CARPENTER MARTY transportation

Hillsboro Transportation Study
SR-73 & Chariss Ave/Fenner Ave

Draft Report

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Prepared for:
Ohio Valley Regional Development Commission &
City of Hillsboro

6612 Singletree Drive
Columbus, OH 43229
614.656.2424
www.cmtran.com

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I. Executive Summary

A. Purpose and Need

The City of Hillsboro seeks to improve the SR-73 & Chariss Avenue/Fenner Avenue intersection based on expected growth of the Roberts Lane and SR-73 corridor. The Roberts Lane Extension project supports new, anticipated development on the east side of SR-73, north of Fenner Avenue. The purpose of this study is to perform a safety and capacity analysis at the intersection and determine countermeasures to reduce crashes and improve operations. The study limits include the intersection of SR-73 & Chariss Avenue/Fenner Avenue. The segment of SR-73 in the study area is identified as an ODOT Pedestrian Priority Segment.

B. Overview of Safety Issues

Crash data was obtained from ODOT Transportation Information Mapping System (TIMS) for four complete years, 2021-2024. There were 14 crashes in the study area during the four-year study period. Of the 14 crashes that occurred at the intersection, eight were injury crashes (57.1%) and six were property damage only crashes (42.9%). The primary crash type was rear end (85.7%) followed by the secondary crash type of fixed object (14.3%).

C. Recommended Countermeasures and Related Costs

Below is a brief overview of the recommended countermeasures. See section **VI Countermeasures** for further details.

Short-term countermeasures:

- Remove "Prepare to Stop When Flashing" (PTSWF) signs and replace with radar detection

Long-term countermeasures:

- Upgrade traffic signal and install turn lanes
- Install a roundabout (single-lane that will have to be expanded before 2045)

The estimated cost for the traffic signal upgrade with turn lane installation is $1,927,600 whereas the cost for the roundabout installations are $2,518,100 (single-lane) and $5,066,700 (expanded). The expected annual crash adjustment shows a decrease in crashes and a benefit-cost ratio less than 1.0 for all long-term countermeasure projects.

It is recommended the traffic signal upgrade with turn lane installation be implemented. While the single-lane roundabout is expected to reduce more crashes, it is expected to require expansion to operate with acceptable LOS with anticipated future growth. The proposed traffic signal upgrade with turn lane installation is expected to operate acceptably past 2045 with anticipated growth and development in the area.

The primary crash type of rear end crashes is expected to be mitigated with the proposed traffic signal upgrades. The installation of a roundabout is not necessarily expected to mitigate the primary crash type. For these reasons, it is recommended the City pursue funding for the traffic signal upgrade with turn lane installation.

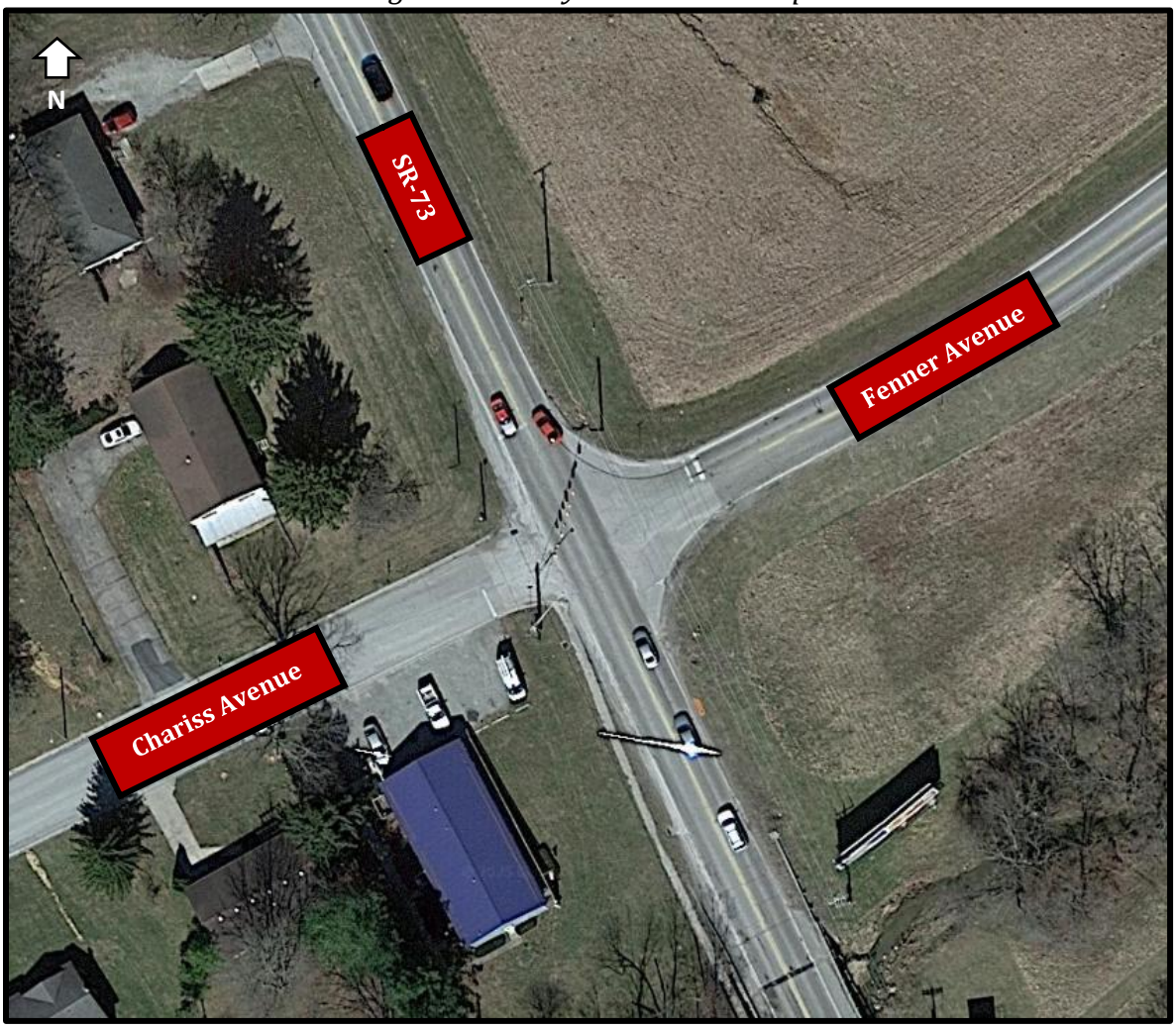
II. Purpose and Need

The City of Hillsboro seeks to improve the SR-73 & Chariss Avenue/Fenner Avenue intersection based on expected growth of the Roberts Lane and SR-73 corridor. The Roberts Lane Extension project will serve as a connecting artery of the City's major commercial thoroughfare. The extension also supports new, anticipated development on the east side of SR-73, north of Fenner Avenue. Additionally, the Pea Ridge Road connection to SR-73 will be terminated with a cul-de-sac. In turn, Fairground Road will be extended to the north and then east and tie into SR-73 at Cross Road.

The purpose of this study is to perform a safety and capacity analysis at the intersection and determine countermeasures to reduce crashes and improve operations. The study limits include the intersection of SR-73 & Chariss Avenue/Fenner Avenue and extend approximately 500' on each intersection approach. The segment of SR-73 in the study area is identified as an ODOT Pedestrian Priority Segment. A project location map is provided in **Figure 1** and a study intersection map is provided in **Figure 2**.

Figure 1 - Project Location Map (Highland County outlined in red)

Figure 2 – Study Intersection Map



III. Existing Conditions

A. Land Use

The study area is in the City of Hillsboro. The area surrounding the study intersection includes residential homes, apartments, the planned Roberts Lane development, and undeveloped land.

B. Roadway Conditions

SR-73

SR-73 serves as a northwest-southeast connector linking many cities including Franklin, Springboro, Waynesville, Harveysburg, Wilmington, New Vienna, Hillsboro, Berrysville, and Portsmouth. Within the study area, SR-73 has a posted speed limit of 35 MPH and is classified as an Urban Minor Arterial. It has a two-lane typical section throughout the study area. The through lanes are generally 11' wide with 1' shoulders. There is no roadway lighting, raised pavement markers, or rumble strips/stripes. Sidewalk is present from the southwest corner of the intersection, continuing south along SR-73 into the City center. A stream with a bridge crossing is located 150' south of the intersection. Vertical curvature is present along the roadway in the study area.

Chariss Avenue

Chariss Avenue is a residential road that terminates approximately 1,000' west of SR-73. The roadway has no posted speed limit, so the assumed speed limit is 25 MPH. Chariss Avenue is classified as an Urban Local Road and has a two-lane typical section. There is curb and gutter present on both sides of Chariss Avenue but no pavement markings or sidewalk.

Fenner Avenue

Fenner Avenue is an east-west road connecting SR-73, Roberts Lane, and US-62. The roadway has a posted speed limit of 25 MPH. Fenner Avenue is classified as an Urban Local Road and has a two-lane typical section. The through lanes are generally 11' wide with 1' shoulders. There is sidewalk present on the north side of the road along the frontage of the Fenner Ridge Apartments development. There is horizontal curvature in the road east of Roberts Lane.

C. Intersection Conditions

SR-73 & Chariss Avenue/Fenner Avenue is a four-leg intersection. Each approach has a single shared left/through/right lane. The intersection operates under signalized control. The traffic signal configuration is a single, diagonal span wire connected to utility poles on the northeast and southwest corners of the intersection. Each approach has two, three-section signal heads painted yellow with no backplates. The signal heads on the north/south approaches are 12" heads whereas the east/west approaches have 8" heads. A single luminaire is present at the intersection. The intersection configuration can be seen in **Figure 3**.

Signage approaching the study intersection along SR-73 includes a PTSWF sign approximately 335' north of the intersection and 342' south of the intersection. There is a "No Passing on Right" sign posted on the northwest corner of the intersection.

Figure 3 – Intersection Configuration (northbound approach)

D. Previous Study: 2023 Hillsboro Traffic Analysis

The City of Hillsboro retained Carpenter Marty Transportation to complete a traffic study reviewing many intersections along SR-73 and US-62 within the Hillsboro area. The study was called the Hillsboro Traffic Analysis and was finalized in November 2023. The study was conducted to determine what required intersection improvements are expected in response to the development along Roberts Lane and other anticipated developments within the area. Additionally, the study analyzed the potential to convert SR-73 and US-62 into one-way streets within the Hillsboro area.

The intersection of SR-73 & Chariss Avenue/Fenner Avenue was included within the study. The analysis was conducted using 2045 planning-level traffic volumes. Regarding this intersection, the study recommended the following improvements:

- 325' westbound left turn lane
- 100' northbound left turn lane
- 325' northbound right turn lane
- 250' southbound left turn lane

The 2023 Hillsboro Traffic Analysis is provided in **Appendix A**.

E. Data Collection

Turning movement counts were collected at the study intersection from 5 AM – 7 PM on Tuesday, April 22, 2025. School was in session and the traffic signal installation at the new intersection of SR-73 with Fairground Road/Cross Road was fully operational beginning on April 11, 2025. Count data is provided in **Appendix B**.

F. Traffic Volume Development

A growth rate of 0.9% for the northbound and southbound through movements was obtained from the previously described 2023 Hillsboro Traffic Analysis via Ohio Department of Transportation (ODOT) Traffic Forecasting Management System (TFMS). A

Design Year of 2045 is assumed for analysis purposes. The 2025 count data was projected to a Design Year of 2045 using the 0.9% growth rate.

The Roberts Lane extension to Fenner Lane will create additional, developable land within the City of Hillsboro. Trips for each development were obtained from the previously conducted Hillsboro Traffic Study and were added to the grown count data to produce Build volumes for the Horizon Year. **Table 1** summarizes the land use assumptions for each development area that was utilized in the previously conducted study. It should be noted that additional development details have been provided since the 2023 study for Zones 1, 2, and 7. These zones have new land use assumptions that were not used in the original study. Detailed trip generation tables, along with site plan markups of the various development zones, are provided in **Appendix B.**

Table 1 – Proposed Developments Land Use Summary

Zone	ITE Land Use Code – Land Use	Size
1 & 2	150 - Warehousing	64,330 SF
3	712 – Small Office Building	7,280 SF
	712 – Small Office Building	4,780 SF
	712 – Small Office Building	4,030 SF
	720 – Medical-Dental Office Building – Stand-Alone	5,530 SF
	720 – Medical-Dental Office Building – Stand Alone	16,950 SF
4	943 – Automobile Parts and Service Center	4,580 SF
	934 – Fast-Food Restaurant with Drive-Through Window	4,000 SF
	932 – High-Turnover (Sit-Down) Restaurant	5,510 SF
	934 – Fast-Food Restaurant with Drive-Through Window	2,190 SF
	912 – Drive-in Bank	5,850 SF
	821 – Shopping Plaza (40-150k) – Supermarket – No	77,500 SF
5	934 – Fast-Food Restaurant with Drive-Through Window	4,270 SF
	220 – Multifamily Housing (Low-Rise) - Not Close to Rail Transit	300 Units
	565 – Day Care Center	8,000 SF
6	875 – Department Store	20,000 SF
7	310 – Hotel	200 Rooms
	932 – High-Turnover (Sit Down) Restaurant	5,000 SF
	822 – Strip Retail Plaza (<40k)	13,000 SF
8	810 – Tractor Supply Store	20,000 SF
9	220 – Multifamily Housing (Low-Rise) – Not Close to Rail Transit	300 Units
	220 – Multifamily Housing (Low-Rise) – Not Close to Rail Transit	300 Units
10	820 – Shopping Center (>150k)	200,000 SF

The full volume calculations are provided in **Appendix B**.

IV. Existing Conditions Analysis

A. Capacity Analysis

Highway Capacity Software (HCS) version 2024 was used to conduct capacity analysis of the existing intersection configuration. AM and PM peak hour volumes for 2025 (Existing Year) and 2045 (Design Year) were used for this analysis.

Existing conditions capacity analysis results for 2025 and 2045 are provided in **Table 2.** In general, a level of service (LOS) of D for the overall intersection, approaches, and individual movements is considered acceptable. Full capacity results are provided in **Appendix C.**

Table 2 – Existing Conditions Capacity Analysis Results

Movement	2025				2045			
	AM		PM		AM		PM	
	Delay [a]	LOS	Delay [a]	LOS	Delay [a]	LOS	Delay [a]	LOS
Chariss Avenue	13.1	B	12.5	B	15.7	B	33.6	C
Fenner Avenue	14.0	B	14.6	B	19.1	B	324.6	F
SR-73 NB	6.7	A	8.1	A	10.5	B	17.4	B
SR-73 SB	6.0	A	8.1	A	9.0	A	283.6	F

a – Average total delay in seconds per vehicle

Overall, the existing conditions analysis shows capacity is currently acceptable but is expected to have high levels of delay for the Fenner Avenue and SR-73 southbound approaches in the Design Year after all the expected development traffic is present.

B. Signal Warrant Analysis

A signal warrant analysis was conducted at the study intersection according to methodologies listed in the Ohio Manual of Uniform Traffic Control Devices (OMUTCD). Analysis was conducted with 2025 raw count data with right turn reductions (RTR). Analysis was not conducted for 2045 volumes, as warrants were already met without the addition of development traffic. **Table 3** shows the results of Warrants 1-3.

Table 3 – 2025 Signal Warrant Analysis Results

Warrant	Result
1	Condition B – 70% Met Combination A/B – 56% Met
2	Met with 70% Factor
3	Met

The results show a traffic signal is warranted per ODOT standards with current 2025 volumes. This does not necessarily mean a traffic signal is the only recommended traffic control type for this intersection, which is discussed later in this report. The full signal warrant analysis can be seen in **Appendix D.**

V. Crash Data

A. Crash Data Summary

Crash data was obtained from ODOT TIMS for four complete years (2021-2024). A total of 16 crashes were obtained which was reduced to 14 crashes after further review. The OH-1 report for each documented crash was reviewed to correct information, where necessary, and properly locate crashes within the study limits.

Table 4 shows a breakdown of the crash data. Crash data for the study area was plotted on an aerial map to identify crash patterns and probable causes. The crash diagram for the study area is shown in **Figure 4**.

Table 4 - Crash Statistics

Crash Year	Number	Percent
2021	6	42.9%
2022	0	0.0%
2023	2	14.3%
2024	6	42.9%

Crash Severity	Number	Percent
Injury Crash	8	57.1%
Property Damage Crash	6	42.9%

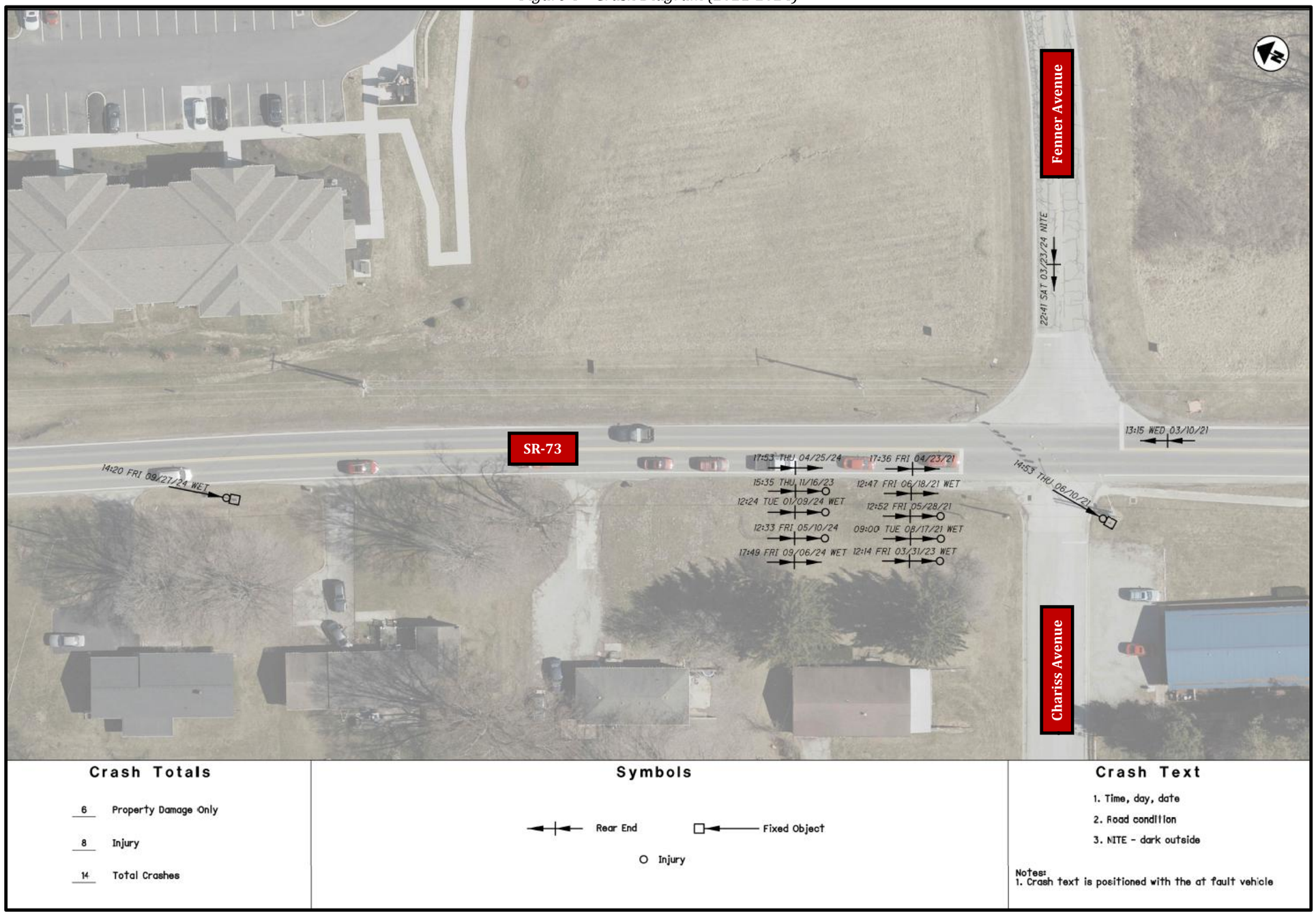
Crash Type	Number	Percent
Rear End	12	85.7%
Fixed Object	2	14.3%

Road Condition	Number	Percent
Dry	8	57.1%
Wet	6	42.9%

Hour of Day	Number	Percent
9:00 AM	1	7.1%
12:00 PM	5	35.7%
1:00 PM	1	7.1%
2:00 PM	2	14.3%
3:00 PM	1	7.1%
5:00 PM	3	21.4%
10:00 PM	1	7.1%

Day of Week	Number	Percent
Sunday	0	0.0%
Monday	0	0.0%
Tuesday	2	14.3%
Wednesday	1	7.1%
Thursday	3	21.4%
Friday	7	50.0%
Saturday	1	7.1%

Figure 4 – Crash Diagram (2021-2024)



B. Probable Causes

Noteworthy crash patterns in the study area are summarized with supporting details and probable causes as follows:

- **Rear End Crashes**
  Rear end crashes were the most prevalent crash type at the study intersection. A total of 12 rear end crashes were reported. Rear end crashes represent 85.71% of the total crashes, significantly higher than the statewide average of 42.25%. Six resulted in a possible injury and six in property damage only. Ten of the rear end crashes occurred on the southbound approach, one occurred on the northbound approach, and one occurred on the westbound approach. This crash type could be attributed to the vertical curvature and downhill grade of the roadway approaching the intersection and poor signal head visibility. Drivers may not be expecting to have to stop or do not give themselves enough time/distance to stop going down the hill.
- **Fixed Object Crashes**
  Two fixed object crashes were reported. Fixed object crashes represent 14.29% of the total crashes, higher than the statewide average of 3.82%. Both fixed object crashes were caused by southbound vehicles on SR-73. One of the crashes occurred north of Fenner Avenue while the other occurred on the southwest corner of the SR-73 & Chariss Avenue/Fenner Avenue intersection. These crashes could be due to the same reasons listed for the rear end crashes, and drivers attempting to avoid rear end crashes.

C. Safety Analysis

The Highway Safety Manual (HSM) predictive method for urban arterial intersections was applied to the study area to determine the potential for safety improvement. The results presented in **Table 5** show the expected crash frequency calculated using HSM predictive method with cleaned crash data and existing conditions for the study intersection.

Table 5 - HSM Results for Existing Conditions for All Crashes (shown in crashes/year)

Predicted Average Crash Frequency	4.3637
Expected Average Crash Frequency – Existing Conditions	3.6037
Expected Excess Crashes	-0.7600
Potential for Improvement	No

The results conclude the expected crash frequency is less than the predicted crash frequency for the study intersection. This suggests the intersection experiences less average crashes per year than its peers and does not have a potential to reduce crashes based on HSM methodology. However, based on engineering judgement, improvements can still be considered to improve safety. HSM output reports is provided in **Appendix E**.

VI. Countermeasures

The following section addresses possible countermeasures to mitigate the prevalent crash types in the study area. The countermeasures listed may be independent solutions and are not necessarily recommended to be implemented concurrently.

A. Short-Term Countermeasures

Remove PTSWF Signs and Replace with Radar Detection

ODOT is reviewing the statewide use of PTSWF signs, which were historically used to alert drivers that a signal is turning red. A statewide review of the signs found that drivers often speed up instead of slowing down upon seeing the flashing sign, increasing the number and severity of crashes at intersections. The signs are being replaced with new technology that can detect the speed of approaching vehicles and adjust the signal to prevent red-light running and crashes.

ODOT has seen a significant reduction in crashes at 14 intersections where the signs were removed within the past two years. The average crash reductions included a 23% reduction in total crashes; 35% reduction in serious crashes; 42% reduction in angle crashes; and 50% reduction in red-light running crashes.

It is recommended that the existing PTSWF signs be removed and replaced with radar-based detection systems.

B. Long-Term Countermeasure

Upgrade Traffic Signal and Install Turn Lanes

While capacity at the study intersection is acceptable with 2025 volumes, the addition of expected developments and overall background growth by 2045 is expected to result in high levels of delay for the westbound and southbound approaches. To mitigate this, turn lanes could be installed at the intersection. Providing turn lanes is expected to reduce the high frequency of rear end crashes at the intersection, as turning vehicles will have dedicated space to decelerate and wait for gaps. Additionally, a full traffic signal reconstruction is recommended. The new traffic signal should be a mast arm configuration with backplates for all approaches and include intersection lighting.

Turn lane length calculations were developed according to the methodologies in the ODOT Location and Design (L&D) Manual. Design Year 2045 traffic volumes for the AM and PM peaks were used to calculate turn lane lengths for all recommended turn lanes at the study intersection. The full turn lane length analysis can be found in **Appendix F.**

It is recommended that left turn lanes be installed on each approach and that a right turn lane be provided for the northbound approach. Note, the eastbound left turn lane was not necessarily needed based on capacity but is recommended to provide appropriate lane alignment with the opposing westbound approach. The lengths of these turn lanes are listed below. Lengths do not include a diverging taper.

- Eastbound Left: 50’

- Westbound Left: 200’
- Northbound Left: 50’
- Northbound Right: 200’
- Southbound Left: 175’

Capacity analysis was conducted using HCS with 2045 traffic volumes to assess the capacity of the proposed turn lane installations. LOS and vehicle delay results are summarized in **Table 6**. Detailed capacity analysis results are provided in **Appendix G**.

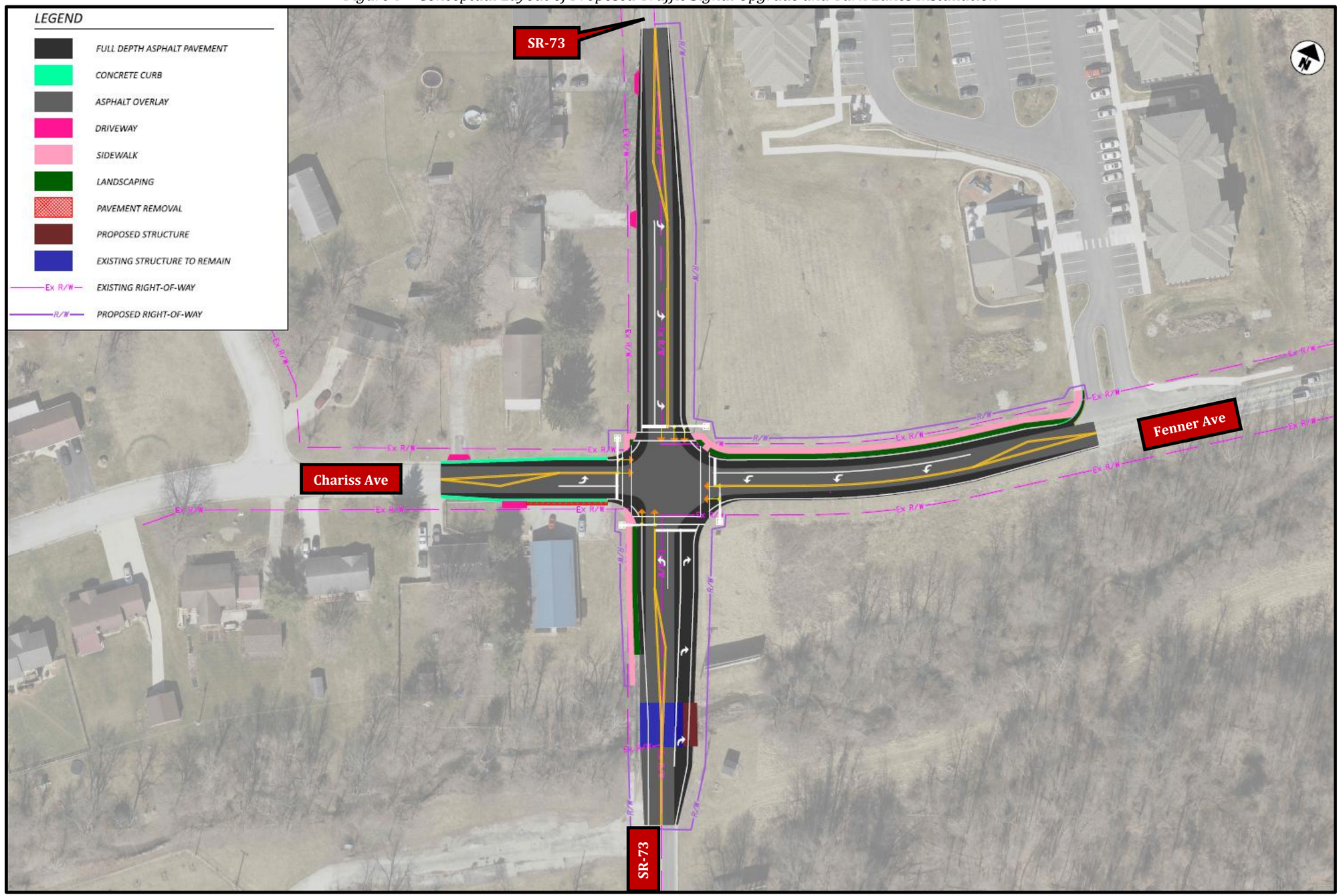
Table 6 – Signal with Turn Lanes Capacity Analysis Results

Movement	2045			
	AM		PM	
	Delay [a]	LOS	Delay [a]	LOS
Chariss Avenue	14.5	B	27.3	C
Fenner Avenue	15.3	B	30.6	C
SR-73 NB	7.9	A	10.5	B
SR-73 SB	8.9	A	14.9	B

a – Average total delay in seconds per vehicle

See **Figure 5** for the proposed intersection reconfiguration concept plan. A more detailed schematic plan with properties labeled is provided in **Appendix H**. Access management is proposed for the parking lot for the building in the southwest corner of the intersection which currently has open frontage onto Chariss Avenue. The existing bridge over the creek, south of the intersection will be impacted due to the proposed turn lanes. Proposed sidewalk connections and pedestrian crossings at the intersection are included.

Figure 5 – Conceptual Layout of Proposed Traffic Signal Upgrade and Turn Lanes Installation



Install a Roundabout

A roundabout should be considered for implementation at this intersection. The FHWA Office of Safety identified roundabouts as a Proven Safety Countermeasure because of their ability to greatly reduce the types of crashes that result in serious injury or fatality. By reducing the number and severity of conflict points at the intersection, and because of the lower speeds of vehicles moving through the intersection, roundabouts are proven to be a safer intersection type. Roundabouts are generally becoming more common throughout Ohio. An existing roundabout is located less than two miles north of the study area, and another is planned along Roberts Lane. It is anticipated that traffic driving through the area will be familiar with roundabouts.

Capacity analysis was conducted using HCS with 2025 and 2045 traffic volumes to assess the capacity of the proposed roundabout installation. LOS and vehicle delay results assuming a single lane single circulating lane roundabout with single lane approaches are summarized in **Table 7**. Detailed capacity analysis results are provided in **Appendix G**.

Table 7 – Single Lane Roundabout Capacity Analysis Results

Movement	2025				2045			
	AM		PM		AM		PM	
	Delay [a]	LOS	Delay [a]	LOS	Delay [a]	LOS	Delay [a]	LOS
Chariss Avenue	4.1	A	5.9	A	6.5	A	B	12.7
Fenner Avenue	5.1	A	7.2	A	10.8	B	E	41.6
SR-73 NB	6.7	A	7.4	A	14.5	B	E	44.6
SR-73 SB	5.5	A	7.9	A	10.3	B	F	62.2

a – Average total delay in seconds per vehicle

Capacity analysis shows that a single circulating lane roundabout with single lane approaches will operate with acceptable LOS with current 2025 volumes. However, by 2045 with expected growth and development, two circulating lanes will be required for southbound traffic, and the northbound and eastbound approaches will require dedicated right turn lanes. LOS and vehicle delay results assuming the expanded roundabout with 2045 volumes are summarized in **Table 8**.

Table 8 – Expanded Roundabout Capacity Analysis Results

Movement	2045			
	AM		PM	
	Delay [a]	LOS	Delay [a]	LOS
Chariss Avenue	5.5	A	9.6	A
Fenner Avenue	6.8	A	10.9	B
SR-73 NB	7.9	A	10.5	B
SR-73 SB	5.6	A	9.4	A

a – Average total delay in seconds per vehicle

Conceptual, planning-level layouts of the single-lane and 2045 expanded roundabout configurations are provided in **Figures 6-7.** More detailed schematic plans with properties labeled is provided in **Appendix H**. Access management and a revision to the parking lot and site circulation is proposed for the building in the southwest corner of the intersection which currently has open frontage onto Chariss Avenue. Proposed sidewalk connections and pedestrian crossings at the intersection are included. The existing bridge over the creek, south of the intersection, will not be impacted with the single-lane roundabout but will be impacted with the 2045 expanded roundabout. Further consideration is recommended for the 2045 expanded roundabout regarding lane continuity, capacity needs north and south of the study intersection, and whether it is anticipated that SR-73 will be widened in the future.

Figure 6 – Conceptual Layout of Proposed Single-Lane Roundabout

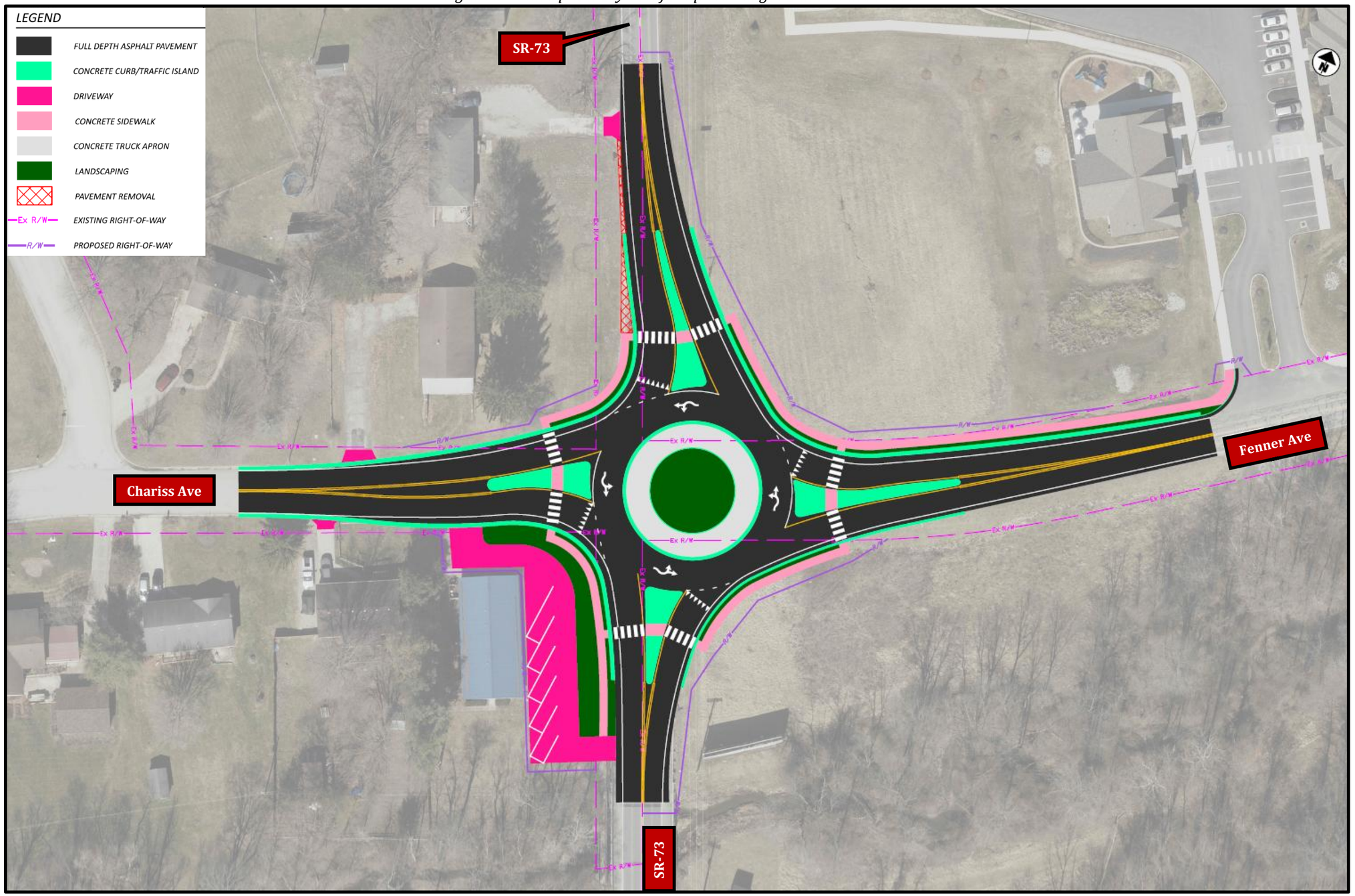
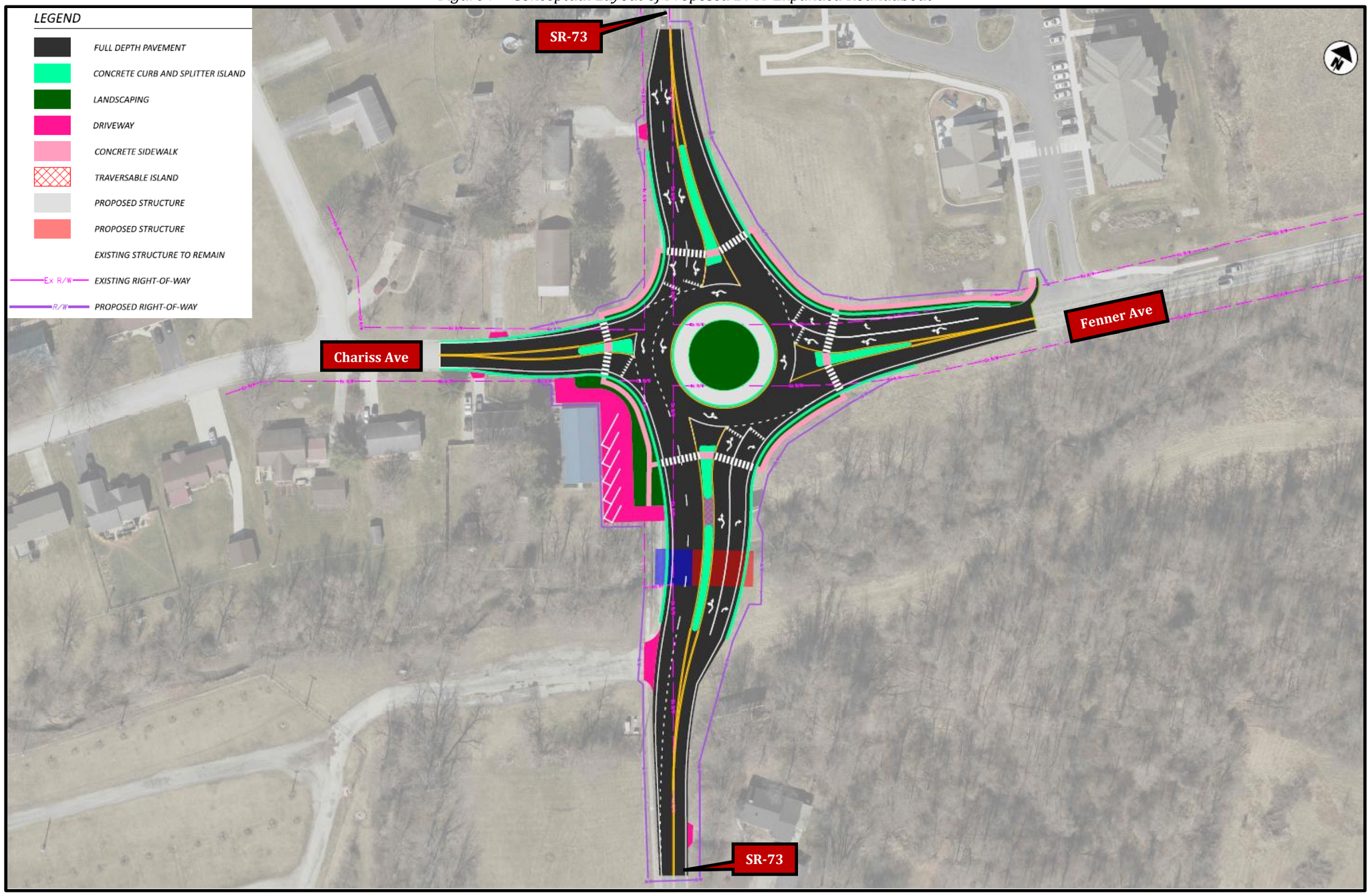


Figure 7 – Conceptual Layout of Proposed 2045 Expanded Roundabout



VII. Benefit-Cost Analysis

Benefit-cost analysis is a tool used to determine the financial benefits of a project by comparing the net present value (NPV) of a project to the NPV of the safety benefit provided by the project. Benefit-cost values greater than one indicate a positive return on the original investment. Preferred countermeasures are those having the highest NPV of safety benefits.

A benefit-cost analysis for the recommended long-term countermeasures was prepared using the ODOT Economic Crash Analysis Tool (ECAT). Crash modification factors (CMF) were applied for the proposed long-term improvements. This analysis does not account for all recommended improvements and only includes countermeasures that have CMF values.

Cost estimates were prepared for the long-term countermeasures. The construction cost estimates assume the following:

- 15% engineering design
- 30% contingency
- 10% environmental, geotechnical, federal requirements
- 9.9% inflation rate for an estimated 2027 construction year
- Right-of-way costs
- Utility relocation costs not included

The estimated costs for the long-term countermeasures are summarized in **Table 9.** Detailed cost estimates are included in **Appendix I.**

Table 9 – Cost Estimates

Countermeasure	Total
Signal with Turn Lanes	$1,927,600
Single-Lane Roundabout	$2,518,100
2045 Expanded Roundabout	$5,066,700

CMFs utilized for the proposed long-term countermeasures include:

Upgrade Traffic Signal and Install Turn Lanes

- **Add turn lanes:** Left turn lanes will be added to all approaches and a northbound right turn lane will be added. This is a standard CMF offering.
- **Improve visibility of signal heads**: A CMF of 0.71 was applied to all fatal and serious/minor injury crashes, and a CMF of 0.79 was applied to all property damage only crashes at the intersection. This accounts for upgrading to mast arm configuration and signal heads with backplates. These CMFs were obtained from the FHWA CMF Clearinghouse and have a three-star quality rating. The CMF is provided in **Appendix J.**

Install Roundabout

- **Conversion of signalized intersection into roundabout:** The proposed roundabout has a dedicated site type in ECAT, which was utilized for the proposed conditions analysis. Geometry differences for the single-lane roundabout versus the 2045 expanded roundabout layouts were reflected in the available inputs.

Table 10 summarizes the benefit-cost analysis results. Detailed benefit-cost analysis reports from ECAT are included in **Appendix J**.

Table 10 - Benefit-Cost Analysis

	Long-Term Countermeasures		
	Signal with Turn Lanes	Single-Lane Roundabout	2045 Expanded Roundabout
Expected Annual Crash Adjustment	-2.236	-2.318	-2.040
NPV of Project	$1,753,958.30	$2,291,265.80	$4,610,282.80
NPV of Safety Benefit	$823,118.94	$986,864.23	$1,062,447.80
Benefit-Cost Ratio	0.47	0.43	0.23

The expected annual crash adjustment shows a decrease in crashes and a benefit-cost ratio less than 1.0 for all long-term countermeasure projects. This indicates the ECAT methods predict the cost of each project is not justified based on the calculated value of safety benefits to be obtained, each project would not have a positive return on the original investment, and crashes are expected to be reduced. The single-lane roundabout is expected to reduce the most crashes per year, but the 2045 expanded roundabout has the highest cost and the least favorable benefit-cost ratio. The traffic signal upgrade with turn lane installation has the lowest cost, is expected to reduce more crashes compared to the 2045 expanded roundabout and has the most favorable benefit-cost ratio.

VIII. Recommendations

It is recommended the traffic signal upgrade with turn lane installation be implemented. While the single-lane roundabout is expected to reduce more crashes, it is expected to require expansion to a multi-lane roundabout to operate with acceptable LOS with anticipated future growth. The proposed traffic signal upgrade with turn lane installation is expected to operate with acceptable LOS through 2045 with anticipated growth and development in the area.

The primary crash type at the intersection is rear end crashes. This is expected to be mitigated with the proposed traffic signal upgrades. The installation of a roundabout is not necessarily expected to mitigate the primary crash type. Furthermore, while the expanded roundabout is not needed now, providing more capacity than is necessary at a roundabout often leads to increased crashes due to driver error, increased speeds, and increased lane transitions (compared to the single-lane option). The need for the multi-lane roundabout is highly dependent upon the opening of the planned developments in the area. For these reasons, it is recommended the City pursue funding for the traffic signal upgrade with turn lane installation.