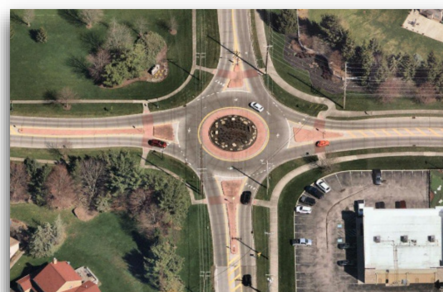
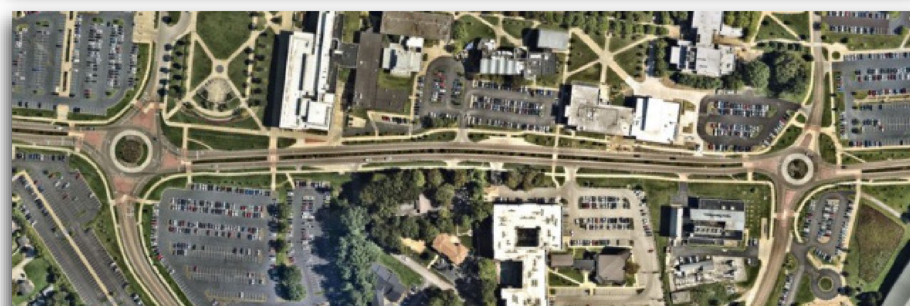
Areawide Roundabout Study





May 2024

Areawide Roundabout Study

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Akron Metropolitan Area Transportation Study
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Cooperative transportation planning by the Village, City and County governments of Portage and Summit Counties and the Chippewa and Milton Township areas of Wayne County; in conjunction with the U.S. Department of Transportation and the Ohio Department of Transportation.

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Chapter 1 — Introduction

Roundabouts are a relatively new form of intersection control in the United States. Even within the Greater Akron area, which embraced roundabouts earlier than most regions within Ohio, it has been less than two decades since the area's first roundabout was constructed.

Understanding and embracing any new concept takes time, especially for something as radically different as a roundabout. Transportation officials and the public alike are all over the spectrum on their level of enthusiasm or disdain for roundabouts. Few concepts in the transportation world elicit such strong reactions as roundabouts.

Despite lingering public misgivings regarding their effectiveness, roundabouts are growing quickly in popularity. However, the reasons for public apprehension are worth addressing.

This report is AMATS' attempt to help regional officials and the public to understand more about roundabouts and evaluate how the area's roundabouts are performing. This report consists of three main sections:

- *Chapter 2* explains key characteristics of roundabouts. This section is based on researching various reports and best practices. It is not a comprehensive design guide, but rather a distillation of many key findings on how roundabouts function, important design considerations, where they are and are not effective, costs, and the various advantages and disadvantages of roundabouts.

- *Chapter 3* focuses on AMATS-area roundabouts. The chapter inventories all existing and proposed roundabouts and other circular intersections within and adjacent to the AMATS planning area. The chapter analyzes the 28 existing roundabouts located within the region. A crash analysis is performed at each intersection, comparing pre-and-post-construction of the roundabout.

- *Chapter 4* shares lessons that have been learned by regional officials as roundabouts have been planned, funded, built, and maintained. This chapter is a best local practice guide for community officials considering a roundabout project. The chapter concludes by explaining how to pursue funding for roundabouts.

The purpose of this report is to provide an objective analysis of roundabouts as a potential option for intersection control. There is substantial data to support roundabouts being an effective solution for many transportation problems. Deciding whether a roundabout is the right solution for an intersection or even a community requires much more nuance. This report—the first of its kind from AMATS—can be used as a guide to help understand when, where, why, and how roundabouts function by utilizing national and area-specific data that allow readers to draw their own conclusions about roundabouts.

Chapter 2 — Roundabout Characteristics

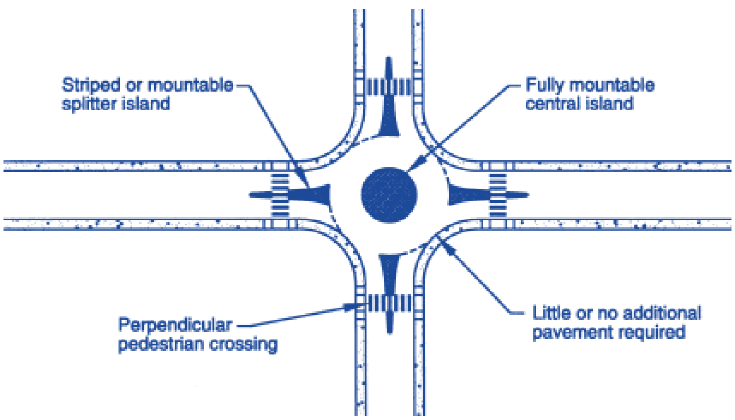
Definition

A roundabout is a circular intersection that moves traffic in a single direction. They are intended to increase safety and efficiency in highly traveled areas by requiring yielding to mitigate car speeds.

Types of Roundabouts

Mini Roundabouts

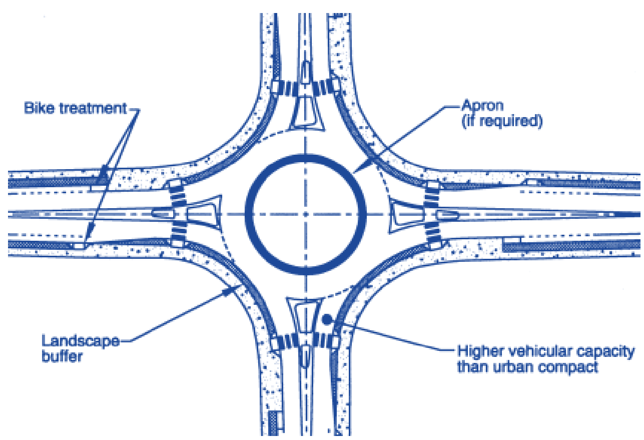
Mini roundabouts generally have an inscribed circular diameter of 45 to 80 feet, with traversable center or splitter islands. They are typically used where the existing speed limit is 25 mph or less in urban, suburban and smaller municipal environments; but are not suited for high-volume use (15,000 vehicles or greater average daily traffic) such as on state routes and major highways. Mini roundabouts have proven to be an effective, low-cost solution to improving intersection capacity and safety.



Top right photo: One of Franklin Boulevard's several recently built mini roundabouts in Cleveland, Ohio; Bottom right photo: Acme Plaza in Green

Single-Lane Roundabouts

Single-lane roundabouts are characterized by having a single-lane entry at all legs and one circulatory lane. They are distinguished from mini roundabouts by their larger inscribed circle diameters and non-traversable central islands. Their design allows slightly higher speeds at the entry, on the circulatory roadway, and at the exit. The geometric design typically includes raised splitter islands, a non-traversable central



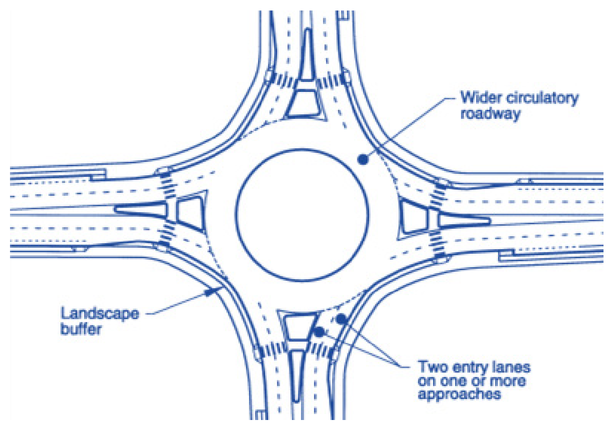
island, crosswalks, and a truck apron. The size of the roundabout is largely influenced by the choice of design vehicle and available right-of-way.

Left: Ridgewood and Hametown in Copley Township; Right: Summit and Powdermill in Franklin Township

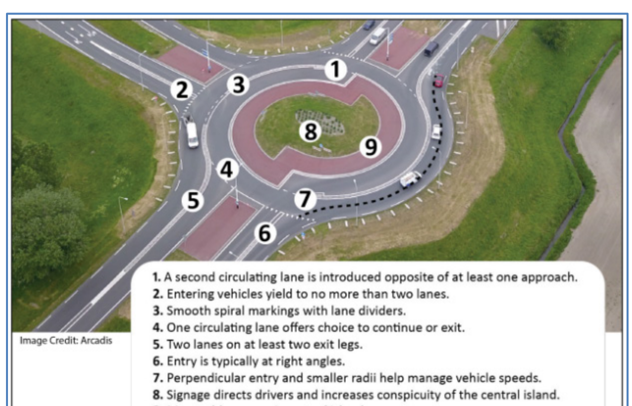
Multi-Lane Roundabouts

Multi-lane roundabouts have at least one entry with two or more lanes. The roundabout may have two lanes on each approach or may have a different number of lanes on one or more approaches, e.g., two-lane entries on the major street and one-lane entries on the minor street. Sometimes multi-lane roundabouts are given titles based on the number of lanes in each direction; 2 x 2 for a four-way intersection where each approach has two lanes; 2 x 1 for a four-way intersection where one road has two lanes and the intersecting road has one lane.

Massillon and Steese roundabout in Green



A relatively new variation of the multi-lane roundabout is what is called a Turbo Roundabout. This design requires a driver to choose its direction prior to entering the roundabout and is notable for its unique shape—many look like a bisected circle that with the two halves being offset.

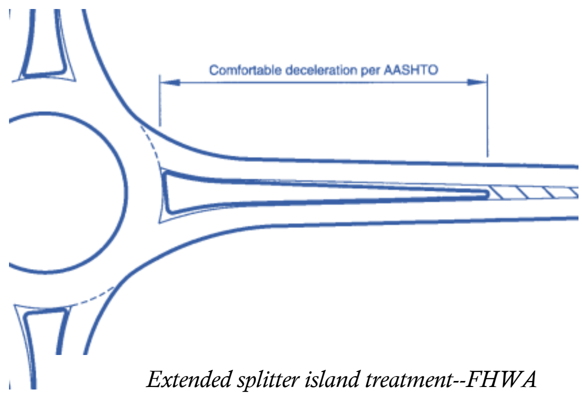


Characteristics of a typical Turbo Roundabout.

Rural and Urban Applications

Roundabouts constructed in rural areas typically contain special design considerations that differentiate them from their more common urban and suburban counterparts. Approach speeds in rural areas are higher, and the average driver may not expect to encounter interruptions in speed. Therefore, these roundabouts are usually designed with particular elements to help alert drivers to the upcoming intersection. Rural roundabout elements may include:

- ***Clear visibility from several hundred feet away***. The geometric alignment of approach roadways should be designed to allow the driver to see the general shape of the roundabout and the central island in particular. Where this is not possible, additional signage and pavement markings should be provided well in advance of the intersection.
- ***Approach curves that are broader and exits that are more tangential***. While any roundabout should be designed to calm and slow traffic, a rural application may require softened entrance and exit curves that help to mitigate higher approach and travel speeds.
- ***Splitter islands that are longer***. Increasing the length of splitter islands to where drivers are expected to decelerate comfortably—typically 200' or more—provides another visual cue of an upcoming roundabout. To further encourage speed reduction, the extended splitter island can be landscaped to provide a "tunnel effect." However, sight distance requirements will dictate the maximum extent of any landscaping.



Extended splitter island treatment--FHWA

Conversely, urban and suburban roundabouts are more likely to have higher levels of pedestrian and bicycle traffic, and therefore should be designed to allow for safe non-motorized transportation. Most roundabouts in these areas contain sidewalks and crosswalks; some also contain bicycle lanes. Also, urban and suburban roundabouts are typically in areas where speed limits are either 25 or 35 miles per hour, and so they can be designed differently than rural roundabouts because of their slower-approaching traffic. Roundabouts in this context can be used effectively as traffic calming devices.

Differences Between Modern Roundabouts and Traffic Circles

As modern roundabouts become more popular, acceptance of them has increased. When the concept was new to the Greater Akron area, many people conflated roundabouts with more traditional circular intersections. A closer look reveals that a modern roundabout functions very differently from an older rotary intersection, e.g., The Tallmadge Circle. Roundabouts use a variety of methods to slow traffic that differentiates them from traffic circles or rotaries. Traffic circles often have higher speed limits and larger diameters which can increase the likelihood of crashes. Roundabouts have smaller diameters, lower speeds, and use yield signage.

Key Differences Between Modern Roundabouts and Traffic Circles

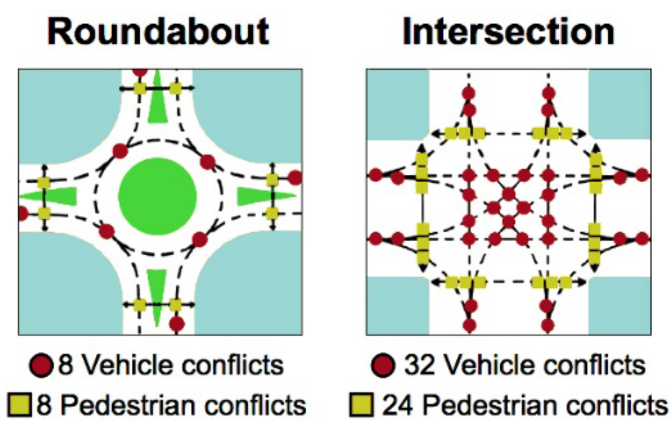
	Modern Roundabout	Traffic Circle
Size	*Smaller—typically under 200' in outside diameter*	*Generally much larger—most are over 200', some significantly larger*
Traffic Control	*Yield control for all entry points*	*Typically stop or yield control for points of entry; some require circulating traffic to yield to entering traffic*
Pedestrian Movement	*Access is allowed only across the legs of the roundabout, behind the yield line*	*Can be similar to roundabouts, but some circles allow pedestrian access to the center island*
Speed	*Designed to slow traffic; typically 10-15 m.p.h.*	*Can be higher speed, especially on larger circles*
Circulation	*All vehicles flow counterclockwise*	*Typically counterclockwise, but some neighborhood circles allow left turns/clockwise flow*

Two local examples of traffic circles, Mull/Hawkins (left) and Tallmadge Circle (right). Note the large, inscribed diameter of both circles.

Advantages of Roundabouts

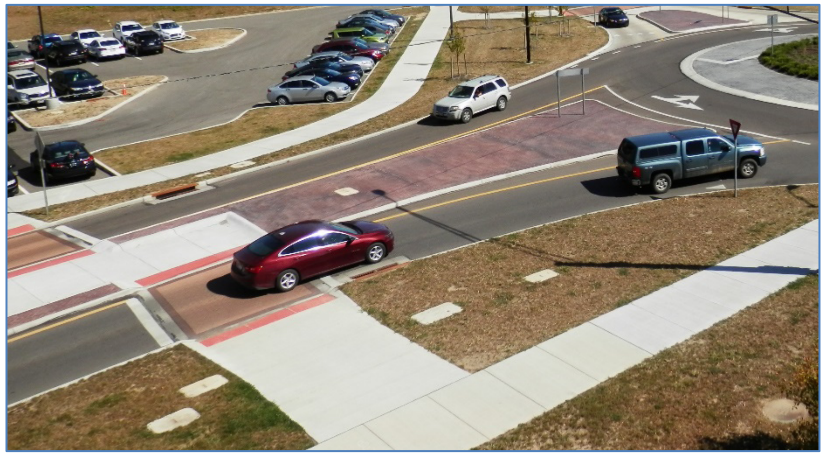
Roundabouts are increasing in popularity due to their efficiency and safety. The benefits of installing a roundabout in place of a traditional intersection are numerous. The initial investment in building a roundabout provides lasting benefits in its upkeep and maintenance. Compared to traffic signals, roundabouts diminish maintenance due to not having electrical or hardware features. Only landscaping requires regular maintenance, and pavement and concrete features need to be maintained on the same cyclical basis as would a typical intersection. This also allows roundabouts to remain fully functional regardless of weather or utility functionality.

Both the Federal Highway Administration (FHWA) and the Ohio Department of Transportation (ODOT) validate the safety of roundabouts. ODOT cites that potential points for vehicular conflict and collision are reduced from 32 points in traditional intersections to eight points in roundabouts.



FHWA data shows there is potential for a 90% reduction in fatal and serious injury causing crashes when roundabouts are used in place of two-way and traffic signal intersections. Traditional intersections using signage and traffic signals often have right-angle, left-turn and head-on collisions made worse by high traveling speeds; roundabouts virtually eliminate these risks by slowing speeds and having traffic flow in a single direction in the rounded shape. The continuous flow is achieved via yielding which eliminates the need for cars to stop, as is typical for traffic signals intersection. Drivers generally do not feel pressure to speed through a roundabout to avoid being stopped by a traffic signal. Roundabouts can be a logical solution to assist with traffic flow and reduce crash potential on intersections with more than four legs.

Beyond speed mitigation, roundabouts calm traffic by making space for other forms of transportation, such as pedestrians, who can also navigate intersections safely. The use of sidewalks and crosswalks improve pedestrian safety by providing splitter islands for refuge when crossing multiple lanes of traffic. These crosswalks are also set further back and protected from traffic flow, giving pedestrians and drivers longer reaction time when crossing the street or continuing through the roundabout. Bicyclists are assisted in multiple ways, as detailed by the Washington State DOT: reduced speeds slow cars to a pace cyclists can maneuver easily, and many roundabouts integrate painted bike lanes free of cars. The painted street bike lanes can lead into designated bike paths away from the road that further reduce potential for conflict with cars. Bicyclists also have the option to walk their bikes along crosswalks if they do not want to ride with the flow of traffic.



When the City of Kent constructed this roundabout on Summit Street, the crosswalks were staggered. Placing crosswalks further from exiting traffic reduces chances for conflict.

The U.S. Department of Transportation (USDOT) defines traffic calming as a variety of measures aimed to reduce negative effects of motor vehicles and improve road atmosphere for non-vehicle street users. Roundabout speed limits calm traffic with a range of 15 to 25 mph. Drivers being required to slow and pay closer attention to the direction and activity ahead of them streamlines the movement of all travelers. Compared to older, larger traffic circles that allowed faster speeds and sometimes utilized traffic signals, yielding at a slower speed reduces waiting times, idling and potential for crashes.

According to the Insurance Institute for Highway Safety (IIHS), environmental benefits are achieved through reductions in car emissions and fuel consumption. Improved traffic flow efficiency in roundabouts leads to a reduction in idling and emissions of carbon monoxide and dioxide, nitrous oxide and hydrocarbon up to 45 percent. Safer roundabouts also encourage alternatives to vehicle travel that further reduce emissions.

These advantages have been studied by state and federal transportation officials and have led to roundabouts being widely promoted as a viable intersection alternative among those who control funding for projects. This itself is an advantage of roundabouts: in many cases, finding funding for a roundabout is becoming much easier than funding more traditional intersection improvements. ODOT's current Highway Safety Improvement Program funding and AMATS' *Funding Policy Guidelines* incentivize the construction of roundabouts.

Disadvantages of Roundabouts

Transportation officials tout roundabouts as a generally positive addition to many roadways and intersections because of their myriad benefits. However, they come with their own set of possible disadvantages that make them unsuitable for some locations.

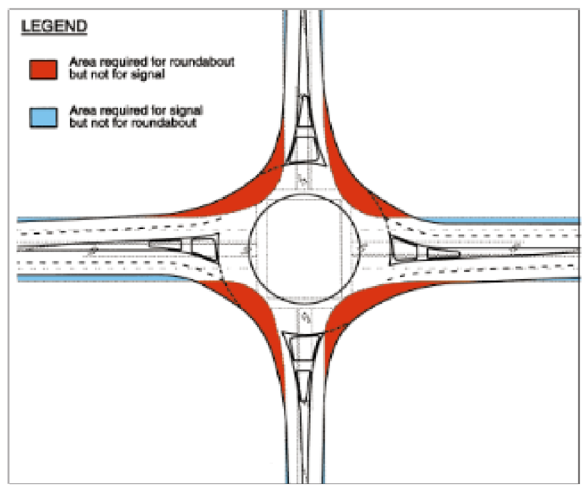
Roundabouts usually come with higher construction costs compared to traditional intersections. Costs vary based on the location of the roundabout and whether landscaped features are included. Because roundabouts are a large undertaking, the following items are all necessary to include in the costs:

- Land acquisition
- Construction of center and splitter islands
- Paving the roundabout
- Signs and pavement markings
- Redirection of traffic during construction
- Impact on local businesses
- Landscaping
- Drainage
- Illumination
- Realignment of roadway

Although constructing a roundabout is typically more expensive than a traditional intersection improvement, costs can be somewhat comparable when the alternative requires the construction of turn lanes and other improvements that drastically alter the intersection's existing conditions.

Many drivers are initially reluctant to the idea of roundabouts, describing them as confusing to navigate and seemingly more complicated than traditional intersections. However, ODOT cites an IIHS survey that shows an increase in the acceptance of roundabouts is often achieved. Within a year of its installation, a prior 31% approval rating of roundabouts can leap to 70%. A better initial approval rating can be achieved by increased education on roundabouts and their benefits. All else being equal, a complicated multi-lane roundabout may be more likely to intimidate drivers than a simpler roundabout. The placement and amount of signage can also alter the public's level of reluctance to a new roundabout. Some people have difficulty processing several signs at once as they approach a roundabout, especially if they are not familiar with the area.

Traditional intersections do not typically take up the same amount of space that roundabouts do. Roundabouts often help with high traffic areas and need the landmark island to define their shape; thus, they will need to acquire more land to be built. This is especially pertinent for multi lane roundabouts and those with pedestrian friendly features, such as setback sidewalks and crossing islands.



Roundabouts, such as this urban double lane roundabout, typically take up more space than would a signalized intersection. Source: FHWA; Roundabouts: An Informational Guide

Siting and Design

Roundabouts can be an effective transportation solution for managing traffic in areas with problematic safety issues or less-than-ideal traffic flow. Conversely, there are numerous roadway characteristics and travel patterns that can make roundabouts a less-than-ideal option for safely managing traffic. Many site-specific considerations must be accounted for before a roundabout can be chosen as a preferred alternative improvement. The following section attempts to capture just some of the most fundamental considerations and is not intended to be all-inclusive.

Traffic Volume and Flow Considerations
Areas with moderate traffic are best suited for roundabouts. To determine the number of lanes needed in the roundabout, traffic flows of the area are generally considered in the following thresholds:

- up to 2,000 vehicles per hour for one-lane roundabouts
- 2,000 to 4,000 vehicles per hour for two-lane roundabouts
- 4,000 to 6,000 vehicles per hour for three-lane roundabouts

Although a roundabout can be a solution for higher hourly volumes (over 2,000 vehicles per hour), several factors can determine whether it is the best solution. Traffic volumes of each road entering the roundabout, the size of the roundabout, angles of roadways, sight distance, and several other factors all must be considered. The community's familiarity and comfort with roundabouts must be measured too, as higher-traffic, multi-lane roundabouts are typically more complex than low-to-moderate volume, single-lane roundabouts.

As the popularity of roundabouts has increased, FHWA has determined that, generally, simpler designs are safer and more effective. Indeed, recent data has shown that 2 x 2 roundabouts—those where each of the four legs have two entrance lanes—tend to present challenges. Driver confusion is high because of its complexity and traffic often moves too fast because the diameter of such roundabouts is larger. FHWA is no longer recommending 2 x 2 roundabouts in many situations. However, 2 x 1 roundabouts—those where the higher volume road has two lanes, but the other street has single-lane entrances—have been much more successful. They can effectively handle capacity of high-volume roadways, particularly in suburban settings.

← High-traffic roundabouts with multiple lanes on each leg, like this one in Dublin, Ohio, are sometimes not as well-received as less-complex roundabouts.

Roundabouts can mitigate situations where traffic flow issues occur. Roundabouts are especially advantageous in locations where stop signs are creating unacceptable delays for side street motorists, where a traffic signal is not warranted, or where a traffic signal would result in greater delays than a roundabout. Locations where there is a high proportion of left turning traffic, or where the major traffic route is not straight through the intersection can benefit from the flow of a roundabout.

If a roundabout is constructed within a network of coordinated traffic signal intersections, it can have detrimental effects on maintaining a closely packed platoon of traffic. Not only will a platoon of traffic leaving a nearby signal make it difficult for the minor street traffic to enter the roundabout, but a roundabout can break down a platoon of traffic. Careful evaluation must be considered if a roundabout is being considered within a coordinated signal network.

Regional Example of a suburban 2 x 1 roundabout located at Cleveland-Massillon/Rothrock in Fairlawn

Safety Considerations
The safety provided by roundabouts for drivers and pedestrians is one of their most notable features. Roundabouts are commonly built because a

signalized or stop-controlled intersection has had significant safety issues. Locations that experience high rates of angle, rear-end or loss-of-control collisions can benefit greatly from the unique characteristics of roundabouts.

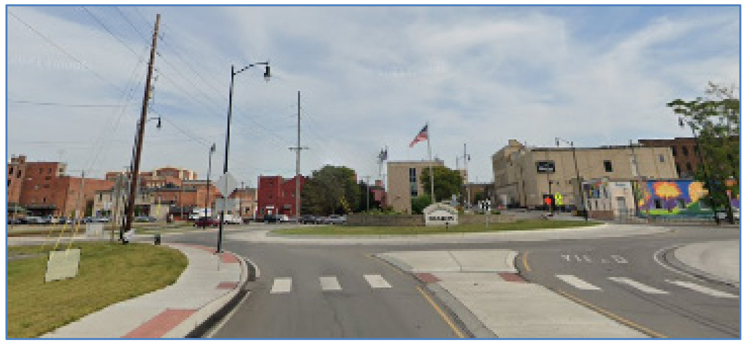
Roundabouts can be particularly effective in situations with unusual intersection geometry. Skewed intersections—those with acute and obtuse angle turns between roadways—often have poorer crash performance than intersections where legs are perpendicular to each other. Roundabouts can help to eliminate the irregular angles and improve sight distance for the left-turning and through traffic that does not line up with other legs of an intersection.

Local example of a roundabout improving the geometry of a previously skewed intersection (E. Market St./Canton Rd./Robindale Dr. in Akron). The two photos on left show the intersection before the roundabout was constructed; right photo showing the roundabout.

Similarly, roundabouts can be an ideal solution for intersections with more than 4 approaches. These intersections necessitate more signal timing phases which create more queuing traffic because of long wait times. Because of so many roads converging, five-and-six-leg intersections create additional conflict points and invite more opportunity for safety issues. Roundabouts can eliminate or minimize these issues. However, many of these intersections carry high volumes of traffic on multiple legs, so care should be taken to evaluate whether a roundabout is an effective solution. Five-and-six-leg roundabouts tend to be larger to allow required spacing between each leg, which can lead to higher speeds within the roundabout and increases in costs for construction and right-of-way acquisition.

Examples of roundabouts with more than four legs—Left: The Northeast/Howe/N. Munroe roundabout in Tallmadge is among the largest roundabouts in the region; Right: This 5-leg elongated roundabout in Rochester, PA combines five high-volume roadways on the edge of the borough's downtown.

Other Siting and Design Considerations

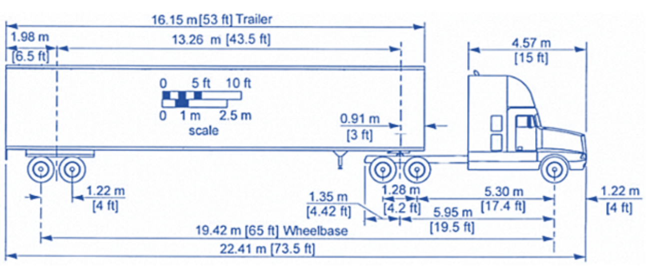


This roundabout in Sharon, PA helps to provide a sense of place and transition zone between a non-descript industrial area and the central business district.

Transition Areas—Roundabouts can be an effective solution in locations where it is important to emphasize the transition between urban and rural environments. Not only can the roundabout serve an important role in calming traffic by reducing vehicular speeds and introducing a more pedestrian and bicycle friendly scale, but these roundabouts can aid in creating a community gateway that helps to define a community's character.

Topography—Roundabouts are generally not recommended for intersections that are along or adjacent to grades exceeding four %. When the approaching roadways slope downward toward the intersection, it is more difficult for entering vehicles to slow or stop as they enter the roundabout as the negative slope increases, particularly during inclement weather. When a roundabout is at the crest of a vertical curve, i.e., approach roadways ascent to the roundabout, with steep approaches, driver sightlines are typically reduced and compromised. If a roundabout is found to be a viable solution along or adjacent to a steeply graded intersection, the intersection itself should be moved or have its vertical profile modified whenever possible, both of which are expensive options.

Vehicle Size—The design of a roundabout might be altered somewhat to account for the type and volume of anticipated truck traffic. While modern roundabouts are designed with truck aprons—and large trucks are *expected* to drive onto this area of the roundabout—a location with high freight volumes may be designed slightly larger to aid truck movement. The turning path of larger vehicles will be greater, and the largest anticipated vehicle—or design vehicle—should be considered in a roundabout's design. A large WB-20 interstate semi-trailer, for example, will utilize intersections at freeway exit ramps and arterial state highways. Smaller design vehicles may be chosen for lower-classification roads and local street intersections. Good roundabout design balances the need to accommodate large vehicles while maintaining low speeds for passenger vehicles.



WB-20 semi-trailers (53' trailers) require a large turning path.

Signage— Roundabouts have signage and markings to alert drivers to their presence and how to navigate them. These signs can contribute to the initial hesitance of drivers to use roundabouts due to being unfamiliar with the meaning of the signs, although they ultimately allow for a safer driving experience. Although some signage can be confusing to drivers unfamiliar with roundabouts, this confusion is reduced over time as more roundabouts are constructed both regionally and nationally.

Signage needs are different for urban and rural applications and for different categories of roundabouts. Signs should be located where they have maximum visibility for road users but a minimal likelihood of even momentarily obscuring pedestrians, motorcyclists and bicyclists, who are the most vulnerable of all roundabout users.

Construction & Maintenance Costs

Construction (and Pre-Construction) Costs
The cost of constructing a new roundabout can vary greatly. Before a roundabout is even built, the pre-construction costs can be sizable. Right-of-way acquisition and the movement of utilities both have the potential to be large expenditures. Re-grading of the adjacent roadways is necessary in some cases, which also increases costs. Construction costs are affected by the width of the street, size of the roundabout, the way the legs of the roundabout are designed, and landscaping. Furthermore, whether a roundabout has sidewalks and/or other active transportation features affects the total cost.

Within the AMATS area, some single-lane roundabouts were built for well under $1 million (as recently as 2014) in rural or suburban locations. But many are well over this amount. It is impossible to give an accurate regional average for roundabout construction costs because so many of the roundabouts built have been a component of larger projects (e.g. a roundabout being built as part of a road's reconstruction that might be a mile or so long). Although outliers are common, a community might anticipate that a standalone single-lane roundabout could be within the range of $1 million to $ 2 million and typical multi-lane roundabouts might be $1.5 million to $3 million. These costs would increase in circumstances where grading, drainage, and other improvements are necessary. If a roundabout is constructed as part of a larger, more transformational roadway project, the additional cost of a roundabout (as part of the overall project scope) may be lower.

Maintenance Costs
The maintenance costs for roundabouts come from landscaping, pavement, markings, drainage and sign upkeep, which are typical considerations for municipal transportation budgets. Notably, the costs associated with maintaining a signal are eliminated when roundabouts are constructed.

Cost Comparison with Other Intersection Alternatives
Intersections with traffic signals and signage use electricity and other methods to control traffic that, compared to roundabouts, have lower associated installation costs, but higher maintenance costs.

Replacing or installing a traffic signal and associated systems can cost around $150,000 to $200,000, or more in some situations. If a non-roundabout alternative is chosen for construction, however, many intersection improvements may justify the construction of additional turning lanes. Typically, even an enlarged intersection with new turning lanes will still have a lower construction cost than a roundabout, but the cost difference will be significantly reduced.

Signalized intersections require the maintenance of hardware that can average around $400-$1,200 per intersection, according to the Wisconsin Department of Transportation (WSDOT), but of course periodic replacement of signal components can increase this amount significantly. The costs of running electricity average around $1,400 per year, per intersection, according to WSDOT. All told, an average signal may cost around $5,000 to $10,000 to operate, maintain, and periodically replace components as needed.

When considering the short-and-long-term costs of constructing a roundabout, an important consideration is the cost of the loss of a human life. The American Automobile Association estimates that a single fatal crash costs around $6 million when accounting for lost household production, earnings, property damage, and other costs. Regardless of how and whether a human life can be monetized, the human cost of a lost or significantly changed life is great. Given that roundabouts tend to result in significant reductions of fatal and serious injury crashes compared to other intersection types, monetary cost comparisons suddenly become less important.

Chapter 3 — AMATS Area Roundabouts

This chapter is divided into two sections. The first section provides an inventory and brief overview of the roundabout and roundabout-like intersections found throughout the Greater Akron region. The second section takes a closer look at the AMATS area's existing roundabouts located on Federal Functionally Classified (FFC) arterial and collector roadways. In addition to providing detailed information about each roundabout, the crash performance of each roundabout is analyzed. Where possible, crash performance prior to the roundabout's construction is compared to the post-construction configuration.

Regional Inventory

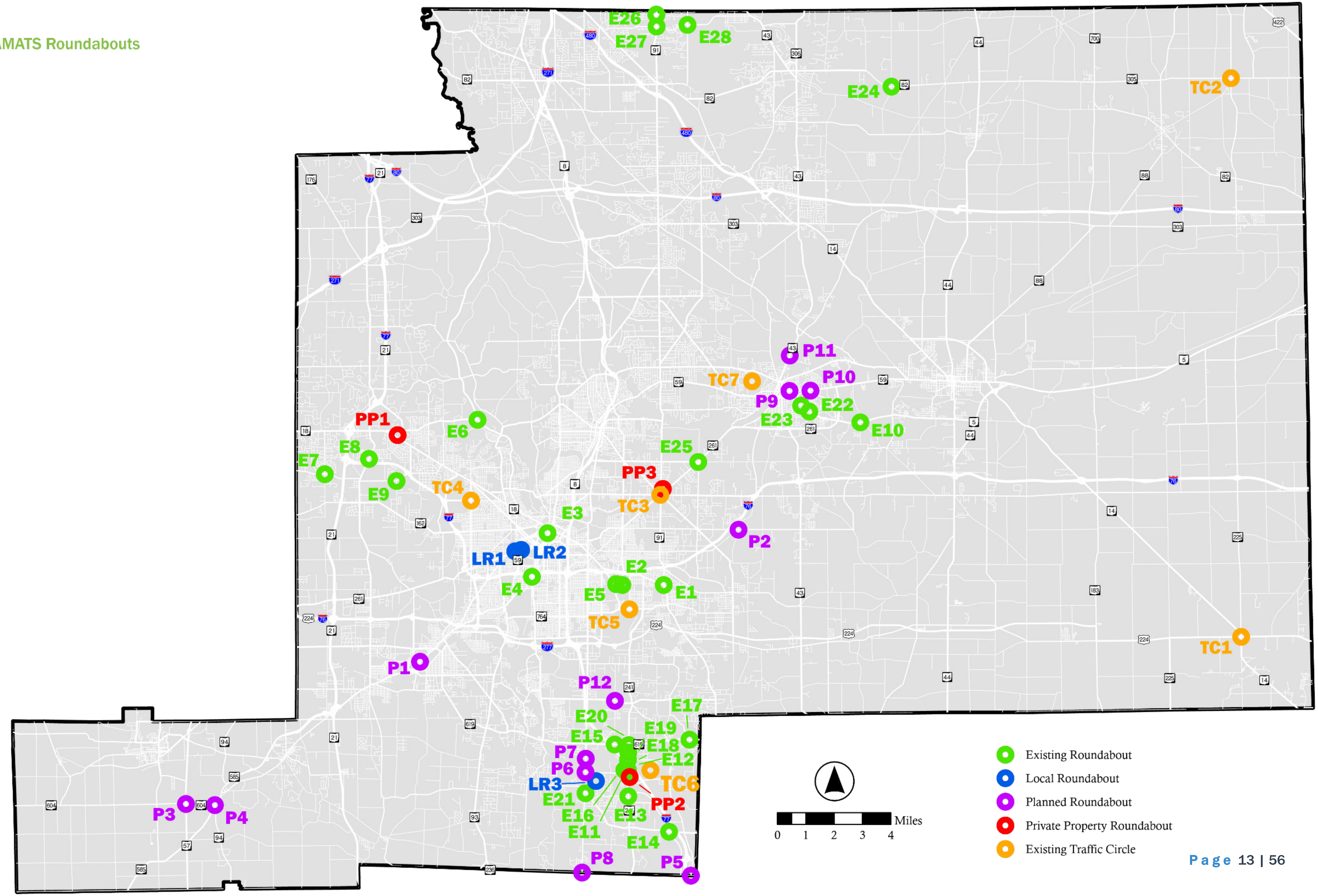
The map on the following page shows the location of all existing and planned roundabouts and other circular intersections within the AMATS planning area.

Existing Roundabouts
This chapter is primarily focused on the analysis of 28 existing modern roundabouts in Summit and Portage Counties. (The AMATS portion of Wayne County does not currently have any roundabouts). A list of these roundabouts can be found below, but detailed information about each location comprises the latter section of this chapter.

Map ID	Community/ies	Road 1	Road 2	Road 3
E1	Akron	E. Market St./SR 18	Canton Rd./SR 91	Robindale Ave.
E2	Akron	Eagle St.	Seiberling Way	
E3	Akron	S. Main St.	Mill St.	
E4	Akron	Bachtel Ave.	Old Main St.	W. South St.
E5	Akron	Innovation Way/SR 241	Seiberling St.	Eagle St.
E6	Akron/Cuyahoga Falls	Riverview Rd.	Smith Rd.	
E7	Copley Twp	Ridgewood Rd.	Hametown Rd.	
E8	Copley Twp/Fairlawn	Cleveland Massillon Rd	Rothrock Rd	
E9	Fairlawn/Copley Twp	Ridgewood Rd.	Jacoby Rd.	
E10	Franklin Twp	Summit Rd.	Powdermill Rd.	
E11	Green	Massillon Rd./SR 241	Boettler Rd.	Franks Pkwy.
E12	Green	Massillon Rd./SR 241	Corporate Woods Cir.	Thorn Dr.
E13	Green	Massillon Rd./SR 241	Steese Rd.	
E14	Green	Greensburg Rd.	Lauby Rd.	
E15	Green	E. Turkeyfoot Lake/SR 619	Pickle Rd.	
E16	Green	Corporate Woods Pkwy.	Corporate Woods Cir.	
E17	Green	E. Turkeyfoot Lake/SR 619	Myersville Rd.	
E18	Green	Massillon Rd./SR 241	Raber Rd.	
E19	Green	Massillon Rd./SR 241	Stein Rd.	
E20	Green	Massillon Rd./SR 241	E. Turkeyfoot Lake/SR 619	
E21	Green	Arlington Rd.	Greensburg Rd.	
E22	Kent	Summit St.	Ted Boyd Dr.	Johnston Dr.
E23	Kent	Summit St.	Campus Center Dr.	Risman Dr.
E24	Mantua Twp.	Twinsburg-Warren Rd./SR 82	Chamberlain Rd.	
E25	Tallmadge	Northeast Ave./SR 261	E. Howe Rd.	N. Munroe Rd.
E26	Twinsburg	Darrow Rd./SR 91	Ethan's Dr.	Meadowood Blvd.
E27	Twinsburg	Darrow Rd./SR 91	Glenwood Dr.	
E28	Twinsburg/Reminderville	Liberty Rd.	Glenwood Dr.	Glenwood Blvd.

Note: The roundabout at Eagle St. and Seiberling Way in Akron was originally planned to include a third intersecting road. However, this road remains unbuilt and the roundabout serves no function as an intersection.

AMATS Roundabouts

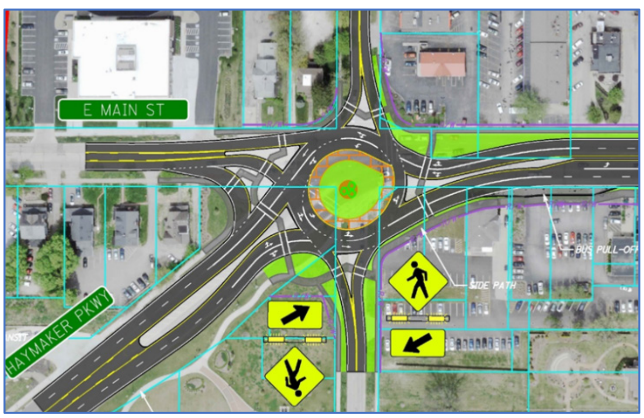


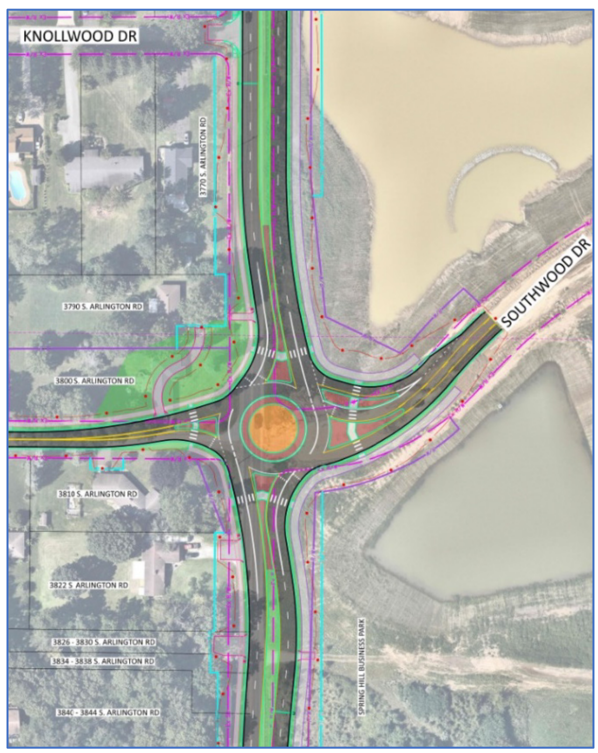
Planned Roundabouts

There are 12* new roundabouts within the AMATS area scheduled for construction over the next five years. Most of these roundabouts are either funded through AMATS' Carbon Reduction Program Funding and/or through Highway Safety Improvement Program funds administered through ODOT. The Mayfair Rd./Mt. Pleasant Rd. roundabout is being managed through the Stark County Engineer's office. This roundabout will be located on the Stark/Summit county line.

Map ID	PID #	Community/ies	Road 1	Road 2	Road 3	AMATS Funded?	Lane Config.	Planned Year of Completion
P1	121598	Barberton	Wooster Rd. North	Hopocan Ave.		Yes	Single	2029
P2	114845	Brimfield Twp	Old Forge Rd	Mogadore Rd		No	Single	2026
P3	116212	Chippewa Twp.	SR 57/Wadsworth Rd.	Easton Rd./SR 604		No	Single	2024
P4	118008	Chippewa Twp.	Akron Rd./SR 585	Mt. Eaton Rd. North/SR 94	Easton Rd./SR 604	No	Single	2027
P5	107649	Green/Jackson Twp.	Mayfair Rd.	Mt. Pleasant Rd.	Pittsburg Ave. NW	No	Single	2024
P6	116917	Green	Arlington Rd.	Boettler Rd.		Yes	Single	2027
P7	116917	Green	Arlington Rd.	Southwood Dr.		Yes	Single	2027
P8	118287	Green	Arlington Rd.	Mt. Pleasant		No	Single	2028
P9	112026	Kent	E. Main St./SR 59	Haymaker Pkwy.	Willow St.	Yes	Multi	2027
P10	112026	Kent	E. Main St./SR 59	Horning Rd.		Yes	Multi	2027
P11	121376	Kent/Franklin Twp.	N. Mantua St./SR 43	Davey Tree HQ (new road)		Yes	Single	2027
P12	121287	Springfield Twp.	Killian Rd.	Pickle Rd.		Yes	Single	2028

* - *Two current traffic circles are planned to be converted to roundabouts. They are described in the* Traffic Circles *section.*

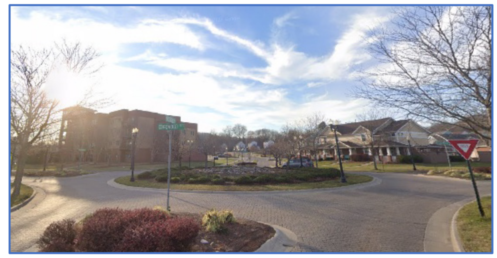




Some of the region's planned roundabouts: Top left—Kent's East Main/Haymaker/Willow; Bottom left—Chippewa Township's SR 57 and SR 604; Right—Green's Arlington and Southwood.

Local Road Roundabouts

There are three known roundabouts on local roadways within the Greater Akron area. Two of these are in newer housing allotments and one is adjacent to corporate offices and alongside a highway exit ramp. Such lower-volume roundabouts are sometimes placed more for aesthetic purposes than to manage traffic efficiently.



Akron's Edgewood and Westerly roundabout

Map ID	Community	Road 1	Road 2	Road 3
LR1	Akron	Edgewood Ave	Westerly Rd	
LR2	Akron	Bell St.	AT&T Offices	Innerbelt Exit Ramp
LR3	Green	Brier Creek Pkwy.	Crest View Dr.	

Private Property Roundabouts

The construction of roundabouts within private commercial developments has become increasingly popular over the past decade. Currently, the Greater Akron area has three such roundabouts.

Summit Mall roundabout in Fairlawn

Map ID	Community	Location
PP1	Fairlawn	Summit Mall
PP2	Green	Acme plaza in Green
PP3	Tallmadge	The Village at Town Center Parking Lot

Neighboring Roundabouts

There are seven roundabouts within approximately two-and-one-half miles outside the AMATS area's borders and one planned roundabout. Most of the neighboring roundabouts are located in Stark County, though Cuyahoga and Medina counties each have one roundabout close to the AMATS planning area.

PID #	County	Community/ies	Road 1	Road 2	Lane Config.	Year of Completion
	Cuyahoga	Glenwillow/Oakwood	Richmond Rd.	Pettibone Rd.	Single	2013
94688	Medina	Granger Twp	SR 94	Granger Rd	Single	2020
93172	Stark	Uniontown	Edison St NW	Kaufman Ave NW	Multi	2021
93172	Stark	Uniontown	Edison St NW	King Church Ave NW	Multi	2021
94438	Stark	Wadsworth	Wadsworth Rd./SR 57	Seville Rd.	Single	2022
103288	Stark	Jackson Twp	Shuffel St. NW	Pittsburg Ave. NW	Single	2023
103288	Stark	Jackson Twp	Pittsburg Ave. NW	Orion St. NW	Single	2023
111050	Stark	Jackson Twp	Lake O' Springs	Strausser Rd. NW	Single	2025 (planned)

Traffic Circles

The AMATS region of Northeast Ohio was settled over 200 years ago as part of the Connecticut Western Reserve. Historically, it was common for township centers to be designed around a town square with roads forming the borders of this central square or rectangle. Many township, village, or city centers have been modernized over time into a circular, oval, or diamond pattern to allow for greater traffic efficiency. The Greater Akron area only has three such circles that still exist, but numerous examples of this design can be found throughout Northeast Ohio. A regional example of a town square that has not been modernized into a circular or diamond-shape configuration can be found in the center of Copley Township. The city of Streetsboro also has its historic town square, though the main arterial routes cut through the historic center.

Municipality	Road 1	Road 2
Deerfield Twp	SR 14/SR 225	US 224
Nelson Twp	SR 305 (Nelson Center)	Parkman Rd.
Tallmadge	Tallmadge Cir. - *N, NE, E, SE, S, SW, N, NW Avenues*	

The Tallmadge Circle, one of the area's most famous landmarks

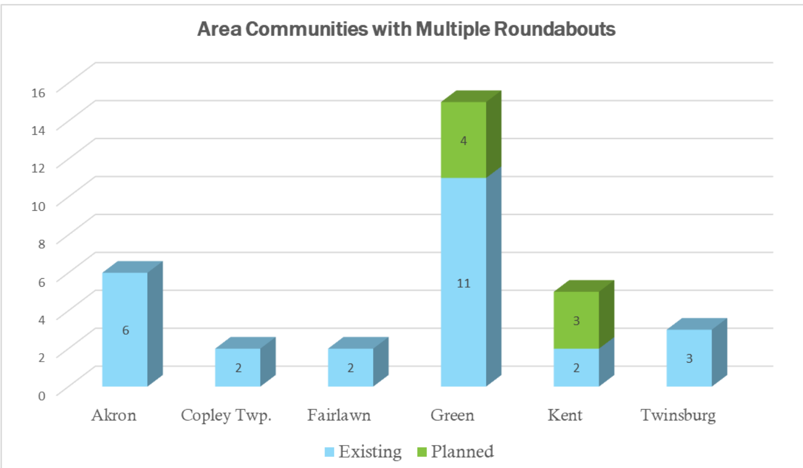
Map ID	Community	Road 1	Road 2
TC4	Akron	Mull Ave.	Hawkins St.
TC5	Akron	Triplett Blvd	Massillon Rd.
TC6	Green	Troon Dr.	Muirfield Dr.
TC7	Kent	Stonewater Dr.	Admore Dr.

A few more modern examples of traffic circles can be found within the region. Traffic circles tend to be much larger than modern roundabouts and typically feature all-way stop control. They may have channelized islands that allow for a slightly angled approach into the circle or be designed to perpendicularly enter the circle. The city of Akron has two such traffic circles that have been in place for the better part of a century. The circle at Triplett Boulevard and Massillon Road does not require stop-control—yield signs exist in place of stop signs—and has recently been partially converted to function more like a modern roundabout. Updated signage will be erected later in 2024. Plans are also in place to retrofit the Mull/Hawkins intersection to function more like a modern roundabout. The third traffic circle, located in the city of Kent, was constructed in the mid-2000s. It is sized and looks much like a modern roundabout but features all-way stop control.

Mull/Hawkins Traffic Circle

Characteristics and Performance of the AMATS Region's Existing Roundabouts

As of spring 2024, there were 28 modern roundabouts on the AMATS region's arterial and collector roadways. The first roundabout was built in 2006, and the concept's popularity quickly grew. Some communities have embraced roundabouts more than others—only six area communities have more than one roundabout—with the city of Green being the undisputed leader in roundabouts, as depicted in the accompanying chart.



Data sheets on each of the 28 roundabouts are included later within this chapter. Photos of the intersection before and after the roundabout's construction are displayed on the right of each page. Three tables comprise the left side of each page. The *Roundabout Characteristics* table provides important statistics about each roundabout. The latter two tables—*Crash History* and *Crash Comparison*—demonstrate how each roundabout has performed in terms of safety.

Crash Analysis

Crashes are analyzed by year and by the level of severity. Two processes were used, depending upon when the roundabout was constructed: (1.) The eight newest roundabouts—those built within the past nine years—utilize crash data from 2012 to 2022. (2.) The nine oldest roundabouts utilize older pre-roundabout crash data (typically to 2000). This data was collected at a different time under a different process and AMATS cannot guarantee its accuracy to quite the same degree as the 2012-and-newer data. Seven of these roundabouts were built prior to 2012, while AMATS decided to also utilize the pre-2012 crash data for two that would have only been able to average two years of pre-roundabout data without pulling in the pre-2012 data.

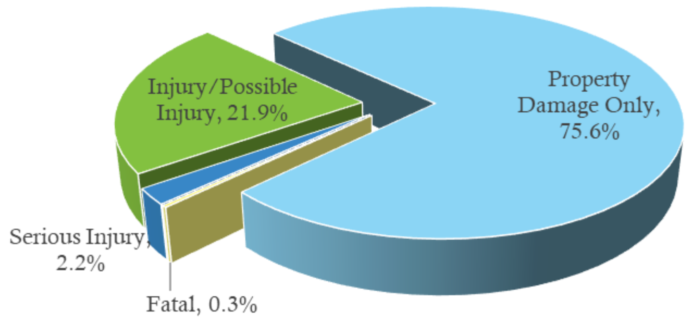
Data is collected by year for the four categories of crash severity:

- ***Property Damage-Only (PDO)***—A crash resulting in no injuries to those involved in the crash.
- ***Injury or Possible/Potential Injury***—A crash either resulting in a non-incapacitating injury or a potential injury, e.g., the victim may be sore or plan to seek medical treatment.
- ***Serious Injury****—A crash causing an incapacitating injury.
- ***Fatal***—A crash resulting in a fatal injury.

* - Serious injury data was collected in its own category beginning in 2020. Any serious injuries prior to 2020 would be classified within the *Injury or Possible/Potential Injury* category.

The chart to the right shows the number of *AMATS Overall Crashes by Level of Severity* during the 2012-2022 timeframe. These numbers include all intersection-related crashes except those involving animals and those related to construction.

AMATS Overall Crashes by Level of Severity
2012-2022



The roundabout's year(s) of construction is (are) noted in red font on the individual data sheets' *Crash History* tables. Any years highlighted in red are excluded from analysis. Additionally, the first full year after the roundabout's construction is excluded and is highlighted in red font. The justification for this is that drivers may still be getting used to the new roadway configuration. Roundabouts built prior to 2012 and using pre-2012 data also exclude years of construction.

The *Crash Comparison* table simply averages all pertinent pre-and-post years of analysis.

The figure below shows a sample of how years of analysis are calculated:

Crash History

Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			1	1	2
2013			1	4	5
2014				7	7
2015			1	4	5
2016			2	2	4
2017			1	4	5
2018				7	7
2019			1	7	8
2020			1	2	3
2021				4	4
2022				2	2
Total	0	0	8	44	52

*Red indicates construction timeframe. Excluding data from comparison.

2018 and 2019 are the years of construction so this crash data is omitted from analysis.

In this example, 2020 would be the first year post-construction, so this year is also omitted from analysis.

Pre-construction analyis includes all years up to 2017. 2012-2017 includes 6 years, so crashes during this time are divided by 6 to calculate the average.

Post construction analysis begins after the first year post-construction (2020), so the average in this case would include only 2 years: 2021 and 2022.

Crash Comparison

	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	1.00	3.67	4.67
Post-Con. Avg	0.00	0.00	0.00	3.00	3.00
% Change	0%	0%	-100%	-18%	-36%

When reviewing the data, it is important to consider that several of the area's roundabouts have been built within the past five years. Therefore, post-data may be limited to only one or two years, as in the example above. Having a longer time period to average produces stronger results, less likely to be affected by aberrations in the data.

The table to the right shows the 11 roundabouts excluded from crash comparison analysis. Most of these roundabouts were omitted because they are newer and do not yet have any post-construction data. Two others—Eagle Street & Seiberling way and Bachtel Avenue & Old Main Street & West South Street—were excluded because they are new roadways or intersections that did not exist previously.

Roundabouts Excluded from Crash Comparison Analysis

Community(ies)	Roundabout Location
Akron	E. Market St./SR 18 & Canton Rd./SR 91 & Robindale Ave.
Akron	Eagle St. & Seiberling Way
Akron	Bachtel Ave. & Old Main St. & W. South St.
Copley Twp/Fairlawn	Cleveland Massillon Rd & Rothrock Rd.
Green	Massillon Rd./SR 241 & Boettler Rd. & Franks Pkwy.
Green	Massillon Rd./SR 241 & Corporate Woods Cir. & Thorn Dr.
Green	Massillon Rd./SR 241 & Raber Rd.
Green	Massillon Rd./SR 241 & Stein Rd.
Green	Massillon Rd./SR 241 & E. Turkeyfoot Lake Rd./SR 619
Green	Arlington Rd. & Greensburg Rd.
Mantua Twp.	Twinsburg-Warren Rd./SR 82 & Chamberlain Rd.

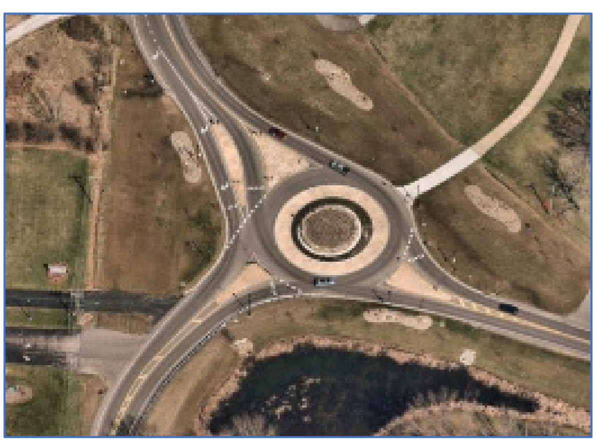
Summary of Findings

The table on the following page shows the 17 roundabouts for which a crash comparison analysis was performed. Roundabouts are sorted from best-to-worst-performing in the overall % change in the yearly average of overall crashes. Detailed data of crashes per year for each roundabout can be found on the corresponding Data Sheet's *Crash History* tables and should be used to analyze a specific roundabout's crashes.

Key findings include:

- ***Injury crashes*** were reduced on 15 of the 17 roundabouts. These ranged from a -100% reduction to a 100% increase. Because *Serious Injury Crashes* were coded as *Injury* crashes until 2020, this analysis does not break out which of these injuries may have been more serious in nature.
- ***Property Damage-Only crashes*** were reduced on 9 of the 17 roundabouts. These ranged from a -91% reduction to a 244% increase.
- ***Overall crashes*** were reduced on 9 of the 17 roundabouts. These ranged from a -94% reduction to a 178% increase.
- ***Fatal crashes*** are not listed on the table below. Only one fatal crash occurred at a roundabout*, but it was not related to actions within the roundabout.

** Franklin Township's Summit Rd. & Powdermill Rd. intersection, 2021. This crash involved an impaired driver who departed the roadway during the approach to the roundabout.*



S. Arlington and Greensburg roundabout in Green

This data will become more comprehensive as more time elapses and as updates to this plan occur. Further, it is essential to consider the circumstances involving each crash before making assumptions about an intersection's safety. One or two crashes can have a large impact on an intersection's performance, so a large percentage increase or decrease in crash performance becomes more meaningful as more data can be collected.

Roundabout Crash Comparison

Community	Roundabout Location	Crash % Change			Years of Data		Lanes	Current ADT
		Injury	PDO	Overall	Pre	Post		
Green	Corporate Woods Pkwy. & Corporate Woods Cir.	-100%	-91%	-94%	6	3	Single	6,600
Green	Greensburg Rd.& Lauby Rd.	-100%	-72%	-76%	14	6	Single	13,092
Kent	Summit St.& Campus Center Dr. & Risman Dr.	-86%	-74%	-76%	3	3	Multi	14,924
Green	E. Turkeyfoot Lake/SR 619 & Myersville Rd.	-100%	-52%	-70%	7	2	Single	11,913
Copley Twp	Ridgewood Rd. & Hametown Rd.	-90%	-46%	-58%	5	16	Single	8,981
Akron	S. Main St. & Mill St.	-100%	-28%	-45%	6	2	Single	5,451
Akron/Cuyahoga Falls	Riverview Rd. & Smith Road	-54%	-31%	-38%	11	10	Single	12,140
Green	E. Turkeyfoot Lake/SR 619 & Pickle Rd.	-67%	-27%	-36%	6	3	Single	11,958
Kent	Summit St. & Ted Boyd Dr. & Johnston Dr.	-100%	-24%	-35%	3	5	Single	14,293
Twinsburg/ Reminderville	Liberty Rd. & Glenwood Rd./Blvd.	-50%	21%	3%	8	13	Single	16,493
Franklin Twp	Summit Rd. & Powdermill Road	-60%	87%	6%	14	7	Single	9,663
Fairlawn/Copley Twp	Ridgewood Rd. & Jacoby Rd.	-38%	37%	17%	9	12	Single	11,846
Twinsburg	Darrow Rd./SR 91 & Ethan's Dr. & Meadowood Blvd.	100%	17%	27%	6	2	Single w/ dedicated turn lanes	14,927
Akron	Innovation Way/SR 241 & Seiberling St. & Eagle St.	-63%	125%	31%	9	12	Single	5,640
Green	Massillon Rd./SR 241 & Steese Rd.	-64%	137%	68%	8	13	Multi	19,450
Tallmadge	Northeast Ave./SR 261 & E. Howe Rd. & N. Munroe Rd.	73%	125%	95%	10	10	Single*	19,410
Twinsburg	Darrow Rd./SR 91 & Glenwood Dr.	-7%	244%	178%	4	5	Single w/ dedicated turn lanes**	21,959

Older Roundabout; used longer data window (pre-2012 data) (pink)

Limited years of post-roundabout data (purple)

* Roundabout was initially a partial multi-lane design; simplified in 2019.

** Roundabout was initially a multi-lane design; simplified in 2018.

Canton Road (SR91) & E. Market (SR18) & Robindale Dr.

Map ID E1

Roundabout Characteristics	
PID	93433
Construction	4/5/21 to 10/14/21
FFC	Principal Arterial (SR 91), Local (Robindale Ave)
Density	High-density/urban neighborhood
Crosswalks	Ladder
Outer Diameter	125-145 ft
Inner Diameter	75-90 ft Including Apron
Current ADT	18,137
Approach Speeds	25, 35, 35 mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			3	9	12
2013			2	8	10
2014			2	13	15
2015			7	12	19
2016			2	8	10
2017			1	13	14
2018			2	12	14
2019			3	8	11
2020			3	5	8
2021		1		4	5
2022				10	10
Total	0	1	25	102	128

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	2.78	9.78	12.56
Post-Con. Avg	n/a	n/a	n/a	n/a	n/a
% Change	n/a	n/a	n/a	n/a	n/a

Eagle Street & Seiberling Way

Map ID E2

Roundabout Characteristics	
PID	84907
Construction	9-5-2012 to 11-1-2014
FFC	Major Collector (Eagle St & Seiberling Way (S leg))
Density	Undeveloped
Crosswalks	None
Outer Diameter	130 ft
Inner Diameter	90ft Including Apron
Current ADT	1,431
Approach Speeds	35mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012					0
2013					0
2014					0
2015					0
2016					0
2017				1	1
2018			1		1
2019					0
2020					0
2021					0
2022					0
Total	0	0	1	1	2

*Red indicates construction timeframe. Excluding data from comparison

After

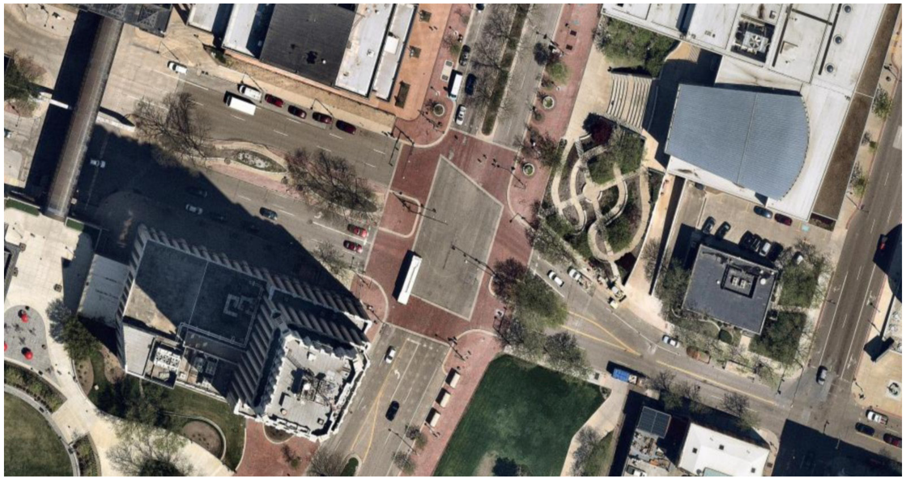
Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	n/a	n/a	n/a	n/a	n/a
Post-Con. Avg	0.00	0.00	0.14	0.14	0.29
% Change	0%	0%	n/a	n/a	n/a

S. Main Street & Mill Street

Map ID E3

Roundabout Characteristics	
PID	104042
Construction	7/9/2018 to 12/13/2019
FFC	Principal Arterial (SR 91), Major Collector (Glenwood Dr)
Density	High density/CBD
Crosswalks	Stamped/Brick
Outer Diameter	105 ft
Inner Diameter	60 ft Including Apron
Current ADT	5,451
Approach Speeds	25 mph

Before



Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012				3	3
2013			4	3	7
2014				3	3
2015			2	5	7
2016			1	8	9
2017			1	3	4
2018				1	1
2019					0
2020					0
2021				2	2
2022				4	4
Total	0	0	8	32	40

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0.00	0.00	1.33	4.17	5.50
Post-Con. Avg	0.00	0.00	0.00	3.00	3.00
% Change	0%	0%	-100%	-28%	-45%

Bachtel Avenue & Old Main Street & W. South Street

Map ID E4

Roundabout Characteristics	
PID	77269
Construction	Opened 2017 (Whole PID 7/12/2016 to 10/29/2021)
FFC	Local (all approaches)
Density	High-density/urban neighborhood
Crosswalks	Ladder
Outer Diameter	120 ft
Inner Diameter	80ft Including Apron
Current ADT	3,687
Approach Speeds	25 and 35 mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012					
2013					
2014					
2015					
2016					
2017					
2018				1	1
2019				1	1
2020				1	1
2021				1	1
2022				1	1
Total	0	0	0	5	5

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	0	0	0
Post-Con. Avg	0.00	0.00	0.00	1.00	1.00
% Change	0%	0%	0%	n/a	n/a

Innovation Way, Seiberling Street & Eagle Street

Map ID E5

Roundabout Characteristics	
PID	84103
Construction	8/24/2009 to 11/15/2010
FFC	Principal Arterial (SR 241), Major Collector (Eagle St), Local (North side of Seiberling St & Eagle Way)
Density	Medium-density
Crosswalks	Ladder
Outer Diameter	200-224 ft
Inner Diameter	165ft Including Apron
Current ADT	5,640
Approach Speeds	35mph

Before

Crash History

Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012				2	2
2013			2	2	4
2014				2	2
2015			2	3	5
2016					0
2017				2	2
2018				2	2
2019				2	2
2020				2	2
2021				3	3
2022				4	4
Total	0	0	4	24	28
2000-2008	0	0	8	8	16
2011	0	0	0	0	0

Note: roundabout constructed prior to 2012

After

Crash Comparison

	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0.00	0.00	0.89	0.89	1.78
Post-Con. Avg	0.00	0.00	0.33	2.00	2.33
% Change	n/a	0%	-63%	125%	31%

Riverview Road & Smith Road

Map ID E6

Roundabout Characteristics	
PID	83628
Construction	7/26/2011 to 12/1/2011
FFC	Principal Arterial (Smith Rd & South side of Riverview Rd), Minor Arterial (North side of Riverview Rd)
Density	Low-Density/Rural or Suburban
Crosswalks	None
Outer Diameter	105 ft
Inner Diameter	70ft Including Apron
Current ADT	12,140
Approach Speeds	35mph

Before

After

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			1	4	5
2013			4	4	8
2014				3	3
2015			1	5	6
2016			5	5	10
2017			2	5	7
2018			1	8	9
2019				9	9
2020			2	4	6
2021		1		7	8
2022			1	5	6
Total	0	1	17	59	77
2000-2010	2	0	38	88	128

*Red indicates construction timeframe. Excluding data from comparison

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0.18	0.00	3.45	8.00	11.64
Post-Con. Avg	0.00	0.10	1.60	5.50	7.20
% Change	-100%	n/a	-54%	-31%	-38%

Ridgewood Road & Hametown Road

Map ID E7

Roundabout Characteristics	
PID	80779
Construction	Opened 2006
FFC	Major Collector (Ridgewood Rd and North side of Hametown Rd), Local (South side of Hametown Rd)
Density	Low-Density/Rural or Suburban
Crosswalks	None
Outer Diameter	105 ft
Inner Diameter	50 ft-Including Apron
Current ADT	8,981
Approach Speeds	35mph

Crash History

Crash Year	Fatal	Serious (post-2019 only)	Injury/Possible Injury	PDO	Total
2012		*Serious crashes coded as Injury/Possible Injury until 2020*		2	2
2013				1	1
2014				3	3
2015				2	2
2016					0
2017			1		1
2018				3	3
2019			1		1
2020				1	1
2021				2	2
2022				2	2
Total	**0**	**0**	**2**	**16**	**18**
2000-2004	**0**	**0**	**6**	**15**	**21**
2007-2011	**0**	**0**	**0**	**10**	**10**

Note: roundabout constructed prior to 2012

Crash Comparison

	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0.00	0.00	1.20	3.00	4.20
Post-Con. Avg	0.00	0.00	0.13	1.63	1.75
% Change	0%	0%	-90%	-46%	-58%

Before

After

Cleveland Massillon Road & Rothrock Road

Map ID E8

Roundabout Characteristics	
PID	103293
Construction	9/8/20 to 9/30/22
FFC	Minor Arterial (Cleveland Masillon Rd), Local (Rothrock Rd)
Density	Low-density/rural or suburban
Crosswalks	Traditional
Outer Diameter	185 ft
Inner Diameter	120-140 ft Including Apron
Current ADT	18,743
Approach Speeds	35 mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012				5	5
2013			1	1	2
2014			1	5	6
2015				2	2
2016			2	6	8
2017			9	15	24
2018			5	11	16
2019			2	10	12
2020			5	10	15
2021			1	7	8
2022	0	0	2	19	21
Total	0	0	28	91	119

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	2.5	6.88	9.38
Post-Con. Avg	n/a	n/a	n/a	n/a	n/a
% Change	n/a	n/a	n/a	n/a	n/a

Ridgewood Road & Jacoby Road

Map ID E9

Roundabout Characteristics	
PID	N/A
Construction	Opened 2010
FFC	Minor Arterial (Ridgewood Rd), Local (Jacoby Rd)
Density	Low-Density/Rural or Suburban
Crosswalks	None
Outer Diameter	102 ft
Inner Diameter	60ft Including Apron
Current ADT	11,846
Approach Speeds	35mph

Crash History

Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012				3	3
2013				3	3
2014				5	5
2015				3	3
2016				3	3
2017			1	2	3
2018				1	1
2019				3	3
2020			1		1
2021			1	1	2
2022			2	3	5
Total	0	0	5	27	32
2000-2008	0	0	6	17	23
2011	0	0	0	4	4

Note: roundabout constructed prior to 2012

Crash Comparison

	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0.00	0.00	0.67	1.89	2.56
Post-Con. Avg	0.00	0.00	0.42	2.58	3.00
% Change	0%	0%	-38%	37%	17%

Before

After

Summit Road & Powdermill Road

Map ID E10

Roundabout Characteristics	
PID	N/A
Construction	Opened 2014
FFC	Minor Collector (Summit St), Local (Powder Mill Rd)
Density	Low-density/rural or suburban
Crosswalks	None
Outer Diameter	115 ft
Inner Diameter	80ft Including Apron
Current ADT	9,663
Approach Speeds	35mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			1	2	3
2013				2	2
2014				1	1
2015				4	4
2016				5	5
2017			2	6	8
2018			2	3	5
2019			1	3	4
2020			1	4	5
2021	1		2	2	5
2022				5	5
Total	1	0	9	37	47
2000-2011	0	0	39	26	65

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	2.86	2.14	5.00
Post-Con. Avg	0.14	0.00	1.14	4.00	5.29
% Change	n/a	0%	-60%	87%	6%

Massillon Road (SR241) & Boettler Road & Frank Blvd.

Map ID E11

Roundabout Characteristics	
PID	103172
Construction	7/18/22 to 2024 (open to traffic 11-18-23)
FFC	Principal Arterial (Massillon Rd), Major Collector (Boettler Rd), Local (Franks Blvd)
Density	
Crosswalks	Ladder
Outer Diameter	
Inner Diameter	105 ft Including Apron
Current ADT	
Approach Speeds	35 mph

Before

After

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			3	21	24
2013			4	9	13
2014			1	9	10
2015			4	8	12
2016			5	14	19
2017			4	14	18
2018			2	9	11
2019			5	16	21
2020			1	14	15
2021			4	8	12
2022			2	27	29
Total	0	0	35	149	184

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	3.18	13.55	16.73
Post-Con. Avg	n/a	n/a	n/a	n/a	n/a
% Change	n/a	n/a	n/a	n/a	n/a

Massillon Road (SR241) & Corporate Woods Cir. & Thorn Dr.

Map ID E12

Roundabout Characteristics	
PID	103172
Construction	7/18/22 to 2024 (open to traffic 11-18-23)
FFC	Principal Arterial (Massillon Rd), Local (Corporate Woods Cir & Thorn Dr)
Density	
Crosswalks	Ladder
Outer Diameter	
Inner Diameter	### Including Apron
Current ADT	
Approach Speeds	25, 35 mph

Before

After

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			2	11	13
2013			1	5	6
2014			1	9	10
2015			2	14	16
2016			5	14	19
2017			2	10	12
2018			3	15	18
2019			2	8	10
2020			3	5	8
2021			1	6	7
2022			3	9	12
Total	0	0	25	106	131

*Red indicates construction timeframe. Excluding data from comparison

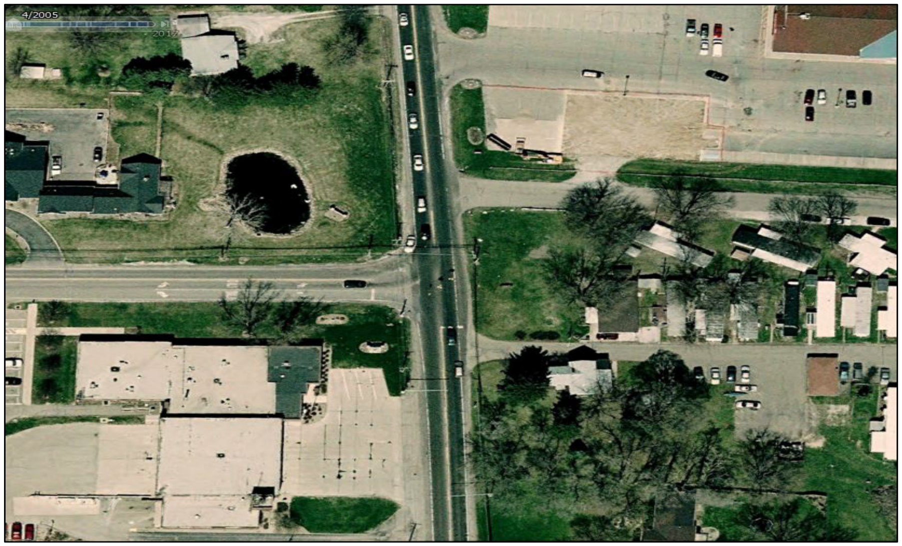
Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	2.27	9.64	11.91
Post-Con. Avg	n/a	n/a	n/a	n/a	n/a
% Change	n/a	n/a	n/a	n/a	n/a

Massillon Road (SR 241) & Steese Road

Map ID E13

Roundabout Characteristics	
PID	N/A
Construction	Opened 2009
FFC	Principal Arterial (Massillon Rd), Major Collector (Steese Rd)
Density	Medium Density
Crosswalks	Ladder
Outer Diameter	185 ft
Inner Diameter	118 ft
Current ADT	19,450
Approach Speeds	35mph and 45mph

Before



After

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			1	5	6
2013			1	12	13
2014			1	5	6
2015				16	16
2016			2	15	17
2017				8	8
2018			2	10	12
2019				11	11
2020				10	10
2021			3	9	12
2022		1	1	11	13
Total	0	1	11	112	124
2000-2007	0	0	19	35	54
2010-2011	0	0	0	23	23

Note: roundabout constructed prior to 2012

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0.00	0.00	2.38	4.38	6.75
Post-Con. Avg	0	0.09	0.85	10.38	11.31
% Change	0%	n/a	-64%	137%	68%

Greensburg Road & Lauby Road

Map ID E14

Roundabout Characteristics	
PID	80665
Construction	7/7/2014 to 10/9/2015
FFC	Minor Arterial (Greensburg Rd), Major Collector (Lauby Rd)
Density	Low-density/rural or suburban
Crosswalks	None
Outer Diameter	125 ft
Inner Diameter	90ft Including Apron
Current ADT	13,092
Approach Speeds	45 mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			1	2	3
2013			1	7	8
2014			2	8	10
2015				2	2
2016					0
2017				1	1
2018				6	6
2019				1	1
2020				2	2
2021				3	3
2022				3	3
Total	0	0	4	35	39
2000-2011	0	0	18	125	143

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	1.43	9.57	11.00
Post-Con. Avg	0.00	0.00	0.00	2.67	2.67
% Change	0%	0%	-100%	-72%	-76%

E Turkeyfoot Lake Road (SR619) & Pickle Road

Map ID E15

Roundabout Characteristics	
PID	N/A
Construction	Opened 11/23/2018
FFC	Minor Arterial (SR 619), Local (Pickle Rd)
Density	Medium Density
Crosswalks	None
Outer Diameter	145 ft
Inner Diameter	103 ft Including Apron
Current ADT	11,958
Approach Speeds	35 mph

Before

Crash History

Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			1	1	2
2013			1	4	5
2014				7	7
2015			1	4	5
2016			2	2	4
2017			1	4	5
2018				7	7
2019			1	7	8
2020			1	2	3
2021				4	4
2022				2	2
Total	0	0	8	44	52

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison

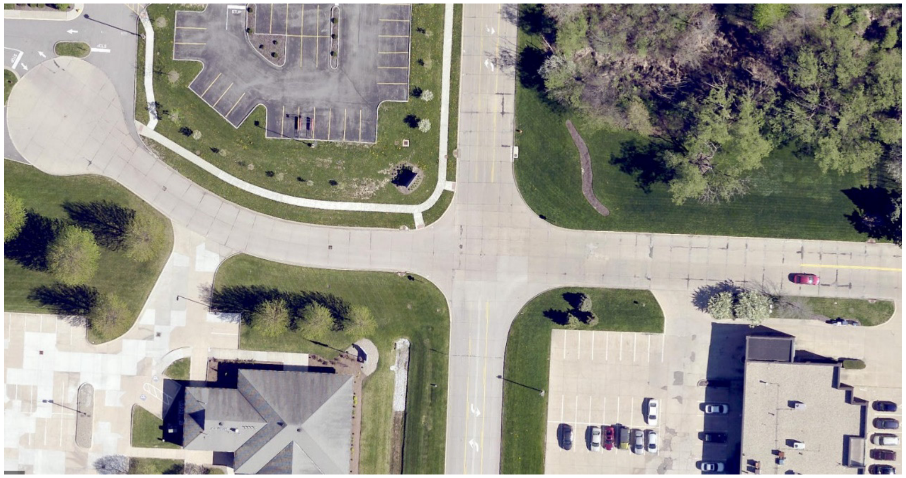
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	1.00	3.67	4.67
Post-Con. Avg	0.00	0.00	0.33	2.67	3.00
% Change	0%	0%	-67%	-27%	-36%

Corporate Woods Parkway & Corporate Woods Circle

Map ID E16

Roundabout Characteristics	
PID	N/A
Construction	Opened Spring 2019
FFC	Local (all approaches)
Density	Medium Density
Crosswalks	Ladder
Outer Diameter	150 ft
Inner Diameter	112ft Including Apron
Current ADT	6,600
Approach Speeds	35 mph

Before



Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			2	10	12
2013			2	7	9
2014			2	8	10
2015			8	4	12
2016			4	9	13
2017			1	7	8
2018			1	8	9
2019				1	1
2020					0
2021				1	1
2022				1	1
Total	0	0	20	56	76

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0.00	0.00	3.17	7.5	10.67
Post-Con. Avg	0.00	0.00	0.00	0.67	0.67
% Change	0%	0%	-100%	-91%	-94%

E. Turkeyfoot Lake (SR 619) & Myersville Road

Map ID E17

Roundabout Characteristics	
PID	N/A
Construction	6/3/2019 to 8/20/2019
FFC	Principal Arterial (SR 619), Major Collector (N side of Myersville), Local (S side of Myersville)
Density	Medium-density
Crosswalks	Ladder
Outer Diameter	140-145ft
Inner Diameter	103 ft Including Apron
Current ADT	11,913
Approach Speeds	25, 35, 35 mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			2	2	4
2013				1	1
2014			1	2	3
2015			3	4	7
2016			2	3	5
2017			2	4	6
2018			3	6	9
2019			1	3	4
2020				2	2
2021				3	3
2022					0
Total	0	0	14	30	44

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	1.86	3.14	5
Post-Con. Avg	0.00	0.00	0.00	1.50	1.50
% Change	0%	0%	-100%	-52%	-70%

Massillon Road (SR241) & Raber Road

Map ID E18

Roundabout Characteristics	
PID	90415
Construction	5/27/20 to 5/15/22
FFC	Principal Arterial (SR 241), Major Collector (Raber Rd)
Density	Medium Density
Crosswalks	Ladder
Outer Diameter	165-185 ft
Inner Diameter	110 ft Including Apron
Current ADT	27,826
Approach Speeds	35 mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			2	4	6
2013			3	3	6
2014			2	4	6
2015			3	5	8
2016				4	4
2017			1	5	6
2018			1	2	3
2019			2	3	5
2020		1	2	5	8
2021			1	5	6
2022			2	7	9
Total	0	1	19	47	67

*Red indicates construction timeframe. Excluding data from comparison

After

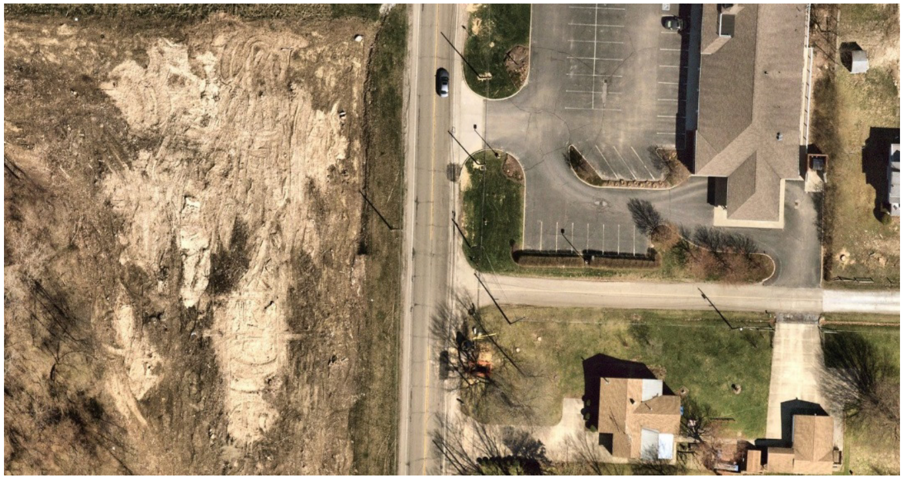
Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	1.75	3.75	5.5
Post-Con. Avg	n/a	n/a	n/a	n/a	n/a
% Change	n/a	n/a	n/a	n/a	n/a

Massillon Road (SR 241) & Stein Road

Map ID E19

Roundabout Characteristics	
PID	90415
Construction	5/27/20 to 5/15/22
FFC	Principal Arterial (SR 241), Major Collector (Stein Rd)
Density	Medium Density
Crosswalks	Ladder
Outer Diameter	150-185 ft
Inner Diameter	115 ft Including Apron
Current ADT	16,591
Approach Speeds	25, 35 mph

Before



Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			2	1	3
2013			4	4	8
2014				3	3
2015			3	2	5
2016			1	5	6
2017				1	1
2018			2	2	4
2019				2	2
2020					0
2021				1	1
2022			1	8	9
Total	0	0	13	29	42

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	1.5	2.5	4
Post-Con. Avg	n/a	n/a	n/a	n/a	n/a
% Change	n/a	n/a	n/a	n/a	n/a

Massillon Road (SR241) & E. Turkeyfoot Lake Road (SR619)

Map ID E20

Roundabout Characteristics	
PID	90415
Construction	5/27/20 to 5/15/22
FFC	Principal Arterial (SR 241 & east side of SR 619), Minor Arterial
Density	Medium Density
Crosswalks	Ladder
Outer Diameter	170-195 ft
Inner Diameter	113 ft Including Apron
Current ADT	21,269
Approach Speeds	35 mph

Before

After

Crash History

Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			2	12	14
2013			3	11	14
2014			7	15	22
2015			2	13	15
2016			2	5	7
2017			4	19	23
2018			4	8	12
2019			3	6	9
2020			3	8	11
2021			1	11	12
2022			4	27	31
Total	0	0	35	135	170

*Red indicates construction timeframe. Excluding data from comparison

Crash Comparison

	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	3.38	11.13	14.50
Post-Con. Avg	n/a	n/a	n/a	n/a	n/a
% Change	n/a	n/a	n/a	n/a	n/a

Arlington Road & Greensburg Road

Map ID E21

Roundabout Characteristics	
PID	N/A
Construction	Opened 2022
FFC	Minor Arterial (Greensburg Rd & north side of Arlington Rd), Major Collector (south side of Arlington Rd)
Density	Medium-density
Crosswalks	None
Outer Diameter	150 ft
Inner Diameter	95 ft Including Apron
Current ADT	13,215
Approach Speeds	40 mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012				4	4
2013			1	1	2
2014			1	3	4
2015			1		1
2016			2	3	5
2017			1	3	4
2018			4	1	5
2019			1	2	3
2020				8	8
2021			3	1	4
2022				2	2
Total	0	0	14	28	42

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	1.4	2.6	4
Post-Con. Avg	n/a	n/a	n/a	n/a	n/a
% Change	n/a	n/a	n/a	n/a	n/a

Summit Street & Ted Boyd Drive & Johnston Drive

Map ID E22

Roundabout Characteristics	
PID	84546
Construction	Opened 2017 (Whole PID 11/13/2015 to 11/29/2019)
FFC	Minor Arterial (Summit St), Local (all other approaches)
Density	Medium Density
Crosswalks	Stamped/Brick
Outer Diameter	130-150 ft
Inner Diameter	90ft Including Apron
Current ADT	14,293
Approach Speeds	25, 25, 35 mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			1	4	5
2013			1	1	2
2014				6	6
2015			4	4	8
2016				4	4
2017			1	5	6
2018				3	3
2019				6	6
2020				2	2
2021				2	2
2022				1	1
Total	0	0	7	38	45

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	0.67	3.67	4.33
Post-Con. Avg	0.00	0.00	0.00	2.80	2.80
% Change	0%	0%	-100%	-24%	-35%

Summit Street & Campus Center Drive & Risman Drive

Map ID E23

Roundabout Characteristics	
PID	84546
Construction	Opened 2018 (Whole PID 11/13/2015 to 11/29/2019
FFC	Minor Arterial (Summit St), Local (all other approaches)
Density	Medium Density
Crosswalks	Stamped/Brick
Outer Diameter	186 ft
Inner Diameter	120 ft Including Apron
Current ADT	14,924
Approach Speeds	25, 25, 35 mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			4	14	18
2013			2	10	12
2014			1	10	11
2015			5	18	23
2016			2	3	5
2017			1	4	5
2018				6	6
2019			1	5	6
2020				2	2
2021				2	2
2022			1	5	6
Total	0	0	17	79	96

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0.00	0.00	2.33	11.33	13.67
Post-Con. Avg	0.00	0.00	0.33	3.00	3.33
% Change	0%	0%	-86%	-74%	-76%

Twinsburg-Warren Road (SR82) & Chamberlain Road

Map ID E24

Roundabout Characteristics	
PID	111007
Construction	9/17/21 to 3/15/23 (Opened 2022)
FFC	Major Collector (SR 82), Local (Chamberlain Rd)
Density	Low-density/rural or suburban
Crosswalks	None
Outer Diameter	131 ft
Inner Diameter	70-85 ft Including Apron
Current ADT	6,096
Approach Speeds	35 mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			1	1	2
2013					0
2014			1	3	4
2015			1	2	3
2016			2	2	4
2017			4	4	8
2018			2	1	3
2019			5	4	9
2020			2		2
2021			2	3	5
2022				4	4
Total	0	0	20	24	44

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	2	1.89	3.89
Post-Con. Avg	n/a	n/a	n/a	n/a	n/a
% Change	n/a	n/a	n/a	n/a	n/a

Northeast Avenue (SR261) & E. Howe Road & N. Munroe Road

Map ID E25

Roundabout Characteristics	
PID	81533
Construction	4/12/2010 to 3/2/2011
FFC	Principal Arterial (SR 261), Minor Arterial (West side of Howe Rd), Major Collector (South side N. Munroe Rd), Local (East side of Howe Rd & N. side of N. Munroe Rd)
Density	Low-Density/Rural or Suburban
Crosswalks	Ladder
Outer Diameter	205 ft
Inner Diameter	135-140 ft Including Apron
Current ADT	19,410
Approach Speeds	35mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012				8	8
2013			1	11	12
2014			1	14	15
2015			2	13	15
2016			1	15	16
2017			3	18	21
2018			3	19	22
2019			1	9	10
2020			1	12	13
2021			4	4	8
2022			2	11	13
Total	0	0	19	134	153
2000-2009	0	0	11	56	67

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0.00	0.00	1.10	5.60	7.44
Post-Con. Avg	0.00	0.00	1.90	12.60	14.50
% Change	0%	0%	73%	125%	95%

Darrow Road (SR91) & Ethans Drive & Meadowood Boulevard

Map ID E26

Roundabout Characteristics	
PID	92032
Construction	9/4/18 to 2019
FFC	Principal Arterial (SR 91), Local (Ethan's & Meadowood)
Density	Medium Density
Crosswalks	Stamped/Brick
Outer Diameter	132-152 ft
Inner Diameter	90 ft Including Apron
Current ADT	14,927
Approach Speeds	25, 35 mph

Before

Crash History

Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			1	4	5
2013				4	4
2014			1	4	5
2015			1	2	3
2016				7	7
2017				2	2
2018				2	2
2019			1	1	2
2020			1	4	5
2021			2	4	6
2022				5	5
Total	0	0	7	39	46

*Red indicates construction timeframe. Excluding data from comparison

After

Crash Comparison

	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	0.5	3.83	4.33
Post-Con. Avg	0.00	0.00	1.00	4.50	5.50
% Change	0%	0%	100%	17%	27%

Darrow Road (SR91) & Glenwood Drive

Map ID E27

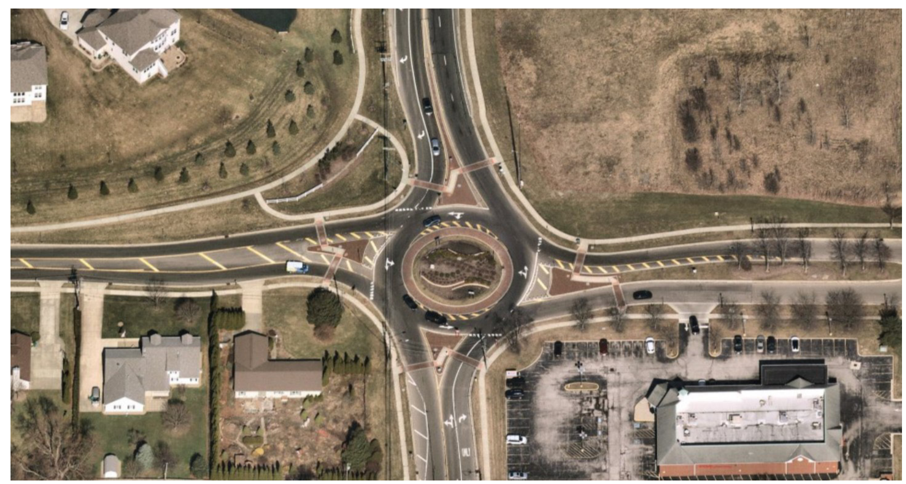
Roundabout Characteristics	
PID	92032
Construction	Opened 2016
FFC	Principal Arterial (SR 91), Major Collector (Glenwood Dr)
Density	High density/CBD
Crosswalks	Stamped/Brick
Outer Diameter	105 ft
Inner Diameter	60 ft Including Apron
Current ADT	21,959
Approach Speeds	25 mph

Before

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			2	2	4
2013			2	4	6
2014			1	7	8
2015			1	4	5
2016			3	7	10
2017			3	29	32
2018			3	20	23
2019			2	10	12
2020				19	19
2021			2	15	17
2022				9	9
Total	0	0	19	126	145

*Red indicates construction timeframe. Excluding data from comparison

After



Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0	0	1.5	4.25	5.75
Post-Con. Avg	0.00	0.00	1.40	14.60	16.00
% Change	0%	0%	-7%	244%	178%

Glenwood Drive and Liberty Road

Map ID E28

Roundabout Characteristics	
PID	N/A
Construction	Opened 2009
FFC	Major Collector (all approaches)
Density	Medium Density
Crosswalks	Stamped/Brick
Outer Diameter	120 ft
Inner Diameter	70 ft Including Apron
Current ADT	16,493
Approach Speeds	35mph and 25mph

Before

After

Crash History					
Crash Year	Fatal	Serious	Injury/Possible Injury	PDO	Total
2012			2	4	6
2013			2	6	8
2014			1	4	5
2015				6	6
2016				7	7
2017			1	5	6
2018			1	9	10
2019			1	4	5
2020				2	2
2021			1	3	4
2022				1	1
Total	0	0	9	51	60
2000-2007	0	0	11	31	42
2010-2011	0	0	0	10	10

Note: roundabout constructed prior to 2012

Crash Comparison					
	Fatal	Serious Injury	Injury/Possible Injury	PDO	Total
Pre-Con. Avg	0.00	0.00	1.38	3.88	5.25
Post-Con. Avg	0.00	0.00	0.69	4.69	5.38
% Change	0%	0%	-50%	21%	3%

Chapter 4 — Planning for Roundabouts in the Greater Akron Area

Eleven communities within the AMATS region have modern roundabouts and four additional communities are slated to construct roundabouts within the next five years. AMATS is aware of additional communities which are seriously considering the construction of roundabouts at intersections throughout the planning area. A few cities, particularly Akron and Green, have constructed multiple roundabouts and continue to seek funding to build more.

Some communities might be concerned with the potential controversy a planned roundabout may present, and other communities have not proceeded in funding and constructing roundabouts due to their relatively high initial cost.

While roundabouts aren't an ideal solution for every unsafe or congested intersection, they should be considered where appropriate. Roundabouts have become common within the Greater Akron area and are projected to increase steadily in number due to their proven effectiveness and because funding is widely available. This chapter introduces some planning considerations for communities that are interested in pursuing the construction of a roundabout and presents procedures to secure funding for roundabouts.

Local Government Planning Considerations

Regional Best Practices
AMATS staff has had numerous roundabout-related conversations with area officials over the past several years, including during this report's writing. Collectively, the Greater Akron area's officials have designed and constructed a variety of roundabouts, learning valuable lessons along the way. Federal and ODOT best-practice guidance and design guidelines have also changed over the past two decades.

The following advice stands out as some of the lessons learned over the past two decades:

Design and build smaller and simpler—Past design guidelines, unrealistic and unnecessary growth rate projections, and traditional methods of focusing on capacity and travel time efficiency have led to some roundabouts that are overbuilt. Single-lane roundabouts have a better safety record overall compared to multi-lane roundabouts. They have more inherent simplicity, particularly for unfamiliar drivers, and can be advantageous for vulnerable road users such as pedestrians. They also cost less to construct and maintain. Therefore, if planners and engineers are looking at traffic volumes that could justify designing a roundabout as either single-or-multi-lane, it is usually best to keep the design as simple as possible.

The same advice applies for slip lanes, where motorists can change roads without entering the intersection. Although slip lanes can assist with and be necessary on roads with high right turning movements, there are some cases where a simpler roundabout without slip lanes can adequately handle traffic.

Growth rates—or the potential for significant growth—have for years been used to justify more capacity on area roadways. However, the AMATS region has seen either stable or decreasing traffic volumes on most regional roadways. This trend is true even in many of the area's communities that have seen the highest growth over the past decade. Several additional trends appear to be emerging that are causing people to drive less: working from home, remote learning, and more teenagers delaying the decision to drive. For nearly all areas within the AMATS planning area, zero growth rates should be utilized in regional traffic projections. If a large-scale development or other major change in traffic is known and can be justified, or if traffic growth is already occurring, communities should reach out to AMATS to review past trends and calculate realistic future projections.

Communities should also recognize that the capacity that they design a street for will directly affect the adjacent area. Roadway designs to move more cars will encourage people to drive more. Conversely, roadway designs with less capacity might encourage people to combine and limit trips, take alternate routes or even encourage non-vehicular travel.

Furthermore, building roundabouts larger will increase long-term maintenance costs. Plowing, striping, resurfacing, and concrete costs will all be higher over time.

In cases where current traffic volumes demonstrate that a simpler roundabout can adequately function, but where there is a *potential* for significant growth, one creative solution is to design a roundabout that can be easily and inexpensively converted to a larger roundabout if necessary.

Conduct meaningful public involvement—The timing and methods of public involvement matter. Even as roundabouts become more common, the suggestion of a new roundabout has the potential to cause significant interest and concern. If a roundabout is proposed for an intersection, chances are the intersection currently has safety and/or congestion issues that professionals have determined can be improved upon by constructing a roundabout.

AMATS encourages would-be project sponsors to invest the time and resources to reach out to residents, elected officials, and other stakeholders through multiple meetings on the proposed project. Some communities utilize citizen advisory committees, which can be an effective tool to educate and learn from a cohort of the interested public. Early public engagement at the outset of roundabout planning is key to a project's success.

Public Engagement for Kent's upcoming E. Main Street

If community leaders and their consultants can focus on explaining the purpose and need of what is proposed, this can help to educate stakeholders and assuage common concerns and myths. In most cases, the safety benefits of roundabouts—particularly reducing the most severe crashes—are what leads to a roundabout being proposed in the first place. Some communities have found that storytelling carries more impact than citing technical facts and figures. Explaining safety data in terms that support the value of a life can be particularly compelling. For example:

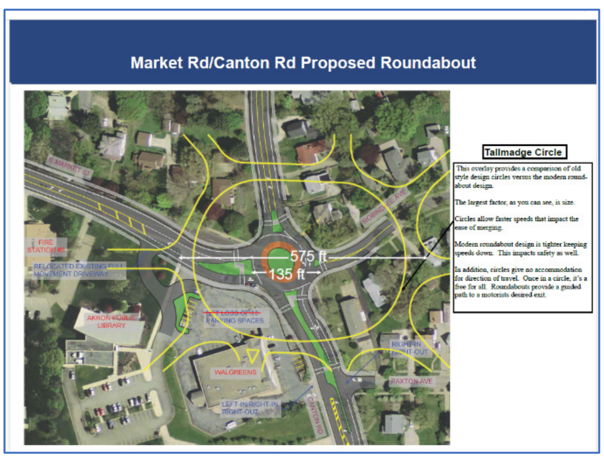
- Reducing opportunities for mistakes by 75%, i.e., fewer conflict points in a roundabout will reduce the chances for crashes.
- Roundabouts are designed to make vehicles travel more slowly, while signals are designed for vehicles to travel the speed limit or faster. This greatly reduces the chance for fatal and serious injury crashes.

- Roundabouts protect the most vulnerable users—pedestrians—who are spending less time in the street and only need to look one direction instead of two.

Presentations featuring visualizations such as conceptual drawings and other potential intersection improvements like bicycle or pedestrian accommodations and landscaping) that help to convey projects in terms that non-technical stakeholders comprehend. Testimonials from community members associated with nearby roundabouts and videos that show how existing roundabouts work can also be powerful tools in educating stakeholders.

The engagement process should offer the public opportunities to provide comments on a proposed roundabout. An open-house format meeting where meeting attendees can break into small groups or travel between different stations after a presentation is an effective way to get people to engage in productive conversation and avoid the issues associated with one or two strong opinions driving the tone of a conversation. Follow-up comment forms or surveys can also be provided. Taking the time to follow-up with attendees and demonstrating that they are being heard builds trust among stakeholders. Moreover, the process allows community officials, engineers, and planners involved in the project to learn other points of view. As with any project, everyday users will have valuable insights into the needs of the area that aren't obvious from traditionally gathered data.

One final consideration during the public engagement process that sponsors should address is the impact of construction. Roundabout construction can be disruptive to nearby businesses and for those traveling the route. Closing an intersection while a roundabout is being constructed is not always an option but keeping it open to maintain traffic may prolong the duration of construction. Communities must be upfront with property owners and businesses about the significance of construction impacts and take the time to address challenges on an individual level. Having compassion and a willingness to do everything legally possible to assist these individuals builds trust with citizens and the community at large.



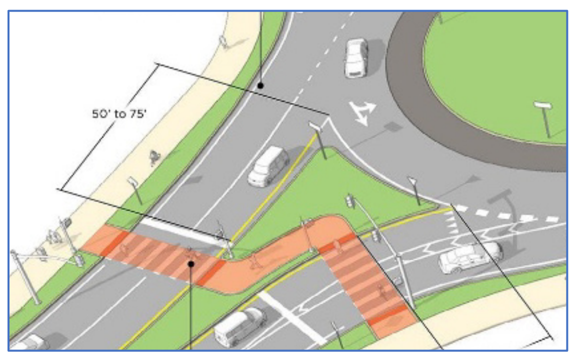
Examples of creative public engagement: Left—The city of Akron shows how a proposed roundabout is different from a traffic circle by imposing the size and design of the Tallmadge Circle over the proposed roundabout in Ellet; Right—The city of Green assisted restaurants affected by construction by providing gift cards to citizens.

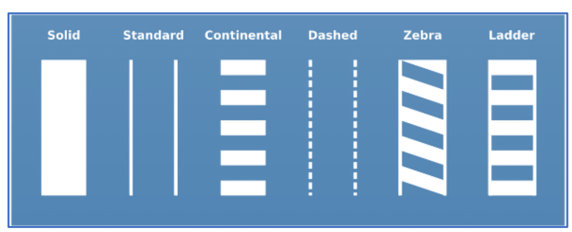
Public understanding increases with familiarization—Sentiments about roundabouts often change as people become familiar with them. While there will always be people who dislike roundabouts for various reasons, anecdotal evidence shows some of this skepticism has eased as more people become comfortable with roundabouts. Based on the increasing number of roundabouts throughout the AMATS planning area, roundabouts are becoming a common sight for travelers in the region. As roundabouts become more common, drivers and even pedestrians and bicyclists are more likely to encounter and navigate them with regularity. While there is no hard data to measure how public sentiment has changed regionally, the Insurance Institute for Highway Safety (IIHS) notes compelling statistics on public opinion through several studies conducted between 2002 and 2014. In each case, the percentage of drivers supporting roundabouts increased significantly after a roundabout was built. In one case, public sentiment more than doubled from 34% to 70% support, and that was for (more controversial) double-lane roundabouts.

Design roundabouts for all users—In many cases, non-vehicular modes of travel have been afterthoughts in the design process of roadway improvements. Over the past 10-15 years, designing around people—not just cars—has shifted from a fringe movement to a commonly accepted practice. AMATS and ODOT strongly support and incentivize meaningful consideration of active transportation amenities within projects. Such accommodations were typically focused in cities and villages of higher-density, but AMATS encourages lower-density suburban fringe and rural areas to consider pedestrians and bicyclists when planning roundabouts. Adding amenities for non-vehicular modes rarely adds significant cost to a project, but may be difficult to justify based on a current lack of pedestrian or bicycle activity. However, designing for the safety of all users is an important long-term consideration.

AMATS cautions that merely including amenities for non-vehicular users is not sufficient. Amenities and related infrastructure must be well designed to make the most vulnerable users *feel* safe. Officials in one AMATS-area community shared that their pedestrians have indicated that they are apprehensive crossing roundabout intersections, particularly at larger and more complex roundabouts. Ideas to consider help make bicyclists and pedestrians feel safer include:

- Pushing the crosswalks on the exit lanes of the roundabout further away from the circulatory lane. This strategy provides exiting motorists with more time to react to a pedestrian in the crosswalk and pedestrians more opportunity to anticipate the path of vehicles. Placing crosswalks further from the roundabout can also help to prevent rear-end crashes within the circulatory lane.
- Having the crosswalks closer to the circulatory lane on the vehicle entry approach to a roundabout is also beneficial. Approaching vehicle speeds are designed to be slower the closer that a vehicle is to the yield point.
- Improving crosswalk visibility can help lower vehicle speeds and provides another visual cue for motorists to watch for pedestrians. Raising crosswalks is perhaps the most dramatic way to make them visible. Stamped asphalt or concrete crosswalks designed to look like brick or alternate road surfaces, or even painted or thermoplastic crosswalk improvements of a ladder or continental style are strongly recommended.





Top photo: Staggered crosswalks; Bottom photo: diagram of various crosswalk marking styles.

- Installing Rectangular Rapid Flashing Beacons (RRFBs) on more complex, multi-lane roundabouts where vehicle approach and exit speeds can be significantly higher reinforces that cars must yield to others.
- Creating an "offramp" for bicyclists to exit the roadway and use the crosswalks in situations where bicycle lanes are constructed going into a roundabout is a sound approach to make bicyclists feel safer.
- Sufficient lighting at crosswalk locations is essential.

Example of RRFB→

Roundabouts provide opportunities for placemaking—Roundabouts stand out within the landscape and, as discussed in Chapter 2, can create community gateways or transition zones. The installation of a roundabout can convey a community's pride using signage, landscaping, statues, or public art.

Left: S. Main/Mill Roundabout in Akron has an iconic rubber worker statue; Right: Lack of landscape maintenance can convey neglect and make a place look decrepit.

Stay informed—Roundabouts are a relatively new concept in the United States, and new and meaningful research is always being conducted. Staying current on the latest research may help communities make the best decisions on how to design roundabouts and prevent them from causing unnecessary problems.

Roundabouts are one of many potential solutions—There is not a single transportation improvement that works universally. Roundabouts are one of several proven safety countermeasures, or tools, that might be considered to improve the transportation system. Like any tool, a roundabout has a particular way and place that it works best, and there are situations and places where a roundabout would not work well. Communities need to consider a variety of tools and must consider the people that they serve before deciding to build a roundabout.

Funding for Roundabouts

The proven effectiveness of roundabouts has led to various funding options available for communities. The table on the following page lists and describes some of the most popular federal funding sources available for the construction of roundabouts. More information about each source can be found by clicking the hyperlinked title of each funding program.

Funding Program	Awarding Agency	Description	Funding Amt. Available	When to Apply
Carbon Reduction Program (CRP)	AMATS	A newer funding source designed to fund projects that reduce carbon dioxide emissions from on-road highway sources. Roundabouts are the top-scoring project type, compared to other eligible activities.	$2m maximum; 20% local match	Applications are due during AMATS' biennial funding rounds, typically in autumn of odd-numbered years.
Surface Transportation Block Grant (STBG)	AMATS	Versatile funding source for a wide variety of transportation projects on federally classified collector and arterial roadways.	$6m maximum; 10%* to 20% local match	Applications are due during AMATS' biennial funding rounds, typically in autumn of odd-numbered years.
Congestion Mitigation/Air Quality (CMAQ)	Ohio Statewide Urban CMAQ Committee (OSUCC)	Flexible funding source for transportation projects and programs to help meet the requirements of the Clean Air Act. Eligible projects must improve air quality and relieve congestion.	No stated maximum, but the AMATS region historically receives about $7m per year; 20% local match	Applications are due biennially, typically during the summer of odd-numbered years. AMATS receives applications and submits them to the OSUCC.
Highway Safety Improvement Program (HSIP) Formal Safety Program	ODOT	Available for higher-cost, more complex safety improvements. Focus on locations with a history of fatal or injury crashes where low-cost safety improvements have failed to solve the problem.	Typically $500k to $5m; 10% local match	Two application cycles per year: March 31 and August 31.
Safe Streets for All (SS4A) Implementation Grants	FHWA	A discretionary federal program designed to implement projects that will prevent roadway deaths and serious injuries. Locations included on the AMATS SS4A Action Plan's High Injury Network (HIN) are much more likely to receive funding.	$2.5m to $25m per project (roundabouts likely to be one component of a larger project); 20% local match	Applications are due annually, typically in May.

* - *Local share can be reduced to 10% if sponsors elect to participate in AMATS' Project Delivery Incentive Program (PDIP), which is a program that incentiviz3es project sponsors to deliver their projects in a specified time window.*

Other possible, non-federal sources to explore include the following:

Ohio Public Works Commission (OPWC) funds
Nineteen districts across Ohio administer OPWC funds that assist in funding infrastructure projects. Various grant and loan programs are available through the OPWC.
https://publicworks.ohio.gov/programs/infrastucture/01-infrastucture
https://publicworks.ohio.gov/districts

Ohio Department of Transportation (ODOT) Transportation Improvement District (TID) program
A TID is a form of local government that strives to promote intergovernmental and public-private cooperation of transportation resources and investments. TIDs must be registered with ODOT to apply for TID program funding, which can go toward various phases of transportation improvements on any publicly owned roadways.
https://www.transportation.ohio.gov/programs/jobs-commerce/03-transportation-improvement-districts

ODOT Jobs and Commerce Economic Development (JCED) program
The Jobs & Commerce Economic Development (JCED) Program provides funding for transportation projects that promote job creation, job retention and private sector investment. ODOT Jobs & Commerce works with private and public partners to find fast and smart solutions to build or improve roads for new or growing businesses within the state.
https://www.transportation.ohio.gov/programs/jobs-commerce/02-jobs-and-commerce-economic+development

Chapter 5 — Conclusion

This report provided an initial look at the key characteristics of roundabouts, an overview of the region's roundabouts including their crash performance, and a summary of some of the lessons learned by the area's communities. The efficacy of roundabouts is a topic that garners passionate debate, though they have been proven nationally to be a viable solution for improving intersections.

Roundabouts will likely become more common both nationally and regionally. As with any transportation solution, there are myriad factors that must be considered in the planning of a roundabout. Pre-existing crash performance and traffic management must be studied alongside the site-specific characteristics of a roadway. In some cases, a roundabout may be an ideal solution when an intersection improvement is planned, but there are various circumstances that may lead to other design alternatives being advanced.

Over the past 18 years within the Greater Akron area, roundabouts have been built at nearly 30 intersections. 12 more are funded and will be built over the next five years. AMATS is aware of additional roundabouts that communities are considering as their leaders think ahead to future transportation improvements. Although they are clearly becoming a popular solution when intersections are improved, roundabouts still represent a small minority of all major intersections. (For comparison, the Greater Akron area has just under 1,000 traffic signals).

Given their newness—about two-thirds of the region's roundabouts have been built within the past decade—post-roundabout crash data is limited. But the data so far is compelling, particularly in the reduction of injury-related crashes. In many cases within the AMATS planning area, less-severe crashes increased or stayed about the same after roundabouts were built, though these *Property Damage-Only* crashes have decreased on more than half of the roundabouts.

Future tracking and further analysis will help to obtain a clearer sense of how the Greater Akron area's roundabouts are performing. Many of the region's highest-volume roundabouts were too new for post-roundabout crash comparison analysis at the time of this study's compilation, so it will be particularly interesting to monitor how the more complex, multi-lane designs perform.

As more roundabouts are planned, constructed, and become operational, best practices will undoubtedly evolve. Design guidance from within the engineering community will adapt, and the communities within Portage, Summit, and Wayne counties will learn more lessons on how and where to build roundabouts. As drivers, pedestrians, and cyclists become more comfortable with circular intersections, perceptions will also most likely change.