Feasibility Study

Symmes Road Grade Separation Project

Butler County Transportation Improvement District

Fairfield, Ohio

March 31, 2025

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1 Introduction

The Butler County Transportation Improvement District (BCTID) was awarded a Rail Crossing Elimination (RCE) grant for $3M from the Federal Rail Administration (FRA), a significant step forward to making safety and mobility improvements at two existing railroad crossings—Symmes Road and North Gilmore Road in the City of Fairfield, Ohio. That grant agreement (the Agreement) and associated Project Planning and Project Development tasks will require the BCTID and the City of Fairfield to commit to following established FRA processes and procedures.

The Symmes Road Grade Separation Project (Project), as scoped per the Agreement, is a $3,750,000 planning and design phase contract, includes a 20% non-federal local match provided by BCTID/City of Fairfield. The Planning and Design activities concluding in Construction of the Project, are a result of ongoing planning by partners and consistent prioritization of highway-railroad grade crossing safety initiatives within the state of Ohio. Regionally tens of millions of dollars have been invested in crossing closures and grade separation along the CSX Railroad corridor in southwest Ohio. BCTID/City of Fairfield now proposes to advance project planning and development activities for highway-rail grade separation on Symmes Road and evaluate the feasibility of closing the North Gilmore Road crossing, toward final design and ultimately construction of the safety improvements. These crossings are located along the CSX Railroad Cincinnati Terminal Subdivision–a vital thoroughfare connecting Louisville, Cincinnati, Dayton, Toledo, and Detroit. This rail line also serves as a link within Amtrak's Cardinal train, with daily service from New York to Chicago via Cincinnati.

The Project Planning and Design work on the Project as scoped will create the Purpose and Need Statement, Stakeholder Coordination Plan, and Project Development Documentation to prepare the Project to pursue construction funding and deliver safety benefits through the elimination of two at-grade crossings within the City of Fairfield. Additional benefits may be realized through the completion of improvements and/or closure of North Gilmore Road.

The Project is located in the City of Fairfield, Ohio. The railroad crossings for Symmes Road and North Gilmore Road are located at the following coordinates (shown in Figure 1):

- Symmes Road (39.34873, -84.52851)
- North Gilmore Road (39.34253, -84.52050)

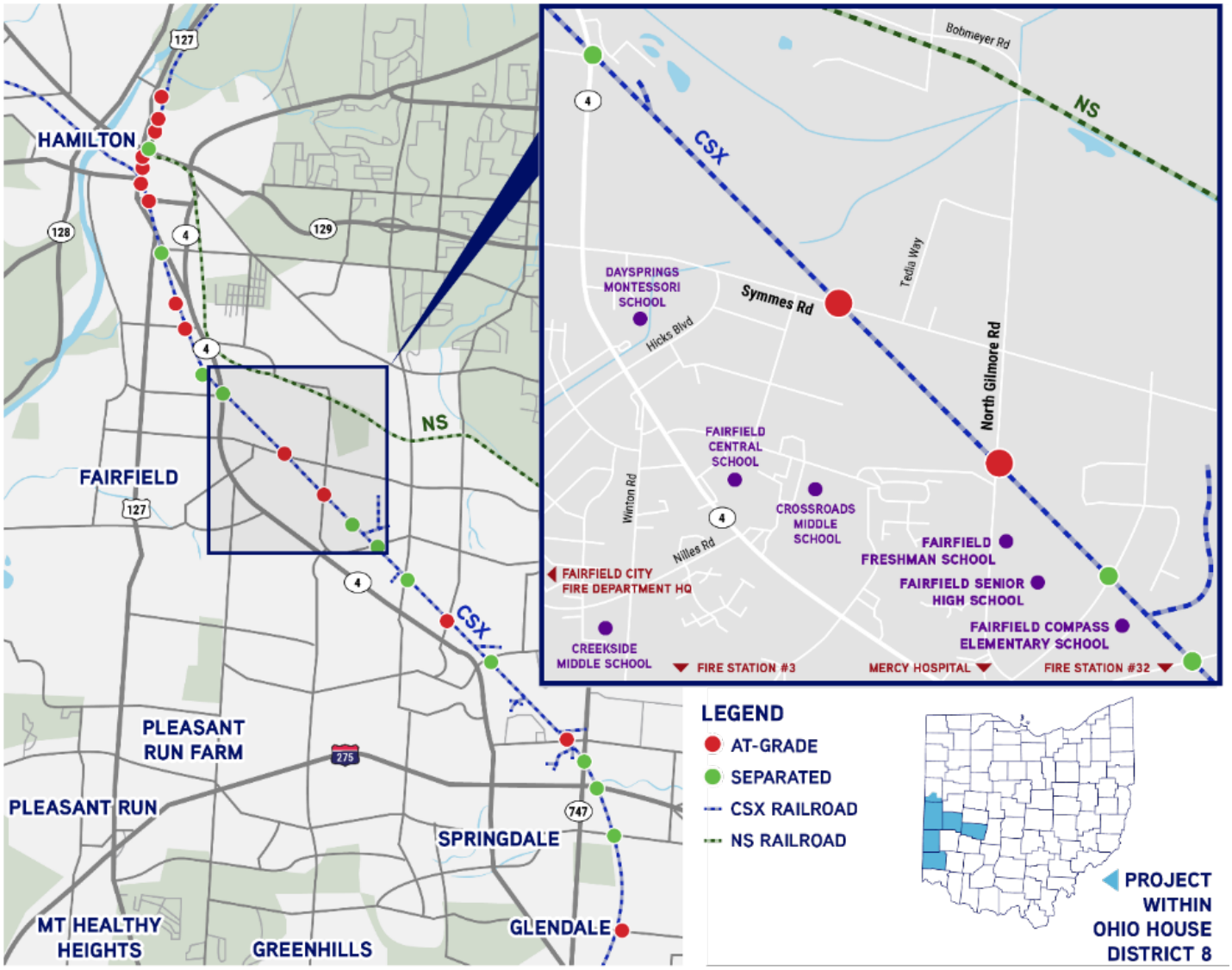

Figure 1: Project Location

This project will provide a range of benefits, including:

- **Safety**: The Symmes Road and North Gilmore Road crossings have seen a combined 16 crashes, eight fatalities, and nine injuries according to the FRA Grade Crossing Inventory. Grade separation and closure of these crossings, respectively, will eliminate two conflict points while improving emergency response times both within the City and regionally.

- **Congestion**: There will be reduced congestion, delay, and emissions by separating over 40 train movements per day on roadways from annual average daily traffic of approximately 13,000 vehicles on Symmes Road and 9,000 vehicles on North Gilmore Road. Trains frequently block one or both crossings.

The FRA has received 7 blocked crossing reports in the last year, which is more than 93% of other railroad crossings in Ohio.

- **Equity**: The benefits characterized above will be concentrated within a Census tract with a 9.5% poverty rate and a median annual household income of under $50,000. The project is in a DOT Historically Disadvantaged Community and qualifies as a Justice40 Community and Federal Opportunity Zone.

- **Rail Operations**: The Project will improve reliability of rail movements along one of the most important freight corridors in the Midwest, connecting several major industrial cities along the I-75 highway corridor. Completion of this project will provide over 4.5 miles of track space without at-grade crossing interference north of the CSX Railroad Queensgate Yard, the fifth largest yard by volume on the CSX Railroad network.

- **Economic Development**: With more than 36,000 jobs within three miles of the Symmes Road crossing, the corridor provides critical access to the region's workforce. Several industrial properties surrounding the Symmes Road crossing present new job attraction and retention opportunities, with some served directly by rail access.

2 Purpose and Need Summary

2.1 Symmes Road

2.1.1 Purpose Statement

The purpose of the project is to improve safety and reduce traffic delays for the public (motorists, pedestrians, and emergency responders) that have been caused by conflict between vehicle and rail traffic at the Symmes Road crossing in the City of Fairfield.

2.1.2 Need Element(s)

The current Symmes Road crossing poses significant safety hazards. The crossing is skewed, reducing driver's ability to see oncoming trains when approaching the crossing. In addition, the crossing lacks advanced warning devices, pedestrian facilities, or remote health monitoring. Both approaches have gates and warning lights, but the flashing lights have not been upgraded to LED bulbs and side lights are not present.

The Symmes Road crossing is ranked within the top 10% most hazardous crossings nationwide according to the Federal Rail Administration (FRA) Accident Prediction and Severity (APS) model. Based on FRA Rail Crossing Inventory Data, the Symmes Road crossing has directly resulted in five (5) crashes over the history of the FRA Grade Crossing Inventory.

Moreover, based on a 2008 study, the Symmes Road crossing may have contributed to an additional nineteen (19) crashes over the previous four years due to congestion caused by backups at the Symmes Road crossing.

The Symmes Road crossing impacts vehicular mobility in the City of Fairfield due to frequent traffic interruptions as well as longer crossing blockages. According to stop-delay analysis conducted by the Fairfield Public Works Department, these frequent traffic interruptions at the Symmes Road crossing result in a maximum stop time of four minutes and thirty-six seconds (4:36) with a maximum queue of over eighty (80) vehicles. As many workers travel from the SR 4 corridor across Symmes Road to reach industrial jobs, companies regularly report employees being late for work due to trains blocking this route.

Over the past year, the FRA received seven (7) blocked crossing reports for the Symmes Road crossing, placing it within the top 7% most frequently reported crossings in Ohio.

Additionally, traffic interruptions at the Symmes Road crossing have impacted emergency response times. Impacts to emergency response services noted in the Symmes Road Grade Separation grant application include:

- The City of Fairfield Fire Department assumes a train will be present and consistently uses alternate routes to bypass the Symmes Road crossing, which increases emergency response times.

- Additional delay from traffic back-ups on Symmes Road (a two-lane road) reduce emergency response times to nearby homes and businesses, and motor vehicle crashes occurring on the road.

- Trains frequently block access to the Butler County Airport, which is just over 1-mile away, and impedes the Fire Department's ability to respond to fires and medical emergencies in the area. The airport is also used to transport acute trauma patients to nearby hospitals. Ambulances transport patients to Bethesda Butler Hospital, University of Cincinnati Health-West Chester Hospital, Christ Hospital Medical Center-Liberty Township, and Cincinnati Children's Hospital-Liberty Campus.

- For structure fires, Fire Department policy dictates response from opposite directions to secure water from two different sources; blockage of the Symmes Road crossing prevents this at certain locations, including M. Bohlke Veneer (manufacturer of wood products) and Tedia Companies (chemical plant).

Reduced emergency access is acute in Hamilton to the north, where the fire station is located on the east side of the CSX Railroad line.

2.1.3 Summary Statement

The purpose of this transportation improvement project is to improve safety and reduce traffic delay for the public (motorists, pedestrians, and emergency responders) that have been caused by conflict between vehicle and rail traffic at the Symmes Road crossing in the City of Fairfield.

2.2 North Gilmore Road

2.2.1 Purpose Statement

The purpose of the project is to improve safety at the North Gilmore Road rail crossing in the City of Fairfield.

2.2.2 Need Element(s)

The current North Gilmore Road crossing poses a significant safety hazard. The crossing is skewed, reducing driver's ability to see oncoming trains when approaching the crossing, and the crossing lacks advanced warning devices, pedestrian facilities, and remote health monitoring. The northern approach is unlit. While the southern approach has gates and warning lights, the flashing lights have not been upgraded to LED bulbs and side lights are not present.

Furthermore, the North Gilmore Road crossing is ranked within the top 10% most hazardous crossings nationwide according to the Federal Rail Administration (FRA) Accident Prediction and Severity (APS) model. Based on FRA Rail Crossing Inventory

Data, the North Gilmore Road crossing has resulted in eleven (11) crashes, including eight (8) fatalities over the history of the FRA Grade Crossing Inventory.

The safety deficiencies of the North Gilmore Road crossing are of particular concern as the crossing is directly adjacent to the Fairfield freshman and senior high schools. The City of Fairfield's analysis of streetlight data indicated that most travelers accessing the City's ninth to twelfth grade school campus currently use an alternate route via Bilstein Boulevard, which provides redundant north-south travel and is already grade separated from the CSX Railroad line.

2.2.3 Summary Statement

The purpose of this transportation improvement project is to improve safety at the North Gilmore Road rail crossing in the City of Fairfield.

3 Alternatives

3.1 Alternatives for Symmes Road Crossing

3.1.1 Alternatives Dismissed

3.1.1.1 ALTERNATIVE 1 BASE DESIGN

Originally developed in 2008, this alternative included a 68'-wide, single span structure along the same alignment as the current Symmes Road. This alternative was originally dismissed due to the need for costly retaining walls along the alignment as well as the need to close Symmes Road for an extended time to construct the project. These reasons still hold true, and this alternative was not investigated further in this feasibility study.

3.1.2 Alternatives Considered

3.1.2.1 NO-BUILD ALTERNATIVE

Under the no build alternative, there would be no significant improvement in safety at the Symmes Road at grade highway railway crossing and there would be no congestion improvements at the Symmes Road crossing. Trains would continue to block Symmes Road causing delay, congestion related crashes, and hampering emergency response. If the no-build alternative is chosen, the team recommends safety upgrades to the Symmes Road crossing such as lighting, LED conversion of the signalized crossing gates, and remote health monitoring. These improvements in and of themselves will not satisfy the purpose and need of the project.

3.1.2.2 ALTERNATIVE 2 ROUNDABOUT DESIGN SOUTH BRIDGE

Alternative 2 will construct a new bridge on Symmes Road over the CSX Railroad tracks, south of the existing crossing, eliminating the current at-grade crossing. Alternative 2 commences at the western approach to Industry Drive and constructs a three-leg, two-lane roundabout at Industry Drive. From there, Alternative 2 turns to the south and the profile of Symmes Road raises significantly to travel over the CSX Railroad tracks south of the current crossing. The bridge would cross the tracks at an approximate 15° skew. As Alternative 2 continues to the east a five-leg (three roadways and two commercial drives), two-lane roundabout will be constructed at the current intersection of Symmes Road with Tedia Way. Alternative 2 would terminate at the current intersection of Symmes Road and North Gilmore Road.

This alternative allows for a shared-use path on the north side of Symmes Road from Industry Drive on the west to North Gilmore Road on the east. A sidewalk would also be constructed on the south side of Symmes Road from Industry Drive to North Gilmore Road. Alternative 2 is approximately 0.75 miles long.

Alternative 2 is shown in Yellow on Figure 2 below.

3.1.2.3 ALTERNATIVE 3 ROUNDABOUT DESIGN NORTH BRIDGE INTERSECTION IMPROVEMENTS

Alternative 3 will construct a new bridge on Symmes Road over the CSX Railroad tracks, south of the existing crossing, eliminating the current at-grade crossing. Alternative 3 commences at the western approach to Hicks Boulevard and constructs a four-leg (3 roadway and 1 commercial drive) two-lane roundabout at Hicks Boulevard. From there, Alternative 3 travels along the existing Symmes Road alignment nearly to Industry Drive where it turns south. Alternative 3 closes the Symmes Road/Industry Drive intersection permanently and vacates Industry Drive north of Veterans Drive. Continuing east, Alternative 3 raises Symmes Road over the railroad tracks. The new bridge would span the railroad slightly south of the current crossing location. The bridge would cross the tracks at an approximate 38° skew. As Alternative 3 continues east the Symmes Road intersection with Tedia Way would also be removed and a commercial drive would be constructed to maintain access to the business on Symmes Road west of Tedia Way. Alternative 3 would terminate at the current intersection of Symmes Road and North Gilmore Road. Alternative 3 is approximately 1.00 mile long.

This alternative allows for a shared-use path on the north side of Symmes Road from Hicks Boulevard on the west to North Gilmore Road on the east. A sidewalk would also be constructed on the south side of Symmes Road from Hicks Boulevard to North Gilmore Road.

Alternative 3 is shown in Green on Figure 2 below.

3.1.2.4 ALTERNATIVE 4 TWIN ROUNDABOUT DESIGN NORTH BRIDGE INTERSECTION IMPROVEMENTS

Alternative 4 will construct a new bridge on Symmes Road over the CSX Railroad tracks, eliminating the current at-grade crossing. Alternative 4 commences at the western approach to Hicks Boulevard and constructs a four-leg (three roadway and one commercial drive) two-lane roundabout at the intersection of Symmes Road and Hicks Boulevard. An additional three-leg roundabout would be constructed at the current intersection of Hicks Boulevard and Veterans Drive. Alternative 4 renames the northern segment of Hicks Boulevard and the entirety of Veterans Drive to Symmes Road realigning Symmes Road south on Hicks Boulevard and east on Veterans Drive. Alternative 4 preserves an intersection of Symmes Road and Industry Drive south of the existing intersection. To the east, Alternative 4 matches the Alternative 3 alignment. Alternative 4 raises Symmes Road over the railroad tracks. The new bridge would span the railroad slightly south of the current crossing location. The bridge would cross the tracks at an approximate 38° skew. As Alternative 4 continues east the Symmes Road intersection with Tedia Way would be maintained and a commercial drive would be constructed to maintain access to the business on Symmes Road west of Tedia Way. Alternative 4 would terminate at the current intersection of Symmes Road and North Gilmore Road. Alternative 4 is approximately 1.05 miles long.

This alternative allows for a shared-use path on the north side of Symmes Road from Hicks Boulevard on the west to North Gilmore Road on the east. A sidewalk would also

be constructed on the south side of Symmes Road from Hicks Boulevard to North Gilmore Road.

Alternative 4 is shown in BLUE on Figure 2 below.

3.2 Alternatives for North Gilmore Road Crossing

3.2.1 Alternatives Dismissed

None

3.2.2 Alternatives Considered

3.2.2.1 NO-BUILD ALTERNATIVE

Under the no build alternative, there would be no significant improvement in safety at the North Gilmore Road highway railway crossing. If the no-build alternative is chosen, the team recommends safety upgrades to the North Gilmore Road crossing such as lighting, LED conversion of the signalized crossing gates, and remote health monitoring. These improvements in and of themselves will not satisfy the purpose and need of the project.

3.2.2.2 ALTERNATIVE 1: CROSSING ELIMINATION

Alternative 1 would close North Gilmore Road on both sides of the railroad to eliminate vehicular/train conflicts. A cul-de-sac would be constructed at the north approach to the railroad. The southern approach of North Gilmore Road would be realigned and merged into Busway Lane.

Alternative 1 is shown in Orange on Figure 2.

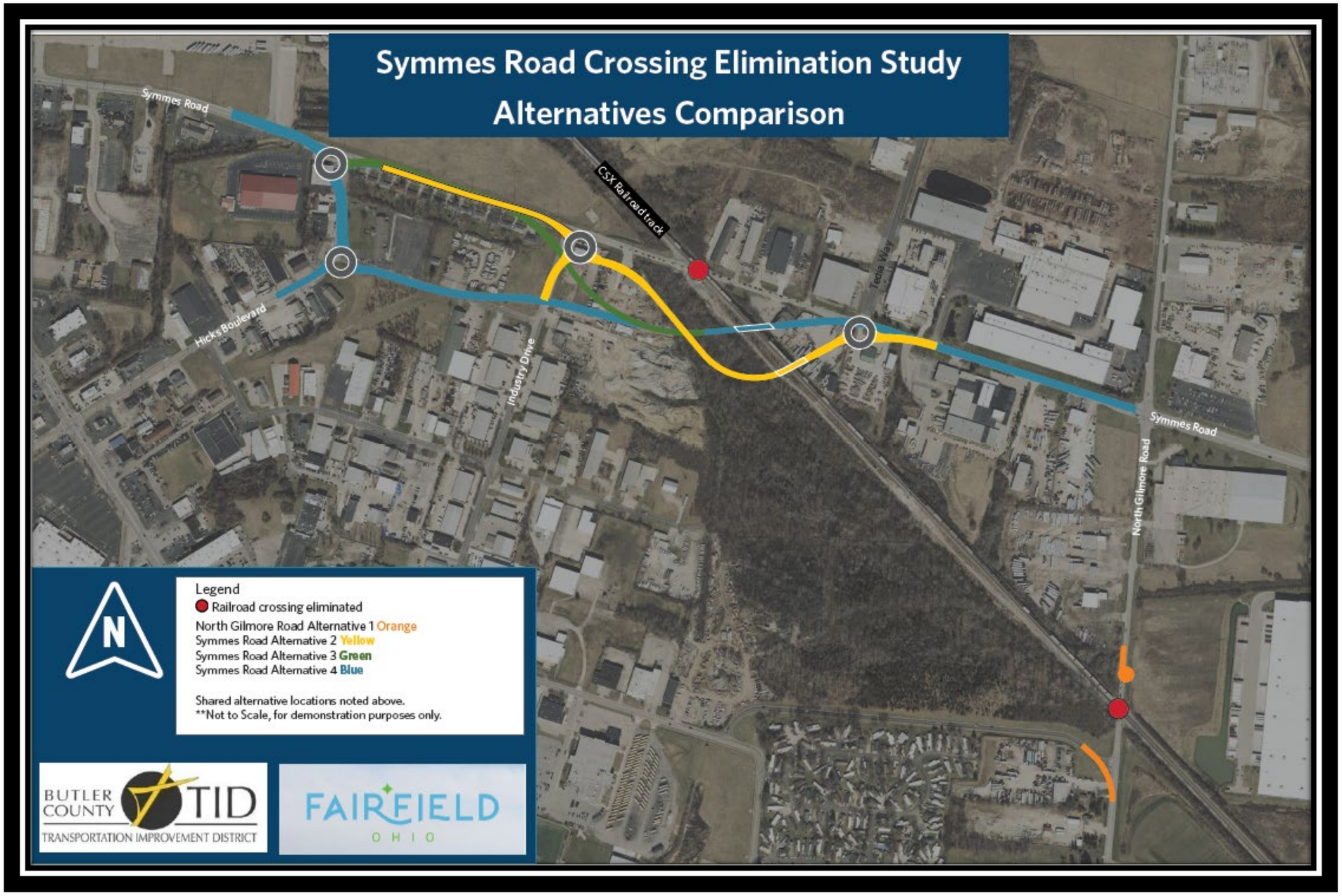

Figure 2: Comparison of Alternatives

4 Key Issues

This section describes the technical studies and information gathered as part of the alternative evaluation process.

4.1 Crash Analysis

A crash analysis was conducted of the most recent 3 years of available crash data from the Ohio Department of Transportation (ODOT) Crash Analysis Tool. The crash data has been summarized below with the full crash data and collision diagrams included in **Appendix A**.

A crash analysis was conducted for the study corridor for the years 2022 to 2024. The results from the crash study have been summarized in Table 1 below. For the study corridor, there were 103 total crashes. 78 (76%) of these crashes occurred at an intersection, and 23 (30%) of those resulted in an injury. Although out of the study range, There were 2 fatalities in 2014 and 2015 at the Symmes Road/North Gilmore Road intersection. The hot spots for crashes within the corridor are Dixie Way, North Gilmore Road, and the At-Grade Crossing on Symmes Road.

According to the crash analysis, the top three crash types were rear end, angle, and left turn. Thirty (29%) crashes that occurred were rear ends, 14 (14%) were angle, and 9 (9%) were left turn. Of the 30 rear end crashes, 5 were located at the At-Grade Crossing on Symmes Road. The removal of the crossing would eliminate these crashes. It is also important to note that the surrounding intersections, Industry Drive and Tedia Way, also have rear end cases, likely the result of congestion due to the At-Grade Crossing on Symmes Road. The elimination of the Symmes Road crossing has the potential to prevent approximately 4 crashes per year.

Furthermore, the North Gilmore Road crossing is ranked within the top 10% most hazardous crossings nationwide according to the Federal Rail Administration (FRA) Accident Prediction and Severity (APS) model. Based on FRA Rail Crossing Inventory Data, the North Gilmore Road crossing has resulted in eleven (11) crashes, including eight (8) fatalities over the history of the FRA Grade Crossing Inventory.

Table 1: Symmes Road Corridor Crash Summary (without animal crashes), 2022-2024

	Total	Injury (%)	Notes
Dixie Way (SR4)	44	15 (34%)	16 Rear End, 14 Angle, 9 Left Turn
Hicks Blvd	3	0	All 3 NB on Hicks
Industry Dr	6	2 (33%)	3 Rear Ends
At Grade Crossing	6	1 (16%)	5 Rear Ends
Tedia Way	6	2 (33%)	3 Rear Ends
N Gilmore Rd	13	3 (23%)	3 Rear Ends, 3 Angle, Fatality in 2014 and 2015
Intersections Total	78	23 (30%)	
Segments	25	5 (20%)	Turns out of drives and loss of vehicle control
Corridor Total	103	28 (27%)	

A summary of the overall crashes for the Symmes Road study corridor is shown below in Figure 3.

Figure 3: Crash Analysis Overview (2022-2024)

4.1.1 Symmes Road Alternatives

The no-build alternative will not address the safety issues with the at-grade railroad crossings.

The build alternatives will address the car/train and rear-end crashes currently occurring at the Symmes Road railroad crossing and North Gilmore Crossing. Additional safety benefits of the build alternatives include capacity improvements at the Symmes Road/North Gilmore Road intersection. These improvements include re-configuring the westbound approach to include one left-turn lane, one through lane, and one shared through/right-turn lane. Another safety benefit is the addition of a shared use path and a sidewalk along the entire project length.

4.1.1.1 ALTERNATIVE 2

Alternative 2 replaces two traditional three-way intersections with roundabouts. Roundabouts have a higher safety rating than traditional intersections and should improve safety in the project area.

4.1.1.2 ALTERNATIVE 3

Alternative 3 replaces one traditional three-way intersection with a roundabout. Roundabouts have a higher safety rating than traditional intersections and should improve safety in the project area. Alternative 3 also eliminates two intersections in the project area which should have a significant safety benefit.

4.1.1.3 ALTERNATIVE 4

Alternative 4 replaces two traditional three-way intersections with roundabouts. Roundabouts have a higher safety rating than traditional intersections and should improve safety in the project area. Alternative 4 also eliminates two intersections in the project area which should have a significant safety benefit.

4.2 Traffic Analysis

4.2.1 Certified Traffic

The process used to develop certified existing and future traffic volumes is outlined in the ODOT Analysis and Traffic Simulation (OATS) Manual and the ODOT Ohio Traffic Forecasting Manual. The assumed 'Opening Year' for the study has been set for 2028 with a 'Design Year' of 2048 (20-year design criteria).

Detailed turning movement counts were performed at the five (5) project intersections on Thursday May 9, 2024. The study intersections included Symmes Road and Hicks Boulevard, SR 4 (Dixie Highway), Industry Drive, Tedia Way, and North Gilmore Road. Reports of the counts, along with plates, can be found in **Appendix B**. Based on a review of the counts, the AM and PM peak periods are set at 7:15 am—8:15 am, and 4:30 pm—5:30 pm, respectively.

The Average Daily Traffic (ADT) volumes were developed by factoring the raw turning movement counts at each intersection with daily and seasonal adjustment factors obtained from ODOT's webpage. The daily factors are dependent upon the functional classification of the roadway as well as the specific hours that the traffic count was performed. The seasonal adjustment factors are determined by the functional classification of the roadway, the day of the week and the month that the traffic count was performed.

Design hour volumes (DHVs) were developed for the study area using the peak hour to design hour factors that are published by the ODOT Office of Statewide Planning and Research. The design hour factors utilized to develop the DHVs are dependent upon the roadway's functional classification as well as the day of the week and month the count was performed. These design hour factors were then applied to the raw movement counts.

The ADT and design hour volumes were rounded to the nearest ten. Additional traffic was added to the roadway network during the design hours to ensure that all movements show a minimum of 10 vehicles.

Developing the future traffic volumes involves developing a proposed growth rate based on historical traffic volume data. The historical data was extracted from TIMS for the study area, and the results are shown in **Table 2**. The data covers 18 years of growth patterns, from 2005 to 2023. The highest increase was in 2021 (5%), and the largest decrease was in 2015 (-12%). The average growth rate over this span of 18 years is −1%. However, after a detailed review of the historical growth rates for the

study area, it was determined that a 0.5% per year growth rate (Background) was appropriate for the area due to anticipated future growth.

Table 2: Historical Traffic Volumes from ODOT TIMS

Year	ADT	Growth	Year	ADT	Growth
2023	18251	2%	2013	19975	-3%
2022	17964	0%	2012	20550	0%
2021	17964	5%	2011	20591	-1%
2020	17141	-7%	2010	20841	-1%
2019	18511	1%	2009	21073	1%
2018	18382	1%	2008	20844	-2%
2017	18218	3%	2007	21226	0%
2016	17758	4%	2006	21311	0%
2015	17042	-12%	2005	21247	
2014	19476	-2%		AVERAGE =	-1%

In addition to the anticipated background growth in the study area, the removal of the at-grade railroad crossing and the associated traffic delays that result will lead to increased traffic along Symmes Road. Traffic that avoids the area due to the at-grade crossing delays will reroute and now use the Symmes Road corridor.

There are also several planned developments, including a 200,000 SF speculative industrial building at the former GM Fisher Body site (representing 500,000 SF added to the site in the last three years); the ongoing expansions of major regional employers Koch Foods, Pacific Manufacturing, and ThyssenKrupp Bilstein; construction of two new commercial buildings within the Jungle Jim's International Market complex; and occupation of several speculative industrial developments near completion including Seward Point Commerce Park, Fairfield Logistics Park, and Fairfield Trade Center.

The City recently purchased several small, vacant, and underperforming properties on Route 4 that will be made available as a larger eight (8) acre parcel to incentivize new development.

Finally, two large land sites on Tedia Way (104 acres) and Busway Lane (53 acres) are attracting attention for new development and have immediate proximity to the railroad crossing. Based on this information it was determined that an additional 0.5%/year growth rate (Build) was appropriate for the area due to rerouted traffic and anticipated future development.

Included in the traffic plates are the TD, T24 values for each of the roadways within the study area. Design designations were calculated based on the existing traffic counts collected within the study area and are shown in **Table 3**.

Table 3: Design Designations for Symmes Road

	west of Dixie	east of Dixie	west of Hicks	east of Hicks	west of Industry	east of Industry	west of Tedia	east of Tedia	west of Gilmore	east of Gilmore
2028 ADT:	13,230	12,610	12,060	14,370	14,270	14,340	14,510	14,430	14,740	20,340
2048 ADT:	16,130	15,380	14,710	17,530	17,400	17,500	17,700	17,610	17,990	24,820
K:	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.10	0.09
2048 DHV:	1,610	1,500	1,490	1,800	1,780	1,850	1,900	1,880	1,760	2,330
D:	0.74	0.74	0.70	0.68	0.68	0.67	0.65	0.66	0.63	0.64
T24:	0.02	0.02	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
TD:	0.01	0.06	0.02	0.05	0.04	0.04	0.04	0.04	0.05	0.04

According to ODOT's *Ohio Traffic Forecasting Manual*, this project does not require a formal review by ODOT. The BCTID/City of Fairfield approved the certified traffic on September 5, 2024.

The full certified traffic memo can be found in **Appendix B**.

4.2.2 Capacity Analysis

Capacity analysis was performed at the study intersections for the design year (2048) no-build and build AM and PM peak hour scenarios. Synchro 11 was used for the analysis of the signalized and stop-controlled intersections, and HCS 2024 software was used for the analysis of the proposed roundabout which utilizes the methodology outlined in the Highway Capacity Manual (HCM).

To evaluate the performance of the study intersections under different scenarios, numerical outputs from the capacity analysis served as key Measures of Effectiveness (MOEs). A widely recognized MOE is Level of Service (LOS), which is commonly used by transportation agencies to evaluate traffic operations. LOS is categorized into six levels, ranging from A to F, where A represents the best operating conditions and F indicates the worst. For signalized, unsignalized, and roundabout intersections, LOS is defined by the average control delay per vehicle, which corresponds directly to driver discomfort, frustration, fuel consumption, and lost travel time. Table 4 below outlines the LOS thresholds as defined in the HCM:

Table 4: LOS Thresholds for Signalized and Un-signalized Intersections

	Control Delay per Vehicle (seconds)	
LOS	Signalized Intersections	Unsignalized Intersections
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50

However, while LOS offers valuable insights into traffic performance, it alone does not always provide a complete picture of the overall facility performance. Consequently, additional performance metrics were included in the analysis to better assess the study intersections and network. In accordance with ODOT Analysis and Traffic Simulation Manual (OATS), several other key performance indicators were evaluated, including 95th percentile queue lengths, volume-to-capacity (v/c) ratios, and queue-storage ratios (QSR). Table 5 below highlights the operational goals for various intersection types (AWSC, TWSC, Roundabout, Signalized) based on their locations within or outside of an MPO (Metropolitan Planning Organization):

Table 5: Traffic Operation Goals (Source: OATS Manual)

Operational Goals (As Per OATS Manual)

Result	Inside An MPO	Outside of an MPO
Intersection LOS	D or better[1]	C or better[1]
Approach LOS	E or better[1]	
Control LOS	E or better[1]	
v/c[2]	All movements < 1.0 with ≤ 0.93 preferred	
QSR[3]	All movements < 1.0	

1: LOS is acceptable if QSR < 1.0; 2: v/c = Volume-to-Capacity ratio; 3: QSR = Queue-Storage ratio

The capacity analysis results at the study intersections under the design year (2048) no-build and build AM and PM peak hour volume scenarios are summarized below. The detailed capacity analysis reports are included in **Appendix C**.

4.2.2.1 OLD SYMMES ROAD AND HICKS BOULEVARD

4.2.2.1.1 No-Build

The existing intersection of Hicks Boulevard and Symmes Road will operate at an overall LOS A in the design year 2048 AM and PM peak hour scenarios. The northbound approach at this intersection is expected to operate at LOS D and LOS C in the same year during AM and PM peak hour scenarios. The no-build traffic analysis is shown in **Table 6**.

Table 6: Design Year (2048) No-Build Capacity Analysis Summary-Intersection of Old Symmes Road and Hicks Boulevard

	2048 AM Peak No-Build (Minor Approach Stop-Controlled)					2048 PM Peak No-Build (Minor Approach Stop-Controlled)				
	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)
EBTR	-	-	-	-	-	-	-	-	-	-
EB Approach	-	-	-		-	-	-	-	-	-
WBL	B	10.8	0.22	0.15	20	A	9.2	0.21	0.15	20
WBT	-	-	-	-	-	-	-	-	-	-
WB Approach	A	3.2	-	-	-	A	1.9	-	-	-
NBLR	D	29.7	0.5	0.17	77.5	C	20.4	0.4	0.10	47.5
NB Approach	D	29.7	-	-	-	C	20.6	-	-	-
Intersection	A	4.4	-	-	-	A	3.0	-	-	-

4.2.2.1.2 Alternative 2 Roundabout Design South Bridge

Alternative 2 will not change the intersection layout of the Hicks Boulevard and Symmes Road intersection. This intersection will operate the same as the no build condition during the design year. It will operate at overall LOS A in the design year 2048. The northbound approach at this intersection is expected to operate at LOS D and LOS C in the same year during AM and PM peak hour scenarios.

4.2.2.1.3 Alternative 3 roundabout design north bridge intersection improvements

Alternative 3 constructs a roundabout at the intersection of Hicks Boulevard and Symmes Road. All roundabout movements are expected to operate at LOS A in the 2048 AM and PM peak hour build scenarios as indicated in **Table 7**.

Table 7: Design Year (2048) Build Capacity Analysis Summary-Intersection of Old Symmes Road and Hicks Boulevard-Alternative 3

	2048 AM Peak Build (Alternative 3 Roundabout)					2048 PM Peak Build (Alternative 3 Roundabout)				
	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)
EBT	A	6.7	0.37	0.03	43.5	A	5.7	0.24	0.02	25.6
EBTR	A	7.3	0.41	0.04	53.8	A	6.0	0.27	0.02	28.2
EB Approach	A	7.0	-	-	-	A	5.9	-	-	-
WBLT	A	4.3	0.20	0.02	17.9	A	7.2	0.46	0.06	64.0
WBT	A	4.5	0.22	0.02	20.5	A	8.0	0.52	0.07	79.4
WB Approach	A	4.4	-	-	-	A	7.6	-	-	-
NBLR	A	8.6	0.25	0.06	25.6	A	5.8	0.17	0.12	55.0
NB Approach	A	8.6	-	-	-	A	5.8	-	-	-
Intersection	A	6.3	-	-	-	A	7.0	-	-	-

4.2.2.1.4 Alternative 4 twin roundabout design north bridge intersection improvements

Alternative 4 realigns Symmes Road (includes re-distributed traffic volumes) and constructs a proposed roundabout at the Hicks Boulevard/Symmes Road intersection. All roundabout movements are expected to operate at LOS A in the 2048 AM and PM peak hour build scenarios as indicated in **Table 8**.

Table 8: Design Year (2048) Build Capacity Analysis Summary-Intersection of Old Symmes Road and Hicks Boulevard

	2048 AM Peak Build (Alternative 4 Roundabout)					2048 PM Peak Build (Alternative 4 Roundabout)				
	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)
EBTR	A	5.3	0.31	0.02	32.5	A	4.2	0.19	0.01	17.5
EBR	A	5.7	0.35	0.03	40.0	A	4.4	0.21	0.02	20.0
EB Approach	A	5.5	-	-	-	A	4.3	-	-	-
WBLT	A	3.8	0.01	-	0.0	A	7.1	0.02	0.00	2.5
WB Approach	A	3.8	-	-	-	A	7.1	-	-	-
NBL	A	3.9	0.16	0.03	15.0	A	6.8	0.43	0.12	55.0
NBLR	A	3.8	0.14	0.03	12.5	A	6.2	0.38	0.10	45.0
NB Approach	A	3.8	-	-	-	A	6.5	-	-	-
Intersection	A	5.0	-	-	-	A	5.8	-	-	-

4.2.2.2 REALIGNED SYMMES ROAD AND HICKS BOULEVARD

Alternative 4 proposes to realign Symmes Road along the existing Veterans Drive creating an additional roundabout at the existing intersection of Hicks Boulevard. While this intersection was not analyzed for all alternatives, it was evaluated for Alternative 4 because of the reconfiguration of Symmes Road. The proposed roundabout at this intersection is expected to operate at a LOS A or better in 2048 AM and PM build scenarios, as indicated in **Table 9.**

Table 9: Design Year (2048) Build Capacity Analysis Summary–Intersection of Symmes Road and Hicks Boulevard

	2048 AM Peak Build (Roundabout)					2048 PM Peak Build (Roundabout)				
	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)
WBLR	A	4.6	0.22	0.02	23	A	8.0	0.50	0.07	74.2
WBR	A	4.9	0.3	0.02	25.0	A	9.1	0.56	0.09	92.5
WB Approach	A	4.8	-	-	-	A	8.6	-	-	-
NBTR	B	10.5	0.4	0.06	43.5	A	7.6	0.32	0.05	35.8
NB Approach	B	10.5	-	-	-	A	7.6	-	-	-
SBL	A	8.3	0.45	0.13	60.0	A	6.5	0.29	0.07	30.0
SBLT	A	7.6	0.40	0.11	47.5	A	6.1	0.26	0.06	25.0
SB Approach	A	7.9	-	-	-	A	6.3			
Intersection	A	7.2	-	-	-	A	7.9	-	-	-

4.2.2.3 SYMMES ROAD AND INDUSTRY DRIVE

4.2.2.3.1 No-Build

The existing intersection of Industry Drive and Symmes Road will operate at an overall LOS A in the design year 2048 AM and PM peak hour scenarios. The northbound approach at this intersection is expected to operate at LOS F in the same year during AM and PM peak hour scenarios. The no-build traffic analysis is shown in **Table 10**.

Table 10: Design Year (2048) No-Build Capacity Analysis Summary-Intersection of Symmes Road and Industry Drive

	2048 AM Peak No-Build (Minor Approach Stop-Controlled)					2048 PM Peak No-Build (Minor Approach Stop-Controlled)				
	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)
EBTR	-	-	-	-	-	-	-	-	-	-
EB Approach	-	-	-	-	-	-	-	-		-
WBLT	B	11.0	0.1	0.02	10.0	A	9.0	0.1	0.01	7.5
WB Approach	-	-	-	-	-	-	-	-	-	-
NBLR	F	53.9	0.5	0.16	70.0	F	121.8	1.0	0.39	170
NB Approach	F	54.9	-	-	-	F	121.8	-	-	-
Intersection	A	3.2	-	-	-	A	9.4	-	-	-

4.2.2.3.2 Alternative 2 Roundabout Design South Bridge

Alternative 2 will construct a roundabout at the intersection layout of Industry Drive and Symmes Road. All roundabout movements are expected to operate at LOS A in the 2048 AM and PM peak hour build scenarios as indicated in Table 11.

Table 11: Design Year (2048) No-Build Capacity Analysis Summary-Intersection of Symmes Road and Industry Drive-Alternative 2

	2048 AM Peak Build (Alternative 2 Roundabout)					2048 PM Peak Build (Alternative 2 Roundabout)				
	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)
EBT	A	6.4	0.37	0.04	46.1	A	4.7	0.22	0.02	23.0
EBTR	A	7.0	0.42	0.05	53.8	A	5.0	0.25	0.02	25.6
EB Approach	A	6.7	-	-	-	A	4.9	-	-	-
WBLT	A	4.5	0.22	0.01	20.5	A	7.5	0.47	0.04	66.6
WBT	A	4.8	0.25	0.02	25.6	A	8.5	0.54	0.05	84.5
WB Approach	A	4.7	-	-	-	A	8.0	-	-	-
NBLR	A	7.4	0.13	0.02	10.2	A	6.0	0.16	0.04	15.4
NB Approach	A	7.4	-	-	-	A	6.0	-	-	-
Intersection	A	6.0	-	-	-	A	7.0	-	-	-

4.2.2.3.3 Alternative 3 Roundabout Design North Bridge Intersection Improvements

Alternative 3 closes the Industry Drive and Symmes Road intersection. No capacity analysis was performed for the intersection closure. It is expected that vehicles currently using this intersection will access Symmes Road from Hicks Boulevard.

4.2.2.3.4 Alternative 4 Twin Roundabout Design North Bridge Intersection Improvements

Alternative 4 relocates the Industry Drive and Symmes Road intersection turning it into a four leg, two-way stop-controlled intersection. The intersection is expected to operate at an overall LOS A in the 2048 AM and PM peak hour build scenarios as indicated in Table 12.

Table 12: Design Year (2048) No-Build Capacity Analysis Summary-Intersection of Symmes Road and Industry Drive-Alternative 4

	2048 AM Peak Build (Alternative 4 -Minor Approach Stop-Controlled)					2048 PM Peak Build (Alternative 4 - Minor Approach Stop-Controlled)				
	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)
EBLT	-	-	-	-	-	-	-	-	-	-
EBT	-	-	-	-	-	-	-	-	-	-
EB Approach	-	-	-	-	-	-	-	-		-
WBT	-	-	-	-	-	-	-	-		-
WBTR	-	-	-	-	-	-	-	-	-	-
WB Approach	-	-	-	-	-	-	-	-	-	-
SBLR	C	18.4	0.1	0.05	5.0	E	40.4	0.02	0.15	170
SB Approach	C	18.4	-	-	-	E	40.4	-	-	-
Intersection	A	0.4	-	-	-	A	0.5	-	-	-

4.2.2.4 SYMMES ROAD AND TEDIA WAY

4.2.2.4.1 No-Build

The existing intersection of Industry Drive and Symmes Road will operate at an overall LOS A in the design year 2048 AM and PM peak hour scenarios. The northbound (driveway) and southbound approaches at this intersection is expected to operate at LOS E and LOS D, respectively, in the same year during AM peak hour. During the PM peak hour, both approaches are expected to operate at LOS F. The no-build traffic analysis is shown in **Table 13**.

Table 13: Design Year (2048) No-Build Capacity Analysis Summary-Intersection of Symmes Road and Tedia Way

	2048 AM Peak No-Build (Minor Approach Stop-Controlled)					2048 AM Peak No- Build (Minor Approach Stop-Controlled)				
	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)
EBL	A	8.9	0.04	0.00	2.5	B	11.0	0.05	0.01	5
EB Approach	A	0.3	-	-	-	A	0.6	-	-	-
WBL	B	10.1	0.02	0.00	0.0	A	8.7	0.01	0.00	0.0
WB Approach	A	0.2	-	-	-	A	0.1	-	-	-
NBLTR	F	58.3	0.33	0.65	32.5	F	91.1	0.46	0.90	45
NB Approach	F	58.3	-	-	-	F	91.1	-	-	-
SBL	F	92.5	0.40	0.27	30.0	F	147.5	0.59	0.52	57.5
SBTR	D	26.2	0.16	0.01	15.0	E	41.6	0.39	0.02	42.5
SB Approach	F	56.0	-	-	-	F	76.2	-	-	-
Intersection	A	3.3	-	-	-	A	5.5	-	-	-

4.2.2.4.2 Alternative 2 Roundabout Design South Bridge

Alternative 2 will construct a roundabout at the intersection layout of Tedia Way and Symmes Road. All roundabout movements are expected to operate at LOS A in the 2048 AM and PM peak hour build scenarios as indicated in **Table 14**.

Table 14: Design Year (2048) Build Capacity Analysis Summary-Intersection of Symmes Road and Tedia Way-Alternative 2

	2048 AM Peak Build (Alternative 2 Roundabout)					2048 PM Peak Build (Alternative 2 Roundabout)				
	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)
NEBLT	A	3.2	0.03	0.00	2.6	A	3.2	0.03	0.00	2.6
NEBTR	B	12.0	0.72	0.12	194.1	A	8.3	0.54	-	97.1
NEB Approach	A	11.7	-	-	-	A	8.1	-	-	-
WBLT	A	4.9	0.25	0.02	31.0	A	8.1	0.52	0.07	96.3
WBTR	A	4.9	0.25	0.02	31.0	A	8.1	0.52	0.07	96.3
WB Approach	A	4.9	-	-	-	A	8.1	-	-	-
NWBLTR	A	7.5	0.08	0.01	6.3	A	6.0	0.43	0.01	5.3
NWB Approach	A	7.5	-	-	-	A	6.0	-	-	-
SBLTR	A	5.5	0.08	0.01	7.3	B	12.3	0.19	0.03	14.8
SB Approach	A	5.5	-	-	-	B	12.3	-	-	-
EBLTR	A	5.4	0.06	0.01	4.9	B	11.3	0.12	0.02	8.5
EB Approach	A	5.4	-	-	-	B	11.3	-	-	-
Intersection	A	8.7	-	-	-	A	8.2	-	-	-

4.2.2.4.3 Alternative 3 Roundabout Design North Bridge Intersection Improvements

Alternative 3 closes the Tedia Way and Symmes Road intersection. No capacity analysis was performed for the intersection closure. It is expected that vehicles currently using this intersection will access Symmes Road or North Gilmore Road from Bohlke Boulevard.

4.2.2.4.4 Alternative 4 Twin Roundabout Design North Bridge Intersection Improvements

Alternative 4 closes the Tedia Way and Symmes Road intersection. No capacity analysis was performed for the intersection closure. It is expected that vehicles currently using this intersection will access Symmes Road or North Gilmore Road from Bohlke Boulevard.

4.2.2.5 SYMMES ROAD AND NORTH GILMORE ROAD

As illustrated in **Table 15**, the overall intersection is expected to operate at LOS B with all the approaches operating at LOS D or better in the 2048 AM and PM peak no-build scenarios.

Table 15: Design Year (2048) No-Build Capacity Analysis Summary-Intersection of Symmes Road and North Gilmore Road

	2048 AM Peak No-Build (Signal, 75s)					2048 AM Peak No-Build (Signal, 80s)				
	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)
EBL	B	16.0	0.15	0.25	30	D	37.8	0.46	0.52	62.5
EBT	B	11.2	0.53	0.26	202.5	A	8.9	0.32	0.15	115
EBTR	B	11.2	0.53	0.25	200	A	8.9	0.32	0.15	115
EB Approach	B	11.5	-		-	B	11.6	-		-
WBL	C	32.7	0.72	1.88	187.5	B	16.1	0.5	1.28	127.5
WBT	B	11.0	0.51	0.09	197.5	C	23.1	0.88	0.24	512.5
WBR	A	8.0	0.09	0.01	22.5	B	10.8	0.53	0.08	182.5
WB Approach	B	16.5	-		-	B	18.7	-		-
NBL	C	30.4	0.48	1.13	107.5	C	31.8	0.35	0.82	77.5
NBT	C	22.1	0.30	0.06	90	C	27.1	0.53	0.13	182.5
NBR	C	22.5	0.34	0.88	87.5	C	26.9	0.51	1.48	147.5
NB Approach	C	25.0	-		-	C	27.8	-		-
SBL	D	48.7	0.84	3.43	257.5	D	37.9	0.57	1.50	112.5
SBTR	C	23.3	0.44	0.07	137.5	C	26.0	0.44	0.08	142.5
SB Approach	D	37.3	-	-	-	C	30.6	-	-	-
Intersection	B	19.5	-	-	-	B	19.9	-	-	-

All build alternatives have the same roadway and intersection configuration for the North Gilmore Road and Symmes Road intersection. As part of the 2048 AM and PM peak hour build scenario analysis, it is recommended that the westbound approach be reconfigured to include one left-turn lane, one through lane, and one shared through/right-turn lane. As illustrated in **Table 16**, the overall intersection is expected to operate at LOS B during the 2048 AM peak hour build scenario, with all approaches operating at LOS C or better. During the 2048 PM peak hour build scenario, the overall intersection is expected to operate at LOS C, with all approaches also operating at LOS C or better.

Table 16: Design Year (2048) Build Capacity Analysis Summary-Intersection of Symmes Road and North Gilmore Road

	2048 AM Peak No-Build (Signal, 80s)					2048 AM Peak No-Build (Signal, 90s)				
	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)	LOS	Delay (sec/veh)	v/c	QSR	95% Queue Length (ft.)
EBL	C	23.5	0.25	0.29	35.0	E	64.3	0.72	0.54	64.5
EBT	B	18.4	0.71	0.17	245.0	A	8.7	0.33	0.09	125.0
EBTR	B	18.3	0.74	0.17	252.5	A	8.7	0.33	0.09	130.0
EB Approach	B	18.6	-	-	-	B	13.6	-	-	-
WBL	C	24.1	0.07	0.08	7.5	B	10.8	0.03	0.05	5.0
WBT	B	16.6	0.61	0.09	200.0	C	23.7	0.90	0.25	535.0
WBR	B	16.7	0.61	0.09	197.5	D	41.9	0.98	0.33	722.5
WB Approach	C	16.8	-	-	-	C	32.7	-	-	-
NBL	B	13.0	0.04	0.11	10	C	25.2	0.04	0.11	10.0
NBT	B	12.2	0.02	0.00	5.0	C	23.5	0.03	0.01	7.5
NBR	B	12.2	0.02	0.05	5.0	C	23.6	0.03	0.08	7.5
NB Approach	B	12.6	-	-	-	C	24.1	-	-	-
SBL	C	23.2	0.76	3.70	277.5	C	32.5	0.70	3.13	235.0
SBTR	B	12.4	0.07	0.01	17.5	C	24.2	0.13	0.02	35.0
SB Approach	C	22.3	-	-	-	C	31.2	-	-	-
Intersection	B	18.6	-	-	-	C	27.6	-	-	-

4.3 Roadway Design Issues

Roadway design criteria, including design designations for each roadway were developed for the project and approved by The BCTID/City of Fairfield and the FRA on December 13, 2024. Design Designations can be seen in **Table 17** below and the full Basis of Design Document can be found in **Appendix D** The following design standards were used for roadway design.

- ODOT Location & Design Manual, Volume 1 (L&D)
- Butler County Thoroughfare Plan 2007 (Updated 2017)
- Fairfield Forward–City of Fairfield Comprehensive Plan
- Fairfield Connects–City of Fairfield Connectivity Plans
- City of Fairfield Standard Construction Drawings
- City of Fairfield Design Construction and Materials Handbook

Table 17: Design Designations

Design Designations							
Design Designation	**Symmes Rd**	**S.R. 4 (Dixie Hwy)**	**Hicks Blvd**	**Industry Dr**	**Tedia Way**	**N Gilmore Rd**	**Reference**
Current ADT (2028)	14,450	25,960	3,250	1,910	580	6,850	Design Traffic
Design Year ADT (2048)	15,970	28,690	3,600	2,110	640	7,570	Design Traffic
Design Hourly Volume (2048)	1,690	2,530	390	200	120	240	Design Traffic
Directional Distribution	74%	62%	67%	65%	50%	50%	Design Traffic
Trucks (24 hour B&C)	4%	3%	2%	2%	2%	2%	Design Traffic
Design Speed	40	40	30	30	30	30	L&D Section 104.2
Legal Speed	35	35	25	25	25	35	Posted Speed Limit
Design Functional Classification	Urban Minor Arterial	Urban Principal Arterial	Local	Local	Local	Urban Minor Arterial	ODOT Functional Classification Maps
NHS Project	No	Yes	No	No	No	No	FHWA National Highway System - Ohio

4.3.1 Symmes Road Alternatives

4.3.1.1 NO-BUILD

There are no existing geometric deficiencies with the current Symmes Road, however, the existing two-lane typical section does create a blockage for through traffic in the corridor when vehicles are turning left at intersections and multiple driveways.

4.3.1.2 ALTERNATIVE 2 ROUNDABOUT DESIGN SOUTH BRIDGE

The alternative 2 conceptual design is discussed in section 3.1.2.2. Plan, Profile, Cross Sections and Typical sections depicting Alternative 2 can be found in **Appendix E**.

At the west approach to the new roundabout at the intersection of Symmes Road and Industry Drive, Symmes Road will be widened from a three-lane typical section to a four-lane section matching the existing three-lane typical section and adding a splitter island to the center turn lane at the roundabout. The newly constructed section of Symmes Road between the intersection at Industry Drive and the intersection at Tedia Way will be a four-lane typical section with splitter islands developed at the roundabout approaches. East of the roundabout intersection at

Tedia Way, Symmes Road will be a five-lane typical section with two-lanes in both the eastbound and westbound directions and a center two way left turn lane.

Reconstructed Symmes Road will feature 11' traffic lanes, per the Butler County TID Thoroughfare Plan typical section requirements for Urban Curb and Gutter Sections on Minor Arterial Roads. The 8' paved shoulder recommendation in the Thoroughfare Plan has been replaced with an ODOT Type 2 curb and gutter to reduce the overall footprint of the project and reduce pavement and earthwork costs.

Horizontal curvature approaching the roundabouts at all legs is designed to provide a normal crown curve at a 30 MPH design speed. This is lower than the 45 mph design criteria, however speed reduction curvature is a recommended design practice for roundabout intersections. This reduction in horizontal design speed is also reflected in the vertical profile of Symmes Road. The profile curves at the roundabout approaches and over the CSX Railroad crossing are designed for a 30 MPH design speed. This reduction in profile design speed allows the bridge approaches to be designed using the 5% max grade requirement and reduce the required embankment. This reduction in design speed does not require a documented design exception since the since the design speed of Symmes Road is under 50 MPH. The profile of Symmes Road to the east of the grade separation will follow the existing pavement grade to allow for overlay and widening construction at the approach to the intersection with North Gilmore Road.

In addition to the abutment walls at the bridge over the CSX Railroad, retaining walls will be required on the reconstructed approach to the roundabout intersection along Tedia Way, and Commercial Drive 1 as shown the plan sheets in Appendix E. The Tedia Way wall has a maximum exposed height of 10 feet and is approximately 115' long. The wall along Commercial Drive 1 has a maximum height of eight feet and is approximately 175' long. These walls are needed to eliminate embankment intrusion onto commercial parking lots and structures to remain. The design of these retaining walls will be completed during final design pending updated survey and geotechnical analysis.

4.3.1.3 ALTERNATIVE 3 ROUNDABOUT DESIGN NORTH BRIDGE INTERSECTION IMPROVEMENTS

The Alternative 3 conceptual design is discussed in section 3.1.2.3. Plan, Profile, Cross Sections and Typical sections depicting Alternative 3 can be found in Appendix E.

At the west approach to the new roundabout at the intersection of Symmes Road and Hicks Avenue, Symmes Road will be widened from a three-lane typical section to a four-lane section to match the existing three-lane typical section and add a splitter island to the center turn lane at the roundabout. The newly constructed section of Symmes Road between the intersection at Hicks Avenue and the intersection at North Gilmore Road will be a five-lane typical section with 2 lanes in both the eastbound and westbound directions and a center two way left turn lane while near existing grades; the center two way left turn lane will be eliminated on the approaches to the

bridge over the CSX Railroad. The existing intersection at Industry Dr will be closed and traffic will be re-routed to existing Veterans Drive. The existing intersection at Tedia Way will be closed and traffic will be diverted to North Gilmore Road.

All legs of reconstructed Symmes Road will feature 11' traffic lanes, per the Butler County TID Thoroughfare Plan typical section requirements for Urban Curb and Gutter Sections on Minor Arterial Roads. The 8' paved shoulder recommendation in the Thoroughfare Plan has been replaced with an ODOT Type 2 curb and gutter to reduce the overall footprint of the project and reduce pavement and earthwork costs.

Horizontal curvature approaching the roundabouts at all legs is designed to provide a normal crown curve at a 30 MPH design speed. This is lower than the 45 mph design criteria, however speed reduction curvature is a recommended design practice for roundabout intersections. All other horizontal curvature for Alternative 3 provides a normal crown curve at 45 MPH design speed. All vertical curves beyond the influence area of the roundabout at Hicks Avenue are designed to provide a 45 MPH design speed. The profile of Symmes road to where the alignment is on the existing footprint will follow the existing pavement grade to allow for overlay and widening construction.

In addition to the abutment walls at the bridge over the CSX Railroad, retaining walls will be required on the reconstructed western approach to the bridge over the CSX Railroad and on Commercial Drive 1 as shown the plan sheets in Appendix E. The western wall has a maximum exposed height of 15 feet and is approximately 315' long. The wall along Commercial Drive 1 has a maximum height of 15 feet and is approximately 230' long. These walls are needed to eliminate embankment intrusion onto commercial properties to remain. The design of these retaining walls will be completed during final design pending updated survey and geotechnical analysis.

4.3.1.4 ALTERNATIVE 4 TWIN ROUNDABOUT DESIGN NORTH BRIDGE INTERSECTION IMPROVEMENTS

The Alternative 4 conceptual design is discussed in section 3.1.2.4. Plan, Profile, Cross Sections and Typical sections depicting Alternative 4 can be found Appendix E.

At the west approach to the new roundabout at the intersection of Symmes Road and Hicks Avenue, Symmes Road will be widened from a three-lane typical section to a four-lane section to match the existing three-lane typical section and add a splitter island to the center turn lane at the roundabout. A new four-lane section with a splitter island will be constructed between the roundabouts at the intersection of Hicks Avenue and existing Symmes Road and at the intersection of Hicks Avenue and Veterans Drive. The newly constructed section of Symmes Road between the intersection at Hicks Avenue and Veterans Drive and the intersection at North Gilmore Road will be a five-lane typical section with 2 lanes in both the eastbound and westbound directions and a center two way left turn lane while near existing grades; the center two way left turn lane will be eliminated on the approaches to the bridge over the CSX Railroad. The existing intersection at Industry Drive will be

reconstructed as a stop-controlled intersection. The existing intersection at Tedia Way will be closed and traffic will be diverted to North Gilmore Road.

All legs of reconstructed Symmes Road will feature 11' traffic lanes, per the Butler County TID Thoroughfare Plan typical section requirements for Urban Curb and Gutter Sections on Minor Arterial Roads. The 8' paved shoulder recommendation in the Thoroughfare Plan has been replaced with an ODOT Type 2 curb and gutter to reduce the overall footprint of the project and reduce pavement and earthwork costs.

Horizontal curvature approaching the roundabouts at all legs is designed to provide a normal crown curve at a 30 MPH design speed. This is lower than the 45 MPH design criteria, however speed reduction curvature is a recommended design practice for roundabout intersections. All other horizontal curvature for Alternative 4 provides a normal crown curve at 45 MPH design speed. All vertical curves beyond the influence area of the roundabout at Hicks Avenue are designed to provide a 45 MPH design speed. The profile of Symmes Road to where the alignment is on the existing footprint will follow the existing pavement grade to allow for overlay and widening construction.

In addition to the abutment walls at the bridge over the CSX Railroad, retaining walls will be required on the reconstructed western approach to the bridge over the CSX Railroad and on Commercial Drive 1 as shown the plan sheets in Appendix E. The western wall has a maximum exposed height of 15 feet and is approximately 525' long. The wall along Commercial Drive 1 has a maximum height of 15 feet and is approximately 230' long. These walls are needed to eliminate embankment intrusion onto commercial properties to remain. The design of these retaining walls will be completed during final design pending updated survey and geotechnical analysis.

4.3.2 North Gilmore Road Alternatives

4.3.2.1 NO-BUILD

There are no existing geometric deficiencies with the current North Gilmore Road at the crossing location.

4.3.2.2 ALTERNATIVE 1

The Alternative 1 conceptual design is discussed in Section 3.2.2.2. A plan sheet depicting Alternative 1 can be found Appendix E. The southern approach to the CSX Railroad will be realigned to connect to Busway Lane. The existing three-lane section on North Gilmore Road will be tapered to a two-lane section. The roadway curvature is designed for 25 MPH. A cul-de-sac will be constructed at the northern approach to the CSX Railroad. The radius will be constructed entirely inside the existing right of way. The radius will be 40' which meets the requirements of the City of Fairfield Design Construction and Materials Handbook.

4.4 Structure Considerations

The elimination of the Symmes Road highway railway crossing will require construction of a new bridge over CSX Railroad. Structural design issues and considerations for the proposed bridge are discussed below. There are no structures proposed for the North Gilmore Road crossing elimination.

CSX Railroad has minimum requirements for outside parties constructing bridges over CSX Railroad's tracks. These requirements are intended to provide safe and continuous passage of all train traffic during and after construction of bridges over its tracks. The *CSX Railroad Public Projects Information Manual*, including but not limited to the Overhead Bridge Criteria Appendix, provides information on the CSX Railroad requirements for overhead bridges. The proposed bridge structure for this project will be developed in accordance with the latest editions of the *AASHTO LRFD Bridge Design Specifications* and the *ODOT Bridge Design Manual*. The full Basis of Design Document was approved by the BCTID/City of Fairfield and the FRA on December 13, 2024, and can be found in Appendix D.

The proposed horizontal alignment for Alternative 2 crosses the existing CSX Railroad tracks farther south than the proposed alignment for Alternatives 3 and 4. Alternatives 3 and 4 over the CSX Railroad tracks have the same crossing location and bearing, so the proposed bridge is assumed to be the same for these alternatives. Coordination with CSX is still ongoing. The plans found in Appendix E are being submitted to CSX Railroad for review concurrently with FRA review of the Draft Feasibility Study. CSX Railroad needs to officially approve the proposed bridge span over their tracks.

The proposed bridge for alternatives 2, 3 and 4 is assumed to be a single span structure of approximately the same width. The proposed bridge abutments are anticipated to be full height cast-in-place concrete wall type abutments on deep pile foundations, constructed parallel to the centerline of tracks and parallel to the east CSX Railroad right of way line. The east abutment will be set so that the entire abutment, including footing, is outside of the existing right of way. The location of the west abutment will be established by measuring perpendicular from the centerline of the existing western track 15'-0" to the centerline of a future track and then another 25'-0" to the face of the proposed abutment. This provides room for a 12'-0" wide future access road between the future track and the proposed abutment. Even though the bridges for Alternative 2 and Alternatives 3 and 4 both span the same area, the proposed span lengths will be different due to the skew of the proposed alignments crossing the tracks. For Alternative 2, the skew will be approximately 15-degrees so the span length will be around 98'; while for Alternatives 3 and 4, the skew will be approximately 38-degrees resulting in about a 120' bridge span.

For Alternative 2, the proposed bridge will carry four 11'-0" wide traffic lanes, two in each direction, and two 2'-0" outside shoulders to the face of curb, for a 48'-0" roadway width. For Alternatives 3 and 4, the proposed bridge will carry five 11'-0" wide lanes due to the center turn lane, and two 2'-0" outside shoulders for a 59'-0"

roadway width. For all build alternatives, on the north side of the bridge will be a 15'-6" wide shared-use path while on the south side of the bridge will be a 9'-6" wide sidewalk. On the outsides of the structure will be ODOT standard concrete bridge railings with curved vandal protection fence on top to satisfy CSX Railroad requirements and the ODOT Bridge Design Manual. The overall out-to-out of bridge deck width will be 75'-4" for Alternative 2 and 86'-4" for Alternatives 3 and 4.

A Structure Type Study will be prepared to compare a prestressed concrete I-beam superstructure with a rolled steel beam or welded steel plate girder superstructure and determine the proposed bridge type, after completion of CSX Railroad approval and selection of roadway alignment alternative. For the prestressed concrete option, it is anticipated ODOT standard wide flange bulb tee beams will be used with the depth and spacing dependent on the span length. For the steel superstructure option, both steel beams and plate girders will be investigated with the rolled beams a possibility for the shorter span bridge but most likely not feasible for the longer span bridge. Grade 50 weathering steel will be recommended to reduce future maintenance considerations and minimize the need for painting over the railroad tracks. In all cases, a minimum 23'-0" vertical clearance measured from the top of high rail will be provided over the tracks.

Since both horizontal roadway alignments are tangent within the bridge limits, semi-integral abutments are envisioned to eliminate the expansion joints at the ends of the bridge and reduce the potential for future deterioration. Full width concrete approach slabs with sleeper slabs will be constructed behind each abutment.

Beyond cost, which is discussed in Section 4.11, there are no structural design issues or considerations that differentiate between the Alternatives.

A preliminary plan view and elevation for each bridge can be found in the Conceptual Plans in **Appendix E**.

4.5 Drainage/BMPs

The existing drainage system along Symmes Road consists of open grading to roadside ditches, along with a few catch basins, storm sewers, culverts, and post construction stormwater controls. The post construction stormwater controls serve the businesses east of the CSX Railroad tracks and are located just outside of existing right of way. In general, the drainage pattern within the project limit flows from east to west and outfalls upstream of the dual culvert bridge on the east side of the site. Figure 4 shows the drainage area, outlined in red, for the dual culvert bridge.

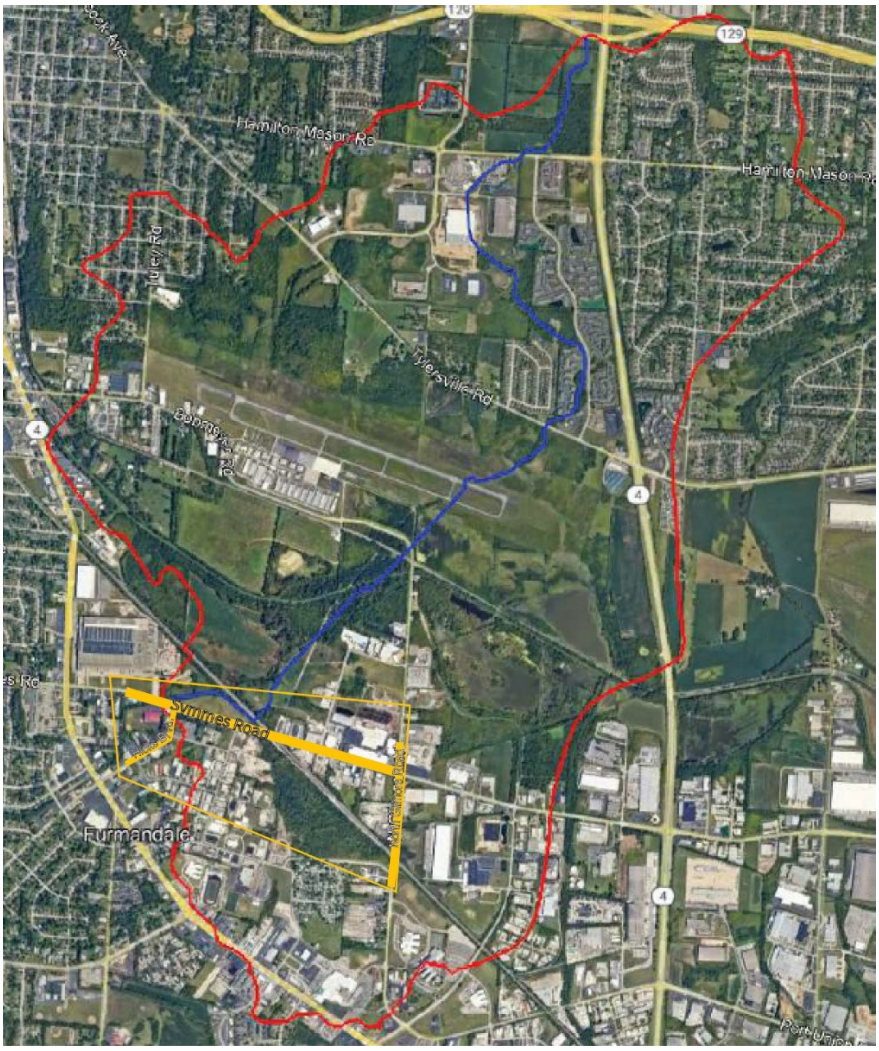

Figure 4: Drainage area

The proposed drainage system will consist of catch basins located along the curb with a storm sewer trunk line located within the roadway. The proposed storm sewer will outlet near the dual culvert bridge. Each alternative produced similar results for general roadway drainage and post construction BMP requirements. Alternatives 3 and 4 both impact the dual culvert bridge which significantly increases the costs for these alternatives. The drainage costs associated with each Alternative are shown in Section 4.11.

Drainage design shall be performed in accordance with the City of Fairfield Design, Construction, and Materials Specification Handbook Section 200. ODOT Location and Design Volume 2 (L&D Vol 2) will be utilized for the post construction BMP design. Additionally, CSX Railroad will require roadway drainage components connecting to CSX Railroad property to match existing flow rates for all storms. The full Basis of Design Document was approved by the BCTID/City of Fairfield and the FRA on 12/13/2024 and can be found in **Appendix D**.

4.5.1 Culvert and Bridge

There is one culvert and one bridge (ODOT 0963933) within the project limits. Both will be impacted by the alternatives. The culvert is located within CSX Railroad right of way west of the tracks. The culvert will be removed and replaced with a ditch or vacated to CSX Railroad in each of the alternatives.

Bridge 0963933 is a twin culvert system with a span over 12 feet. The bridge was inspected on April 25, 2023, and had a General Appraisal rating of 7. Alternative 3 and 4 longer pavement work impacts 0963933. The existing bridge will be removed and replaced with a box culvert on a new alignment. The bridge skew will require custom headwalls.

4.5.2 Existing Detention Basins

Four parcels within the study have detentions basins as part of their on-site storage and treatment of stormwater. These are dry basins that do not contain water between storm events. The basins are owned and maintained by the parcel owners. None of the alternatives impact the existing detention basins.

4.5.3 Post Construction BMPs

Post-Construction Storm Water Best Management Practices (BMPs) requirements were determined using the design guidance in ODOT L&D Vol 2. BMP provide for long term management of storm water runoff quality and quantity so that a receiving stream's physical, chemical, and biological characteristics are protected, and stream functions are maintained.

Post-construction storm water treatment is divided into two categories: water quality treatment and water quantity treatment. Water quality treatment is providing for reduction of pollutants from storm water runoff before leaving the site. Water quantity treatment is reducing the volume or peak flow rate of storm water runoff in order to protect the receiving stream's physical characteristics. Projects exceeding the minimum thresholds in L&D Vol 2, *Section 1115.2* must address water quality and potentially water quantity treatment in the post-construction BMP.

All Symmes Road crossing build alternatives have an expected earth disturbed area greater than 1 acre, which will require quality post construction BMPs. None of the alternatives are considered a maintenance project per L&D Vol 2, Sec. 1112.2, or discharge directly to a large river. Alternatives 2, 3, and 4 move the alignment and require the purchase of new Right of Way. The area of new Right of Way is partly paved, and impervious area will be removed with the construction of the new

alignment. The overall net addition of new impervious area (Ain) is less than one acre for each of the alternatives. Therefore, the project requires quality treatment only. See **Table 18** for summary.

Table 18: Post Construction BMP

		Alt 1	Alt 2	Alt 3	Alt 4
	Units				
Project EDA	acres	Not Analyzed	18.7	20	20.9
Is the Project Routine Maintenance per L&D Vol. 2, Sec. 1112.2			No	No	No
BMPs Required?			BMPs Required	BMPs Required	BMPs Required
Ain (New Impervious Area in New Permanent right of way)	acres		2.4	1.6	2.7
Removed Impervious Area inside New right of way	acres		1.9	2.4	2.2
Ain (New Impervious Area in New Permanent right of way)	acres		0.5	-0.8	0.5
Water Quality Treatment Required			Yes	Yes	Yes
Water Quantity Treatment Required			No	No	No
Treatment Percent and Treatment Requirement					
Aix (Project EDA that is inside the existing right of way)	acres		8.3	10.3	10.4
Ain (New Impervious Area in New Permanent right of way)	acres		0.5	-0.8	0.5
T% (Treatment Percent)	%		**24.55**	**20.00**	**23.67**
Treatment Requirement	**acres**		**4.59**	**4.00**	**4.95**

The project will require treatment for water quality in a post construction BMP. See **Table 19** for a list of the types of BMPs included in the L&D Vol 2.

Table 19: Types of Post Construction BMPs

Water Quality and Water Quantity	Only Water Quality	Only Water Quantity
• Detention Basin • Retention Basin (also called Wet Extended Detention Basin in Ohio EPA permit) • Bioretention Cell • Infiltration Trench • Infiltration Basin • Constructed Wetlands	• Manufactured Systems • Vegetated Biofilter • Vegetated Filter Strip	• Stream grade control structures (within Waters of the U.S.) • Underground Extended Detention

BMPs provide treatment of water quality or quantity, several BMP types provide both quality and quantity. The project requires water quality treatment only, because of this the first choice for BMPs are those that provide quality treatment. The BMPs that only provide quantity treatment will not be considered as options for the project, because these do not provide the required project treatment. ODOT L&D Vol 2

section 1117 provides a toolbox to assist with the selection and design of post construction BMPs. Several types of BMPs from the toolbox were considered to meet the project water quality treatment requirement. See **Table 20** for the list of BMPs considered for the project.

Table 20: Post Construction BMPs Evaluation

BMP type	BMP use evaluation
Manufactured Systems	Preferred alternative
Vegetated Biofilter	Project has curbs which prevent the free flow of water into a vegetated biofilter
Vegetated Filter Strips	Project has curbs which prevent the free flow of water into a vegetated filter strip
Detention Basin	Not considered as an option-project requires quality treatment only
Bioretention cell	Not considered as an option-project has curbs which prevent the free flow of water into a bioretention cell
Retention basin	Not considered as an option-project requires quality treatment only
Infiltration trench/basin	Not considered as an option-project has curbs which prevent the free flow of water into an infiltration trench/basin
Constructed Wetlands	Not considered as an option-project requires quality treatment only

The proposed BMPs for quality treatment are manufactured systems. See **Table 21** for a summary of the treatment provided for each alternative. During Stage 1 design, the location and design will be optimized to provide maximum treatment.

Table 21: Summary of Treatments for Alternatives Considered

Alternative	Number of Manufactured Systems Required	Total Area Treated
2	3	5.60 acres
3	2	5.06 acres
4	2	8.50 acres

EDA and treatment % calculations are provided in **Appendix F** for each alternative.

4.6 Maintenance of Traffic

This section discusses the temporary traffic impacts required to construct the various build alternatives. The no build alternative will not create any temporary traffic impacts.

4.6.1 Symmes Road Alternatives

The sequence of construction is intended to guide the work in a manner that provides a basic level of service to the traveling public. While the sequence below lists tasks in a specific order, not every item listed must be completed before commencing the next item, and some tasks may be performed concurrently.

- Phase 1–Construct the proposed bridge over the railroad and embankment leading up to the bridge to the extent possible without impacting existing traffic.
    - This will begin the anticipated settlement periods for proposed abutments and embankments.
- Phase 2–Shift traffic south on existing Symmes Road in order to construct the proposed widening on the north side both east and west of the railroad.
- Phase 3–Shift traffic north on existing Symmes Road in order to construct the proposed widening on the south side both east and west of the railroad.
- Phase 4–Construct enough proposed pavement, in areas outside the existing pavement, for the western tie in point.
- Phase 5–Sheet piling or other temporary shoring should be used, as necessary. to construct half of the proposed pavement for the eastern tie in point to existing Symmes Road.
- Phase 6–Shift traffic onto the new Symmes Road alignment in order to complete the tie in work, pavement removals, and drive connections.

Specific MOT challenges with each alternative are noted below.

4.6.1.1 ALTERNATIVE 2 ROUNDABOUT DESIGN SOUTH BRIDGE

Alternative 2 will be the least complicated to construct of the three build alternatives. The alignment is shorter meaning fewer impacts and less duration. The extra roadway width through the intersection of Symmes Road and Tedia Way, because of the roundabout, will make it easier to construct the tie-in to the existing roadway than the other alternatives. Access to Tedia Way from Symmes Road may need to be closed during construction. During construction, access to Tedia Way will be provided via Bohlke Boulevard and North Gilmore Road. While there is potential for part width intersection construction, a 12-week closure of Symmes Road is allowable for the complete construction of the roundabouts.

4.6.1.2 ALTERNATIVE 3 ROUNDABOUT DESIGN NORTH BRIDGE INTERSECTION IMPROVEMENTS

The construction of Alternative 3 will require additional subphases to construct the proposed box culvert west of the intersection of Symmes Road and Hicks Boulevard. The construction of this box culvert will require temporarily extending the existing twin culvert system and placing temporary pavement on top of the temporary

extension to construct the proposed improvements in part width phases. It is expected that this will also extend the construction timeline as multiple utilities will need to be relocated around the proposed culvert. Major construction on the Hicks Boulevard roundabout should be completed prior to the closing of Industry Drive with this alternative. Grade differences between the existing and proposed design will prove challenging near Tedia Way. It is expected that some temporary shoring will be needed to keep Symmes Road open to traffic. Similar to Alternative 2, while part width intersection construction may be possible as described, a 12-week closure of Symmes Road is allowable for the construction of each roundabout.

4.6.1.3 ALTERNATIVE 4 TWIN ROUNDABOUT DESIGN NORTH BRIDGE INTERSECTION IMPROVEMENTS

The construction of Alternative 4 will require additional subphases to construct the proposed box culvert west of the intersection of Symmes Road and Hicks Boulevard. The construction of this box culvert will require temporarily extending the existing twin culvert system and placing temporary pavement on top construct the proposed improvements in part width phases. It is expected that this will also extend the construction timeline as multiple utilities will need to be relocated around the proposed culvert as well. Alternative 4 will also have temporary traffic impacts through construction on Veterans Drive. One lane of traffic in each direction on Veterans Drive should be maintained at all times. Active construction should only occur on one roundabout at a time if possible. Grade differences between the existing and proposed design will prove challenging near Tedia Way. It is expected that some temporary shoring will be needed in this area to keep Symmes Road open to traffic. Similar to Alternative 2 and 3, while part width intersection construction may be possible as described above, a 12-week closure of Symmes Road is allowable for the construction of each roundabout.

4.6.2 North Gilmore Road Alternatives

4.6.2.1 ALTERNATIVE 1

Traffic can be maintained on North Gilmore Road and at the intersection of North Gilmore Road with Busway Lane south of the CSX Railroad crossing with temporary pavement and a temporary signal. The temporary signal will maintain one-lane, two-way traffic. Since North Gilmore Road is being permanently closed north of the CSX Railroad track and there are no properties requiring access from the proposed cul-de-sac, North Gilmore Road can be closed during construction without impacting traffic.

4.7 Right of Way Requirements

4.7.1 Existing Right of Way

Existing right of way and parcel limits for the project study area were determined using available GIS data. Property owners and parcel information were researched using the Butler County Auditor's website.

4.7.2 Right of Way Impacts

Each of the build alternatives requires both permanent and temporary right of way takes along the proposed alignments. While the exact amount of right of way required for each build alternative has not been determined, estimations of new permanent and/or temporary right of way for the build alternatives have been developed for the purposes of comparison and cost estimation. The land and structures values used by the Butler County Auditor were used to develop the right of way cost estimates. Land purchases were assumed to cost 1.5× the auditors value. Acquisition and relocation costs were developed using the method outlined in the ODOT Real Estate Manual and included in the cost estimates.

A summary or estimated right of way impacts for each Symmes Road and North Gilmore Road alternative are shown in Table 22 below and a detailed breakdown of right of way costs by parcel for each alternative is included in Appendix G.

Table 22: Right of way summary

	Number of Properties Impacted	Right of Way Take (Permanent and Temporary) Acre	Number of Residential Relocation Impacts	Number of Commercial Relocation Impacts	Cost Estimate
North Gilmore Road	1	0.09	0	0	$25,000.00
Symmes Road No-Build	0	0	0	0	$0.00
Symmes Road Alternate 2	30	16.20	0	5	$1,904,800.00
Symmes Road Alternate 3	46	15.70	3	6	$2,565,200.00
Symmes Road Alternate 4	49	15.28	1	4	$2,281,300.00

4.8 Utilities

4.8.1 Existing Utilities

Existing utilities within the project study area were located through design coordination with OHIO811 and supplemental limited field survey methods. There are many existing utilities located within the study area, both public and private. The existing utility owners with assets in the study area are listed in **Table 23** below.

Table 23: Existing Utilities

Utility Owner	Utility Type
Charter Communications-Time Warner	Cable
Duke Energy	Electric
AltaFiber	Fiber, Telecommunications
MCI World Communications	Fiber
BP Pipelines (North America), Inc.	Gas
Duke Energy	Gas
Texas Gas Transmission, LLC	Gas
City of Fairfield Public Utilities Department	Sanitary
City of Fairfield Public Utilities Department	Water

4.8.2 Utility Impacts

Although additional utility investigation and coordination will be required with the existing utility companies to determine the final scope of utility impacts, several impacts have already been identified among the project alternatives. The project cost estimate includes cost to relocate and/or modify utility poles, manholes, gas valves, and water hydrants, meters, and valves as appropriate. It is assumed that utility facilities within the existing public right of way will be relocated at the utility owners' expense, however, facilities in dedicated easements will be covered by the project. An assessment of the utility conflicts was documented so that they may be further considered during the project design. These impacts are summarized for each alternative in **Table 24** below. Alternative 1 (No-Build) does not impact any existing utilities.

Table 24: Utility Impacts

Utility	Symmes Road				North Gilmore Road
	No-Build	Alternative-2	Alternative 3	Alternative 4	Alternative 1
Cable	No impact	Overhead-Relocated with Electric	Overhead-Relocated with Electric	Overhead-Relocated with Electric	Overhead-Relocated with Electric
Electric	No impact	Overhead-14 Transmission Pole Relocations, 14 Distribution Pole Relocations	Overhead-16 Transmission Pole Relocations, 15 Distribution Pole Relocations	Overhead-14 Transmission Pole Relocations, 20 Distribution Pole Relocations	Overhead-3 Distribution Pole Relocations
Fiber	No impact	No Known Conflict	No Known Conflict	No Known Conflict	No Known Conflict

Utility	Symmes Road				North Gilmore Road
	No-Build	Alternative-2	Alternative 3	Alternative 4	Alternative 1
Gas	No impact	Adjustments to Valves	200' of Gas Line Relocation, Adjustments to Valves	200' of Gas Line Relocation, Adjustments to Valves	No Known Conflict
Sanitary	No impact	No Known Conflict	No Known Conflict	No Known Conflict	No Known Conflict
Tele-communications	No impact	Overhead-Relocated with Electric	Overhead-3 Pole Relocations, Also Relocated with Electric	Overhead-3 Pole Relocations, Also Relocated with Electric	Overhead-Relocated with Electric
Water	No impact	500' of Waterline Relocation, 5 Hydrant Relocations, Adjustments to Valves and Meters	700' of Waterline Relocation, 8 Hydrant Relocations, Adjustments to Valves and Meters	700' of Waterline Relocation, 6 Hydrant Relocations, Adjustments to Valves and Meters	No Known Conflict

4.9 Railroad Coordination

The project team has started coordination with CSX Railroad and provided notification of intent to establish a new grade separation and crossing elimination at Symmes Road in Fairfield, OH. CSX Railroad has expressed support of this project and submitted a formal letter of support to the FRA on October 3, 2022. The letter notes,

> *"For operating railroads serving Ohio based industries in the greater Cincinnati area, this project will have a dramatic impact to the entire region, as the elimination of these crossings will provide over 4.5 miles of track space without at-grade crossing interference north of the CSX Queensgate Yard. As background, Queensgate Yard is the fifth largest by volume on the entire CSX network, with over 650,000 carloads per year through the terminal.*
>
> *In a heavily congested rail corridor like this, shared with multiple railroads as well as Amtrak, track space of this length would allow all trains to operate safely within federal standards without impacting crossings in Butler and Hamilton Counties."*

The BCTID submitted a New Project Information Form to CSX Railroad in October 2024 for the creation of a new CSX Railroad project and billing account. The project team also provided CSX Railroad, for preliminary review, conceptual drawings providing elevations and overall preview of the project. To date, CSX Railroad has provided no comments, however, immediately after the Draft submission of this Feasibility Study and local approval of the document, the project team will submit the conceptual plans of the grade separation to CSX Railroad for formal review and comment.

4.10 Environmental Analysis

Several environmental Analyses were conducted for this study. The environmental section addresses each analysis and the associated alternatives. The following resources do not occur in the project area and are not discussed further in this memorandum: coastal zone management areas, navigable waterways, drinking water (aquifer, well, reservoirs), prime and unique farmland, recreational areas including those that would be regulated under Section 6(f), and seismic areas. Resources that are present but have similar impacts for the alternatives are not discussed and include land use, noise and vibration, air quality, and floodplains.

4.10.1 Wetland/Stream Assessment

The project team developed an Ecological Survey Report for the Symmes Road and North Gilmore Road study areas. The full report is included in Appendix H. The United States Army Corps of Engineers (USACE) makes the final jurisdictional determination for Waters of the United States (WOTUS). Coordination and permits with the USACE and/or the Ohio Environmental Protection Agency (OEPA) may be required for impacting the features identified in this report. Specific stream and wetland impacts are shown in the Evaluation Matrix for each alternative.

4.10.1.1 SYMMES ROAD CROSSING

Three wetlands (Wetland E, Wetland F, and Wetland G) were identified within the study area during the field investigation. A total of 1.46 acres of wetland are present within the study area. One intermittent stream (UNT 2) was identified within the study area during field investigation. A total of approximately 690 linear feet of provisionally classified jurisdictional stream are present within the study area. Additionally, one provisionally classified non-jurisdictional pond (Pond 1) was identified within the study area.

4.10.1.2 GILMORE ROAD CROSSING

Four wetlands (Wetland A, Wetland B, Wetland C, and Wetland D) were identified within the study area during the field investigation. A total of 0.14 acres of wetland are present within the study area. One intermittent stream (UNT 1) and one non-jurisdictional stream (EPH 1), provisionally classified as an ephemeral stream, were identified within the study area during field investigation. A total of approximately 90 linear feet of provisionally classified jurisdictional stream are present within the study area.

4.10.2 Ecological (Threatened and Endangered Species)

Threatened and endangered species information for the proposed project was requested from the Ohio Department of Natural Resources (ODNR) and the United States Fish and Wildlife Service (USFWS) and is summarized in the Ecological Survey Report in Appendix H.

4.10.2.1 SYMMES ROAD CROSSING

Several noted threatened or endangered species may occur in the project area.

- **State and Federally listed Bats:** The ranges for both the federally endangered Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) extend throughout the entire State of Ohio. In an effort to avoid adverse effects to these two species, the USFWS recommended trees greater than or equal to 3 inches diameter breast height (dbh) be saved wherever possible. The USFWS also recommended the removal of any trees greater than or equal to 3 inches dbh occur between October 1 and March 31. The USFWS recommended that summer surveys be completed to document the presence or probable absence of Indiana bats within the study area when seasonal tree-cutting dates cannot be implemented. Ohio summer mist net surveys should be conducted between June 1 and August 15.

- **State and Federally listed Mussels:** As the study area does not feature any streams with drainage areas greater than five square miles there is no suitable mussel habitat within the study area and no mussel reconnaissance survey was performed.

- **State Listed Fish and Aquatic Species:** In-water work within a perennial stream should not be completed between April 15 and June 30 to reduce impacts to indigenous aquatic species and their habitat.

4.10.2.2 NORTH GILMORE ROAD CROSSING

Several noted threatened or endangered species are suspected in the project area.

- **Federally listed Bats:** The ranges for both the federally endangered Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) extend throughout the entire State of Ohio. In an effort to avoid adverse effects to these two species, the USFWS recommended trees greater than or equal to 3 inches diameter breast height (dbh) be saved wherever possible. The USFWS also recommended the removal of any trees greater than or equal to 3 inches dbh occur between October 1 and March 31. The USFWS recommended that summer surveys be completed to document the presence or probable absence of Indiana bats within the study area when seasonal tree-cutting dates cannot be implemented. Ohio summer mist net surveys should be conducted between June 1 and August 15.

- **State and Federally listed Mussels:** As the study area does not feature any streams with drainage areas greater than five square miles there is no suitable mussel habitat within the study area and no mussel reconnaissance survey was performed.

- **State Listed Fish and Aquatic Species:** In-water work within a perennial stream should not be completed between April 15 and June 30 in order to reduce impacts to indigenous aquatic species and their habitat.

4.10.3 Environmental Justice Population Screening

The project team conducted an Environmental Justice screening of the four census blocks (CBs) associated with the project area. The results are presented in a memorandum to the FRA dated August 4, 2024, and included in Appendix I. () The US EPA's EJScreen tool was used to determine whether minority, low-income, limited English speaking, elderly, disabled, or Native American populations are present within the study areas. The reports generated by the EJScreen tool for census blocks overlapping with the Symmes Road Crossing and Gilmore Road Crossing study areas are included is summarized in **Table 25** and **Table 26**.

Table 25: Symmes Road Crossing Study Area Demographic Data Summary

Census Block	Minority Populations	Limited English Households	Low-Income Populations	Elderly Populations	Disabled Populations	Native American Populations
390170109041	6%	0%	3%	22%	8%	0%
390170109061	82%	40%	83%	8%	11%	0%
390170110044	35%	6%	36%	12%	10%	0%

Table 26: Gilmore Road Crossing Study Area Demographic Data Summary

Census Block	Minority Population	Limited English Household	Low-Income Population	Elderly Population	Disabled Population	Native American Population
390170109061	82%	40%	83%	8%	11%	0%
39017011004	35%	6%	36%	12%	10%	0%
390170109131	71%	0%	0%	16%	8%	0%

4.10.4 4(f) Screening

The project team conducted a desktop review and site visit to identify any properties within the study areas that may be protected under Section 4(f) of the US Department of Transportation Act, including publicly owned parks, recreational facilities, and wildlife refuges as well as publicly or privately owned historic sites. No publicly owned parks, recreational facilities, or wildlife refuges were identified within the study areas. There are no 4(f) resources within the North Gilmore Road Crossing area. There are several historic structures and an archaeological inventory site within the Symmes Road Crossing area that are included in the Cultural Resources Report in Appendix J. The project would have no effect to Section 4(f) resources.

4.10.5 Cultural Resources

The proposed Project's area of potential effects (APE) includes an area for the archaeological survey (Archaeological APE), and an area for the historical and architectural resources survey (Architectural APE). The Archaeological APE encompasses Symmes Road between the Dixie Highway and North Gilmore Road as well as North Gilmore Road between Symmes Road and Holden Boulevard. The Architectural APE includes the Archaeological APE and adjacent parcels that would have an unobstructed view of the APE (Viewshed). The results of both the

archaeological survey and the historical and architectural survey are summarized below. The full Cultural Resources Survey can be found in Appendix J.

The project team conducted an initial desktop review in May 2024 and again in January 2025, which resulted in a request for Section 106 of the National Historic Preservation Act consultation with the Ohio State Historic Preservation Office (SHPO). The cultural resources survey was performed in accordance with the Secretary of the Interior's Standards and Guidelines for Identification (36 Code of Federal Regulations [CFR] 61; 48 CFR 44720–44723) and Ohio Historic Preservation Office procedural standards outlined by the Ohio Historical Society. The purpose of the cultural resources survey was to determine the presence/absence of cultural resources within the proposed route and to evaluate identified resources for their eligibility for inclusion in the National Register of Historic Places (NRHP).

Archaeologists investigated the Archaeological APE via a combination of visual inspection and shovel testing. Surveyors noted cultural material intermixed with modern trash in one shovel test location, indicating a highly disturbed context at the site location. Archaeologists noted no other cultural material and encountered no additional archaeological sites during the survey. No further archeological resources investigations are recommended within the APE for the Project as defined. However, in the event that archaeological deposits are encountered during construction, work should cease, and the Ohio SHPO should be notified.

Architectural historians recorded several historic-age dwellings within the Architectural APE; none are recommended eligible for listing in the NRHP. In accordance with 36 CFR 800, the team recommends a finding of **no historic properties affected** within the APE.

4.10.6 Environmental Site Assessment (ESA) Screening

Development patterns and historic land use suggest areas of contamination or other unknown environmental issues may present in the study area. The project team conducted Phase I ESA Screenings of the environmental study area which included both the Symmes Road crossing, and the North Gilmore crossing. The report is included in Appendix K. Phase I ESA Screening identifies potential areas of contamination of soil and groundwater within the study area that may warrant a full Phase 1 ESA. The Phase I ESA Screening considerations related to each alternative are summarized below. The full ESA Screening is included as Appendix K.

4.10.6.1 SYMMES ROAD CROSSING

According to the 7.5-minute quadrangles, the study area was depicted as cleared land featuring a road and railroad from 1915. The surrounding area was depicted developing over time from 1955 to 1981. The Report recommends Phase I ESA Assessments for 39 sites at the Symmes Road Crossing area based on current or historical land use. Nine of these sites have environmental record listings varying from underground storage tanks (UST), leaking underground storage tanks (LUST), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund), Resource Conservation and Recovery Act (RCRA), Ohio Division of

Environmental Response and Revitalization (DERR), and Emergency Response Notification.

4.10.6.2 NORTH GILMORE ROAD CROSSING

According to the 7.5-minute quadrangles, the study area was depicted as cleared land featuring a road and railroad from 1915. The surrounding area was depicted developing over time from 1955 to 1981. The Report recommends Phase I ESA Assessments for five sites in the North Gilmore Road Crossing area based on current or historic high-risk Land use. Two of the five sites have environmental record listings of UST or LUST.

4.10.7 Stakeholder and Public Engagement

Public Engagement activities are planned by the consultant team to be part of the decision-making process that assists the team in determining the preferred alternative. The consultant team will educate the public about the study process and provide multiple information channels that offer the public the opportunity to learn more about the benefits of the project, including mechanisms for providing feedback and asking questions. Meaningful public engagement is accessible, inclusive, and equitable.

Future stakeholder and public engagement activities associated with the Preliminary Engineering will be advanced in the Spring of 2025 after the draft Feasibility Study has been submitted. Public engagement activities will help inform the selection of the preferred alternative in the Summer of 2025.

Important characteristics of this program will be on-line and in person feedback sessions. It is anticipated that regular project updates will be provided to key stakeholders through partner websites and other digital resources. Key stakeholders include federal, state, and local transportation and community partners, as well as property owners and businesses within and adjacent to the project area. A draft Stakeholder Coordination Plan was submitted to FRA in January 2025.

4.11 Cost Estimates

A preliminary construction cost estimate has been developed for each build alternative and shown in Appendix L. These estimates were built by developing quantities and unit prices for major construction items and cost drivers. A contingency has been included in each estimate to account for other construction items not specifically itemized. Other cost estimating assumptions are included in Appendix L.

5 Comparison of Alternatives

The following **Table 27** summarizes the comparison of impacts of the Symmes Road Alternatives. Table 28 summarizes the comparison of impacts of the North Gilmore Road Alternatives.

Table 27: Symmes Road Crossing Alternatives Considered

Key Issue	No-build	Alternative 2	Alternative 3	Alternative 4
Fulfills Purpose and Need	No	Yes	Yes	Yes
Safety	Conflicts remain between vehicles and trains	Anticipated benefits by reducing intersection conflict points at two intersections. Adds pedestrian and multimodal facilities.	Anticipated benefits by reducing intersection conflict points at three intersections. Adds pedestrian and multimodal facilities.	Anticipated benefits by reducing intersection conflict points at four intersections. Adds pedestrian and multimodal facilities.
Capacity Analysis	No Change	Adds capacity.	Adds capacity	Adds capacity
Roadway Design	No geometric deficiencies	Reduced design speed of 30 MPH over railroad.	Removes Industry Drive and Tedia Way access to Symmes Road.	Removes Industry Drive north of Symmes Road.
Structural Design	N/A	Requires new structure over CSX Railroad Tracks	Requires new structure over CSX Railroad Tracks	Requires new structure over CSX Railroad Tracks
Drainage/BMPs	No impact	Stormwater improvements made in project area	Replace existing culvert structure at Hicks Boulevard, Overall reduction in post project impervious surface area.	Replace existing culvert structure at Hicks Boulevard.
Maintenance of Traffic	No impact	Temporary traffic impacts during construction will occur. Anticipate two 12-week closures for roundabout construction.	Increased construction phases and duration.	Increased construction phases and duration.
Right of Way Requirements	No impact	Impacts 30 properties, relocation of 5 commercial properties	Impacts 46 properties, relocation of 3 residential and 6 commercial properties	Impacts 49 properties, relocation of 1 residential and 4 commercial properties
Utilities	No impact	Significant impact to overhead utilities along Symmes Road 500 feet of waterline relocations	Significant impact to overhead utilities 700 feet of Waterline relocations 200 feet of Gas line relocations	Significant impact to overhead utilities 700 feet of Waterline relocations 200 feet of Gas line relocations
Railroad Concerns	No change	Eliminates At-grade rail crossing	Eliminates At-grade rail crossing	Eliminates At-grade rail crossing
Wetland/ Streams	No impact	155 feet of stream impact 1.6 acres of wetland impact	375 feet of stream impact 1.31 acres of wetland impact	375 feet of stream impact 1.30 acres of wetland impact
EJ Communities	No connectivity for Pedestrians	Adds pedestrian and multimodal capacity	3 residential property relocations, adds pedestrian and multimodal capacity; anticipated adverse effect to an EJ community	1 residential property relocation, adds pedestrian and multimodal capacity; residential property relocations are part of an EJ community
4(f) Resources	No impact	No impact to 4(f) resources	No impact to 4(f) resources	No impact to 4(f) resources
Ecological T&E Species	No impact	Potential impacts to bat habitat	Potential impacts to bat habitat	Potential impact to bat habitat
Cultural and Historical Resources	No impact	No Resources affected	No Resources affected	No Resources affected
Phase 1 ESA requirements	No impact	Recommend further assessment on 18 properties	Recommend further assessment on 20 properties	Recommend further assessment on 29 properties
Public Comment	Will be solicited Summer 2025			
Cost	Minimal	$25.2M	$31.5M	$32.0M

Table 28: North Gilmore Road Crossing Alternatives Considered

Key Issue	No-build	Alternative 1
Fulfills Purpose and Need	No	Yes
Safety	Conflict remains between vehicles and trains	Did not evaluate
Roadway Design	No geometric deficiencies	Meets design standards.
Maintenance of Traffic	No impact	Traffic maintained during construction.
Right of Way Requirements	No impact	Impacts 1 commercial property, no relocations
Utilities	No impact	Impacts to overhead utilities on North Gilmore Road
Railroad Concerns	No change	Eliminates Railroad Crossing
Wetland/ Streams	No impact	No impact
EJ Communities	No impact	No impact
4(f)	No impact	No impact
Ecological T&E Species	No impact	No impact
Cultural and Historical Resources	No impact	No impact
ESA requirements	No impact	Recommend further assessment on 5 properties
Public Comment	Will be solicited Summer 2025	
Cost	Minimal	$850,000

6 Next Steps

The next steps for the Symmes Road Grade Separation Project include:

- BCTID/City of Fairfield review of this Draft Feasibility Study
- FRA review of this Draft Feasibility Study
- Conduct Public Involvement activities as discussed in Section 4.10.7
- Selection of a preferred alternative for the Symmes Road Crossing and the North Gilmore Road Crossing
- Finalization of the Feasibility Study Report