirements discussed previously. The

[35] Title II regulations are the Department of Justice regulations that implement the ADA for state and local governments. Title III are the Department of Justice regulations that implement the ADA for businesses and non-profit service providers.
[36] AASHTO Store: Browse Transportation Publications and Online Training
[37] https://nacto.org/publication/urban-street-design-guide/

standardization of all the design elements related to a roadway is important to enhance public safety, not only for pedestrians, but for all roadway users. Standardization enhances expectancy among road users which, in turn, promotes safety. The following guidelines relate to pedestrians:

*Roadway Design*

Intersection Design (Roadside Design Guide): Crashes at intersections often occur between vehicles; however, intersection crashes in which vehicles hit roadside objects also are common[38]. In some cases, a crash occurs because a driver attempts to avoid hitting another vehicle, but single vehicle crashes also occur frequently at intersection locations. Collisions can occur because of the presence of objects or persons in the roadway that are not noticeable by drivers. Roadside object placement strategies at intersections, therefore, can be addressed as follows:

- For intersection channelization islands, the island design should adhere to the criteria in AASHTO's *A Policy on Geometric Design of Highways and Streets*. The island should be sufficiently designed so it is conspicuous to approaching drivers while not encroaching on vehicle paths. Because of the frequency of collisions at these locations (channelization islands are prone to being struck by errant vehicles), placing rigid objects at either the corner island or the median nose should be avoided when possible. Unless specifically designed for pedestrian use, it should not be assumed that channelizing islands are safe spaces for pedestrian use.
- Often a turning vehicle does not successfully navigate the designated turn path and strays onto the adjacent curb return or shoulder. This situation often occurs for truck-turning movements. A target lateral offset value for the intersection return should be 6 feet for curbed facilities with a minimum value of 3 feet. Unless specifically designed and designated as pedestrian areas, it should not be assumed that areas adjacent to the roadway are safe for pedestrian use.

(Guide for the Planning, Design, and Operation of Pedestrian Facilities): Intersections are often the best and most direct place for pedestrians to cross a roadway and are the most common and expected pedestrian crossing locations[39]. Some of the attributes associated with good intersection crossing design include:

- Clarity: It should be obvious to motorists that there will be pedestrians present; it should be obvious to pedestrians where crossing should occur.
- Predictability: The placement of crosswalks should be predictable. Additionally, the frequency of crossings should increase where pedestrian volumes are greater.
- Visibility: The location and illumination of the crosswalk allows pedestrians to see and be seen by approaching traffic while crossing.
- Short Wait: Pedestrians ideally should not have to wait an unreasonably long period of time for an opportunity to cross.

[38] Roadside Design Guide 10.1.3.4
[39] Guide for the Planning, Design, and Operation of Pedestrian Facilities, Section 3.3

- Adequate Crossing Time: The time available for crossing accommodates users of all abilities.
- Limited Exposure: Conflict points with traffic are few, and the distance to cross is short or is divided into shorter segments with crossing islands when appropriate.
- Clear Crossing: The crosswalk is free of barriers, obstacles, and hazards and is accessible to all users.

Visibility and Sight Distance (Urban Street Design Guide): Visibility and sight distance are parameters central to the inherent safety of intersections, driveways, and other conflict points. Intersection design should facilitate eye contact between street users, ensuring that motorists, bicyclists, pedestrians, and transit vehicles intuitively interpret intersections as spaces involving other types of users[40].

Speed Management (Guide for the Planning, Design, and Operation of Pedestrian Facilities): Studies have indicated that in a vehicle-pedestrian crash, the faster a motorist is traveling, the greater the risk that injuries to a pedestrian will result in death. Reduced speeds provide more opportunity for pedestrians and motorists to see and react to one another in a safe manner[41]. (Urban Street Design Guide) Lower design speeds reduce observed speeding behavior, providing a safer place for people to walk, park, and drive[42]. **Figure 9** depicts differences in driver peripheral vision, stopping distance, and crash risk at different speeds. As a driver's speed increases, the driver's peripheral vision narrows, making it less likely for a driver to spot pedestrians. Greater speeds also increase stopping distance and crash risk. Stopping distance is the distance it takes for a driver to realize that he/she needs to brake and stop the vehicle.



[40] Urban Street Design Guide, page 121
[41] Guide for the Planning, Design, and Operation of Pedestrian Facilities, Section 3.1.1
[42] Urban Street Design Guide, page 140

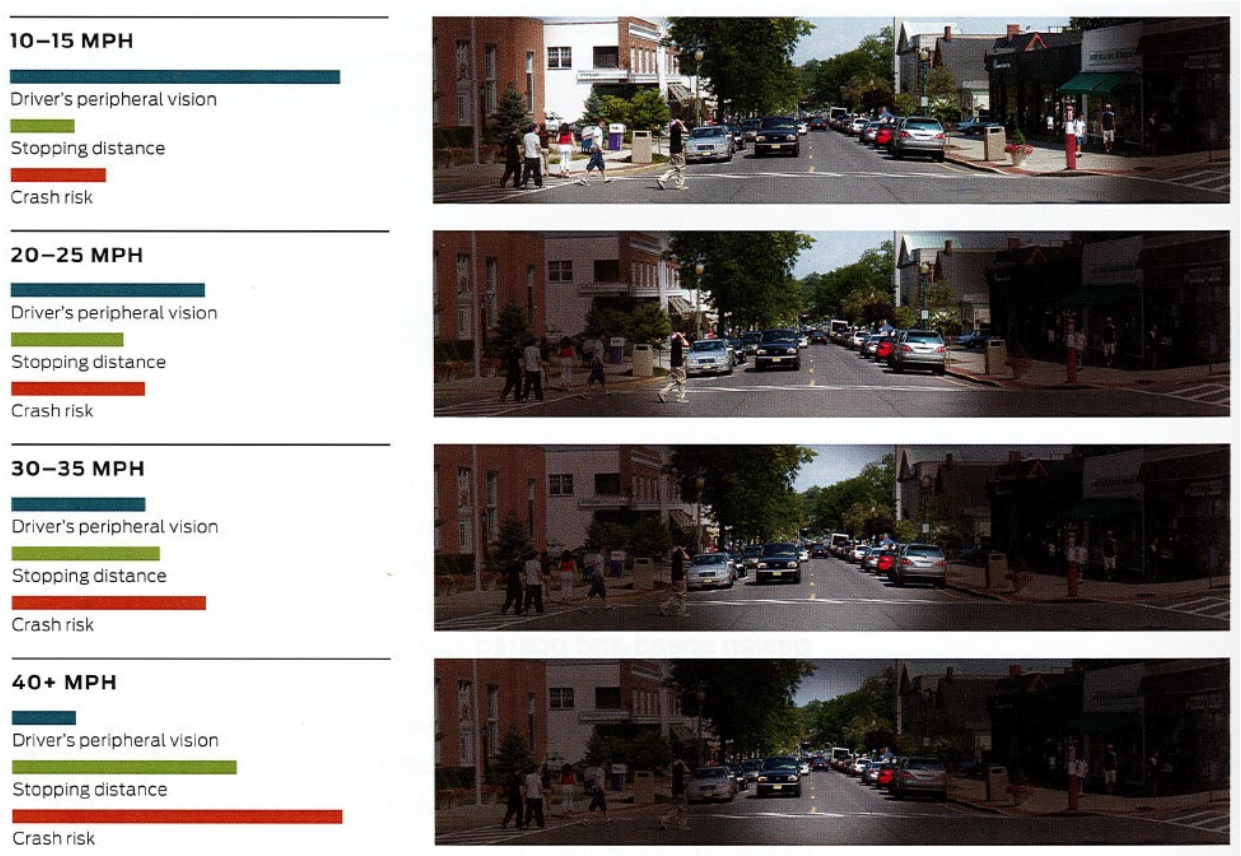



**Figure 9: Levels of driver peripheral vision, stopping distance, and crash risk with different speeds**

*Lateral Clearance*

Lateral Offset (MUTCD): The minimum lateral offset is intended to keep vehicles that use the shoulders from striking the signs or supports along the sides of the travelway. The MUTCD states, "On conventional, low-volume rural, and special-purpose roads in areas where it is impractical to locate a sign with the lateral offset prescribed by this Section because of roadside features such as terrain or vegetation, a lateral offset of at least 2 feet may be used" and "a lateral offset of at least 1 foot from the face of the curb may be used in business, commercial, or residential areas where sidewalk width is limited or where existing poles are close to the curb."[43] Anywhere within this lateral offset is an undesirable place for pedestrians to stand because pedestrians could get hit. The MUTCD also guides that objects or signs should not protrude into the usable width of a sidewalk or other pedestrian facility. **Exhibit 1** (see Appendix) shows examples of lateral distances along roadways and at intersections.

(Green Book) In Chapter 6, this authority specifies that all streets should seek to provide a minimum lateral offset of 1.5 feet along roadways. At intersections, a three (3) foot lateral offset should be provided when practical.

[43] MUTCD Section 2A.16

(Roadside Design Guide): Where curb is used, the lateral offset is measured from the face of the curb. A minimum of 1.5 feet should be provided from the face of the curb with 3 feet at intersections[44]. This offset provides sufficient clearance to keep the overhang of a truck from striking a person or an object.

(Roadside Design Guide): Historically, the lateral distance value (referred to as an operational offset) of 1.5 feet has been considered a minimum lateral distance for placing the edge of objects from the curb face[45]. This minimum lateral offset was never intended to represent an acceptable safety design criteria, though sometimes it has been misinterpreted as such. Research has shown that in an urban environment, approximately 80 percent of roadside crashes involved an object with a lateral offset from the curb face equal to or less than 4 feet and more than 90 percent of urban roadside crashes have a lateral offset less than or equal to 6 feet. This area is not a safe location for pedestrians to stand because of the risk of getting hit by an errant vehicle.

*Pedestrian Facilities*

It is evident from the literature that great care is taken in defining, designating, and delineating pedestrian areas in and adjacent to roadways. One reason such care is taken is to ensure that it is clear to both pedestrians and motorists precisely where pedestrian space is located, and that motorists know where to expect to encounter and safely react to pedestrians.

Types of Pedestrian Facilities (Guide for the Planning, Design, and Operation of Pedestrian Facilities): Pedestrian facilities include sidewalks, off-road paths, shared-use paths, and shared streets. Off-road paths are generally set back from the road and separated by a green area, ditch, swale, or trees. Shared-use paths are off-road paths developed for use by both pedestrians and bicyclists. Shared streets are streets shared by pedestrians and low speed vehicles.

*Sidewalks*

Sidewalk Definition (MUTCD): That portion of a street between the curb line, or the lateral line of a roadway, and the adjacent property line or on easements of private property that is paved or improved and intended for use by pedestrians[46].

Sidewalk widths (Guide for the Planning, Design, and Operation of Pedestrian Facilities): The minimum clear width for a sidewalk is 4 feet, not including any attached curb[47]. Where sidewalks are less than 5 feet in width, passing spaces at least 5 feet in width should be provided at reasonable intervals. This width is needed for wheelchair users to pass one another or to turn around. There are many locations where clear sidewalk widths greater than the minimum are desirable. Along arterials not in the central business district, sidewalk widths of 6 to 8 feet are desirable where a planting strip is provided between the sidewalk and the curb, and sidewalk widths of 8 to 10 feet are desirable where the sidewalk is flush against the curb.

[44] Roadside Design Guide 10.0
[45] Roadside Design Guide 10.1.3.1
[46] MUTCD Section 1C.02
[47] Guide for the Planning, Design, and Operation of Pedestrian Facilities, Section 3.2

(Urban Street Design Guide) Sidewalks have a desired minimum through zone of 6 feet and an absolute minimum of 5 feet. Where a sidewalk is directly adjacent to moving traffic, the desired minimum is 8 feet, providing a minimum 2-foot buffer for street furniture and utilities[48].

*Crosswalks and Signage*

Crosswalks are locations where pedestrian pathways cross motorist pathways. As shown in the sections below, these locations require a high degree of care in their physical design and regulation to ensure drivers know where to expect pedestrians.

Crosswalk Definition (MUTCD): (a) that part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the roadway measured from the curbs or in the absence of curbs, from the edges of the traversable roadway, and in the absence of a sidewalk on one side of the roadway, the part of a roadway included within the extension of the lateral lines of the sidewalk at right angles to the centerline; (b) any portion of a roadway at an intersection or elsewhere distinctly indicated as a pedestrian crossing by pavement marking lines on the surface, which are sometimes supplemented by contrasting pavement texture, style or color[49].

Signing and Striping (MUTCD): Crosswalk markings provide guidance for pedestrians who are crossing roadways by defining and delineating paths on approaches to and within signalized intersections, and on approaches to other intersections where traffic stops[50]. In conjunction with signs and other measures, crosswalk markings help to alert road users of a designated pedestrian crossing point across roadways at locations that are not controlled by traffic control signals or STOP or YIELD signs. At non-intersection locations, crosswalk markings legally establish the crosswalk. Because non-intersection pedestrian crossings are generally unexpected by driver, it is recommended that warning signs be installed for crosswalks at non-intersection locations and parking prohibitions should be considered[51].

Standardization of Location (MUTCD): The MUTCD guides, "in urban areas where crosswalks exist, signs should not be placed within 4 feet in advance of the crosswalk."[52]

Sign Colors (MUTCD): Fluorescent yellow-green – pedestrian warning, bicycle warning, playground warning, school bus stop warning, and school warning[53]. **Figure 10** shows some examples of pedestrian signs. The sign on the left is a pedestrian crossing warning sign (W11-2), the sign in the center is "Yield Here to Peds" (R1-5), and the sign on the right is an in-street pedestrian crossing sign (R1-6).

[48] Urban Street Design Guide, page 40
[49] MUTCD Section 1C.02
[50] MUTCD Section 3C.01
[51] MUTCD Section 3C.01
[52] MUTCD Section 2A.13
[53] MUTCD Section 1D.05


**Figure 10: Pedestrian signs**

The critical objective of pedestrian safety results in assignment of a dedicated sign color.

Pedestrian-Related Signage (Guide for the Planning, Design, and Operation of Pedestrian Facilities): Signage is governed by the MUTCD, which provides specifications on the design and placement of traffic control signs installed within the public right-of-way[54].

Pedestrian Crossing Sign (Guide for the Planning, Design, and Operation of Pedestrian Facilities): The pedestrian crossing sign (W11-2) serves two functions: to provide advance warning to motorists of possible pedestrian conflicts, and at a crosswalk, to advise motorists of the potential that pedestrians may be attempting to cross.

Visibility at Crossings and Along School Walk Routes (Guide for the Planning, Design, and Operation of Pedestrian Facilities): Because children are smaller than adults, motorists may have more difficulty seeing them at street crossings[55]. Extra care is necessary in the vicinity of schools to ensure that utility poles, traffic control devices, mailboxes, landscaping, and other street furniture do not inhibit motorists' ability to see children.

Marked Crosswalks (Guide for the Planning, Design, and Operation of Pedestrian Facilities): Marked crosswalks alone should not be installed within an uncontrolled environment when speeds are greater than 40 mph[56]. Research indicates that where crosswalk markings are used at uncontrolled crossing locations along multilane roads (i.e., roads with four or more lanes) on which traffic volumes exceed approximately 12,000 vehicles per day with no raised medians, or exceed 15,000 vehicles per day with raised medians that could serve as crossing islands, the potential for motor vehicle-pedestrian crashes increases.

Crosswalk Design (Guide for the Planning, Design, and Operation of Pedestrian Facilities): The width for marked crosswalks should not be less than 6 feet. In the central business districts of larger cities, a 10 foot or wider crosswalk may be more appropriate, as determined by an engineering study.

[54] Guide for the Planning, Design, and Operation of Pedestrian Facilities, Section 4.2
[55] Guide for the Planning, Design, and Operation of Pedestrian Facilities, Section 2.5.3
[56] Guide for the Planning, Design, and Operation of Pedestrian Facilities, Section 3.3.4

If used, diagonal or longitudinal lines should be 1 to 2 feet wide and spaced 1 to 5 feet apart. The placement of lines for diagonal and longitudinal markings should avoid wheel paths, and line spacing should not exceed 2.5 times the width. Transverse crosswalk line markings consist of solid lines not less than 6 inches wide nor greater than 2 feet wide. All crosswalk markings should be white, per the MUTCD.

Midblock Crossings (Guide for the Planning, Design, and Operation of Pedestrian Facilities): Designated midblock crossings are located according to a number of factors including pedestrian volume, traffic volume, roadway width, traffic speed and type, desired paths for pedestrians, and adjacent land use. Designated midblock crossings should not be installed where sight distance or sight lines are limited for either the motorist or pedestrian. In most cases, marked crosswalks alone should not be installed within an uncontrolled environment when speeds are greater than 40 mph. Under certain conditions, marked crosswalks may be used to supplement an existing or new traffic control feature. Research indicates that where crosswalk markings are used at uncontrolled crossing locations along multilane roads (i.e., roads with four or more lanes) on which traffic volumes exceed approximately 12,000 vehicles per day with no raised medians, or exceed 15,000 vehicles per day with raised medians that could serve as crossing islands, the potential for motor vehicle-pedestrian crashes increases.

(Urban Street Design Guide) On streets with higher volume (>3,000 ADT), higher speeds, or more lanes (2+), crosswalks are ideal at intersections[57].

Urban Street Design Guide recommends that communities stripe crosswalks as wide, if not wider, than the walkway they connect to. An advanced stop bar should be located at least eight (8) feet in advance of the crosswalk to reinforce yielding to pedestrians[58].

*Medians*

Pedestrian Islands and Medians (MUTCD): Raised islands or medians of sufficient width that are placed in the center area of a street or highway can serve as a place of temporary refuge for pedestrians who are attempting to cross at a midblock or intersection location. Center islands or medians allow pedestrians to find an adequate gap in one direction of traffic at a time as the pedestrians are able to stop, if necessary, in the center island or median area and wait for an adequate gap in the other direction of traffic before continuing to cross the second half of the street or highway. The minimum widths for accessible refuge islands and for design and placement of detectable warning surfaces are provided in the Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)[59]. Refuge islands are protected locations placed in the center of streets to facilitate bicycle and pedestrian crossings. These islands are cut into center medians so they remain level with the roadway.

[57] Urban Street Design Guide, page 110
[58] Urban Street Design Guide, page 113
[59] MUTCD Section 3C.12

(ADA) The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG) states, "Any raised islands in crossings shall be cut through level with the street or have curb ramps at both sides and a level area at least 48 inches long between the curb ramps in the part of the island intersected by the crossings."[60] It should be noted that the four (4) foot minimum does not include the width of the curbs. **Figure 11** is a cut through at an island.

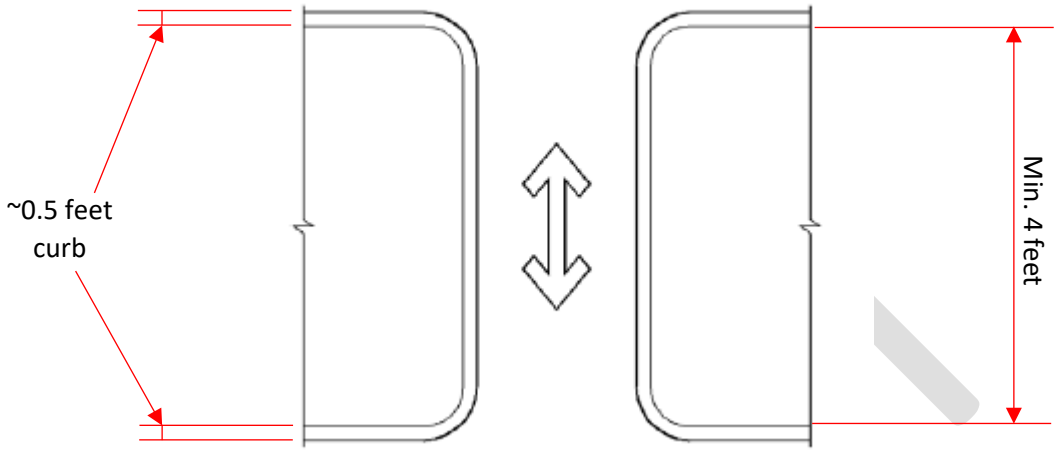



**Figure 11: Island cut through[61]**

ADA regulations define a path of travel as "a continuous, unobstructed way of pedestrian passage by means of which the altered area may be approached, entered, and exited, and which connects the altered area with an exterior approach (including sidewalks, streets, and parking areas)…"

The ADA also specifies that "newly constructed or altered streets, roads, and highways must contain curb ramps or other sloped areas at any intersection having curbs or other barriers to entry from a street level pedestrian walkway" and that "newly constructed or altered street level pedestrian walkways must contain curb ramps or other sloped areas at intersections to streets, roads, or highways."

(Green Book) The Green Book suggests that a pass through median refuge for pedestrians and bicyclists should ideally be at minimum six (6) feet wide[62]. Medians less than six feet wide can provide passage but should not be utilized for refuge. Pedestrians are only allowed to pass directly through medians less than six feet wide. For example, a crosswalk and cut through median less than six feet wide may be used by pedestrians; however, pedestrians should not be

[60] https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/background/adaag#4.7
[61] https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/ada-standards/chapter-4-accessible-routes
[62] A Policy on Geometric Design of Highways and Streets Section 4.17.3

allowed to use the insufficiently wide median for temporary refuge from traffic. A minimum width of five feet should be provided for median and island cut-throughs. Utilizing these guidelines, a minimum center island width of six feet allows for 1.5 foot lateral clearance on each side of the center median and simultaneously provides a three (3) foot wide area in the middle of the center median for temporary refuge by pedestrians.

Any median less than 6 feet wide should not be used for a pedestrian refuge or pass through.

(Roadside Design Guide) The separation of traffic movements by using a raised median or turning island often is referred to as channelization[63]. A flush or traversable median or island is considered part of the roadway. A raised median or raised island is considered part of the roadside and, accordingly, the suggested minimum lateral offset of 1.5 foot minimum along the road and 3 feet at intersections would still apply.

(Guide for the Planning, Design, and Operation of Pedestrian Facilities): The width of the median or crossing island is determined by the expected pedestrian or bicycle use of the crossing and the traffic characteristics of the street to be crossed[64]. A relatively narrow median may be acceptable in areas without pedestrian activity and low traffic volumes and speeds. When pedestrian volumes are present and traffic volumes and speeds are higher, a wider crossing island may be appropriate.

The width of a newly-constructed crossing island should be six feet or more to provide space for a wheelchair user or more than one pedestrian to wait, and so that the pedestrian storage area is separated from the face of the curb. Island size can be increased based on anticipated pedestrian storage area and crosswalk level of service criteria. Existing four-foot medians may be retained, but medians should be widened to 6 feet or more in reconstruction projects.

(Urban Street Design Guide) Pedestrian islands ideally should be a minimum of six feet wide, but are preferred, when practicable, to be eight to 10 feet wide. Where a six foot wide median is not practical or feasible, a narrower median is still preferable to nothing. The minimum protected width is six feet, based on the length of a bicycle or a person pushing a stroller. Ideally such areas should be 40 feet long[65]. It is preferable to have crosswalks cut through medians. Where the median is wider than 17 feet, ramps are preferred.

*Pedestrians*

The Green Book suggests certain measures to safeguard pedestrians and road users, regardless of age[66]. Some of these measures include:

- Use simple designs that minimize crossing widths and minimize the use of more complex elements such as channelization and separate turning lanes. Where these features are appropriate, consider alternative designs, such as 11-foot lane widths.

[63] Roadside Design Guide 10.2.1.3
[64] Guide for the Planning, Design, and Operation of Pedestrian Facilities, Section 3.3
[65] Urban Street Design Guide, page 116
[66] A Policy on Geometric Design of Highways and Streets Section 2.6.2

- Assume lower walking speeds.
- Provide lighting and reduce or eliminate glare souces at locations that demand multiple information gathering and processing.
- Consider advance warnings or guide signs for situations that could surprise drivers or pedestrians or increase their crash frequencies.
- Consider increasing sign letter size and retroreflectivity to accommodate individuals with impaired visual acuity.
- Provide enhanced markings and delineation.
- Use repetitions and redundancy in design and signage.

Other Programs to Increase Pedestrian Safety (Guide for the Planning, Design, and Operation of Pedestrian Facilities): Education programs targeted at motorists and pedestrians are an important part of a comprehensive pedestrian strategy[67]. Law enforcement departments can take a leading role in improving public awareness of existing traffic laws and ordinances for motorists (e.g., obeying speed limits, yielding to pedestrians when turning, traffic signal compliance, and obeying drunk driving laws) and pedestrians (e.g., crossing the street only at legal crossings, not lingering in or near roadways and/or medians longer than is necessary to directly cross the street, and obeying pedestrian signals).

The MUTCD, Green Book, *Roadside Design Guide*, Americans with Disabilities Act, *Urban Street Design Guide*, and *Guide for the Planning, Design, and Operation of Pedestrian Facilities* all provide standards and/or guidelines for pedestrians and pedestrian facilities. Some of these specifications include defining the width of a median for use by pedestrians (six-foot minimum) and a lateral clearance between the curb face and roadside objects (1.5-foot minimum) which applies to medians, as well. The guidelines and standards in this section have all been designed to improve the safety of pedestrians.

## Pedestrians in the Roadway Outside of Marked Areas

Special events and roadway maintenance/construction sometimes result in people in the roadway, outside of marked pedestrian facilities (crosswalks, sidewalks, etc.), and this type of activity implicates special traffic control and road closure issues. In the case of construction within the roadway, temporary work zones are created to protect workers and pedestrians. Road closures occasionally occur for special events like parades or races. In these cases, special care is given to either close the roadway to motorists or alert motorists to look out for pedestrians that could be in or adjacent to the roadway in undesignated areas. In cases where roadways are left open, special training and high-visibility clothing are often required for pedestrians allowed in areas not otherwise designated for pedestrian use.

**MUTCD on Temporary Traffic Control**

General Standard: Addressing the needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, or on private roads open to public travel, including persons with

[67] Guide for the Planning, Design, and Operation of Pedestrian Facilities, Section 2.7

disabilities in accordance with the American with Disabilities Act of 1990, Title II, Paragraph 35.13) through a temporary traffic control zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents[68].

The safety of workers performing the many varied tasks within the work space is equally important. Temporary traffic control zones present constantly changing conditions that are unexpected by other road users. This creates an even higher degree of vulnerability for workers and incident management responders on or near the roadway.

Each person whose actions affect temporary traffic control zone safety, from the upper-level management through the field workers, receives training appropriate to the job decisions each individual is required to make[69].

Worker safety considerations: The safety of workers in relation to road users traveling through temporary traffic control zone is another important area of concern[70]. Temporary traffic control zones present temporary and constantly changing conditions that are unexpected by road users. This creates an even higher degree of vulnerability for workers on or near the roadway. It is recommended that all workers are trained on how to work next to moving vehicles to reduce their vulnerability. Temporary traffic barriers should be placed alongside work space and reduce the speed of adjacent moving traffic where practicable.

All persons within the right-of-way, who are exposed either to traffic or to work vehicles and construction equipment within the temporary traffic control zone shall wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107-2015 publication entitled "American National Standard for High-Visibility Safety Apparel and Headwear," or equivalent revisions, and labeled as meeting the ANSI 107-2006 standard performance for Class 2 or 3 risk exposure.

Qualifications for flaggers: Because flaggers are responsible for public safety and make the greatest number of contacts with the public of all highway workers, they should be trained in safe traffic control practices and public contact techniques[71]. Flaggers should meet qualifications described by the MUTCD, including the ability to recognize dangerous traffic situations and warn workers in sufficient time to avoid injury.

High-visibility safety apparel: For daytime and nighttime activity, it is recommended that flaggers wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107-2015 publication entitled "American National Standard for High-Visibility Apparel and Headwear"[72].

[68] MUTCD Section 6A.01, page 765
[69] MUTCD Section 6A.02, page 767
[70] MUTCD Section 6C.04, page 781
[71] MUTCD Section 6D.01, page 783
[72] MUTCD Section 6C.05, page 782

The high visibility clothing is required so drivers are better positioned to more quickly identify persons outside of a particular pedestrian facility. Temporary traffic barriers, along with temporary signage, alert drivers that there is work ahead that is within or adjacent to the street. Barriers also warn drivers that workers are located outside of traditional pedestrian facilities.

**Occupational Safety and Health Administration (OSHA)**

OSHA, created by the Occupational Safety and Health Act of 1970, is charged with protecting worker health and safety on the job by enforcing standards and providing training, outreach, education, and assistance[73]. In the case of work zones in or near the roadway, OSHA provides guidelines in areas such as safety apparel, construction areas, and traffic control devices. The MUTCD is referenced for all traffic control requirements for road closures or work zones.

OSHA provides materials that describe best practices in placing temporary traffic control devices, as well as safe practices for the workers[74]. These practices generally refer to the guidelines in Chapter 6 of the MUTCD that is summarized in the previous section.

**International Municipal Signal Association (IMSA)**

IMSA has been active since October 1896 and has developed work zone safety seminars and certifications for those involved in the field of traffic control[75]. Certification is provided in areas such as roadway lighting, signs and markings, traffic signals, and work zone traffic control safety. IMSA published the Flagging and Basic Traffic Control manual which was developed to enhance flagger knowledge to promote work zone safety.

**Regulations**

NHTSA developed several model pedestrian ordinances with the goal of reducing pedestrian crashes. These model ordinances are included to show that pedestrian safety is an important enough issue that NHTSA invested time into developing potential ordinances for jurisdictions to adopt. The City of Columbia has adopted the multiple vehicle-overtaking ordinance, the parking near intersections or crosswalks ordinance, and the school bus ordinance.

School bus ordinance: In the case of school buses, drivers are required to stop behind a school bus when the school bus stops and uses its red flashing lights or its extended stop arm. The regulation was developed by NHTSA to protect children entering and exiting school buses. On two-lane roads, drivers travelling in both directions are required to stop, while on a multi-lane road, only drivers travelling in the same direction as the bus are required to stop[76]. This regulation has been implemented to protect children who walk into the roadway after stepping off the bus.

[73] https://www.osha.gov/about.html
[74] https://www.osha.gov/dte/grant_materials/fy10/sh-21004-10/wztc_refguide.pdf
[75] http://www.imsasafety.org/history.htm
[76] https://www.nhtsa.gov/road-safety/school-buses

Different variations of the school bus ordinance have been adopted in states across the U.S. The City of Columbia has enacted a version of this ordinance[77].

Multiple vehicle-overtaking ordinance: One type of crash occurs when pedestrians step into traffic, often in a crosswalk, in front of a stopped vehicle and then into the adjacent lane without looking for oncoming vehicles and are struck by the oncoming vehicle[78]. This ordinance requires drivers to yield to pedestrians in a crosswalk and to stop before passing a vehicle stopped at a crosswalk. The City of Columbia has adopted this ordinance[79].

Parking near intersections or crosswalks ordinance: The model ordinance states that vehicles should not park within 50 feet of a marked crosswalk or within 60 feet of a marked crosswalk at an intersection[78]. The goal is to provide better visibility to both pedestrians and drivers. The City of Columbia has adopted a specification that no person shall stop, stand, or park a vehicle on a crosswalk or within 20 feet of a crosswalk[80].

All of these standards, guides, organizations, and ordinances are put into place to protect pedestrians and workers in special cases when they are outside of designated pedestrian facilities. If there are people (typically workers) on the road, temporary traffic control measures are implemented to alert drivers. These individuals are required to wear safety gear to improve their visibility to drivers.

## Columbia Initiatives to Improve Pedestrian Safety

The City of Columbia has implemented numerous practices to enhance pedestrian safety. The City launched an initiative, Vision Zero, aimed at increasing awareness for pedestrian safety. The City generally follows national design standards and guidelines as well as crosswalk timing standards. The City's crosswalk timing procedure is outlined in the Appendix. The City also considers pedestrian safety when evaluating permits for special events when pedestrians will be outside of typical pedestrian facilities.

### Vision Zero Community

In response to the increasing number of crashes involving pedestrians each year, the City of Columbia became a Vision Zero City back in 2016. This pedestrian safety campaign aimed to foster increased awareness among motorists and pedestrians to look out for one another by

[77] Columbia Missouri ordinances https://library.municode.com/mo/Columbia/codes/code_of_ordinances?nodeId=PTIICO_CH106TRVE_ARTVOP

[78] https://www.fhwa.dot.gov/publications/research/safety/pedbike/03042/part3.cfm

[79] Columbia Missouri ordinances https://library.municode.com/mo/Columbia/codes/code_of_ordinances?nodeId=PTIICO_CH106TRVE_ARTVIIPE

[80] Columbia Missouri ordinances https://library.municode.com/mo/Columbia/codes/code_of_ordinances?nodeId=PTIICO_CH106TRVE_ARTVISTSTPA_DIV2SPST_S106-284AUERSIRESTPECR

initiating a cultural change to be more pedestrian friendly and responsible[81]. The campaign kicked off in May 2017 with its first Vision Zero action plan and a goal to eliminate deaths and serious injuries in Columbia by 2030.

**SS4A Grants**

Columbia applied for the Safe Streets and Roads for All grant in September 2022 and received $1,440,000 on February 1, 2023. This grant will fund planning studies to improve safety for all road users. Those supplemental planning projects include a highway safety manual analysis, high-injury network update, complete streets policy reexamination, leading pedestrian signal exam, Go CoMo transit route study, and a pedestrian level of comfort map. There are also potential future SS4A projects and some of those are road safety audits (RSAs), sidewalk master plan projects, infrastructure improvements for pedestrians and bicycles, and education and behavior modification programs[82].



[81] https://www.como.gov/public-works/vision-zero/
[82] TMP-24390 - Vision Zero Presentation

**Local Examples of Crossings**

The following photographs are images of crosswalks in the City of Columbia. These images provide examples of pedestrian crossings and document that the City takes great care in the design of pedestrian areas and crossings.

**Photograph 1: W Broadway & Edgewood Ave (RRFB & Bike Boulevard)**


**Photograph 2: S College Ave between Wilson Ave & Rosemary Ln (HAWK)**

**Photograph 3: S College Ave between Wilson Ave & Rosemary Ln (HAWK)**

**Photograph 4: N Providence Rd North of Park Ave**

**Photograph 5: St. Charles at Demaret (RRFB on Two-Lane Road)**

**Photograph 6: Old 63 & E Walnut (RRFB on Two-Lane Road with Median)**

**Photograph 7: Forum Blvd & Green Meadows (RRFB at Roundabout)**

**Photograph 8: Scott Blvd South of Abbington Terrace (RRFB)**

**Photograph 9: S Old 63 & Access Rd (RRFB with Bike Lane)**

**Photograph 10: N Garth Ave & Parkade Blvd (RRFB)**

**Photograph 11: Hinkston Ave & Paris Rd (Crosswalk on Side-Street with Median)**

**Photograph 12: Clark Ln East of Ballenger Ln**

**Photograph 13: SB Grant and Maple Bluff**

**Photograph 14: Elm Near Providence (unsignalized crossing)**


**Photograph 15: Providence Pedestrian Bridge**


**Photograph 16: Stadium Blvd DDI at I-70**

**Photograph 17: Stadium Blvd DDI at I-70 (Pedestrian Bridge)**

**Photograph 18: Stadium and Bernadette (High Volume & Median with Ped buttons midway)**

**Photograph 19: Rangeline St South of Wilkes Blvd (Unsignalized Crossing)**

**Photograph 20: SB S Providence Rd & Mick Deaver Dr (High Speed)**

**Photograph 21: Providence & Business Loop 70**

**Photograph 22: Providence & Business Loop 70**

**Photograph 23: Providence & Green Meadows**


**Photograph 24: Providence & Green Meadows**

**City Permits**

When pedestrians must be in the roadway for construction, maintenance, or special events; the City relies on two general permits (right of way permit[83] and street/sidewalk closure permit) to ensure that appropriate traffic control measures are put into place to enhance pedestrian safety. Special event permits can be applied for on the City of Columbia website, https://www.como.gov/convention-and-visitors-bureau/city-special-events/. This process collects organizational and personal information, as well as event information.

Sample right-of-way permits and sidewalk/street closure permits from the City of Columbia are attached in the **Appendix**. Any time a portion of the public right-of-way is having work done, such as grading, paving, and excavation, right-of-way permits are required. Sidewalk/street closure permits are required for any sidewalk and/or street closures that happen on the right-of-way due to work. Some additional closure requirements involve a temporary traffic control and routing plan and evidence that the businesses along the closure have been rightfully notified. Each of these permits affects public right-of-way and has the potential of placing workers (pedestrians) within the roadway. The City's policies are clear that anything requiring a pedestrian outside of a pedestrian facility requires a permit. Some examples include facilities maintenance, emergencies, and excavation.

**Neighborhood Traffic Management Program**

Neighborhood Traffic Management is made up of the Columbia Public Works Department. They provide traffic calming solutions for neighborhoods that have issues regarding speed, volume, and/or collisions of great severity. Neighborhood residents voice their concerns, and the public works group conducts studies to find ways to address these concerns. Their website contains ADA resources, neighborhood traffic information, and signs to improve safety[84].

The Columbia public works department developed the *Traffic Calming Guidebook* to provide policies and practices proven effective at solving the City of Columbia's speed, volume, and/or collision rate problems in neighborhoods. The manual creates a uniform method of traffic control within the City of Columbia by following national standards and local practices. The manual begins by explaining what traffic calming is and then goes into explaining each traffic calming tool that can be used.

As summarized above, the City of Columbia has a number of practices in place to improve safety on roadways. Vision Zero was launched to increase awareness among motorists and pedestrians about pedestrian safety. The City follows national design standards and requires permits for instances when pedestrians are present outside of pedestrian facilities.

[83] https://library.municode.com/mo/columbia/codes/code_of_ordinances?nodeId=COORCOMI_CH24STSIPUPL_ARTXPUUTRI-WUS_S24-168RI-WWOPE

[84] https://www.como.gov/public-works/street-division/traffic-management/neighborhood-traffic-management/

## Hierarchy of Concern

Several factors were considered to explore the conditions that most significantly contribute to ongoing pedestrian risk on Columbia roadways. Of these aspects, speed, traffic volume, and median width, were identified as primary contributory risk factors and these hierarchical concerns are discussed in the following sections:

### (1) Speed

Vehicle speed is one of the main contributing causes in pedestrian fatalities. One study, supported by numerous other studies, has shown that when a pedestrian is hit by a vehicle at 20 mph there is a 13% chance of death or severe injury compared to a 73% chance of pedestrian fatality or serious injury at 40 mph[85]. **Figure 12** illustrates the percentage of pedestrians that will die or suffer a severe injury if hit by a vehicle for given speed intervals.

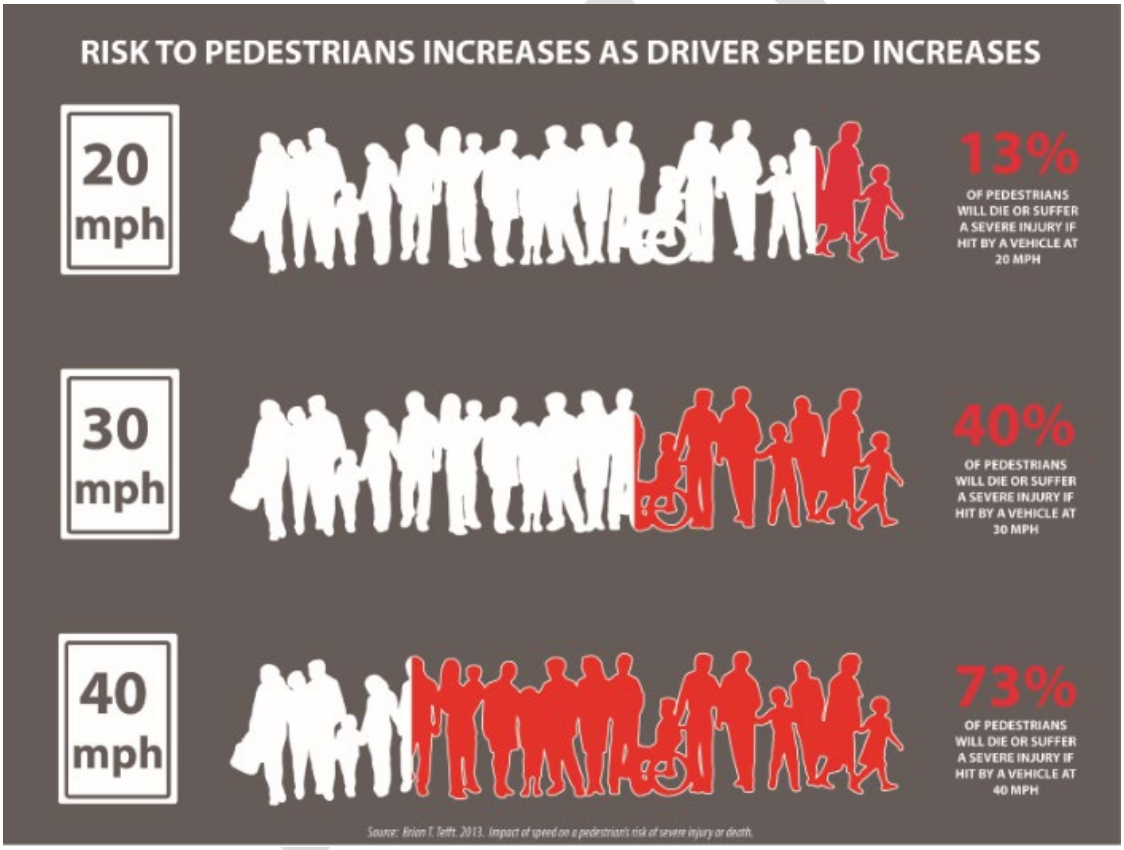



**Figure 12: Pedestrian survival rates by vehicle speed[86]**

[85] There are a number of studies about the relationship between vehicle speed and pedestrian fatality or injury. The FHWA lists many (https://safety.fhwa.dot.gov/ped_bike/pssp/background/psafety.cfm). Tefft studied the *Impact of Speed on a Pedestrian's Risk of Serious Injury or Death* in 2013.

[86] 2023 Vision Zero City Council Update Presentation - https://gocolumbiamo.legistar.com/gateway.aspx?M=F&ID=8abcf80a-2c1e-49ee-8209e20001579798.pdf

**Figure 13** compares the percent of pedestrians killed to the estimated traffic speed given an age range, based on four years' worth of data from Florida. This chart documents that a higher percent of pedestrians in older age groups are more likely to suffer fatal injuries when struck by a vehicle travelling at any given speed. The common trend throughout each age group is that as speed increases, the likelihood of a pedestrian being killed from a collision with a vehicle increases.

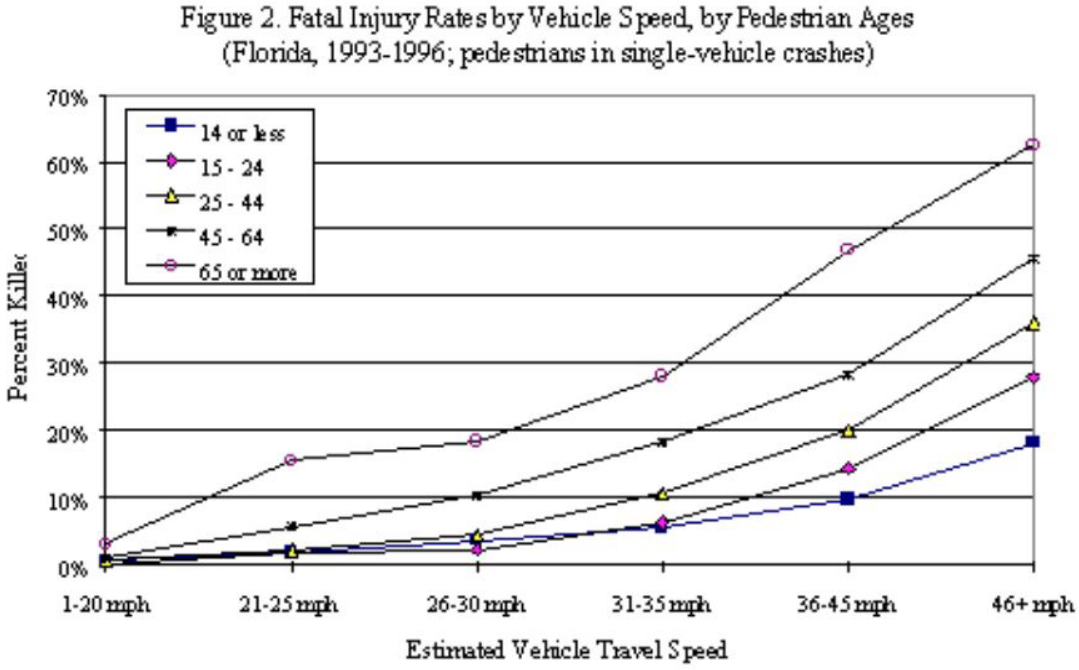



**Figure 13: Fatal injury rates by vehicle speed by pedestrian ages[87]**

Zegeer et al. does not recommend installing marked crosswalks on roads with speed limits higher than 40 mph without the use of other crossing treatments, like traffic calming treatments or traffic and pedestrian signals[88]. Traffic calming treatments include any technique used to slow the speeds of moving vehicles. Some treatments include speed bumps/humps, raised crosswalks, narrower traffic lanes, and street closures.

### (2) Volume

Zegeer et al. found that, with annual daily traffic volumes (ADTs) of about 10,000 vehicles per day or less, pedestrian-involved crash rates were less than 0.25 pedestrian-involved crashes per million pedestrians crossing at both marked and unmarked crosswalks[88]. ADT is a roadway metric used to reflect the total number of vehicles travelling along a roadway (in both directions) in one

87 Literature Review on Vehicle Travel Speeds and Pedestrian Injuries https://www.pedbikeinfo.org/cms/downloads/LitReview_VehicleTravel%20Speeds_PedInjuries.pdf

88 Zegeer, C., Stewart, J., Huang, H., Lagerwey, P., Feaganes, J. and Campbell, B.J. Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations: Final Report and Recommended Guidelines. 2005. FHWA-HRT-04-100.

day. For ADTs greater than 10,000 vehicles per day, pedestrian-involved crash rates increased as ADT increased. The report recommends against installing marked crosswalks on roads with ADTs greater than 12,000 vehicles per day (with no raised medians) or 15,000 vehicles per day (with raised medians that serves as refuge areas) at uncontrolled crossing locations.

The MUTCD cites similar volumes and limitations. New marked crosswalks alone, without other measures designed to reduce traffic speeds should not be installed across uncontrolled roadways when the speed limit exceeds 40 mph and either:

- The roadway has four or more lanes of travel without a raised median or pedestrian refuge island and an ADT of 12,000 vehicles per day or greater; or
- The roadway has four or more lanes of travel with a raised median or pedestrian refuge island and an ADT of 15,000 vehicles per day or greater[89].

A compelling study, "Development of Guidelines for Pedestrian Safety Treatments at Signalized Intersections"[90], documents that pedestrian-involved crash frequency increases with an increase in vehicular volume. **Figure 14** shows that, starting at 20,000 vehicles per day, at a 4-leg intersection with a 15 percent increase in volume, there is a corresponding 8% increase in crashes.

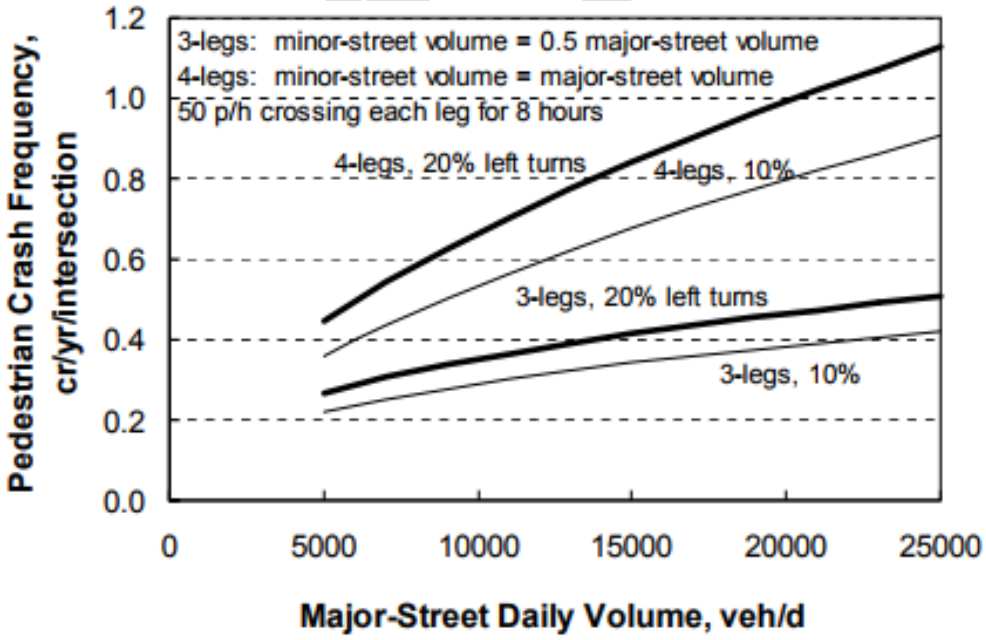



**Figure 14: Crash Frequency Based on Traffic Volume**

### (3) Median Width

The ADAAG recommends a minimum median width of 5 feet, from curb face to curb face. According to AASHTO's Green Book, AASHTO's *Guide for the Planning, Design, and Operation of*

[89] MUTCD Section 3C.02
[90] http://tti.tamu.edu/documents/0-6402-1.pdf

*Pedestrian Facilities*, and NACTO's *Urban Street Design Guide*, the minimum protected median width should be 6 feet, based on the length of a bicycle or a person pushing a stroller. If a person were to trip and fall while standing on a median less than 5 or 6 feet wide, there is a significantly increased likelihood that such person who trips and falls into the roadway will do so into the path of a moving vehicle.

The Roadside Design Guide states that where curb is used the lateral offset is measured from the face of the curb. A minimum of 1.5 feet should be provided from the face of the curb with 3 feet at intersections[91]. This offset provides sufficient clearance to keep the overhang of a truck from striking a person or object. The curb itself is a vertical barrier between vehicular traffic and pedestrian traffic. If a pedestrian is located within the lateral clearance region, there is significantly increased likelihood that the pedestrian will be struck by a moving vehicle. Pedestrians should only be allowed within the designated pedestrian facilities and sufficiently far removed from the roadway itself to ensure pedestrian and motorist safety.



[91] Roadside Design Guide 10.0

## Recommendations

Columbia has taken a number of proactive steps to enhance safety of pedestrians and motorists within the city. However, to ensure the safety of its citizens and visitors, further regulations are needed concerning certain high speed and/or high-volume roadways and intersections. As this report documents, arterial roadways present the highest dangers for pedestrians (due to high traffic volume and speed). Additionally, at certain intersections, drivers only expect to see pedestrians in designated areas.

To facilitate safety for pedestrians and motorists alike, pedestrians should only be located in a roadway when:

- They occupy designated pedestrian areas where motorists reasonably expect them to be located (e.g., sidewalks and crosswalks); or
- There is temporary traffic control established to warn drivers that pedestrians will be located there (e.g., maintenance or special events); or
- Using particular roadways that sustain low traffic volumes and speeds that are designed and designated as shared spaces for both motorists and pedestrians.

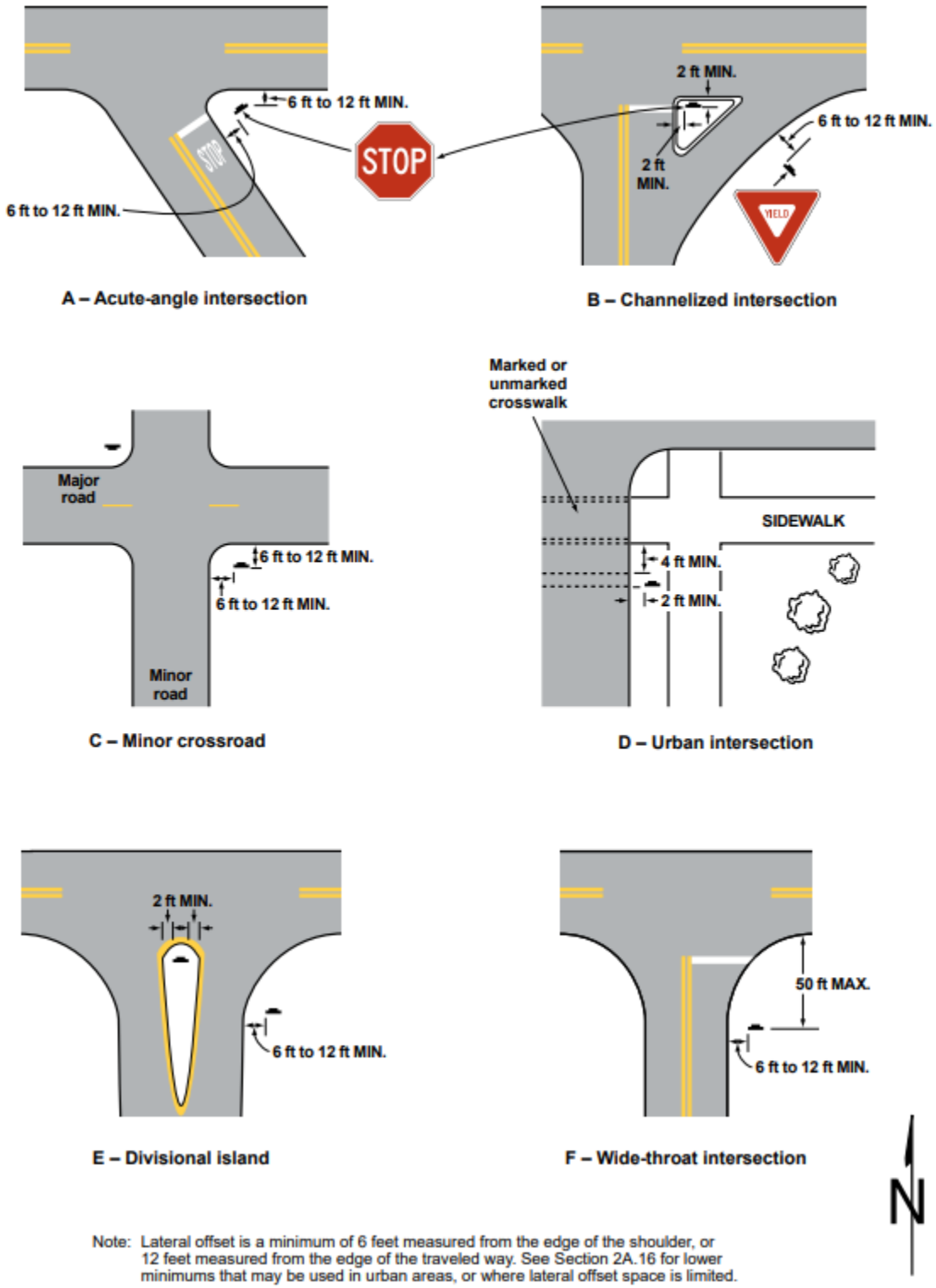
Additionally, restrictions should be implemented to prohibit use of medians and islands by pedestrians at intersections with any of the following characteristics:

- Speeds on at least one approach of 35 mph or greater, or
- Traffic volumes greater than 15,000 vehicles per day on at least one roadway, or
- Median widths less than 6’ wide.

# Appendix A

**Exhibit 1: MUTCD lateral offset at typical intersections**

## Figure 2A-3. Examples of Locations for Some Typical Signs at Intersections




Note: Lateral offset is a minimum of 6 feet measured from the edge of the shoulder, or 12 feet measured from the edge of the traveled way. See Section 2A.16 for lower minimums that may be used in urban areas, or where lateral offset space is limited.

**Exhibit 2: City permits**

*Right-of-Way Permit*

CITY OF COLUMBIA, MISSOURI

PUBLIC WORKS DEPARTMENT

## Right of Way Permit Application

**Date:** ____/____/____ **Permit No:** _____

**Owner:**

Owner: _____

Address: _____

Phone: _____

Email: _____

**Contractor:**

Contractor: _____

Address: _____

Phone: _____

Email: _____

**Plan Engineer:** _____

**Plan Approval Date:** _____

**Work Location:**

_____

_____

**Type of Work:**

☐ **Sidewalk** ☐ **Drive Approach** ☐ **Street Cut** ☐ **Closure** ☐ **Grading** ☐ **Paving** ☐ **Storm Sewer**
☐ **Excavation** ☐ **Other**

**Description of Work:**

_____

_____

**FOR OFFICE USE ONLY:**
Calendar Days for Permit: _____

701 E. Broadway PO Box 6015 Columbia, MO 65205-6015
(573) 874-7474 FAX (573) 874-7283 TTY (573) 874-7251 ww.GoColumbiaMo.com pg. 1

(1) Any person who shall do any work for which a permit is required hereunder shall conduct such work in accordance with standard plans and specifications on file in the office of the Director of Public Works and the office of the city clerk, which shall be marked "Official Copy of Plans and Specifications for Improvements Under Division 1, Article II, Chapter 24 of the Code of Ordinances of Columbia, Missouri." (City of Columbia Code of Ordinances, Chapter 24, Section 31)

(2) No person shall construct, reconstruct, repair, alter or grade any sidewalk, curb, curb cut, driveway or street on the public streets or rights-of-way without first obtaining a permit from the Director of Public Works. (City of Columbia Code of Ordinances, Chapter 24, Section 41)

(3) The Director of Public Works is authorized to issue a stop work order whenever he believes a violation of this Article is occurring. A stop work order shall be in writing and shall be given to the owner of the property involved or to the owner's agent or to the person engaged in the activity suspected of violating this Article. It shall be unlawful for any person to engage in any activity in violation of a stop work order. (City of Columbia Code of Ordinances, Chapter 24, Section 90)

(4) Failure to follow all guidelines set forth by the City of Columbia and the Manual of Uniform Traffic Control Devices (MUTCD) will be subject to Chapter 24, Section 20 of the City of Columbia Code of Ordinances, which states "Any person violating any of the provisions of this article shall be deemed guilty of a Misdemeanor." (City of Columbia Code of Ordinances, Chapter 24, Section 20)

(5) Traffic control plans for any project in the downtown area, collector and arterial street or any other locations as determined appropriate by the Director of Public Works shall be prepared by a Professional Land Surveyor or Professional Engineer licensed in the State of Missouri.

(6) Contractor is responsible for the installation and maintenance of all necessary erosion and sediment control on site until which time the project is completed and is determined to be stable and non erosive.

(7) Prior to excavation the contractor must contact 1-800-DIG-RITE for utility locations.

A Right of Way user shall indemnify and hold the City of Columbia and its officers and employees harmless against any and all claims, lawsuits, judgments, costs, liens, losses, expenses, fees (including reasonable attorney fees and cost of defense), proceedings, actions demands, causes of action, liability and suits of any kind and nature, including personal bodily injury (including death), property damage or others harm for which recovery of damages is sought, to the extent that it is found by a court of competent jurisdiction to be caused by the negligence of the Right of Way user, any agent, officer, director, or their respective officers, agents, employees, directors or representatives, while installing, repairing or maintaining Facilities in a public Right of Way.

**Attach all applicable information required per the City of Columbia checklist for short term street closures for construction projects and repairs. Please note that Downtown projects must comply with the City of Columbia's checklist for Downtown construction projects and repairs.**

**Certification: I certify that I have read and understand the provisions of this permit as it pertains to construction, restoration, and liability to the City of Columbia. I also certify that the traffic control utilized during this project meets the most current edition of the MUTCD.**

Signature: _____

Date: ____/ ____/____

Approved: Director of Public Works

by: _____

Date: ____/ ____/____

** Signature indicates acceptance of permit requirements and conditions of both the City of Columbia and MUTCD

# City of Columbia - Public Works Department

## Application for Street/Sidewalk Closures & Restrictions for Construction Projects & Repair

Application date: _____ Address of proposed work: _____

owner): _____

_____

_____

Party to perform the closure (contractor): _____

Address: _____

Phone Number and Email: _____

Area/location to be closed (be as specific as possible):

Type of Closure: ☐ Traffic Lane (# of lanes ___) ☐ Lane Restriction (without closure) ☐ Sidewalk ☐ Alley ☐ Parking Lane

Exact purpose of proposed work:

Date of closure or restriction:

From: _____ (day of the week) _____ (date) _____ (time)

To: _____ (day of the week) _____ (date) _____ (time) _____ (hours per day)

_____ Applicant Signature _____ Date

*****Return this form along with the required listed items on page 2*****

# City of Columbia - Public Works Department

## Checklist for Street/Sidewalk Closures & Restrictions for Construction Projects & Repairs

**Additional Required Items:**

___ Temporary traffic control and routing plan (per MUTCD guidelines) with a location map and details showing all required signs, barricades and flagmen. Traffic control plans must be prepared by a Professional Engineer licensed to practice in the State of Missouri. If sidewalks are closed or restricted, plan must include pedestrian routing information. The plan must be computer-drawn at a scale which allows all required details to be clearly seen;

___ Evidence showing that a list of business owners (name, address, and phone numbers) along the sidewalk frontage of the impacted block have been given, in writing and by posting at the site of the closure, at least three (3) days notice for any closure seven (7) days or less. or at least fourteen (14) days notice for any closure between eight (8) to thirty (30) days, containing the dates and times of the proposed closure, and their right to protest by written notice given to the Director of Public Works; or in the event of a closure greater than thirty (30) days the City Council has otherwise authorized issuance of the permit pursuant to the procedures set forth in Section 24.45 of the City of Columbia Code of Ordnances

It takes approximately three (3) days to circulate and review each planned closure/restriction. Upon approval of the plan, an additional three (3) days are required to allow time for public and emergency services notification before construction will be allowed to begin. Making the total review process six (6) days. The review time is increased with any closure longer than thirty (30) days. **Any closure longer than thirty (30) days must be approved by City Council.**

Meter bags are required for all meters that will be blocked. The cost is $10 per day for single meters and $20 per day for double meters. A deposit of $25 per bag is required and is refundable upon return of the bag(s). Applications for meter bags must be submitted a minimum of 24 hours before the date needed and bags must be placed on the meter(s) four (4) hours before use.

Prior to the start of construction, the applicant must obtain a Right-of-Way Permit from the Community Development Department and any other permits required from the appropriate City Departments.

- Contractor is required to follow the provisions of the City's Brick Streets Policy (PR 229-13)
- Public Inconvenience Fee will apply to any closure greater than seven (7) calendar days per Section 24.43(b) of the City of Columbia Code of Ordnances
- Contractor is required to follow the provisions of Section 24.44(c) & 24.44(d) in regards to indemnity and insurance requirements
- Contractor is responsible for notifying the following agencies, as required, immediately prior to closure, during construction for inspections, and again when work is complete and street or sidewalk is reopened:

**City of Columbia Contact Telephone Numbers**
Building and Site Development (Right-of-way / Building Safety)..... 874-7474
Joint Communications (Emergency Services) ..... 874-7471
Parking Enforcement (Parking Meters) ..... 874-7674

**CBB Qualifications**

**St. Louis, Missouri – Headquarters**
12400 Olive Boulevard, Suite 430
Saint Louis, MO 63141
(314) 878-6644

# 2025 STATEMENT OF QUALIFICATIONS:

## CITY OF COLUMBIA, MO

**Date:** April 17, 2025

**CBB CONTACT**
Shawn Leight, PE, PTOE, PTP
314-922-3099
sleight@cbbtraffic.com

**SERVING THE MIDWEST FOR MORE THAN 50 YEARS**

**EXPERT.** | **TRUSTED ADVISOR.** | **FRIEND.**

# TABLE OF CONTENTS

**April 17, 2025**

Dawn Ettleman
Assistant to the Public Works Director
City of Columbia, MO
701 E Broadway
Columbia, MO 65205

**RE: 2025 Statement of Qualifications**

Dear Ms. Ettleman:

CBB is pleased to submit our firm's statement of qualifications (SOQ) to the City of Columbia for providing professional consulting services for traffic engineering and transportation planning. After reviewing these qualifications, you will see that CBB is well suited to support and provide value to the City's engineering and planning staff through these services.

At CBB, our mission is to foster an environment where free thinking, innovation, and collaboration merge with international best practices to provide traffic engineering and transportation planning solutions for safer, more sustainable, and economically vibrant communities. We are well known for our ability to develop innovative transportation solutions to solve our client's unique problems in cost-effective and efficient ways.

We are a specialized firm wholly focused on traffic engineering and transportation planning. Our staff include traffic engineers, transportation planners, and transportation designers with the skills and experience needed to support your project needs. We have 16 registered Professional Engineers (PE), 14 Professional Traffic Operations Engineers (PTOE), 2 Professional Transportation Planners (PTP), 2 Roadway Safety Professionals (RSP2I and RSP2B), 1 American Institute of Certified Planners (AICP), as well as emerging young professional staff and several highly trained technical personnel. Our team is actively engaged in numerous technical societies and professional organizations that keep our staff abreast of new trends, advancements, and technologies within the industry.

CBB has developed many deep relationships in the Columbia region through projects such as the CATSO 2055 Metropolitan Transportation Plan (MTP) update and Paris Road/Route B Road Safety Audit (RSA). CBB is a trusted traffic and safety engineering expert with MoDOT's Central District. CBB has recently completed projects for MoDOT's Central District to study the interchanges at US 63/AC, US 63/Broadway, and I-70/Business Loop as well as identify and prioritize district-wide safety projects for inclusion in the State Transportation Improvement Program (STIP) and develop a tool for MoDOT's SAFER program. CBB has also completed numerous Traffic Impact Studies to support local development.

As a regional leader in the fields of traffic engineering and transportation planning, we greatly appreciate this opportunity to further our relationship with the City of Columbia. CBB is committed to your community, and we look forward to the opportunity to work with you as you enhance your transportation infrastructure.

Included in the following pages you will find CBB's qualifications, related project information, key personnel experience, and other required information. We appreciate the opportunity to assist the City of Columbia and welcome the opportunity to further discuss our qualifications.

**Sincerely,**

Shawn Leight, PE, PTOE, PTP
Vice President
314.922.3099 / sleight@cbbtraffic.com

# GENERAL OVERVIEW

## Our Mission Statement

CBB is a Midwest firm where free-thinking, innovation, and collaboration merge with international best practices to provide traffic engineering and transportation planning solutions for safer, more sustainable, and economically vibrant communities. CBB is your **EXPERT | TRUSTED ADVISOR | FRIEND**.

## Expert

Established in 1973, CBB is a leader in transportation engineering and planning. Several of our staff members have advanced professional accomplishments including post-graduate degrees in transportation engineering and planning; licensure as Professional Engineers (PE); and certifications as Professional Traffic Operations Engineers (PTOE), Professional Transportation Planners (PTP), AICP (American Institute of Certified Planners), and Road Safety Professionals (RSP). Our active engagement in technical societies such as the Institute of Transportation Engineers (ITE), American Public Works Association (APWA), International Municipal Signals Association (IMSA), American Planning Association (APA), National Association of City Transportation Officials (NACTO), Transportation Research Board (TRB), and the American Society of Civil Engineers (ASCE) keep us abreast of new trends, advancements, and technologies.

EXPERT

TRUSTED ADVISOR

FRIEND

## Trusted Advisor

We have focused on transportation engineering and planning since 1973. Our deep experience in the field means there are few challenges we can't figure out. You can trust us to get the job done and get it done right the first time.

Our longstanding success can be attributed to the quality of our service and attentiveness to our clients, which have included private businesses, developers, landowners, government agencies, not-for-profit organizations, advocacy organizations, public institutions, engineering firms, and architects.

## Friend

We're a family that genuinely cares about our staff and our clients. We're focused on transportation and traffic systems, making things safer and more efficient, and improving communities. We take on projects with a community outreach approach because what we do affects the community. We'll host presentations, workshops, neighborhood "brainstorming charrettes," citizen surveys and public meetings; produce media (brochures, newsletters, social media); and work with specific interest groups. Your input is important to us and everything we do.

# OUR SERVICES

## Transportation Studies and Planning

CBB blends transportation engineering and planning to develop visionary, practical solutions that meet the needs of our clients. CBB has participated in every stage of project development such as access management, safety studies, traffic impact studies, comprehensive transportation plans, public engagement, and the writing of grant applications. We are well versed in tackling projects in both the private and public sector. In the private sector, we have years of experience guiding clients through the process of site plan approvals, obtaining permits, and acquiring funding. In the public sector, CBB's team of expert planners, engineers, and designers are well equipped to tackle projects of all levels, from Design-Build projects to Great Streets Initiatives. We are experienced in working with key stakeholders like State DOT's, Metropolitan Planning Organization, City Planning and Public Works Departments, School District, and Transit Agencies. CBB prides itself on the work we do in creating holistic transportation solutions that serve every member of the community. With the latest analytical tools, we work to promote safe and efficient access, mobility, and circulation.

**Parking Study**

Webster Groves Business District

Several tools are employed to solve transportation problems as part of CBB's transportation studies and planning process. Our team members are experts in the use of transportation resources from agencies such as FHWA, AASHTO, and ITE. CBB staff are also proficient in transportation analysis software such as Synchro, VISSIM, Highway Capacity Software (HCS), and SIDRA. CBB provides an unparalleled level of expertise and attention to detail in transportation engineering and planning projects to ensure safe and efficient transportation solutions for all users. Key capabilities include:

- Access Justification Reports (AJR)
- Access Management
- Campus Planning
- Comprehensive Transportation Plans
- Intersection Design Studies (IDS)
- MoDOT Transportation Engineering Assistance Program
- Parking Studies
- Peer Reviews
- Planning for Connected and Autonomous Vehicles
- Public Engagement
- Corridor and Alignment Studies
- Expert Witness Testimony
- Freeway Operations Studies
- Interchange Concept Development
- School Circulation and Operational Studies
- Signal Warrants Studies
- Site Plan Review/Refinement
- Smart Cities Planning
- Traffic Assessments
- Traffic Impact Studies

## Transportation Modeling

We understand that transportation modeling is crucial in developing transportation solutions. CBB's staff are experts in the latest transportation modeling techniques and methodologies for analysis, planning, and communication. We are equipped to perform high level macroscopic analyses for concept level studies to in-depth microsimulation models built with vehicular travel, parking, public transit, and pedestrian behavioral features for specialized in-depth planning studies. We realize that once a transportation solution has been developed, the next vital step is communicating the solution to the community. To that end, we are skilled in utilizing microsimulation models to create visual animations that can depict the benefits a transportation project has to offer.

**Ward Parkway Study**

Kansas City, MO

We also have expertise in big data analytics, which has become increasingly important in the transportation industry. We can analyze large amounts of data to understand any correlation, hidden patterns, and other underlying insights to improve efficiency and flexibility in traffic operations and safety projects. Big data analytics can also improve the accuracy of travel demand models. CBB has experience in developing travel demand models that forecast future travel behavior based on socioeconomic, environmental, and financial factors. We are using data driven approaches to meet the needs of our clients. We are also collaborating with research institutions on data analytics research areas.

CBB emphasizes using cutting-edge technologies and up-to-date research methodologies to provide the best solutions for our clients and are well-versed in the following areas such as Data Analytics, Travel Demand Modeling, Microsimulation (e.g., VISSIM, VISUM), Macrosimulation (e.g., SYNCHRO, SIDRA, VISTRO, HCS), Pedestrian Modeling (e.g., VisWalk), Transportation Visualization and Animation, and Geographic Information Systems (GIS).

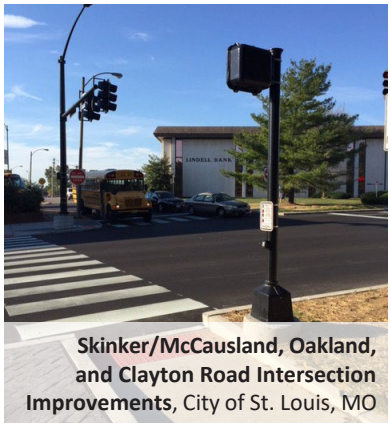
## Traffic Signals and Transportation Systems Operations

At CBB, we understand the importance of a smart and efficient transportation network. This involves everything from managing the traffic impacts that large-scale projects have on our local roads, to maintaining Intelligent Transportation Systems (ITS) equipment to ensure proper functionality. With years of experience working in ITS and traffic signal technologies, CBB is an expert and trusted advisor when it comes to transportation operations. Our staff is experienced in traffic signal and intersection design, ITS network/device design and integration, signal turn-ons and on-call maintenance, traffic management center (TMC) operations, maintenance of traffic (MOT) during construction, signal coordination and timing projects and much more.

We have successfully managed traffic for countless large and small projects, municipal bodies, and government organizations. Our knowledge and experience of how drivers react to a closure, crash, or high-volume event allows us to mitigate traffic and reduce travel times. We pride ourselves on the ability to efficiently move traffic along planned detour and egress routes, but also the ability to find and manage nearby locations that are indirectly affected by the construction interruptions.

Having a safe, efficient, and intelligent traffic system is a must in today's travel-demanding landscape. Our staff has the knowledge and experience to select, design, program, troubleshoot, and implement numerous ITS components. This allows our clients to focus on their daily tasks while CBB handles the problems of today and plans for the challenges of tomorrow. We have deep expertise with several types of traffic management software including Tactics, Centracs, TransSuite, and MAXVIEW. We field program and troubleshoot signal detections software such as Iteris and Autoscope cameras in addition to many types of traffic controllers including Siemens, Econolite, McCain, and Intelight. We are experts in several types of traffic operations software including Synchro, Tru-Traffic, and are well-versed in Traffic Signal Optimization and Synchronization, Maintenance of Traffic during Construction, Field Services / Signal Turn-Ons, and Programming, and TMC Staffing.

## Transportation Design Services



**Skinker/McCausland, Oakland, and Clayton Road Intersection Improvements**, City of St. Louis, MO

CBB's roadway, traffic signal, ITS, and lighting designers take an innovative and methodical approach to solving design challenges by understanding the fundamental needs of the project. We provide design services for both public and private clients, including DOTs, jurisdictions, and developers. The projects we complete range in size from interchanges to turning lanes and driveways. Each project is a unique assignment, and we strive to develop alternatives that minimize impacts and construction costs while maximizing safety and functionality.

We are committed to detail and coordination in our design process. We are well versed in completing high-level concept plans to final design plans for construction. We have been involved in high-level planning studies, design-bid-build projects, and design-build projects. We are adaptable to last-minute changes that are inevitable during construction as well as finding ways to cut costs without sacrificing quality. CBB has years of expertise in a wide range of design experience including complex intersections and interchanges, roundabouts, traffic signals, lighting, and Intelligent Transportation Systems (ITS). Our staff is also skilled in the latest versions of powerful software tools such as AutoCAD Civil 3D, MicroStation and Autoturn. We also provide construction review and inspection services, which allow for a seamless transition from the project design phase to final implementation. At CBB, we are passionate about providing accurate and well-designed plans and are committed to accomplishing our client's goals within the required budget.

Key areas of design expertise include:

- Roadway Design
- Bicycle & Pedestrian Facility Design
- ADA Compliance
- Construction Review & Inspection
- Traffic Signal Design
- ITS Design
- Lighting Design
- Roundabout Design

## Complete Streets

CBB's mission is to develop sustainable transportation systems that support the health and well-being of our communities. We are committed to a holistic transportation system that provides for all modes of transportation, ensuring access to opportunity for everyone. Our team understands that as public spaces, streets should be designed to move people and goods efficiently while providing the opportunity for everyone to get around. To that end, we are committed to our work in the areas of Complete Streets and Sustainable Transportation. Transportation impacts everyone daily, from driving to work, to walking to the park or to the bus stop. Our team is committed to ensuring we design transportation systems in a context that is sensitive to all needs and to the environment. We are well-versed in complete streets principles and have extensive experience working on multimodal transportation plans. CBB understands the impacts transportation has on many elements of communities, including health and equity.

Key project areas include:

- Bicycle System Planning
- Complete Street Design
- Great Street Studies
- Multi-Modal Planning
- Mobility as a Service Planning
- Safe Routes to School
- Transportation and Health
- Transportation Equity
- Traffic Calming
- Trail Planning
- Transit Studies
- Walkability Audits and Studies

## Transportation Safety

CBB is committed to the importance of safety in the transportation network and understands the impact it has on communities and people of all ages and abilities. We put safety at the forefront in every aspect of transportation design. It is the foundation for our work from designing a full highway reconstruction project to determining the location of a new crosswalk. We understand that every detail can make the proposed improvement more intuitive to the user and ultimately safer for everyone. We strive to optimize the design for safety at the core of the design, but also have a toolbox of safety countermeasures that we pull from to help mitigate underlying safety issues. There are countless metrics with which to evaluate a road system: travel time, capacity, safety, etc. However, the most important goal is for road users to get to their destinations safely.

While numbers and monetary values are assigned to crashes to better facilitate crash evaluation, our team understands that every crash represents a real-life impact to one or more people. With this in mind, we strive to provide thorough safety recommendations and evaluations. We are well versed in all levels of safety analysis and design, from a localized crash analysis at an intersection to expansive network screenings of an entire Metropolitan Planning Organization that includes multiple counties. We have extensive experience in safety evaluations and use an innovative, data-driven approach to safety analysis. Our staff is experienced and trained in HSM Methodologies. We have been working with all the safety analysis software for years including HSM spreadsheets, ISATe, IHSDM and ArcGIS. Finally, we have certified Road Safety Professionals (RSP2I and RSP2IB) so that you can have confidence that all safety results are reliable and accurate.


We are experienced in the following safety tasks:

- Before and After Safety Studies
- Crash Data Summary and Analysis
- Countermeasure Selection and Design
- Innovative Technology Solutions for Safety
- Multimodal Safety Evaluations and Design
- Network Screening of Crashes
- Predictive Analysis/HSM Studies/ISATe/IHSDM
- Roadway, Bicycle, and Pedestrian Safety Audits
- Safety Evaluations for Design Exception
- Sight Distance Measurements
- Sign Retro-reflectivity Analysis
- Systematic Safety Study and Improvements
- Traffic Calming
- Vehicular Speed Studies

## Planning

CBB is passionate about integrating fun and vibrant public spaces into our communities, as well as within our transportation spaces where applicable. We understand within the built environment that transportation spaces represent a large part of our public spaces, and we work to enhance these places for users of all ages and abilities, ages 8 to 80. Specifically, we know that there are many options for placemaking within these public spaces. CBB has experience on placemaking projects around complete streets planning, public transit projects, and neighborhood planning. At the heart of this work is creating places where people want to be, and places where people feel comfortable and safe, and that serve as cornerstones for the community. A sense of place is when people feel a sense of belonging toward a place or a city. People know when they are in a place and understand they have arrived in a place. When a community has a strong sense of place the trip becomes more about the journey than the destination. Placemaking is an important component of any design process, and our staff has experience with bringing

these concepts into our planning and design work. Thinking about who will use the space and how they will use it is an important consideration whether you are planning and designing for a streetscape, a neighborhood, or a bus stop. Well-designed placemaking efforts strengthen identity and a sense of place by investing in physical infrastructure to create new and interesting experiences.

## Data Collection

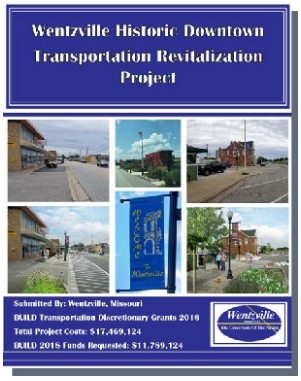
CBB understands the importance of starting projects with accurate transportation data, which is foundational to decision-making. Our staff performs speed studies, gap and delay studies, origin and destination studies, emissions reduction analyses, and more. It is important that this information is accurate and well-organized whether it is used for transportation planning or post-project construction evaluations. CBB uses transportation data to understand travel patterns and demands for our planning and studies work. This information is essential in the development of the innovative and practical solutions that we have built our reputation on. We also collect post-project data to measure project performance in the field and validate the implemented solutions.

CBB has a comprehensive in-house inventory of traffic count equipment including HD traffic count cameras, radar units, pneumatic tubes, turning count boards, and drones. Our dedicated field staff use these devices to collect counts, classifications, and travel speeds for cars, heavy trucks, bicycles, and pedestrians. This data is processed and reported for clear and easy analysis. With big data becoming invaluable in today's transportation landscape, CBB has begun working with other providers to acquire and utilize applicable transportation data to supplement our data collection methods. This data can include vehicle speeds, volumes, travel delays, traffic patterns, signal data collected for months or years at a time. With all the technological advances in data acquisition, the field of transportation engineering and planning is ever-changing.

CBB is capitalizing on these developing technologies to provide our clients with the data they need to implement their project goals. We are experienced in using GIS information and big data providers such as Streetlight and Airsage as well as data software such as Jamar, Miovison, and Iteris. Our staff are experts in the following areas:

- Drone Observation Studies
- Field Inventories
- Origin and Destination Studies
- Parking Counts
- Pedestrian and Bicycle Counts
- Speed and Gap Studies
- Traffic Counts
- Travel Time Studies

## Grant Writing




CBB recognizes the need for communities to update and maintain quality infrastructure. We also understand the significant expense this infrastructure can be on a local budget. Many of our partners look to the State and Federal governments to assist them with their infrastructure planning and building needs. Often, this assistance comes in the form of grants. CBB is well-versed in grant writing and has successfully procured many grants for our clients. Grant writing is seldom an easy and straight-forward process, and many times local agencies do not have the staff capacity to complete the process on their own. CBB is here to help you navigate that process. We have specialized skills and technical expertise to put together strong grant applications that are sound in their project description, cost estimation, and any additional needs. We can help in every stage of the process. Many times, we help clients identify a need and a solution to that need, locate a grant resource to further develop the project, complete the grant application, and upon award of the funding, help design the final product. CBB has experience working on small-scale and large-scale grants.

# PROJECT MANAGEMENT APPROACH

We approach each project with quality, practicality, and innovation through a spirit of collaboration to bring best practices to our clients. CBB's project management philosophy is simple: assign talented people to the tasks at which they excel. Our vision is clear: develop improvement concepts, complete alternatives analyses, and develop solutions that result in constructible and cost-effective improvement plans that will improve safety and enhance mobility to better serve residents, visitors, and commerce. This requires a practical approach. We employ standard industry project controls (for cost, schedule, and quality) to ensure that we meet client expectations on every project. CBB provides strong project management through all levels of the project team.

- Our **Project Principal** will oversee the project to ensure a quality product. They are your resource for any issues that may arise. All CBB's Project Principals are licensed engineers with deep experience in transportation engineering.
- The **Project Manager** will work directly with you and your staff on day-to-day tasks and will keep the project on schedule and budget. They will implement QA/QC controls and coordinate CBB staff and subconsultants.
- Our **Task Managers** are subject matter experts in their field and will lead the technical aspects of the project.

**Resources:** CBB supports our Project Managers with highly trained and qualified technical staff. Our culture is one of collaboration and CBB is well versed in all facets of transportation engineering. We have the expertise and professional resources to bring innovation to our work and complete a wide range of transportation projects on time and within budget.


**Project Planning:** A great project starts with a great project plan. Our project managers develop a detailed scope of work at the start of the project to think through process, coordination, and resource needs. We define deliverables up front and develop our plan toward the creation of those deliverables. By having a solid planning and preparation process, this minimizes surprises and scope creeps. We plan for innovation by engaging our team in brainstorming events at critical points in the project process.

**Communication and Stakeholder Management:** Project management requires communication. We understand the importance of collaboration with you and other project stakeholders early in project scoping and development. We will meet with you and other stakeholders up-front and at key milestones to identify needs, resources, and critical issues.

## QUALITY ASSURANCE / QUALITY CONTROL APPROACH

CBB's internal Quality Assurance/Quality Control (QA/QC) program is designed to establish a standardized process of checks and balances throughout each project from early conceptual planning stages to final design implementations. Our QA/QC process begins and ends with strong project management staff. Typical efforts would include a Project Principal and Project Manager, both of which are responsible for delivering a product to the client with professional integrity and of excellent quality. This can be achieved by setting clear project goals consistent with the client's needs and concerns at the start of each project. With proper direction established, CBB can develop specific task checklists, perform peer reviews of technical analyses, design, documentation, quality control audits, comment resolution, and file archiving.

CBB's QA/QC program promotes accuracy during technical analysis and design, consistency in transportation practices, anticipating and preventing issues instead of reacting to them, clear and concise documentation, project team communication and cooperation. For each project, CBB's QA/QC Program is unique in that we can pull from our collective depth of experience in the many sub-disciplines of transportation and traffic engineering to set realistic and practical procedures.

## COMMUNITY RELATIONS APPROACH

Projects enjoy a higher level of success when an appropriate level of outreach is conducted, and consensus is achieved with stakeholders. CBB routinely conducts public outreach and engagement through the planning process. CBB has directed and/or supported public engagement on many successfully completed projects. A few examples include:


### CBB Led Public Engagement

- East West Gateway SS4A Regional Safety Action Plan
- Jackson Missouri Middle School Crosswalk Study
- Paris Road/Route B Road Safety Audit
- Wentzville Downtown Revitalization
- City of St. Louis Downtown Multimodal Plan
- Columbia Area Transportation Study Organization 2055 MTP
- City of St. Louis Neighborhood Traffic Calming Studies
- O'Fallon Connected Project

We have a wide range of experience including presentations and workshops, neighborhood planning panels, citizen surveys, public meetings, virtual meetings, media (brochures, newsletters, social media), project websites, and work with specific interest groups. CBB will work with you to develop the most appropriate public engagement process tailored specifically for your projects.

# WORK WITH GOVERNMENT AGENCIES

CBB has recently worked with the following agency clients:

**State Agencies**

MoDOT and IDOT

**Metropolitan Planning Organizations**

East-West Gateway Council of Governments (EWGCOG)

Southeast (MO) Metropolitan Planning Organization (SEMPO)

Southern Illinois Metropolitan Planning Organization (SIMPO)

Columbia Area Transportation Study Organization (CATSO)

**Cities**

Arnold, MO
Ballwin, MO
Brentwood, MO
Clayton, MO
Collinsville, IL
Columbia, MO
Creve Coeur, MO
Dardenne Prairie, MO
Des Peres, MO
Eureka, MO
Fairview Heights, IL
Farmington, MO
Ferguson, MO
Festus, MO
Frontenac, MO
Hazelwood, MO
Kansas City, MO
Ladue, MO
Lake St. Louis, MO
Maplewood, MO
Manchester, MO
Maryland Heights, MO
Mascoutah, IL
O'Fallon, IL
O'Fallon, MO
Olivette, MO
Sauget, IL
Springfield, MO
St. Charles, MO
St. Louis, MO
Sunset Hills, MO
University City, MO
Washington, MO
Weldon Springs, MO
Wentzville, MO

## PROJECT EXPERIENCE

| CBB PROJECT EXPERIENCE | SERVICE DISCIPLINES | | | | |
|---|---|---|---|---|---|
| | Central Missouri | Traffic/Safety Engineering | Transportation Design | Transportation Planning | Construction Inspection |
| On-Call Traffic Engineering for Municipalities | X | X | X | X | X |
| MoDOT On Call Traffic Engineering Services | X | X | X | X | |
| CATSO 2055 MTP Update | X | | | X | |
| Paris Road/Route B Road Safety Audit (RSA) | X | X | X | X | |
| Boone County Northeast Transportation Plan | X | | | X | |
| MoDOT Central District Safety Study | X | X | X | | |
| Grace Lane Alignment Study | X | X | X | | |
| I-70/Business Loop 70 E Interchange Study | X | X | X | | |
| US 63/MO AC Interchange Conceptual Study | X | X | X | | |
| US-63/MO WW/Broadway Interchange Study | X | X | X | | |
| Moberly School Study | X | X | | X | |
| Rocheport I-70 Missouri River Bridge Design-Build | X | X | X | | |
| Springfield City-Wide Pedestrian Safety Study | | X | | X | |
| Sunshine Economic Analysis | | X | | X | |
| STEP Training Workshop | | X | X | X | |
| Southeast Missouri MPO Intersection Analysis | | X | X | X | |
| Wentzville Downtown Transportation Revitalization | | X | X | X | |
| St. Louis Region Safety Action Plan (SS4A) | | X | | X | |
| City of St. Louis Traffic Calming Engineering Guidelines | | X | X | X | |
| St. Louis County Action Plan for Walking and Biking | | X | | X | |
| East-West Gateway Great Streets | | X | X | X | |
| I-270 North Design-Build | | X | X | X | |
| Hilton Head Island US 278 Transportation Study | | X | X | X | |
| Downtown Multimodal Plan | | X | X | X | |

***For your reference, we have included project descriptions for each of the above-featured projects in the following pages.***

## ON-CALL TRAFFIC ENGINEERING FOR MUNICIPALITIES

*Various Locations*

CBB maintains several on-call traffic engineering service contracts with various municipalities throughout the region, acting as an extension of the City/County staff. In this role, CBB is responsible for reviewing proposed developments and making recommendations to staff regarding the traffic, parking and site circulation issues. Additionally, as an on-call traffic engineer, CBB represents many of the agencies with regards to traffic engineering issues at Planning and Zoning meetings, Council Meetings and Public Hearings. Duties include services from signal optimization to safety analysis and studies, as well as grant writing and projects utilizing federal and state funds.

CURRENT ON-CALL CONTRACTS INCLUDE:

- Boone County, MO
- Brentwood, MO
- Chesterfield, MO
- Clayton, MO
- Des Peres, MO
- Highland Park, IL
- Maryland Heights, MO
- O'Fallon, IL
- St. Charles, MO
- St. Charles County, MO
- St. Louis, MO
- St. Peters, MO
- University City, MO
- Weldon Springs, MO
- Wentzville, MO
- Wildwood, MO


CONTACTS

**Justin Randall, AICP**
Community Development Director
City of O'Fallon, IL
T:(618) 624-4500 extension 4
E: JRandall@ofallon.org

**Lisa Koerkenmeier**
Planning Director
City of Brentwood, MO
T: (314) 963-8629
E: LKoerkenmeier@brentwoodmo.org

**Matt Malick**
Public Works Director
City of Clayton, MO
T: (314) 290-8540
E: MMalick@clyatonmo.gov

**CBB Key Personnel:** Varies per Municipality

## MISSOURI DEPARTMENT OF TRANSPORTATION (MODOT) ON CALL TRAFFIC ENGINEERING SERVICES

CBB has maintained an on-call traffic engineering services contract with the Missouri Department of Transportation since 1998. This contract has resulted in numerous projects throughout Missouri. Services provided through this contract include a wide range of traffic engineering and planning studies. A sample is shown below.

- Extension of MoDOT Staff
- Continuous Contract since 1998
- Traffic Signal Coordination and Timing Plans
- Access Justification Reports
- Microsimulation Modeling Services
- Transportation Planning Studies
- Travel Demand Forecasting
- Interchange Studies
- Value Engineering Studies
- Traffic Counts

### ENGINEERING STUDIES & PLANNING

- Central District Roadway Safety Plan
- MoDOT SAFER Project
- Route 54/Ellis Interchange Study (Jefferson City)
- Route 54/5 Interchange Study (Camdenton)
- Route 63/AC Interchange Study (Columbia)
- Route 63/Broadway Interchange Study (Columbia)
- I-270/Dorsett Road (DDI) Study
- Page Avenue (MO 364) Traffic Forecasting
- Traffic Modeling for New Mississippi River Bridge
- US 50 Lees Summit Traffic Forecasting
- MO M Median Crossover Studies (J-Turn)

### DESIGN SERVICES

- ITS Design Services along Route 340, Route 100 and Route 67
- Route 340 Preemption Signal Design
- MO M/Old Lemay Ferry Road J- Turn Cross over D

### ARTERIAL OPERATIONS

- Traffic Signal Timing Plans for MO 141 and US 67
- I-270/Dorsett Road Interchange (DDI) Traffic Signal Timing Plans
- MO 47 Traffic Signal Timing Optimization

### FREEWAY OPERATIONS

- I-70 Business Loop Study, AJR, and CE (Columbia)
- I-55/MO M Interchange Access Justification Report
- Poplar Street Bridge Access Justification Report
- Jefferson National Memorial/CAR 2015 Access Justification Report
- I-64 Value Engineering Study
- I-270 Traffic Modeling; North St. Louis County Feasibility Study
- I-70/Mid Rivers Mall Drive DDI Interchange Access Justification Report

### CONTACT

**Ed Hassinger, PE**
Missouri Department of Transportation
T: 573.751.2803
E: Ed.Hassinger@modot.mo.gov

### CBB Key Personnel:

Shawn Leight, PE, PTOE, PTP
Srinivas Yanamanamanda, PE, PTOE, PTP
Gregory Owens, PE
Joanne Stackpole, PE, PTOE
Nirav Patel, PE, PTOE
Brian Rensing, PE, PTOE, RSP2I

## CATSO 2055 MTP UPDATE

*Columbia/Central Boone County, MO*

The City of Columbia, on behalf of the Columbia Area Transportation Study Organization (CATSO) is performing an update to the existing 2050 Metropolitan Transportation Plan (MTP) and CBB is leading the comprehensive update. This project is centered on understanding the current transportation landscape and strategically planning for future growth, with a focus on safety, sustainability, and multimodal options. The plan is updating data and recommendations from the previous plan, including five years of safety, traffic, demographic, and socioeconomic information, to assess progress toward performance measures and guide the development of new goals.

METROPOLITAN TRANSPORTATION PLAN
COLUMBIA AREA
TRANSPORTATION STUDY ORGANIZATION
CATSO
2055 UPDATE

Key elements of the plan include a detailed review of existing conditions and transportation infrastructure, that will include climate considerations and emerging technologies. We are working closely with local stakeholders to ensure that the updated plan aligns with active transportation plans and maximizes safety through the Safe System Approach.

Public engagement is an integral component to the MTP update. CBB recognized the importance of community input in creating a plan that reflects the diverse needs of Columbia's population. This includes considerations for multimodal transportation options and strategies to adapt to and mitigate the impacts of climate change. The financial planning component will involve forecasting revenues, developing detailed cost estimates, and exploring innovative funding strategies to ensure the long-term viability of the transportation network. CBB's forward-thinking approach aims to position Columbia as a leader in sustainable, safe, and efficient transportation planning.

CBB is also committed to exploring innovative solutions for freight movement within the Columbia MPA, particularly with regard to the unique challenges and opportunities presented by the COLT short line railroad service and significant trucking routes like I-70 and US-63. By leveraging our experience with major MoDOT projects and our in-depth understanding of freight logistics, we are proactively addressing the safety and efficiency of goods movement, ensuring that Columbia remains a vital hub for regional commerce.

In addition, the plan will examine emerging transportation technologies such as electric vehicles, micro-mobility, ride-sharing, and autonomous vehicles with an eye for the future. CBB is evaluating how these technologies can be integrated into Columbia's transportation network, focusing on space allocation, infrastructure needs, and the potential impacts on the existing system. By staying ahead of these trends, we aim to create a transportation system that is not only resilient and adaptable but also capable of supporting Columbia's growth and its commitment to a greener, more sustainable future.

## CONTACT

**Mitch Skov**
Senior Planner, CATSO
Community Development Department
City of Columbia, Missouri
Phone 573-874-7243
mitch.skov@como.gov

**CBB Key Personnel:**
Mike Albin, AICP
Shawn Leight, PE, PTOE, PTP
Brian Rensing, PE, PTOE, RSP2I
Julia Curry
Alex Zarate

## ROUTE B/PARIS RD. ROAD SAFETY AUDIT

*Columbia, Missouri*

CBB conducted a Road Safety Audit (RSA) along Route B/Paris Road in Columbia, Missouri; a 5.25-mile corridor bounded by Oakland Church Road on the north and Business Loop 70 on the south. This project was completed in support of the City's Vision Zero policy, a comprehensive approach that considers all road users, including vulnerable road users such as people walking, biking, using a wheelchair, or using public transit. As part of their work on Vision Zero, the City of Columbia has identified priority projects on corridors where a disproportionately high number of serious injuries and fatalities occur.

One component of these priority projects is to complete a Roadway Safety Audit (RSA) on these corridors. An RSA is a formal review of a road or intersection to identify safety issues and opportunities for improvement. RSAs are completed by an independent, multi-disciplinary team of individuals which may include state or local officials, traffic engineers, roadway users, or other stakeholders. The RSA process is designed to identify and determine ways to eliminate or mitigate the elements of the road that may present a safety concern, considering all road users.

The Federal Highway Administration (FHWA) provides more information about the RSA process. In part, FHWA states that the aim of an RSA is to answer the following questions. 1) What elements of the road may present a safety concern: to what extent, to which road users, and under what circumstances? 2) What opportunities exist to eliminate or mitigate identified safety concerns?

The RSA team included representatives from City of Columbia (Vision Zero, Public Works, Transit/Parking, Parks & Recreation, Planning/ CATSO, Police Department, Fire Department, Disabilities Commission, Bike & Ped Commission), MoDOT, FHWA, Regional Economic Development Inc., and other special representatives (Neighborhood Representative, Motorcycle Representative, Local Motion).

The RSA process included 3 major activities. First, an engagement process was undertaken to understand the public's perceptions and concerns with the study corridor. The engagement process included two public meetings and a community survey with over 1,100 responses in the summer of 2022. Second, the study team undertook an extensive data collection and review effort including traffic and speed counts, traffic operations analysis with SYNCHRO to understand capacity challenges, a study of the corridor's crash history, and a traffic safety analysis. Finally, the RSA team conducted the field audit on September 20, 2022. The outcome is a comprehensive plan including recommendations for 100 potential safety enhancements.
More at: https://beheard.como.gov/route-b-audit

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Brian Rensing, PE, PTOE, RSP2I
Joanne Martin, PE, PTOE
Mike Albin, AICP

**CONTACT**
**Krista Shouse-Jones**
City of Columbia
T: (573) 817-6446
E: krista.shouse-jones@como.gov

## BOONE COUNTY NORTHEAST TRANSPORTATION PLAN

*Boone County, MO*

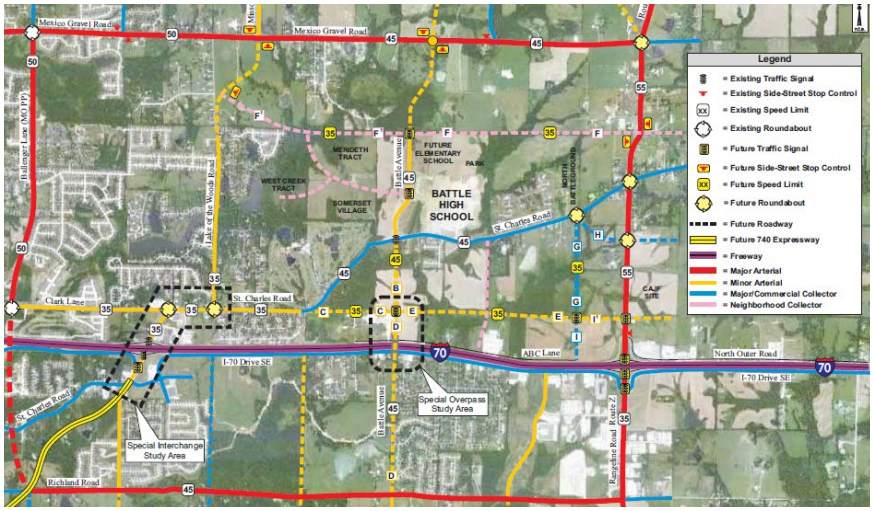
CBB worked with Boone County to create a master transportation plan for the northeast portion of Boone County. The northeast subarea has come under increased development pressure and partnering agencies (the City of Columbia, Columbia, Columbia Area Transportation Study Organization, and Missouri Department of Transportation) have recognized the need for collaborative planning to better facilitate the development of a coordinated and cohesive roadway network.

CBB's work consisted of several tasks including: 1) forecasting of how much traffic will be generated from future developments over the next 20 years using the CATSO regional travel demand model,

2) projecting how this traffic will be distributed on local roadways,

3) identifying the roadway improvements needed to accommodate the forecasted future travel demands,

4) developing estimated costs to provide for these improvements, and




5) development of a funding plan to pay for the future improvements. The result was the development of a $70,000,000 master transportation plan which will guide the development of the area's roadway network over the next 20-40 years.

### PROJECT HIGHLIGHTS:

- Collaborative effort between Boone County, the City of Columbia, CATSO, and MoDOT
- Use OF the Regional CATSO Travel Demand Model to develop future traffic forecasts
- High level review of ongoing development proposals
- Development of a trip generation fee framework

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Chris Brammeier, PE, PTOE

### CONTACT

**Thaddeus Yonke**
Senior Planner
Boone County Government
T: (573) 886-4330
E: TYonke@boonecountymo.org

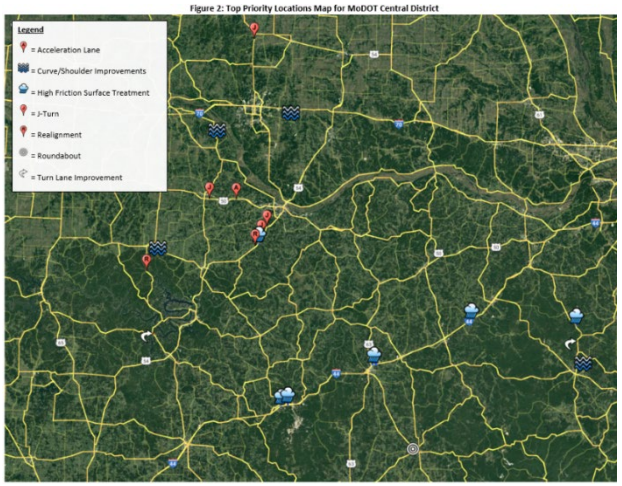
## MODOT CENTRAL DISTRICT SAFETY STUDY

*18 Counties (Laclede, Dent, Washington, Crawford, Phelps, Pulaski, Camden, Morgan, Miller, Maries, Gasconade, Osage, Cole, Moniteau, Cooper, Howard, Boone, and Callaway Counties)*

CBB analyzed crash data within the 18 counties of the MoDOT Central District to make specific safety recommendations to reduce severe and fatal crashes at at-risk locations. MoDOT provided an initial network screening of higher severity locations for curves, expressway intersections, wet crash locations, high severity intersections, 2-mile high-severity range as well as locations developed from the Area Engineers. For this safety study, crash data from 2019 to 2021 was analyzed and all locations on the lists were mapped using Google Earth. The network screenings provided by MoDOT were based on a severity rating, which includes a weighting factor for fatal (9), serious/disabling injury (6) and minor injuries (3). After some initial investigations, these lists were reorganized to remove the minor injury crashes since the benefit-to-cost ratio calculations heavily factor the fatal and severe crashes.

The top 30% of the crash locations in each category were then evaluated with a more in-depth analysis. Historical crashes were investigated at each location to identify the frequency, crash type, severity, lighting conditions and weather conditions. Additionally, the crash reports were reviewed for the severe injury and fatal crashes. Google Earth and Google Street View were utilized to get an understanding of the existing conditions and if any existing safety features were already installed at the location. Once the crash issues were understood, countermeasures were identified. The issues and potential countermeasures were then discussed with MoDOT staff at each location. Based on those discussions, a Top Priority list was generated to begin benefit to cost analysis of the preferred solutions.

Potential safety countermeasure concepts were drawn over an aerial and cost estimates were generated. Some locations included several alternatives in order to provide some flexibility and options of improvements. For example, alternatives included different roadway alignments at an intersection or completely different solutions i.e. roundabout or Green Tee at a high severity intersection. CBB performed benefit-to-cost ratios for each of the priority locations to document the proposed countermeasure's impact to safety relative to the cost of the project. The benefit to cost analysis includes the crash history, the Crash Modification Factor (CMF) for the safety countermeasure, the cost of the improvement as well as the lifespan of the countermeasures. Ultimately, a list of the Top Priority list was generated summarizing the locations, the severity of crashes, the countermeasures, the cost and the BC numbers. Additionally, Appendix reports were created for each of the Top Priority locations so that anyone could easily understand the existing conditions, the safety issues from the historical crashes, the countermeasures identified, the cost of the solution and the benefit-to-cost ratio. Additionally, electronic versions of the information were also provided so that locations could be easily found with Google Maps.




**CBB Key Personnel:**
Brian Rensing, PE, PTOE, RSP2I
Chris Brammeier, PE, PTOE
Mirza Shariff, PHD

**CONTACT**
**John Schaefer Jr., PE**
MoDOT Central District Traffic Operations Engineer
Missouri Department of Transportation
T: (573) 751-7380
E: John.Schaefer@modot.mo.gov

## GRACE LANE ALIGNMENT STUDY

*Columbia, MO*

The City of Columbia needed a new transportation plan for Grace Lane to accommodate traffic that would be added to the network once a new connection to Missouri Route 740 is built. Expecting the area to continue to develop in future years, the project team developed a two-phase plan for the roadway system. The multi-part plan allows for the city to address the current transportation issues in a shorter time frame while having a plan for future treatments in place to most effectively expand the network system as traffic volumes increase over the years. The alternatives were tested using VISSIM, SYNCHRO, SIDRA. Additionally, high level conceptual drawings and construction costs were developed to compare the alternatives. Utlimately, the alternative which reduced the number of conflict points, provides direct access to I-70, provides good mobility for exisitng and future volumes, and optimized construction costs and phasing was selected.


**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Joanne Stackpole, PE, PTOE

### CONTACT

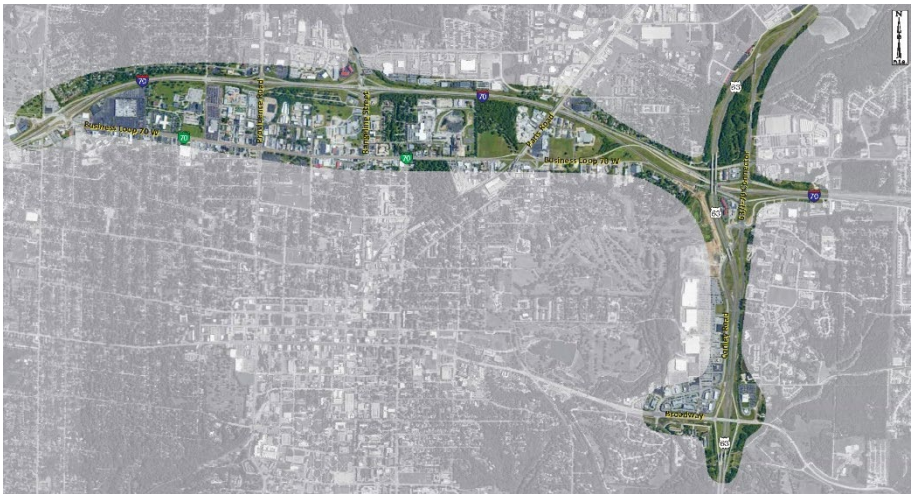
**Allison Anderson, PE**
Engineering Supervisor
City of Columbia – Public Works
T: (573) 817-5048
E: Allison.Anderson@como.gov

## I-70 AND BUSINESS LOOP 70 E INTERCHANGE STUDY

*Columbia, MO*

CBB conducted a thorough study analyzing the impact of closing the I-70 West off-ramp to Business Loop 70 E in Columbia, Missouri. The bridge over I-70 on this ramp is in substandard condition and requires either removal or replacement. This interchange project was also combined with the Business Loop 70 CID project identifying revitalization efforts for the corridor. The full project study area included I-70 between Business Loop 70 W and the US-63/I-70 Connector, US-63 between Vandiver and Broadway, the full extent of Business Loop 70, Rangeline, Providence, Broadway, and Conley Road. An origin-destination study was performed to identify traffic diversion routes from closure of the off-ramp. Once traffic diversions were determined, the no-build and off-ramp closure scenarios were analyzed using SYNCHRO, VISSIM, SIDRA, and HCS to identify impacts to the surrounding transportation network. We identified mitigation measures for impacts from closure of the off-ramp and mitigation measures for existing deficiencies. From this study, MoDOT decided to permanently close the off-ramp and CBB completed the Conceptual Study Report, Access Justification Report (AJR), and Categorical Exclusion (CE2). The ramp has been closed a part of MoDOT's Improve I-70 program.

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Joanne Stackpole, PE, PTOE
Brian Rensing, PE, PTOE, RSP2I




**CONTACT**
**Trent Brooks, PE**
MoDOT Central District Traffic Engineer
MoDOT Central District
T: (573) 751-7692
E: trent.brooks@modot.mo.gov

## US-63 AND ROUTE AC INTERCHANGE CONCEPTUAL STUDY

*Columbia, Missouri*

CBB conducted an interchange study and Conceptual Study Report for the MoDOT Central Office for the US-63 and Route AC interchange to address the safety, capacity, and mobility needs of the corridor. A folded diamond on the east side was proposed to provide a free-flow movement for eastbound Route AC to northbound US-63 to mitigate queuing in the corridor. A phased construction plan was developed as there is an immediate need to increase traffic capacity but the structure over US-63 still has significant service life. The folded diamond can be built with 5-lanes on the existing bridge structure, which can be widened to 6-lanes for increased capacity when the bridge is replaced. Special considerations were made for impacts to the development property east of Lenoir Street, New Haven Elementary School, and bike and pedestrian accommodations. Cost estimates were developed for MoDOT to utilize in programming the project in the Statewide Transportation Improvement Program (STIP). The 5-lane folded diamond will be constructed in 2025.


**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Joanne Stackpole n, PE, PTOE
Brian Rensing, PE, PTOE, RSP2I
Chris Brammeier, PE, PTOE
Brian Courtwright, PE, PTOE

### CONTACT

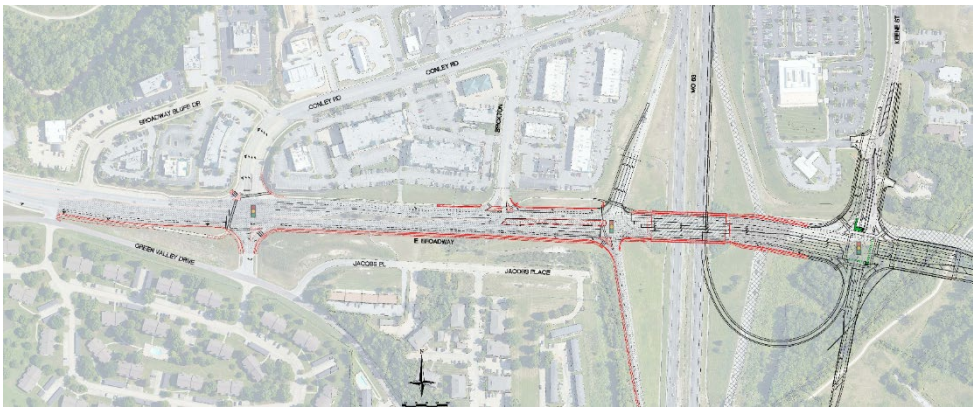
**Trent Brooks, PE**
MoDOT Central District Traffic Engineer
MoDOT Central District
T: (573) 751-7692
E: trent.brooks@modot.mo.gov

## US-63 AND ROUTE WW/BROADWAY INTERCHANGE STUDY

*Columbia, Missouri*

CBB conducted an interchange study for the MoDOT Central Office for the US-63 and Route WW/Broadway interchange due to extensive queueing and closely spaced signalized intersections present under the existing conditions. In addition to the heavy demand at the US-63 ramps, Keene Street located just east of the interchange is also a major traffic generator. Under the existing standard diamond interchange, there is not enough storage between the northbound ramp terminal and the Keene Street intersection to provide adequate safety and mobility for drivers. CBB proposed a folded diamond on the east side to consolidate the two signalized intersections to mitigate queueing in the corridor. The existing US-63 overpass still has significant service life left so CBB developed a phased construction plan that will address the capacity needs of the interchange in the near-term utilizing the existing bridge structure and can be widened to handle future volumes when the overpass needs replacement with minimal rework. The interchange configurations and mainline US-63 operations were analyzed in SYNCHRO, VISSIM, and HCS. A historical crash analysis and predictive safety analysis using ISATe and HSM were completed to evaluate the anticipated safety benefits of the folded diamond configuration. Additionally, cost estimates and conceptual drawings were developed for MoDOT to utilize in programming the project in the STIP. CBB also explored at a high level a number of additional projects to help with Keene Street access, the US-63 weaving segment between Route WW/Broadway and the US-63/I-70 Connector, and new connections to serve anticipated developments east of the interchange for MoDOT and the City to consider in their long-range planning efforts.

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Joanne Stackpole, PE, PTOE
Brian Rensing, PE, PTOE, RSP2I
Chris Brammeier, PE, PTOE
Brian Courtwright, PE, PTOE



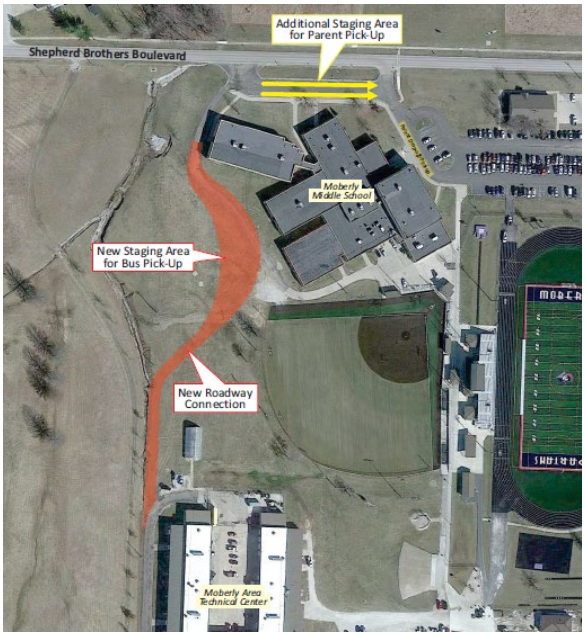

CONTACT

**Jason Vanderfeltz, PE**
Central District Design Engineer
MoDOT – Central District
T: (573) 526-6998
E: Jason.Vanderfeltz@modot.mo.gov

## MOBERLY SCHOOL STUDY

*Moberly, Missouri*

CBB was hired to complete a review of the existing traffic flow in and around the Moberly school campus in Moberly, Missouri. The City of Moberly requested a traffic study to identify the existing traffic conditions, both on-site and off-site of the Moberly school campus and to identify any traffic concerns and what, if anything, can be done to mitigate them.


The school campus is located on the west side of Gratz Brown Street between Urbandale Drive and Shepard Brother Boulevard. The study area included several schools including Moberly High School, Moberly Middle School, Gratz Brown Elementary School, Moberly Area Technical Center and Central Christian College of the Bible. CBB evaluated several intersections near the schools during the school arrival and dismissal peak hours and made recommendations as to how to improve traffic flow to/from the schools in the study area. Specifically, the City was concerned about the queueing on the public roadways during school drop-off and pick-up times, as well as pedestrian activity in and around the schools with the lack of designated pedestrian ways.

Upon completion of the study, CBB provided several recommendations, including improved pedestrian connections between the middle school, elementary school and nearby YMCA. The study also recommended a new sidewalk along the east side of Gratz Brown Street from Shephard Brothers Boulevard north to the elementary school along with new marked crosswalks across all legs of the Gratz Brown Street and Shephard Brothers Boulevard intersection.

Based on CBB staff observations, the primary cause of congestion during the school dismissal along Shephard Brothers Boulevard and the corresponding intersection at Gratz Brown Street is the parent pick-up line at the middle school. CBB recommended several options to improve the school dismissal pick-up operations including more efficient staging areas within the existing parking lot footprint. Another potential improvement recommended an alternate bus pick-up area for the middle school so that the circle drive in front of the middle school currently used for bus pick-up could also be used for parent stacking during the school dismissal.

**CBB Key Personnel:**
Shawn White, PE, PTOE

## ROCHEPORT I-70 MISSOURI RIVER BRIDGE REPLACEMENT DESIGN-BUILD PROJECT

*Boone and Cooper Counties, MO*


CBB is a key team member on the Lunda and Parsons team for the MoDOT Rocheport I-70 Missouri River Bridge Replacement Design-Build Project. The I-70 Rocheport Bridge spans the Missouri River and the Katy Trail west of Columbia Missouri. his section of I-70 carries about 34,000 vehicles per day, 25% of which are trucks.

CBB was a key player in assisting the Lunda Team in developing the team's roadway safety plan. Historically, the crash rate on the Rocheport Bridge has been more than four times the average statewide crash rate for similar facilities. Over a 3-year period, 62 crashes occurred on the bridge, resulting in significant human and property loss and significant mobility constraints on this critical section of I-70. With such a high crash rate, the Lunda Team made safety a top priority of the new Rocheport Bridge design. The Lunda Team used five strategies to improve safety:

1) Geometric improvements (new passing lane, wider shoulders)
2) Enhanced roadway delineation (wet reflective pavement markings, linear delineation system, recessed pavement markings, rumble stripes)
3) Pavement friction treatments (high-friction surface treatment, ultra-thin bonded asphalt wearing surface)
4) Intelligent Transportation Systems (roadway condition warning system, CCTV, message boards, smart traffic alerts)
5) Roadside safety (upgraded guard rail systems)

The project's safety package increases safety for freight travel, reduces wet weather incidents, and minimizes distracted driving. The safety enhancements will benefit both autos and trucks, particularly the wider shoulders and climbing lane. Several safety measures target wet weather incidents, such as wet reflective pavement markings and pavement friction treatments. Lastly, we employed several elements to reduce distracted driving, such as our roadway condition warning system and linear delineation system to make drivers more alert and aware during adverse conditions. This comprehensive safety package is expected to reduce the total number of crashes on the Rocheport Bridge by 47%, fatal and disabling injury crashes on the Rocheport Bridge by 57%. Construction on this project will be complete in 2025. https://www.modot.org/projects/RocheportBridge

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Joanne Stackpole PE, PTOE
Brian Rensing, PE, PTOE, RSP2I
Chris Brammeier, PE, PTOE
Greg Owens, PE
Erika Fuesting, BSEE

**CONTACT**
**Brandi Baldwin**
Project Director
Missouri Department of Transportation
T: 573.338.4035
E: Brandi.Baldwin@modot.mo.gov

## SPRINGFIELD CITY-WIDE PEDESTRIAN SAFETY STUDY

*City of Springfield, MO*

In 2017, CBB partnered with the City of Springfield, Missouri, to expand the City's pedestrian safety program. Collisions between vehicles and pedestrians are a significant concern in the US and around the world. Pedestrian fatalities have been increasing. From 2006 to 2015 the percentage of US pedestrian fatalities, as compared to all roadway fatalities, increased from 11% to 15%. In 2015, there were 5,376 pedestrians killed in US traffic crashes, a 10% increase from 2014. In response, the City of Springfield launched SGF Yields in 2017, a pedestrian safety campaign aimed to foster an awareness in motorists and pedestrians to look out for one another by initiating a cultural change to be more pedestrian responsible and friendly. CBB's work built upon the SGF Yields program by investigating several elements affecting pedestrian safety and developing recommendations for pedestrian safety on roadways, medians, and islands located in the City.

CBB's work shows that special care for vehicular/pedestrian conflicts should be given under the following conditions: 1) speeds on at least one approach of 35 mph or greater, 2) traffic volumes greater than 15,000 vehicles per day on at least one roadway, or 3) median widths less than 6' wide. Under these conditions pedestrians should remain in designated pedestrian areas where motorists reasonably expect them to be located (e.g., sidewalks and crosswalks) unless one of the following conditions is present: 1) there is temporary traffic control set up to warn drivers that pedestrians will be present (e.g., maintenance or special events); 2) the roadway has low traffic volumes and speeds and is designated as a shared space for both motorists and pedestrians; or 3) pedestrians are using a temporary pedestrian refuge as a part of the process of promptly crossing a road. Based upon these factors CBB worked with the City of Springfield to update their pedestrian safety ordinance and create a safer environment for the City's pedestrians.

### CONTACT

**Martin Gugel, P.E.**
Assistant Director of Public Works
City of Springfield
T: (417) 864-1020
E: mgugel@springfieldmo.gov

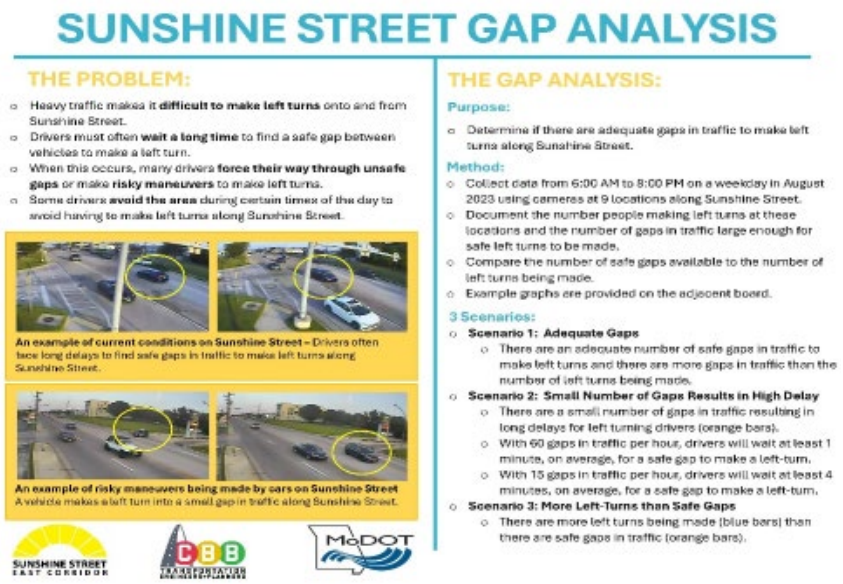
**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Brian Rensing, PE, PTOE, RSP2I
Paige Martz, PE, PTOE, RSP2IB

## SUNSHINE ECONOMIC ANALYSIS

*Springfield, MO*

MoDOT engaged CBB to evaluate the potential economic impacts of providing access management along sections of Sunshine Street in Springfield, MO. The corridor had been configured as a four-lane roadway with a center left turn lane along its entirety. However, increased traffic and an abundance of driveways into commercial businesses has led to both a safety and convenience issue with drivers struggling to safely make left turns into and out of these businesses.

CBB documented and mapped businesses in the affected corridor, detailing their type, location, and location of access points. This process included creating a business inventory from property tax data. Businesses were identified by their North American Industrial Classification System (NAICS) codes, and distances were calculated to illustrate the impact of eliminating left-turn access points. CBB also conducted a gap analysis to determine how many gaps in traffic became available for left turning vehicles versus the number of vehicles turning left for each hour of the day.




To gather firsthand data from business owners and operators, we developed and distributed an internet-based survey. Additionally, we conducted several roundtable meetings with affected businesses to understand their concerns and gather suggestions for mitigating economic impacts. These facilitated discussions provided valuable insights that complemented the survey data.

At the same time, we analyzed relevant economic data to estimate revenues and compare these figures to city and regional economic data. This analysis helped create a context for understanding the corridor's economic significance within Springfield. We also examined historic trends to assess growth patterns and predict future economic impacts. This involved obtaining historic data on retail sales taxes and property tax appraisals for the corridor, comparing these trends to other areas and overall city/county totals. This data was analyzed and used to illustrate trends and inform our impact assessments.

Finally, we compiled all findings into a comprehensive technical report. This report integrated the results from the literature reviews, business documentation, stakeholder surveys, roundtable discussions, economic data analysis, and historic trend examinations. The report provided a detailed understanding of the potential economic impacts of the median installation on Sunshine Street, supporting informed decision-making on the part of MoDOT.

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Mike Albin, AICP

**CONTACT**
**Kristi Bachman**
Transportation Project Manager
MoDOT
T: (417) 829-8040
E: Kristi.Bachman@modot.gov

## STEP TRAINING WORKSHOP

*Springfield, Missouri*

CBB hosted a two-day Safe Transportation for Every Pedestrian (STEP) training workshop for the City of Springfield, MoDOT, and other local agencies. This training event included classroom instruction about the who, what, why, where, and how of STEP and included a practical exercise for participants to practice what they had learned. During the practical exercise, participants worked in groups to review data and conduct field observations to evaluate the problems, needs, and opportunities of four different roadway segments with significant pedestrian activity and used the training they had received to develop conceptual plans to improve pedestrian safety at those locations.

Pedestrian fatalities have increased by an alarming 51% over the past decade and now make up 17% of all roadway traffic deaths. The STEP initiative was created by the Federal Highway Administration (FHWA) to promote safety countermeasures which enhance the safety of people walking along and across our roadways. These treatments improve safety and enhance quality of life through targeted investments.

CBB staff crafted the presentations and materials for the workshop and led the practical exercises. The resulting concepts from the practical exercise have led to implementable design projects.

More about FHWA's STEP program can be found at: https://highways.dot.gov/safety/pedestrian-bicyclist/step

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Joanne Stackpole, PE, PTOE
Brian Rensing, PE, PTOE, RSP2I
Mike Albin, AICP

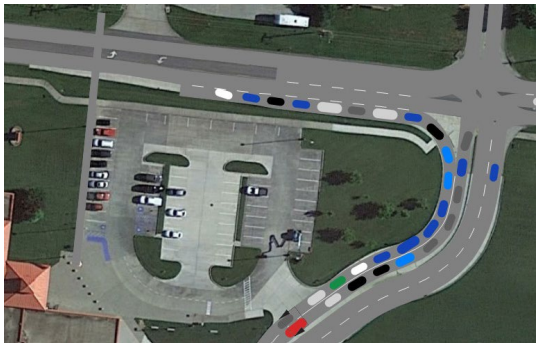
CONTACT
**Shaun Tooley, AICP**
MoDOT
T: (314) 453-1838
E: Shaun.Tooley@modot.mo.gov

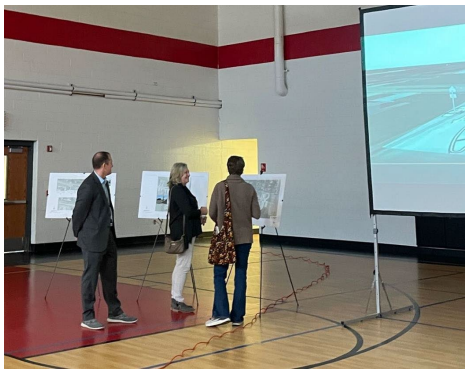
## SEMPO INTERSECTION ANALYSIS

*Cape Girardeau and Jackson, MO*

CBB conducted the SEMPO Intersection Analysis Project to address traffic safety and operational concerns at two critical locations: the intersection of Perryville Road and County Road 621 in Cape Girardeau, Missouri, and the Independence Street corridor near Jackson Middle School in Jackson, Missouri. Both studies aimed to enhance road safety, improve traffic flow, and address specific issues such as driver confusion, high speeds, and pedestrian safety risks.

This study focused on the complex geometry of the Perryville Road/County Road 621 intersection, which had caused frequent driver confusion and an average of 2.7 crashes per year between 2014 and 2022. A majority of these crashes occurred on wet pavement, often involving vehicles losing control on the steep downgrade of Perryville Road. CBB analyzed existing traffic patterns and crash data to evaluate six potential roadway alternatives. The proposed improvements ranged from realigning the intersection to installing a single-lane roundabout. The alternatives were evaluated using VISSIM and SYNCHRO traffic modeling software to ensure the recommended design would maintain efficient traffic operations while improving safety.





Among the options, the installation of a roundabout or a significant realignment of Perryville Road offered the greatest potential safety benefits, with crash modification factors suggesting a possible reduction in crashes by up to 68.5%. Additional low-cost safety enhancements, such as high-friction surface treatments to address the high number of crashes on wet pavement, advanced warning signs, and flashing beacons, were recommended to further reduce crash risk, especially at night and during adverse weather conditions.

The Independence Street corridor study focused on improving pedestrian safety near Jackson Middle School, where high vehicle speeds and a lack of marked crosswalks posed risks for students crossing Independence Street and Broadridge Drive. Traffic data revealed that vehicle speeds, particularly during school drop-off and pick-up times, exceeded safe limits, with some drivers reaching speeds of 45 mph in a 35 mph zone. This, combined with the high volume of student pedestrians, created significant safety concerns.

CBB's recommendations included installing marked crosswalks with pedestrian-actuated flashing beacons at key intersections along Independence Street and Broadridge Drive, providing safer crossing opportunities for students. Additionally, CBB suggested the construction of a new sidewalk on the north side of Independence Street to improve pedestrian accessibility. To further enhance safety, speed enforcement during school hours and improved signage were also proposed to calm traffic and reduce speeding near the school.

In both studies, CBB used a data-driven approach to identify traffic safety issues and recommend practical, effective solutions. The proposed improvements aimed not only to reduce crash rates but also to enhance pedestrian safety and traffic flow, ensuring safer and more efficient roadways for drivers and pedestrians alike.

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Nirav Patel, PE, PTOE
Mike Albin, AICP

**CONTACT**
**Alexander McElroy, MPA**
Executive Director
Southeast Metropolitan Planning Organization
T: (573) 339-6734
E:amcelroy@CityofCapeGirardeau.org

## WENTZVILLE HISTORIC DOWNTOWN TRANSPORTATION REVITALIZATION PROJECT

*Wentzville, Missouri*

CBB was the lead consultant on the Wentzville Historic Downtown Transportation Revitalization Project. The goal of this project is to ensure that Downtown Wentzville continues to be a vibrant and integrated part of the community with improved access, circulation, parking, walkability, wayfinding, gateway treatments, and streetscape. Wentzville was founded with the expansion of the railroads in the 1850s, and Downtown Wentzville has been the central gathering place for the city ever since. Downtown Wentzville is one of the authentic historic places that define the midwestern United States. It is critical that these places are healthy, vibrant, and economically successful.

In the pre-interstate era, Pearce Boulevard was a principal thoroughfare for east-west traffic, serving as a site for businesses that served local residents and travelers alike. The expansion of the interstate system relocated through traffic to Interstate 70, leaving behind a grid of walkable, charming, and compact blocks, featuring an eclectic collection of pedestrian-scale buildings dating from different periods of Wentzville's development. Today, these buildings house a variety of independent businesses and function as a unique commercial center within Wentzville and the St. Louis region. Wentzville is one of the fastest growing cities in Missouri. Wentzville leaders, recognizing the opportunity to better capitalize on the downtown assets, partnered with CBB to develop transportation improvement recommendations that can be leveraged toward revitalization of the downtown district.

CBB conducted transportation planning studies, alignment studies, traffic operations studies, alternatives development/ evaluation, and public engagement as a part of this project. CBB also submitted Build America 2018 Grant application on behalf of the city. Revitalization recommendations include:

- A better downtown environment for business and visitors by completing sidewalks; constructing a multi-use path; and installing amenities such as pocket parks, benches, and streetscape elements.
- Improved circulation of traffic on downtown streets by building stronger connections to Allen Street, which is underutilized. This allows for better traffic management during events, maintenance activities, and daily use.
- Improved traffic flow by upgrading the corridor's four-way stop controlled intersections to traffic signals.
- Raising electric and other above-ground utilities by approximately 15 feet higher than the existing poles for better aesthetics. The taller poles will allow for longer spans reducing the total number of utility poles by about a third.
- Implementation of a "quiet zone" through four-quadrant gates at the Linn at-grade railroad crossing.
- New gateway treatments that reflect Wentzville's unique character and history.

As a subsequent phase of the project, CBB completed the design for improvements to Allen Street, which was one recommendation that came from the revitalization plan. The Allen Street project was constructed in 2021.

**CBB Key Personnel**:
Shawn Leight, PE, PTOE, PTP
Chris Brammeier, PE, PTOE
Paige Martz, PE, PTOE, RSP2IB

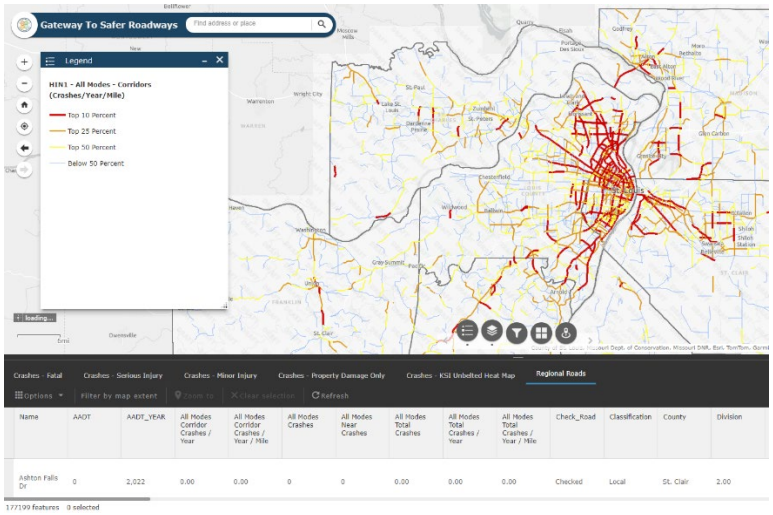
CONTACT
**Susan Spiegel**
City of Wentzville
T: 636) 639-2045
E: susan.spiegel@wentzvillemo.org

## GATEWAY TO SAFER ROADWAYS: ST. LOUIS REGIONAL SAFETY ACTION PLAN

*East West Gateway Council of Governments*

The Gateway to Safer Roadways: St. Louis Regional Safety Action Plan was developed as part of the East-West Gateway Council of Governments' (EWG) initiative to improve transportation safety across the region. Recognizing the serious public health concern posed by roadway fatalities and injuries, this plan provides a comprehensive strategy to reduce these incidents across the eight-county East-West Gateway region, including St. Louis City and County. CBB Transportation Engineers + Planners led the development of the Action Plan, which focuses on three key areas: engagement, safety analysis, and policy review. These elements, with equity woven throughout, are grounded in the Safe System Approach—a framework designed to reduce the risk of severe crashes and improve safety for all users. The plan aims for a 50% reduction in fatalities and serious injuries by 2050.

CBB's engagement efforts involved collaboration with over 50 stakeholder organizations, ensuring a wide range of perspectives from transportation agencies, law enforcement, public health, and community advocates. This collaboration helped form recommendations tailored to the region's diverse needs. The safety analysis revealed that approximately 50% of fatal and serious injury crashes occur on just 25% of the roadways, known as the High-Injury Network (HIN). Improving safety on these roads became a top priority, as it offers the greatest potential for reducing crashes. Additionally, the analysis identified key risk factors, such as speeding, which contributes to 30% of serious and fatal crashes.




In parallel, CBB conducted a review of current policies and programs, identifying ways to address human error, which is responsible for over half of the region's serious injuries and fatalities. This review led to recommendations for adopting evidence-based countermeasures like speed management and targeted enforcement initiatives.

The Action Plan outlines three main strategies. First, it emphasizes addressing safety deficiencies on the High-Injury Network. Second, it calls for the systematic implementation of proven safety measures across the entire roadway network, such as enhanced crosswalks, protected bike lanes, improved lighting, and traffic calming to reduce speeding and driver inattention. Finally, CBB recommended policy changes aimed at reducing human error and encouraging safer driving behaviors through initiatives like seatbelt promotion, impaired driving reduction, and driver education programs. Learn more at: https://www.ewgateway.org/gtsr/

**CBB Key Personnel**:
Joanne Stackpole, PE, PTOE
Shawn Leight, PE, PTOE, PTP
Brian Rensing, PE, PTOE, RSP2I
Mike Albin, AICP
Mirza Sharif, Ph.D.

**CONTACT**
**Marcie K. Meystrik**
East-West Gateway Council of Governments
T : (314) 421-4220
E : marcie.meystrik@ewgateway.org

## CITY OF ST. LOUIS TRAFFIC CALMING ENGINEERING GUIDELINES

*City of St. Louis Board of Public Service*

CBB prepared a set of guidelines for the design and implementation of traffic calming elements on City-owned streets. The goal of the project is to increase the consistency and effectiveness of these measures for successful implementation and continued maintenance. The guidelines define the following:

1. Which traffic calming measures are allowed on City streets based on roadway characteristics, such as functional classification, speeds, vehicular volumes, etc.
2. What routes are not eligible for some traffic calming measures, such as speed humps on primary snow routes.
3. Standardized design considerations for each traffic calming measure, including standard details.
4. What materials can be used for construction; and
5. General maintenance needs of the traffic calming devices.


A data-driven approach guiding where and how to apply traffic calming is key to maximizing the impact of traffic calming investments made.

Two deliverables are being prepared for the Board of Public Service (BPS). The first is a set of guidelines that detail the design criteria and specifications of each traffic calming element to be used by engineers and designers for design and construction. It also includes standard details, prepared by our sub-consultant Civil Design Inc., for each measure for a consistent design of these measures.

The second is a guide that is intended to educate the public on traffic calming features, outlining where and how they can be used and the process to request traffic calming on your street. The public facing document describes what traffic calming tools are available, their benefits, and their limitations, in approachable terms for community members and leaders.

These guidelines will ensure consistency, effectiveness, and successful construction and maintenance for traffic calming devices, which will enhance safety, improve accessibility, elevate livability, and create positive economic impacts across the City of Saint Louis. These documents will be used for currently funded traffic calming projects throughout the city this year and for many years to come.

Learn more at:
https://www.stlouis-mo.gov/government/departments/public-service/projects/documents/traffic-calming-guidelines.cfm

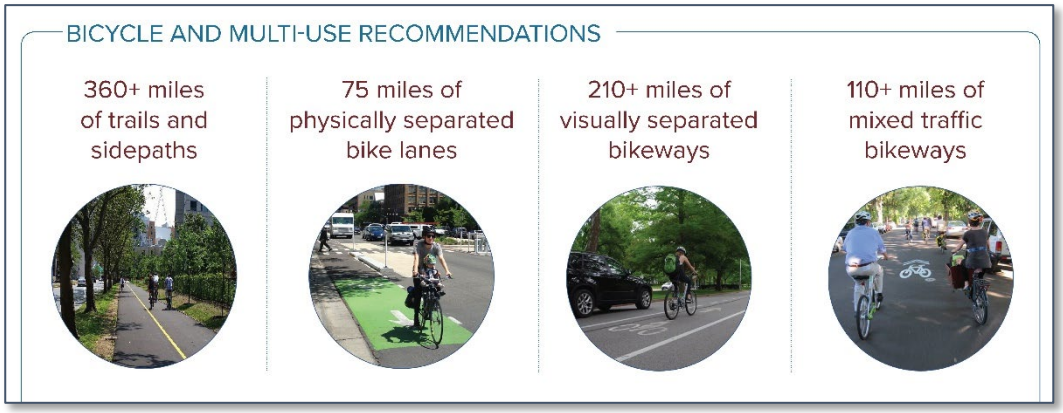
**CBB Key Personnel:**
Joanne Stackpole, PE, PTOE
Shawn Leight, PE, PTOE, PTP
Srinivas Yanamanamanda, PE, PTOE, PTP

CONTACT
**Jarek Czernikiewicz, PE**
Board of Public Service
City of St. Louis
T : (314) 589-6615
E: czernikiewiczj@stlouis-mo.gov

## ST. LOUIS COUNTY ACTION PLAN FOR WALKING AND BIKING

*St. Louis County, Missouri*

CBB was a member of the Alta team on the St. Louis County Action Plan for Walking and Biking. This plan is a federally funded (Transportation Alternative Program TAP) project to provide and updated plan for walking and biking facilities in St. Louis County. Building off the Gateway Bike Plan, the Action Plan for Walking and Biking seeks to provide a vision for a more walkable and bikeable St. Louis County, by addressing facilities on St. Louis County Roads.





The project involved a robust public engagement process, soliciting feedback at public open houses, virtual meetings, and stakeholder outreach. The outcome of the project is a plan that includes recommendations for the addition of enhanced bicycle facilities (bike lanes, cycle tracks, shared use paths, etc.) and enhanced pedestrian facilities throughout St. Louis County. Additionally, the plan includes a path for implementation of the recommended facilities.

CBB played a key role in analyzing traffic and transportation patterns on critical corridors as well as was involved in the public engagement component of the project. CBB provided transportation engineering and planning at various levels to determine feasibility of roadway reconfiguration to make room for recommended walking and biking facilities. We worked with St. Louis County to determine priority corridors for further analysis.

On these 12 corridors, we used SYNCRHO to analyze traffic patterns and make a recommendation about what walking and biking facilities would fit within the existing Right-of-Way. Each corridor analysis included a white paper outlining the process, findings, and recommendations. Additionally, CBB was involved in the stakeholder engagement and public outreach through participation in open houses and online virtual meetings. Learn more: https://stlouiscountymo.gov/st-louis-county-departments/transportation-and-public-works/planning-for-the-future/action-plan-for-walking-and-biking1/

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Joanne Stackpole, PE, PTOE
Ashley Fillback, PE

CONTACT
**Stephanie Leon Streeter, PE**
St. Louis County Department of Transportation and Public Works
T: 314-615-8504
E: sleonstreeter@stlouisco.com

## EAST-WEST GATEWAY GREAT STREETS

*Various Locations (East-West Gateway Council of Governments)*

CBB has experience working on many projects as part of the East-West Gateway Council of Governments (EWGCOG) Great Streets program. Launched in 2006, the EWG Great Streets program works in various communities across the St. Louis region to enhance streets as quality public spaces that support a variety of land uses, encourage economic development, are environmentally friendly, and support all modes of transportation, including bicyclists, pedestrians, motorists, and transit users. CBB has worked as the expert transportation planner on 11 of these projects.

- Illinois
  - Route 159/Main Street in Smithton
  - St. Louis Road/Collinsville Road in Collinsville
  - Mascoutah Main Street
  - Illinois Planning Panel for Belleville, Lebanon, and Grantfork
- St. Louis County, MO
  - West Florissant Avenue
  - Woodson Road in Overland
- City of St. Louis, MO
  - Grand Center
  - Bevo Mill
  - Dr. Martin Luther King Boulevard
  - 14th Street
- Jefferson County, MO
  - Festus and Crystal City - Twin Cities

These projects started with team kick-off meetings to further develop the goals and vision of the agency for their corridor. The team was then responsible for working with the agency to collect the necessary background information needed for each discipline as we further investigated the corridor. In addition to these data collection efforts, the team met with pre-identified key stakeholders for interviews prior to the public engagement.

In these projects, CBB evaluated the automobile, pedestrian, bicycle, and transit operations and accommodations along the corridor and helped the project team develop alternatives that support desired land use and balance the operations of the various transportation modes along the route. As a part of this process CBB completed comprehensive speed studies, walkability and bikeability audits, corridor crash analysis, and multi-modal level of service analysis.

The projects included an involved charrette week process consisting of stakeholder interviews and group discussions as well as public meetings and open design working sessions. Each project culminates with a final report outlining high-level conceptual planning recommendations and a discipline specific white paper on each specialty area associated with the project. As a result of these projects, each of these communities will have the necessary tools to progress project development and work to identify any potential future funding for continued study and planning, corridor design, and project implementation.
Learn more at: https://www.ewgateway.org/transportation-planning/great-streets-initiative/

**Last Project Completed:** 2024

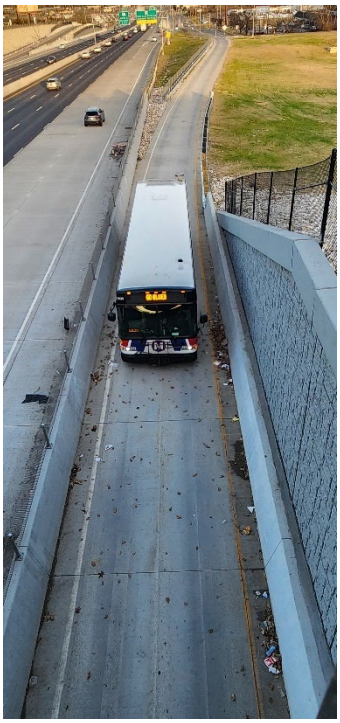
CONTACT
**Paul Hubbman**
East-West Gateway Council of Governments
T : (314) 421-4220
E: paul.hubbman@ewgateway.org

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Joanne Stackpole, PE, PTOE
Mike Albin, AICP

## I-270 NORTH DESIGN-BUILD

*St. Louis County, MoDOT*

CBB participated in the I-270 North design-build project to enhance I-270 in North St. Louis County. The goal of the project is to improve safety, mobility, and travel reliability for all users. CBB worked on the conceptual study for the project during the pursuit phase and was responsible for all safety evaluation and traffic modeling as well as the resubmission of the Access Justification Report to FHWA.



The team created a design that eliminated all crossover slip ramps on the outer roads through a one-way outer road system, mitigated bottlenecks on the freeway through widening and innovative interchange designs, and enhanced pedestrian and bike facilities through implementation of a multi-use path. The North St. Louis Community is heavily reliant on multi-modal travel, so it was important to the team to enhance walking, biking, and transit operations. A critical part of the project is the construction of a new 10-mile multi-use path along Dunn Road between Lindbergh Boulevard and Breezy Point and along Pershall Road between Hanley/Graham Road and Old Halls Ferry Road. This new multi-use path provides pedestrian and bicycle connectivity through the entire project area. The project team also constructed a counter-flow bus-only lane to provide direct connections between Metro's north county transportation center and both West Florissant Avenue and the Florissant Valley Community College. This innovation saves Metro around $1Million/year in operating costs.



One unique aspect of this project is the ability to enhance the corridor's mobility and travel reliability through the implementation of Intelligent Transportation Systems (ITS) and Transportation System Maintenance & Operations (TSMO). CBB designed an ITS/TSMO plan that enables enhanced integrated corridor operations through an array of equipment, techniques, and methodologies to fully integrate the freeway, outer roads, arterials, public transit, and nonmotorized transportation into a cohesive system. This ITS program builds off existing components with upgrades to devices and incorporates new state-of-the-art technologies.

CBB completed the design of all traffic signals, overhead signage, freeway and arterial lighting, CCTV, Dynamic Message Boards (DMS), traffic detection equipment, and fiber/wireless communications for the project and is managing all traffic signal operations during construction. As one innovation CBB operated a drone to observe traffic conditions during major construction events to provide better visibility on how traffic was moving in the corridor. As another, CBB has developed a new Dynamic Trailblazer System which will be used by MoDOT's TMC staff to manage the traffic in the corridor during incidents. Construction was completed in 2023.

**MoDOT Contact**
Eric Kopinski, PE
MoDOT
T: (314) 415-0964
E: eric.kopinski@modot.mo.gov

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Joanne Stackpole, PE, PTOE
Nirav Patel, PE, PTOE
Brian Rensing, PE, PTOE, RSP2I
Chris Brammeier, PE, PTOE
Erika Fuesting, BSEE

## HILTON HEAD ISLAND US 278 TRANSPORTATION STUDY

*Hilton Head Island, South Carolina*

CBB completed a transportation study to improve access and traffic flow between the mainland and the Town of Hilton Head Island. The focus of the study was the section of US 278 that connects Hilton Head Island to the mainland. US 278 is the only access to Hilton Head Island, and it is currently congested during peak commute times. Approximately two-thirds of the Hilton Head Island workforce, many of whom are employed in service sectors, live on the mainland due in large part to the cost of housing on the island. Multimodal options are limited between the island and the mainland. Efficient transportation options are a critical need for Hilton Head Island residents, workers, and visitors.

The purpose of CBB's study was to address two key questions:
1) Is widening US 278 to six-lanes necessary and will increasing the roadway's capacity create downstream traffic impacts on other parts of the Island?
2) Could increasing the extent and usability of other local forms of transportation beyond the private automobile, deploying adaptive traffic signals, and/or implementing Intelligent Transportation Systems (ITS) address congestion and improve access?

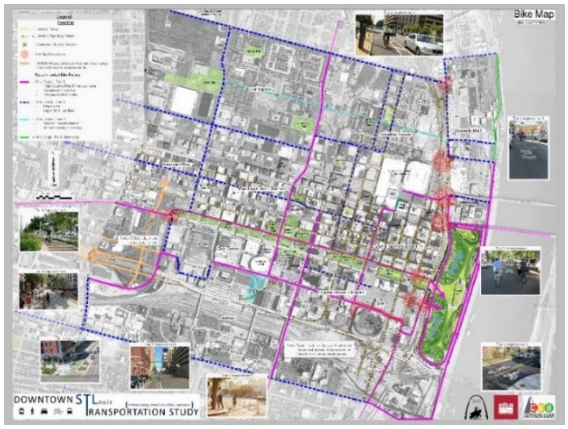
CBB addressed these questions by building a comprehensive VISSIM model and completing a multimodal access evaluation. In this work CBB validated the need to expand US 278 to 6-lanes and also developed several recommendations: 1) the local bus service should be augmented and expanded to provide tourists and commuters with travel alternatives, 2) connections between public transportation and local shuttles could be improved to provide continuity of service, 3) better connections can be made between local trail system and a new multi-modal path that will be constructed as a part of the US 278 bridge replacement project, 4) the local Intelligent Transportation System (ITS) should be expanded to allow transportation operators to better respond to incidents and optimize traffic management, and 5) some intersections on Hilton Head Island should be reconfigured to accommodate future traffic volumes.

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Joanne Stackpole, PE, PTOE
Nirav Patel, PE, PTOE
Mike Albin, AICP

CONTACT
**Jared Fralix**
Assistant County Administrator
Beaufort County
**843-255-2730**
**jared.fralix@bcgov.net**

## DOWNTOWN MULTIMODAL PLAN

*City of St. Louis, MO*




CBB completed a Downtown Multimodal Plan for the City of St. Louis that envisions a connected and accessible transportation system for all residents and visitors. The vision of this plan is a robust multimodal system that enhances connections for pedestrians, bicyclists, transit users and motorists of all ages and abilities, while improving quality of life, supporting economic growth and community development, easing congestion, and bettering air quality and improving public health. The plan includes goals, objectives, strategies, and elements as actionable strategies that are needed to make this vision reality. In building a transportation system that supports all modes of transportation, St. Louis can provide pathways for equitable access to economic opportunity. The project limits are generally bounded by Jefferson on the west, Cass on the north, Mississippi River on the east, and Chouteau on the south.


The driving force behind the creation of the Downtown Multimodal Plan was to better balance user needs and address significant impacts to traffic patterns in Downtown St. Louis resulting from recently completed transformative projects. The New Mississippi River Bridge opened in 2014, connecting Downtown St. Louis with Interstate 70 traffic, via Tucker, bringing visitors to the heart of Downtown. Additionally, the City+Arch+River project built a park over the highway, connected Downtown St. Louis with the Gateway Arch and the Mississippi Riverfront, and closed Memorial Drive providing direct access via interstate ramps. These significant projects had impacted transportation patterns within Downtown St. Louis. Additionally, the city had made substantial progress promoting active transportation by implementing new bicycle facilities, achieving the Silver Level Bicycle Friendly City Status, as designated by the League of American Bicyclists, and joining the National Association of City Transportation Officials (NACTO) as a large City affiliate member. While recent projects have upgraded connections to Downtown St. Louis, there remains a need to better connect users of all ages and abilities with the downtown. This Downtown Multimodal Plan works to balance user needs, ensuring all St. Louis City residents have enhanced access to opportunity.

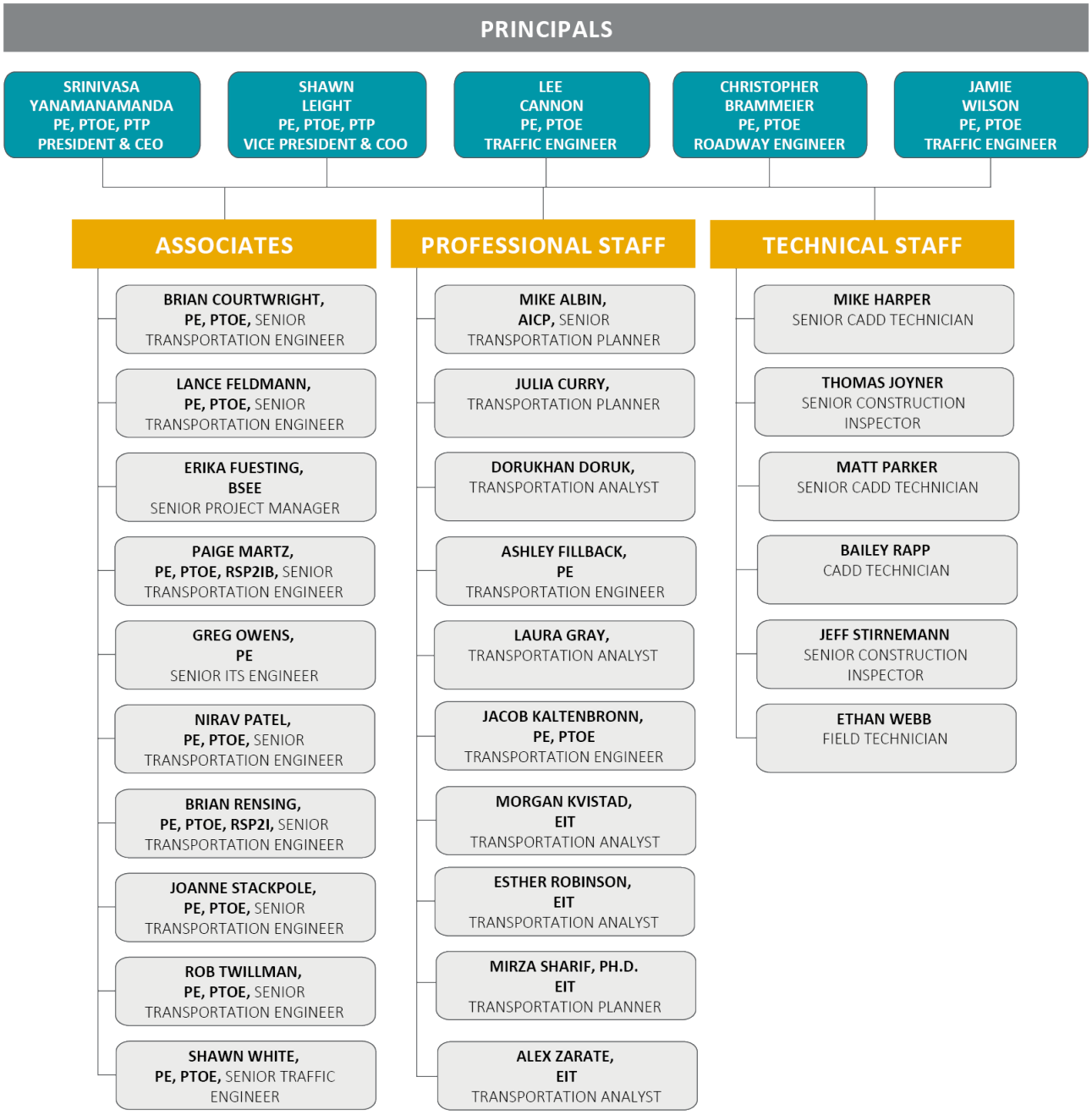
The plan was completed in June 2018 and adopted by the City's Planning Commission in December 2018. In 2019 the project was recognized by the American Planning Association for Achievement in Transportation Planning – Silver; and by the East-West Gateway Council of Governments (EWGCOG) for an Outstanding Local Government Achievement Award for Leadership in Planning and Design Innovation. Learn more at: https://www.stlouis-mo.gov/government/departments/planning/documents/downtown-transportation-study.cfm

**CBB Key Personnel:**
Shawn Leight, PE, PTOE, PTP
Srinivas Yanamanamanda, PE, PTOE, PTP

**CONTACT**
**John P. Kohler, P.E.**
City of St. Louis Board of Public Service
T: (314) 589-6623
E: kohlerj@stlouiscity.com

# FIRM ORGANIZATION CHART / STAFF RESUMES

CBB STAFF



## Srinivas Yanamanamanda, PE, PTOE, PTP
**Chief Executive Officer**

**Contact**
syanamanamanda@cbbtraffic.c
636-219-8673

**Education**
M.S., Civil Engineering, Universi Missouri, Columbia, 2003

Bachelor of Technology Civil Engineering, India Institute of Technology, Madras, India, 200

**Registration**
Professional Engineer: Missouri Illinois

Professional Traffic Operations Engineer (PTOE) as Certified by Transportation Professional Certificate Board (ITE Affiliated)

Professional Transportation Plar (PTP) as certified by the Transportation Professional Certificate Board (ITE Affiliated)

**Professional Activities**
Gateway Section of the Institute Transportation Engineers (GSITE formerly TEAM STL

TRB Freeway Simulation Subcommittee

TRB Emerging Freeway Operatic Concepts Subcommittee

Institute of Transportation Engineers (ITE)

**Academic Appointments**
Adjunct Faculty, Southern Illinoi University Edwardsville (Spring 2013)

Adjunct Faculty, Saint Louis University (Spring 2016)

Srinivas Yanamanamanda is the President and Chief Executive Officer of CBB. He is responsible for managing the overall operations of CBB and implementing strategies for continued client satisfaction. On the technical front, Srinivas leads CBB's freeway operations and multi-modal transportation modeling disciplines and manages transportation planning projects. He has developed expertise in providing practical transportation solutions utilizing traditional analysis techniques and robust transportation simulation and demand models. He has been involved in the development of freeway and arterial corridor planning efforts, interstate access justification reports, long-range transportation plans, parking studies and masterplans, design studies, ATMS and signal timing/operations, ITS/Signal design, and traffic impact studies. Srinivas has been very successful in assisting transportation decision makers, including elected officials and public agency leadership, during the transportation project decision making process. The following projects represent Srinivas' experience.

**I-270 North Corridor Study** *St. Louis County, MO*
Srinivas led the traffic operations analysis component of the I-270 North Corridor Study for the Missouri Department of Transportation (MoDOT). This study examined the problems, needs, and opportunities of a 10-mile I-270 corridor in St. Louis County and identified possible solutions to address those problems and needs. Large-scale transportation models were developed to aid traffic operational analysis for the study. This study also included coordination with other agencies including East-West Gateway Council of Governments, St. Louis County Department of Highways and Traffic, and Metro. Srinivas also assisted MoDOT in the public involvement process, including Community Advisory Group (CAG) meetings and public meetings. In addition, he led the development and implementation of signal timing plans during construction of Route N and Route AC bridges.

**St. Louis Lambert International Airport CMAQ Project** *City of St. Louis, MO*
Srinivas managed the design of ITS and Signal Improvements at the St. Louis Lambert International Airport. This project consisted of traffic management enhancements at St. Louis Lambert International Airport including signal, roadway and ITS improvements along Lambert International Boulevard and a signal timing optimization of airport and adjacent MoDOT intersections. ITS improvements designed and constructed in this project included new fiber optic cable, networking equipment, surveillance cameras, count stations and monitoring stations. The new fiber and ITS devices were designed to allow for video sharing between MoDOT and Lambert International Airport. This project also included design and installation of a new central system software for traffic signal management at the airport.

**I-270/Dorsett Road Diverging Diamond Interchange Study** *Maryland Heights, MO*
Srinivas led the traffic operations analysis and modeling for the I-270/Dorsett Road Diverging Diamond Interchange (DDI) study in Maryland Heights, Missouri. He was involved in every step of the interchange reconfiguration to a DDI – from conceptual plan development, traffic modeling analysis of the DDI interchange using VISSIM, public involvement, refining concept during final design and construction staging development. Extensive public engagement was also undertaken to educate the local elected officials, business owners and residents about the two options considered – Single Point Urban Interchange (SPUI) and Diverging Diamond Interchange (DDI).

**IL-15/IL-158/IL-13 Interchange Study** *Belleville, IL*
Srinivas managed the traffic operations evaluation of the IL-15/IL-158/IL-13 interchange in Belleville, Illinois for the Illinois Department of Transportation (IDOT). This heavily traveled interchange is comprised of three closely spaced signalized intersections. SIDRA and VISSIM traffic analysis software packages were used to evaluate the traffic operations of the existing interchange. The evaluation included evaluating and optimizing conceptual layout for the recommended roundabout interchange. Srinivas also assisted IDOT in the stakeholder involvement process to demonstrate the traffic operations of this innovative roundabout interchange concept.

## Shawn Leight, PE, PTOE, PTP
Vice President

**Contact**
sleight@cbbtraffic.com
314-922-3099

**Education**
M.S., Transportation Engineering, University of Wisconsin at Madison, 1997

B.S., Environmental Engineering, United States Military Academy at West Point, 1993

**Academic Appointments**
Adjunct Professor, Washington University & University of Missouri St. Louis Joint Civil Engineering Program (2003 to Present)

**Registrations**
Professional Engineer: CO, IL, KY, MN, MO, NV, NC, SC, WI

Professional Traffic Operations Engineer (PTOE)

Professional Transportation Planner (PTP)

**Professional Activities**
Institute of Transportation Engineers (ITE)
International President – 2017

Missouri Valley Section of ITE
President – 2009

Gateway Section of ITE (GSITE) formerly, TEAM STL
President – 2005
Administrator – 2007 to Present

Transportation Research Board, Transportation for National Defense Committee – 2013 to Present

Co-Author: The Practical Playbook II: Building Multisector Partnerships That Work

Shawn Leight works to develop transportation solutions that support community values by forging relationships and advancing forward-thinking solutions. Shawn has more than 30 years of experience in transportation engineering and planning. He is the vice president and a principal owner of CBB, where he manages project delivery and business development.

Shawn has played a key role in several innovative projects such as the reconstruction of I-64 in St. Louis, which was awarded AASHTO's 2010 America's Best Transportation Project in the United States. He led the development of the Downtown St. Louis Multi-modal Transportation Plan, which was recognized by the East West Gateway Council of Governments for Outstanding Local Government Achievement In 2019. He served as the lead traffic engineer for the I270 North Design Build project, which was awarded the ITE's 2024 Transportation Achievement Award for Traffic Engineering.

Shawn has served as an adjunct professor of transportation engineering at Washington University in St. Louis, where many of his 350+ students are now leaders in the transportation profession. Shawn supports the transportation industry by serving on boards and committees for professional organizations. He was the 2017 International President of the Institute of Transportation Engineers (ITE) and currently serves as the research coordinator for the Transportation Research Board (TRB) Transportation for National Defense Committee. Shawn's work in the St. Louis region has been featured on KMOX and St. Louis Public Radio as well as in St. Louis Magazine and the River Front Times. The following projects represent Shawn's experience.

**I-270 North Design-Build Project** *St. Louis County, MoDOT*
Shawn led CBB's traffic engineering efforts for Millstone Weber's Design-Build team on the I-270 North Design-Build Project in St. Louis County. The goal of the project is to improve safety, mobility, and travel reliability throughout the I-270 corridor for all users. The team created a design that eliminated all crossover slip ramps on the outer roads through a one-way outer road system, mitigated bottlenecks on the freeway through widening and innovative interchange designs, and enhanced pedestrian and bike facilities through implementation of a multi-use path. The project includes several innovative features such as MoDOT's first counterflow bus-only lane and Dynamic Trailblazer signs. This project was completed in December of 2023. Learn more at: http://www.i270north.org/.

**I-70 Interchange Studies (Missouri River to I-64)** *St. Charles County, Missouri*
Shawn completed studies of the I-70 interchanges with 5th Street, Route 94, Zumbehl Road, Cave Springs Road, Mid Rivers Mall Drive, and Highway K. These studies involved partnerships with the Cities of St. Charles, St. Peters, and O'Fallon with St. Charles County and MoDOT and included Interchange Planning, Traffic Analysis, Safety Studies, Conceptual Plan Design, Construction Cost Estimates, Public Engagement, Economic Studies, the preparation of Funding (Grant) Applications, and Multi-modal (bicycle/pedestrian) coordination. CBB prepared CMAQ applications for improvements to the 5th Street, Cave Springs Road, Mid Rivers Mall Drive, Route 79, and Highway K interchanges. The 5th Street, Route 94, Zumbehl Road, Cave Springs Road, and Mid Rivers Mall Drive interchanges have all been reconstructed from these efforts.

**Gateway to Safer Roadways: St. Louis Regional Safety Action Plan** *Greater St. Louis Region*
Shawn led the development of a comprehensive strategy aimed at reducing roadway fatalities and serious injuries across the eight-county East-West Gateway region. He oversaw the coordination of engagement efforts with over 50 stakeholder organizations, ensuring a collaborative approach that incorporated diverse perspectives from transportation agencies, public health officials, and community groups. Under his leadership, the team conducted an extensive safety analysis that identified high-risk areas and key crash factors and developed evidence-based recommendations for policy changes and infrastructure improvements. Shawn also ensured the plan adhered to the Safe System Approach, emphasizing equity and proactive safety measures to create safer roadways for all users. More information at: https://www.ewgateway.org/gtsr/

**East-West Gateway Great Streets Projects** *Greater St. Louis Region*
Shawn served as the lead traffic engineer for several projects sponsored by the East-West Gateway Council of Governments (EWG) Great Streets program. The EWG Great Streets programs works in communities across the St. Louis region to enhance streets as quality public spaces that support a variety of land uses, encourage economic development, are environmentally friendly, and support all modes of transportation, including bicyclists, pedestrians, motorists, and transit users. CBB collected field data such as traffic and pedestrian counts, speed profiles, and inventories of the physical roadway, sidewalks, and public transportation system. Shawn and his staff participated in a charrette process consisting of stakeholder interviews and group discussions as well as public meetings and open design working sessions. More information can be found at: https://www.ewgateway.org/transportation-planning/great-streets-initiative/

## R. Lee Cannon, PE, PTOE
**Principal, Traffic Engineer**

**Contact**
lcannon@cbbtraffic.com
314-308-6547

**Education**
M.S., Civil Engineering, University of Tennessee, 1994

B.S., Civil Engineering, Christian Brothers University, 1992

**Registration**
Professional Engineer: Idaho, Illinois, Indiana, Kentucky, Missouri, Nevada, North Dakota, Ohio, Texas

Certified Professional Traffic Operations Engineer (PTOE)

**Professional Activities**
Institute of Transportation Engineers (ITE)

Missouri Valley ITE (MOVITE)

Gateway Section of ITE (GSITE) formerly, TEAM STL
Past President, TEAM Fair Planning Committee, 2003- 2019

American Public Works Association (APWA), Missouri Board – Past President

Chi Epsilon

Lee Cannon has been involved in nearly every facet of traffic engineering and transportation planning since joining CBB in 1994. He has completed hundreds of traffic impact studies, operational improvement studies, safety studies, comprehensive master plans, route and intersection concept layouts and parking studies both large and small in scale. Lee is the firm's lead on traffic studies. He has addressed residential, commercial, industrial, healthcare, educational and other land use proposals, expansions, and re-developments. He has also completed corridor studies (roadway realignment, relocation, and bypass studies) and roadway, intersection, and interchange geometric improvement projects.

Lee is well versed in the specialized requirements of federally funded projects and has completed multiple successful funding applications, prepared service contracts and supplemental agreements and overseen compliance with funding goals and requirements. Lee acts as a third-party traffic engineer for a variety of municipalities and often works closely with review agency officials to find reasonable and financially feasible solutions to complex access, congestion and safety issues on public agency and private projects. He routinely provides public hearing testimony in cases involving development projects and expert witness testimony for high profile developments, condemnation cases and vehicular crashes.

**Danforth Plant Science Center and Wexford** *Creve Coeur, MO*
Lee led the initial traffic and parking studies for development of a consortium research facility for Danforth Foundation, Monsanto, Washington University, University of Missouri, and others. The study addressed access to the facility which was to be built in multiple phases. Access for the first phase was accommodated from Warson Road, but additional access to state Route 340 (Olive Boulevard) was recommended for future build-out. Later expansion of the project created a separate parcel for private business incubator space. Shared access with the Danforth site was recommended for phase one, and a second access from Warson Road was recommended for the second and third building phases. City, County and State approvals were required for the access serving these sites.

**St. Anthony's Medical Center Traffic and Parking Study** *St. Louis County, MO*
As project principal, Lee oversaw a study of the new Master Plan at St. Anthony's Medical Center. Working with County and State Highway officials, mutually agreeable solutions were identified to mitigate existing deficiencies as well as impacts from nearly 700,000 square feet of improved medical space. An additional access point was necessary on the County route, and significant improvements were recommended at several intersections along the State Route. A roundabout and realigned loop road were proposed to solve traffic congestion and pedestrian conflicts on the south end of campus, while improving access to the medical center and alleviating concerns raised by adjacent residents.

**Monsanto World Headquarters, Various Projects** *Creve Coeur, MO*
Lee has been involved in several projects completed for Monsanto's main campus, including a Master Planning Study and multiple individual building additions. In the planning study, he addressed external traffic impacts and recommended off-site improvements to accommodate large increases in campus population. He also forecasted on-site parking needs and recommended appropriate numbers and locations for new parking and considered on-site traffic flow and safety of pedestrians to recommend changes for on-site roadway alignments.

## Christopher Brammeier, PE, PTOE

**Principal, Roadway Design**

**Contact**
cbrammeier@cbbtraffic.com
314-449-8243

**Education**
M.S., Civil Engineering, University of Missouri – Rolla, 1995

B.S., Civil Engineering, Southern Illinois University- Edwardsville, 1991

**Registrations**
Professional Engineer: Arkansas, Illinois, Iowa, Kansas, Kentucky, Missouri, Oklahoma, South Dakota, Tennessee

Professional Traffic Operations Engineer (PTOE)

**Professional Activities**
Gateway Section of the Institute of Transportation Engineers (GSITE)

American Public Works Association (APWA)

**Specialized Training**
FAA Standards
AutoTurn
GuideSign
Roundabout Design
AutoCad
Stormwater and Floodplain Analysis (HEC2)

Chris Brammeier has over 30 years of experience in the civil engineering field. He oversees all civil engineering design and construction engineering projects at CBB and serves as project manager on a variety of CBB efforts in multiple municipalities and counties. His areas of expertise include roadway design, hydraulics and hydrology, and floodplain management. Prior to CBB, he was employed by the St. Louis County Department of Highways and Traffic and by St. Louis County as the Airport Engineer at Spirit of St. Louis Airport. The following projects are typical of Chris' experience.

**Skinker Boulevard/McCausland Avenue, Clayton Road, Oakland Avenue Intersection Improvements, CMAQ 5401 (707)** *City of St. Louis, MO*
As the project manager, Chris oversaw the design of three new traffic signals, including bicycle and pedestrian accessibility improvements, which enhanced the overall operation and safety at the 'front door to Forest Park'. Upon completion, the project will provide new traffic signals to replace the gaining system that currently controls the multi-legged complex intersection. In addition to signals, the pedestrian enhancements include the addition of marked continental crosswalks, as well as signalized pedestrian crossings, bump outs at Tamm, lane removals and the extension of a dual use trail that connects Forest Park to a mile of new sidewalk and buffered bicycle lanes, extending to Hampton Avenue.

**Kiener Plaza Roadway Design** *City of St. Louis, MO*
Chris served as the project manager, overseeing the design of $1.25 million CMAQ funded roadway improvements associated with the $19 million Kiener Plaza redesign (as part of the $380 million Gateway Arch Grounds renovation). CBB designed traffic signal improvements at five signals surrounding the park, ADA upgrades- curb ramps and sidewalks, and updated signal infrastructure to replace the current system. As a part of the sidewalk improvements, CBB designed curb 'bulb outs', where appropriate to enhance pedestrian visibility and shorten crossing distance. CBB's plans include updated medians and midblock crossings, in addition to new bicycle facilities, a parking protected bicycle lane on Chestnut and the City's first bike signal at 6th and Chestnut, as well as wireless sensor detection for bicycles.

**Wentzville Parkway and Pearce Boulevard, CMAQ 5437 (602)** *Wentzville, MO*
Chris served as project manager for the design of roadway, traffic signal and lighting improvements at the intersection of Wentzville Parkway and Pearce Boulevard. The design of this heavily congested intersection is providing dual left turns at all four approaches, decorative medians, sidewalk, as well as additional lanes recommended by the traffic study. Construction staging and traffic control were major parts of the design effort on this project to ensure minimum disruption during construction.

**Broadway and Park – 7th Street, STP 5422(612)** *City of St. Louis, MO*
Chris served as project manager for intersection improvements for the City of St. Louis, Board of Public Service on this STP project. The improvements to the intersection included two new traffic signals, geometric modifications, decorative medians, sidewalk, ADA curb ramp design as well as street lighting, mill, and repaving of the project limits with Enviropave material and a decorative, low maintenance tree lawn. Improvements required coordination with the adjacent expansion of the Clean Company building as well as construction of M and L Foods.

# Jamie Wilson, P.E., PTOE

**Principal, Traffic Engineer**

**Education**
B.S., Civil Engineering, University of Missouri – Rolla, 1996

**Registration & Certifications**
Professional Engineer (PE) in Missouri

Professional Traffic Operations Engineer (PTOE)

International Municipal Signal Association (IMSA):
-Work Zone Safety
-Traffic Signal Technician I
-Traffic Signal Field Technician II

**Professional Activities**
Institute of Transportation Engineers (ITE)

Gateway Section of ITE (GSITE)

American Public Works Association (APWA)- MO

Intelligent Transportation Systems (ITS)- Heartland Chapter

National Society of Professional Engineers (NSPE)

Jamie Wilson has a unique, well-rounded traffic engineering background over his professional career having served at the highest levels of leadership in both the private and public sectors of the industry for over 25 years. Jamie joined CBB in 1998 where he specialized in traffic signal operations. In 2011, Jamie was named President of CBB and became CEO in 2013. As President/CEO, his role transitioned to serving as the project principal for efforts within the City of St. Louis while also administering the firm.

In 2015, Jamie accepted an invitation for a position at the City of St. Louis as their first Bicycle and Pedestrian Coordinator under Mayor Francis Slay's "Complete Streets" initiative. In that role he was responsible for chairing the Complete Streets Committee and ensuring that the City's public right-of-way project planning, design, construction, operations, and maintenance accommodated all modes of travel and persons of all abilities. Later in 2017, Jamie was appointed Director of Streets in Mayor Lyda Krewson's cabinet where he was administrator over the Street Department which included the Director's Office, Street Maintenance Division, Traffic Division, Refuse Division, and Tow Division and was responsible for all operations and maintenance within 62 square miles of the City. In 2021, Jamie accepted a position as the Commissioner of Traffic within the Street Department where he served as the City's Traffic Engineer and was responsible for 500 traffic signals, 55,000 streetlights, and all signing and pavement markings.

In 2024, Jamie accepted a position to return to CBB as a Principal of the firm to continue pursuing his interest in traffic signal operations, specifically the optimization of traffic signal timings, traffic signal programming and turn-ons, maintenance of traffic (MOT), and Intelligent Transportation Systems (ITS). Back at CBB, Jamie provides leadership and mentoring within this service area while being actively engaged in project deliverance for the firm.

**City of St. Louis, On-Call Traffic Engineer** *City of St. Louis, MO*
Through the Board of Public Service (BPS) since 2012, Jamie has served as an on-call traffic engineer for the City of St. Louis providing critical on-going engineering services for new transportation projects throughout the City. Examples of this include Congestion Mitigation and Air Quality (CMAQ) grant planning and preparation, traffic safety improvement studies, traffic signal optimizations, video surveillance system (VSS) design projects, ward studies, and Intelligent Transportation System (ITS) fiber optic communication diagrams. In this role, he routinely coordinates efforts with the Board of Public Service, Street Department, Parks Department, Mayor's Office, Board of Aldermen, Greater St. Louis, Inc., St. Louis Development Corporation (SLDC), Great Rivers Greenway (GRG), Forest Park Forever, and the Missouri Department of Transportation (MoDOT).

**City of St. Louis Traffic Signal and Intelligent Transportation System (ITS)** *City of St. Louis, MO*
Since 2000, Jamie has served at every level of deliverance for Congestion Mitigation and Air Quality (CMAQ) projects including grant planning and applications, design, and construction services – leading to the successful implementation of transportation improvements within the City of St. Louis. Specifically, over decades CMAQ improvements have been accomplished on every major arterial including Skinker/McCausland, Hampton, Kingshighway, Grand, Jefferson, Union, Forest Park Parkway, Watson, Chippewa, Natural Bridge, Gravois, Tucker, Lafayette, 18th St/Grattan, Lindell/Olive, Vandeventer, West Florissant, Morganford, Delmar, Martin Luther King, Goodfellow, North and South Broadway, and the Central Business District (CBD). Jamie currently maintains the City of St. Louis' traffic signal GIS inventory for the purpose of daily operations as well as asset management planning for future CMAQ efforts.

## Brian Courtwright, PE, PTOE
### Associate, Senior Transportation Engineer

**Contact**
bcourtwright@cbbtraffic.com
618-391-1113

**Education**
M.S., Civil Engineering, Southern Illinois University, Edwardsville, 2002

B.S., Civil Engineering, Southern Illinois University- Edwardsville, 1999

**Registrations**
Professional Engineer: Illinois, Missouri

Professional Traffic Operations Engineer (PTOE)

**Professional Activities**
Gateway Section of the Institute of Transportation Engineers (GSITE)

Institute of Transportation Engineers (ITE)

**Specialized Training**
Illinois Department of Transportation Standards

Missouri Department of Transportation Standards

Autodesk Civil 3D

Intersection Design and Channelization

Roundabout Design

Professional Advancement for Career Engineers, Illinois Department of Transportation, Bureau of Employee Services

MicroStation and Geopak

AutoCAD/Civil 3D

Brian Courtwright has over 25 years of experience in the civil engineering field. He has served as design engineer on several roadway projects. His areas of expertise include roadway design, intersection layouts, construction cost estimate, working day studies, and plan preparation. Brian designs horizontal geometrics, profile grades, storm sewers and prepares construction plans and specifications for roadway projects ranging from local roads to interstate highways. In addition, he coordinates the client's needs, municipality specifications, utility relocation, survey requirements and design continuity with the proposed site plan, as well as provides engineering support during construction and finalizes as-built plans. Prior to CBB, Brian was employed by the Illinois Department of Transportation as a Design Engineer and Squad Leader. The following projects represent some of Brian's experience.

**North Green Mount Road over I-64** *Shiloh, IL*
Brian served as design engineer for the preliminary engineering and preparation of the roadway plans for the widening of North Green Mount Road to four lanes from North Green Mount Crossing Drive to Pierce Boulevard / Regency Park Drive. North Green Mount Road will be widened and the structure over I-64 restriped, as well as the existing right turn lane taper north of Regency extended to accommodate the proposed through lanes. The improvements also included widening, shoulder construction, grading, traffic island modifications, storm sewer design and sidewalk replacement. In addition to the roadway plans, Brian prepared the required IDS, Abbreviated Bridge Condition Report, Project Development Report, and all required coordination.

**Illinois Route 3 and Missouri Avenue** *Granite City, IL*
Brian served as design engineer for access improvements on State Route 3 for a new commercial development. The improvements included the construction of a left and right turn lane on State Route 3 into a proposed commercial development, as well as the reconstruction of the Missouri Avenue intersection. This project was coordinated with signal design engineers, the Illinois Department of Transportation District 8 permit section, Granite City engineers and site engineers.

**North Green Mount Road and Central Park Drive** *O'Fallon, IL*
Brian served as design engineer for the preparation of the IDS, as well as preparation of the Project Development Report and Roadway Plans for the improvements to this intersection to provide new traffic signals and additional auxiliary lanes. The project was coordinated with the City of O'Fallon as well as St. Clair County Highway Department and the Illinois Department of Transportation.

**Lincoln Highway and Lexington/Aubuchon** *Fairview Heights, IL*
Brian served as design engineer for the realignment of Aubuchon Drive and reconstruction of the apron to Lexington Drive. This project was coordinated with signal design engineers, the Illinois Department of Transportation District 8 permit section and site engineers.

**Illinois Route 109 and West County Road** *Jerseyville, IL*
Brian prepared an IDS for the signalization of West County Road and Route 109 that was used in the preparation of the Project Development Report and Construction Plans for the project. The project converted an existing four way stop controlled intersection to a signalized intersection with auxiliary lanes. Included in the project was a design of a 10' wide shared use path to provide a Complete Street

## Lance Feldmann, PE, PTOE
**Senior Transportation Engineer**

**Contact**
lfeldmann@cbbtraffic.com
314-449-9573

**Education**
B.S., Civil Engineering, Saint Louis University, 2016

**Registration**
Professional Engineer: Missouri, Illinois

Professional Traffic Operations Engineer (PTOE)

International Municipal Signal Association (IMSA) Work Zone Temporary Traffic Control Technician

International Municipal Signal Association (IMSA) Traffic Signal Technician Level I/II

**Professional Activities**
Institute of Transportation Engineers (ITE)

Gateway Section of the Institute of Transportation Engineers (GSITE)

International Municipal Signal Association (IMSA)

**Specialized Training**
- Synchro 11
- Siemens Tactics Transportation Management Software
- TransSuite Transportation Management Software
- PC-Travel/GPS2LT Travel Delay Software

Lance Feldmann joined CBB after receiving his Bachelor of Science in Civil Engineering from Saint Louis University. Over the past several years, he has assumed many roles related to Traffic Signal Operations. Lance has been prominent in his role as a Traffic Management Center Operator for both the City of St. Louis and the Missouri Department of Transportation. He has worked with city officials to improve vehicle flow, as well as pedestrian and bicycle usability in the St. Louis downtown area. During the past 8 years, Lance has managed numerous Signal Timing and Coordination projects for both the Illinois and Missouri Departments of Transportation. He is currently responsible for the training of new CBB staff in all facets of signal retiming projects and signal timing operations. Lance has also handled several large Mitigation of Traffic (MOT) projects and special event efforts in the St. Louis Area. His MOT efforts include large scale interstate projects such as the I-270 North Design-Build project, I-70 Cave Springs to Fairgrounds Design- Build project, I-44 Interchange project, Poplar Street Bridge MOT, and the I-55 Bridge Reconstruction project, as well as smaller corridor MOT projects such as Missouri Route 94, Missouri Route 109, and Creve Coeur Mill Road. His work involving high volume special events includes the downtown Fair St. Louis celebration, Forest Park Balloon Glow, Clayton Art Fair, and the Chesterfield Airshow.

**I-270 North Corridor Improvements** *Missouri Department of Transportation*
Lance works with the I-270 North project team to manage the mitigation of traffic (MOT) and implementation of new signals during the ongoing I-270 North Design-Build project. During full interstate closures related to bridge reconstruction, Lance is responsible for making observations and real-time adjustments to the effected traffic signals to move traffic safely and efficiently through the various detours. Other tasks include developing and implementing timing plans, monitoring traffic signal turn-ons, and making post implementation observations to ensure the new signals and optimized timing plans operate effectively.

**Signal Control and Timing Projects** *Illinois Department of Transportation*
Lance has completed multiple signal control and timing (SCAT) projects over the past 6 years for the Illinois Department of Transportation (IDOT). These projects have included the U.S. Route 50 in Salem, Illinois; South Grand Avenue in Springfield, Illinois; IL Route 157 in Collinsville, Illinois; and IL Route 16 in Charleston, Illinois. Data collection for these projects included intersection counts, "critical location" hose volume counts, intersection inventories, field observations, and travel time delay studies. Data was then used to prepare multiple cycle length options using Synchro 11 software, and an optimal cycle length for various times of day and various days of the week were chosen. These new timing plans and the resulting improvements to travel times were evaluated using GPS-based travel delay software. Additionally, cost and emissions savings were calculated and used to evaluate the timing plans.

**Traffic Management Center** *St. Louis, MO*
In Lance's role as a traffic system operator for the Missouri Department of Transportation Traffic Management Center (TMC) he supports the MoDOT Traffic Department throughout the day, from before morning peak hours until after evening peak hours. The operators' primary tasks are to monitor traffic flow and to react to incidents and congestion; this includes performing signal timing adjustments to mitigate traffic congestion and managing traffic flow during road closures and other incidents that cause major traffic impacts. Operators assist during traffic signal installations and upgrades, as well as performing field observations to improve traffic operation.

**MoDOT Timing Improvement Projects** *St. Louis, MO*
Lance worked on several large MoDOT Timing Improvement projects in the St. Louis regional area. These projects consisted of the development, implementation, and evaluation of new timing plans for major MoDOT Arterials. Following extensive data collection including intersection and mainline volume counts, new signal timing plans were developed using Synchro 11 software. These timing plans were then implemented and optimized to provide improved progression and reduced travel times, delays, and traffic queues throughout the corridor. Post implementation travel data is collected and compared to pre-project data to summarize the positive impacts of the new signal timing plans and are then summarized in a final report. The most recent of these projects being Missouri Route 141 in St. Louis, Missouri.

## Erika Fuesting, BSEE
**Senior Project Manager**

**Contact**
efuesting@cbbtraffic.com
314-449-9557

**Education**
B.S., Electrical Engineering, Southern Illinois University – Edwardsville, 1995

**Certifications**
ISO 9000

**Professional Activities**
Gateway Section of the Institute of Transportation Engineers (GSITE)

Women's Transportation Seminar (WTS)

International Municipal Signal Associate (IMSA)

Erika Fuesting has over 25 years of experience in the electrical engineering field. Her primary focus is Traffic Signal Design and the development of plans, specifications, and cost estimates for a wide range of traffic signal, ITS, and lighting projects. She also serves as a liaison between developers, clients, and public agencies engaging in project budgeting, project management, and project bidding services. Erika has been involved in the development of signal/ITS/lighting plans and specifications for many locations in the St. Louis region and throughout the Midwest for permit, public agency funded, and locally sponsored/federally funded projects. A sample of Erika's experience follows below.

**Kiener Plaza Intersection Improvements, CMAQ 9900 (676)** *City of St. Louis, MO*
Erika served as the lead designer for the signal, lighting, and ITS portions of this project. CBB designed traffic signal improvements at five signals surrounding the park including new signal controllers, ADA upgrades- curb ramps and sidewalks, and updated signal infrastructure to replace the current system. The signal arms along Chestnut and a portion of Broadway were designed with the ability to swivel away from the road to accommodate parades and other special events. As a part of the sidewalk improvements, CBB designed curb 'bulb outs', where appropriate to enhance pedestrian visibility and shorten crossing distance. CBB's plans include updated medians and midblock crossings, in addition to new bicycle facilities - a parking protected bicycle lane on Chestnut and the City's first bike signal at 6th and Chestnut, as well as wireless sensor detection for bicycles.

**I-270 North Design-Build** *St. Louis County, MO*
Erika served as the lead designer for the signal, lighting, and ITS portion of the project, which covered over 10 miles worth of improvements. CBB prepared a conceptual study for the project during the pursuit phase. The team created a design that eliminated all crossover slip ramps on the outer roads through a one-way outer road system, mitigated bottlenecks on the freeway through widening and innovative interchange designs, and enhanced pedestrian and bike facilities through implementation of a multi-use path. CBB was responsible for the design of all traffic signals, overhead signage, freeway and arterial lighting, CCTV, Dynamic Message Boards (DMS), traffic detection equipment, and fiber/wireless communications for the project as well as for managing all traffic signal operations during construction. As one innovation, CBB developed a new Dynamic Trailblazer System which will be used by MoDOT's TMC staff to manage the traffic in the corridor during incidents.

**Flashing Yellow Arrow Signal Improvements, CMAQ 7302 (667)** *O'Fallon, MO*
CBB was selected to prepare the plans, specifications, and estimates for the upgrade of 30 intersections to include left turn flashing yellow arrow signal heads and related upgrades. Each signalized intersection slated for improvement was evaluated to ensure MUTCD compliance with flashing yellow arrows. Upon evaluation, two intersections were omitted, leaving 28 intersections to be upgraded. Field checks were performed to compile inventories of the existing signal equipment, conduit capacity for additional cable, mast arm lengths, and signal head layouts to ensure upgrades were physically possible and MUTCD compliant. Cost estimates were provided during several phases of design to ensure the project remained within the programmed budget. All LPA required documentation was prepared and followed throughout the project approval and bid process. Federal requirements for bidding were observed when preparing the bid and specification documents.

## Paige Martz, PE, PTOE, RSP2IB

**Associate, Senior Transportation Engineer**

**Contact**
pmartz@cbbtraffic.com
816-643-2408

**Education**
M.S., Civil & Environmental Engineering, University of Wisconsin – Madison, 2017

B.S., Civil Engineering, University of Missouri, Columbia, 2015

**Academic Appointment**
Adjunct Professor, Washington University and University of Missouri St. Louis Joint Civil Engineering Program

**Registration**
Professional Engineer: Illinois, Kansas, Missouri, Wisconsin

Professional Traffic Operations Engineer (PTOE)

Road Safety Professional Infrastructure Level 2 (RSP2I)

Road Safety Professional Behavioral Level 2 (RSP2B)

IMSA Work Zone Temporary Traffic Control Technician

**Professional Activities**
Kansas Section of the Institute of Transportation Engineers (KSITE)

Institute of Transportation Engineers (ITE)

Women's Transportation Seminar (WTS)

Paige Martz works to make the transportation system safer for all road users by identifying and integrating safe solutions into CBB's projects. Mrs. Martz is primarily involved in CBB's design and safety projects, though she has been involved in a wide variety of transportation engineering projects, including safety, planning, design work, and traffic studies. Paige has served as a design engineer on many roadway projects with varying scopes. Her areas of experience include roadway design, construction cost estimates, plan preparation, and conceptual layouts. She is knowledgeable with methodologies and procedures for using the Highway Safety Manual (HSM) and Interchange Safety Analysis Tool Enhanced (ISATe). Paige has earned both the Road Safety Professional Level 2 Infrastructure Specialty (RSP2I) and the Behavioral Specialty (RSP2B) certifications from the Institute of Transportation Engineers (ITE).

### Southern Illinois Metropolitan Planning Organization (SIMPO) Safety Study *Williamson and Jackson Counties, IL*

Paige was the Project Engineer on a safety study in the SIMPO Planning Area to make specific recommendations to reduce severe crashes at at-risk locations. To determine crash prone locations, a network screening was performed for the entire study area using crash data from 2014 to 2018. Locations were screened using the Equivalent Property Damage Only (EPDO) Method. The initial screening resulted in a priority list of intersections and segments for both the local and state roadways which were presented to the SIMPO Technical Advisory Committee. The lists were refined, and the top locations were investigated to identify effective safety countermeasures for each specific location. Based on the diagnosis, a variety of safety countermeasures were suggested to provide a range of cost options for improving safety. Some solutions include signing and striping, physical road improvements, shoulder improvements, speed management solutions, signal improvements, pedestrian/bike improvements/ accommodations and roundabouts. CBB then aided the cities, counties, and state in the completion of Highway Safety Improvement Program (HSIP) grant applications. The potential safety benefits of the countermeasures were compared to the opinions of probable cost to calculate the benefit to cost ratio for the HSIP application.

### Springfield Street and Intersection Pedestrian Safety Study *Springfield, MO*

Paige was involved in the analysis and report outlining the safety of pedestrians at streets and intersections in Springfield, Missouri. The analysis looked at intersection and roadway characteristics within the city limits, such as speed limits, traffic volumes, and median widths. The report summarized crash data from the city, state, and federal levels, as well as reviewed standards and guidelines from the transportation field. A GIS database was developed to document island and median widths, roadway traffic volumes, and roadway speed limits along every road within the city limits. The report and research were used to aid in the development of a pedestrian safety ordinance in the City.

### Zumbehl Road Corridor Study, 17STR35 *St. Charles, MO*

Paige worked on the crash study along the current Zumbehl Road Corridor Study. Crash data were obtained from the City of St. Charles to identify locations along the corridor with high numbers of crashes. Ms. Martz created intersection collision diagrams of the two intersections with the highest number of crashes from the crash reports provided by the City. The intersection diagrams were evaluated for crash trends and potential improvement options were provided.

### Old Lemay Ferry Road Safety/Speed Study *Jefferson County, MO*

Paige worked on the safety and speed study of Old Lemay Ferry Road in Jefferson County, Missouri. Old Lemay Ferry Road was singled out as the most dangerous roadway within the County maintained roadway system. Crash data were obtained from Jefferson County to identify crash patterns along the corridor. Collision diagrams and tables indicating type, severity, pavement conditions, lighting conditions, and location with respect to the allotted intersection were generated by Ms. Martz to determine crash patterns and high crash locations.

## Gregory Owens, PE
**Associate, Senior ITS Engineer**

**Contact**
gowens@cbbtraffic.com
314-449-9574

**Education**
B.S., Civil Engineering, University of Missouri-Rolla, 1989

**Registrations**
Professional Engineer: Missouri, Illinois

**Professional Activities**
ITS Heartland Chapter

ITS Midwest Chapter

Greg Owens has over 35 years in local traffic operations. He joined the CBB staff after a 28-year career in the public sector for the Missouri Department of Transportation's (MoDOT) St. Louis District Traffic Department. During his tenure at MoDOT, Greg came to specialize in traffic signal operations, Intelligent Transportation Systems (ITS), as well as supervising employees and several operations for signing and striping. He coordinated deployment of all aspects of Arterial Management, including two generations of central traffic signal systems and integrating Freeway ITS features into Arterial systems to provide a total Roadway Management System. He also led the St. Louis District's ITS team for over five years with a combined focus of both Arterial and Freeway devices to cover most District roadways with a modern and reliable traffic management system. In addition, he led MoDOT efforts in forming the initial St. Louis regional ITS partnership with St. Charles County's Gateway Green Light program. With CBB, he has continued participation in support of the Gateway Green Light program, MoDOT's Advanced Traffic Management System (ATMS), St. Louis' signal operations, local signal optimization projects, designed the upgraded Lambert Airport ITS system, and Lead ITS Engineer for the MoDOT I-270 North design/build project.

**I-270 North Design-Build Project** *St. Louis County, MO*
The I-270 North project requires the upkeep, replacement, and enhancement of MoDOT's ITS system. Nearly 100 ITS devices network the corridor with data collection, information distribution, and incident management. As construction progresses during the 4-year project timeline, Greg is overseeing the sustained operation of the existing devices and detailed planning and design of obsolete devices, strategic use of serviceable devices, and implementation of new devices and systems. High-Definition cameras, full color, full matrix Dynamic Message Signs, and saturated placement of modern non-intrusive data collection devices will, on their own, provide an enhanced ITS experience. In addition, MoDOT's Signal Performance Measurement system is being greatly expanded at all signalized intersections, and a unique Dynamic Trailblazer system is being installed for the first time in Missouri which will provide motorists detailed routing information along the corridor.

**Traffic Management Enhancements, Lambert International Boulevard, CMAQ-9901(644)** *St. Louis, MO*
Greg worked on this project which included a needed upgrade to the traffic control network and devices throughout Lambert's facilities, as well as extension of the dual left turn lanes for added capacity leading into Terminal 2. CBB was the lead consultant and responsible for the signal, ITS, and timing/implementation components. CBB designed a modern upgrade starting with a foundation of an improved field network via efficient communication links (either fiber optics or high-bandwidth wireless radios depending on the need) and network components providing both increased capacity, improved network security, more efficient network management, and the ability to easily expand for future needs. This improved network allows for an expansion of roadway surveillance via high definition PTZs, and the organization of the new modern signal controllers and other traffic control devices in one Advanced Traffic Management System (ATMS) that incorporates adaptive signal control.

**ATMS Support Systems** *Missouri Department of Transportation*
MoDOT has a vast ATMS which encompasses both the traditional freeway items and arterial devices such as traffic signals and detection systems. Looking to harness the large amount of information from the arterial portion of the system, MoDOT hired CBB to provide live support at their Traffic Management Center (TMC) integrated with their existing staff to focus on the operation and management of their traffic signals. Greg leads an experienced CBB engineering staff which proactively reports signal operation problems, validates incoming complaints, dynamically adjusts traffic signals during major incidents, and reviews existing timing plans for any immediate improvements.

## Nirav Patel, PE, PTOE

**Associate, Senior Transportation Engineer**

**Contact**
npatel@cbbtraffic.com
314-449-9558

**Education**
B.S., Civil Engineering, Saint Louis University, 2016

**Registration**
Professional Engineer: Arizona, Illinois, Iowa, Missouri

Professional Traffic Operations Engineer (PTOE)

IMSA Work Zone Temporary Traffic Control Technician

**Professional Activities**
Institute of Transportation Engineers (ITE)

Gateway Section of the Institute of Transportation Engineers (GSITE)

American Public Works Association (APWA)

Nirav Patel joined CBB in June 2016 after receiving his Bachelor of Science in Civil Engineering from Saint Louis University. Nirav is primarily involved in CBB's transportation engineering and modeling efforts. Nirav has developed transportation operational models for several corridor and interchange planning studies and traffic impact studies in the St. Louis region. He is proficient in multiple modeling software packages, including VISSIM, VISTRO, VISUM, SYNCHRO, SIDRA, and HCS. He excels in this position because of his knowledge of transportation engineering and modeling, as well as his passion within the field and careful attention to detail. The projects below are reflective of Nirav's experience.

**I-270 North Design Build** *St. Louis, MO*
As a traffic engineer, Nirav was responsible for the traffic modeling evaluation of a $278 million freeway reconstruction in St. Louis. This project includes rebuilding bridges and interchanges for a 7-mile urban freeway. The project consists of a new system interchange connecting I-270 to 8 service interchanges. Nirav used Microsimulation Model (Vissim) to evaluate interchange concepts, ensure acceptable operations for the freeway mainline, and optimize design details. Construction on the project was completed in 2023.

**SLU Medical Hospital** *St. Louis, MO*
Recently, Nirav worked with Lee Cannon and the CBB team on the Traffic Impact Study for the SLU Medical Hospital campus development. During the project, Nirav worked on the Microsimulation Model (Vissim) to visualize how traffic in and out of the hospital will be affected and how the drop-off and pick-up of patients will work. He also worked on evaluating traffic at the site, including Level of Service (LOS) tables, a potential increase in turning lanes and side street stops, and signage along the cross streets to Grand Boulevard.

**Grand Mixed-Use Traffic Impact Study** *St. Louis, MO*
CBB recently worked on a traffic impact study for the proposed Target and residential development in St. Louis, Missouri. The purpose of the study was to determine the number of additional trips that the proposed mixed-use development would generate, evaluate the impact on operating conditions for the adjacent roadways, and determine the ability of motorists to enter and exit the site safely. Nirav was involved with all elements of the traffic impact study, including reporting on the existing traffic conditions, trip generation, trip distribution, forecasted conditions, and making traffic recommendations to mitigate the impact of the proposed development.

**Columbia Middle School** *Columbia, MO*
Nirav worked with Shawn White on a traffic impact study for a proposed middle school. The purpose of the evaluation was to determine the number of trips the new school would generate and to evaluate their impact on operating conditions along the adjacent roadways. Roadway improvements were recommended to mitigate the operational impact, including turning lanes to improve traffic flow efficiency.

**Olive Boulevard and Lindbergh Boulevard Interchange** *St. Louis, MO*
Nirav worked with Lee Cannon and the CBB team on the traffic study for the Olive Boulevard and Lindbergh Boulevard Interchange Improvements. Nirav helped refine the initial concept by identifying future traffic levels, evaluating operating conditions under the proposed roadway configurations, and recommending mitigating measures to ensure safe and efficient traffic flow.

## Brian Rensing, PE, PTOE, RSP2I

**Associate, Senior Transportation and Safety Engineer**

**Contact**
brensing@cbbtraffic.com
314-449-9569

**Education**
B.S., Civil Engineering, Bradley University, Peoria, Illinois, 2001

**Registrations**
Professional Engineer: Missouri, Illinois

Professional Traffic Operations Engineer (PTOE)

Road Safety Professional Level 2 Infrastructure (RSP2I)

Road Safety Professional Level 1 (RSP1)

**Professional Activities**
Institute of Transportation Engineers (ITE)

Gateway Section of the Institute of Transportation Engineers (GSITE)

American Society of Civil Engineers (ASCE) – St. Louis Section

Brian Rensing has more than 20 years of experience in the traffic and transportation engineering field as an employee of CBB. He has been involved in many facets of transportation engineering and has completed numerous traffic safety studies, traffic impact studies, school safety studies, operational improvement studies, and parking studies. Brian has performed a wide range of safety studies, including analysis for Access Justification Reports (AJR), interchanges, corridors, as well as single intersections. He is knowledgeable with methodologies and procedures for using the Highway Safety Manual (HSM) and Enhanced Interchange Safety Analysis Tool (ISATe), as well as performing Road Safety Audits (RSA). Additionally, Brian has earned the Road Safety Professional Infrastructure (RSP2I) certification from ITE. The following projects are typical of Mr. Rensing's experience as transportation engineer.

**Southern Illinois Metropolitan Planning Organization (SIMPO) Safety Study** *Williamson and Jackson Counties, IL*

As Project Manager, Brian lead the SIMPO Safety Study that provided specific safety recommendations to reduce sever crashes at at-risk locations. Network screening as well as in-depth safety analysis was used to identify the frequency, crash type, severity, and locations on both the state and local roadways. A data driven approach was used to identify the priority locations for the in-depth review to identify safety countermeasures to address the specific safety issues. The safety performance was investigated by reviewing and analyzing safety data (crash reports), evaluating supporting documentation, and assessing field conditions to select effective safety countermeasures for each specific location. Based on the diagnosis, a variety of safety countermeasures were suggested to provide a range of cost options for improving safety. Some solutions included signing and striping, physical road improvements, shoulder improvements, speed management solutions, signal improvements, roundabouts, and pedestrian/bike improvements/accommodations. Ultimately, several Highway Safety Improvement Program (HSIP) grant applications were completed.

**I-270 North Design Build – Safety Analysis** *St. Louis City and St. Louis County, MO*

CBB, along with Parsons and Millstone Weber, teamed together for the winning proposal on MoDOT's I-270 North Design-Build Project in St. Louis. One of the project goals was to maximize reliability and safety while linking communities for all users. The project required the use of the Highway Safety Manual and Enhanced Interchange Safety Analysis Tool (ISATe) methodologies to quantify the expected reduction in Fatal and Serious Injury Crashes for the proposed safety countermeasures. Brian led the safety analysis effort and performed data-driven safety analyses along the mainline freeway, freeway ramps, ramp terminals as well as the outer road system. The use of data-driven safety analysis was critical to provide feedback to the design team early in the design build process to help guide decisions when determining base geometrics along the freeway, ramps, and ramp terminals as well as the outer road system. Overall, the proposed changes were estimated to reduce fatal and injury crashes by about 15.5% and total crashes by approximately 20% over 20-years, when compared to the No-Build condition.

**Safety Analysis for Interchanges** *Various Locations*

As traffic engineer, Brian was responsible for evaluating the safety needs for several interchange projects. Sample interchange projects include I-270 North Design Build, I-70 at Fifth Street AJR, Mid Rivers Mall Drive/I-70 & Route 79/I-70 Interchange Study, The Highland Access Justification Report, I-44 Corridor Traffic Operation Analysis and Conceptual Improvement Study, Page Phase III AJR, and I-44 at Highway 141 Design-Build proposal. For each project area, three to five years of traffic crashes were summarized by location, crash type, severity, weather condition, pavement condition, and lighting condition to identify crash patterns at each of the interchanges. Crash rates were generated along the segments of interstate as well as the arterial cross streets. Fatal crashes were scrutinized in detail to determine if improvements could reduce the severity of crashes. Crash rates were utilized to determine if any of the study areas were a high crash location. The ISATe method was used for predicting the future crashes with specific changes to the interchanges while the HSM Methodologies for were also used to predict crashes along the cross streets and was utilized for the I-270 North Design Build, I-70 at Fifth Street, and I-44/141 Design Build project. Nonetheless, suggestions were made, and countermeasures were identified to reduce the number and severity of crashes based on the historic crash patterns and the predictive crash tools.

## Joanne (Martin) Stackpole, PE, PTOE

**Associate, Senior Transportation Engineer**

**Contact**
jstackpole@cbbtraffic.com
314-449-9563

**Education**
B.S., Civil Engineering, Saint Louis University, 2016

**Registration**
Professional Engineer: Missouri, Illinois, Mississippi

Professional Traffic Operations Engineer (PTOE)

**Acquired Skills**

- PTV Vissim
- PTV Vistro
- PTV Visum
- SYNCHRO
- Highway Capacity Software
- SIDRA Solutions
- ArcGIS

Joanne (Martin) Stackpole is dedicated to creating innovative, long-lasting transportation solutions to challenges facing today's communities. She is at the forefront of using new modeling methods for more efficient and effective traffic analyses. Striving to develop robust traffic models which accurately represent today's complex transportation networks, her modeling techniques are thorough and detailed. Joanne has contributed to projects focusing on a wide variety of transportation network needs, including Great Streets studies, planning for new connections to major thoroughfares, and developing roadway enhancements for all modes of transportation. She analyzes the project corridor at a macro-level to determine the ideal configuration for the transportation network to work as a system and a micro-level to ensure each design element is optimized to best serve all users.

**Mascoutah Great Streets Project** *City of Mascoutah, IL*
The City of Mascoutah was selected for a Great Streets Project to revitalize Downtown Main Street. The Great Streets Initiative was designed to envision streets for moving people, improving connectivity, enhancing local economies, and creating attractive, interesting places. The project team encompassed a variety of disciplines including environmental, land use and urban design, and market analysis and strategy. CBB was brought on for the transportation discipline. Joanne conducted site visits and analyzed the existing transportation network and was active in the community engagement process to identify the goals, concerns, and ideas of the residents of Mascoutah. She helped to develop a plan for a connected bike and pedestrian network, locally and regionally. She worked on recommendations for improvements to the parking supply, wayfinding signage, and overall traffic circulation and safety of the project corridor. Lastly, she provided concrete implementation and funding strategies for the City of Mascoutah to put the plans into action.

**I-270 North Design-Build** *MoDOT St. Louis, MO*
MoDOT commissioned a design-build project for the enhancement of I-270 in North County St. Louis. The goal of the project is to improve safety and mobility throughout the I-270 corridor for the local community, commuters, freight traffic, and multi-modal users. Joanne helped to develop creative interchange concepts which optimized cost, safety, and mobility. The team focused on eliminating all crossover slip ramps on the outer roads, mitigating bottlenecks on the freeway through widening and eliminating short weaving segments, enhance pedestrian and bike facilities through implementation of a multi-use path, and improving transit services through transit signal priority and installing a contra-flow bus lane. She completed the update to the Access Justification Report and has been involved in MOT Coordination throughout construction of the project.

**Collinsville Planning Study** *Collinsville, IL*
The City of Collinsville engaged CBB to develop a master plan and complete impact studies for incoming developers for the area near Horseshoe Lake Road, I-255, and I-55/I-70. The area has a lot of developable ground which is primed for industrial uses. CBB will identify the long-term needs of the area that will support a healthy transportation network to serve the future uses, which will then inform how to accommodate the incoming developers in the short-term. Joanne is leading the traffic analysis efforts, including long-range traffic forecasting, site trip estimations, trip distribution and assignments, SYNCHRO analyses, and signal and turn lane warrants.

**Manchester Road Corridor Improvement Project** *City of Brentwood, MO*
Joanne has actively participated in developing enhancements for Manchester Road between Bremerton Road and Hanley Road. The enhancements included increasing bike and pedestrian safety with the implementation of a multi-use path as well as improved access management. She assisted in analyzing business parking configurations and how each business would be impacted by the proposed roadway plan. Joanne also engaged with the Brentwood community members at several open houses to help explain the project and collect information about everyone's current issues and concerns, which were used as a guideline while developing proposed designs for the roadway corridor. The design ultimately improved aesthetics, walkability, and encouraged economic develop within the area.

## Rob Twillman, PE, PTOE

**Associate, Senior Transportation Engineer**

**Contact**
rtwillman@cbbtraffic.com
314-449-9571

**Education**
B.S., Civil Engineering, University of Missouri – Saint Louis, 2003

**Registrations**
Professional Engineer: Missouri, Illinois

Professional Traffic Operations Engineer (PTOE)

**Professional Activities**
American Public Works Association (APWA)

**Specialized Training**

- Synchro
- TransSuite
- AutoCAD Civil 3D
- AutoTurn
- ADA Standards for Accessible Design
- ADA – Project Civic Access

Rob Twillman has enjoyed working on a variety of transportation projects during his time at CBB. Rob has accumulated more than 20 years of traffic and transportation engineering experience and has been with CBB since 2006. He has a background in signal operations, roadway and signal design, and roadway and signal construction. Rob has received extensive training on ADA standards, ensuring that our designs comply with current PROWAG standards for sidewalk, signal, and curb ramp design. His experience on projects at CBB has included signal timing optimization, roadway/signal design, roadway/signal inspection, traffic impact studies, parking studies, mitigation of construction related congestion, TMC signal system monitoring, field programming of traffic signal controllers, turn-ons of traffic signals and troubleshooting traffic signal issues.

**MoDOT Arterial Management Interface Project** *St. Louis and St. Charles Counties, MO*
Rob worked with the Missouri Department of Transportation (MoDOT) and St. Charles County to expand diversion route planning capabilities within the region, building on his previous work in St. Louis County and St. Louis City. Rob used expansive Synchro models to develop diversion route plans and signal timing using arterials in the event of major incidents on I-70, I-64, I-55, I-44, I-270, 370, 367 and 364. This project was awarded the Best ITS Product in the ITS Heartlands Region in 2018.

**Route N and Lake Saint Louis Boulevard Intersection Improvements** *O'Fallon, MO*
Rob was responsible for the design of roadway and drainage improvements, which was an exercise in coordination. The improvements were part of a MoDOT right-of-way tying into a new roadway in O'Fallon right-of-way and an existing roadway in Lake Saint Louis right-of-way. During construction, Rob programmed the traffic signal controller. Once the signal was put online, Rob monitored traffic and made changes to programming and timing as necessary.

**Maryland Heights Traffic Signal Modifications and ADA Upgrades** *Maryland Heights, MO*
Rob assisted the City of Maryland Heights to bring their traffic signals up to current MUTCD standards and into compliance with ADA (PROWAG). Rob led the design, including field checking survey information and current conditions, layout of curb ramps and the placement of signal equipment. Rob was also tasked with checking the pedestrian clearance intervals and the sound levels of the audible pushbuttons. When it was determined that the clearance intervals were lacking at two intersections, he made the changes in the field to make the intervals adequate for general pedestrian crossing, per MUTCD standards.

**City of St. Louis Phase 3 Traffic Enhancements** *St. Louis, MO*
Rob was responsible for multiple tasks in this CMAQ project. He assisted CBB staff in the creation of PTZ camera plans. These plans consisted of PTZ installations and network upgrades throughout the city. Rob worked on signal timing improvements. This task started with updating a synchro model of over 100 signals in the downtown area. Then was used to evaluate new signal timing options. After implementation of new timing, Rob verified the improvement in movement of vehicles through travel time comparisons.

## Shawn Lerai White, PE, PTOE

**Associate, Senior Traffic Engineer**

**Contact**
swhite@cbbtraffic.com
314-449-9572

**Education**
B.S., Civil Engineering, University of Missouri – Rolla, 1994

**Registrations**
Professional Engineer: Arkansas, Illinois, Kansas, Michigan, Missouri, Nebraska, Oklahoma, South Dakota, Tennessee

Professional Traffic Operations Engineer (PTOE)

**Professional Activities**
Institute of Transportation Engineers (ITE)

Gateway Section of the Institute of Transportation Engineers (GSITE)

Shawn White has 30 years of experience in the traffic and transportation engineering field. Shawn has been involved in various aspects of traffic and transportation engineering, including traffic impact studies, safety studies, school studies, micro modeling of roadway networks, parking analyses, optimization of traffic signal systems, traffic signal design, project management and client representation at City Council meetings, Planning and Zoning meetings, and other Public Hearings. Shawn has been successful in assisting transportation decision makers, including elected officials and public agency leadership, during the transportation project decision making process. Shawn has specialized in analyzing the relationships between land use and traffic demand including trip generation, distribution, and assignment. She is also well versed in the subsequent traffic operations analysis using a variety of software packages, such as HCS, Synchro and SimTraffic. The following projects are representative of Shawn's experience.

**Missouri State Road Corridor Study** *Arnold, MO*
Shawn completed a comprehensive study to determine the need for roadway improvements along Missouri State Road. The study considered the traffic impacts from several new developments in the surrounding area, including a new junior college, a large retail center, two residential subdivisions, and other small retail sites. A list of priority projects was identified to mitigate constraints along the corridor, including roadway and signal improvements at the intersection of Highway 141 and Astra Way and a roundabout at the intersection of Missouri State Road and Astra Way.

**Jefferson County Curve Inventory and Old Lemay Ferry Safety Study** *County of Jefferson, MO*
Shawn conducted a curve inventory of priority routes identified by the County's Strategic Highway Safety Plan's list of roadways with curve contributing crashes. CBB collected field data such as roadway speed, existing striping, super elevation, and shoulder presence for use in the roadway evaluation. The appropriate advisory speed for each curve was determined by using the ball banking method and the curve signing was evaluated to determine its compliance with the MUTCD. A final report was generated to summarize all the curve data sheets for each route, as well as general findings and recommendations.

In addition, Shawn completed a subsequent more detailed study to address safety concerns along a 6.45-mile section of Old Lemay Ferry Road that was identified by the County's Strategic Highway Safety Plan as having the highest number of crashes within the County maintained roadway system. As part of this work, CBB reviewed 5-years of crash data along the corridor to identify any patterns or trends, compiled a roadway safety audit (RSA) team including a CBB Traffic Engineer, a CBB Roadway Design Engineer, and the County Engineer, collected field data along Old Lemay Ferry Road including roadway width, existing signing and striping, super-elevation, shoulder presence, intersection dynamics, curve speed advisory postings, and other relevant characteristics, and observed sight distance. Ultimately, the field data, and crash experience were evaluated to provide specific countermeasures that would serve to improve traffic safety along the corridor as well as generate planning-level opinion of probable costs. Based on the field review findings, crash data analysis and anticipated crash reduction factors, a list of near-term and long-term improvements to specifically address the higher crash locations was provided. Shawn then assisted the County in preparing grant applications to secure funding to implement some of the higher priority projects identified in the study to address safety and reduce crashes.

## Mike Albin, AICP
**Senior Transportation Planner**

**Contact**
malbin@cbbtraffic.com
515-451-9782

**Education**

M.S., Urban Planning and Development, Saint Louis University, 2019

B.S., Community and Regional Planning, Iowa State University, 2008

**Certifications**

American Institute of Certified Planners (AICP)

**Professional Activities**

American Planning Association, Board Member of the Missouri Chapter, St. Louis Section

Mike Albin is a transportation planner who has extensive experience with providing strategic solutions towards the context sensitive integration of transportation facilities with surrounding land uses. Mike has worked on transportation planning and coordination efforts involving multiple regional, state, and national stakeholders. His responsibilities have included research and development of technical information for plans, assisting clients in developing a vision, goals, and strategy recommendations that will allow them to address community needs effectively and viably. He is passionate about creating multimodal transportation systems that are safe, comfortable, and accessible to everyone.

### Town of Merrillville Comprehensive Plan *Merrillville, IN*
The Town of Merrillville Comprehensive Plan is an ongoing project where CBB is part of a team completing the transportation planning component. This involves assessing and reporting current conditions, engaging with stakeholders on their wants and desires for the future transportation network, and working within the team to create a network that is more multimodal, offers better connectivity, and works together with recommended changes to land use, utilities, and environmental sustainability. Mike's role in this project has been to discuss transportation issues with local leadership and lead CBB's transportation team in providing expertise and viable strategies that match the goals and vision of the comprehensive plan update.

### SR-278 Corridor Independent Review *Beaufort County, SC*
The purpose of this project is to address structural deficiencies at the existing eastbound Mackay Creek bridge connecting the Town of Hilton Head Island with the mainland and reduce congestion within the project study area. While the original purpose of this project was to replace the structurally deficient eastbound Mackay Creek Bridge, at the request of Beaufort County, the project was expanded to include improvements throughout the corridor between Moss Creek Drive and Wild Horse/Spanish Wells Road. Mike examined the role that multimodal transportation can play in decreasing congestion along this corridor. He conducted an in-depth analysis, including a site visit, of the current transit, bicycle, and pedestrian networks and discussed multimodal strengths and weaknesses with local leadership. With this information, Mike assembled a litany of tailored recommendations for increasing multimodal transportation's reach and viability in the Town of Hilton Head Island and immediate vicinity in Beaufort County.

### Safe Transportation for Every Pedestrian (STEP) Workshop *Springfield, MO*
CBB was selected to provide a two-day training workshop on the FHWA's STEP program. The program is designed to teach local governments how to implement safe spaces for pedestrians as well as how to lessen the impacts of pedestrian-involved crashes when they occur. The workshop was held for staff from the City of Springfield, MoDOT's Southwest District, and other local agencies. Mike's role had two parts. First, he presented the background, reasoning, and values behind the STEP program. Second, he led a small group on a local site visit to identify pedestrian safety issues present, followed by an activity to implement the training provided with a plan to mitigate those issues.

### Route B/Paris Road Safety Audit *Columbia, MO*
CBB was tasked to provide an audit of existing and potential safety hazards along a 5-mile corridor that included a diversity of land uses, transportation modes used, and outdated traffic planning efforts. During the audit, the CBB team provided public engagement, collected data, and conducted a field visit with local stakeholders to get a first-hand sense of the issues. Mike led a small group of stakeholders during the field visit to examine issues from the perspective of wheelchair users, the visually impaired, as well as overall issues at particularly complex intersections. He assisted the CBB team in providing findings from the small group as well as recommendations in the final report.

## Ashley Fillback, PE
**Transportation Engineer**

**Contact**
afillback@cbbtraffic.com
314-449-9575

**Education**
M.S., Civil Engineering, Southern Illinois University Edwardsville, 2022

B.S., Civil Engineering, Missouri University of Science and Technology, 2020

B.S., Architectural Engineering, Missouri University of Science and Technology, 2020

**Registrations**
Professional Engineer: Illinois, Indiana, Missouri

**Professional Activities**
Institute of Transportation Engineers (ITE)
Women in ITE Member Program Committee

Missouri Valley District of the Institute of Transportation Engineers (MOVITE)
Board Director

Gateway Section of the Institute of Transportation Engineers (GSITE)
Board Director – 2022 to Present

American Public Works Association (APWA)

Women's Transportation Seminar (WTS)

Ashley Fillback joined CBB in May 2020 after earning her Bachelor of Science degrees in Civil Engineering and Architectural Engineering from the Missouri University of Science and Technology. Ashley is primarily involved in CBB's study efforts and has been involved with many projects during her time at CBB. Ashley has completed several traffic impacts studies, parking studies, and other traffic-related assessments for a variety of land uses. In completing these projects, Ashley has gained considerable experience with software packages such as Synchro, Sidra and HCS, and she has grown familiar with industry standards and guidelines produced by ITE, AASHTO, MUTCD, and similar organizations. Ashley recently received her master's degree in Civil Engineering with an emphasis in Transportation Engineering from Southern Illinois University Edwardsville.

**St. Louis County Action Plan** *St. Louis, MO*
The St. Louis County Action Plan analyzed selected corridors in St. Louis County for a road diet to incorporate bike lanes and shared use paths. Ashley used average weekday daily traffic and turning movement counts to analyze these corridors with SYNCHRO. Signalized intersections were analyzed for each corridor with existing lane configurations, signal timing, and traffic volumes. Each corridor was then analyzed for a road diet scenario. The project team considered the results of the analysis to determine the feasibility of implementing a road diet and created design alternatives for St. Louis County to consider. Each corridor was proposed as a full road diet, partial road diet, or no road diet depending on the results of the analysis. Recommendations for each corridor included various lane widths, two-way left-turn lanes, bike lanes with buffers, shared-use paths, on-street parking options, and signal timing adjustments.

**I-270 North Design-Build** *St. Louis, MO*
The I-270 North Design-Build project was commissioned by MoDOT to enhance I-270 in North County. The purpose of the project was to improve traffic mobility and safety throughout the corridor. Ashley collected initial research and observations to prepare the team for the project. The team developed creative solutions for interchanges, transit services, pedestrian facilities, slip ramps, and weaving segments. Ashley helped to determine traffic routes and eliminate slip ramps on the outer roads through traffic exhibits and PTV VISSIM. She also helped develop bus lane and interchange concepts.

**Wentzville Historic Downtown Transportation Revitalization BUILD Grant** *Wentzville, MO*
The purpose of the Wentzville Historic Downtown Transportation Revitalization Project was to improve the access, circulation, parking, walkability, wayfinding, gateway treatments, and streetscape of Downtown Wentzville. Ashley researched the criteria for the BUILD Grant program and coordinated the writing of the report. Ashley collected observations throughout the downtown corridor and incorporated these into the BUILD Grant application. As part of the community outreach, Ashley prepared flyers and posters for public meetings in Wentzville.

**Orchard Town Center Traffic Impact Study** *Glen Carbon, IL*
CBB recently worked on a traffic impact study for the proposed commercial development at the Orchard Town Center in Glen Carbon, Illinois. The purpose of the study was to determine the number of additional trips that would be generated by the proposed mixed-use development, evaluate the impact on operating conditions for the adjacent roadways, and determine the ability of motorists to safely enter and exit the site. Ashley was involved with all elements of the traffic impact study including reporting on the existing traffic conditions, trip generation, trip distribution, forecasted conditions, and making traffic recommendations to mitigate the impact of the proposed development. Throughout this project, Ashley used SYNCHRO 10 to complete the traffic modeling and evaluate all scenarios. She coordinated with the developer, IDOT, Village of Glen Carbon, City of Edwardsville, and Madison County to meet the needs of all agencies involved.

## Jacob Kaltenbronn, PE, PTOE
**Transportation Engineer**

**Contact**
jkaltenbronn@cbbtraffic.com
314-449-9556

**Education**
M.S., Civil Engineering – Transportation Emphasis, University of Missouri – Columbia, 2019

B.S., Civil and Environmental Engineering, University of Missouri – Columbia, 2018

**Registration**
Professional Engineer: Illinois, Missouri

FAA-Certified Drone Pilot

**Professional Activities**
Institute of Transportation Engineers (ITE)

Missouri Valley District of the Institute of Transportation Engineers (MOVITE)

Gateway Section of the Institute of Transportation Engineers (GSITE)

**Specialized Training**
IMSA Work Zone Temporary Traffic Control Technician

IMSA Traffic Signal Technician Level II

ITE Signalized Intersection Design Training, 2021

Jacob Kaltenbronn joined CBB in 2019 after obtaining a master's degree in civil engineering from the University of Missouri. In his role at CBB, he primarily works on signal timing and optimization projects, roadway, and signal design projects, and assists in Maintenance of Traffic (MOT) efforts during roadway construction projects. Jacob has gained significant experience in signal design and operations and is familiar with programming and operation of a variety of signal controllers. He is well versed in design standards such as ADA and PROWAG, as well as software such as AutoCAD Civil 3D, Autoturn, Synchro, HCS, and Advanced Traffic Management Software (ATMS) such as TACTICS and TransSuite. Jacob has also overseen CBB's data collection efforts and is a FAA-Certified Drone Pilot responsible for implementing drone operations at CBB.

**MO Route 141 Timing Improvement Project** *Missouri Department of Transportation*
This project consisted of developing optimized signal timing plans for a 31-mile section of MO Route 141 that included 80 intersections throughout St. Louis County and Jefferson County. Throughout the project, Jacob was heavily involved in data collection and analysis, which included the collection and analysis of 24-hour hose volumes, turning movement counts, intersection geometry, travel time delay studies and intersection delay studies. Additionally, Jacob was involved in the development of models using Synchro 10 software. These models were used to analyze various measures of effectiveness for existing timing plans and various alternative plans. Ultimately, optimal cycle lengths and offsets were chosen to determine the optimal timing plans for various peak periods. Jacob was also involved in programming the proposed timing plans in the signal controllers along the corridor using TransCore controller management software.

**Signal Coordination and Timing Improvement** *Illinois Department of Transportation*
Jacob has worked on signal coordination and timing (SCAT) projects for CBB and the Illinois Department of Transportation. His primary role in these projects involved data collection and analysis, including 24-hour hose volume analysis, turning movement counts, fuel cost and emissions savings calculations and analysis of various measures of effectiveness using Synchro. These efforts resulted in the selection of optimal cycle lengths and offsets throughout the project corridors for the various peak periods of traffic. Jacob was also involved in the implementation of the proposed signal timing plans, which included programming the timing plans in the signal controllers and conducting field observations of the corridors once the timing plans had been implemented.

**I-270 North Design-Build** *Missouri Department of Transportation*
Jacob is involved with maintenance of traffic (MOT) efforts during interstate closures and other major traffic events during this $275 million design-build project along I-270 in North St. Louis County. His duties include monitoring traffic in the field and adjusting signal timing along detour routes, as necessary using TransCore controller management software and by programming timing changes in signal controllers in the field. Jacob also led the effort to implement a tethered drone. The drone operation assists MOT operations during construction by improving traffic monitoring capabilities. Jacob is responsible for planning all drone operations. He also acts as the remote pilot-in-command during all MOT operations and is responsible for all communications between the drone operation in the field, off-site CBB traffic engineers, and TMC operators.

**Gateway Green Light (GGL Phase 5)** *St. Charles County, MO*
This project consisted of signal optimization along 4 priority corridors in St. Charles County, MO. Jacob was involved in the collection and analysis of data including 24-hour hose volume counts, intersection delay studies, and travel time delay studies. He was also involved in the development of models using the Synchro software package that were used to select optimal signal timing plans for various peak periods. Jacob was also involved in the implementation of the proposed signal timing plans, which included programming the timing plans in the signal controllers using Transcore controller management software and conducting field observations of the corridors once the proposed timing plans had been implemented.

**QuikTrip Off-Site Improvements** *Rolla, MO*
Jacob assisted in the design of access and other off-site roadway improvements for a development in Rolla, MO. During the project, Jacob assisted in various aspects of the design, including modifications to preliminary layouts, the development of a 3D model using AutoCAD Civil 3D, and the design of both a new storm sewer system and modifications to an existing storm sewer system. He also developed traffic control and staging plans and assisted in the preparation of the final construction plans.

## Mirza Sharif, Ph.D.

**Transportation Planner**

**Contact**
msharif@cbbtraffic.com
314-449-8246

**Education**

Ph.D., Civil Engineering – Transportation Engineering, Kansas State University, 2020

Graduate Certificate – Applied Statistics, Kansas State University, 2019

M.S., Civil Engineering – Transportation Engineering, University of Wyoming, 2015

B.S., Civil Engineering, University of Asia Pacific, Bangladesh, 2012

**Registrations**

Engineer-in-Training (EIT)

**Professional Activities**

Institute of Transportation Engineers (ITE)

Missouri Valley District of Institute of Transportation Engineers (MOVITE)

Gateway Section of the Institute of Transportation Engineers (GSITE)

Dr. Mirza Sharif joined CBB after earning his Ph.D. in civil engineering with an emphasis in transportation engineering from Kansas State University. At CBB, Mirza is primarily involved with transportation research, traffic safety, and traffic operations. Mirza is currently working on two research projects for MoDOT as a subconsultant to the University of Missouri. Mirza has experience in a diverse range of transportation engineering projects, including traffic safety, planning, TS&O, and maintenance of traffic for construction projects. He is knowledgeable with methodologies and procedures for using the Highway Safety Manual (HSM) and Interchange Safety Analysis Tool Enhanced (ISATe), and Geographic Information System (GIS). Mirza has been involved in several projects which required traffic safety analysis, data analysis, statistical modelling, and data visualizations. At CBB, Mirza has been involved in safety evaluation for projects such as I-70 Cave Springs to Fairgrounds Design-Build project, US 63- WW, and US 54-Ellis interchange studies.

**I-70 Cave Springs to Fairgrounds Design-Build Project** *St. Charles County, MO*

Mirza worked on the I-70 design-build project as part of the safety team. Mirza was involved in modelling and analyzing the safety of the proposed build for this project. Mirza analyzed the crashes using the Interactive Highway Safety Design Model (IHSDM) which is based on the Highway Safety Manual (HSM) procedures. As a part of the study, 4.41 miles of I-70, 11.32 miles of adjacent arterial roadways, and 17 ramps were analyzed for crash prediction. The proposed model also included 9 ramp terminals, 22 intersections, and 3 roundabouts. The project required use of various crash modification factors to improve the historically crash-prone segments/intersections within the project area. The potential safety benefits were compared with the Missouri Department of Transportation's (MODOT) results and anticipated to reduce 40% crashes once built.

**MoDOT Central District Safety On-Call** *Central District, MO*

As a traffic engineer, Mirza was tasked with the responsibility of analyzing historical crash data, creating concept plans for cost estimates, and identifying safety countermeasures for various locations within the central district regions of Missouri. Multiple lists of locations were provided by MoDOT, categorized based on different criteria such as expressway intersections, expressway segments, curve locations, wet crash locations, and high severity corridors. Collaborating with MoDOT, CBB developed methodologies to pinpoint project locations for future safety enhancements within each category. A scoring system was applied to evaluate each location's safety performance. Subsequently, priority was assigned to locations with higher scores for potential safety enhancements. The subsequent phase involved determining appropriate safety countermeasures for each location, followed by the development of concept drawings and cost estimates for the selected sites in the final stage.

**Safety Analysis for Interchanges** *Various Locations*

As a traffic engineer, Mirza was responsible for evaluating the safety analysis for several interchange studies. Example interchange projects include US 54 at Ellis Blvd (Jefferson City, MO), US 63 at Rte WW (Columbia, MO), US 65 at Kearny St. (Springfield, MO). For each project area, three to five years of traffic crashes were summarized by location, crash type, severity, weather condition, pavement condition, and lighting condition to identify crash patterns at each of the interchanges. Crash rates were generated along the segments of interstate as well as the arterial cross streets. Fatal crashes were scrutinized in detail to determine if improvements could reduce the severity of crashes. Crash rates were utilized to determine if any of the study areas were a high crash location. The IHSDM/ISATe method was used for predicting the future crashes with specific changes to the interchanges while the HSM Methodologies were applied to predict crashes along the cross streets within the project area. Based on the safety analysis, recommendations were made, and countermeasures were identified to improve the safety for the interchange studies.

## Jeffrey Stirnemann
### Senior Construction Inspector

**Contact**
jstirnemann@cbbtraffic.com
314-517-6788

**Education**
St. Charles Community College, St. Charles, Missouri, 2013 CAD Certificate

**Specialized Training**
Work Zone Temporary Traffic Control Technical Certification (ISMA), 2019

Advanced Construction Inspection (APWA) Certificate of Accomplishment, 2014

Advanced Construction Inspection (APWA) Certificate of Accomplishment, 2011

MoDOT (LPA) Training Course, 2011

Construction Inspection Training Workshop (APWA), 2007

Flagging and Traffic Control Certificate, Manual of Uniform Traffic Control Devices (MUTCD), 2006

Flagging and Work Zone Safety Specialist (ISMA), 2004

Actra-Advanced Traffic Management Systems Training, 2003

**Inspection Experience**
- Roadway Projects
- Signal Projects
- LPA/CMAQ Projects

Jeffrey Stirnemann has been an employee of CBB for 20 years. During that time, he has been a member of our field technician staff that performs a wide range of tasks that provides data and information to our Studies and Design departments, as well as performing inspection duties on various state of Missouri construction projects. For the past several years, Jeff has served solely as a senior construction inspector on many MoDOT permit, LPA, and CMAQ roadway and traffic signal construction projects in the St. Louis and St. Charles area. Based on his extensive field experience, Jeff is familiar with all facets of roadway and signal construction, as well as the implementation and maintenance of proper traffic control practices for short-term and long-term roadway work. The following are projects that represent Jeff's experience in the field of construction inspection:

### Traffic Signal Inspection Projects
- Mackenzie Road & Rogers Elementary- New Traffic Signal, Afton, MO
- Fifth Street and Fire Station No. 2- New Fire Station Traffic Signal, Eureka, MO
- Olive Boulevard and Questover/Ross Avenue- Signal Modification, Creve Coeur, MO
- Delmar Boulevard and I-170 NBOR- New Traffic Signal, University City, MO
- St. Charles Rock Road and Brown/McKinnen Road- Signal Modification, St. Ann, MO
- Technology Drive and MasterCard Boulevard- Signal Modification, O'Fallon, MO
- Highway K and O'Fallon Pkwy/Royal Springs- Signal Modification, O'Fallon, MO
- Watson Road and Trianon Parkway- New Traffic Signal, Shrewsbury, MO
- Missouri Route 141 and 13 Street- Signal Modification, Fenton, MO
- Missouri Route Z and Perry Cate Boulevard- New Traffic Signal, Wentzville, MO
- Missouri Route 50 and Progress Pkwy/Denmark Road- New Traffic Signal, Union, MO
- Missouri Route 109 and Legends Pkwy- East 4th Street, Eureka, MO

### Roadway Inspection Project
- Route K and Highway N- Entrance Modification, O'Fallon, MO
- Route 94 and O'Fallon Road/Centerpointe Hospital Drive- Signal Modification and Roadway Construction, Weldon Springs, MO
- Olive Boulevard and Danforth Science Center- New Traffic Signal and Roadway Construction, Creve Coeur, MO
- Mid Rivers Mall Drive and N. Outer Road (GBT Shoppes @MRM)- New Traffic Signal and Roadway Construction, St. Peters, MO
- Missouri Route Z and Wentzville School- Entrance Roadway Construction, Wentzville, MO
- Missouri Route 109 and Highway W/FF- Roadway Construction, Jefferson County, MO
- Missouri Route 109 and Legends Pkwy- East 4th Street, Eureka, MO
- Missouri Route 109 and 4th Street/Milner Rd – QT, Eureka, MO
- Missouri Route V and I-44 Outer Road – QT, Rolla, MO

### LPA/CMAQ Inspection Projects
- Missouri Route 94 and Zumbehl Road/Friedens Road- New Traffic Signal and Roadway Construction, St. Charles, MO
- Wentzville Parkway and W. Pearce Boulevard – New Traffic Signal and Roadway Construction, Wentzville, MO
- Gateway Green Light Phase 1 & 3: Traffic Signal Equipment and Communication Upgrades- Signal Controller Modifications and Equipment Installations, St. Charles County, MO
- I-170 NBOR and Ladue Road – New Traffic Signal and Roadway Construction, Ladue, MO
- Missouri Route A and Pounds Road – New Traffic Signal and Roadway Construction, Festus, MO
- Jeffco Boulevard and Tenbrook Road – New Traffic Signal and Roadway Construction, Arnold, MO