2024 PRELIMINARY FEASIBILITY STUDY
DRAFT

U.S. 23 Corridor Study, PID 112768

ROUTE 23 CONNECT

Prepared for ODOT District 6
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INTRODUCTION

The Ohio Department of Transportation (ODOT), in conjunction with the Mid-Ohio Regional Planning Commission (MORPC) and the Toledo Metropolitan Area Council of Governments (TMACOG), has conducted a *2024 Preliminary Feasibility Study* to address the conditions on U.S. 23 between the Village of Waldo in Marion County and I-270 in Franklin County, Ohio. This is a continuation of the U.S. 23 Corridor Study titled *May 2022 Preliminary Feasibility Study*.

The *May 2022 Preliminary Feasibility Study* was conducted to determine the feasibility of creating a free-flowing connection between Waldo and I-270. The proposed concepts developed and evaluated included upgrading the existing U.S. 23 corridor to a fully free-flowing route with new and modified interchanges, constructing a new freeway to the west to connect with U.S. 33, and constructing a new freeway to the east to connect with I-71. A No-Build concept was also evaluated. Each concept was evaluated using various metrics to analyze travel times, safety benefits, community impacts, environmental impacts, and cost.

The results of the *May 2022 Preliminary Feasibility Study* indicated that all of the proposed Build concepts would have costs far exceeding the anticipated benefits, with benefit-cost ratios well below 1.00. While the Build concepts are expected to provide substantial reductions in regional travel times, the costs – including construction, engineering, inspection, and right-of-way – were all at least three times greater than the anticipated benefits. In addition to the high monetary costs, the creation of fully free-flowing connections in each of the Build concepts would result in substantial impacts to natural and/or cultural resources. None of the proposed Build concepts, as presented, can be reasonably implemented in the immediate future, therefore none were advanced.

While converting U.S. 23 to a fully free-flowing facility was determined to be infeasible, the *May 2022 Preliminary Feasibility Study* indicates that improvements to the existing U.S. 23 corridor would positively affect tens of thousands of drivers daily. Therefore, ODOT and the project team began work on this study titled *2024 Preliminary Feasibility Study*. This study is a forward-thinking approach to address specific congestion and safety issues on existing U.S. 23 between Waldo and I-270 that will result in an action plan to identify and prioritize a series of stand-alone improvements. These improvements will provide meaningful benefits to through traffic and local road users sooner rather than later. This action plan will build upon the data, public feedback, and findings from this study.

Study Area

The study area includes U.S. 23 between Waldo and I-270, spanning 23.5 miles. The study area includes a 0.5-mile buffer along U.S. 23, as shown on **Figure 1** and **Figure 2**.

According to the 2023 ODOT Traffic Operation Assessment Systems Tool (TOAST) data, which measures safety, capacity, and operations, the portion of U.S. 23 studied is the worst-performing section between Columbus and Toledo. The portion of U.S. 23 between Waldo and I-270 is part of the larger I-75/U.S. 23/SR 15 corridor, which provides the most-commonly used route between the Columbus region and the Toledo region. ODOT has classified the I-75/U.S. 23/SR 15 corridor as part of the State Freight System, which includes the transportation infrastructure carrying the highest volumes and values of freight moving in and through Ohio. The 23.5-mile section between Waldo and I-270 is the only portion of the U.S. 23/SR 15/I-75 corridor between Columbus and Toledo that does not have free-flow operation for through traffic. Thirty-nine (39) signals exist on this portion of U.S. 23, resulting in frequent stops and delays for through motorists and freight carriers. These are the only signals on the entire 119-mile U.S. 23/SR 15/I-75 corridor between I-270 in Franklin County and I-475 in Wood County – the outerbelts of Columbus and Toledo, respectively.

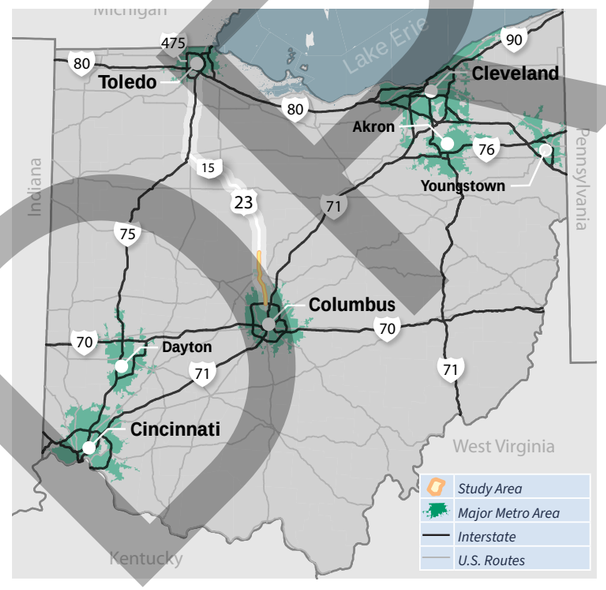


Figure 1: Study Area Location

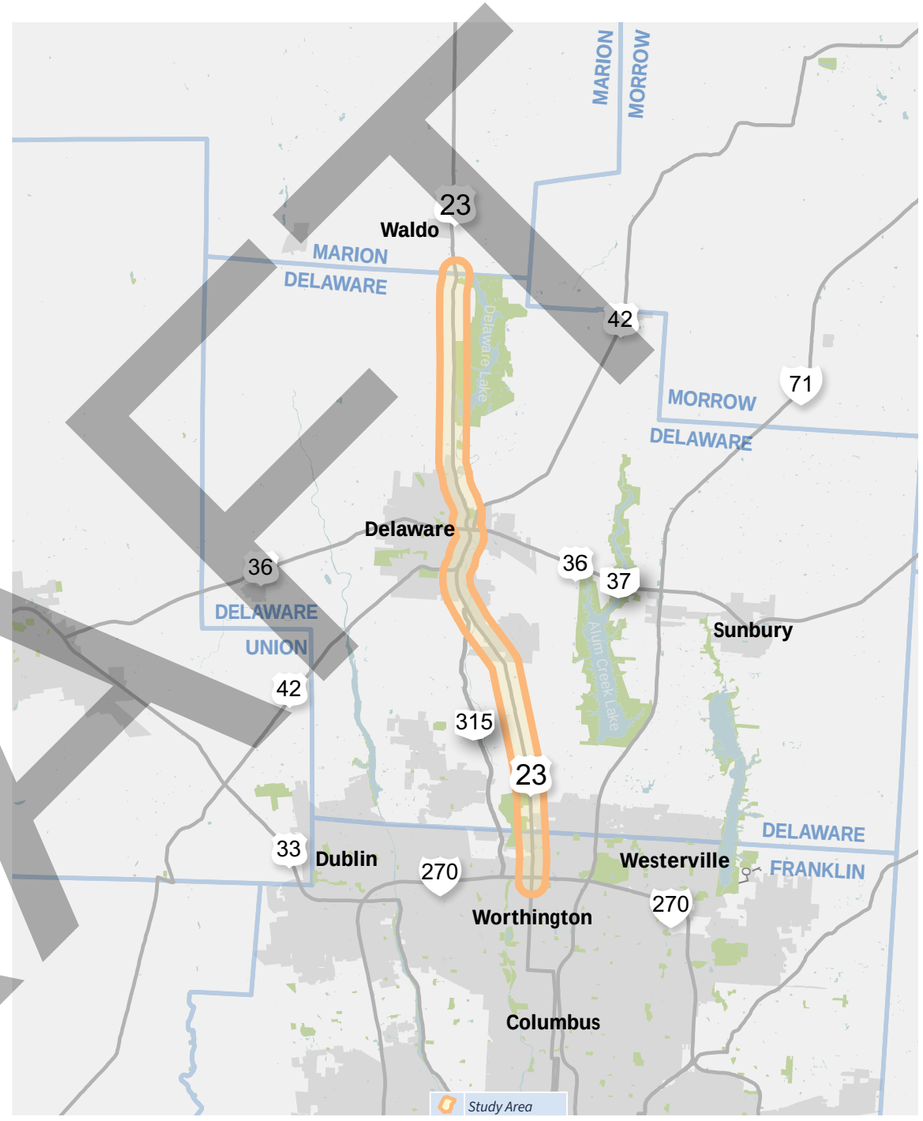


Figure 2: Study Area

Characteristics of U.S. 23

U.S. 23 is a major arterial route with two through lanes in each direction. The corridor transitions from densely developed suburban areas in the south, through the City of Delaware, to rural areas in northern Delaware County. The U.S. 23 corridor contains a mix of commercial land uses – retail, office, and light industrial, as well as single-family and multifamily residential land uses. The corridor serves a mix of local users and regional through traffic. U.S. 23 is a major commuter route between Columbus, the City of Delaware, suburban Delaware County, and communities north of the study area such as Marion and Upper Sandusky. Traffic volumes are substantially higher in the southern end of the study area compared to the northern section. According to data from ODOT's Transportation Mapping System (TIMS), 2023 average daily vehicular volumes on U.S. 23 range from 30,000 near Waldo to over 80,000 near I-270 in Franklin County. Truck volumes are substantial on U.S. 23, with nearly 5,000 trucks per day (15%) in the northern part of the study area. Truck volumes are lower south of the City of Delaware, where there are approximately 2,500 trucks per day.

While U.S. 23 is the most direct connection between Waldo and I-270, through vehicles often use other routes within the study area. U.S. 36/SR 37, U.S. 42, and SR 315 are such routes. A breakdown of the travel paths used by Waldo-to-I-270 through traffic for the year 2019 was obtained using StreetLight origin-destination data, a service that compiles traffic volume data based on Bluetooth, navigation, and GPS devices (see **Figure 3**).

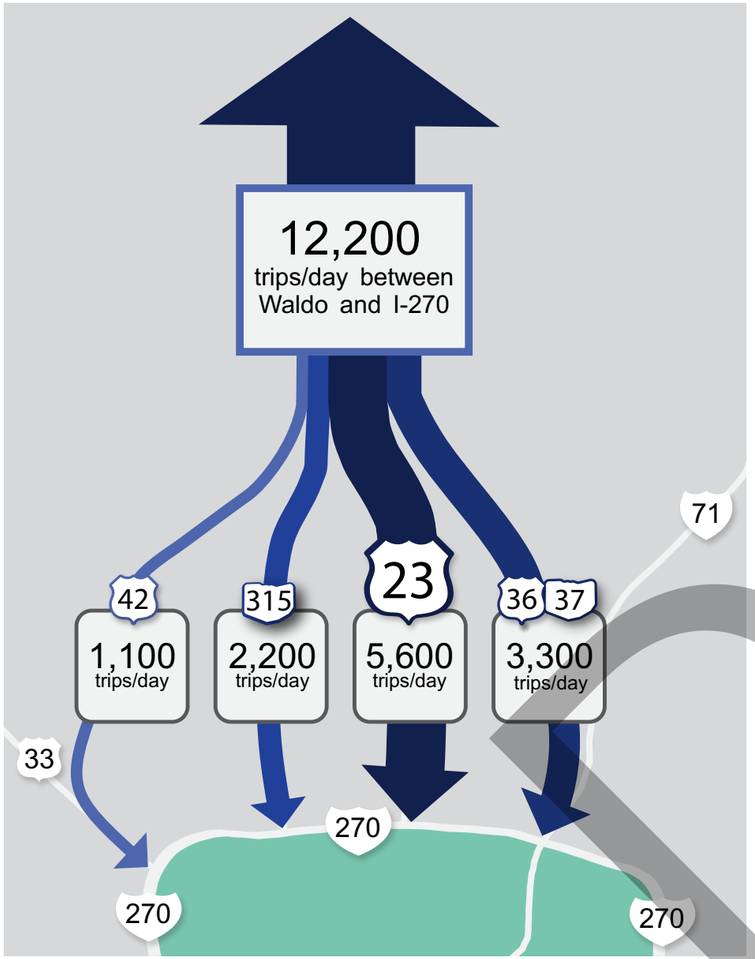


Figure 3: Distribution of Through Traffic between I-270 and Waldo
Data Source: StreetLight

Characteristics of Study Area

DELAWARE COUNTY

Most of the study area is in Delaware County. Delaware County is immediately north of Franklin County, where Columbus is located. Delaware County has experienced rapid growth over recent decades – growing from a population of 54,000 residents in 1980 to over 200,000 residents today. By 2050, the population is expected to exceed 390,000 (see **Figure 4**).

Delaware County, particularly the southern portion, has been transitioning from an agricultural community to a dense suburban community. Delaware County has become a desirable place for Columbus-area citizens to reside. Employment also increased, as the county experienced rapid growth in commercial, office and manufacturing land uses.

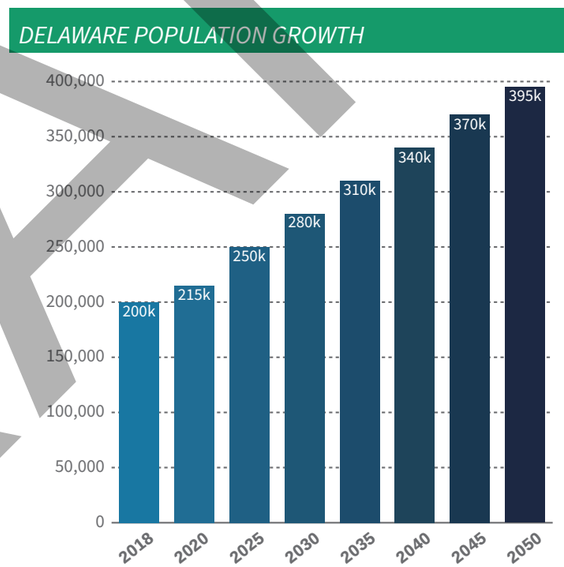


Figure 4: Delaware County Population
Data Source: Mid-Ohio Regional Planning Commission

FRANKLIN COUNTY

The southern two miles of the U.S. 23 study area is in northern Franklin County, including portions of the cities of Columbus and Worthington. Like Delaware County, the northern portion of Franklin County along U.S. 23 has seen a transition to densely developed suburban, residential, and office land uses in recent decades.

MARION COUNTY

A small portion of the northern study area extends into a rural part of Marion County. Marion County, beyond this study area, has a substantial manufacturing industry and an intermodal rail terminal that relies on the U.S. 23 corridor. Many Marion County residents rely on U.S. 23 to commute south to growing employment centers in Delaware and Franklin counties.

DRAFT PURPOSE AND NEED SUMMARY

The purpose statement of the project is as follows:

The purpose of the project is to enhance regional connectivity, mobility, and safety and improve U.S. 23 between Waldo and I-270.

The primary need of this project is to improve traffic flow and safety for commuter vehicles and freight on U.S. 23 between Waldo and I-270. The need focuses on the following metrics:

IMPROVE TRAVEL TIMES

Travel times between Waldo and I-270 need to improve. The U.S. 23 corridor in the study area experiences delays and congestion, particularly in comparison with other portions of the I-75/U.S. 23/SR 15 corridor between Toledo and Columbus. The study area is the only portion of the corridor between Toledo and Columbus with signals. Signalized intersections create delays and are more likely to experience crashes that will further delay traffic, compared with grade-separated locations. The nearly 40 signals in the study area create bottlenecks for through traffic and freight, adding over 10 minutes of travel time compared with a freeway facility.

IMPROVE TRAVEL TIME RELIABILITY

Travel time reliability is the consistency or dependability in travel times, as measured from day to day, across different times of day. The study area is the only portion of the U.S. 23/SR 15 corridor with signals. Signalized intersections are more likely to experience crashes that will further delay traffic, compared with grade-separated locations. Crashes often lead to short-term closures of lanes or entire roads, leading to unexpected and unpredictable delays.

Many of the corridor signals experience congestion, which is expected to worsen in coming years. Traffic flow at intersections is expressed as Level-of-Service (LOS) that is determined by the average vehicle delay. Levels-of-Service range from LOS A to LOS F. Level-of-Service ratings of A, B, and C are considered to be in the acceptable range. LOS D is considered to be acceptable in urban and suburban areas. LOS E and F have traffic volumes at or exceeding capacity, leading to unstable flow characteristics and greater unpredictability in travel times.

Capacity analyses were performed for the AM and PM peak hours of the future No-Build condition (2050). The capacity analyses were performed using Highway Capacity Software (HCS Streets Version 2023). The analyses showed that at least 23 intersections are expected to operate at LOS E or worse by 2050 (**Table 1**).

Additionally, INRIX data provided by MORPC indicates that the study area corridor, on average, experiences one day each week with peak hour travel times nearly 5 minutes greater than the average peak hour travel times. The inconsistency in daily travel times forces drivers to allocate extra time for their trip, or risk arriving at their destination late.

IMPROVE SAFETY

The most recent (2024) Highway Safety Improvement Program (HSIP) Priority Locations published by the ODOT Office of Statewide Planning & Research show 27 locations on U.S. 23 in the study area ranking in the HSIP top 500 statewide, including 13 locations in the Top 100.

The Secondary Need of the study is as follows:

IMPROVE CONSISTENCY WITH LOCAL COMMUNITY PLANS

Local leaders have concluded that potential development sites along the U.S. 23 corridor are often passed up because of traffic issues. The 2019 Route 23 Strategic Guide prepared by One Delaware, a local economic development organization, indicates that a better functioning U.S. 23 in the study area will help the area attract and retain businesses. Prior studies have noted that having a better-functioning U.S. 23 will also help preserve adjacent corridors. The existing congestion on U.S. 23 creates concern for local residents, as drivers frequently use other routes, creating safety and/or congestion issues on those corridors.

Table 1: Planning-Level LOS for Signalized Intersections

U.S. 23 INTERSECTION	AM PEAK	PM PEAK
I-270 Eastbound	C	E
I-270 Westbound	E	E
Campus View Boulevard	E	E
Flint Road	C	B
Northwoods Boulevard	D	D
Highbluffs Boulevard/Windsong Way	D	C
Lazelle Road	E	E
Olentangy Meadows Drive	C	E
Green Meadows Drive/Highbanks Park	C	E
SR 750 (E. Powell Road)	E	F
Meadow Park Avenue	E	E
Windbrush Avenue	E	E
Hidden Ravines Drive	E	F
Orange Road	F	F
Orange Point Drive/Gooding Boulevard	E	E
Corduroy Road	E	E
Home Road	F	E
Lewis Center Road	E	E
Olentangy Crossings	E	E
Hyatts Road/Shanahan Road	E	E
Greif Parkway	B	B
Glenn Parkway	E	C
OhioHealth Boulevard	C	C
Cheshire Road	C	C
SR 315	D	C
Meeker Way	C	C
Hawthorn Boulevard	E	C
Penny Way/Delaware Plaza South	B	C
Delaware Plaza North	B	B
Cottswold Drive	D	D
S. Sandusky Street	C	C
U.S. 42	B	C
N. Sandusky Street/Pennsylvania Avenue	D	C
Panhandle Road	F	F
McDonald's/BMV plaza	E	E
Hills-Miller Road	E	E
Coover Road	E	F
Delaware State Park	A	B
SR 229 (Norton Road)	C	D

**Delay values calculated in HCS were scaled downward to reflect potentially conservative traffic volume forecasts*

TRAFFIC VOLUME PROJECTIONS

Planning-level traffic volumes were developed for this study using the previously developed models from the *May 2022 Preliminary Feasibility Study*. MORPC and ODOT had previously developed 2030 and 2050 traffic volumes for the six freeway concepts and the No-Build condition. One previous concept, C1, was developed assuming that U.S. 23 would be a free-flowing route between Waldo and I-270, with eleven new or modified interchanges in the corridor.

For this study, the No-Build model and the C1 model were both used to develop planning level traffic volumes. The No-Build model was used as a base, while the C1 model was used to increase the amount of through traffic on U.S. 23, assuming that improvements to U.S. 23 would result in more traffic diverting to U.S. 23 from adjacent routes such as U.S. 36/SR 37 and SR 315. The following weighting factors were applied when combining the No-Build and C1 travel demand model results for an improved U.S. 23 arterial:

- North of Pennsylvania Avenue
  - » No-Build – 80%
  - » C1 – 20%
- U.S. 42 to SR 750
  - » No-Build – 70%
  - » C1 – 30%
- South of SR 750
  - » No-Build – 70%
  - » C1 – 30%

STUDY AREA SEGMENTATION

In order to effectively analyze the 23.5-mile study area, the corridor was broken into seven segments for further study. The segments include:

Segment 1 – I-270 to Gold Meadow Drive

Segment 2 – Green Meadows Drive to Parkway Drive

Segment 3 – Orangepoint Drive to Orangewick Drive

Segment 4 – Hyatts Road/Shanahan Road to Pollock Road

Segment 5 – SR 315 to U.S. 42

Segment 6 – Pennsylvania Avenue to Coover Road

Segment 7 – Main Road to SR 229

As concepts were developed for Segment 1, this segment was further divided into two segments, since the concepts in these areas were independent of each other:

Segment 1S – I-270 to Flint Road

Segment 1N – Northwoods Boulevard to Gold Meadow Drive

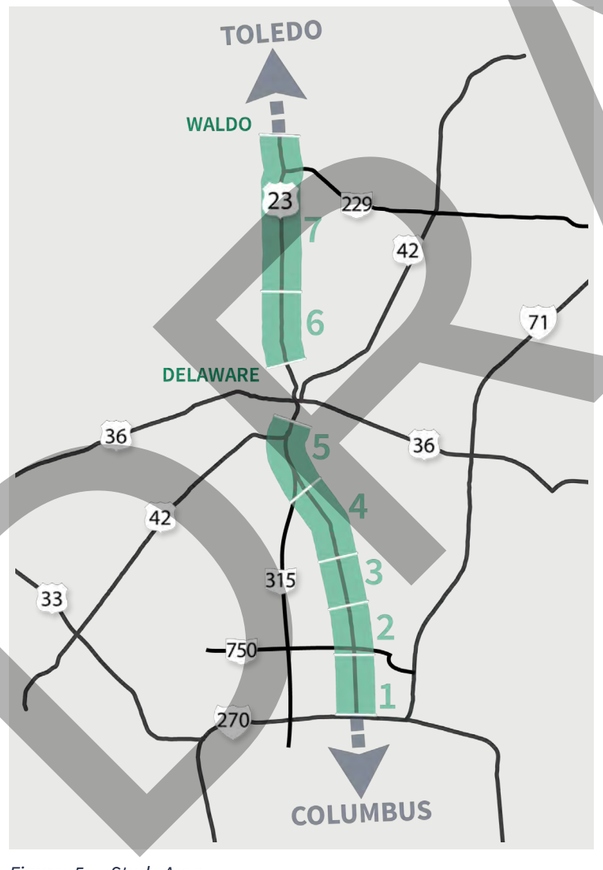


Figure 5: Study Area

IMPROVEMENTS CONSIDERED

For this study, a wide range of improvement options were considered from minor intersection improvements to traditional freeway interchanges. A variety of improvement options were considered at each intersection and then several intersections were combined to develop a concept.

The improvements considered were developed from public input received via a public survey (for more details, see Public Involvement section). Some of the improvements suggested by the public included signal coordination, removing signals, limiting access, and constructing frontage/backage roads. Based on the public comments and preliminary analysis, the concepts developed for each segment generally consisted of four major types of improvements. These four major improvement options are described below and on **Figure 6**.

Traditional Freeway Interchanges

Traditional freeway interchanges replace an intersection with a bridge and ramp connections, eliminating the need for a signal on U.S. 23. Traffic enters and exits U.S. 23 at high speeds. There are many shapes of potential traditional freeway interchanges. The ramp configurations can vary based on the balance of access and impacts at each intersection. Some ramp configurations that were considered include:

- Diamond Interchange
- Tight Diamond Urban Interchange
- Single Point Urban Interchange (SPUI)
- Diamond Interchange with Roundabouts
- Partial Cloverleaf Interchange

Connector Road Interchanges

Connector road interchanges replace an intersection with a bridge and two-way connector roads. This eliminates the need for a signal on U.S. 23. However, traffic enters and exits U.S. 23 at low speeds. These are flexible in design to minimize adjacent property impacts. Additionally, these interchanges can utilize some existing streets as the connector road(s). Only two quadrants of the intersection/interchange will be affected with a connector road interchange.

Restricted Crossing U-turns (RCUTs)

Restricted Crossing U-turns (RCUTs) restrict side street left turns and through movements at the intersection, but allow these movements via a nearby U-turn. RCUTs can be signalized or unsignalized, with either only one signal in the center intersection or with three signals including a signal at each U-turn location. Signals at the U-turn location only stop a single direction of traffic, resulting in vehicles only passing through two signals in either direction. At some three-leg intersections, a partial RCUT with a single U-turn location is being considered as a potential improvement. RCUTs reduce intersection delays and improve safety, compared with traditional signals.

Overpasses & Underpasses

Overpasses and underpasses allow traffic on U.S. 23 and side streets to flow without stopping at an intersection. These do not have direct connections between U.S. 23 and the side street. Traffic wishing to make a connection between routes must divert to another location.

Other Improvement Options

The above list does not represent an exhaustive list of improvements that were considered for this corridor. Other solutions considered include:

- Thru-cut intersections (similar to RCUTs, but without U-turns for minor street left turns),
- Echelon intersections
- Restriction of left turns on one or more approaches
- Bypass lanes for through traffic
- Continuous-T or Green-T intersections
- Widening for additional through lanes
- Additional turn lanes at signalized intersections
- New frontage/backage road connections
- Modifications to existing frontage/backage roads

Some of these improvements have been incorporated into one or more concepts.

TRADITIONAL FREEWAY INTERCHANGES


Fishers, IN


Marion, OH


New Albany, OH

Typical Advantages:

- Reduces delay to zero for U.S. 23 through movements
- Offers various alignment options to limit impacts
- Eliminates left turning movements to/from U.S. 23
- Allows for grade-separated crossing of U.S. 23 for pedestrian and bicycle movements

Typical Disadvantages:

- Requires much larger footprint than other options
- Entails highest cost
- Introduces new signals on minor streets/cross streets
- Increases bridge maintenance

CONNECTOR ROAD INTERCHANGES


Meigs Co., OH


Hamilton Co., OH


Tuscarawas Co., OH

Typical Advantages:

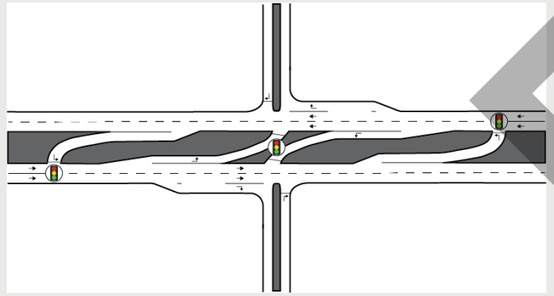
- Reduces delay to zero for U.S. 23 through movements
- Offers greatest flexibility in interchange design to avoid/limit impacts, including a smaller footprint compared to traditional freeway interchanges
- Eliminates left turning movements to/from U.S. 23
- Allows for grade-separated crossing for pedestrian and bicycle movements

Typical Disadvantages:

- Typically requires more footprint than intersection designs
- Requires low-speed right turns to enter/exit U.S. 23
- Introduces delays for vehicles entering U.S. 23, unlike traditional freeway interchanges
- Increases bridge maintenance

RESTRICTED CROSSING U-TURNS (RCUTs)


Berlin Township, OH



Typical Advantages:

- Reduces delays for U.S. 23 through movements
- Reduces conflict points from existing signalized intersection
- Typically requires smaller footprint compared to interchange
- Lower costs than interchange options

Typical Disadvantages:

- Introduces additional signalized locations
- Results in more conflict points than interchanges or overpasses
- Creates more circuity for minor street through and left turn movements
- Often increases delays for minor street through and left turn movements

OVERPASSES & UNDERPASSES


Delaware, OH


OH

Typical Advantages:

- Reduces delay to zero for U.S. 23 through movements
- Reduces delay to zero for minor street through movements
- Eliminates all conflict points at a location, maximizing safety
- Typically requires smaller footprint than interchange options

Typical Disadvantages:

- Eliminates connectivity between U.S. 23 and minor street
- Increases circuity for accessing businesses in corridor

Figure 6: Improvements Considered

PUBLIC ENGAGEMENT

Public engagement is an important element to all ODOT projects, but particularly in early planning studies to determine what the community's main issues are and what their goals are. As part of May 2022 Preliminary Feasibility Study, which looked at bypass options spanning a vast study area, numerous meetings were held to share study progress and gather input from communities across Delaware, Franklin, Marion, Morrow, and Union Counties. Because the 2024 Preliminary Feasibility Study focused on improvements to U.S. 23, the public engagement strategy shifted focus toward engaging communities and all interested parties along the existing U.S. 23 corridor.

Community Partners

During the previous study, there were three groups (technical advisory committee, steering committee, and stakeholder group) to provide oversight for the project. At the beginning of the 2024 study, these groups were merged to form the Community Partners group. This group includes representatives from local public agencies, elected officials, environmental organizations, agricultural organizations, community organizations, planning agencies, business leaders, and trade groups. The Community Partners group includes over 200 contacts, with members from three counties spanning the entire study area. The Community Partners group also includes representative groups from Northwest Ohio, who use the U.S. 23 corridor as a link to the Columbus region. During all rounds of public engagement and outreach, Community Partner meetings were held to provide dedicated attention to the Community Partners. A list of the Community Partners can be found in Appendix A.

Engagement Summary

MAY 2022 PRELIMINARY FEASIBILITY STUDY

In the 2022 study, there were two rounds of public engagement. The primary focus of the engagement for the May 2022 Preliminary Feasibility Study was to share findings on the performance of the existing U.S. 23 corridor, to hear about the public's concerns and goals, and to share the range of potential solutions being considered, most of which were freeway bypasses. After these two rounds of public engagement, the technical analysis in the May 2022 Preliminary Feasibility Study determined that none of the Build concepts as presented would be feasible, and none of the presented concepts were advanced.

A summary of the engagement activities that were included in each round can be found below:

- Summer 2021
  - » 1 virtual steering committee meeting
  - » 10 virtual stakeholder meetings
  - » 6 virtual public meetings
  - » Online public survey
  - » Frequently Asked Questions, Public Engagement Round 1 (November 2021)
    - ◦ Over 2,500 comments provided via the ODOT website and online survey
- Fall/Winter 2021/2022
  - » 1 virtual steering committee meeting
  - » 2 virtual and 2 in-person stakeholder meetings
  - » 2 virtual and 3 in-person public meetings
  - » Route 23 Connect, Round 2 Comment Response (April 2022)
    - ◦ Over 3,500 comments provided throughout this engagement period
- Summer 2022
  - » ODOT announcement that no Build concepts from the May 2022 Preliminary Feasibility Study will be moved forward and improvements along U.S. 23 will be prioritized

2024 PRELIMINARY FEASIBILITY STUDY

The public engagement for the 2024 Preliminary Feasibility Study began in Summer 2022. It refocused the study on improvements to the existing U.S. 23 alignment. With the more detailed focus on the existing corridor, the Community Partners list was modified to include more representation from entities, such as school districts, that are located in the corridor. Coordination with road-maintaining agencies along U.S. 23 (City of Columbus, City of Delaware, Delaware County, City of Worthington) was increased because any improvements would directly affect their roadways.

A summary of the engagement activities that were included in each round can be found below:

- Summer/Fall 2022
  - » 1 virtual and 4 in-person community partner meetings
  - » Online public survey
  - » Route 23 Connect, Public Comment Map Summary (May 2023)
  - » Over 500 comments submitted on the online public comment map tool
- Fall 2023
  - » 2 in-person community partner meetings
  - » 2 virtual and 4 in-person public meetings
  - » Route 23 Connect, Fall 2023 Meetings – Comment Response (April 2024)
  - » Over 600 comments provided throughout this engagement period
- Summer 2024
  - » 2 in-person community partner meetings
  - » 2 virtual and 6 in-person meetings
  - » Comment response (October 2024)

Summer/Fall 2022

The primary focus of this round of engagement was to refocus the study to improving safety and congestion along U.S. 23. The Community Partners and the public were asked to identify locations along the study area for the following categories:

- Congestion
- Safety Concern
- Improvement Needed
- Planned Development

Community Partners completed this activity in-person, while members of the public were able to provide their comments via an online map survey tool. Overall, this activity generated over 500 comments and a summary document was provided in May 2023 via email and the project website.

Fall 2023

Using the feedback provided from the Community Partners and the public, the corridor was divided into seven segments and multiple concepts were developed for each segment. The concepts were developed using four primary improvement options, summarized in the Improvements Considered section. Prior to the meetings, the project team developed an informational video to share the types of improvement options being considered, helping the public prepare for the concepts they would see at the public meetings.

The purpose of the Fall 2023 public meetings was to introduce the concepts being considered for each of the seven segments of U.S. 23. These concepts were presented prior to performing any technical analysis or study findings. All in-person meetings were open-house style, with all segments presented at every meeting location. Additionally, online question-and-answer sessions were hosted to allow people who could not attend the meeting to ask questions directly to the project team. Over 600 comments were provided during this round of meetings and a summary of the comments was provided in April 2024.

Feedback from this round of public engagement indicated that some support existed for each of the concepts. However, there was more support for improvements that prioritized improving travel time and safety, as opposed to improvements that prioritized maintaining all existing access points along U.S. 23. The greater public support for prioritizing travel times was true for each of the segments.

Summer 2024

At the Summer 2024 public meetings, the concepts shown in Fall 2023 – with minor tweaks based on Community Partner/public feedback – were supplemented with preliminary findings of the 2024 Preliminary Feasibility Study. The public were given the opportunity to see how each concept is expected to perform in a wide range of evaluation criteria, including traffic operations, safety, environmental resource impacts, and costs.

Feedback from the Summer 2024 public meetings included support for the high-performing concepts. There are concerns from local travelers who access U.S. 23 at existing signals where the concepts are showing that U-turn movements will be required to access their desired path onto U.S. 23. Additionally, there were concerns from local businesses regarding potential, future property impacts. There was support for the overpasses along the corridor as they provide pedestrian and/or bicycle connection across U.S. 23.

Over 350 written public comments were provided during this round of meetings and a summary of the comments was provided in October 2024.

Outreach Efforts

Various public outreach tactics were utilized to aid in reaching the widest possible cross section of people in the study area. For all rounds of public engagement, the following outreach methods were used:

- Roadside banners erected throughout the corridor
- Flyers distributed to Community Partners and posted at locations throughout the study area
- Email updates to those on the Route 23 Connect mailing list
- Newspaper ads in the Delaware Gazette
- Updates on the project website (publicinput.com/23connect)
- Social media posts on ODOT-maintained accounts

Additionally, the Route 23 Connect study has received substantial media coverage from newspapers, television, and radio outlets covering Central Ohio/Columbus, Northwest Ohio/Toledo, and many other communities in between. Governor DeWine held a press conference on June 17, 2024 to discuss the Route 23 Connect study, announcing that there would be upcoming Route 23 Connect public engagement meetings in Summer 2024. The governor's announcement received widespread news coverage from local and statewide media outlets.

EVALUATION CRITERIA

This section lists the evaluation criteria used for this study and describes the performance metrics used in this evaluation.

Primary Needs

U.S. 23 THROUGH TRAVEL TIMES THROUGH SEGMENT

Segment travel times are comprised of two components – delays experienced at traffic signals plus time spent in motion at free-flow speed.

To calculate vehicle delays, Highway Capacity Software (HCS) was used to analyze each signalized intersection in the corridor for the 2050 Design Year. The larger of the AM or PM peak hour delays was used for the analysis. See Appendix B for Highway Capacity Analysis Reports.

Free-flow travel times were calculated based on existing or anticipated conditions. Existing speed limits were assumed to remain for concepts where U.S. 23 would continue to operate as a signalized arterial. Speed limits were assumed to increase for concepts where all signals would be removed, allowing for more freeway-like operations.

TRAVEL TIME RELIABILITY

Travel time reliability is the consistency or dependability in travel times, as measured from day to day, across different times of day. Inconsistent travel times force drivers to allocate buffer time for their trip, or risk arriving late to their destination.

Travel time reliability is difficult to predict, especially for future year and future road network scenarios. Two metrics are used to represent travel time reliability – the number of signals, and the number of intersections operating at Level-of-Service (LOS) E or worse.

TRAVEL TIME RELIABILITY – NUMBER OF SIGNALS ON U.S. 23

Every signal on the corridor creates delay and an opportunity for variance in travel times, depending on whether drivers arrive during a green light with no stopped traffic, or arrive on a red light with potentially many vehicles stopped in front. Additionally, signalized intersections are locations with conflicting movements that lead to crashes, creating the potential for lane closures and blockages. Thus, the number of signals on U.S. 23 directly correlates to the travel time reliability of the corridor.

TRAVEL TIME RELIABILITY – INTERSECTIONS AT LOS E OR WORSE

Traffic flow at intersections is expressed as Level-of-Service (LOS), which is determined by the average delay of all vehicles at the intersection. Levels-of-Service range from LOS A to LOS F. Level-of-Service ratings of A, B, and C are considered to be in the acceptable range with little to no delay for motorists. LOS D is typically considered to be acceptable in urban and suburban areas. LOS E and F are considered to be unacceptable with substantial delays experienced by motorists. LOS E and LOS F represent unstable flow characteristics, leading to greater unpredictability in travel times. Thus, locations with LOS E or LOS F are more likely to see substantial variability in travel times, as relatively small volume fluctuations can trigger larger additional delay.

SAFETY – FORECASTED CRASHES

This metric compares the forecasted crashes over a 20-year period for the No-Build and Build concepts.

The ODOT Economic Crash Analysis Tool (ECAT) was used to analyze each of the concepts for expected crash frequency and severity. The ECAT tool accounts for intersection characteristics (intersection control type, traffic volumes, etc.), crash history and crash frequencies from similar intersections throughout Ohio and elsewhere.

ECAT was used to create forecasts for serious injury/fatal crashes and for all crash types. The ODOT State Highway Safety Program emphasizes reducing serious injury/fatal crashes, thus those are given special consideration in this study.

See Appendix C for ECAT results.

SAFETY – CONFLICTING MOVEMENTS FOR U.S. 23 THROUGH TRAFFIC

This metric measures the number of conflicting vehicle movements that cross paths with U.S. 23 through traffic at major intersections in the corridor. Each conflicting movement represents an opportunity for a collision, as two vehicle paths could intersect. Conflicting movements for U.S. 23 through vehicles include left turns or right turns from side streets, through movements on side streets, left turns from the opposing direction of U.S. 23, and vehicles turning off U.S. 23 from the same direction. For concepts with freeway ramps, each merge or diverge point represents a conflicting movement.

See Appendix D for conflicting movement calculations.

Secondary Need

CONSISTENCY WITH LOCAL PLANS

Current local land use and transportation plans for jurisdictions throughout the study area were reviewed. Concepts were evaluated against these adopted planning documents to determine whether concepts would help or hinder the achievement of stated goals. Feedback received at public engagement activities from elected officials and administrators of local governments was also used to evaluate a concept's consistency with local goals.

Natural & Cultural Resource Impacts

For each concept, estimated construction limits were developed assuming typical areas for interchanges, connector road interchanges, roadway widening, and other improvements. These were based on current design standards and similar interchanges/improvements throughout Ohio. These limits were compared to natural and cultural resource boundaries to determine estimated impacts. If a Build concept is advanced, further study would evaluate various configurations to minimize impacts.

PARK & RECREATIONAL RESOURCES

Several public park and recreational facilities – including Highbanks Metro Park, Shale Hollow Preservation Park, Mingo Park and Delaware State Park – are located along the existing U.S. 23 corridor. Many of the proposed concepts could require right-of-way from parkland or impact access to/from parkland. If a Build concept with park and recreational resources impacts is advanced, further study would evaluate strategies to minimize or avoid potential impacts.

HISTORIC SITES

Within 1,000 feet of U.S. 23 in the study area, there are 11 locations on the National Register Historic Places list and 6 National Register Historic Sites. These include the Delaware Historic District, Highbanks Metropolitan Park Mounds, and the Delaware Historical Society. If a Build concept with potential historic sites impacts is advanced, further study would evaluate strategies to minimize or avoid potential impacts.

SCENIC RIVER (OLENTANGY RIVER)

The Olentangy River south of Delaware Dam is designated as a State Scenic River. An existing Ohio Environmental Protection Agency (EPA) agreement is intended to protect the Olentangy River watershed. The agreement delineates the boundary of required stream setback distances, consisting of a streamside buffer and an outer buffer. It is expected that any concepts involving work in the Olentangy watershed can be designed to minimize encroachment on the riparian protection areas.

Some of the proposed concepts are likely to require new roadway crossings of the Olentangy River for new ramp connections. Many of the proposed concepts could require widening the existing bridges over the Olentangy River. If a Build concept with potential Scenic River impacts is advanced, further study would evaluate strategies to minimize or avoid potential impacts.

STREAMS & WATERWAYS

U.S. 23 crosses over numerous streams and waterways within the 23.5-mile study area length. Many of the proposed concepts would require lengthening these existing stream/waterway crossings. If a Build concept is advanced, further study would evaluate various configurations to minimize or avoid potential impacts.

ENDANGERED SPECIES HABITAT

The study area is within the known range of several endangered species habitat, including the Rayed Bean Mussel, Snuffbox Mussel, Indiana Bat, and Northern Long-eared Bat. Additionally, the proposed concepts may impact existing crossings or required new crossings of the Olentangy River, thus could have impacts to mussel habitat. Some of the proposed concepts could affect woodlots that are potential Indiana and long-eared bat habitat. However, the expected woodlot impacts for many concepts would be strips immediately adjacent to the existing corridor and not new alignments bisecting woodlots. If a Build concept is advanced with potential impacts to mussel or bat habitat, further study would evaluate ways to minimize impacts.

REGULATED MATERIALS

There are several sites within the study area that potentially contain hazardous materials or regulated substances. These sites include multiple gas stations, automobile related land uses, and commercial sites along U.S. 23. If a Build concept is advanced, further study would evaluate various configurations to minimize impacts.

FARMLAND

Minimal farmland impacts are expected since the concepts proposed improvements and widening along the existing U.S. 23 alignment. With the exception of work in the far northern part of Delaware County, most of the improvements would be in developed or urbanized sections and have limited impacts (less than 50 acres) to farmland. If a Build concept is advanced, further study would evaluate various configurations to minimize impacts.

Community Impacts

ENVIRONMENTAL JUSTICE AND OTHER TRADITIONALLY UNDERREPRESENTED POPULATIONS

While the No-Build concept will not result in new impacts to Environmental Justice and other traditionally underrepresented populations, these groups will continue to be affected by the existing and future congestion and travel delays. However, some Build concepts could result in higher impacts to these groups.

At this point, no specific Environmental Justice or traditionally underrepresented populations have been identified in the corridor. For the purposes of this current study, potential impacts to multi-family residential dwellings and manufactured home communities have been noted within each segment. If a Build concept is advanced, further study would evaluate specific neighborhood characteristics and concepts would be refined to avoid or minimize impacts.

SPECIAL LAND USES

The study area features several large special uses that are valued by the community for recreation or cultural activities but are not publicly owned. Examples of special land uses include Stratford Woods Ecological Center, Camp Mary Orton, and Camp Lazarus.

RESIDENTIAL DISPLACEMENTS

For each concept, estimated right-of-way limits were developed assuming typical areas for traditional freeway interchanges, connector road interchanges, roadway widening, and other improvements. These were based on current design standards and similar interchanges/improvements throughout Ohio.

Estimated residential displacements were calculated using the estimated right-of-way areas developed for each concept. Current zoning classifications from county auditor GIS map tools were used to determine which parcels are residential land uses. Residential properties with over 50% of acreage impacted were assumed to be displacements. It should be noted that the number of displacements is merely an estimate. If an owner has two or more parcels, more than one displacement could be counted for a single owner as owner names and other details were not considered for this preliminary residential displacement calculation. Similarly, detailed estimates of dwelling units impacted in multi-family parcels were not performed for this preliminary estimate.

Current county auditor online appraised values were used as a basis for estimated right-of-way valuations. Parcel values for possible displacements were increased by 200% to account for relocation and damage costs.

COMMERCIAL DISPLACEMENTS

For each concept, estimated right-of-way limits were developed assuming typical areas for interchanges, connector road interchanges, roadway widening, and other improvements. These were based on current design standards and similar interchanges/improvements throughout Ohio.

Estimated commercial displacements were calculated using the estimated right-of-way areas developed for each concept. Current zoning classifications from county auditor GIS tools were used to determine which parcels were commercial. For most segments, commercial parcels with over 25% of acreage impacted were assumed to be displacements, although this value varies in some segments due to the setbacks of commercial buildings to U.S. 23. It should be noted that the number of commercial displacements reflects the number of parcels affected – not necessarily the number of businesses affected. In many situations, a single commercial entity spans multiple adjacent parcels, thus the number of displacements reported could be overestimated. Owner names and other details were not considered for this preliminary commercial displacement calculation.

Current county auditor online appraised values were used as a basis for estimated right-of-way valuations. Parcel values for possible displacements were increased by 200% to account for relocation and damage costs.

AIR QUALITY

Air quality impacts can be estimated using traffic data from travel demand models, including vehicle miles travelled (VMT). For this preliminary analysis, travel demand models were not developed for all concepts considered. However, VMT is expected to be similar for all Build concepts, therefore similar impacts are expected for all Build concepts. If a Build concept is advanced, further study would be performed to determine if the Build concept meets conformity requirements with regional air quality goals.

NOISE SENSITIVE AREAS

No noise analysis has been performed as part of this study. The Build concepts would all involve construction adjacent to noise sensitive areas. Noise impacts will be evaluated based upon ODOT Office of Environmental Services guidance if a Build concept is advanced. Any concept that adds through capacity (added through lanes), constructs a new location roadway, or moves travel lanes more than 50% closer to sensitive receivers would require a noise analysis.

BICYCLE/PEDESTRIAN EAST-WEST CONNECTIVITY

This evaluation criteria assesses how the various concepts would help or hinder bicycle traffic crossing U.S. 23. Because U.S. 23 is a principal arterial with over 30,000 vehicles per day and large truck volumes, it is recognized that north-south bicycle traffic in the corridor should be focused away from U.S. 23 and toward parallel routes, regardless of which concepts are selected for U.S. 23. Thus, only east-west bicycle connectivity is evaluated in this study.

VEHICULAR EAST-WEST CONNECTIVITY

Throughout the corridor, local vehicular traffic relies on crossing U.S. 23 in order to access the numerous retail, residential, medical, and institutional land uses along both sides of U.S. 23. Additionally, several major east-west streets cross U.S. 23 serving as key commuter routes. This evaluation criteria assesses how the various concepts would maintain, improve, or hinder the ability for local traffic to cross U.S. 23.

CIRCUITY/BACKTRACKING TO PUBLIC STREETS

Build concepts will have varying effects on the circulation patterns to/from the public streets intersecting U.S. 23. Many concepts will limit or remove left turning movements at public street intersections, which may require drivers to reroute and possibly backtrack in order to get to their desired destination. This criteria evaluates the number of public streets where direct access to/from U.S. 23 is restricted or eliminated. For the purposes of this metric, interchanges are considered to be full access.

PRIVATE DRIVEWAY ACCESS TO U.S. 23

This evaluation criteria assesses how the various concepts would affect the number and spacing of direct access points to U.S. 23, primarily for private driveways. The U.S. 23 Access Management Plan was developed to provide a plan for consolidating driveways to help improve safety and operation of the corridor. While the corridor has changed significantly since the adoption of the plan, the overall goal of trying to consolidate access points remains to protect the efficiency and safety of U.S. 23 through traffic.

PUBLIC TRANSPORTATION

Except for the far southernmost part of the corridor (Segment 1S), no fixed-route transit service currently exists on U.S. 23. Delaware County Transit provides demand-response service along U.S. 23 in and south of the City of Delaware. The Central Ohio Transit Authority (COTA) provides service to the Crosswoods development in the northeast quadrant of I-270 and U.S. 23. There are two routes. Route 102 provides service between Downtown and Polaris, and Route 41 is a rush hour only route. This evaluation criteria assesses how the various concepts would affect existing or potential public transportation options.

K-12 PUBLIC SCHOOL ACCESS

Access to/from K-12 public schools was evaluated for segments with such facilities, such as Olentangy Local Schools, Buckeye Valley Schools, and the Delaware Area Career Center. This category does not include post-secondary educational facilities, such as the Columbus State Community College Delaware Campus or the Methodist Theological School in Ohio.

ACCESS TO/FROM U.S. 23 FOR EMERGENCY SERVICES

A range of important emergency service providers are located within the study area. Concepts were evaluated on how they would impact access to hospitals/emergency room facilities from U.S. 23. Additionally, access to U.S. 23 from first responder facilities, such as police, fire, and EMS stations were also evaluated.

Infrastructure Impacts

MAINTENANCE OF TRAFFIC (MOT)

It is generally assumed that concepts involving widening of U.S. 23 can be implemented with minimal disruption of traffic, as ODOT Permitted Lane Closure Policy does not allow for long-term lane closures on U.S. 23, except for north of Delaware. Concepts with new grade separations may require long-term disruptions or closures of cross streets.

DESIGN STANDARDS

A screening of the existing corridor indicates that all travel lanes on U.S. 23 are 12' wide and thus meet ODOT Location & Design Manual (L&D) standards. Many areas have shoulder widths (outside and/or inside) and median widths that do not meet current L&D criteria. However, the shoulder widths and median widths do not appear to be contributing to any of the existing crash patterns noted in the study area. While a detailed analysis was not performed, horizontal and vertical curvature do not appear to be presenting a safety issue in the majority of the corridor.

It is too early in the project development process to make definitive statements about whether a concept would fully adhere to design standards. As any concepts are advanced further, alignments will be developed and refined. Deviations from design criteria may be considered to help minimize property or resource impacts. For the purpose of this Feasibility Study, it has been assumed that existing outside shoulder width deficiencies would not be corrected with Build conditions, unless the concept is already widening U.S. 23. For concepts where an existing two-way left-turn lane would be replaced by a raised median, it is generally assumed that the median width would remain unchanged (even if L&D criteria may not be fully met).

MAJOR UTILITIES

A screening of existing information was performed to identify potential impacts to major utility infrastructure, such as electric transmission towers, high-pressure gas lines, and water/sewer lines exceeding 36" in diameter. These major utilities are most likely to cause substantial increases to project costs or schedules. Because of the vast study area and the extensive amount of adjacent development, it is not practical at this stage to analyze all utilities.

RAILROADS

There are no existing at-grade railroad crossings of U.S. 23, nor any at-grade railroad crossings of cross streets immediately adjacent to U.S. 23. One railroad overpass exists between Segment 6 and Segment 7.

Costs

RIGHT-OF-WAY (PARCELS, ACRES, AND COSTS)

For each concept, estimated right-of-way limits were developed assuming typical areas for interchanges, connector road interchanges, roadway widening, and other improvements. These were based on current design standards and similar interchanges/improvements throughout Ohio.

Estimated acreages, estimated displacements, and estimated valuations were calculated using the estimated right-of-way areas developed for each concept. Current zoning classifications were used to provide a breakdown of estimated acreage impacts into four categories – agricultural land, residential land, commercial land, and exempt uses. Agricultural, residential, or exempt properties with over 50% of acreage impacted were assumed to be displacements. For most segments, commercial parcels with over 25% of acreage impacted were assumed to be displacements, although this value varies in some segments due to the proximity of commercial properties to U.S. 23.

Current county auditor online appraised values were used as a basis for estimated right-of-way valuations. Based on recent experience with right-of-way acquisitions, the values for residential areas were adjusted upward by 30% and values for commercial areas were adjusted upward by 50%. In order to account for business operations often associated with agricultural land uses, values for agricultural land uses were adjusted upward by 50%. Parcel values for possible displacements were increased by 200% to account for relocation and damage costs. A cost of $10,000 per parcel was applied to reflect costs for acquisition services including title research, appraisals, and negotiations.

USER BENEFIT (20-YEAR)

The two primary benefits calculated for roadway users are reduced travel delays and reduced number of crashes. Travel delay benefits were calculated for a 20-year life cycle timeframe, comparing Build condition intersection delays for each concept to the No-Build condition. These delays were monetized using the latest values from the Federal Highway Administration Benefit-Cost Analysis Guidance for Discretionary Grant Programs. The ODOT Economic Crash Analysis Tool (ECAT) was used to monetize the safety benefits from expected reductions in crashes over a 20-year period for each concept.

As mentioned in the Traffic Volume Projections section, the traffic volumes used for this study assumed some diversion of traffic onto U.S. 23 from other routes due to the potential increased capacity the Build concepts would provide. For the purposes of the user benefits calculations, predicted intersection delays were scaled downwards to reflect that drivers would be unwilling to divert to a roadway where long delays were occurring – particularly in the No-Build condition. These "scaled" intersection delays were used to be conservative in estimating user benefits. All user benefits – safety and travel times – are shown in current year dollars.

BENEFIT-COST RATIO

The benefits used in this analysis are the 20-year user benefits representing reduced travel delays and reduced crashes (see User Benefit section above). The costs used for this analysis include construction costs, design engineering costs, and right-of-way acquisition costs. All benefits and costs used for this analysis are in current year (2024) dollars. See Appendix G for benefit-cost calculations.

A benefit-cost ratio greater than 1.00 represents a concept where benefits exceed the projected cost. A ratio under 1.00 represents a concept where benefits are less than the projected cost.

Potential emissions and economic development benefits are not included at this stage of analysis due to the high complexity in monetizing these types of benefits. This calculation does not account for other potential negative impacts to natural or cultural resources because dollar values for such impacts are inappropriate at this stage of analysis.

PROJECT COSTS (2030)

Unit costs for major project construction elements – roadway widening, new roadways/ramps, bridges, traffic signals, etc. – were developed based on costs of recent similar ODOT projects. Engineering and construction administration costs are incorporated. A 30% contingency is applied to the construction costs given the unknowns at this stage of project development. Right-of-way costs are also included.

Because specific alignments of the concepts have not been developed, a low-range and high-range cost have been developed. The high-range cost assumes an additional 25% contingency for construction and right-of-way costs.

These costs are reported in 2030 dollars, as it is likely that most concepts would require numerous years of development and design before construction could commence. Details on the conceptual cost estimates are shown in Appendix H.

SEGMENT 1S

Segment Overview

GENERAL/LAND USES

Segment 1S is the southernmost segment of the corridor, extending from the I-270 interchange to Flint Road. This section is mostly located in the City of Columbus, as well as unincorporated portions of Sharon Township in Franklin County. The Crosswoods development is located east of U.S. 23, featuring hotels, office buildings, and restaurants. A large multi-family complex is also located east of U.S. 23. West of U.S. 23 are single-family residential land uses, Camp Mary Orton (non-profit outdoor children's camp), and the Pontifical College of the Josephinum. The City of Worthington is located on the south side of the I-270 interchange. Segment 1S serves the highest traffic volumes in the corridor, with over 80,000 vehicles per day immediately north of I-270.

The I-270/U.S. 23 interchange area was reconstructed as part of the ODOT North Side Mega-Fix Project in 2017. This project constructed an express lane system that allows northbound U.S. 23 through traffic to bypass the Campus View Boulevard and Flint Road signals. All southbound U.S. 23 traffic and local northbound traffic are under signal control at these locations. The North Side Mega-Fix project eliminated weaving movements on U.S. 23 at I-270, bringing the exit ramps under signal control and providing additional lanes. Southbound U.S. 23 vehicles bound for I-270 can bypass the I-270 signals, allowing for free-flow operations.

U.S. 23 ROADWAY

U.S. 23 has a varying cross-section throughout Segment 1S, with the number of lanes changing frequently. Four signals are located within the segment – two at I-270 ramps and two at arterial intersections. A two-lane express roadway carries northbound U.S. 23 through traffic underneath the Campus View Boulevard and Flint Road signals. Northbound through traffic can bypass the two arterial signals, while southbound through traffic to I-270 can bypass the I-270 signals. Thus, through traffic to/from I-270 only has to pass through two of the four signals in either direction.

OTHER ROADWAYS

I-270 is the outerbelt for the Columbus area, serving over 150,000 vehicles per day, one of the busiest freeway segments in Ohio. The I-270 ramps to/from the north on U.S. 23 are very heavily traveled, each serving 15,000 vehicles per day. Compared with traffic going to/from I-270, the volume of U.S. 23 through traffic crossing over I-270 is much smaller. Thus, for the purposes of Segment 1S, the term "through traffic" refers to vehicles traveling between I-270 and points north on U.S. 23.

Two major roadways intersect U.S. 23 in Segment 1S – Campus View Boulevard and Flint Road. Campus View Boulevard E is a five-lane major collector that links to many suburban neighborhoods in northern Columbus. Campus View Boulevard W is a local roadway serving the Pontifical College, a subdivision, and the York Temple Golf Club. Flint Road is a two-lane collector road serving residential areas in Franklin County.

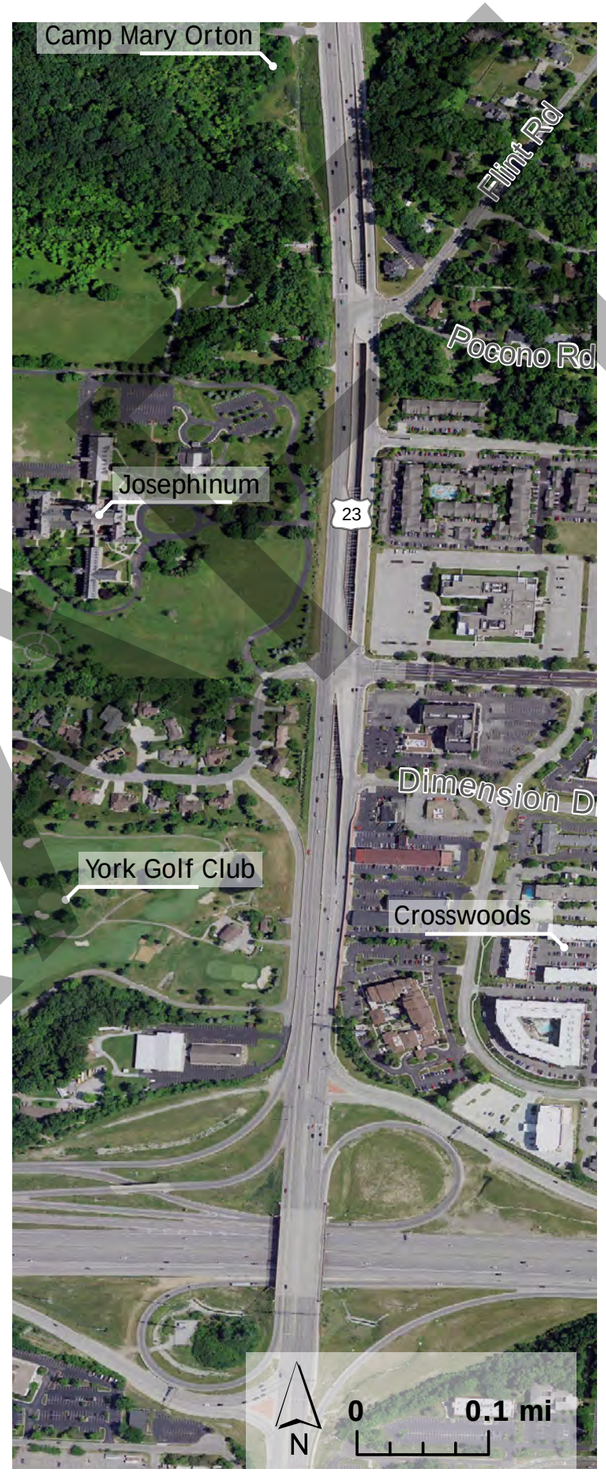


Figure 7: Segment 1S Study Area

Proposed Concepts

Two Build condition concepts have been developed for Segment 1S, in addition to the No-Build condition. The Segment 1S concepts are shown on **Figure 8**.

CONCEPT 1S-A

Concept 1S-A would remove all signals for through traffic in both directions of U.S. 23. Concept 1S-A would be identical to Concept 1S-B for the southbound direction, by creating an express lane system. In the northbound direction, new ramp connections would be made from both directions of I-270 to allow exiting traffic to bypass the interchange signals. The new ramps from I-270 would connect to the existing or modified northbound express lane system, allowing traffic to continue bypassing the Campus View Boulevard and Flint Road signals. Full access to/from the local road system would remain – vehicles from I-270 and U.S. 23 south of I-270 would still be able to access Campus View Boulevard and Flint Road. Likewise, traffic from Campus View Boulevard and Flint Road would still be able to access U.S. 23 south of I-270, both directions of I-270, and SR 315 as they do today.

CONCEPT 1S-B

Concept 1S-B would allow for southbound vehicles on U.S. 23 bound for I-270 to avoid all signals. Similar to the northbound direction, express lanes would be constructed allowing southbound through traffic to bypass the Flint Road and Campus View Boulevard signals. A connection would be made to allow southbound U.S. 23 to continue to access Flint Road or Campus View Boulevard. Further engineering and analysis would determine if the express lanes should be built on the inside, like the northbound express lanes, or would be built on the outside of existing pavement. Traffic from Campus View Boulevard and Flint Road would still retain access to U.S. 23 south of I-270, both directions of I-270, and SR 315 as they do today.

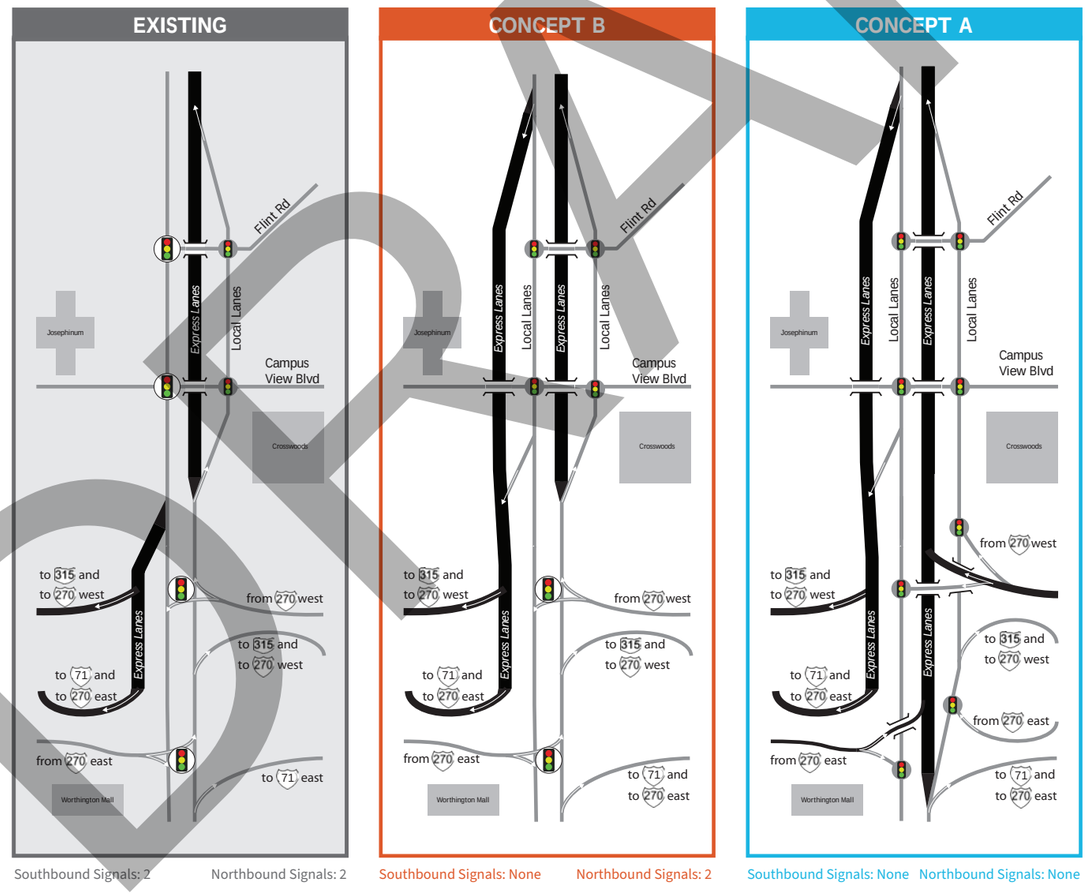


Figure 8: Segment 1S Concepts

Primary Needs

U.S. 23 THROUGH TRAVEL TIMES THROUGH SEGMENT

With no improvements, it is anticipated that it will take through vehicles 4-8 minutes to travel through Segment 1S during peak hours in 2050. For northbound vehicles, the delays will occur at the I-270 ramp signals. For southbound vehicles, the delays will occur at the Flint Road and Campus View Boulevard signals, with the Campus View signal causing the greatest delays. Concept 1S-A would make the segment entirely free-flow for vehicles in both directions, reducing segment travel times to approximately 1 minute. Concept 1S-B would eliminate signals for the southbound direction, improving travel times for that direction. Concept 1S-B would not affect northbound travel times.

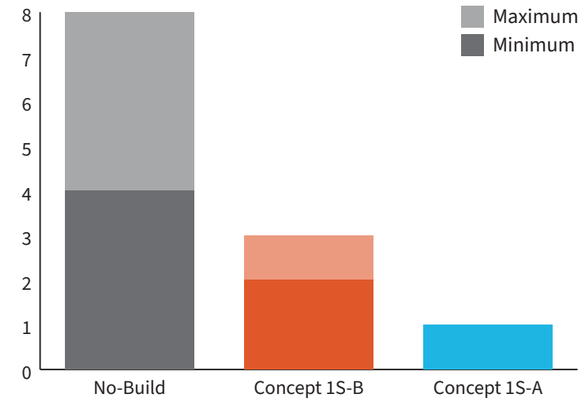


Figure 9: Segment 1S Travel Time
(in minutes)

TRAVEL TIME RELIABILITY – NUMBER OF SIGNALS ON U.S. 23

There are four signals in the No-Build condition in Segment 1S – two of the signals impact U.S. 23 northbound through traffic and the other two signals impact U.S. 23 southbound through traffic. Concept 1S-A would allow both directions of U.S. 23 through traffic to bypass all signals, resulting in free-flow operation. Concept 1S-B would allow southbound U.S. 23 through traffic to bypass all signals, resulting in free-flow operation, but would have no effect on northbound U.S. 23 through traffic.

TRAVEL TIME RELIABILITY – INTERSECTIONS AT LOS E OR WORSE

Three of the four existing signals in Segment 1S are expected to operate at LOS E or worse by 2050, with Flint Road expected to operate at LOS C. Concept 1S-A would improve the operation at all four signals, eliminating all LOS E conditions. Concept 1S-B is expected to improve the Campus View Boulevard signal, leaving the I-270 westbound ramp signal as the only signal operating at LOS E or worse.

SAFETY – FORECASTED CRASHES

Because of the complexity of Segment 1S, the ODOT ECAT tool was unable to be used to forecast safety effects of the concepts. Instead, it was assumed that construction of express lanes and allowing through traffic to bypass signals would reduce many of the rear-end and angle collisions at signals in the segment. Not all rear-end and angle crashes would be eliminated with the Build concepts because signals would still remain for local traffic. Neither Build condition is expected to have a substantial effect on serious injury/fatal crashes, as the severe crash types in this segment have generally not been signal-related. Concept 1S-A is expected to have the greatest effect on safety, reducing crashes by about 35% compared to the No-Build condition. Concept 1S-B is expected to reduce crashes by about 20% compared to the No-Build condition.

SAFETY – CONFLICTING MOVEMENTS FOR U.S. 23 THROUGH TRAFFIC

U.S. 23 through traffic travelling in Segment 1S encounters a combined 17 conflicting movements today in the No-Build condition. Concept 1S-B would eliminate almost all conflicting movements for southbound through traffic. Concept 1S-A would eliminate most conflicting movements for both directions of through traffic, providing the greatest safety benefit. However, it should be noted that Concept 1S-A could result in additional weaving movements on I-270 due to the additional ramp connections needed.

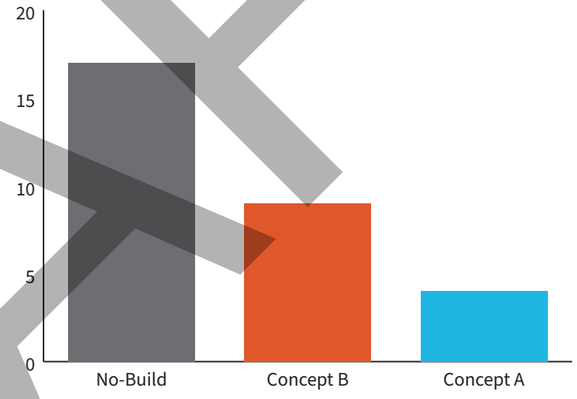


Figure 10: Segment 1S Conflicting Movements
(number of conflicting movements for U.S. 23 through movements)

Secondary Need

CONSISTENCY WITH LOCAL PLANS

Concept 1S-B is likely to impact properties on the west side of U.S. 23 in Segment 1S. However, it is unlikely that such impacts would greatly affect the viability or character of the adjacent area.

Concept 1S-A is likely to have substantial impacts to the Crosswoods development and adjacent areas on the east side of U.S. 23. Comments received from the City of Columbus during public engagement indicate that major disruption to the Crosswoods businesses and development area would be inconsistent with city goals. Concept 1S-A could also result in substantial impacts to the commercial properties along the south side of I-270 between SR 315 and U.S. 23 in Worthington. The 2005 City of Worthington Comprehensive Plan states that it is a goal of the City to keep this Freeway Commercial Area competitive with other regional business parks. The likely disruption to the existing businesses in Concept 1S-A would be inconsistent with this City of Worthington goal.

Table 2: Segment 1S - Primary & Secondary Needs

		NO-BUILD	CONCEPT 1S-B	CONCEPT 1S-A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	4-8 minutes	2-3 minutes	1 minute
	Travel Time Reliability - Number of Signals on U.S. 23	4 signals (2 NB, 2 SB)	2 signals (2 NB, 0 SB)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	3 signals (2 NB, 1 SB)	1 signal (1 NB, 0 SB)	0 signals
	Safety - Forecasted Crashes	55 expected annual crashes 34 expected fatal/serious injury crashes over 20 years	43 predicted annual crashes 32 predicted fatal/serious injury crashes over 20 years	35 predicted annual crashes 31 predicted fatal serious/injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	17 conflicting movements	9 conflicting movements	4 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	No effects anticipated	I-270/U.S. 23 interchange modifications could disrupt commercial areas in Crosswoods area and in City of Worthington

Natural & Cultural Resource Impacts

PARK & RECREATIONAL RESOURCES

Concept 1S-A is likely to have minor impacts to Olentangy Parklands and the Olentangy Trail (southeast quadrant of I-270/SR 315 interchange) due to possible improvements at the I-270 eastbound ramps to U.S. 23. Concept 1S-B is not expected to impact park or recreational resources.

HISTORIC SITES

Concepts 1S-A and 1S-B are likely to have minor impacts due to widening of U.S. 23 to provide express lanes adjacent to Pontifical College of the Josephinum.

SCENIC RIVER (OLENTANGY RIVER)

Concept 1S-A may result in a possible impact to the Olentangy River due to new or modified I-270 eastbound ramps to U.S. 23. Concept 1S-B is not expected to have Scenic River impacts.

STREAMS & WATERWAYS

Both Concept 1S-A and Concept 1S-B would likely involve minor impacts to Flint Run, a waterway located north of the Flint Road intersection. These concepts would likely require lengthening an existing structure that spans this waterway.

ENDANGERED SPECIES HABITAT

Concept 1S-A may have possible mussel impacts due to the potential impacts to the Olentangy River. Concepts 1S-A and 1S-B may have possible impacts to suitable wooded habitat (SWH) for Indiana Bats and Northern Long-eared Bats due to widening of U.S. 23.

NOT APPLICABLE

No impacts are expected for regulated materials or farmland in this segment.

Table 3: Segment 1S - Natural & Cultural Resource Impacts

		NO-BUILD	CONCEPT 1S-B	CONCEPT 1S-A
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	No park or recreational resource impacts expected	Possible impacts to Olentangy Parklands due to modified I-270 eastbound ramps to U.S. 23 Possible impacts to Olentangy Trail due to modified I-270 eastbound ramps to U.S. 23
	Historic Sites	No impacts	Minor impacts likely due to widening adjacent to Pontifical College of the Josephinum	Minor impacts likely due to widening adjacent to Pontifical College of the Josephinum
	Scenic River (Olentangy River)	No impacts	No impacts to Scenic Rivers expected	Possible impacts to Olentangy River due to modified I-270 eastbound ramps to U.S. 23
	Streams & Waterways	No impacts	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Possible impacts to Indiana and Long-eared Bat habitat due to construction of express lanes adjacent to U.S. 23	Possible impacts to mussel habitat due to potential work in Olentangy River Possible impacts to Indiana and Long-eared Bat habitat due to construction of express lanes adjacent to U.S. 23
	Regulated Materials	No impacts	No regulated materials impacts expected	No regulated materials impacts expected
	Farmland	No impacts	No farmland in segment	No farmland in segment

Community Impacts

ENVIRONMENTAL JUSTICE AND OTHER TRADITIONALLY UNDERREPRESENTED POPULATIONS

No specific Environmental Justice or traditionally underrepresented populations have been identified at this time. Concept 1S-A would have potential impacts to multi-family complexes on the east side of U.S. 23 north of Campus View Drive. Concept 1S-B is not expected to impact any Environmental Justice or traditionally underrepresented populations.

SPECIAL LAND USES

Camp Mary Orton is located on the west side of U.S. 23, with an access point just north of Flint Road. Camp Mary Orton is a non-profit children's camp that has been operational since 1910. Both Concept 1S-A and Concept 1S-B are likely to result in minor impacts to Camp Mary Orton, as both concepts are likely to require additional right-of-way to accommodate widening for southbound express lanes. Depending on the design of the express lane system, it is possible that Camp Mary Orton would only have access to either the local lanes only or the express lanes.

RESIDENTIAL & COMMERCIAL DISPLACEMENTS

Concept 1S-A has the potential for substantial displacement of commercial and residential properties. The new ramp connections from I-270 to U.S. 23 northbound and northbound express lanes are likely to require additional right-of-way along the east side of U.S. 23 and the south side of I-270. These areas have large buildings and parking lots relatively close to the existing right-of-way, making the likelihood of displacements high.

Concept 1S-B is likely to have fewer residential and commercial displacements than Concept 1S-A, only affecting properties along the west side of U.S. 23 for the creation of southbound express lanes. The west side of U.S. 23 is less densely developed and has generally larger setbacks from existing pavement, as compared with the east side of U.S. 23. Any displacements required to construct the southbound express lanes in Concept 1S-B would also be required for Concept 1S-A.

If any Build concept is advanced, further study would evaluate various configurations to minimize potential displacements and other impacts.

AIR QUALITY

All Build concepts are likely to have similar and minor air quality impacts.

NOISE SENSITIVE AREAS

Concepts 1S-A and 1S-B may have possible minor noise impacts due to widening of U.S. 23 and for work on new I-270 ramp connections.

BICYCLE/PEDESTRIAN CONNECTIVITY TO EAST-WEST MOVEMENTS

There are currently signalized pedestrian crossings of U.S. 23 at Campus View Boulevard, but no pedestrian crossings of U.S. 23 at Flint Road. The Build concepts would have minimal impact on east-west pedestrian connectivity. In both Build conditions, the signalized crossing at Campus View Boulevard would remain, but fewer vehicles would be passing through the signal, as U.S. 23 through traffic would use the express lanes. No change in pedestrian access is anticipated at Flint Road in any concept.

VEHICULAR CONNECTIVITY FOR EAST-WEST TRAFFIC

There is limited demand for east-west vehicular connectivity in Segment 1S, as the west leg of Campus View Boulevard has low traffic volumes. Both Build concepts and the No-Build condition would retain east-west connectivity at Campus View Boulevard. Flint Road would continue to be a three-leg intersection in all concepts.

CIRCUITY/BACKTRACKING TO PUBLIC STREETS

The Build concepts would have no effect on the circulation patterns in the area. All movements would be retained in both Build concepts, meaning that access to and from surrounding properties and roadways would remain unchanged.

PRIVATE DRIVEWAY ACCESS TO U.S. 23

The Build concepts would have limited effect on access management, as only two private driveways exist in Segment 1S, both with access to U.S. 23 southbound only. With either Build concept, these driveways would continue to have access to either the local lanes or the express lane system.

PUBLIC TRANSPORTATION

Central Ohio Transit Authority (COTA) and Delaware County Transit service in this segment would be minimally affected by any of the concepts. If fixed route service were implemented on this corridor, it is unlikely that transit stops would ever be located directly on U.S. 23 – transit vehicles would turn off and on U.S. 23 to access future transit stops. COTA has two routes – Route 41 and Route 102 - in Segment 1S that serve the Crosswoods development in the northeast quadrant of the I-270/U.S. 23 interchange. The Crosswoods development contains a transfer point to Delaware County Transit service. In both Build concepts, buses could continue to turn to/from U.S. 23 and Campus View Boulevard to access the Crosswoods development.

NOT APPLICABLE

No impacts to K-12 public schools, or emergency service providers are expected in this segment.

Table 4: Segment 1S - Community Impacts

		NO-BUILD	CONCEPT 1S-B	CONCEPT 1S-A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	No impacts to Environmental Justice and other traditionally underrepresented populations expected	Potential impacts to multi-family complexes on the east side of U.S. 23
	Special Land Uses	No impacts	Minor impacts likely to Camp Mary Orton due to adjacent U.S. 23 widening	Minor impacts likely to Camp Mary Orton due to adjacent U.S. 23 widening
	Residential Displacements	No impacts	0-10 residential parcels with displacements	0-10 residential parcels with displacements
	Commercial Displacements	No impacts	0-10 commercial parecels with displacements	10-30 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected
	Bicycle/Pedestrian Connectivty for East-West Movements	No impacts	Minimal impacts to pedestrian/bicycle connectivity expected	Minimal impacts to pedestrian/bicycle connectivity expected
	Vehicular Connectivity for East-West Traffic	No impacts	No impacts to east-west vehicle connections expected	No impacts to east-west vehicle connections expected
	Circuity/Back-tracking to Public Streets	No impacts	No impacts to public street connectivity expected	No impacts to public street connectivity expected
	Private Driveway Access to U.S. 23	No impacts	Minimal impacts to existing driveways expected	Minimal impacts to existing driveways expected
	Public Transportation	No impacts	Minimal impacts to transit service expected	Minimal impacts to transit service expected
	K-12 Public School Access	No schools in segment	No schools in segment	No schools in segment
	Access to/from U.S. 23 for Emergency Services	No emergency service providers/first response facilities in segment	No impacts to access for emergency service/ first response facilities	No impacts to access for emergency service/ first response facilities

Infrastructure Impacts

MAINTENANCE OF TRAFFIC (MOT)

The No-Build concept would have no impacts to traffic, as no construction would occur. Minor MOT effects are anticipated with any Build concepts. Off-peak hour lane closures on U.S. 23, ramps or side streets may be needed for widening or construction of new express lanes or I-270 ramp connections.

DESIGN STANDARDS

There are no known design deficiencies on U.S. 23 in Segment 1S. Due to the complexity and unknown alignments of either of the Build concepts, it is too early to evaluate whether all current design criteria would be met. Further evaluation would be needed if any Build concept is advanced in the project development process.

MAJOR UTILITIES

Construction of a new ramp connection from I-270 eastbound to U.S. 23 northbound in Concept 1S-A is likely to impact the high-voltage transmission line along the south side of I-270. Further study of potential alignments would be needed to determine any impacts to existing towers or clearances from these lines. Concept 1B-S is unlikely to have impacts to major overhead or underground utility infrastructure.

NOT APPLICABLE

No impacts expected to railroad facilities in this segment.

Costs

RIGHT-OF-WAY (PARCELS, ACRES, AND COSTS)

Concept 1S-B is expected to require additional right-of-way from properties along the west side of U.S. 23 in order to construct new southbound express lanes. This would widen the U.S. 23 right-of-way in the segment. Concept 1S-A is expected to require much more additional right-of-way than Concept 1S-B. Right-of-way needs would be the same along the west side of U.S. 23, but substantial additional right-of-way needs are anticipated on the east side of U.S. 23 and the south side of I-270.

USER BENEFITS

Concept 1S-A is expected to offer $200 million in congestion and safety user benefits over a 20-year timeframe. Concept 1S-B is expected to offer roughly half of the user benefits, $95 million, over that same timeframe.

BENEFIT-COST RATIO

Concept 1S-A is expected to have a benefit-cost ratio in the range of 0.36 to 0.50. This would indicate that the costs of Concept 1S-A are well above the anticipated benefits the concept would provide. Concept 1S-B is expected to have a benefit-cost ratio of 1.12 to 1.47, indicating that the concept would have greater user benefits than anticipated costs. The No-Build concept would have no user benefits, but would have no costs other than continued maintenance of the existing system.

PROJECT COSTS (2030)

Both Build concepts are expected to have large costs. Concept 1S-B is expected to have costs near $100 million to construct the southbound express lanes. Concept 1S-A is expected to have a cost about five times greater than Concept 1S-B. The northbound express lanes and new ramp connections from I-270 are expected to have cost between $500-750 million. Much of the additional cost in Concept 1S-A is attributable to potential right-of-way and displacement impacts.

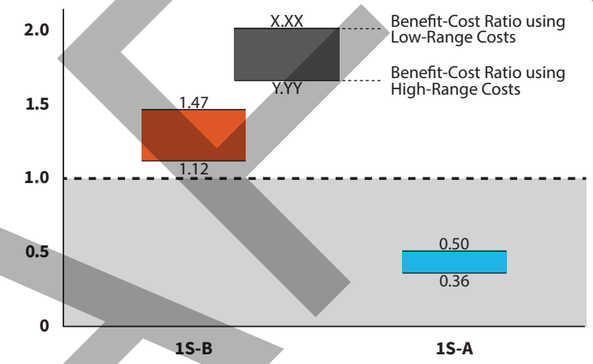


Figure 11: Segment 1S Benefit-Cost Ratios

Table 5: Segment 1S - Infrastructure Impacts & Costs

		NO-BUILD	CONCEPT 1S-B	CONCEPT 1S-A
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minor MOT impacts expected	Minor MOT impacts expected
	Design Standards	No impacts	No deviations from design standards expected	No deviations from design standards expected
	Major Utilities	No impacts	No impacts to major utilities expected	Likely impacts to high-voltage transmission lines south of I-270
	Railroads	No railroads in segment	No railroads in segment	No railroads in segment
Costs	**Right-of-Way (parcels & acres)**	No impacts	0-25 parcels 10-30 acres	25-75 parcels 30-70 acres
	Right-of-Way Costs (2030)	None	$5 - 15M	$180 - 310M
	User Benefit (20-year)	None	$95M	$200M
	Benefit-Cost Ratio	N/A	1.12 - 1.47	0.36 - 0.50
	Projected Costs (2030)	Routine maintenance	$90 - 115M	$535 - 750M

Community Engagement Results

Input from the public and Community Partners indicated support for all concepts shown, including the existing condition. The City of Columbus was supportive of the existing condition, as the property impacts to construct either concept would be high.

Some residents were concerned about potential impacts to The Woods at Josephinum neighborhood and the Pontifical College Josephinum in either concept. Some commenters mentioned that there are existing issues at the interchange, however ODOT anticipates that the future I-71/I-270 project will alleviate some of the queues within the I-270/U.S. 23 interchange.

Conclusions

While Concept 1S-B is showing greater benefits than costs, the concept is expected to have impacts to the Pontifical College, Camp Mary Orton, and other adjacent properties. The Concept 1S-B improvements would have relatively limited safety benefits, while entailing substantial cost (~$100M). There has been limited public support for the concept, and the City of Columbus has not expressed any support for this concept.

Concept 1S-A would have substantial impacts to adjacent properties on both sides of U.S. 23, as well as along the south side of I-270 between SR 315 and U.S. 23. Concept 1S-A would potentially impact parkland and waterways south of I-270. The impacts south of I-270 are especially notable as they affect properties/locations not directly affected by the congestion or safety issues on U.S. 23, and thus would be minimally benefited by the improvements. Impacts south of I-270 could disrupt the commercial district along Wilson Bridge Road, contrary to the City of Worthington's goals to keep the Freeway Commercial District competitive with regional business parks. The expected benefits of Concept 1S-A are expected to be well below the costs. There has been limited public support for the concept, and the City of Columbus has not expressed any support for this concept.

ODOT invested tens of millions of dollars in the past decade to improve traffic flow on U.S. 23 in this segment and has been making further refinements to improve southbound traffic flow. Therefore, the No-Build concept is the most appropriate for Segment 1S. ODOT will continue to evaluate U.S. 23 southbound in this area for further signing, pavement marking, and/or traffic control changes to improve traffic flow, lane utilization, and wayfinding.

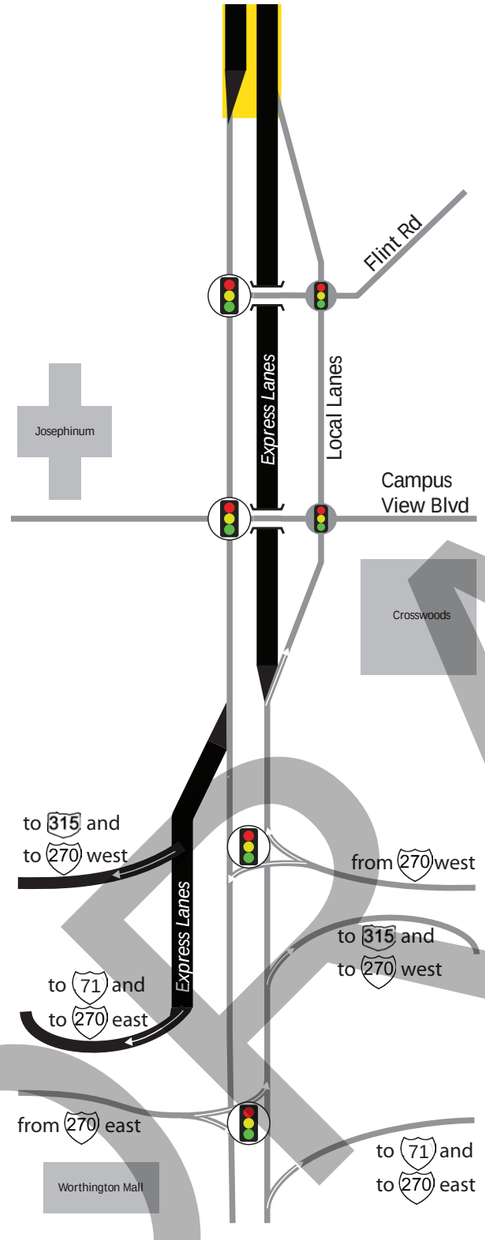


Figure 12: Segment 1S High-Performing Concept

SEGMENT 1N

Segment Overview

GENERAL/LAND USES

Segment 1N begins at the merge at the U.S. 23 tunnel traffic with mainline U.S. 23, just south of Northwoods Boulevard. The northern point of Segment 1N is just north of the Olentangy Meadows signal at Gold Meadows Drive. Most of this segment is located in the City of Columbus, but some unincorporated portions are located in Orange Township of Delaware County. The Franklin County/Delaware County line is located at Lazelle Road, with the City of Columbus located in both counties.

This section of U.S. 23 includes many different uses, including office parks, commercial uses, and single and multi-family residential neighborhoods. Many of the residential and commercial developments do not connect with each other, leaving U.S. 23 as their only access point to the public street system. The JPMorgan Chase McCoy Center, with over 10,000 employees, is located about 1 mile east of U.S. 23 on Lazelle Road. North of Lazelle Road, there are many commercial uses that each have one or more driveways.

U.S. 23 ROADWAY

South of Lazelle Road, U.S. 23 has three through lanes in each direction and a center left turn lane. This section is located within the City of Columbus and has curbs and gutters for drainage, sidewalk on the west side, and a shared-use path on the east side. North of Lazelle Road, U.S. 23 is a five-lane roadway with a center two-way left turn lane. This section has a more rural design, with no curbs or sidewalks. Some of the private driveways in Segment 1N have channelizing islands to encourage only right-in/right-out access.

OTHER ROADWAYS

There is only one minor arterial intersecting U.S. 23 in Segment 1N, Lazelle Road E. Lazelle Road E was recently upgraded as part of a major City of Columbus improvement project to add sidewalk, shared-use path, enclosed drainage, and widening east of Dillmont Drive. The other signalized intersections include Northwood Boulevard, which leads to office and residential uses with no other outlet. Similarly, Highbluffs Drive and Windsong Way both have no outlets, making those subdivisions reliant on U.S. 23 for access to the public street system. Olentangy Meadows Drive serves a residential neighborhood that includes Olentangy Meadows Elementary School. This neighborhood has an additional right-in/right-out access on U.S. 23 at Gold Meadow Drive and access to Lazelle Road via Olenbrook Drive. Due to the Olentangy River and Highbanks Metro Park on the west side of U.S. 23, there are no major east-west roadways in this segment.

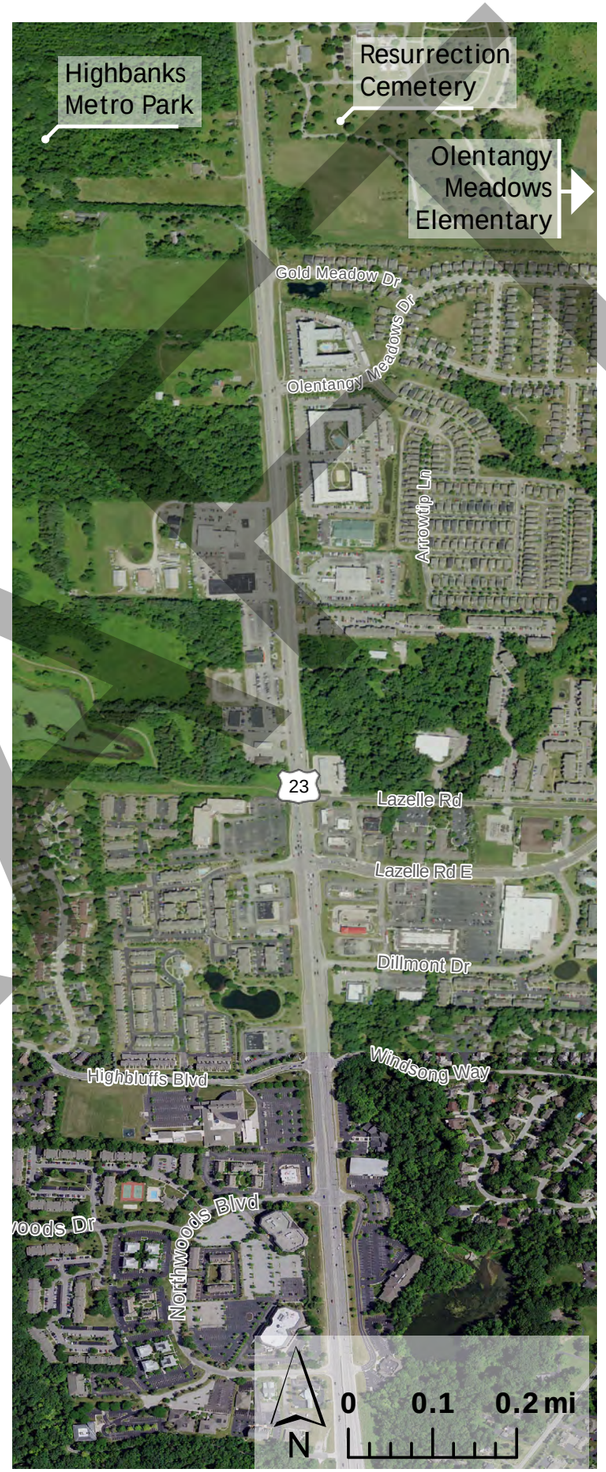


Figure 13: Segment 1N Study Area

Proposed Concepts

Four Build condition concepts have been developed for Segment 1N, in addition to the No-Build condition. Consistent with other segments, Concept A is most freeway-like, while Concept D is most like the existing signalized corridor. The Segment 1N concepts are shown on **Figure 14**.

CONCEPT 1N-A

Concept 1N-A would remove all signals on U.S. 23. Access on U.S. 23 would be limited to a traditional freeway interchange at Lazelle Road and two right-in/right-out (RIRO) access points. Two-way service roads would be constructed to provide access to Lazelle Road, both north and south of the new interchange. Right-in/right-out access points would be provided at Northwoods Boulevard and north of Gold Meadow Drive. The center two-way left turn lane would be replaced with a raised median, eliminating all left turns to or from U.S. 23 throughout the segment. Due to the high projected through volumes, U.S. 23 would be widened to three lanes in each direction throughout the corridor.

CONCEPT 1N-B

Concept 1N-B would also remove all signals on U.S. 23. Concept 1N-B would include three connector road interchanges – at Northwoods Boulevard, Lazelle Road, and Olentangy Meadows Drive/Gold Meadow Drive. Existing roadways would be used for some or all connector roads at these interchanges. All other intersections would be converted to right-in/right-out access only. The center two-way left turn lane would be replaced with a raised median, eliminating all left turns to or from U.S. 23 throughout the segment. Due to the high projected through volumes, U.S. 23 would be widened to three lanes in each direction throughout the corridor.

CONCEPT 1N-C

Concept 1N-C would be the same as Concept 1N-B, except that a signalized northbound U-turn location would be provided north of Olentangy Meadows Drive/Gold Meadow Drive, instead of a connector road interchange. Only southbound traffic would be stopped at this signal, and it would be the only signal in the corridor. Due to the high projected through volumes, U.S. 23 would be widened to three lanes in each direction throughout the corridor.

CONCEPT 1N-D

Concept 1N-D is the only Build concept without any grade separations. An RCUT intersection would be constructed at Lazelle Road and a partial RCUT would be constructed at Olentangy Meadows Drive. The signal at Northwoods Boulevard would remain, but the signal at Windsong Way/ Highbluffs Boulevard would be converted to right-in/right-out access only with U-turn movements at Northwoods Boulevard and Lazelle Road. An additional through lane would be constructed in each direction of U.S. 23. A raised median would be installed to prohibit left turns to or from U.S. 23 outside of the signalized intersections.

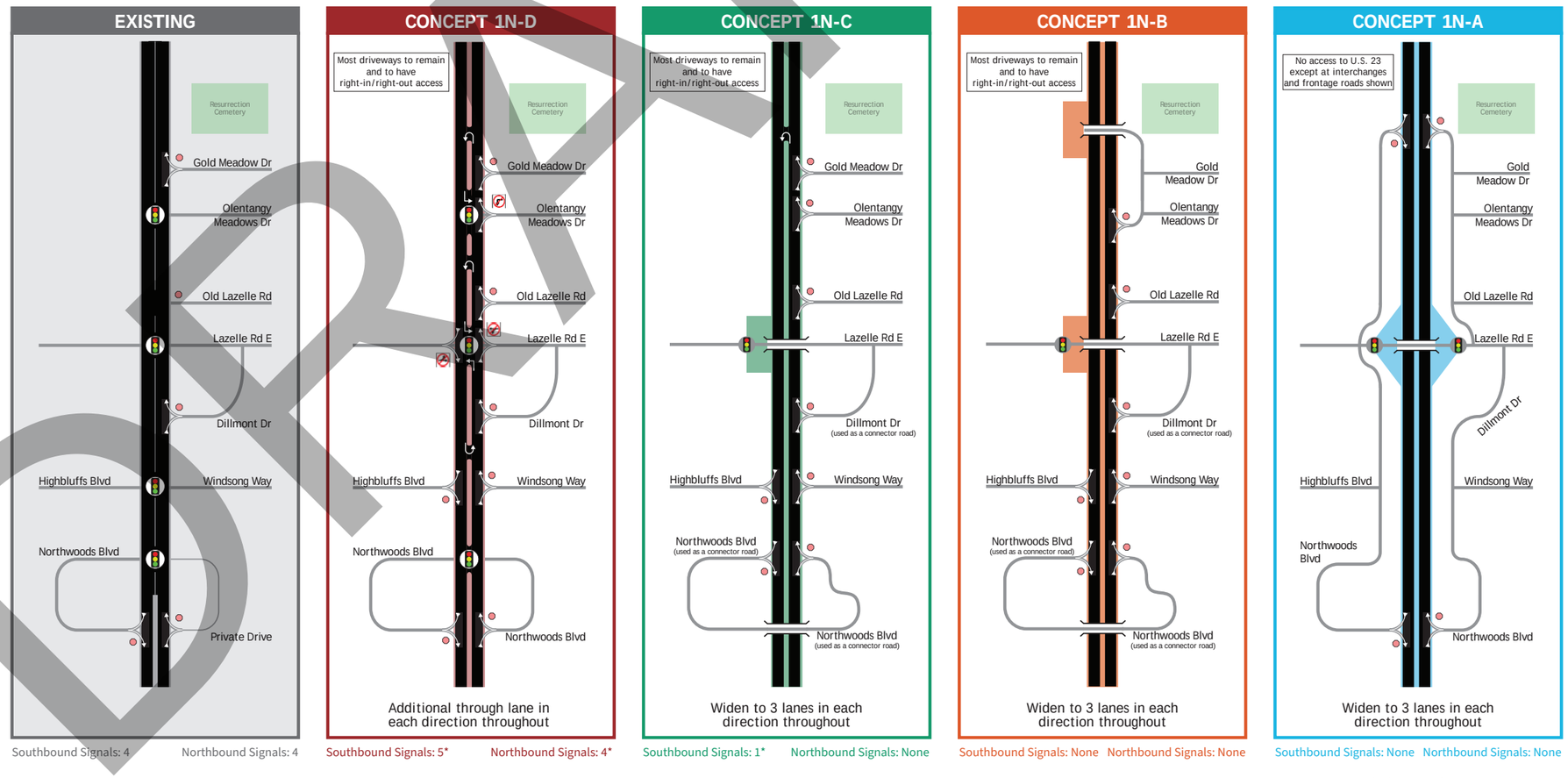


Figure 14: Segment 1N Concepts

**Includes signals at U-turn locations*

Primary Needs

U.S. 23 THROUGH TRAVEL TIMES THROUGH SEGMENT

With no improvements, it is anticipated that it would take vehicles 5-8 minutes to travel through Segment 1N during peak hours in 2050. Concept 1N-D is expected to result in travel times of 2-3 minutes, while Concepts 1N-B and 1N-C are anticipated to only be 2 minutes. Due to a higher design speed for Concept 1N-A, travel times are predicted to be 1-2 minutes. Overall, any improvements to this segment would result in over a 50% travel time reduction.

TRAVEL TIME RELIABILITY – NUMBER OF SIGNALS ON U.S. 23

There are four signals in the No-Build condition in Segment 1N. Concept 1N-A and Concept 1N-B would remove all signals, resulting in free-flow operation for U.S. 23 through traffic in the segment and thus the greatest travel time reliability. Concept 1N-C would result in one signal for southbound traffic only, allowing for a U-turn movement for northbound vehicles. Concept 1N-D would result in five signals, four northbound and five southbound. The signal at Windsong Way/Highbluffs Boulevard would be removed, but the RCUTs would result in two signals in each direction.

TRAVEL TIME RELIABILITY – INTERSECTIONS AT LOS E OR WORSE

Two of the four signals in Segment 1N are expected to operate at LOS E or worse by 2050, Lazelle Road and Olentangy Meadows Drive. Concept 1N-A and Concept 1N-B would remove all signals, resulting in free-flow operation for U.S. 23 through traffic. Concept 1N-C and Concept 1N-D would result in LOS D or better operations at all signalized intersections, leading to better travel time reliability due to the reduced congestion at each signal.

SAFETY – FORECASTED CRASHES

Concept 1N-D is anticipated to have the least effect on crashes, likely because the roadway would be wider and continue to have multiple signals. Concepts 1N-B and 1N-C are predicted to reduce severe crashes by approximately 30%. Concept 1N-A is expected to have the greatest reduction in crashes, with a 50% reduction in severe crashes and nearly 70% reduction in all crashes.

SAFETY – CONFLICTING MOVEMENTS FOR U.S. 23 THROUGH TRAFFIC

U.S. 23 through traffic travelling in Segment 1N encounters 68 conflicting movements today in the No-Build condition. Concept 1N-D would reduce the number of conflicting movements by approximately 30%. Concepts 1N-A, 1N-B, and 1N-C would result in more than 70% less conflicting movements for U.S 23 through traffic, offering the greatest safety benefits.

Secondary Need

CONSISTENCY WITH LOCAL PLANS

Comments received from the City of Columbus during public engagement have indicated a desire to improve safety in the corridor, to retain the recent investment the City made in widening Lazelle Road, and to provide for better pedestrian access across U.S. 23. Providing pedestrian/bicycle connectivity between the neighborhoods in this area and Highbanks Metro Park is a City goal. Concepts 1N-A, 1N-B, and 1N-C would all include a grade separation at Lazelle Road, which could be designed to allow for pedestrian/bicycle crossing. Conversely, Concept 1N-D would force pedestrians to cross a wider U.S. 23, resulting in a less desirable and less safe condition for non-motorized travel modes. Concept 1N-A may provide the best potential pedestrian/bicycle connection to Highbanks Metro Park, as any sidewalk/shared-use path would be adjacent to a frontage/backage road instead of U.S. 23, making for a more desirable pedestrian/bicycle experience. However, Concept 1N-A would be most likely to disrupt a larger portion of Lazelle Road in order to construct a traditional freeway interchange.

The 2018 Orange Township Comprehensive Land Use Plan calls for limiting the number of direct access points to U.S. 23 and reducing the number of cul-de-sac streets to improve connectivity. Concept 1N-A would be most consistent with this goal, as it would eliminate all direct private access points within Orange Township. Other Build concepts would have minimal effect on the number of private access points along U.S. 23 in this segment.

Table 6: Segment 1N - Primary & Secondary Needs

		NO-BUILD	CONCEPT 1N-D	CONCEPT 1N-C	CONCEPT 1N-B	CONCEPT 1N-A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	5-8 minutes	2-3 minutes	2 minutes	2 minutes	1-2 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	4 signals	5 signals (4 NB, 5 SB)	1 signal (0 NB, 1 SB)	No signals (free-flow)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	2 signals	0 signals	0 signals	0 signals	0 signals
	Safety - Forecasted Crashes	68 expected annual crashes 33 expected fatal/serious injury crashes over 20 years	66 predicted annual crashes 30 predicted fatal/serious injury crashes over 20 years	45 predicted annual crashes 23 predicted fatal/serious injury crashes over 20 years	40 predicted annual crashes 23 predicted fatal/serious injury crashes over 20 years	22 predicted annual crashes 16 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	68 conflicting movements	48 conflicting movements	20 conflicting movements	18 conflicting movements	12 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	Least desirable pedestrian connection across U.S. 23 for future trail connection to Highbanks Metro Park	Improved pedestrian connection across U.S. 23 for future trail connection to Highbanks Metro Park	Improved pedestrian connection across U.S. 23 for future trail connection to Highbanks Metro Park	Would greatly reduce access points on U.S. 23, consistent with Township goal Improved pedestrian connection across U.S. 23 for future trail connection to Highbanks Metro Park

Natural & Cultural Resource Impacts

PARK & RECREATIONAL RESOURCES

All Build concepts are likely to have minor impacts to Highbanks Metro Park due to U.S. 23 widening. Concept 1N-A would likely have additional minor impacts due to construction of a new frontage/backage road along the west side of U.S. 23. All Build concepts are likely to have minor impacts to Highbluffs Park due to U.S. 23 widening. Concept 1N-A would likely have additional impacts due to construction of a new frontage/backage road along the west side of U.S. 23.

HISTORIC SITES

All Build concepts are likely to have minor impacts due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District.

ENDANGERED SPECIES HABITAT

All Build concepts are expected to have minor impacts to suitable wooded habitat (SWH) for Indiana Bats and Northern Long-eared Bats due to U.S. 23 widening.

REGULATED MATERIALS

All Build concepts are expected to have minor potential regulated materials impacts. Widening and/or interchange improvements could impact existing gas stations and automobile sales/service businesses.

NOT APPLICABLE

No impacts to scenic rivers, streams and waterways, or farmland are expected in this segment.

Table 7: Segment 1N - Natural & Cultural Resource Impacts

		NO-BUILD	CONCEPT 1N-D	CONCEPT 1N-C	CONCEPT 1N-B	CONCEPT 1N-A
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	Minor impacts likely to Highbluffs Park due to U.S. 23 widening	Minor impacts likely to Highbluffs Park due to U.S. 23 widening	Minor impacts likely to Highbluffs Park due to U.S. 23 widening	Substantial impacts likely to Highbluffs Park due to U.S. 23 widening and new frontage road
	Historic Sites	No impacts	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District
	Scenic River (Olentangy River)	No impacts	No impacts to Scenic River expected	No impacts to Scenic River expected	No impacts to Scenic River expected	No impacts to Scenic River expected
	Streams & Waterways	No impacts	No stream/waterway impacts expected	No stream/waterway impacts expected	No stream/waterway impacts expected	No stream/waterway impacts expected
	Endangered Species Habitat	No impacts	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No impacts	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected

Community Impacts

ENVIRONMENTAL JUSTICE AND OTHER TRADITIONALLY UNDERREPRESENTED POPULATIONS

No specific Environmental Justice or traditionally underrepresented populations have been identified at this time. Concept 1N-A would have potential impacts to a multi-family complex near Lazelle Road W. There are no Environmental Justice impacts expected with Concepts 1N-B, 1N-C, or 1N-D.

RESIDENTIAL & COMMERCIAL DISPLACEMENTS

All Build concepts in Segment 1N could result in both residential and commercial displacements. Concept 1N-A is likely to result in the most overall displacements, due to the right-of-way needed to construct all of the frontage/backage roads, as well as the traditional freeway interchange at Lazelle Road. Concepts 1N-B and 1N-C are likely to result in a lower number of displacements, due to the lack of frontage/backage roads and the more compressed and flexible footprint of a connector road interchange. Concept 1N-D is likely to require more widening than other concepts, due to the need for double left turn lanes at the RCUT intersection, thus potentially having more displacements in this area. If any Build concept is advanced, further study would evaluate various configurations to minimize potential displacements and other impacts.

AIR QUALITY

All Build concepts are likely to have similar and minor air quality impacts.

NOISE SENSITIVE AREAS

Concepts 1N-A, 1N-B, 1N-C and 1N-D are likely to have minor or no impacts to noise sensitive receptors.

BICYCLE/PEDESTRIAN CONNECTIVITY FOR EAST-WEST MOVEMENTS

The three signalized intersections maintained by the City of Columbus in Segment 1N each have marked pedestrian crossings and signals of U.S. 23. However, these locations require pedestrians to cross at least six through lanes of U.S. 23. At Olentangy Meadows Drive, there is no pedestrian crossing allowed across U.S. 23.

In Concept 1N-D, the pedestrian crossings would be maintained at Northwoods Boulevard, however it would require pedestrians to cross an additional two lanes of traffic. Concepts 1N-B and 1N-C would allow for grade-separated crossings at Northwoods Boulevard and Lazelle Road, which would allow pedestrians to cross U.S. 23 more safely. Concept 1N-A would only have one grade-separated crossing at Lazelle Road.

VEHICULAR CONNECTIVITY FOR EAST-WEST TRAFFIC

The No-Build condition has three direct east-west vehicular connections across U.S. 23, however none of these serve as major east-west connector routes. West of U.S. 23, the public roadways only access office parks and/or residential neighborhoods, as there are no roadway connections that extend over the Olentangy River in this segment. All Build concepts would convert Highbluffs Boulevard and Windsong Way to right-in/right-out access only, removing this east-west connection across U.S. 23. The Northwoods Boulevard east-west connection would be maintained in all concepts except for Concept 1N-A. The Lazelle Road east-west connection would be grade separated in all concepts except for Concept 1N-D, where there would be an RCUT that requires east-west through traffic to make indirect turning movements.

CIRCUITY/BACKTRACKING TO PUBLIC STREETS

All Build concepts would affect the circulation patterns in the area, including removing the traffic signal at Windsong Way/Highbluffs Boulevard and converting the intersection to right-in/right-out access only. Additionally, all Build concepts would limit left turns from most cross streets and would require U-turn movements either via an at-grade U-turn location or using one of the interchanges. The only location to maintain side-street left turn movements is Northwoods Boulevard in Concept 1N-D. Concept 1N-A would result in the greatest amount of circuity, with the only connections to the public street system at the Lazelle Road interchange and the north and south service road right-in/right-out connections. In Concept 1N-A, all traffic would be funneled to the Lazelle Road grade separation if they wish to cross from one side of U.S. 23 to the other.

PRIVATE DRIVEWAY ACCESS TO U.S. 23

All Build concepts would include a center median, converting all unsignalized intersections and driveways to right-in/right-out access only. Concept 1N-A would eliminate all direct driveway access to U.S. 23 and all driveways would have access to the adjacent two-way service roads. Concepts 1N-B, 1N-C, and 1N-D would maintain most driveways in the corridor, however all driveways would be right-in/right-out only.

Table 8: Segment 1N - Community Impacts

		NO-BUILD	CONCEPT 1N-D	CONCEPT 1N-C	CONCEPT 1N-B	CONCEPT 1N-A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected	Potential impacts to multi-family complex near Orchard Knoll Drive
	Special Land Uses	No impacts	No impacts to special land uses expected	No impacts to special land uses expected	No impacts to special land uses expected	No impacts to special land uses expected
	Residential Displacements	No impacts	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements	10-30 residential parcels with displacements
	Commercial Displacements	No impacts	0-10 commercial parcels with displacements	0-20 commercial parcels with displacements	0-20 commercial parcels with displacements	10-40 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected
	Bicycle/Pedestrian Connectivity for East-West Movements	3 signalized crossing locations	3 signalized crossing locations, each with longer crossing distances	2 grade-separated crossing locations	3 grade-separated crossing locations	1 grade-separated crossing location
	Vehicular Connectivity for East-West Traffic	3 direct east-west signalized connections	1 direct east-west signalized connection	2 grade-separated east-west connections	3 grade-separated east-west connections	1 grade-separated east-west connection
	Circuity/Back-tracking to Public Streets	5 public street intersections with left turn access	3 public streets with left turn access	1 public street with left turn access	2 public streets with left turn access	1 public street with left turn access
	Private Driveway Access to U.S. 23	No impacts	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	Some existing driveways would remain All private driveways would be right-in/right-out only	No direct private access points All access to private properties via frontage/backage roads
	Public Transportation	No impacts	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected
	K-12 Public School Access	No impacts	No impacts to K-12 school access expected	No impacts to K-12 school access expected	No impacts to K-12 school access expected	No impacts to K-12 school access expected
	Access to/from U.S. 23 for Emergency Services	No impacts	No impacts to emergency services expected	No impacts to emergency services expected	No impacts to emergency services expected	No impacts to emergency services expected

PUBLIC TRANSPORTATION

Delaware County Transit service in this segment would be minimally affected by any of the concepts. If fixed route service were implemented on this corridor, it is unlikely that transit stops would ever be located directly on U.S. 23 – transit vehicles would turn off and on U.S. 23 to access future transit stops.

K-12 PUBLIC SCHOOL ACCESS

The only K-12 public school in the Segment 1N study area is Olentangy Meadows Elementary, part of the Olentangy Local School District. The school only has full access from U.S. 23 at Olentangy Meadows Drive. All Build concepts would limit turning movements at Olentangy Meadows Drive, which could impact bussing operations for the school district. Further coordination with Olentangy Local School District will occur if any concepts are advanced into further project development.

Segment 1N additionally includes residences located within Worthington City Schools. Further coordination with Worthington City Schools will occur if any Build concepts are advanced into further project development.

NOT APPLICABLE

There are no special land uses or emergency service providers located within this segment.

Infrastructure Impacts

MAINTENANCE OF TRAFFIC (MOT)

The No-Build concept would have no impacts to traffic, as no construction would occur. Minimal MOT effects on U.S. 23 are anticipated with any Build concepts, as ODOT policy does not allow for lane reductions on U.S. 23 during high-volume time periods. Off-peak hour lane closures on U.S. 23 may occur with any of the Build concepts. Long-term closures and/or restrictions of side streets may be needed for construction of the new grade separations in Concepts 1N-A, 1N-B, or 1N-C.

DESIGN STANDARDS

Some locations in the northern part of this segment have outside shoulder widths that are less than current ODOT Location & Design Manual (L&D) criteria. However, it does not appear that the shoulder widths are contributing to crash patterns. All Build concepts would widen U.S. 23 for additional travel lanes. ODOT's Performance-Based Practical Design policy would be used to determine if the proposed widening would be all current design criteria or if reduced design criteria should be used to help minimize impacts to adjacent properties.

NOT APPLICABLE

No impacts expected to major utilities or railroad facilities in this segment.

Costs

RIGHT-OF-WAY (PARCELS, ACRES, AND COSTS)

All Build concepts are expected to require some right-of-way due to all concepts requiring some widening of U.S. 23. Concepts 1N-C and 1N-D are expected to require less than 80 acres each, while Concept 1N-A has possible impacts to over 100 acres. Concepts 1N-B, 1N-C, and 1N-D may entail over $50 million in right-of-way costs, primarily attributed to the widening along U.S. 23. Concept 1N-A is anticipated to have much greater right-of-way costs because of the right-of-way required for the frontage/backage road system and traditional freeway interchange, resulting in more than double the right-of-way cost of any other Build concept. Further study of potential alignments would be needed to determine if any impacts could be avoided or lessened.

USER BENEFITS

Concepts 1N-A and 1N-B are expected to have the highest user benefits, as both concepts would eliminate delays for U.S. 23 through traffic and improve safety by eliminating most conflicting movements. Concept 1N-C is expected to have slightly lower user benefits, due to the signal for southbound traffic to accommodate the U-turn location near Olentangy Meadows Drive. Concept 1N-D would have the least amount of user benefit due to the delays resulting from the RCUT signal at Lazelle Road.

BENEFIT-COST RATIO

Concepts 1N-B, 1N-C, and 1N-D are all predicted to have a benefit-cost ratio of close to 1.0, with projected benefits roughly equaling costs. Concept 1N-A is expected to have a benefit-cost ratio well below 1.0, due to its substantially higher costs than other concepts while providing similar benefits.

PROJECT COSTS (2030)

The Build concepts in Segment 1N are all projected to have costs in excess of $100 million. Concept 1N-D is expected to have the least cost, as no grade separations or new roadways are required. Concept 1N-C and 1N-B, with grade separations and a connector road interchange, are expected to have similar costs of approximately $200 million, with Concept 1N-B slightly higher due to the additional grade separation near Olentangy Meadows. Concept 1N-A is estimated to have the greatest cost at over $375 million, due to the additional costs associated with the traditional freeway interchange and construction of frontage/backage roads throughout the segment.

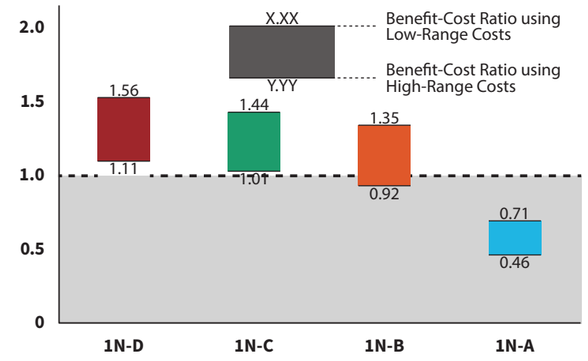


Figure 15: Segment 1N Benefit-Cost Ratios

Table 9: Segment 1N - Infrastructure Impacts & Costs

		NO-BUILD	CONCEPT 1N-D	CONCEPT 1N-C	CONCEPT 1N-B	CONCEPT 1N-A
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected
	Design Standards	No impacts	Shoulder widths likely increased to current design criteria	Some shoulder widths less than current design criteria likely would remain	Some shoulder widths less than current design criteria likely would remain	Some shoulder widths less than current design criteria likely would remain
	Major Utilities	No known major utilities present	No impacts to major utilities expected	No impacts to major utilities expected	No impacts to major utilities expected	No impacts to major utilities expected
	Railroads	No railroads in segment	No impacts to railroads expected	No impacts to railroads expected	No impacts to railroads expected	No impacts to railroads expected
Costs	**Right-of-Way (parcels & acres)**	No impacts	25-75 parcels 30-60 acres	25-100 parcels 40-80 acres	25-100 parcels 50-100 acres	75-125 parcels 70-140 acres
	Right-of-Way Costs (2030)	None	$50 - 90M	$75 - 130M	$95 - 165M	$230 - 400M
	User Benefit (20-year)	None	$125M	$155M	$180M	$180M
	Benefit-Cost Ratio	N/A	1.11 - 1.56	1.01 - 1.44	0.92 - 1.35	0.46 - 0.71
	Projected Costs (2030)	Routine maintenance	$115 - 165M	$165 - 235M	$190 - 275M	$375 - 565M

Key Intersection Analysis

Some key intersections have been analyzed in greater detail, as they are among the larger intersections in the corridor. Improvements selected for the key intersections are also likely to impact the selection of concepts for adjacent locations. Matrices for the key intersections for this segment are presented below.

Table 10: Segment 1N - Lazelle Road

		NO-BUILD	CONCEPT 1N-D	CONCEPT 1N-C	CONCEPT 1N-B	CONCEPT 1N-A
Primary Needs	**Safety - Forecasted Crashes**	35 expected annual crashes 18 expected fatal/serious injury crashes over 20 years	35 predicted annual crashes 15 predicted fatal/serious injury crashes over 20 years	25 predicted annual crashes 11 predicted fatal/serious injury crashes over 20 years	25 predicted annual crashes 11 predicted fatal/serious injury crashes over 20 years	4 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	16 conflicting movements	8 conflicting movements	2 conflicting movements	2 conflicting movements	4 conflicting movements
	Intersection Capacity (all movements)	LOS E 75 seconds of delay/vehicle	LOS C 25 seconds of delay/vehicle	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
	Travel Time Reliability for U.S. 23	1 signal	2 northbound signals 2 southbound signals	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
Costs	**Projected Costs (2030)**	Routine maintenance	$35M	$65M	$75M	$280M

Community Engagement Results

Input from the public and Community Partners has indicated support for a Lazelle Road interchange and the replacement of the Northwoods Boulevard signal with an overpass/underpass. The City of Columbus and others were especially supportive of an interchange at Lazelle Road, which would allow for a grade-separated pedestrian crossing of U.S. 23, eventually connecting many neighborhoods to a future path to Highbanks Metro Park. Many community members raised questions and concerns about the proposed signal removals at Windsong Way/Highbluffs Drive. There was minimal public support for the construction of an overpass/underpass near Olentangy Meadows Drive (Concept 1N-B).

Conclusions

Concept 1N-C should be used as the baseline and starting point for further study in this segment. Concept 1N-B and Concept 1N-C are very similar and both would provide substantial safety and operational benefits. However, the overpass near Olentangy Meadows Drive in Concept 1N-B would have more costs and potential impacts as implementing indirect left turns (RCUT) for vehicles exiting the subdivision, while providing relatively minimal incremental safety and operations benefit.

Concept 1N-A would provide the greatest overall benefit for the traveling public, however it is expected to cost nearly double other costs with similar benefits. Concept 1N-A is expected to have much greater right-of-way impacts and potential for displacements

Concept 1N-D would provide much less benefit than any of the other build concepts. Drivers would have to navigate through more signals in Concept 1N-D than in the No-Build condition. Concept 1N-D is expected to have minimal or no reduction in fatal/serious injury crashes, and potentially increase overall crashes.

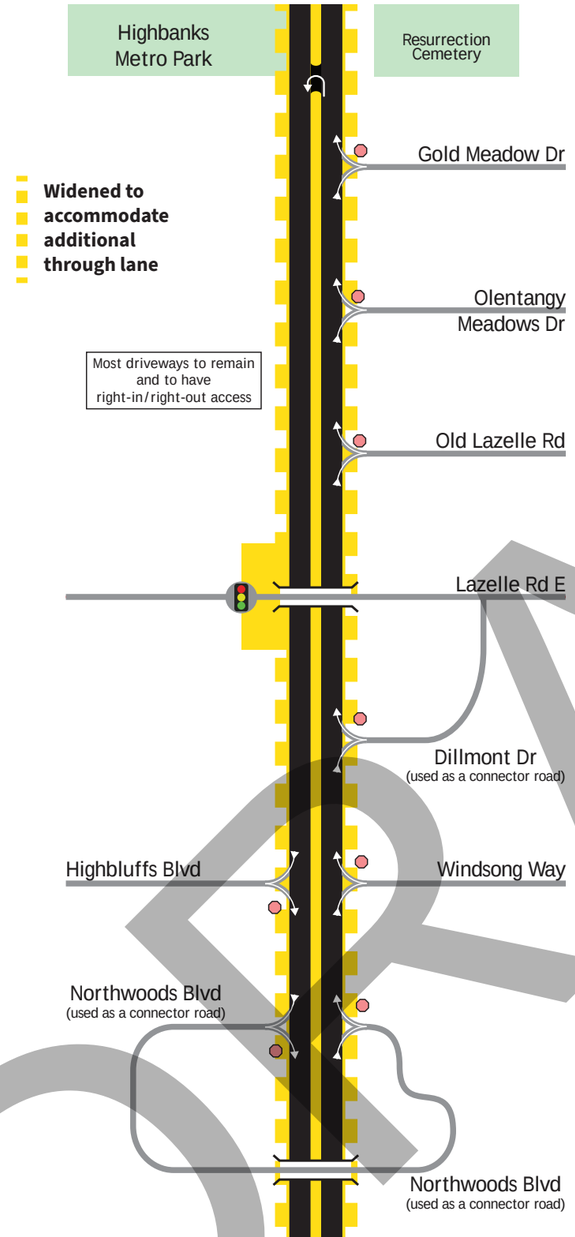


Figure 16: Segment 1S High-Performing Concept

SEGMENT 2

Segment Overview

GENERAL/LAND USES

Segment 2 extends from Green Meadows Drive/Highbanks Metro Park to Parkway Drive. This section is located entirely within Orange Township. Segment 2 serves primarily commercial retail land uses, but several residential, industrial, institutional, and office land uses are located within the study area. North of SR 750, both sides of U.S. 23 have large retail developments with big-box stores, outlots and retail strip plazas. Highbanks Metro Park, the most-visited park in the Franklin County Metro Parks system, is located south of SR 750 on the west side of U.S. 23. Much of this segment grew rapidly in prior decades, and growth is still occurring in some locations.

U.S. 23 ROADWAY

Within Segment 2, U.S. 23 is a five-lane roadway with a center two-way left turn lane. The segment currently has six signalized intersections and several other public and private accesses. Left turns are generally only permitted at signalized intersections within Segment 2. ODOT has made recent improvements to the U.S. 23/SR 750 intersection, adding a double southbound left turn lane, a southbound right turn lane, and a westbound right turn lane.

OTHER ROADWAYS

Two major east-west arterials intersect U.S. 23 in Segment 2 – SR 750 and Orange Road. Segment 2 contains a number of parallel roadways on both sides of U.S. 23, such as Owenfield Drive, Highfield Drive, and Green Meadows Drive. These parallel roadways help to reduce the number of access points needed on U.S. 23 and helps minimize the need for local traffic to use U.S. 23. Green Meadows Drive/Highfield Drive spans the entire Segment length, from SR 750 and Orange Road. Owenfield Drive connects from SR 750 to Hidden Ravines Drive. It is unlikely that Owenfield Drive will ever connect to Orange Road, as any potential alignments are blocked by a cemetery or residential development.

ODOT's 2024 HSIP list indicates that the U.S. 23/SR 750 intersection is the highest ranked suburban intersection in the state. Based on the characteristics of the intersection and crash history, it is predicted that this intersection will experience 10.94 fatal and injury crashes per year.

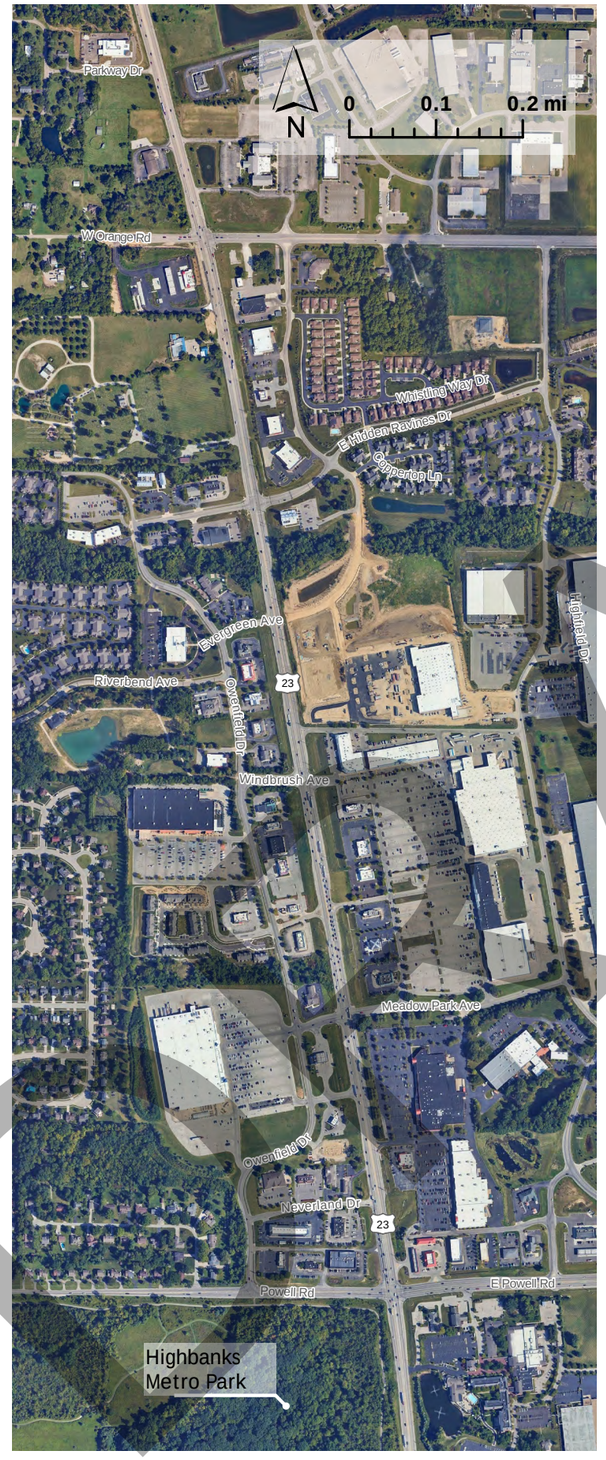


Figure 17: Segment 2 Study Area

Proposed Concepts

Four Build condition concepts have been developed for Segment 2, in addition to the No-Build condition. Consistent with other segments, Concept A is most freeway-like, while Concept D is most like the existing signalized corridor. The Segment 2 concepts are shown on **Figure 18**.

CONCEPT 2A

Concept 2A would remove all signals on U.S. 23. Access on U.S. 23 would be limited to traditional freeway interchanges on each end of the segment, at SR 750 and Orange Road. Additionally, new grade separations would be constructed at Meadow Park Avenue and Green Meadows Drive. The grade separation at Meadow Park Avenue would provide access between the two shopping centers, while the Green Meadows Drive grade separation would provide access to Highbanks Metro Park. The existing parallel roadways of Owenfield Drive and Green Meadows Drive/Highfield Drive would provide access and connectivity along each side of U.S. 23.

CONCEPT 2B

Concept 2B would also remove all signals on U.S. 23. Concept 2B would have a traditional interchange where each direction of U.S. 23 would have ramp connections to SR 750, Green Meadows Drive, or both. The exact interchange configuration would be determined by further study that would evaluate various configurations to minimize potential displacements and other impacts. At Orange Road, a connector road interchange would provide access. Concept 2B would also have a grade separation at Meadow Park Avenue to provide access between the two shopping centers. There would also be right-in/right-out access at Hidden Ravines Drive and Windbrush Avenue. All paved medians would be replaced with a raised median, eliminating all left turns to or from U.S. 23 throughout the segment.

CONCEPT 2C

Concept 2C would have two grade-separated intersections with a connector road interchange at Orange Road and an overpass/underpass at SR 750. The turning movements at SR 750 would be redirected to Green Meadows Drive, which would become a continuous green T-intersection, allowing southbound through traffic to bypass the signal. There would be two additional signals in the corridor at Windbrush Avenue and Meadow Park Avenue. These intersections would become three-legged intersections to allow for more efficient traffic signal operations than the existing four-legged intersections. All paved medians would be replaced with a raised median, eliminating all left turns to or from U.S. 23 throughout the segment.

CONCEPT 2D

Concept 2D is the only Build concept without any grade separations. RCUT intersections would be constructed at Orange Road and Windbrush Avenue. A signal would remain at SR 750, however left-turning movements would be restricted. Vehicles needing to make left turns at U.S. 23/SR 750 would need to use Green Meadows Drive or Neverland Drive to make indirect turns. A raised median would be installed to prohibit left turns to or from U.S. 23 outside of the signalized intersections.

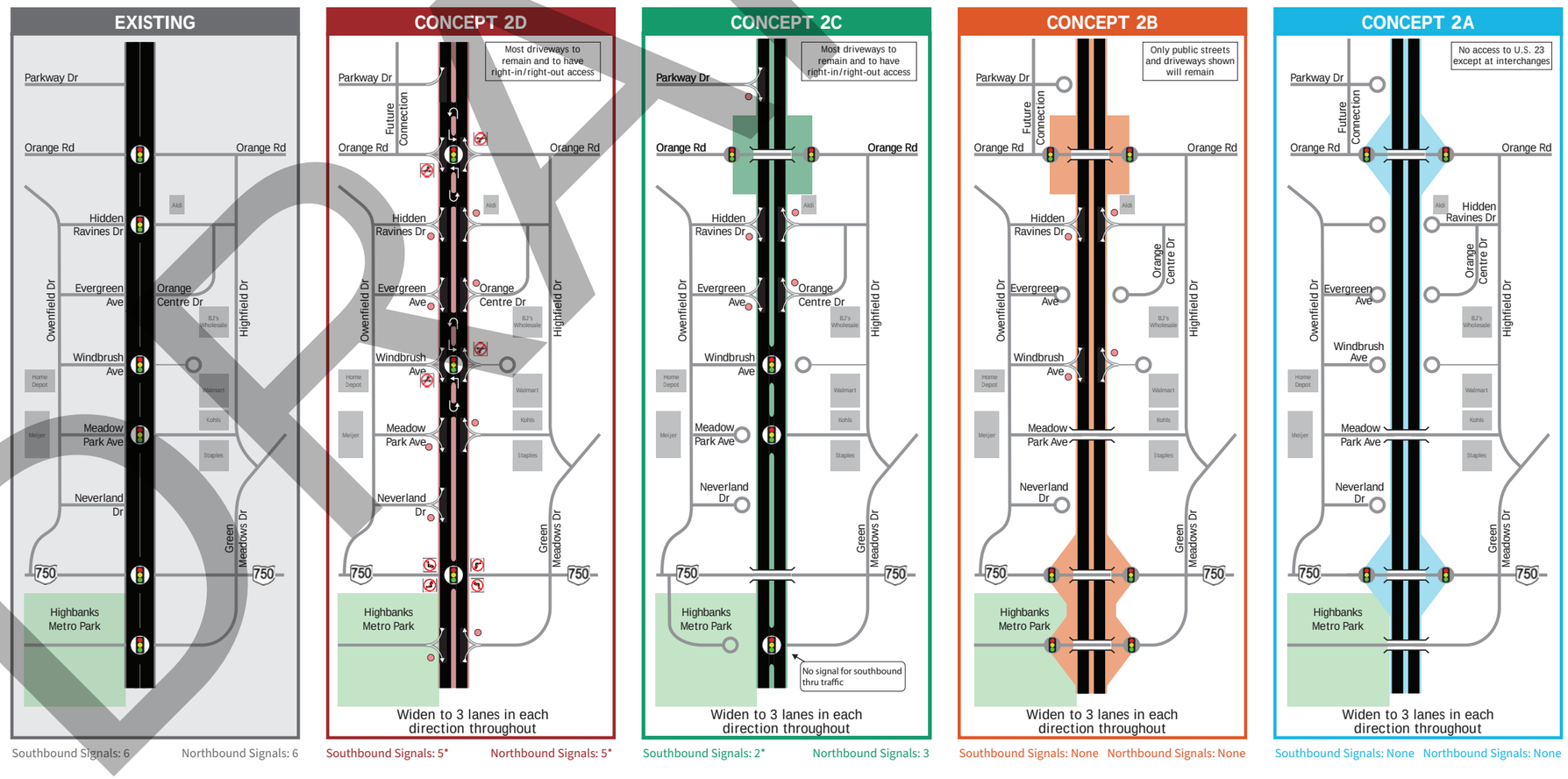


Figure 18: Segment 2 Concepts

**Includes signals at U-turn locations*

Primary Needs

U.S. 23 THROUGH TRAVEL TIMES THROUGH SEGMENT

With no improvements, it is anticipated that it will take vehicles 12-25 minutes to travel through Segment 2 during peak hours in 2050. All Build concepts are expected to reduce travel time by over 50%. Concepts 2C and 2D would have signals remaining, resulting in travel times of 3-7 minutes. Concepts 2A and 2B are expected to result in travel times of 2-3 minutes as U.S. 23 would be entirely free-flow.

TRAVEL TIME RELIABILITY – NUMBER OF SIGNALS ON U.S. 23

There are six signals in the No-Build condition in Segment 2. Concept 2A and Concept 2B would remove all signals, resulting in free-flow operation for U.S. 23 through traffic in the segment and thus the greatest travel time reliability. Concept 2C would result in three signals for northbound traffic and two signals for southbound traffic, as southbound traffic does not have to stop at Green Meadows Drive. U.S. 23 through traffic would pass through five signals in Concept 2D. Signals would be removed at Green Meadows Drive, Meadow Park Avenue, and Hidden Ravines Drive, but there would be two signals in each direction at the RCUTs at Windbrush Avenue and Orange Road.

TRAVEL TIME RELIABILITY – INTERSECTIONS AT LOS E OR WORSE

All six of the existing signals in Segment 2 are expected to operate at LOS E or worse by 2050. Concept 2A and Concept 2B would remove all signals, resulting in free-flow operation for U.S. 23 through traffic. Concepts 2C and 2D would improve operations at the signals compared to No-Build condition, but both concepts are predicted to have at least one signal remaining at LOS E or worse. Concept 2C would have LOS E operations at Meadow Park Avenue, while Concept 2D would have LOS E operations at Windbrush Drive and Orange Road.

SAFETY – FORECASTED CRASHES

Concept 2D would have the least impact on crash reduction, with an estimated 20% crash reduction. Concept 2C is predicted to reduce over 60% of crashes in this segment. Concepts 2A and 2B would have the greatest impacts on crash reduction, as they each are predicted to reduce overall crashes by over 75% and reduce severe crash types by over 70%. Both concepts would eliminate all signals and most access points on U.S. 23.

SAFETY – CONFLICTING MOVEMENTS FOR U.S. 23 THROUGH TRAFFIC

U.S. 23 through traffic travelling in Segment 2 encounters 100 conflicting movements today in the No-Build condition. Concept 2D would eliminate half of the conflicting movements, while Concept 2C would eliminate 70% of conflicting movements. Concept 2A and Concept 2B would reduce the number of conflicting movements for U.S. 23 through traffic over 90% and 80% respectively, offering the greatest safety benefit.

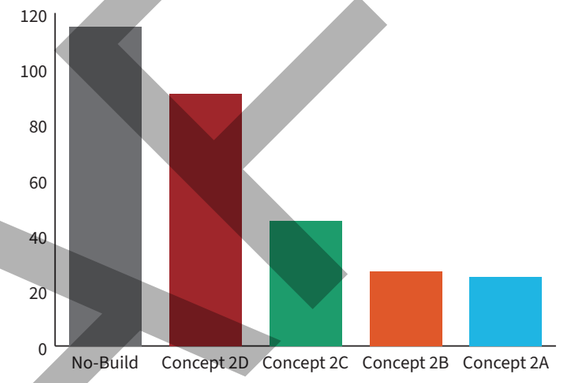


Figure 19: Segment 2 Annual Forecasted Crashes
(all crash types, per year)

Secondary Need

CONSISTENCY WITH LOCAL PLANS

The 2018 Orange Township Comprehensive Land Use Plan calls for limiting the number of direct access points to U.S. 23 and reducing the number of cul-de-sac streets to improve connectivity. Concept 2A would result in the greatest reduction of U.S. 23 access points, while Concept 2B would also reduce a substantial number of access points. Concept 2D would result in no change to the number of access points. Concepts 2A, 2B, and 2C would each result in additional cul-de-sac streets, with Concept 2A resulting in the greatest number of cul-de-sacs, making it most inconsistent with township goals.

Table 11: Segment 2 - Primary & Secondary Needs

		NO-BUILD	CONCEPT 2D	CONCEPT 2C	CONCEPT 2B	CONCEPT 2A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	12-25 minutes	5-7 minutes	3-5 minutes	2-3 minutes	2-3 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	6 signals	5 signals	3 signals (3 NB, 2 SB)	No signals (free-flow)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	6 signals	2 signals	1 signal	0 signals	0 signals
	Safety - Forecasted Crashes	115 expected annual crashes 66 expected fatal/serious injury crashes over 20 years	91 predicted annual crashes 42 predicted fatal/serious injury crashes over 20 years	45 predicted annual crashes 24 predicted fatal/serious injury crashes over 20 years	27 predicted annual crashes 19 predicted fatal/serious injury crashes over 20 years	25 predicted annual crashes 12 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	106 conflicting movements	50 conflicting movements	30 conflicting movements	16 conflicting movements	8 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	No new dead-end public streets, consistent with Township goal U.S. 23/SR 750 turning movements diverted to multiple Township/local roadways such as Neverland Drive, Owenfield Drive, and Green Meadows Drive	Creates some additional dead-end streets, inconsistent with Township goal U.S. 23/SR 750 turning movements diverted to Green Meadows Drive	Creates some new dead-end public streets, inconsistent with Township goal Interchanges may negatively impact existing businesses/tax base Some U.S. 23/SR 750 turning movements diverted to Green Meadows Drive	Creates most additional dead-end streets, inconsistent with Township goal Interchanges may negatively impact existing businesses/tax base Would eliminate all U.S. 23 access points, consistent with Township goal to reduce direct U.S. 23 access

Natural & Cultural Resource Impacts

PARK & RECREATIONAL RESOURCES

Concepts 2A and 2B would likely have moderate impacts to Highbanks Metro Park due to interchanges/overpasses at SR 750 and at Green Meadows Drive and U.S. 23 widening. Concept 2C would likely have moderate impacts to Highbanks Metro Park due to removal of the existing U.S. 23 access point, construction of a new park access point on SR 750, and widening of U.S. 23 adjacent to the park. Concept 2D would likely have minor impacts to Highbanks Metro Park due to U.S. 23 widening and due to the access point onto U.S. 23 converting to a right-in/right-out only access point.

HISTORIC SITES

All Build concepts are likely to have minor impacts due to U.S. 23 widening adjacent to the Highbanks Metropolitan Mounds I & II Historic District.

SCENIC RIVER (OLENTANGY RIVER)

Concept 2C may result in a possible impact to the Olentangy River due to the new Highbanks Metro Park access point on SR 750 needed due to the closure of the existing U.S. 23 access point in this concept. Concepts 2A, 2B and 2D are not expected to impact the Scenic River.

STREAMS & WATERWAYS

Each of the Build concepts are anticipated to have minor impacts to streams/waterways. There is an existing stream/waterway crossing of U.S. 23 in Segment 2, located just south of Hidden Ravines Drive. All Build concepts are likely to require lengthening the structure spanning this waterway.

ENDANGERED SPECIES HABITAT

Concepts 2A, 2B, and 2C would have minor impacts to suitable wooded habitat (SWH) for Indiana Bats and Northern Long-eared Bats due to widening adjacent to U.S. 23, as well as construction of new overpasses and new connector roads. Concept 2D is expected to have the least impacts to suitable wooded habitat due to widening.

REGULATED MATERIALS

All Build concepts are likely to impact sites with potential for regulated materials. Widening and/or interchange improvements could impact existing gas stations and automobile sales/services businesses.

NOT APPLICABLE

No farmlands are present in this segment.

Table 12: Segment 2 - Natural & Cultural Resource Impacts

		NO-BUILD	CONCEPT 2D	CONCEPT 2C	CONCEPT 2B	CONCEPT 2A
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	Minor impacts likely to Highbanks Metro Park due to adjacent U.S. 23 widening, plus change of existing U.S. 23 access point to right-in/right-out only	Moderate impacts likely to Highbanks Metro Park due to removal of U.S. 23 access point and construction of new park access point on SR 750, plus adjacent U.S. 23 widening	Moderate impacts likely to Highbanks Metro Park due to interchanges/overpasses at SR 750 and at Green Meadows Drive and adjacent U.S. 23 widening	Moderate impacts likely to Highbanks Metro Park due to interchanges/overpasses at SR 750 and at Green Meadows Drive and adjacent U.S. 23 widening
	Historic Sites	No impacts	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District
	Scenic River (Olentangy River)	No impacts	No impacts to Scenic Rivers expected	Possible minor impacts to Olentangy River near relocated Highbanks Metro Park access point on SR 750	No impacts to Scenic Rivers expected	No impacts to Scenic Rivers expected
	Streams & Waterways	No impacts	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected	Least minor impacts to potential Indiana and Northern Long-eared bat habitat expected
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No farmland in segment	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected

Community Impacts

RESIDENTIAL & COMMERCIAL DISPLACEMENTS

All Build concepts are expected to have less than 10 potential residential displacements. Commercial displacements are expected to be minimal under Concepts 2B, 2C, and 2D. Concept 2A has the highest potential for commercial displacements, with up to 30 possible displacements. The proposed traditional interchange at SR 750 in Concept 2A is most likely to have commercial displacements as the new interchange ramps could affect developments on the corners of U.S. 23/SR 750. The connector road interchanges in Concepts 2B and 2C would have more flexibility in design and thus are likely to have fewer commercial displacements at the SR 750 and Orange Road areas. If any Build concept is advanced, further study would evaluate various configurations to minimize potential displacements and other impacts.

AIR QUALITY

All Build concepts are likely to have similar and minor air quality impacts.

NOISE SENSITIVE AREAS

All Build concepts are likely to have minor or no impacts to noise sensitive receptors.

BICYCLE/PEDESTRIAN CONNECTIVITY TO EAST-WEST MOVEMENTS

There are currently marked pedestrian crossings on U.S. 23 at the following signalized intersections: Green Meadows Drive, Meadow Park Avenue, Hidden Ravines Drive, and Orange Road. However, there are no pedestrian/bicycle facilities connecting to these crossings, either along U.S. 23 or the adjacent streets. Concepts 2A and 2B would provide grade separations at Meadow Park Avenue and Green Meadows Drive, which could be designed to include bicycle/pedestrian facilities that allow for safer crossing of U.S. 23. Concepts 2A, 2B, and 2C would provide grade-separated crossings at Orange Road and SR 750, which could be designed to accommodate pedestrians and/or bicycles.

While pedestrian crossings could be implemented at signalized intersections in Concept 2C or 2D, it would require pedestrians to cross a wider U.S. 23, making these crossings more challenging for pedestrians to navigate. The continuous-T intersection proposed for Green Meadows Drive in Concept 2C would preclude pedestrian crossing at this location in front of Highbanks Metro Park.

VEHICULAR CONNECTIVITY FOR EAST-WEST TRAFFIC

The No-Build condition has six direct east-west vehicular connections across U.S. 23, all at existing signals. All Build conditions would result in fewer east-west connections, but many would be grade-separated that could allow for more efficient crossing of U.S. 23. Of the Build conditions, Concepts 2A and 2B would have the most direct vehicular east-west connections – with four grade-separated crossings of U.S. 23. Concept 2D would have only one direct east-west connection at SR 750. The other signals in Concept 2D would be RCUTs that require east-west through traffic to make indirect movements.

CIRCUITY/BACKTRACKING TO PUBLIC STREETS

All Build concepts would affect the circulation patterns in the area. Concept 2A would have the greatest effect on circulation, as SR 750 and Orange Road would be the only public streets with access to U.S. 23. Concept 2B would allow for additional right-in/right-out public street connections in the northern part of the segment. Concepts 2A and 2B would provide a grade-separated east-west connection at Meadow Park Avenue. Concepts 2C and 2D would allow for one left turn location to/from U.S. 23 in each direction between SR 750 and Orange Road. Concept 2C would retain full access to U.S. 23 at Green Meadows Drive. All Build concepts would remove left turns at Hidden Ravines Drive.

Table 13: Segment 2 - Community Impacts

		NO-BUILD	CONCEPT 2D	CONCEPT 2C	CONCEPT 2B	CONCEPT 2A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected
	Special Land Uses	No special land uses in segment	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Residential Displacements	No impacts	No residential parcel displacements expected	No residential parcel displacements expected	No residential parcel displacements expected	No residential parcel displacements expected
	Commercial Displacements	No impacts	0-10 commercial parcels with displacements	0-10 commercial parcels with displacements	10-20 commercial parcels with displacements	10-30 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected
	Bicycle/Pedestrian Connectivity for East-West Movements	4 signalized crossing locations	3 signalized crossing locations, each with longer crossing distances	2 signalized crossing locations, each with longer crossing distances 2 grade-separated crossing locations	4 grade-separated crossing locations	4 grade-separated crossing locations
	Vehicular Connectivity for East-West Traffic	6 direct east-west signalized connections	1 direct east-west signalized connection	2 grade-separated east-west crossings	4 grade-separated crossing locations	4 grade-separated crossing locations
	Circuity/Back-tracking to Public Streets	6 public streets with left turn access	2 public streets with left turn access	3 public streets with northbound left turn access 4 public streets with southbound left turn access	3 public streets with left turn access	2 public streets with left turn access
	Private Driveway Access to U.S. 23	No impacts	Most existing private driveways would remain All private driveways would be right-in/right-out only, except for driveway across from Windbrush Avenue	Most existing private driveways would remain, except for driveway across from Windbrush Avenue All private driveways would be right-in/right-out only	Driveway across from Windbrush Avenue (right-in/right-out only) would be only direct private access on U.S. 23	No direct private access points
	Public Transportation	No impacts	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected
	K-12 Public School Access	No K-12 public schools in segment	No impacts to K-12 school access expected	No impacts to K-12 school access expected	No impacts to K-12 school access expected	No impacts to K-12 school access expected
	Access to/from U.S. 23 for Emergency Services	No emergency service providers or first responders in segment	No impacts to emergency services expected	No impacts to emergency services expected	No impacts to emergency services expected	No impacts to emergency services expected

PRIVATE DRIVEWAY ACCESS TO U.S. 23

All Build concepts would include a center median, converting any unsignalized intersections and driveways to right-in/right-out access only. Concept 2A would have the greatest impact on direct access on U.S. 23, eliminating all private driveways. Concept 2B would likely eliminate private access points between SR 750 and Meadow Park Avenue due to interchange ramps. Concept 2B would also convert the private access point into NorthPointe Plaza across from Windbrush Avenue to right-in/right-out access operation. Concepts 2C and 2D would retain most or all existing private driveway access locations on U.S. 23, but existing full access points would be converted to right-in/right-out access only.

Access to Highbanks Metro Park is discussed in the Park & Recreational Resources section.

PUBLIC TRANSPORTATION

Delaware County Transit service in this segment would be minimally affected by any of the concepts. If fixed route service were implemented on this corridor, it is unlikely that transit stops would ever be located directly on U.S. 23 – transit vehicles would turn off and on U.S. 23 to access future transit stops.

NOT APPLICABLE

No special land uses, K-12 public schools, or emergency service providers are located within this segment. It is unlikely that any Environmental Justice and other traditionally underrepresented populations are present in this segment.

Infrastructure Impacts

MAINTENANCE OF TRAFFIC (MOT)

The No-Build concept would have no impacts to traffic, as no construction would occur. Minimal MOT effects on U.S. 23 are anticipated with any Build concepts, as ODOT policy does not allow for lane reductions on U.S. 23 during high-volume time periods. Off-peak hour lane closures on U.S. 23 may occur with any of the Build concepts. Long-term closures and/or restrictions of side streets may be needed for construction of the new grade separations in Concepts 2A, 2B, or 2C.

DESIGN STANDARDS

Some locations in this segment have outside shoulder widths that are less than current ODOT Location & Design Manual design criteria. However, it does not appear that the shoulder widths are contributing to crash patterns. All Build concepts would replace the existing two-way left-turn lane on U.S. 23 with a raised median. In Concept 2A and Concept 2B, the raised median could result in an inside shoulder width that is less than ODOT design criteria for such a facility, unless U.S. 23 were widened for additional pavement width. Concept 2C and Concept 2D are less likely to have substandard shoulder widths, as a wider median would be required in most areas due to the need for double left turn lanes. If any Build concept is advanced, the ODOT Performance-Based Practical Design policy would be used to assess the need to widen for larger shoulder widths.

NOT APPLICABLE

There are no railroad facilities in this segment.

Costs

RIGHT-OF-WAY (PARCELS, ACRES, AND COSTS)

Concepts 2A and 2B are expected to require the most amount of right-of-way due to the high number of grade separated intersections. Both concepts are expected to require more than 70 acres. Concepts 2C and 2D are expected to have approximately half the right-of-way costs as other Build concepts.

USER BENEFITS

Concepts 2A and 2B are expected to have the greatest user benefits, with delays for U.S. 23 through traffic eliminated and the greatest predicted crash reduction due to many fewer conflicting movements. Concept 2C is expected to have slightly lower user benefits than 2A and 2B, primarily due to the delays and conflicting movements resulting from the Meadow Park Avenue and Windbrush Avenue signals. Concept 2D is expected to have the least user benefits of Build concepts, as the additional signals are expected to result in increased delays.

BENEFIT-COST RATIO

All Build concepts are anticipated to have a benefit-cost ratio greater than 2.0, with projected user benefits over double the projected costs. Concepts 2C and 2D are expected to have the highest benefit-cost ratios, with benefits approximately triple the projected costs. Concept 2A and 2B have somewhat lower benefit-cost ratios.

PROJECT COSTS (2030)

All Build concepts are expected to exceed $150 million in total costs. All Build concepts involve widening for an additional through lane in each direction on U.S. 23. Concepts 2A and 2B each involve four new grade separations, resulting in projected costs nearly double that of other Build concepts. Concept 2D is expected to have the least cost, as it does not include any grade separations or new connector roads. However, the improvements needed to local streets to handle diverted turning movements make the estimated cost of Concept 2D similar to Concept 2C.

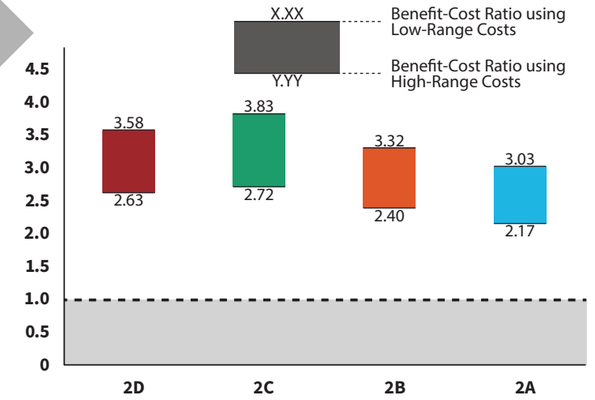


Figure 20: Segment 2 Benefit-Cost Ratios

Table 14: Segment 2 - Infrastructure Impacts & Costs

		NO-BUILD	CONCEPT 2D	CONCEPT 2C	CONCEPT 2B	CONCEPT 2A
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected
	Design Standards	No impacts	Shoulder widths likely increased to current design criteria	Shoulder widths likely increased to current design criteria	Some shoulder widths less than current design criteria likely would remain	Some shoulder widths less than current design criteria likely would remain
	Major Utilities	No known major utilities present	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Railroads	No railroads present	No impacts expected	No impacts expected	No impacts expected	No impacts expected
Costs	**Right-of-Way (parcels & acres)**	No impacts	75-150 parcels 40-80 acres	75-175 parcels 50-100 acres	100-175 parcels 70-130 acres	75-175 parcels 70-130 acres
	Right-of-Way Costs (2030)	None	$50 - 90M	$55 - 95M	$95 - 160M	$105 - 180M
	User Benefit (20-year)	None	$450M	$520M	$650M	$660M
	Benefit-Cost Ratio	N/A	2.63 - 3.58	2.72 - 3.83	2.40 - 3.32	2.17 - 3.03
	Projected Costs (2030)	Routine maintenance	$170 - 230M	$185 - 255M	$260 - 365M	$290 - 405M

Key Intersection Analysis

Some key intersections have been analyzed in greater detail, as they are among the larger intersections in the corridor. Improvements selected for the key intersections are also likely to impact the selection of concepts for adjacent locations. Matrices for the key intersections for this segment are presented below.

Table 15: Segment 2 - Orange Road

		NO-BUILD	CONCEPT 2D	CONCEPT 2C	CONCEPT 2B	CONCEPT 2A
Primary Needs	**Safety - Forecasted Crashes**	20 expected annual crashes 11 expected fatal/serious injury crashes over 20 years	19 predicted annual crashes 8 predicted fatal/serious injury crashes over 20 years	6 predicted annual crashes 5 predicted fatal/serious injury crashes over 20 years	7 predicted annual crashes 6 predicted fatal/serious injury crashes over 20 years	6 predicted annual crashes 3 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	16 conflicting movements	12 conflicting movements	4 conflicting movements	4 conflicting movements	4 conflicting movements
	Intersection Capacity (all movements)	LOS F 120 seconds of delay/vehicle	LOS E 75 seconds of delay/vehicle	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
	Travel Time Reliability for U.S. 23	1 signal	2 northbound signals 2 southbound signals	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
Costs	**Projected Costs (2030)**	Routine maintenance	$50M	$70M	$85M	$125M

Table 16: Segment 2 - SR 750 Area

		NO-BUILD	CONCEPT 2D	CONCEPT 2C	CONCEPT 2B	CONCEPT 2A
Primary Needs	**Safety - Forecasted Crashes**	66 expected annual crashes 31 expected fatal/serious injury crashes over 20 years	47 predicted annual crashes 24 predicted fatal/serious injury crashes over 20 years	23 predicted annual crashes 11 predicted fatal/serious injury crash over 20 years	14 predicted annual crashes 7 predicted fatal/serious injury crashes over 20 years	9 predicted annual crashes 5 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	50 conflicting movements	18 conflicting movements	12 conflicting movements	4 conflicting movements	4 conflicting movements
	Intersection Capacity (all movements)	LOS F 4.25 minutes of delay/vehicle	LOS C 0.5 minutes of delay/vehicle	LOS E 1.5 minutes of delay/vehicle	No signal (free-flow)	No signal (free-flow)
	Travel Time Reliability for U.S. 23	3 signals	1 signal	2 signals	No signal (free-flow)	No signal (free-flow)
Costs	**Projected Costs (2030)**	Routine maintenance	$70M	$75M	$115M	$150M

Community Engagement Results

The public and Community Partners have indicated that this segment, especially the U.S. 23/SR 750 intersection, needs to be upgraded to improve safety and operations. There is public concern regarding impacts to the Highbanks Metro Park, including property impacts and access changes.

Conclusions

Concept 2B should be the baseline and starting point for further study in this segment. Concepts 2A and 2B are both predicted to provide the greatest benefits in traffic operations and safety, addressing the purpose and need better than other concepts. While both concepts appear to be feasible, Concept 2B is expected to provide nearly equal benefit to Concept 2A while having a somewhat lower cost. Unlike Concept 2A, Concept 2B would allow some direct access into the large retail plazas to be maintained, potentially being less disruptive to businesses and helping to maintain an important tax revenue source for the local jurisdictions. Concept 2B is more consistent with local planning documents than Concept 2A, as it would create fewer cul-de-sac roadways. While Concept 2B is expected to impact Highbanks Metro Park, it is expected that impacts to its recreational and cultural resources can be minimized.

Concept 2C is expected to provide less safety and traffic operational benefit, leaving multiple signals on U.S. 23. Concept 2C would create an indirect connection between U.S. 23 and SR 750, especially for the heavy south-to-east and west-to-north movements. Concept 2C is also expected to have impacts to Highbanks Metro Park and an approximately $200 million cost, a similar magnitude as more effective concepts.

Concept 2D is expected to provide the least safety and traffic operational benefit and have a high cost (approximately $200 million). Concept 2D would divert U.S. 23/SR 750 left turning movements onto local roadways and eliminate all direct east-west connections between SR 750 and Orange Road.

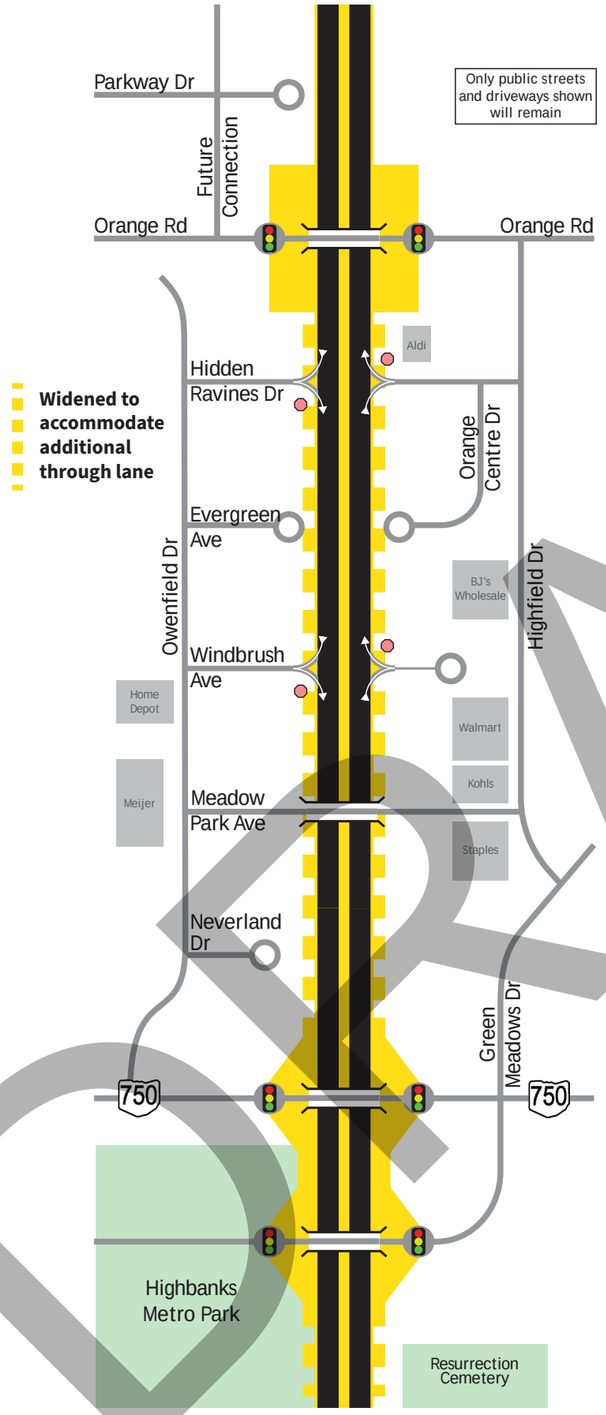


Figure 21: Segment 2 High-Performing Concept

SEGMENT 3

Segment Overview

GENERAL/LAND USES

Segment 3 extends from Orangepoint Drive to Orangewick Drive. This section is located entirely within Orange Township. Segment 3 serves primarily commercial land uses, but several residential, industrial, and institutional land uses are located within the study area. Several medical facilities and an Orange Township fire/EMS station are located in Segment 3. Olentangy Local School District has a large high school, a middle school, and an elementary school located in this segment – just east of Rail Timber Way. The area surrounding much of this corridor has been rapidly developing in recent years.

U.S. 23 ROADWAY

South of Home Road, U.S. 23 is a five-lane roadway with a center two-way left turn lane. North of Home Road, U.S. 23 has a grass median with breaks at signals and some other intersections and driveways. The southern part of the corridor only has access to U.S. 23 via public street intersections. North of Home Road, there are private commercial and residential driveways with direct access to U.S. 23.

OTHER ROADWAYS

Two major east-west arterials intersect U.S. 23 in Segment 3 – Home Road and Lewis Center Road. The Delaware County Thoroughfare Plan has long identified these two roadways as the key east-west connections across southern Delaware County. An ongoing Delaware County construction project is extending Home Road east to link with Lewis Center Road via a grade separation over railroad tracks. This will make a continuous Home Road-Lewis Center Road connection across the county, increasing traffic and importance of the U.S. 23/Home Road intersection while decreasing traffic on Lewis Center Road at U.S. 23.

Segment 3 contains a number of parallel roadways on both sides of U.S. 23, such as Gooding Boulevard, Graphics Way, Artesian Run, and Rail Timber Way. These parallel roadways help to reduce the number of access points needed on U.S. 23 and helps minimize the need for local traffic to use U.S. 23. Green Meadows Drive, a collector road located about ½ mile east of U.S. 23 is currently under construction to be extended north from Home Road to Lewis Center Road.

Figure 22: Segment 3 Study Area

Proposed Concepts

Four Build condition concepts have been developed for Segment 3, in addition to the No-Build condition. Consistent with other segments, Concept A is most freeway-like, while Concept D is most like the existing signalized corridor. The Segment 3 concepts are shown on **Figure 23**.

CONCEPT 3A

Concept 3A would remove all signals on U.S. 23. Access on U.S. 23 would be limited to a traditional freeway interchange at Home Road and three right-in/right-out (RIRO) access points. A new grade separation would be constructed in the southern part of the segment, and another grade separation would be constructed for Lewis Center Road. The combination of these grade separations and RIRO access points would provide connectivity, functioning similar to connector road interchanges. All paved medians would be replaced with a raised median, eliminating all left turns to or from U.S. 23 throughout the segment.

CONCEPT 3B

Concept 3B would also remove all signals on U.S. 23. Concept 3B would be similar to Concept 3A, except that Home Road would become a connector road interchange (instead of a traditional freeway interchange) and a grade separation would be constructed at Olentangy Crossings (instead of Lewis Center Road). It is possible that some existing public roads could be used for part of the connector road system for the Home Road interchange. All paved medians would be replaced with a raised median, eliminating all left turns to or from U.S. 23 throughout the segment.

CONCEPT 3C

Concept 3C would construct a connector road interchange at Home Road and RCUT intersections at Orangepoint Drive and at Olentangy Crossings. An additional U-turn location would be provided north of Orangewick Drive. Like Concept 3B, it is possible that some existing public roads could be used for part of the connector road system for the Home Road interchange. All existing public street intersections would remain – either as signals or RIRO access points. Because this concept would have signals on U.S. 23, it is assumed that widening to 3 lanes in each direction would be needed for traffic operations.

CONCEPT 3D

Concept 3D is the only Build concept without any grade separations. An RCUT intersection would be constructed at Home Road. Three other signals would remain in the segment, but each would be converted to 3-leg intersections to help improve traffic operations on U.S. 23. Like Concept 3C, it is assumed that widening to 3 lanes in each direction would be needed for traffic operations. A raised median would be installed to prohibit left turns to or from U.S. 23 outside of the signalized intersections.

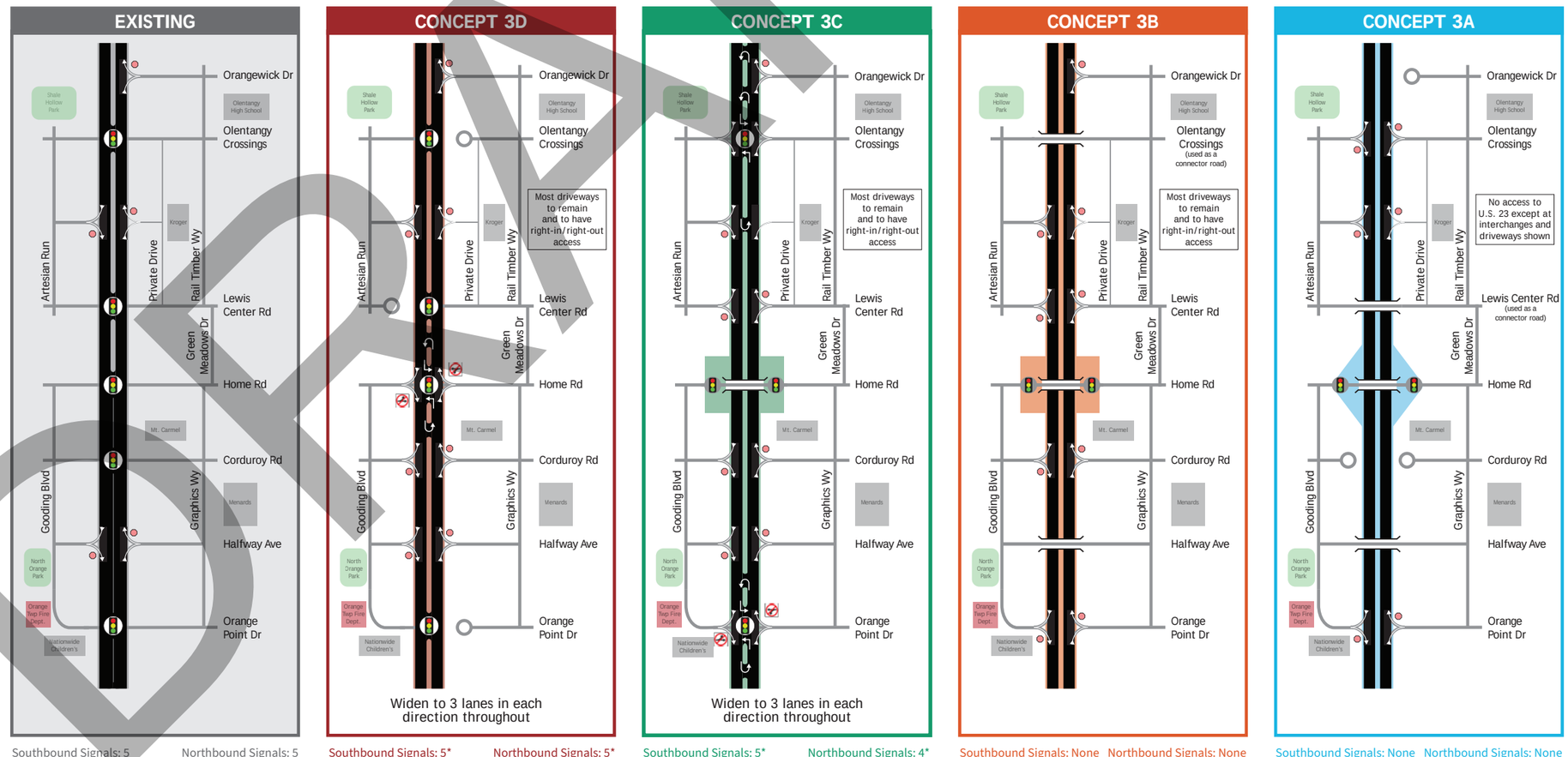


Figure 23: Segment 3 Concepts

Primary Needs

U.S. 23 THROUGH TRAVEL TIMES THROUGH SEGMENT

With no improvements, it is anticipated that it will take vehicles 10-17 minutes to travel through Segment 3 during peak hours in 2050. The Home Road signal is expected to operate above capacity, leading to long delays. Concept 3D is expected to result in travel times of 4-8 minutes, much longer than other Build concepts, with delays at Home Road potentially exceeding No-Build conditions. Concepts 3A, 3B, and 3C are anticipated to have peak hour travel times in the 2-4 minute range, providing a substantial reduction from No-Build travel times. Concepts 3A and 3B would have the least overall travel times because U.S. 23 would be entirely free-flow.

TRAVEL TIME RELIABILITY – NUMBER OF SIGNALS ON U.S. 23

There are five signals in the No-Build condition in Segment 3. Concept 3A and Concept 3B would remove all signals, resulting in free-flow operation for U.S. 23 through traffic in the segment and thus the greatest travel time reliability. Concept 3C would result in four signals for through travelers in the northbound direction of U.S. 23 – two signals at each of the RCUT locations. A fifth signal would exist for through travelers in the southbound direction in Concept 3C. All five existing signals would remain in Concept 3D, thus offering the least travel time reliability among Build concepts.

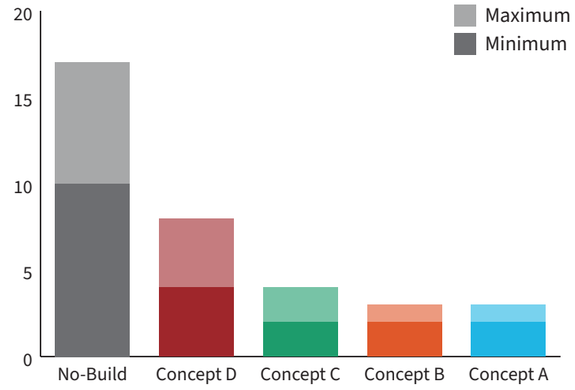


Figure 24: Segment 3 Design Year (2050) Travel Time (in minutes)

TRAVEL TIME RELIABILITY – INTERSECTIONS AT LOS E OR WORSE

All five of the existing signals in Segment 3 are expected to operate at LOS E or worse by 2050. Concept 3A and Concept 3B would remove all signals, resulting in free-flow operation for U.S. 23 through traffic. Concepts 3C and 3D would improve operations at the signals compared to the No-Build condition, but in Concept 3D, Home Road is predicted to operate at LOS F.

SAFETY – FORECASTED CRASHES

Concepts 3C and 3D are anticipated to have similar effects on crash frequency, reducing crashes by about 40% compared to the No-Build condition. Concepts 3A and 3B are anticipated to have a much greater reduction in future crashes – dropping crashes of all types by approximately 70% from No-Build levels. Concepts 3A and 3B offer the least number of conflict points and no signals, which helps to contribute toward the greater predicted safety benefits in the ODOT ECAT calculations.

SAFETY – CONFLICTING MOVEMENTS FOR U.S. 23 THROUGH TRAFFIC

U.S. 23 through traffic travelling in Segment 3 encounters 90 conflicting movements today in the No-Build condition. Concept 3C and Concept 3D would reduce the number of conflicting movements by approximately 50%. Concept 3A and Concept 3B would reduce the number of conflicting movements for U.S. 23 through traffic by approximately 80%, offering the greatest safety benefit.

Secondary Need

CONSISTENCY WITH LOCAL PLANS

The 2018 Orange Township Comprehensive Land Use Plan calls for limiting the number of direct access points to U.S. 23 and reducing the number of cul-de-sac streets to improve connectivity. Concept 3A would result in the greatest reduction of U.S. 23 access points, while Concepts 3B and 3C would result in some access point reductions. Concept 3D would result in no change to the number of access points. Concept 3A and Concept 3D would create multiple new cul-de-sac streets.

Delaware County has prioritized making Home Road a prominent east-west connection across the southern part of the county, as evidenced by the ongoing Home Road extension to Lewis Center Road. Concept 3A would be most consistent with the county's goal of prioritizing Home Road as a primary east-west arterial, while the RCUT proposed in Concept 3D would create increased circuity for Home Road through vehicles.

Concept 3A and Concept 3B would each create a new grade separation in the southern portion of the segment. This new grade separation may impact vacant properties, making them potentially less attractive for future development.

Table 17: Segment 3 - Primary & Secondary Needs

		NO-BUILD	CONCEPT 3D	CONCEPT 3C	CONCEPT 3B	CONCEPT 3A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	10-17 minutes	4-8 minutes	3-4 minutes	2-3 minutes	2-3 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	5 signals	5 signals	5 signals (4 NB, 5 SB)	No signals (free-flow)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	5 signals	1 signal	0 signals	0 signals	0 signals
	Safety - Forecasted Crashes	80 expected annual crashes 42 expected fatal/serious injury crashes over 20 years	50 predicted annual crashes 23 predicted fatal/serious injury crashes over 20 years	49 predicted annual crashes 27 predicted fatal/serious injury crashes over 20 years	26 predicted annual crashes 18 predicted fatal/serious injury crashes over 20 years	24 predicted annual crashes 14 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	90 conflicting movements	44 conflicting movements	48 conflicting movements	22 conflicting movements	18 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	Restricted/diverted east-west through movements at Home Road is inconsistent with Delaware County's goal of making Home Road/Lewis Center Road/Big Walnut Road a cross-county arterial Would create more dead-end streets, which is inconsistent with Township goal No reduction in number of U.S. 23 access points	Minimal reduction in number of U.S. 23 access points	Would reduce number of U.S. 23 access points, consistent with Orange Township goal Halfway Lane overpass/underpass may make adjacent parcels less attractive to develop	Most robust connection to Home Road/Lewis Center corridor - consistent with County support of Home Road/Lewis Center as key arterial & Orange Township support of I-71/Big Walnut Road interchange Would reduce number of U.S. 23 access points, consistent with Orange Township goal Halfway Lane grade separation may make adjacent parcels less attractive to develop

Natural & Cultural Resource Impacts

PARK & RECREATIONAL RESOURCES

Concepts 3A and 3B are not expected to have any impacts to existing parks or recreational resources. Concepts 3C and 3D are likely to have minor impacts to Shale Hollow Park (Delaware County Preservation Parks) and Orange Bridge Park (Orange Township) due to the widening required on U.S. 23. These minor impacts would be adjacent to U.S. 23 if additional right-of-way is required for the additional travel lanes in Concepts 3C or 3D.

HISTORIC SITES

Concept 3A would have minor possible impact to an unnamed historic site on Artesian Run between Olentangy Crossings and Coal Bend. Concept 3C is likely to have minor impacts to 7630 Columbus Pike (U.S. 23) due to the U.S. 23 widening and U-turn location, while Concept 3D may possibly impact this site due to U.S. 23 widening.

STREAMS & WATERWAYS

U.S. 23 crosses over a tributary to the Olentangy River north of Home Road. Concept 3A is likely to have moderate impacts to this tributary due to interchange/overpass at Home Road. Concepts 3B, 3C, and 3D are all likely to have minor impacts to the tributary due to US 23 widening, but Concepts 3B and 3C have possible moderate impacts due to the connector road interchange roadways.

ENDANGERED SPECIES HABITAT

Concepts 3A, 3B, and 3C are likely to have moderate impacts to suitable wooded habitat (SWH) for Indiana Bats and Northern Long-eared Bats due to interchange/overpass at Home Road and U.S. 23 widening. Concept 3D is likely to have minor impacts to suitable wooded habitat (SWH) for Indiana Bats and Northern Long-eared Bats due to US 23 widening.

REGULATED MATERIALS

All Build concepts are likely to impact sites with potential for regulated materials. Widening and/or grade separation improvements could impact existing gas stations and automobile sales/service businesses.

NOT APPLICABLE

No Scenic Rivers or farmlands are present in this segment.

Community Impacts

RESIDENTIAL & COMMERCIAL DISPLACEMENTS

No residential displacements are anticipated with any of the concepts. Commercial displacements are expected to be minimal under any of the Build concepts. The widening of U.S. 23 to three lanes in Concepts 3C and 3D is expected to largely occur within existing right-of-way. Similarly, the proposed connector road interchanges in Concept 3B and 3C are unlikely to require displacements of adjacent commercial properties. The grade separations in Concept 3A and 3B have low potential for displacements to commercial properties. Concept 3A is most likely to have commercial displacements, as the new interchange ramps could affect potential or ongoing developments along Home Road. If a Build concept is advanced, further study would evaluate various configurations to minimize potential displacements and other impacts.

AIR QUALITY

All Build concepts would likely have similar and minor air quality impacts.

NOISE SENSITIVE AREAS

All Build concepts are likely to have minor or no impacts to noise sensitive receptors.

BICYCLE/PEDESTRIAN CONNECTIVITY TO EAST-WEST MOVEMENTS

A pedestrian bridge, the Len T. Fisher Memorial Bridge, over U.S. 23 is located between Corduroy Road and Home Road. However, none of the signals in this segment currently have marked pedestrian crossings of U.S. 23 or pedestrian indications. Concept 3B would provide a grade separation at Olentangy Crossings, which would allow pedestrians to cross U.S. 23 more safely. Olentangy Local School District officials have noted that students attempt to cross U.S. 23 at the Olentangy Crossings signal. Concept 3A would provide a new grade separated crossing at Lewis Center Road. Concepts 3A and 3B would provide a grade separation in the southern portion of the segment. Concepts 3A, 3B, and 3C would provide a grade separation at Home Road.

None of the concepts are anticipated to impact the existing grade separated bicycle/pedestrian bridge located north of Corduroy Road.

VEHICULAR CONNECTIVITY FOR EAST-WEST TRAFFIC

The No-Build condition has five direct east-west vehicular connections across U.S. 23, all at existing signals. All Build conditions would result in fewer east-west connections, but many would be grade-separated that could allow for more efficient crossing of U.S. 23. Of the Build conditions, Concept 3A and Concept 3B would have the most direct vehicular east-west connections – with three grade-separated crossings of U.S. 23. Concept 3C would have one direct east-west connection at Home Road. Concept 3D would have no direct east-west connections, as all U.S. 23 signals would be RCUTs that require east-west through traffic to make indirect movements.

CIRCUITY/BACKTRACKING TO PUBLIC STREETS

All Build concepts would affect the circulation patterns on public streets in the area. In Concept 3A and 3B, all left turning movements would be restricted to interchanges, with new grade separations used to facilitate indirect left turns similar to a connector road interchange. Concept 3C and Concept 3D would allow for left turn movements at signals that remain. Concepts 3A, 3B, and 3C would

Table 18: Segment 3 - Natural & Cultural Resource Impacts

		NO-BUILD	CONCEPT 3D	CONCEPT 3C	CONCEPT 3B	CONCEPT 3A
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	Minor impacts likely to Orange Bridge Park due to adjacent U.S. 23 widening Minor impacts likely to Shale Hollow Park due to adjacent U.S. 23 widening	Minor impacts likely to Orange Bridge Park due to adjacent U.S. 23 widening Minor impacts likely to Shale Hollow Park due to adjacent U.S. 23 widening	No impacts to parks or recreational resources expected	No impacts to parks or recreational resources expected
	Historic Sites	No impacts	Possible minor impacts to 7630 Columbus Pike due to adjacent U.S. 23 widening	Minor impacts likely to 7630 Columbus Pike due to adjacent U.S. 23 widening and U-turn location	No impacts to historic sites expected	Possible minor impacts to unnamed historic site on Artesian Run
	Scenic River (Olentangy River)	No impacts	No impacts to Scenic Rivers expected	No impacts to Scenic Rivers expected	No impacts to Scenic Rivers expected	No impacts to Scenic Rivers expected
	Streams & Waterways	No impacts	Minor impacts to streams and waterways likely	Possible moderate impacts to streams and waterways	Possible moderate impacts to streams and waterways	Moderate impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Minor impacts to Indiana and Northern Long-eared Bat habitat likely	Moderate impacts to Indiana and Northern Long-eared Bat habitat likely	Moderate impacts to Indiana and Northern Long-eared Bat habitat likely	Moderate impacts to Indiana and Northern Long-eared Bat habitat likely
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No farmland in segment	No impacts to farmland expected	No impacts to farmland expected	No impacts to farmland expected	No impacts to farmland expected

eliminate left turn movements to/from Lewis Center Road, which is a minor arterial roadway – although its importance in this area will be somewhat diminished after completion of the Home Road extension to Lewis Center Road.

PRIVATE DRIVEWAY ACCESS TO U.S. 23

All Build concepts would include a center median with no median breaks for private driveways, thus any remaining driveways would be right-in/right-out access only. Concept 3A would have the greatest impacts, eliminating all private access on U.S. 23, except for the northbound driveway at the Kroger shopping plaza. Concept 3B, 3C, and 3D would maintain all private driveway access points, but all would convert to right-in/right-out access operation. These private driveway access points are all located in the northern portion of the segment.

PUBLIC TRANSPORTATION

Delaware County Transit service in this segment would be minimally affected by any of the concepts. If fixed route service were implemented on this corridor, it is unlikely that transit stops would ever be located directly on U.S. 23 – transit vehicles would turn off and on U.S. 23 to access future transit stops.

K-12 PUBLIC SCHOOL ACCESS

Several K-12 public schools, including Olentangy High School are located about ¼ mile east of this segment of U.S. 23. Concept 3C would likely have the fewest impacts to circulation of vehicles and buses accessing these schools, as a signal would remain at Olentangy Crossings, but outbound left turns onto U.S. 23 would have to make an indirect movement via an RCUT. Other concepts would require school traffic to use Lewis Center Road to access the schools if coming from U.S. 23 southbound. Comments from Olentangy Local School District indicated that some students currently cross U.S. 23 at the Olentangy Crossings signal as pedestrians. Concept 3B would construct a grade separation at Olentangy Crossings, providing a safer pedestrian connection. Further coordination with Olentangy Local School District will occur as any concepts are advanced into further project development.

ACCESS TO/FROM U.S. 23 FOR EMERGENCY SERVICES

The No-Build condition would not affect access to or from the Nationwide Children's/OhioHealth emergency room, the Orange Township fire/EMS station, or the Mount Carmel emergency room/medical complex. Concepts 3A and 3B would have the greatest impact on access to/from the Nationwide Children's/Ohio Health and Orange Township facilities, due to the removal of the signal and left turns at Orangepoint Drive. Concept 3C would not affect the inbound access but would introduce indirect left turns for traffic leaving these two facilities. Concept 3D would have minimal impacts, other than restricting access to the east leg of Orangepoint Drive. All Build concepts remove the signal at Corduroy Road, which will redirect southbound access to/from Mount Carmel to Home Road. If any concepts are advanced into further development, refinements to the concepts could be considered to minimize impacts to emergency service access.

NOT APPLICABLE

No special land uses are located within this segment. There are no land uses containing likely to contain Environmental Justice and other traditionally underserved populations in this segment.

Table 19: Segment 3 - Community Impacts

		NO-BUILD	CONCEPT 3D	CONCEPT 3C	CONCEPT 3B	CONCEPT 3A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Special Land Uses	No impacts	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Residential Displacements	No impacts	No residential parcel displacements expected	No residential parcel displacements expected	No residential parcel displacements expected	No residential parcel displacements expected
	Commercial Displacements	No impacts	0-10 commercial parcels with displacements	0-10 commercial parcels with displacements	0-10 commercial parcels with displacements	0-10 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected
	Bicycle/Pedestrian Connectivity for East-West Movements	1 existing grade-separated pedestrian/ bicycle crossing	Minimal to no change	1 new grade-separated crossing	3 new grade-separated crossings	3 new grade-separated crossings
	Vehicular Connectivity for East-West Traffic	5 direct east-west vehicular connections	0 direct east-west vehicular connections	1 direct east-west vehicular connection	3 direct east-west vehicular connections	3 direct east-west vehicular connections
	Circuity/Back-tracking to Public Streets	5 public streets with left turn access	3 public streets with northbound left turn access 2 public streets with southbound left turn access	3 public streets with left turn access	1 public street with left turn access	1 public street with left turn access
	Private Driveway Access to U.S. 23	No impacts	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	No direct private access points, except for northbound Kroger plaza driveway
	Public Transportation	No impacts	No impacts expected	No impacts expected	No impacts expected	No impacted expected
	K-12 Public School Access	No impacts	Moderate impact to school access expected	Low impacts to school access expected	Moderate impact to school access expected.	Moderate impact to school access expected
	Access to/from U.S. 23 for Emergency Services	No impacts	Orange Township EMS: Low impact Nationwide Children's: Low impact OhioHealth: Low impact Mount Carmel: Medium impact	Orange Township EMS: Medium impact Nationwide Children's: Low impact OhioHealth: Low impact Mount Carmel: Medium impact	Orange Township EMS: High impact Nationwide Children's: High impact OhioHealth: High impact Mount Carmel: Medium impact	Orange Township EMS: High impact Nationwide Children's: High impact OhioHealth: High impact Mount Carmel: Medium impact

Infrastructure Impacts

MAINTENANCE OF TRAFFIC (MOT)

The No-Build concept would have no impacts to traffic, as no construction would occur. Minimal MOT effects on U.S. 23 are anticipated with any Build concepts. Off-peak hour lane closures on U.S. 23 may be required for the widening in Concepts 3C and 3D. Long-term closures and/or restrictions of side streets may be needed for construction of the new grade separations in Concepts 3A, 3B, or 3C.

DESIGN STANDARDS

Some locations in this segment have outside shoulder widths that are less than current ODOT Location & Design Manual (L&D) criteria. However, it does not appear that the shoulder widths are contributing to crash patterns. Concept 3C and Concept 3D are more likely to address these existing substandard outside shoulder widths, as widening would already be necessary. All Build concepts would replace the existing two-way left-turn lane south of Home Road with a raised median. In Concept 3A and Concept 3B, the raised median would likely result in an inside shoulder width that is less than ODOT design criteria for such a facility. Concept 3C and Concept 3D are less likely to have inside shoulder widths less than ODOT criteria, as a wider median would already be needed due to the need for double left turn lanes. ODOT Performance-based practical design policy would be considered with any Build concept to reduce impacts and costs with any concept.

MAJOR UTILITIES

In Segment 3, there are high-voltage transmission lines crossing U.S.23 between Orangepoint Drive/Gooding Boulevard and Halfway Avenue. Concept 3A and Concept 3B would construct a new grade separation in the vicinity of high-voltage transmission lines. Further study of potential alignments would be needed to determine any impacts to existing towers or clearances from these lines.

NOT APPLICABLE

No railroad facilities are present in this segment.

Costs

RIGHT-OF-WAY (PARCELS, ACRES, AND COSTS)

Concept 3A is expected to require the greatest amount of right-of-way, potentially affecting over 100 parcels. Concept 3A is expected to have over 50% more right-of-way costs than other Build concepts, primarily due to space needed for the traditional freeway interchange proposed at Home Road plus other grade separations. Concepts 3C and 3D are expected to require lesser amounts of right-of-way for widening of U.S. 23, impacting 10-40 acres and 20-50 acres respectively. Further study of potential alignments would be needed to determine if any impacts could be avoided or lessened.

USER BENEFITS

Concept 3A and Concept 3B are expected to have the greatest user benefits, with delays for U.S. 23 through traffic eliminated and the greatest predicted crash reduction due to many fewer conflicting movements. The user benefits related to safety improvements for Concept 3A and 3B are expected to be nearly double that of other Build concepts. Concept 3C is expected to have slightly lower user benefits than 3A and 3B, primarily due to the delays and conflicting movements at the Orangepoint Drive and Olentangy Crossings signals. Concept 3D is anticipated to have the least user benefits, as it would have the most intersection delays, particularly at Home Road, and greatest number of conflicting movements for U.S. 23 through traffic.

BENEFIT-COST RATIO

All Build concepts are anticipated to have a benefit-cost ratio greater than 1.0, with projected user benefits substantially exceeding projected costs. Concepts 3B and 3C are expected to have the highest benefit-cost ratios, with benefits approaching triple the projected costs. Concept 3A and 3D are projected to have somewhat lower benefit-cost ratios than the other Build concepts.

PROJECT COSTS (2030)

All Build concepts are expected to exceed $100 million in total costs. Concepts 3A and 3B involve three new grade separations, while Concepts 3C and 3D involve widening for an additional through lane in each direction on U.S. 23. Concept 3D is expected to have the least cost, as it does not include any grade separations or new connector roads. Concept 3A is expected to have the highest cost at over $200 million, with three new grade separations plus a traditional freeway interchange at Home Road. The connector road interchange at Home Road proposed in Concept 3B would have greater flexibility in potential alignments to reduce costs compared to Concept 3A.

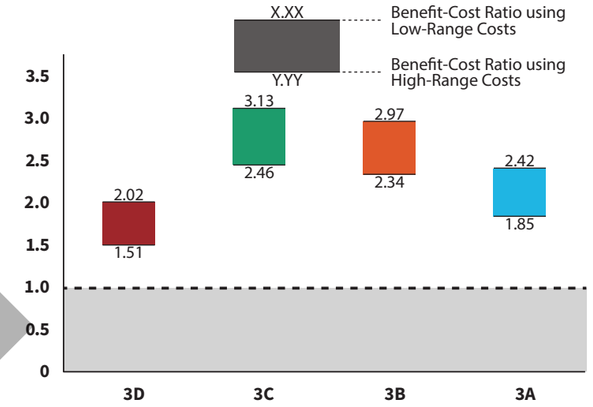


Figure 25: Segment 3 Benefit-Cost Ratios

Table 20: Segment 3 - Infrastructure Impacts & Costs

		NO-BUILD	CONCEPT 3D	CONCEPT 3C	CONCEPT 3B	CONCEPT 3A
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts	Minimal MOT impacts	Minimal MOT impacts	Minimal MOT impacts
	Design Standards	No impacts	Shoulder widths likely increased to current design criteria	Shoulder widths likely increased to current design criteria	Some shoulder widths less than current design criteria likely would remain	Some shoulder widths less than current design criteria likely would remain
	Major Utilities	No impacts	No impacts to major utilities expected	No impacts to major utilities expected	Possible impact to high-voltage transmission lines/towers	Possible impact to high-voltage transmission lines/towers
	Railroads	No impacts	No railroad impacts	No railroad impacts	No railroad impacts	No railroad impacts
Costs	**Right-of-Way (parcels & acres)**	No impacts	50-100 parcels 10-40 acres	50-125 parcels 20-50 acres	50-125 parcels 30-70 acres	75-150 parcels 40-80 acres
	Right-of-Way Costs (2030)	None	$10 - 25M	$15 - 30M	$10 - 25M	$25 - 45M
	User Benefit (20-year)	None	$180M	$340M	$390M	$390M
	Benefit-Cost Ratio	N/A	1.51 - 2.02	2.46 - 3.13	2.34 - 2.97	1.85 - 2.42
	Projected Costs (2030)	Routine maintenance	$125 - 160M	$145 - 190M	$175 - 220M	$220 - 285M

Key Intersection Analysis

Some key intersections have been analyzed in greater detail, as they are among the larger intersections in the corridor. Improvements selected for the key intersections are also likely to impact the selection of concepts for adjacent locations. Matrices for the key intersections for this segment are presented below.

Table 21: Segment 3 - Home Road

		NO-BUILD	CONCEPT 3D	CONCEPT 3C	CONCEPT 3B	CONCEPT 3A
Primary Needs	**Safety - Forecasted Crashes**	21 expected annual crashes 10 expected fatal/serious injury crashes over 20 years	18 predicted annual crashes 8 predicted fatal/serious injury crashes over 20 years	9 predicted annual crashes 7 predicted fatal/serious injury crashes over 20 years	9 predicted annual crashes 7 predicted fatal/serious injury crashes over 20 years	8 predicted annual crashes 3 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	16 conflicting movements	12 conflicting movements	4 conflicting movements	4 conflicting movements	4 conflicting movements
	Intersection Capacity (all movements)	LOS F 100 seconds of delay/vehicle	LOS F 120 seconds of delay/vehicle	N/A	N/A	N/A
	Travel Time Reliability for U.S. 23	1 signal	2 northbound signals 2 southbound signals	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
Costs	**Projected Costs (2030)**	Routine maintenance	$50M	$65M	$65M	$100M

Community Engagement Results

Input from the public and Community Partners has indicated that improvements are desired in this segment. The U.S. 23/Home Road intersection was identified as a location that should move forward sooner due to impending development at the intersection. Orange Township and many community members expressed concern about emergency response times and concerns that concepts would modify the access to/from the Orange Township fire/EMS and the Nationwide Children's/OhioHealth emergency rooms on Gooding Boulevard west of U.S. 23. Similarly, concerns were raised about modified access to/from the Mount Carmel complex near Home Road. There were many comments regarding school related traffic and circulation for all Build concepts. Comments were also received regarding improving pedestrian activity across U.S. 23, particularly at Olentangy Crossings near the Olentangy Schools' buildings. All of these items will be a consideration in further study if a concept is advanced.

Conclusions

A combination of Concepts 3A and 3B should be the baseline and starting point for further study in this segment. For all intersections except for Home Road, Concept 3B should be the baseline and starting point. Concept 3B would remove all signals in the corridor, replacing them with two overpasses and many right-in/right-out locations, which would function similarly to connector road interchanges. This concept provides the greatest reduction in crashes, while providing the shortest through travel time.

At Home Road, a traditional freeway interchange (Concept 3A) should be used as the baseline and starting point for further study. A traditional freeway interchange is expected to have the greatest reduction in fatal/serious injury crashes and greatest delay reduction. The traditional freeway interchange would be most consistent with Home Road being a major east-west thoroughfare across southern Delaware County and potentially connecting to I-71. However, if the additional cost and right-of-way impacts for Concept 3A become impractical, a connector road interchange (Concept 3B, Concept 3C) could be used as the baseline and starting point for further study. A connector road interchange is expected to provide very similar safety and operational benefits as a traditional freeway interchange for less cost and less additional right-of-way needs. An RCUT intersection (Concept 3D) is expected to provide no operational benefits and add signals while entailing similar costs as a connector road interchange.

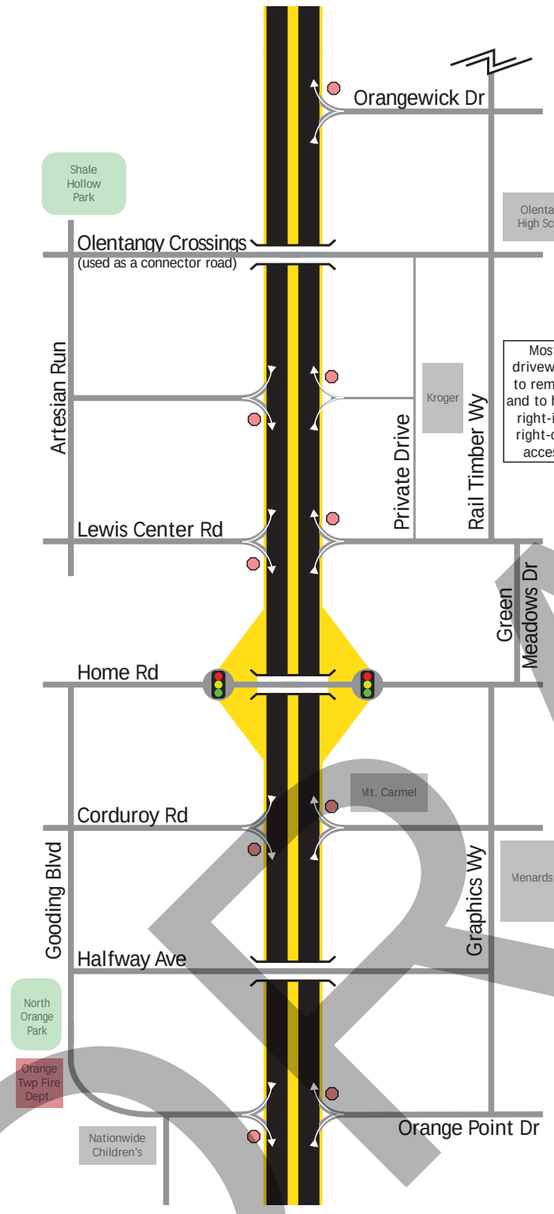


Figure 26: Segment 3 High-Performing Concept

SEGMENT 4

Segment Overview

GENERAL/LAND USES

Segment 4 extends from the Hyatts Road/Shanahan Road intersection to the Pollock Road intersection just south of the bridge over the Olentangy River. This section is located within Berlin Township, Liberty Township, Delaware Township, as well as southernmost portions of the City of Delaware. Segment 4 is somewhat less densely developed than surrounding segments, with some large tracts of undeveloped parcels or parcels used for outdoor recreation. Several institutional or educational land uses, such as the Delaware Area Career Center, Columbus State Delaware Campus, and the Methodist Theological School are located in Segment 4. An industrial park is located on the west side of U.S. 23 at Greif Parkway. Several small residential and commercial land uses are located within the segment. Rapid residential development has been occurring in recent years in areas just east of this segment.

U.S. 23 ROADWAY

Through much of Segment 4, U.S. 23 is a divided arterial with two lanes in each direction and a grass median. A total of five signalized intersections are located in Segment 4. There are multiple breaks in the grass median, allowing for full access at many private driveways. North of Cheshire Road, U.S. 23 has a continuous concrete median barrier, with no breaks south of the Delaware Golf Club. North of the Delaware Golf Club, U.S. 23 has a five-lane cross-section including a center two-way left turn lane. ODOT has acquired limited-access right-of-way along many areas in Segment 4.

OTHER ROADWAYS

The three largest intersections in Segment 4 are at Hyatts Road/Shanahan Road, Glenn Parkway, and Cheshire Road. The U.S. 23 intersection at Hyatts Road/Shanahan Road was recently improved to provide left and right turn lanes on the east-west approaches. There are a number of constraints at this location, including a waterway passing through the intersection area and high-voltage overhead power lines. Shanahan Road connects to the Olentangy Local School District complex located south and east of this intersection. Multiple new residential developments are located immediately east of the intersection.

Glenn Parkway is a key arterial serving the southeast portion of the City of Delaware. The City of Delaware and Delaware County plan to complete Glenn Parkway in coming years, creating a connection between U.S. 23 and U.S. 36/SR 37 on the east side of Delaware. Glenn Parkway is a divided roadway with raised median east of U.S. 23.

Cheshire Road is a major east-west arterial that runs from U.S. 23 east to the City of Sunbury. The Delaware County Engineer's Office has a planned project to realign Cheshire Road, relocating the U.S. 23 intersection about ¼ mile south of the existing location. This project is currently in final design phases, with construction anticipated in 2026. The existing Cheshire Road intersection will be converted to right-in/right-out access only.

Figure 27: Segment 4 Study Area

Proposed Concepts

Four Build condition concepts have been developed for Segment 4, in addition to the No-Build condition. The No-Build condition assumes that Cheshire Road has been relocated to the south. Consistent with other segments, Concept A is most freeway-like, while Concept D is most like the existing signalized corridor. The Segment 4 concepts are shown on Figure 28.

CONCEPT 4A

Concept 4A would remove all signals on U.S. 23. Access on U.S. 23 would be limited to a traditional freeway interchange at Hyatts Road/Shanahan Road, a traditional freeway interchange at Glenn Parkway, and a connector road interchange at relocated Cheshire Road. The Pollock Road intersection would be eliminated, and a frontage road would be constructed between Cheshire Road and Pollock Road to provide access to properties along the east side of U.S. 23. A roadway would be constructed west of U.S. 23 to connect Greif Parkway with Glenn Parkway and with Hyatts Road/ Shanahan Road. All left turns to or from U.S. 23 throughout the segment would be eliminated.

CONCEPT 4B

Concept 4B would also remove all signals on U.S. 23. Three connector road interchanges would be constructed – at Hyatts Road/Shanahan Road, Glenn Parkway, and relocated Cheshire Road. A frontage road would be constructed between Cheshire Road and Pollock Road to provide access to properties along the east side of U.S. 23, with a right-in/right-out access being allowed near Pollock Road. The Greif Parkway and OhioHealth Boulevard signals would be replaced with right-in/right-out intersections. A roadway would be constructed west of U.S. 23 to connect Greif Parkway with Glenn Parkway and with Hyatts Road/ Shanahan Road. All left turns to or from U.S. 23 throughout the segment would be eliminated.

CONCEPT 4C

Concept 4C would construct a connector road interchange at Glenn Parkway and RCUT intersections at Hyatts Road/ Shanahan Road and at relocated Cheshire Road. Unlike other Build concepts, the existing Cheshire Road intersection would remain, operating with only right-in/right-out movements. Greif Parkway and Pollock Road would also be converted to right-in/right-out operation. Because this concept would have signals on U.S. 23, it is assumed that widening to three lanes in each direction would be needed for traffic operations. A raised median would be installed to prohibit left turns to or from U.S. 23 outside of the signalized intersections.

CONCEPT 4D

Concept 4D is the only Build concept without any grade separations. An RCUT intersection would be constructed at Greif Parkway. Three other signals would remain in the segment, while the OhioHealth Boulevard signal would be removed and the intersection converted to an unsignalized right-in/right-out operation. The west leg of the Glenn Parkway intersection would be removed, creating a three-leg intersection with improved traffic operations at the signal. Like Concept 4C, it is assumed that widening to three lanes in each direction would be needed for traffic operations. A raised median would be installed to prohibit left turns to or from U.S. 23 outside of the signalized intersections, except at Pollock Road where the left-in movement would remain allowed.

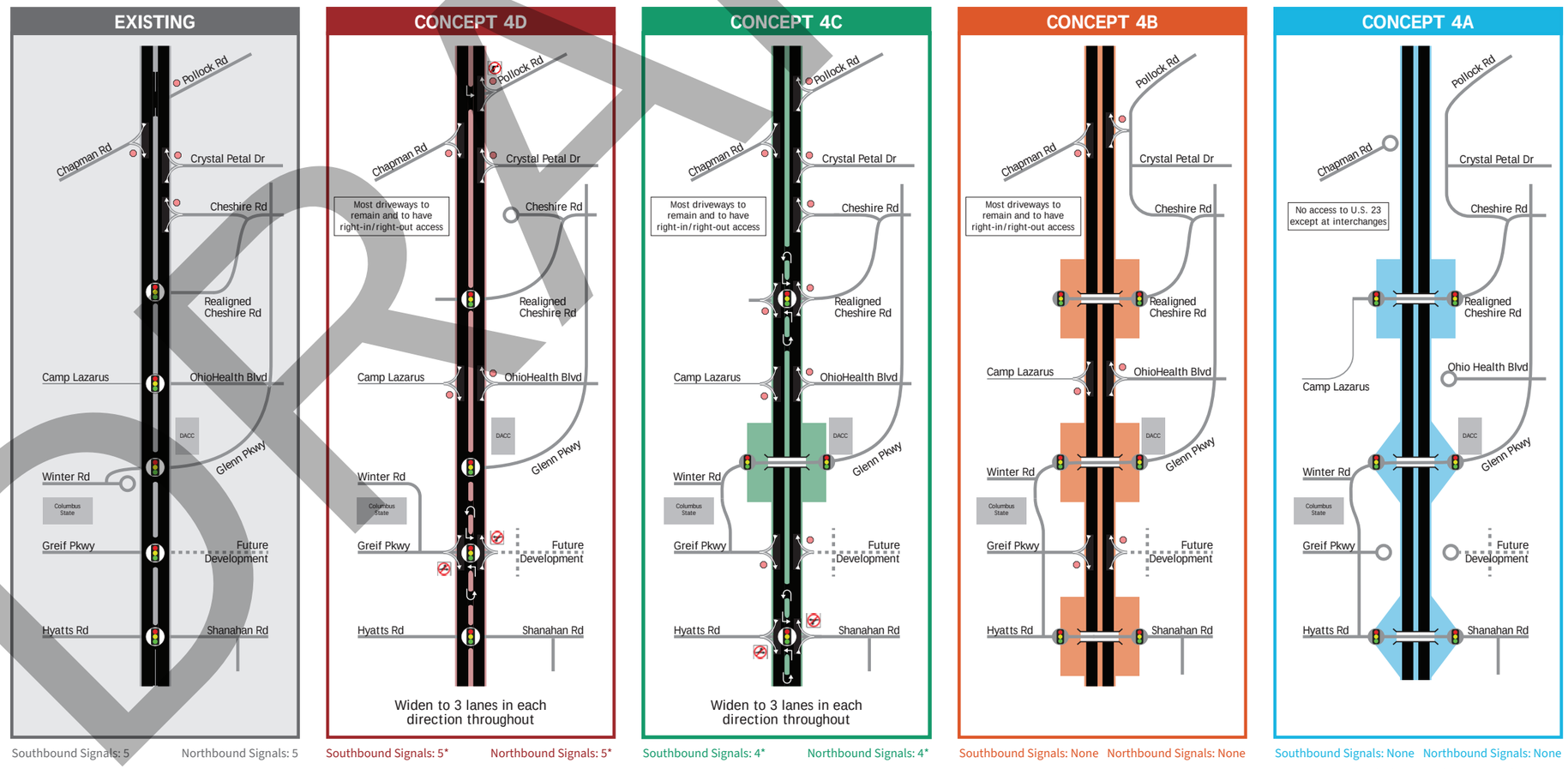


Figure 28: Segment 4 Concepts

**Includes signals at U-turn locations*

Primary Needs

U.S. 23 THROUGH TRAVEL TIMES THROUGH SEGMENT

With no improvements, it is anticipated that it will take vehicles 6-9 minutes to travel through Segment 4 during peak hours in 2050. The Hyatts Road/Shanahan Road signal and Glenn Parkway signals are expected to experience the longest delays in the No-Build condition. Concept 4D is expected to have the least reduction in travel times, with Concept 4C having a slightly greater reduction. Concepts 4A and 4B would have the greatest reduction in travel times because U.S. 23 would be entirely free-flow. These two concepts are anticipated to reduce segment travel times by over 50%.

TRAVEL TIME RELIABILITY – NUMBER OF SIGNALS ON U.S. 23

There are five signals in the No-Build condition in Segment 4. Concept 4A and Concept 4B would remove all signals, resulting in free-flow operation for U.S. 23 through traffic in the segment and thus the greatest travel time reliability. Concept 4C would result in four signals for through travelers in each direction of U.S. 23 – two signals at each of the RCUT locations. Through drivers would encounter five signals in each direction in Concept 4D, thus offering the least travel time reliability among Build concepts.

TRAVEL TIME RELIABILITY – INTERSECTIONS AT LOS E OR WORSE

Two of the five existing signals in Segment 4 are expected to operate at LOS E or worse by 2050. Concept 4A and Concept 4B would remove all signals, resulting in free-flow operation for U.S. 23 through traffic. Concepts 4C and 4D would improve operations at the signals to operate at LOS D or better. Thus, all Build concepts are expected to have no signals operating at LOS E or worse in the Design Year.

SAFETY – FORECASTED CRASHES

Concepts 4D is anticipated to have the least effect on crash frequency of all Build concepts, reducing overall crashes by about 10%. Concept 4C is expected to reduce all crashes by 30% and severe crash types by about 40%. Concepts 4A and 4B are anticipated to have a much greater reduction in future crashes – reducing crashes of all types by over 60% from No-Build levels. Concepts 4A and 4B offer the least number of conflict points and no signals, which helps to contribute toward the greater predicted safety benefits in the ODOT ECAT calculations.

SAFETY – CONFLICTING MOVEMENTS FOR U.S. 23 THROUGH TRAFFIC

U.S. 23 through traffic travelling in Segment 4 encounters 92 conflicting movements today in the No-Build condition. Concept 4D would reduce conflicting movements by approximately one-third, while Concept 4C would reduce conflicting movements by approximately one-half. Concepts 4B and 4A would provide the greatest safety benefit, reducing conflicting movements by roughly 75% and 88% respectively.

Secondary Need

CONSISTENCY WITH LOCAL PLANS

The Delaware County Engineer's Office has a planned project to realign Cheshire Road, relocating the U.S. 23 intersection about ¼ mile south of the existing location. This project is currently in final design phases, with construction anticipated in 2026. While all Build concepts are compatible with the proposed realignment, Concepts 4A and 4B would result in the greatest disruption to the ongoing final engineering. Concept 4C would have minimal deviation from the current plans, while Concept 4D would have no effect on the relocation of Cheshire Road.

Concepts 4A and 4B would construct a frontage road between Cheshire Road and Pollock Road, replacing all U.S. 23 access in that area. Comments received from the City of Delaware and Delaware County during public engagement activities indicate that a frontage road would not be consistent with community vision, creating disruption to numerous parcels including the Delaware Golf Club, Perkins Observatory (Ohio Wesleyan University), and the Methodist Theological School.

Table 22: Segment 4 - Primary & Secondary Needs

		NO-BUILD	CONCEPT 4D	CONCEPT 4C	CONCEPT 4B	CONCEPT 4A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	6-9 minutes	4-6 minutes	4-5 minutes	3-4 minutes	3-4 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	5 signals	5 signals	4 signals	No signals (free-flow)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	2 signals	0 signals	0 signals	0 signals	0 signals
	Safety - Forecasted Crashes	64 expected annual crashes 38 expected fatal/serious injury crashes over 20 years	56 predicted annual crashes 25 predicted fatal/serious injury crashes over 20 years	47 predicted annual crashes 22 predicted fatal/serious injury crashes over 20 years	24 predicted annual crashes 15 predicted fatal/serious injury crashes over 20 years	28 predicted annual crashes 14 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	92 conflicting movements	62 conflicting movements	43 conflicting movements	24 conflicting movements	12 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	No disruption to planned Cheshire Road realignment	Minimal disruption to planned Cheshire Road realignment	Greatest disruption to planned Cheshire Road realignment New connector between Cheshire Road and Pollock Road not consistent with City/County plans	Greatest disruption to planned Cheshire Road realignment New connector between Cheshire Road and Pollock Road not consistent with City/County plans

Natural & Cultural Resource Impacts

PARK & RECREATIONAL RESOURCES

There are no active parks or recreational resources along U.S. 23 in Segment 4. However, Preservation Parks of Delaware County has recently acquired property along the west side of U.S. 23 near Cheshire Road for use as a future park. In addition, Preservation Parks of Delaware County has recently acquired land on the northwest corner of U.S. 23 and Glenn Parkway for use as a park with hiking trails and nature areas. No access to U.S. 23 is planned for this new park.

HISTORIC SITES

All Build concepts would impact the access point to Perkins Observatory (Ohio Wesleyan University) by changing its access drive to right-in/right-out only operation.

STREAMS & WATERWAYS

All Build concepts are expected to have minor impacts to streams and waterways. U.S. 23 crosses over two waterways within this segment. All concepts would likely impact the waterway at Hyatts Road/Shanahan Road either due to the interchange ramps/connector roads or U.S. 23 widening. Similarly, all concepts are likely to impact the waterway located south of OhioHealth Boulevard, either due to Glenn Parkway interchange ramps/connector roads or widening of U.S. 23.

ENDANGERED SPECIES HABITAT

Concepts 4A, 4B, and 4C could have moderate impacts to suitable wooded habitat (SWH) for Indiana Bats and Northern Long-eared Bats due to new ramps/connector roads for interchanges, as well as widening for travel lanes or new frontage/backage roads. Concept 4D would have minor impacts to SWH for Indiana Bats and Northern Long-eared Bats due to U.S. 23 widening.

REGULATED MATERIALS

All Build concepts would have possible impacts to sites with potential for regulated materials. Widening and/or interchange improvements could impact an existing gas station and automobile/watercraft sales businesses.

FARMLAND

There is some active farmland in Segment 4, located on the west side of U.S. 23 near Cheshire Road. However, this land has been recently acquired by Delaware County Preservation Parks District.

NOT APPLICABLE

There are no Scenic Rivers present in this segment.

Community Impacts

ENVIRONMENTAL JUSTICE AND OTHER TRADITIONALLY UNDERREPRESENTED POPULATIONS

No specific Environmental Justice or traditionally underrepresented populations have been identified at this time. All Build concepts are likely to impact the access to the Worthington Arms manufactured home community located just south of Greif Parkway on the east side of U.S. 23. Concept 4A would eliminate the current access point, requiring residents to connect via future adjacent development roadways. In other concepts, residents would use indirect left turns via adjacent interchanges or U-turn locations. The widening of U.S. 23 proposed in Concepts 4C and 4D is likely to require right-of-way from the Worthington Arms property. If a Build concept is advanced, further study would be conducted to identify and minimize impacts to any Environmental Justice and other traditionally underrepresented populations.

SPECIAL LAND USES

Camp Lazarus is an outdoor children's camp run by the Boy Scouts of America (Scouting America) that is located on the west side of U.S. 23 in Segment 4. The only public access to Camp Lazarus is on U.S. 23 at the signal at OhioHealth Boulevard. (A gravel driveway also exists on Winter Road, but is only one lane wide and is gated.) All Build concepts would remove the signal at OhioHealth Boulevard. Concept 4A would have the greatest impact to Camp Lazarus, as the access to U.S. 23 would be eliminated and a new roadway built to connect to the interchange at relocated Cheshire Road. Other Build concepts would convert the Camp Lazarus access point to right-in/right-out, diverting left turn movements to adjacent interchanges or intersections. Concept 4C and 4D may have minor right-of-way impacts to the camp due to widening for an additional southbound through lane.

RESIDENTIAL & COMMERCIAL DISPLACEMENTS

All Build concepts are expected to have minimal or no residential displacements. Residential dwellings generally have large setbacks in this area, meaning that the widening of U.S. 23 in Concept 4C and 4D could occur without impacts to residential buildings. There are few, if any, residential structures near the proposed interchange locations at relocated Cheshire Road and Glenn Parkway. There are some dwellings near the Hyatts Road/Shanahan Road intersection, which may be impacted by interchanges in Concept 4A or Concept 4B.

Some commercial displacements are likely with each of the Build concepts. Concept 4A is most likely to have the largest number of commercial displacements, as the new traditional freeway interchange ramps would require more space to construct than connector road interchange designs in Concepts 4B and 4C. While the widening of U.S. 23 to three lanes in Concepts 4C and 4D is expected to occur largely within existing right-of-way, there are several businesses located relatively close to the existing roadway.

If any Build concept advanced, further study would evaluate various configurations to minimize potential displacements and other impacts.

AIR QUALITY

All Build concepts are likely to have similar and minor air quality impacts.

NOISE SENSITIVE AREAS

All Build concepts are likely to have minor or no impacts to noise sensitive receptors.

BICYCLE/PEDESTRIAN CONNECTIVITY TO EAST-WEST MOVEMENTS

Currently, there are marked pedestrian crossings with pedestrian indications at two signals on U.S. 23 in this segment. In the No-Build condition, there would be a third crossing location added as the relocated Cheshire Road intersection is expected to have crosswalks and pedestrian signals. Concepts 4A and 4B would provide three grade separations in Segment 4, creating the most opportunity for enhanced east-west bicycle/pedestrian

Table 23: Segment 4 - Natural & Cultural Resource Impacts

		NO-BUILD	CONCEPT 4D	CONCEPT 4C	CONCEPT 4B	CONCEPT 4A
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	No impacts to existing parks or recreational resources expected.Possible impacts to parks under development.	No impacts to existing parks or recreational resources expected.Possible impacts to parks under development.	No impacts to existing parks or recreational resources expected.Possible impacts to parks under development.	No impacts to existing parks or recreational resources expected.Possible impacts to parks under development.
	Historic Sites	No impacts	Access point to Perkins Observatory (Ohio Wesleyan University) to change to right-in/right-out only	Access point to Perkins Observatory (Ohio Wesleyan University) to change to right-in/right-out only	Access point to Perkins Observatory (Ohio Wesleyan University) to change to right-in/right-out only	Access to Perkins Observatory (Ohio Wesleyan University) would be via frontage road
	Scenic River (Olentangy River)	No impacts	Minor impacts likely due to widening of U.S. 23 bridge over Olentangy River for additional through lanes	Minor impacts likely due to widening of U.S. 23 bridge over Olentangy River for additional through lanes	No impacts to Scenic River expected	No impacts to Scenic River expected
	Streams & Waterways	No impacts	Minor impacts to streams and waterways likely	Moderate impacts to streams and waterways likely	Moderate impacts to streams and waterways likely	Moderate impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Minor impacts to Indiana and Northern Long-eared Bat habitat likely	Moderate impacts to Indiana and Northern Long-eared Bat habitat likely	Moderate impacts to Indiana and Northern Long-eared Bat habitat likely	Moderate impacts to Indiana and Northern Long-eared Bat habitat likely
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No impacts	No impacts to farmland expected	No impacts to farmland expected	No impacts to farmland expected	No impacts to farmland expected

connectivity. Concept 4C would provide a grade separation at Glenn Parkway, but the RCUT signals would be difficult to accommodate pedestrian or bicycle crossings. Concept 4D would be similar to the No-Build condition, but the OhioHealth signal would be removed, leaving only 2 signalized crossing locations.

VEHICULAR CONNECTIVITY FOR EAST-WEST TRAFFIC

The No-Build condition has five direct east-west vehicular connections across U.S. 23, all at existing or committed signals. However, there is relatively limited demand for east-west through traffic in this segment, except at Hyatts Road/ Shanahan Road. All Build conditions would result in fewer east-west connections, but many would be grade-separated that could allow for more efficient crossing of U.S. 23. Of the Build conditions, Concept 4A and Concept 4B would have the most direct vehicular east-west connections – with three grade-separated crossings of U.S. 23. Concept 4C would have one direct east-west connection at Glenn Parkway, as all U.S. 23 signals would be RCUTs that require east-west through traffic to make indirect movements. Concept 4D would have two direct east-west connections.

CIRCUITY/BACKTRACKING TO PUBLIC STREETS

All Build concepts would affect the circulation patterns to public streets in the area. In Concept 4A and Concept 4B, all left turning movements would be restricted to interchanges, with new grade separations used to facilitate indirect left turns similar to a connector road interchange. Concept 4C and Concept 4D would allow for left turn movements at signals that remain. Concept 4D would have the least impact on circulation to/from public streets, retaining full movements at many locations. Pollock Road traffic would be most impacted by the concepts, requiring the longest diversion path for any left turn restrictions.

PRIVATE DRIVEWAY ACCESS TO U.S. 23

Concept 4A would have the greatest impact on direct access on U.S. 23, eliminating all private driveway access. Concepts 4B, 4C, and 4D would close existing median openings at private driveways, converting driveways to right-in/right-out access only. Most existing private driveways in Concepts 4B, 4C, and 4D would remain, but some driveway consolidation or elimination could occur in close proximity to connector road interchanges or RCUT intersections. With the proposed frontage/backage road south of Greif Parkway on the west side of U.S. 23 in Concept 4B, it is expected that private properties in this area would likely access the new roadway instead of maintaining direct access to U.S. 23.

PUBLIC TRANSPORTATION

Delaware County Transit service in this segment would be minimally affected by any of the concepts. If fixed route service were implemented on this corridor, it is unlikely that transit stops would ever be located directly on U.S. 23 – transit vehicles would turn off and on U.S. 23 to access future transit stops. Concepts 4A and 4B would restrict all left turns to the connector road interchanges. Concepts 4C and 4D would restrict all left turns to the remaining signalized intersections.

K-12 PUBLIC SCHOOL ACCESS

The Delaware Area Career Center (DACC) South Campus is located at the northeast corner of the U.S. 23/Glenn Parkway intersection. The DACC is a vocational school serving high school students in the County. Because students come from a wide area, students overwhelmingly arrive via car or bus, as opposed to on foot or bicycle. Concepts 4A, 4B, and 4C would all have similar effects on access to DACC, as drivers would use a new Glenn Road interchange for access to/from U.S. 23. This could be an improvement over the existing signal, which is observed to have long queues on Glenn Parkway during school dismissal hours. Concept 4D would have almost no change in DACC access, except that the west leg of the Glenn Parkway signal would be removed. However, the west leg serves very low volumes of DACC traffic.

No other K-12 school facilities are present within Segment 4.

NOT APPLICABLE

There are no emergency service providers or first responder stations located within this segment.

Table 24: Segment 4 - Community Impacts

		NO-BUILD	CONCEPT 4D	CONCEPT 4C	CONCEPT 4B	CONCEPT 4A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	Possible right-of-way impact due to U.S. 23 widening Left turn access to Worthington Arms manufactured home park would be indirect via adjacent interchanges	Possible right-of-way impact due to U.S. 23 widening Left turn access to Worthington Arms manufactured home park would be indirect via adjacent interchanges	Left turn access to Worthington Arms manufactured home park would be indirect via adjacent interchanges	Direct access eliminated from Worthington Arms manufactured home park
	Special Land Uses	No impacts	Minor impacts likely to Camp Lazarus (Boy Scouts of America) due to widening of U.S. 23 and conversion of access point to right-in/right-out only	Minor impacts likely to Camp Lazarus (Boy Scouts of America) due to widening of U.S. 23 and conversion of access point to right-in/right-out only	Minor impacts likely to Camp Lazarus (Boy Scouts of America) due to widening of U.S. 23 and conversion of access point to right-in/right-out only	Minor impacts likely to Camp Lazarus (Boy Scouts of America) due to widening of U.S. 23 and construction of frontage road/ relocation of access point
	Residential Displacements	No impacts	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements
	Commercial Displacements	No impacts	0-20 commercial parcels with displacements	10-20 commercial parcels with displacements	10-30 commercial parcels with displacements	10-30 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected
	Bicycle/Pedestrian Connectivity for East-West Movements	3 signalized crossing locations	2 signalized crossing locations	1 grade-separated crossing	3 grade-separated crossings	3 grade-separated crossings
	Vehicular Connectivity for East-West Traffic	5 locations with direct crossing at signal	2 locations with direct crossing at signal	1 location with direct crossing at signal	3 grade-separated crossings	3 grade-separated crossings
	Circuity/Back-tracking to Public Streets	No impacts	5 public streets with left turn access	3 public streets with left turn access	3 public streets with left turn access	3 public streets with left turn access
	Private Driveway Access to U.S. 23	No impacts	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	No direct private access points
	Public Transportation	No impacts	Minimal impacts expected	Minimal impacts expected	Minimal impacts expected	Minimal impacts expected
	K-12 Public School Access	No impacts	Minimal impact due to removal of west leg of Glenn Parkway	Minimal impact due to replacement of Glenn Parkway signal with interchange	Minimal impact due to replacement of Glenn Parkway signal with interchange	Minimal impact due to replacement of Glenn Parkway signal with interchange
	Access to/from U.S. 23 for Emergency Services	No emergency service providers/first responder facilities in segment	No impacts to access for emergency service/ first response facilities	No impacts to access for emergency service/ first response facilities	No impacts to access for emergency service/ first response facilities	No impacts to access for emergency service/ first response facilities

Infrastructure Impacts

MAINTENANCE OF TRAFFIC (MOT)

The No-Build concept would have no impacts to traffic, as no construction would occur. Minimal MOT effects on U.S. 23 are anticipated with any Build concepts. Off-peak hour lane closures on U.S. 23 may be required for the widening in Concepts 4C and 4D. Long-term closures and/or restrictions of side streets may be needed for construction of the new grade separations in Concepts 4A, 4B, or 4C.

DESIGN STANDARDS

Many locations in this segment have outside shoulder widths that are less than current ODOT Location & Design Manual (L&D) criteria. However, it does not appear that the shoulder widths are contributing to crash patterns. Concept 4C and Concept 4D are more likely to result in wider outside shoulder widths, as widening would already be necessary. With any Build concept, ODOT Performance-Based Practical Design policy would be considered to potentially reduce impacts and costs without compromising safety.

MAJOR UTILITIES

In Segment 4, there are high-voltage transmission lines crossing U.S.23 at the Hyatts Road/Shanahan Road intersection. There are also high-voltage overhead lines paralleling the west side of U.S. 23 at this location. Concept 4A and Concept 4B would construct a new grade separation in the vicinity of these high-voltage lines. Substantial impacts to these overhead lines and multiple transmission towers are likely with either concept, in order to provide adequate clearance to the new overpass. Due to the presence of a waterway in the intersection, constructing a below-grade separation would be infeasible at this location. Concept 4C and Concept 4D would have the lowest impact to these high-voltage lines, with potential impacts due to widening along U.S. 23. Further study of potential alignments would be needed to determine any impacts to existing towers or clearances from these lines.

NOT APPLICABLE

There are no railroad facilities located within Segment 4.

Costs

RIGHT-OF-WAY (PARCELS, ACRES, AND COSTS)

All Build concepts are anticipated to impact a similar number of parcels. However, Concept 4A is expected to require substantially more right-of-way acreage than other Build concepts. The traditional freeway interchanges in Concept 4A are expected to require a larger right-of-way footprint than other improvement options for these locations. Concept 4D is expected to have the lowest right-of-way cost, while Concepts 4A and 4B are expected to have highest right-of-way costs approximately double Concept 4D. If any Build concept is advanced, further study of potential alignments would be needed to determine if any impacts could be avoided or lessened.

USER BENEFITS

Concept 4A and Concept 4B are expected to have the greatest user benefits, with delays for U.S. 23 through traffic eliminated and the greatest predicted crash reduction due to many fewer conflicting movements. Concept 4C is expected to have lower user benefits than Concepts 4A and 4B, primarily due to the delays and conflicting movements at the two RCUT signals. Concept 4D is anticipated to have the least user benefits of Build concepts, as it would have the most signals creating intersection delays and the greatest number of conflicting movements.

BENEFIT-COST RATIO

Concept 4B is the only concept projected to have a benefit-cost ratio near or above 1.0. Concept 4B would generate nearly identical user benefits as Concept 4A, but for substantially less cost due to the use of connector road interchanges instead of traditional freeway interchanges. Concepts 4A, 4C, and 4D are all expected to have costs exceeding the projected user benefits.

PROJECT COSTS (2030)

All Build concepts are expected to exceed $100 million in total costs. Concepts 4B and 4C are expected to have roughly similar costs, somewhat higher than Concept 4D. Concept 4D is expected to have the least cost, as it does not include any grade separations or new frontage roads. Concept 4A is expected to have the highest cost, at over $300 million. The traditional freeway interchanges in Concept 4A are expected to have much larger construction costs and right-of-way costs compared with the interchanges in Concept 4B.

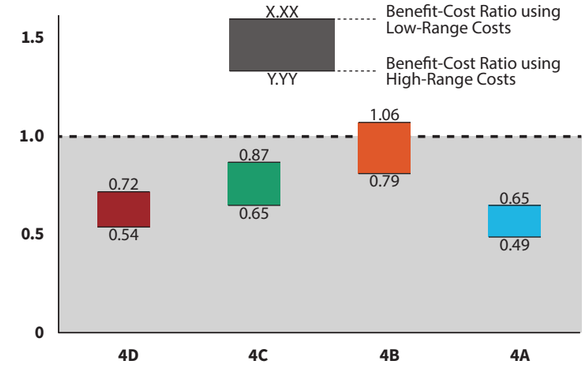


Figure 29: Segment 4 Benefit-Cost Ratios

Table 25: Segment 4 - Infrastructure Impacts & Costs

		NO-BUILD	CONCEPT 4D	CONCEPT 4C	CONCEPT 4B	CONCEPT 4A
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected
	Design Standards	No impacts	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23
	Major Utilities	No impacts	Potential minor Impacts to high-voltage transmission lines due to widening at Hyatts Road/Shanahan Road intersection	Potential minor Impacts to high-voltage transmission lines due to widening at Hyatts Road/Shanahan Road intersection	Substantial Impacts to high-voltage transmission lines likely due for grade separation and interchange at Hyatts Road/ Shanahan Road intersection	Substantial Impacts to high-voltage transmission lines likely due for grade separation and interchange at Hyatts Road/ Shanahan Road intersection
	Railroads	No railroad facilities in segment	No impacts	No impacts	No impacts	No impacts
Costs	**Right-of-Way (parcels & acres)**	No impacts	50-125 parcels 50-100 acres	50-125 parcels 70-120 acres	50-125 parcels 80-140 acres	50-125 parcels 120-210 acres
	Right-of-Way Costs (2030)	None	$20 - 40M	$25 - 50M	$40 - 70M	$45 - 85M
	User Benefit (20-year)	None	$65M	$105M	$155M	$150M
	Benefit-Cost Ratio	N/A	0.54 - 0.72	0.65 - 0.87	0.79 - 1.06	0.49 -0.65
	Projected Costs (2030)	Routine maintenance	$120 - 160M	$160 - 215M	$200 - 265M	$320 - 420M

Key Intersection Analysis

Some key intersections have been analyzed in greater detail, as they are among the larger intersections in the corridor. Improvements selected for the key intersections are also likely to impact the selection of concepts for adjacent locations. Matrices for the key intersections for this segment are presented below.

Table 26: Segment 4 - Glenn Parkway

		NO-BUILD	CONCEPT 4D	CONCEPT 4C	CONCEPT 4B	CONCEPT 4A
Primary Needs	**Safety - Forecasted Crashes**	15 expected annual crashes 7 expected fatal/serious injury crashes over 20 years	8 predicted annual crashes 4 predicted fatal/serious injury crashes over 20 years	6 predicted annual crashes 4 predicted fatal/serious injury crashes over 20 years	4 predicted annual crashes 3 predicted fatal/serious injury crashes over 20 years	10 predicted annual crashes 4 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	8 conflicting movements	6 conflicting movements	4 conflicting movements	4 conflicting movements	4 conflicting movements
	Intersection Capacity (all movements)	LOS E 65 seconds of delay/vehicle	LOS B 15 seconds of delay/vehicle	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
	Travel Time Reliability for U.S. 23	1 signal	1 signal	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
Costs	**Projected Costs (2030)**	Routine maintenance	$35M	$50M	$50M	$90M

Table 27: Segment 4 - Hyatts Road/Shanahan Road

		NO-BUILD	CONCEPT 4D	CONCEPT 4C	CONCEPT 4B	CONCEPT 4A
Primary Needs	**Safety - Forecasted Crashes**	19 expected annual crashes 9 predicted fatal/serious injury crashes over 20 years	16 predicted annual crashes 7 predicted fatal/serious injury crashes over 20 years	18 predicted annual crashes 7 predicted fatal/serious injury crashes over 20 years	7 predicted annual crashes 5 predicted fatal/serious injury crashes over 20 years	5 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	16 conflicting movements	16 conflicting movements	12 conflicting movements	4 conflicting movements	4 conflicting movements
	Intersection Capacity (all movements)	LOS E 65 seconds of delay/vehicle	LOS C 35 seconds of delay/vehicle	LOS D 45 seconds of delay/vehicle	No signal (free-flow)	No signal (free-flow)
	Travel Time Reliability for U.S. 23	1 signal	1 signal	2 northbound signals 2 southbound signals	No signal (free-flow)	No signal (free-flow)
Costs	**Projected Costs (2030)**	Routine maintenance	$30M	$40M	$70M	$145M

Community Engagement Results

The City of Delaware was generally supportive of concepts that would provide more free-flow conditions on U.S. 23, provided that adequate business access and east-west connections can still be provided. OhioHealth offered comments that future expansion of their facility will necessitate a continued need for full access to/from U.S. 23.

Comments from businesses on Greif Parkway were supportive of concepts that removed the U.S. 23/Greif Parkway signal and/or access, if ample connections were provided to adjacent interchanges. There were many comments regarding Olentangy school related traffic and circulation for all Build concepts, which would be a consideration in further study if a concept is advanced.

Conclusions

A combination of improvements from several concepts should be used as the baseline and starting point for further study of Segment 4.

HYATTS ROAD/SHANAHAN ROAD

At Hyatts Road/Shanahan Road, a connector road interchange (Concept 4B) should be used as the baseline and starting point for further study. Concept 4B is expected to provide the greatest safety and operational benefit, while having nearly half the cost of a traditional freeway interchange. However, the design of a connector road interchange would be challenging due to the numerous overhead high-voltage lines and the stream crossing. If the design challenges are problematic, widening U.S. 23 for additional lanes (Concept 4D) could be used as baseline and starting point for further study. Concept 4D is expected to reduce intersection delays by nearly half and reduce fatal/serious injury crashes by nearly half, while having half the cost of Concept 4B. A traditional freeway interchange (Concept 4A) would have similar benefits as Concept 4B but would have much greater property impacts and cost than all other concepts. An RCUT intersection (Concept 4C) is predicted to have higher costs and less benefit than Concept 4D.

GREIF PARKWAY

At Greif Parkway, replacing the signal with a right-in/right out intersection (Concept 4B/4C) should be used as the baseline and starting point for further study. This would involve construction of frontage/backage road connections to Hyatts Road and Glenn Parkway on the west side of U.S. 23. Concept 4A would provide slightly more safety benefit, but would remove direct access to all properties along U.S. 23. An RCUT intersection (Concept 4D) would have minimal safety and operational benefit, while increasing the number of signals.

GLENN PARKWAY

At Glenn Parkway, a connector road interchange (Concept 4B/4C) should be used as the baseline and starting point for further study. The connector road interchange is expected to provide the greatest safety and operational benefit among all concepts. Concept 4B/4C is consistent with feedback received by numerous businesses and the DACC. A traditional freeway interchange (Concept 4A) is expected to have nearly twice the cost and more property impacts, while providing no additional benefits. Retaining the existing signal (Concept 4D) would have minimal safety and operational benefits, while requiring costly widening of U.S. 23.

CHESHIRE ROAD

For the Cheshire Road area, a connector road interchange at relocated Cheshire Road (Concept 4A/4B) along with conversion of the OhioHealth intersection to right-in/right-out operation should be used as the baseline and starting point for further study. Concept 4A/4B is expected to provide the greatest safety and operational benefits without substantial impacts to adjacent properties. This concept is also supported by Camp Lazarus, who has indicated that connection to a new interchange would be preferable to their current access at the OhioHealth signal. If the cost of an interchange becomes prohibitive, an RCUT intersection at relocated Cheshire Road (Concept 4C) could be used as a baseline and starting point for further study. Concept 4C would provide some safety and operational benefits for less cost than Concept 4A/4B. Widening of the planned signal at relocated Cheshire Road (Concept 4D) would provide the least amount of safety and operational benefits.

SEGMENT BETWEEN CHESHIRE ROAD AND POLLOCK ROAD

North of Cheshire Road, construction of a raised median throughout and conversion of all driveways and intersections to right-in/right-out only operation (Concept 4C) should be used as a baseline and starting point for further study. Concept 4C would eliminate all left turn conflicts, including at the Pollock Road intersection that is located in close proximity to the SR 315 junction (Segment 5). Improvements at adjacent locations (Cheshire Road, SR 315) would allow drivers to make U-turns for indirect left turn access into all of these locations in the northern part of Segment 4. Concept 4C is expected to require minimal, if any, additional right-of-way to accomplish these safety benefits. Construction of a new frontage road along the east side of U.S. 23 (Concept 4A, Concept 4B) would have substantial cost and additional right-of-way impacts, while providing no additional safety benefit. Retaining southbound left turns at Pollock Road (Concept 4D) would have less safety benefit and may possibly conflict with future improvements at SR 315.

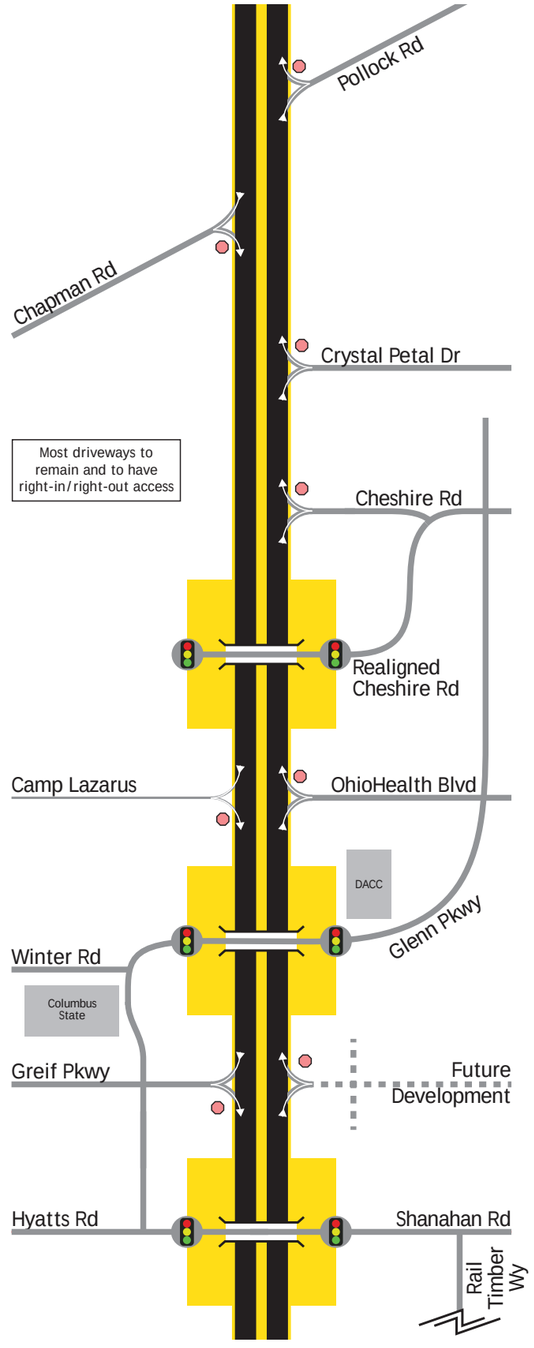


Figure 30: Segment 4 High-Performing Concept

SEGMENT 5

Segment Overview

GENERAL/LAND USES

Segment 5 extends from SR 315 to US 42. This section is primarily within southern portions of the City of Delaware, but some parts of the segment lie in unincorporated Delaware Township. Segment 5 contains the largest retail land uses in the southern part of the City of Delaware. Delaware Plaza, including a Wal-Mart and Kroger, is located on the west side of U.S. 23. Coughlin's Crossing, an emerging large mixed-use development with many auto-centric retail uses, is located on the east side of U.S. 23. Several car dealerships are also in operation throughout this segment. Multiple residential subdivisions are located on both sides of U.S. 23.

U.S. 23 ROADWAY

For the majority of Segment 5, U.S. 23 is a divided highway with a grass median and two through lanes in each direction. A center two-way left turn lane exists at the far southern end of the segment. There are 8 signals within Segment 5, making it one of the more densely signalized locations on the corridor. Several of the signals and intersections have turning movement restrictions to better enhance traffic flow. For most of the segment, access to U.S. 23 is restricted to public street intersections and signals. However, some private access exists between Hull Drive and Cottswold Drive, as well as the SR 315 intersection vicinity. The posted speed limit is 55 miles per hour throughout Segment 5.

OTHER ROADWAYS

Two major routes intersect U.S. 23 in Segment 5 – SR 315 and U.S. 42. The SR 315 intersection area was improved in 2016 to enhance safety and operations by removing Stratford Road from the signal operation. A signal was installed at Meeker Way to serve the east side of U.S. 23. SR 315 parallels U.S. 23 and is frequently used by drivers an alternate route from congestion on U.S. 23.

The junction with U.S. 42 was reconfigured in 2001 to allow for full movements between U.S. 23, U.S. 42, and S. Sandusky Street. The resulting design has a pair of two-phase signals with restricted movements on U.S. 23 that serve these connections. U.S. 42 connects to the Delaware Industrial Park and serves a high truck volume.

The remaining intersecting roadways in Segment 5 are local roads serving residential and commercial developments. There is very little north-south connectivity between these intersecting roadways, resulting in many drivers having to turn onto U.S. 23 for very short distances to make local connections. Liberty Road and Stratford Road are parallel north-south collector roads but have few direct connections to the busy commercial developments.

The City of Delaware Thoroughfare Plan shows a future planned extension of Cottswold Drive east of U.S. 23 to connect to Stratford Road. This planned extension is assumed to exist in the No-Build condition and all Build concepts. Thus, costs and impacts resulting from this connection are not included in the Build concepts.

Figure 31: Segment 5 Study Area

Proposed Concepts

Five Build condition concepts have been developed for Segment 5, in addition to the No-Build condition. Consistent with other segments, Concept 5A is most freeway-like, while Concept 5E is most like the existing signalized corridor. The Segment 5 concepts are shown on **Figure 32**.

CONCEPT 5A

Concept 5A would remove all signals on U.S. 23. Access on U.S. 23 would be limited to a traditional freeway interchange at SR 315 and a traditional freeway interchange at U.S. 42. Three new grade separations would be constructed between SR 315 and U.S. 42 to allow for east-west connectivity. The grade separations would be located at Hawthorn Boulevard, Delaware Plaza North, and Cottswold Drive. Delaware Plaza North would become a public street and extended east to connect to Stratford Road. Short frontage roads would be built north of Hull Drive to connect properties that only have access to U.S. 23. S. Sandusky Street would no longer directly connect to U.S. 23 and U.S. 42, with Olentangy Avenue and Stratford Road being used to make these connections. All median breaks would be replaced with a raised median, eliminating all left turns to or from U.S. 23 throughout the segment.

CONCEPT 5B

Concept 5B would remove almost all signals on U.S. 23. The SR 315 intersection would be replaced by a grade separation, with no direct connection between the two routes. The portion of Stratford Road in this segment would become SR 315, making the U.S. 42 interchange the northern terminus of SR 315. Like Concept 5A, there would be a traditional freeway interchange at U.S. 42. S. Sandusky Street would no longer directly connect to U.S. 23 and U.S. 42, with Olentangy Avenue and Stratford Road being used to make these connections. Two grade separations (Delaware Plaza North, Cottswold Drive) and one signal (Hawthorn Boulevard) would provide east-west connections. Three unsignalized access points would remain for right-in/right-out access on U.S. 23. Delaware Plaza North would become a public street and extended east to connect to Stratford Road. All median breaks would be replaced with a raised median, eliminating all left turns to or from U.S. 23 throughout the segment. Short frontage roads would be built north of Hull Drive to connect properties that only have access to U.S. 23. The southern half of the segment would be widened to three through lanes in each direction in order to allow for acceptable traffic operations at the Hawthorn Boulevard signal.

CONCEPT 5C

Concept 5C would be similar to Concept 5B, except for the improvements at SR 315, Hawthorn Boulevard, and U.S. 42. Concept 5C would provide a connector road interchange at SR 315, using new connector roads for the west side of U.S. 23 and using Meeker Way as a connector road on the east side of U.S.23. A connector road interchange would also be built at U.S. 42, which would have partial connections to S. Sandusky Street. RCUT intersections would be constructed at Hawthorn Boulevard and Cottswold Drive. A grade separation would be constructed at Delaware Plaza North, with Delaware Plaza North becoming a public street and extended east to connect to Stratford Road. No change to the left-in/right-out unsignalized intersection at Hull Drive is proposed. Short frontage roads would be built north of Hull Drive to provide full access to properties that only have access to U.S. 23. S. Sandusky Street would have a partial connection with U.S. 23 and U.S. 42, with the other movements requiring use of Olentangy Avenue and Stratford Road. A raised median would be installed through the segment, except at some intersection noted above, eliminating most left turns to or from U.S. 23. Because of the multiple signals on U.S. 23, this segment would be widened to three lanes in each direction to achieve acceptable traffic operations.

CONCEPT 5D

Concept 5D would only have one grade-separated intersection at U.S. 42, the same connector road interchange proposed in 5C. There are five signalized intersections in Concept 5D, including Cottswold Drive, Delaware Plaza North, Hawthorn Boulevard, Meeker Way, and SR 315. The Hawthorn Boulevard signal would not permit westbound through or left turn movements to allow for the signal to operate more efficiently. Similarly, the Meeker Way intersection would not permit southbound left turn movements. The "missing" movements can be accommodated using either Hawthorn Boulevard or Meeker Way. A raised median would be installed through the segment, except at some intersection noted above, eliminating most left turns to or from U.S. 23. Because of the multiple signals on U.S. 23, this segment would be widened to three lanes in each direction to achieve acceptable traffic operations.

CONCEPT 5E

Concept 5E is the only Build concept without any grade separations on U.S. 23 and would leave the most signals on U.S. 23. Continuous-T (often known as Green-T) configurations would be built at the SR 315 and northern U.S. 42 intersections. These intersections would allow northbound through traffic to operate free-flow, but southbound traffic would be under signal control. The signal at Meeker Way would be replaced with an unsignalized right-in/right-out intersection. The operation of all other intersections and driveways would remain unchanged. Because of the multiple signals on U.S. 23, this segment would be widened to three lanes in each direction to achieve acceptable traffic operations.

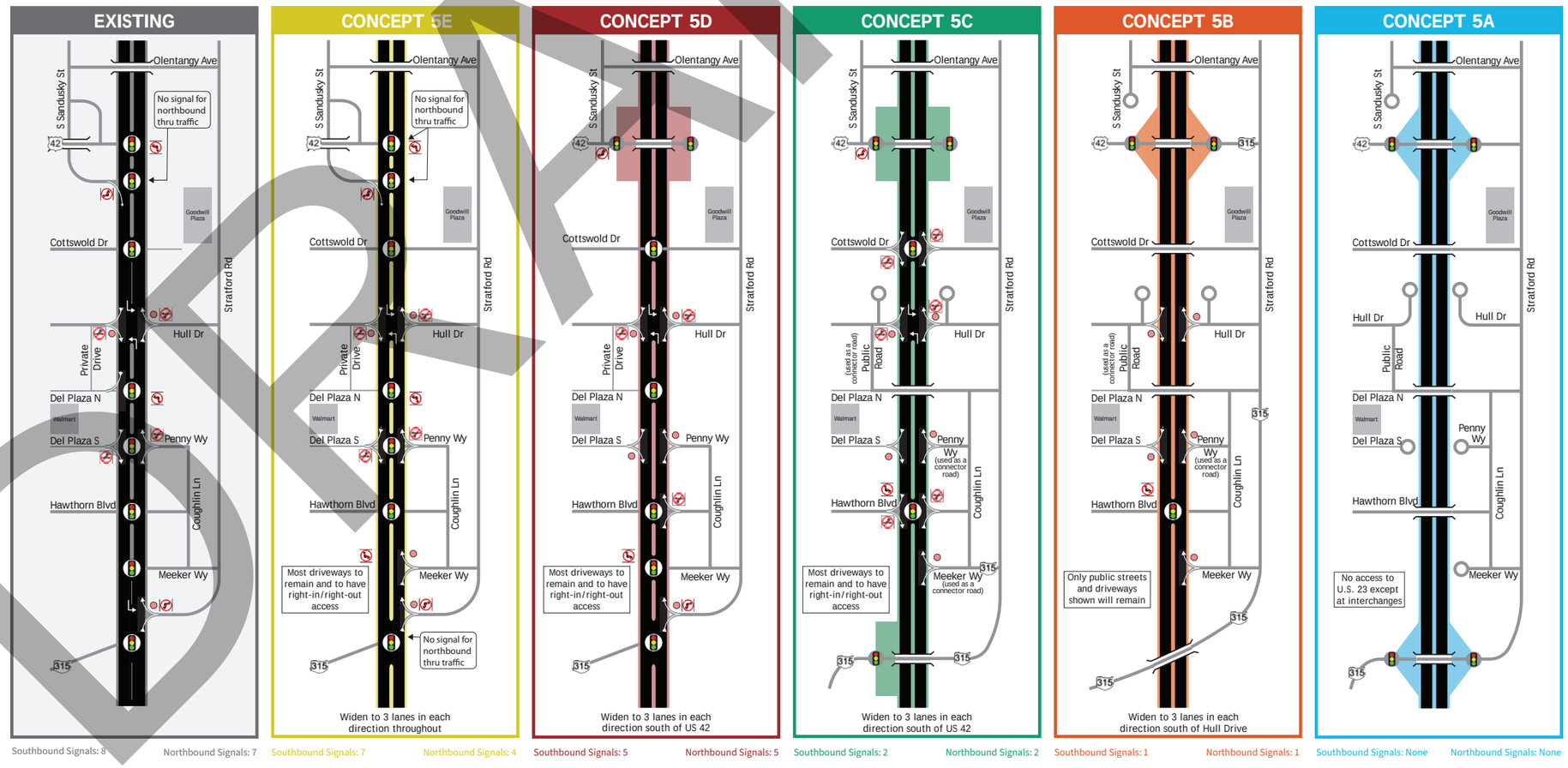


Figure 32: Segment 5 Concepts

**Includes signals at U-turn locations*

Primary Needs

U.S. 23 THROUGH TRAVEL TIMES THROUGH SEGMENT

With no improvements, it is anticipated that it will take vehicles 5-8 minutes to travel through the 1.7 miles of Segment 5 during peak hours in 2050. Concepts 5E and 5D are expected to reduce travel times by nearly half compared with No-Build. Concepts 5C and 5B are expected to reduce travel times down to 2-3 minutes in each direction. Concept 5A would eliminate all signals, making the segment freeway-like in character. Thus, Concept 5A is expected to have the largest reduction in travel times, allowing vehicles to drive through the segment in approximately two minutes.

TRAVEL TIME RELIABILITY – NUMBER OF SIGNALS ON U.S. 23

There are eight signals in the No-Build condition in Segment 5, although northbound through traffic only passes through seven signals. Concept 5A would remove all signals, resulting in free-flow operation for U.S. 23 through traffic in the segment and thus the greatest travel time reliability. Concept 5B and Concept 5C would see similar improvements in travel time reliability, with a reduction to one and two signals, respectively. Concept 5E would offer the least travel time reliability among Build concepts, with seven signals remaining, although only four signals would affect northbound through traffic.

TRAVEL TIME RELIABILITY – INTERSECTIONS AT LOS E OR WORSE

The Hawthorn Boulevard signal is expected to operate at LOS E or worse in the No-Build condition. All Build concepts are expected to improve operations such that no signals with LOS E or worse operations would remain.

SAFETY – FORECASTED CRASHES

Concepts 5D and 5E are anticipated to have the least effects on crash frequency, reducing crashes by about 20% compared to the No-Build condition. Concepts 5B and 5C, with the introduction of multiple grade separations, are anticipated to reduce crashes by about 50%. Concept 5A is predicted to have the greatest crash reduction among all concepts, with a predicted 70% reduction. Concept 5A would have the least number of conflict points and no signals, which helps to contribute toward the greater predicted safety benefits in the ODOT ECAT calculations.

SAFETY – CONFLICTING MOVEMENTS FOR U.S. 23 THROUGH TRAFFIC

U.S. 23 through vehicles travelling in Segment 5 encounter 76 conflicting movements today in the No-Build condition. Concept 5D and Concept 5E would reduce the number of conflicting movements by a relatively small amount – less than 20%. Concept 5B and Concept 5C would eliminate just over half the number of conflicting movements for U.S. 23 through traffic. Concept 5A would eliminate nearly 90% of conflicting movements, offering the greatest safety benefit.

Secondary Need

CONSISTENCY WITH LOCAL PLANS

Numerous local goals may be affected by the concepts in Segment 5. The local goals listed below have been identified either via published local planning documents or via public engagement activities:

For decades, the City of Delaware has identified the Southeast Connector, an extension/rerouting of U.S. 42 east of U.S. 23, as a future transportation project. The Southeast Connector, which is included on the current City of Delaware Thoroughfare Plan, would help to divert truck traffic off of E. William Street through the east side of the City. There is no current timetable or funding for this Southeast Connector to undertake formal study, design, or construction. Concepts 5A and 5B, with a traditional freeway interchange at U.S. 42, are most likely to be compatible with a potential Southeast Connector. The partial interchanges in Concepts 5C and 5D are unlikely able to easily accommodate a future Southeast Connector. Concept 5E would not allow for a future Southeast Connector, as a continuous-T intersection concept can only be applied to 3-leg intersections.

When the U.S. 23/U.S. 42 interchange was reconstructed two decades ago, a goal was to allow for full movements between S. Sandusky Street and all directions of U.S. 23 and U.S. 42. The City of Delaware still holds this goal and views S. Sandusky Street as a key roadway serving the south side of the City. Concept 5E would retain all connectivity for S. Sandusky Street, meeting City goals. Concepts 5C and 5D would allow for some movements to be retained between S. Sandusky Street and U.S. 23 or U.S. 42. Other movements would have to divert via Olentangy Avenue and Stratford Road. Concepts 5A and 5B would completely disconnect S. Sandusky Street from both U.S. 23 and U.S. 42, causing all traffic to be rerouted, thus being least consistent with this City goal.

The City of Delaware has expressed a desire to maintain connectivity across U.S. 23 in Segment 5, as many of the adjacent neighborhoods and developments have limited connectivity other than to/from U.S. 23. The City also does not want U.S. 23 to become even more of a barrier separating portions of the City. Concepts 5D and 5E would generally retain the existing access and traffic patterns in Segment 5, being most consistent with this City goal. Concept 5B would have some substantial rerouting and traffic pattern changes, however several access points would still remain on U.S. 23. Concept 5A would result in the greatest amount of traffic rerouting, as most traffic to/from retail centers in this segment would have to use local roads in order to access U.S. 23 for their destination.

There is also a desire from the local community that Stratford Road, particularly in the vicinity of the Delaware Historical Society and other historic sites, retain its current character and not see a large increase in traffic or truck volumes. Concept 5B would have the greatest effect on Stratford Road, substantially increasing traffic volumes as the entire length in Segment 5 would become SR 315. It is possible that some portions of Stratford Road would require improvements to be suitable as a state route in Concept 5B. Concept 5C would substantially increase traffic on the southernmost portion of Stratford Road, as traffic traveling between SR 315 and U.S. 23 northbound would use Stratford

Table 28: Segment 5 - Primary & Secondary Needs

		NO-BUILD	CONCEPT 5E	CONCEPT 5D	CONCEPT 5C	CONCEPT 5B	CONCEPT 5A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	5-8 minutes	3-4 minutes	3-5 minutes	2-3 minutes	2-3 minutes	2 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	8 signals (7 NB, 8 SB)	7 signals (4 NB, 7 SB)	5 signals	2 signals	1 signal	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	1 signal	0 signals	0 signals	0 signals	0 signals	0 signals
	Safety - Forecasted Crashes	78 expected annual crashes 43 expected fatal/serious injury crashes over 20 years	66 predicted annual crashes 34 predicted fatal/serious injury crashes over 20 years	53 predicted annual crashes 31 predicted fatal/serious injury crashes over 20 years	39 predicted annual crashes 20 predicted fatal/serious injury crashes over 20 years	36 predicted annual crashes 22 predicted fatal/serious injury crashes over 20 years	22 predicted annual crashes 10 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	76 conflicting movements	70 conflicting movements	62 conflicting movements	34 conflicting movements	32 conflicting movements	8 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	Retains full S. Sandusky Street connection to/from U.S. 23 Unlikely to be compatible with City of Delaware planned Southeast Connector Existing traffic patterns to/across U.S. 23 generally remain unchanged	Partial connection to/from S. Sandusky Street and U.S. 23 will remain Unlikely to be compatible with City of Delaware planned Southeast Connector Existing traffic patterns to/across U.S. 23 generally remain unchanged	Partial connection to/from S. Sandusky Street and U.S. 23 will remain Unlikely to be compatible with City of Delaware planned Southeast Connector Increased traffic on southernmost portion of Stratford Road	Loss of S. Sandusky Street connection to/from U.S. 23 Most compatible with City of Delaware planned Southeast Connector Increased traffic volumes on Stratford Road Rerouting of traffic to/from retail centers and local roads	Loss of S. Sandusky Street connection to/from U.S. 23 Most compatible with City of Delaware planned Southeast Connector Greatest rerouting of traffic to/from retail centers and local roads

Road and Meeker Way to make that connection. Concepts 5D and 5E are unlikely to have impacts to Stratford Road.

Natural & Cultural Resource Impacts

HISTORIC SITES

Concepts 5A, 5B, and 5C are likely to have moderate impacts to Forrest Meeker House & Farm, while Concepts 5D and 5E would likely have minor impacts. Concepts 5A, 5C, and 5E would likely have substantial impacts to the former Stratford Methodist Episcopal Church and the other historic site on the west side of U.S. 23 at SR 315, while Concepts 5B and 5D would likely have moderate impacts. Concepts 5A, 5B, and 5C would likely have minor impacts to multiple historic sites on east side of Stratford Road, while Concepts 5D and 5E are not expected to have impacts.

SCENIC RIVER (OLENTANGY RIVER)

Concept 5A would likely have major impacts due to the likely need for two new bridges crossing the Olentangy River and the likely need to remove an existing dam structure east of U.S. 23. Concept 5C would likely have moderate impacts due to the potential need for a new bridge over Olentangy River at SR 315 and the potential widening of existing U.S. 23 bridge over the Olentangy River. Concepts 5B, 5D, and 5E would likely have minor impacts due to the widening of the existing U.S. 23 bridge over the Olentangy River.

STREAMS & WATERWAYS

U.S. 23 passes over two waterways within Segment 5 – one south of Meeker Road and one north of Hull Drive. All Build concepts are expected to have minor impacts to streams and waterways due to interchange concepts and/or U.S. 23 widening. See Scenic River section above for information regarding the Olentangy River.

ENDANGERED SPECIES HABITAT

Concepts 5A, 5B and 5C would likely have minor impacts to Suitable Wooded Habitat (SWH) for Indiana at and Northern Long-eared Bats. Concepts 5D and 5E would likely have minimal impacts to Suitable Wooded Habitat for Indiana Bat and Northern Long-eared Bats.

REGULATED MATERIALS

All Build concepts could potentially have minor impacts to regulated materials sites due to interchange concepts and/or U.S. 23 widening. There are several automotive sales and repair businesses and gas stations within Segment 5.

NOT APPLICABLE

There are no known parks or recreational resources or farmland in this segment.

Community Impacts

ENVIRONMENTAL JUSTICE AND OTHER TRADITIONALLY UNDERREPRESENTED POPULATIONS

No specific Environmental Justice or traditionally underrepresented populations have been identified at this time. Concepts 5A and 5B could possibly minimally impact the multi-family complexes along Stratford Road due to improvements related to the proposed U.S. 42 interchange in these concepts. Concepts 5C, 5D and 5E are not expected to have impacts to Environmental Justice or traditionally underrepresented populations.

SPECIAL LAND USES

The Stratford Ecological Center is located on the northwest corner of U.S. 23 and SR 315, with no access onto U.S. 23. Stratford Ecological Center is a non-profit educational farm with activities for children and adults. All Build concepts are anticipated to have some impact on the Stratford Ecological Center. Concepts 5B, 5D, and 5E are expected to have the least impact, with minor additional right-of-way needed for U.S. 23 widening. Concept 5A and Concept 5C are expected to have greater impact due the construction of new interchange ramps or connector roads, respectively.

RESIDENTIAL & COMMERCIAL DISPLACEMENTS

The Build concepts are expected to have a minimal number of residential displacements – less than 10 per concept. Residential displacements are most likely to occur in areas surrounding SR 315 and U.S. 42 improvements. Concepts 5D and 5E are expected to have the least number of commercial displacements, while Concepts 5A, 5B, and 5C have potential for more than 10 commercial displacements. Commercial displacements are most likely to occur in the vicinity of interchanges and/or grade separations. If any Build concept is advanced, further study would be undertaken to minimize any potential displacements and other impacts.

AIR QUALITY

All Build concepts are likely to have similar and minor air quality impacts.

NOISE SENSITIVE AREAS

Concepts 5A, 5B and 5C would likely have moderate impacts to noise receptors due to the interchange and/or grade separations proposed for the U.S. 42 and SR 315 vicinities. Concept 5D would likely have minor impacts to noise receptors due to the proposed US 42 connector road interchange. Concept 5E would likely have minor impacts to noise receptors due to widening of US 23.

Table 29: Segment 5 - Natural & Cultural Resource Impacts

		NO-BUILD	CONCEPT 5E	CONCEPT 5D	CONCEPT 5C	CONCEPT 5B	CONCEPT 5A
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	No impacts to public parks or recreation areas expected	No impacts to public parks or recreation areas expected	No impacts to public parks or recreation areas expected	No impacts to public parks or recreation areas expected	No impacts to public parks or recreation areas expected
	Historic Sites	No impacts	Minor impacts likely to Forrest Meeker House & Farm Substantial impacts likely to former Stratford Methodist Episcopal Church. Minor impact likely at other historic site west of SR 315 No impacts expected to historic sites on east side of Stratford Road	Minor impacts likely to Forrest Meeker House & Farm Moderate impacts likely to former Stratford Methodist Episcopal Church. Minimal impact likely at other historic site west of SR 315 No impacts expected to historic sites on east side of Stratford Road	Moderate impacts likely to Forrest Meeker House & Farm Substantial impacts likely to former Stratford Methodist Episcopal Church and other historic site on west side of U.S. 23 and SR 315 Minor impacts likely to multiple historic sites on east side of Stratford Road expected	Moderate impacts likely to Forrest Meeker House & Farm Moderate impacts likely to former Stratford Methodist Episcopal Church and other historic site on west side of U.S. 23 at SR 315 Minor impacts likely to multiple historic sites on east side of Stratford Road expected	Moderate impacts likely to Forrest Meeker House & Farm Substantial impacts likely to former Stratford Methodist Episcopal Church and other historic site on west side of U.S. 23 at SR 315 Minor impacts likely to multiple historic sites on east side of Stratford Road expected
	Scenic River (Olentangy River)	No impacts	Minor impacts likely Widening of existing U.S. 23 bridge over Olentangy River is likely	Minor impacts likely Widening of existing U.S. 23 bridge over Olentangy River is likely	Moderate impacts likely Potential for one new bridge over Olentangy River at SR 315, depending on connector road alignment Potential for widening of existing U.S. 23 bridge over Olentangy River	Minor impacts possible Potential widening of existing U.S. 23 bridge over Olentangy River	Major impacts likely Two new Olentangy River crossings likely needed for SR 315 interchange Replacement or removal of dam structure east of U.S. 23 bridge is likely
	Streams & Waterways	No impacts	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Moderate impacts to streams and waterways likely	Moderate impacts to streams and waterways likely	Moderate impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Minimal impacts to Indiana and Northern Long-eared Bat habitat likely	Minimal impacts to Indiana and Northern Long-eared Bat habitat likely	Minor impacts to Indiana and Northern Long-eared Bat habitat likely	Minor impacts to Indiana and Northern Long-eared Bat habitat likely	Minor impacts to Indiana and Northern Long-eared Bat habitat likely
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No farmland in segment	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected

BICYCLE/PEDESTRIAN CONNECTIVITY TO EAST-WEST MOVEMENTS

Four of the existing signals in Segment 5 have marked pedestrian crossings and pedestrian signal indications, representing the only locations for pedestrians and bicycles to cross U.S. 23. Concept 5A would remove all signalized crossings, but provide four new grade separations that could be designed to allow for safer, more appealing pedestrian/bicyclist crossings of U.S. 23. Concepts 5B and 5C would also provide some grade separations that could allow for pedestrian/bicycle crossings of U.S. 23. Concept 5D and 5E would offer similar connectivity as the No-Build condition.

VEHICULAR CONNECTIVITY FOR EAST-WEST TRAFFIC

The No-Build condition has two direct east-west vehicular connections across U.S. 23, at the Hawthorn Boulevard and Cottswold Drive signals. Concept 5D and 5E would each retain two direct east-west crossings at signals. Concept 5A and 5C would eliminate all signalized east-west crossings, but would construct five grade-separated crossings and two grade-separated crossings, respectively. Concept 5B would result in a combination of grade-separated and signalized east-west vehicle crossing locations.

BACKTRACKING/CIRCUITY TO PUBLIC STREETS

Concept 5E would retain public street access almost identical to the No-Build condition. Concept 5D would be largely similar to the existing condition, with notable restrictions for left turns at Penny Way and access to/from S. Sandusky Street. Concept 5C would introduce turning movement restrictions at most intersections, plus removal of the Delaware Plaza North intersection. Concept 5B would have indirect movements for almost all left turns to/from U.S. 23. Concept 5A would result in the greatest amount of circuity, with the SR 315 and U.S. 42 interchanges being the only connections to/from the public street system.

PRIVATE DRIVEWAY ACCESS TO U.S. 23

There are relatively few unsignalized private driveways with direct access to U.S. 23 in Segment 5, with most located between Hull Drive and Cottswold Drive. All Build concepts would include a center median and closure of existing median breaks, converting any remaining unsignalized driveways to right-in/right-out access only. Concepts 5B, 5C, 5D, and 5E would allow for all existing private driveways to remain. Concept 5A would have the greatest effect on access management, as it would eliminate all private driveway access points.

PUBLIC TRANSPORTATION

Delaware County Transit service in this segment would be minimally affected by most of the Build concepts. If fixed route service were implemented on this corridor, it is unlikely that transit stops would ever be located directly on U.S. 23 – transit vehicles would turn off and on U.S. 23 to access future transit stops. Concept 5A would have the fewest connections to/from U.S. 23, creating the most circuity for future transit service accessing the areas within Segment 5.

ACCESS TO/FROM U.S. 23 FOR EMERGENCY SERVICES

The Ohio State Highway Patrol has an outpost located on the west side of U.S. 23 between Hull Drive and Cottswold Drive. The patrol outpost has direct driveway access to U.S. 23 with a median opening, allowing for access to/from both directions of U.S. 23. There are no emergency medical providers or local police/fire/EMS stations located along Segment 5. The No-Build condition would not affect access to or from the patrol outpost. If any Build concept is advanced, further coordination with the State Highway Patrol would be needed.

NOT APPLICABLE

No impacts expected to K-12 public schools in this segment.

Table 30: Segment 5 - Community Impacts

		NO-BUILD	CONCEPT 5E	CONCEPT 5D	CONCEPT 5C	CONCEPT 5B	CONCEPT 5A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected	Minimal impacts possible to multi-family complexes along Stratford Road, which could be impacted by U.S. 42 interchange	Minimal impacts possible to multi-family complexes along Stratford Road, which could be impacted by U.S. 42 interchange
	Special Land Uses	No impacts	Minor impacts likely to Stratford Ecological Center for U.S. 23 widening	Minor impacts likely to Stratford Ecological Center for U.S. 23 widening	Moderate impacts likely to Stratford Ecological Center for U.S. 23 widening and potential SR 315 connector road	Minor impacts likely to Stratford Ecological Center for U.S. 23 widening	Moderate impacts likely to Stratford Ecological Center for interchange at SR 315
	Residential Displacements	No impacts	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements
	Commercial Displacements	No impacts	0-10 commercial parcels with displacements	0-10 commercial parcels with displacements	10-30 commercial parcels with displacements	10-30 commercial parcels with displacements	10-30 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected	Moderate noise impacts likely	Moderate noise impacts likely	Moderate noise impacts likely
	Bicycle/Pedestrian Connectivity for East-West Movements	4 signalized crossing locations	3 signalized crossing locations	4 signalized crossing locations	2 grade-separated crossing locations 2 signalized crossing locations	3 grade-separated crossing locations 1 signalized crossing location	4 grade-separated crossing locations
	Vehicular Connectivity for East-West Traffic	2 locations with direct crossing at signal	2 locations with direct crossing at signal	2 locations with direct crossing at signal	2 grade-separated crossings	4 grade-separated crossings 1 location with direct crossing at signal	5 grade-separated crossings
	Circuity/Back-tracking to Public Streets	No impacts	Minimal impacts expected	Left turn restrictions at many intersections	Left turn restrictions at many intersections Removal of Delaware Plaza North intersection	Nearly all left turns to/from U.S. 23 would be indirect movements Removal of Delaware Plaza North & Cottswold Drive intersections	No public street access between SR 315 and U.S. 42 Stratford Road and other local roads used for connectivity
	Private Driveway Access to U.S. 23	No impacts	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	No direct private access points
	Public Transportation	No impacts	Minimal impacts expected	Minimal impacts expected	Minimal impacts expected	Minimal impacts expected	Moderate impacts expected due to limited U.S. 23 access points
	K-12 Public School Access	No K-12 public schools in segment	No impacts to K-12 public schools	No impacts to K-12 public schools	No impacts to K-12 public schools	No impacts to K-12 public schools	No impacts to K-12 public schools
	Access to/from U.S. 23 for Emergency Services	No impacts	Minimal potential impacts on access to/from OSHP outpost	Minimal potential impacts on access to/from OSHP outpost	Minimal potential impacts on access to/from OSHP outpost	Potential impacts on access to/from OSHP outpost	Potential impacts on access to/from OSHP outpost

Infrastructure Impacts

MAINTENANCE OF TRAFFIC (MOT)

The No-Build concept would have no impacts to traffic, as no construction would occur. Minimal MOT effects on U.S. 23 are anticipated with any Build concepts. Off-peak hour lane closures on U.S. 23 may be required for median work and/or widening in all Build concepts. Long-term closures and/or restrictions of side streets may be needed for construction of the new grade separations in Concepts 5A, 5B, 5C, and 5D.

DESIGN STANDARDS

Some locations in this segment have outside shoulder widths that are less than current ODOT Location & Design Manual design criteria. However, it does not appear that the shoulder widths are contributing to crash patterns. Concepts 5C, 5D and Concept 5E are more likely to address these existing substandard outside shoulder widths, as widening of the entire segment would already be necessary. All Build concepts would replace the existing two-way left-turn lane on U.S. 23 with a raised median, which could result in an inside shoulder width that is less than ODOT design criteria for such a facility.

MAJOR UTILITIES

In Segment 5, there are high-voltage transmission lines crossing U.S.23 at Cottswold Drive. Concept 5A and Concept 5B would construct a new grade separation at Cottswold Drive, thus being most likely to impact the high-voltage transmission lines. Further study of potential alignments would be needed to determine any impacts to existing towers or clearances from these lines. The proposed traditional freeway interchange in Concept 5A is also likely to impact the Olentangy River dam located just east of U.S. 23.

NOT APPLICABLE

No impacts expected to railroad facilities in this segment.

Costs

RIGHT-OF-WAY (PARCELS, ACRES, AND COSTS)

Concept 5E is expected to require the least amount of additional right-of-way, while Concept 5D is expected to require slightly more acreage. Concepts 5A, 5B, and 5C are expected to entail larger right-of-way needs, likely requiring over 40 acres of additional right-of-way and possible impacts to over 100 parcels. Because of the larger footprint required for the two traditional freeway interchanges, Concept 5A is expected to have the greatest right-of-way cost – potentially exceeding $100 million. For any Build concept that is advanced, further study of potential alignments would be needed to determine if any impacts could be avoided or lessened.

The widening of U.S. 23 to three lanes in Concepts 5B, 5C, 5D, and 5E is projected to occur largely within existing right-of-way.

USER BENEFITS

Concept 5A is expected to have the greatest user benefits. Concepts 5B and 5C are expected to have slightly lower user benefits, mostly due to increased vehicle delays. Concepts 5D and 5E are expected to have the least user benefits of the Build concepts. Both Concepts 5D and 5E have many more signals than other Build concepts that create delays and many more conflict points that minimize predicted safety benefit in ODOT ECAT analysis. Concept 5A and Concept 5B are each predicted to have well over twice the safety benefit of Concept 5D or Concept 5E.

BENEFIT-COST RATIO

Concepts 5B, 5C, and 5D are expected to have very similar benefit-cost ratios, with estimated values over 1.00. Concept 5A is expected to have a benefit-cost ratio near 1.00. Concept 5E is predicted to have the highest benefit-cost ratio primarily due to its lower cost than other concepts, even though its user-benefits are among the lowest.

PROJECT COSTS (2030)

All Build concepts are expected to exceed $100 million in total costs. Concept 5E is expected to have the least cost, as it does not include any grade separations or new connector roads. Concept 5A is expected to have the highest cost, with three new grade separations plus two traditional interchanges, one of which is adjacent to the Olentangy River. Concepts 5B and 5C are expected to have similar costs – with Concept 5B involving a more expensive interchange at U.S. 42, but Concept 5C involving more widening of U.S. 23 and a connector road interchange at SR 315.

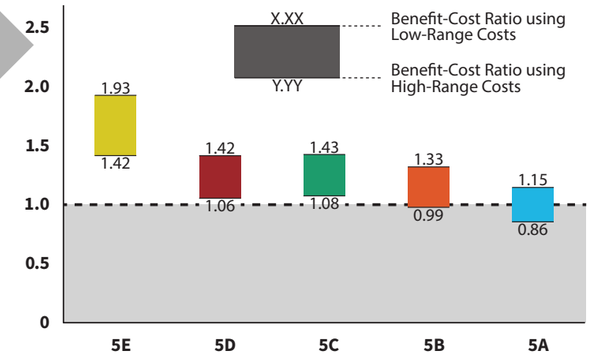


Figure 33: Segment 5 Benefit-Cost Ratios

Table 31: Segment 5 - Infrastructure Impacts & Costs

		NO-BUILD	CONCEPT 5E	CONCEPT 5D	CONCEPT 5C	CONCEPT 5B	CONCEPT 5A
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected
	Design Standards	Some shoulder widths less than current design standards	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23
	Major Utilities	No impacts	Impacts to major utilities unlikely	Impacts to major utilities unlikely	Impacts to major utilities unlikely	Potential impacts to high-voltage lines at Cottswold Drive due to overpass	Likely impacts to Olentangy River dam Potential impacts to high-voltage lines at Cottswold Drive due to overpass
	Railroads	No railroads in segment	No impacts	No impacts	No impacts	No impacts	No impacts
Costs	**Right-of-Way (parcels & acres)**	No impacts	25-100 parcels 10-40 acres	50-100 parcels 20-40 acres	75-150 parcels 40-90 acres	75-175 parcels 40-80 acres	100-200 parcels 60-110 acres
	Right-of-Way Costs (2030)	None	$15 - 30M	$20 - 40M	$45 - 80M	$55 -95M	$70 - 115M
	User Benefit (20-year)	None	$165M	$165M	$245M	$255M	$280M
	Benefit-Cost Ratio	N/A	1.42 - 1.93	1.06 - 1.42	1.08 - 1.43	0.99 - 1.33	0.86 - 1.15
	Projected Costs (2030)	Routine maintenance	$115 - 155M	$160 - 210M	$230 - 305M	$260 - 345M	$335 - 445M

Key Intersection Analysis

Some key intersections have been analyzed in greater detail, as they are among the larger intersections in the corridor. Improvements selected for the key intersections are also likely to impact the selection of concepts for adjacent locations. Matrices for the key intersections for this segment are presented below.

Table 32: Segment 5 - U.S. 42 Intersections

		NO-BUILD	CONCEPT 5E	CONCEPT 5D	CONCEPT 5C	CONCEPT 5B	CONCEPT 5A
Primary Needs	**Safety - Forecasted Crashes**	17 expected annual crashes 9 expected fatal/serious injury crashes over 20 years	14 predicted annual crashes 7 predicted fatal/serious injury crashes over 20 years	7 predicted annual crashes 5 predicted fatal/serious injury crashes over 20 years	6 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years	5 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years	5 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	8 conflicting movements	8 conflicting movements	4 conflicting movements	4 conflicting movements	4 conflicting movements	4 conflicting movements
	Intersection Capacity (all movements)	LOS C 1.0 minutes delay/vehicle	LOS B 0.5 minutes delay/vehicle	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
	Travel Time Reliability on U.S. 23	1 signal for northbound 2 signals for southbound	0 signals for northbound 2 signals for southbound	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
Costs	**Projected Costs (2030)**	Routine maintenance	$30M	$75M	$80M	$125M	$125M

Table 33: Segment 5 - SR 315 Area

		NO-BUILD	CONCEPT 5E	CONCEPT 5D	CONCEPT 5C	CONCEPT 5B	CONCEPT 5A
Primary Needs	**Safety - Forecasted Crashes**	15 expected annual crashes 8 expected fatal/serious/injury crashes over 20 years	12 predicted annual crashes 6 predicted fatal/serious injury crashes over 20 years	15 predicted annual crashes 8 predicted fatal/serious injury crashes over 20 years	5 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years	5 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years	5 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	16 conflicting movements	10 conflicting movements	12 conflicting movements	4 conflicting movements	2 conflicting movements	4 conflicting movements
	Intersection Capacity (all movements)	LOS D 1.0 minutes of delay/vehicle	LOS D 45 seconds of delay/vehicle	LOS D 1.0 minutes of delay/vehicle	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
	Travel Time Reliability on U.S. 23	2 signals	Signal for southbound only	2 signals	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
Costs	**Projected Costs (2030)**	Routine maintenance	$40M	$40M	$80M	$60M	$145M

Community Engagement Results

There were many comments from residents concerned about Concepts 5A, 5B, or 5C increasing traffic volumes on Stratford Road. There were also numerous concerns about these concepts negatively impacting the historic and cultural resources in the SR 315/Stratford Road area. A common suggestion was to shift the proposed SR 315 overpass/underpass away from Stratford Road to limit resource impacts and traffic increases on the southern portion of Stratford Road. If any of these concepts are advanced, further study would evaluate this suggestion and others to determine the optimal configuration for this area.

The City of Delaware indicated support for overpass/underpasses at Hawthorn Boulevard (Concept 5A), Delaware Plaza North (Concept 5B/5C), and Cottswold Drive (Concept 5A/5B) with some intermediate access points provided like Concept 5B/5C. The City of Delaware indicated support for concepts that would retain maximum connectivity to S. Sandusky Street.

Many comments were received regarding how traffic would redistribute with each concept, particularly if/how shopping center traffic would divert onto residential streets.

Conclusions

A combination of improvements from several concepts in Segment 5 should be used as a baseline and starting point for future study.

SR 315

A traditional freeway interchange (Concept 5A) would result in excessive cost and impacts to environmental and cultural resources. An overpass (Concept 5B) would have less impacts and cost, but would hamper connectivity and is not preferred by the public and City of Delaware. The signalized options (Concept 5D and 5E) would generate a low amount of safety and congestion benefits. A connector road interchange (Concept 5C) should be used as a baseline and starting point for further study. Concept 5C would maximize safety and congestion benefits by removing the signal and conflict points, while having far fewer impacts than a traditional freeway interchange. Meeker Road and Stratford Road can be used for the northbound connector road, while a new connector road can be built on the west side of U.S. 23 for the southbound movements. Further study can develop an optimal alignment for the new connector road to minimize impacts to cultural and community resources.

HAWTHORN BOULEVARD

An overpass/underpass (Concept 5A) at Hawthorn Boulevard should be used as a baseline and starting point for further study. An overpass/underpass would maximize safety and congestion benefits while also providing east-west connectivity for vehicles and pedestrians. Other concepts would retain a signal that has minimal improvement to the delays and safety issues, while not necessarily providing full movements and connectivity.

DELAWARE PLAZA NORTH & SOUTH AND HULL DRIVE

Between Hawthorn Boulevard and Cottswold Drive, a combination of right-in/right-out driveways and overpasses/underpasses (Concept 5B) should be used as a baseline and starting point for further study. These improvements, in conjunction with linking Delaware Plaza North drive and Cottswold Drive to Stratford Road, would maximize congestion and safety benefits while maintaining or improving east-west connectivity. Concept 5A would have no direct access to/from U.S. 23 in this area, which is not deemed desirable for local businesses, and would increase traffic volume on Stratford Road. Concepts 5D and 5E would retain most of the signals in this section, thus providing much less safety and congestion benefits.

U.S. 42

At U.S. 42, a connector road interchange (Concept 5C, 5D) should be used as a baseline and starting point for further study. A connector road interchange is expected to provide the best balance of safety/congestion benefits while limiting impacts to adjacent areas. A connector road interchange is also expected to provide a greater opportunity to maintain the link with S. Sandusky Street, which is a key priority for the City of Delaware.

In summary, the baseline and starting point concept that should be advanced for further study includes:

- A connector road interchange at SR 315
- An overpass/underpass at Hawthorn Boulevard
- Conversion of Delaware Plaza South/Penny Way to unsignalized right-in/right-out operation
- An overpass/underpass at Delaware Plaza North, with extension to Stratford Road
- Conversion of Hull Drive to right-in/right-out operation
- An overpass/underpass at Cottswold Drive
- A connector road interchange at U.S. 42

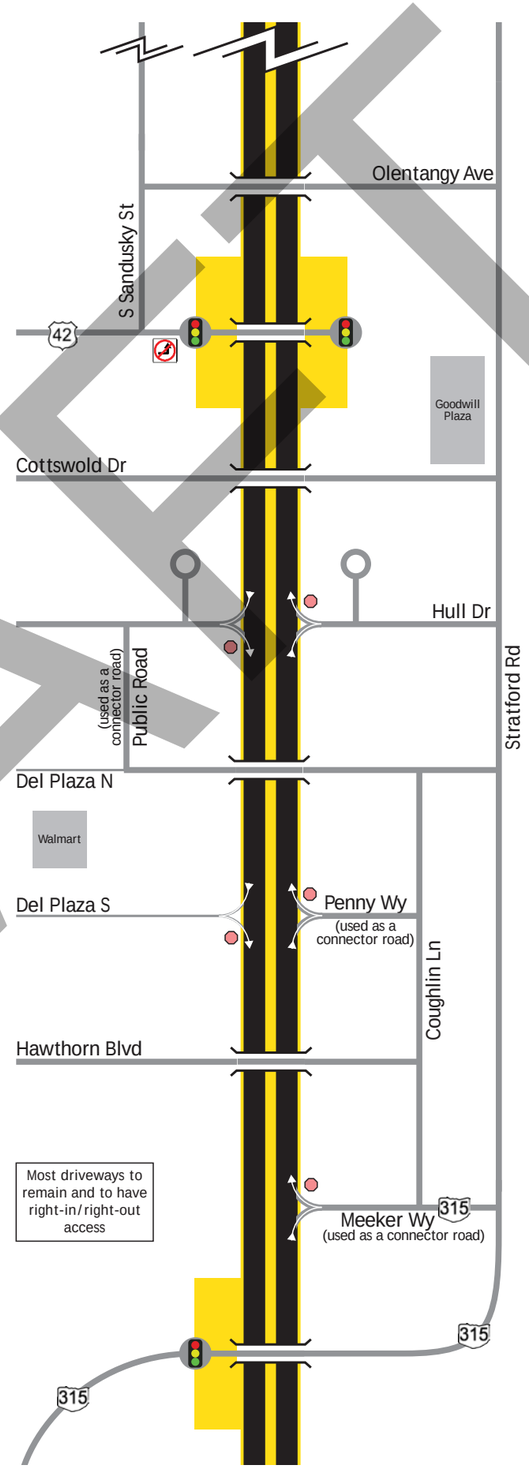


Figure 34: Segment 5 High-Performing Concept

SEGMENT 6

Segment Overview

GENERAL/LAND USES

Segment 6 extends from Pennsylvania Avenue to Coover Road. This section includes northern portions of the City of Delaware, as well as unincorporated portions of Delaware Township and Troy Township. The southern portion of Segment 6 serves many commercial land uses, whereas the northern portion of Segment 6 is more rural and agricultural in nature. A large new development is being constructed west of U.S. 23, along with a new arterial – Merrick Parkway – that will intersect U.S. 23 at the Panhandle Road signal. Buckeye Valley Local School District has a large high school middle school, bus garage, and an administrative office located on Coover Road just west of U.S. 23. The Delaware County Fairgrounds is located on the west side of U.S. 23 north of Pennsylvania Avenue. Segment 6, along with Segment 7, has the highest truck volumes in the corridor.

U.S. 23 ROADWAY

At Pennsylvania Avenue, U.S. 23 transitions from a freeway to a five-lane roadway with center two-way left turn lane. South of Hills-Miller Road, the alignment closely follows the west bank of the Olentangy River and has multiple closely-spaced commercial access points and other driveways. North of Hills-Miller Road, the horizontal alignment is more tangent and access points are less frequent.

OTHER ROADWAYS

Several collector roads intersect U.S. 23 in Segment 6. A partial interchange exists at Pennsylvania Avenue, with a traffic signal and connector road providing full movements at this location. Panhandle Road provides a bridge over the Olentangy River, linking to areas east of the river. Hills-Miller Road provides access to areas of far north Delaware west of U.S. 23, while Coover Road links to Buckeye Valley School District buildings west of U.S. 23. A signal exists at a private commercial driveway that serves fast-food restaurants, the Delaware County Board of Elections, and other uses.

Merrick Parkway is an arterial that is currently being extended east to U.S. 23 in conjunction with the Addison Farms residential development. Merrick Parkway will intersect U.S. 23 directly across from Panhandle Road. Merrick Parkway is planned to have a grade-separated crossing of the CSX railroad, creating a link across the northwest portion of City of Delaware.

City of Delaware and Delaware County planning documents show two potential new arterial connections east of U.S. 23 in this segment. One of these connections would be an eastward extension of Pennsylvania Avenue across the Olentangy River. The other connection would be either across from Hills-Miller Road or at Panhandle Road. It should be noted that no funding has been obtained or National Environmental Policy Act (NEPA) studies have been performed for these potential future roadways.

Figure 35: Segment 6 Study Area

Proposed Concepts

Four Build condition concepts have been developed for Segment 6, in addition to the No-Build condition. Consistent with other segments, Concept A is most freeway-like, while Concept D is most like the existing signalized corridor. The Segment 6 concepts are shown on **Figure 36**.

CONCEPT 6A

Concept 6A would remove all signals on U.S. 23. Access on U.S. 23 would be limited to four interchanges. At Pennsylvania Avenue, the partial interchange would be upgraded to a traditional freeway interchange, removing the existing signal. There would also be a traditional interchange at Panhandle Road/Merrick Parkway, with Panhandle Road serving as the location for the future eastern connection across the Olentangy River. Connector road interchanges would be constructed at Hills-Miller Road and Coover Road. N. Sandusky Street would be extended north to provide access to properties along the west side of U.S. 23 south of Pinecrest Drive. A system of frontage/backage roads would be constructed north of Merrick Parkway/Panhandle Road to provide access to all properties that currently have direct access to U.S. 23. The existing center two-way left-turn lane would be replaced with a raised median, eliminating all left turns to or from U.S. 23 throughout the segment.

CONCEPT 6B

Concept 6B would also remove all signals on U.S. 23. Concept 6B would be the same as Concept 6A in the Pennsylvania Avenue vicinity, with a traditional freeway interchange and extension of N. Sandusky Street as a frontage road. A partial connector road interchange would be provided at Panhandle Road/Merrick Parkway, with connections only for southbound U.S. 23 due to the close proximity of the Olentangy River. Similar to Concept 6A, a connector road interchange would be constructed at Hills-Miller Road, with frontage/backage roads providing access to properties south of Hills-Miller Road that currently have direct access to U.S. 23. The connector road interchange at Hills-Miller Road would allow for the planned eastern connection across the Olentangy River. A connector road interchange would be built at Coover Road. North of Hills-Miller Road, most driveways will remain and be converted to right-in/right-out access only. The existing center two-way left-turn lane would be replaced with a raised median, eliminating all left turns to or from U.S. 23 throughout the segment.

CONCEPT 6C

Concept 6C would eliminate all but one signal in this segment. At Pennsylvania Avenue, a northbound exit ramp would be built, allowing for the removal of the existing signal. Pinecrest Drive, Merrick Parkway, Panhandle Road, and the retail plaza signal intersections would all be converted to right-in/right-out access only. Vehicles wishing to make left turns would use the Hills-Miller Road and Pennsylvania Avenue interchanges to make U-turns, allowing for indirect left turn movements. Similar to Concept 6B, a connector road interchange would be constructed at Hills-Miller Road with allowances for a future eastern connection across the Olentangy River. Turn lanes would be added at the Coover Road signal to improve capacity. South of Hills-Miller Road, most private driveways will maintain direct access to U.S. 23, however they will be limited to right-in/right-out access only, with a raised median replacing the existing center two-way left-turn lane. North of Hills-Miller Road, most driveways will remain unchanged, with the existing center two-way left turn lane providing left turn access to the existing driveways.

CONCEPT 6D

Concept 6D is the only Build concept without any new grade separations. At Pennsylvania Avenue, this concept would be identical to Concept 6C, with a northbound exit ramp allowing the signal to be eliminated. An RCUT intersection would be built at the Panhandle Road/Merrick Parkway intersection and at the Hills-Miller Road intersection. Widening for an additional through lane in each direction would occur in order to ensure the signals can operate effectively. The signal at the retail plaza would be removed and right-in/right-out access would be maintained. Similar to Concept 6C, turn lane additions would be constructed at the Coover Road signal. Private driveway access to U.S. 23 will be the same as Concept 6C, with driveways south of Hills-Miller Road being limited to right-in/right-out access with a center raised median eliminating all left turns. The U-turns at the RCUTs will allow for indirect left turns in the southern part of the segment. North of Hills-Miller Road, most driveways will remain unchanged, with the existing center two-way left turn lane providing left turn access to the existing driveways.

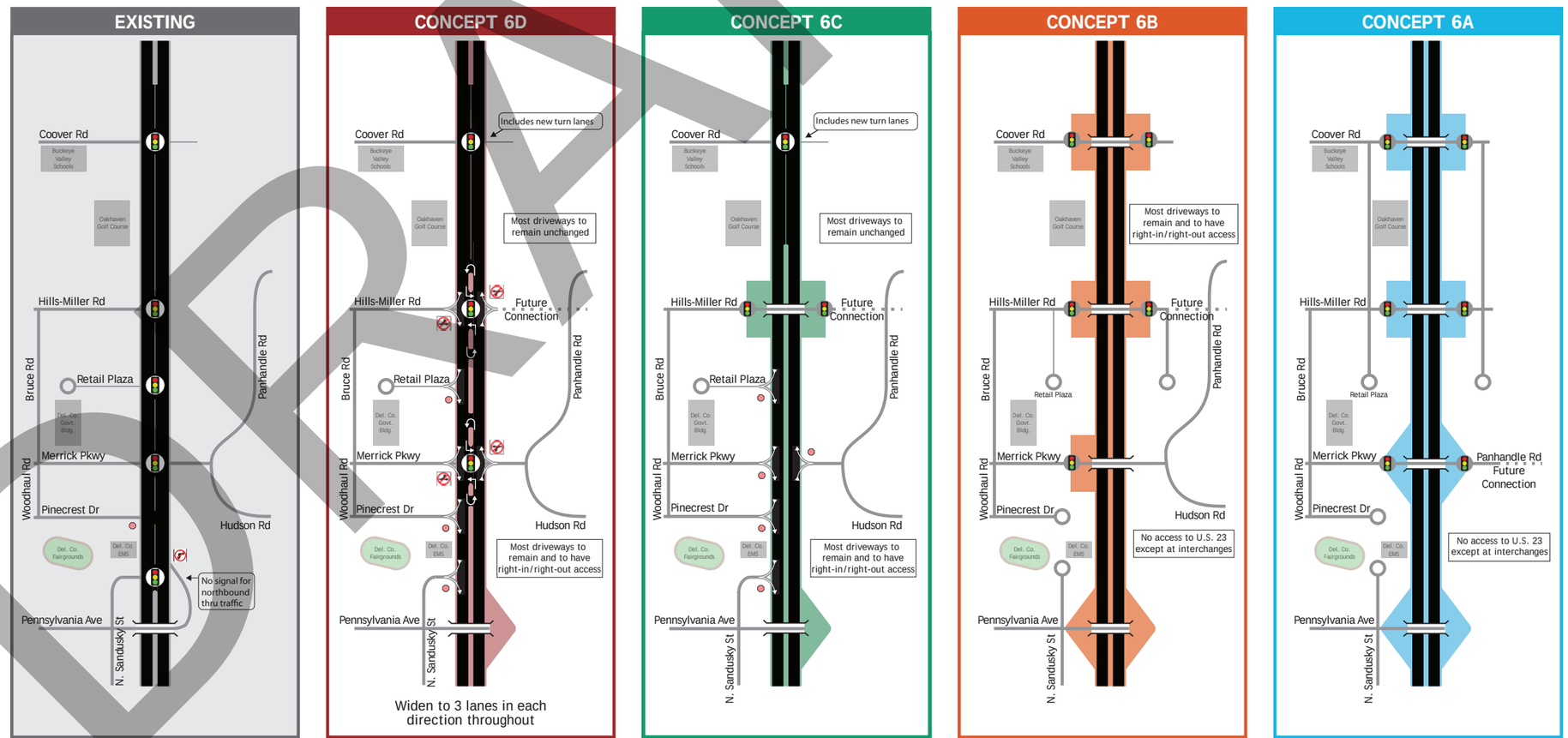


Figure 36: Segment 6 Concepts

**Includes signals at U-turn locations*

Primary Needs

U.S. 23 THROUGH TRAVEL TIMES THROUGH SEGMENT

With no improvements, it is anticipated that it will take vehicles 10-18 minutes to travel through Segment 6 during peak hours in 2050. The Panhandle Road/Merrick Parkway and Coover Road intersections are predicted to operate at well above capacity, leading to long delays. All Build concepts are expected to reduce delays by over 50%. Concept 6A and Concept 6B are expected to have the greatest travel time reductions, while Concept 6D would result in the least reduction in travel times.

TRAVEL TIME RELIABILITY – NUMBER OF SIGNALS ON U.S. 23

There are five signals in the No-Build condition in Segment 6, with the Sandusky Street signal allowing for free-flow northbound through movements. Concepts 6A and 6B would remove all signals, resulting in free-flow operation for U.S. 23 through traffic in the segment and thus the greatest travel time reliability. Concept 6C would have one remaining signal at Coover Road. Concept 6D would result in five signals for through travelers in each direction of U.S. 23 – two signals at each of the RCUT locations plus a signal at Coover Road.

TRAVEL TIME RELIABILITY – INTERSECTIONS AT LOS E OR WORSE

Four of the five existing signals in Segment 6 are expected to operate at LOS E or worse by 2050. The N. Sandusky Street/ Pennsylvania Avenue intersection is expected to operate at LOS D in the existing condition in 2050. Concepts 6A and 6B would remove all signals, resulting in free-flow operation for U.S. 23 through traffic. Concept 6D would improve operations at the signals compared to No-Build condition, but the Hills-Miller Road intersection is predicted to operate at LOS E.

SAFETY – FORECASTED CRASHES

Concept 6D is anticipated to have a similar number of annual crashes compared to No-Build, while reducing fatal/ serious injury crashes by over 25%. Concepts 6A and 6B are anticipated to reduce annual crashes and fatal/serious injury crashes by over 50%. Concepts 6A and 6B offer the least number of conflict points and no signals, which helps to contribute toward the greater predicted safety benefits in the ODOT ECAT calculations.

SAFETY – CONFLICTING MOVEMENTS FOR U.S. 23 THROUGH TRAFFIC

U.S. 23 through traffic travelling in Segment 6 encounters 55 conflicting movements today in the No-Build condition. Concepts 6A and 6B reduce the number of conflicting movements by over 70%, offering the greatest safety benefit.

Secondary Need

CONSISTENCY WITH LOCAL PLANS

The City of Delaware has prioritized making Merrick Parkway a key east-west connection across the northern part of the city, including a grade separated railroad crossing. Merrick Parkway is currently being built as part of a development west of U.S. 23 and will intersect U.S. 23 directly across from Panhandle Road. Because Merrick Parkway is intended to be a key route in northwest Delaware, the City wants Merrick Parkway to have full access to U.S. 23. Concept 6A would provide full access to/from U.S. 23 at Merrick Parkway, making it most consistent with local plans. Concept 6D would provide full access, but via indirect left turns at the proposed RCUT signal. Concepts 6B and 6C would be least consistent with local goals at Merrick Parkway, as Merrick Parkway would only have access to/from the southbound lanes of U.S. 23.

The City of Delaware Thoroughfare Plan shows a potential future eastern extension of Pennsylvania Avenue going across U.S. 23 and over the Olentangy River toward U.S. 42. Concepts 6A and 6B would be more challenging to accommodate a future Pennsylvania Avenue extension due to the proximity of new southbound ramps near the existing Sandusky Street intersection. Concepts 6C and 6D would more easily be able to accommodate a Pennsylvania Avenue extension, as only northbound ramps would be constructed.

The City of Delaware and Delaware County thoroughfare plans show a potential new arterial connector east of U.S. 23 in the vicinity of Panhandle Road or Hills-Miller Road. Each of the Build concepts could accommodate a new eastern connection. However, Concept 6C would only allow for a connection to/from the northbound lanes of U.S 23, thus making it least consistent with City/County goals for this connection. Concept 6A would be compatible if the new connector was located at Panhandle Road, while Concepts 6B, 6C, and 6D would be compatible if the new connector was located at Hills-Miller Road.

Table 34: Segment 6 - Primary & Secondary Needs

		NO-BUILD	CONCEPT 6D	CONCEPT 6C	CONCEPT 6B	CONCEPT 6A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	10-18 minutes	5-7 minutes	4-5 minutes	3-4 minutes	3 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	5 signals (4 NB, 5 SB)	5 signals	1 signal	No signals (free-flow)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	4 signals	1 signal	0 signals	0 signals	0 signals
	Safety - Forecasted Crashes	50 expected annual crashes 33 expected fatal/serious injury crashes over 20 years	23 predicted annual crashes 12 predicted fatal/serious injury crashes over 20 years	34 predicted annual crashes 18 predicted fatal/serious injury crashes over 20 years	25 predicted annual crashes 14 predicted fatal/serious injury crashes over 20 years	23 predicted annual crashes 12 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	55 conflicting movements	48 conflicting movements	32 conflicting movements	14 conflicting movements	16 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	Can most easily accommodate a potential future Pennsylvania Avenue extension Full movements at U.S. 23 for new Merrick Parkway arterial Future eastern connection would be at Hills-Miller Road	Can most easily accommodate a potential future Pennsylvania Avenue extension New Merrick Parkway arterial would only have right-in/right-out movements Future eastern connection would be at Hills-Miller Road	More challenging to accommodate a potential future Pennsylvania Avenue extension Restricted movements to/from northbound U.S. 23 for new Merrick Parkway arterial Future eastern connection would be at Hills-Miller Road	More challenging to accommodate a potential future Pennsylvania Avenue extension Full movements at U.S. 23 for new Merrick Parkway arterial Future eastern connection would be at Panhandle Road

Natural & Cultural Resource Impacts

PARK & RECREATIONAL RESOURCES

All Build concepts would likely have minor impacts at Mingo Park due to the addition of a northbound exit ramp at Pennsylvania Avenue. All Build concepts will likely have minor impacts to Riverview Park, south of Coover Road – with Concept 6C and 6D impacts likely due to U.S. 23 widening. Concept 6A will have additional impacts to Riverview Park as the direct access to U.S. 23 will be replaced with access to the frontage road only. Concept 6B will have additional impact to Riverview Park due to the access at U.S. 23 converted to only right-in/right-out operation.

HISTORIC SITES

Concepts 6A and 6B would likely have moderate impacts to properties in the Historic Northwest District due to construction of new southbound ramps at Pennsylvania Avenue. Concept 6A would also likely have minor impact to 175 Hudson Road property due to interchange ramps at Merrick Parkway/Panhandle Road. Concepts 6C and 6D would likely have minimal potential impact to Historic Northwest District.

SCENIC RIVER (OLENTANGY RIVER)

All Build concepts would likely have moderate impacts to the scenic river near Pennsylvania Avenue due to the new northbound interchange ramps being constructed adjacent to the Olentangy River. Concept 6A is likely to have substantial scenic river impacts near Panhandle Road due to the likelihood of multiple new crossings for interchange ramps. Concept 6D would likely have substantial scenic river impact near Panhandle Road due to U.S. 23 widening for additional through and left turn lanes, as the existing roadway is close to the Olentangy River channel. Concept 6B would have possible impact near Panhandle Road due to construction of a grade separation on US 23.

STREAMS & WATERWAYS

All Build concepts are expected to have minor impacts to streams and waterways due to interchange concepts and/or U.S. 23 widening. There are multiple stream/waterway crossings of U.S. 23 in this segment.

ENDANGERED SPECIES HABITAT

All Build concepts are likely to have substantial impact to Suitable Wooded Habitat (SWH) for Indiana Bat and Northern Long-eared Bat near Pennsylvania Avenue due to the construction of new northbound interchange ramps. Concept 6A will likely have additional substantial impact to Suitable Wooded Habitat (SWH) for Indiana Bat and Northern Long-eared Bat near Panhandle Road due to likelihood of multiple new bridge crossings for interchange ramps.

REGULATED MATERIALS

All Build concepts could potentially have minor impacts to regulated materials sites due to interchange concepts and/or U.S. 23 widening.

FARMLAND

Concept 6A is likely to have a major impact to farmland due to interchange ramps at Merrick Parkway/Panhandle Road, at Hills-Miller Road, and at Coover Road. Concept 6B is likely to have minor farmland impact due to interchange ramps at Coover Road. Concept 6C and Concept 6D are not expected to impact farmland.

Table 35: Segment 6 - Natural & Cultural Resource Impacts

		NO-BUILD	CONCEPT 6D	CONCEPT 6C	CONCEPT 6B	CONCEPT 6A
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	Minor impacts likely at Mingo Park due to new northbound ramp to Pennsylvania Avenue Minor impact likely to Riverview Park due to U.S. 23 widening	Minor impact likely at Mingo Park due to northbound ramp addition Minor impact likely to Riverview Park due to U.S. 23 widening	Minor impact likely at Mingo Park due to northbound ramp addition Minor impact likely to Riverview Park due to U.S. 23 widening. Driveway will be converted to right-in/right-out operation	Minor impact likely at Mingo Park due to northbound ramp addition Access to Riverview Park will be from frontage road only
	Historic Sites	No impacts	Minimal potential impact to Historic Northwest District	Minimal potential impact to Historic Northwest District	Moderate impact likely to properties in Historic Northwest District due to southbound ramps	Moderate Impact likely to properties in Historic Northwest District due to southbound ramps Minor impact likely to 175 Hudson Road property due to interchange ramps at Merrick Parkway/Panhandle Road
	Scenic River (Olentangy River)	No impacts	Substantial impact likely near Panhandle Road due to U.S. 23 widening Moderate impact likely near Pennsylvania Avenue due to new northbound interchange ramps	Moderate impact likely near Pennsylvania Avenue due to new northbound interchange ramps	Possible impact near Panhandle Road due to overpass/underpass Moderate impact likely near Pennsylvania Avenue due to new northbound interchange ramps	Substantial impact likely near Panhandle Road due to likelihood of multiple new bridge crossings for interchange ramps Moderate impact likely near Pennsylvania Avenue due to new northbound interchange ramps
	Streams & Waterways	No impacts	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Substantial impacts likely to Indiana and Northern Long-eared Bat habitat at Pennsylvania Avenue interchange	Substantial impacts likely to Indiana and Northern Long-eared Bat habitat at Pennsylvania Avenue interchange	Substantial impacts likely to Indiana and Northern Long-eared Bat habitat at Pennsylvania Avenue interchange	Substantial impacts likely to Indiana and Northern Long-eared Bat habitat at Pennsylvania Avenue interchange and Merrick Parkway/Panhandle Road interchange
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No impacts	No farmland impacts expected	No farmland impacts expected	Minor impact to farmland likely near Coover Road	Major impact to farmland likely in vicinity of Merrick Parkway/Panhandle Road interchange

Community Impacts

ENVIRONMENTAL JUSTICE AND OTHER TRADITIONALLY UNDERREPRESENTED POPULATIONS

No specific Environmental Justice or traditionally underrepresented populations have been identified at this time. Concept 6A will likely have the greatest displacements in Shroyer Homes manufactured home community due to the Panhandle Road interchange and revised access system. Concepts 6B and 6D will have possible manufactured home displacements due to revised access system and U.S. 23 widening. Concept 6C has the least potential for displacements in the manufactured home park. If a Build concept is advanced, further study would be conducted to identify and minimize impacts to any Environmental Justice and other traditionally underrepresented populations.

SPECIAL LAND USES

The Delaware County Fairgrounds is located on the west side of U.S. 23 just north of Pennsylvania Avenue. The fairgrounds complex is used year-round for various special events, in addition to the County Fair each September. The Fairgrounds has a full access driveway onto U.S. 23, as well as access points on Pennsylvania Avenue. Concepts 6A and 6B would remove the direct access point on U.S. 23, replacing it with access to a frontage road. Concepts 6C and 6D would convert the Fairgrounds access point to right-in/right-out only. Concept 6D would entail widening of U.S. 23 across the frontage of the Fairgrounds, which would likely have minimal or no impact on the Fairgrounds.

RESIDENTIAL & COMMERCIAL DISPLACEMENTS

All Build concepts have the potential to require residential and/or commercial displacements. Concept 6A has the highest potential for displacements due to the interchanges and service roads to be constructed. Concepts 6C and 6D are expected to have similar levels of potential displacements, with less than 10 residential and/or commercial properties each. If a Build concept is advanced, further study will evaluate various configurations to minimize potential displacements and other impacts.

AIR QUALITY

All Build concepts will likely have similar and minor air quality impacts. None of the Build concepts are expected to substantially increase vehicle-miles traveled in the segment.

NOISE SENSITIVE AREAS

No noise analysis on Build concepts has been performed to date. Concepts 6A and 6B will likely have a moderate impact due to interchange ramps at Pennsylvania Avenue, interchange ramps at Merrick Parkway/Panhandle Road, interchange ramps at Hills-Miller Road and interchange ramps at Coover Road. Concept 6C will likely have a minor impact near Pennsylvania Avenue due to new northbound interchange ramps and due to Hills-Miller Road interchange ramps. Concept 6D will likely have a minor impact near Pennsylvania Avenue due to new northbound interchange ramps. The widening of U.S. 23 for additional through lanes in Concept 6D could also have impacts throughout the segment.

Table 36: Segment 6 - Community Impacts

		NO-BUILD	CONCEPT 6D	CONCEPT 6C	CONCEPT 6B	CONCEPT 6A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	Possible displacements in manufactured home park due to U.S. 23 widening	Least potential for displacements in manufactured home park	Possible manufactured home displacements due to revised access system	Greatest displacements likely in manufactured home park due to Panhandle Road interchange and revised access system
	Special Land Uses	No impacts	Minor impact likely to Delaware County Fairgrounds due to relocation of U.S. 23 access point to frontage road	Minor impact likely to Delaware County Fairgrounds due to relocation of U.S. 23 access point to frontage road	Minor impact likely to Delaware County Fairgrounds due to conversion of U.S. 23 access point to right-in/right-out only	Minor impact likely to Delaware County Fairgrounds due to adjacent U.S. 23 widening and conversion of access point to right-in/right-out only
	Residential Displacements	No impacts	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements
	Commercial Displacements	No impacts	0-10 commercial parcels with displacements	0-10 commercial parcels with displacements	10-30 commercial parcels with displacements	10-40 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor noise impacts likely	Minor noise impacts likely	Moderate noise impacts likely	Moderate noise impacts likely
	Bicycle/Pedestrian Connectivity for East-West Movements	No bicycle/pedestrian facilities	1 signalized crossing location	2 grade-separated crossings 1 signalized crossing location	4 grade-separated crossings	4 grade-separated crossings
	Vehicular Connectivity for East-West Traffic	Direct signalized east-west connection at Merrick Pkwy./Panhandle Rd.	No direct east-west connection at Merrick Pkwy./Panhandle Rd.	No direct east-west connection at Merrick Pkwy./Panhandle Rd.	Grade-separated east-west connection at Merrick Pkwy./Panhandle Rd.	Grade-separated east-west connection at Merrick Pkwy./Panhandle Rd.
	Circuity/Back-tracking to Public Streets	Full access at all public street intersections	Indirect left turns onto U.S. 23 from public streets south of Hills-Miller Road No change to public street access north of Hills-Miller Road	Public streets converted to right-in/right-out access south of Hills-Miller Road No change to public street access north of Hills-Miller Road	Direct access to U.S. 23 only at interchanges south of Hills-Miller Road Public streets converted to right-in/right-out access north of Hills-Miller Road	Direct access to U.S. 23 only at interchanges
	Private Driveway Access to U.S. 23	No impacts	South of Hills-Miller Road: Most existing driveways would remain. All private driveways would be right-in/right-out only North of Hills-Miller Road: No change in access for private driveways	South of Hills-Miller Road: Most existing driveways would remain All private driveways would be right-in/right-out only North of Hills-Miller Road: No change in access for private driveways	South of Hills-Miller Road: No direct private access points. All access via frontage/backage roads North of Hills-Miller Road: Most existing driveways would remain. All private driveways would be right-in/right-out only	No direct private access points. All access via frontage/backage roads
	Public Transportation	No impacts	No impacts to public transportation expected	No impacts to public transportation expected	No impacts to public transportation expected	No impacts to public transportation expected
	K-12 Public School Access	No impacts	Existing school bus stops on U.S. 23 within area of widening would have to be relocated	Minimal impacts to K-12 public school access	Grade-separation at Coover Road could improve safety for Buckeye Valley students School bus stops on U.S. 23 south of Hills-Miller Road would have to be relocated	Grade-separation at Coover Road could improve safety for Buckeye Valley students School bus stops on U.S. 23 would have to be relocated
	Access to/from U.S. 23 for Emergency Services	No impacts	County EMS Station 1 would have right-in/right-out only access	County EMS Station 1 would have right-in/right-out only access	County EMS Station 1 would access frontage road instead of U.S. 23	County EMS Station 1 would access frontage road instead of U.S. 23

BICYCLE/PEDESTRIAN CONNECTIVITY TO EAST-WEST MOVEMENTS

There are currently no marked pedestrian crossings of U.S. 23 or signals with pedestrian indications in this segment. Concepts 6A and 6B would create a new grade-separated crossing at Coover Road, which could provide bicycle/pedestrian access from the Buckeye Valley schools across U.S. 23. However, there are currently limited homes or destinations on the east side of U.S. 23 for pedestrian demand to occur.

Concepts 6A, 6B, and 6C would provide a grade-separation at Hills-Miller Road, Concepts 6A and 6B would provide a grade-separation at Merrick Parkway/Panhandle Road, and all Build concepts would provide a grade-separation at Pennsylvania Avenue. Each of these grade separations could be designed to accommodate bicycle/pedestrian movements, although there is no bicycle/pedestrian infrastructure on the east side of U.S. 23. The Hills-Miller or Merrick Parkway/Panhandle Road grade separations could help connect the Shroyer Homes manufactured home community. Otherwise, the demand for pedestrian/bicycle connectivity is likely limited.

VEHICULAR CONNECTIVITY FOR EAST-WEST VEHICULAR TRAFFIC

There are no existing direct east-west public street connections across U.S. 23 in Segment 6. Once Merrick Parkway is completed by developers, an east-west connection will occur at Panhandle Road. Concepts 6A and 6B would maintain this future direct east-west connection, while Concept 6C and 6D would replace the direct connection with indirect through movements. Concepts 6A, 6B, and 6C would provide a direct east-west connection at Hills-Miller Road, although there is currently limited development on the east side of U.S. 23 that would utilize such a connection. An east-west connection at Coover Road is possible with any concept, if development occurred east of U.S. 23.

CIRCUITY/BACKTRACKING TO PUBLIC STREETS

All Build concepts would affect the circulation patterns in the area. The frontage/backage roads in Concept 6A would minimize the amount of circuity to/from smaller public streets (e.g. Clear Run Road, Stoneridge Drive). Concept 6B would result in much greater circulation impacts from these public streets. Both Concepts 6A and 6B would eliminate the Pinecrest Drive intersection, while Concepts 6C and 6D would convert it to right-in/right-out only operation. Concept 6C would likely result in the greatest disruption in circulation to/from public streets, with left turn prohibitions at Merrick Parkway, Panhandle Road, and Pinecrest Drive. Unlike Concept 6D, there would be no U-turn locations, forcing drivers to divert to Pennsylvania Avenue or Hills-Miller Road to make indirect left turn movements.

PRIVATE DRIVEWAY ACCESS TO U.S. 23

Concept 6A would remove all direct private access points from Segment 6, making all private access via frontage/backage roads. Concept 6B would remove all private access points south of Hills-Miller Road, but would allow existing access points to remain as right-in/right-out access north of Hills-Miller Road. In Concepts 6C and 6D, almost all private driveway accesses would remain, although access points south of Hills-Miller Road would be right-in/right-out only.

PUBLIC TRANSPORTATION

Delaware County Transit service in this segment would be minimally affected by any of the concepts. If fixed route service was implemented on this part of the corridor, it is unlikely that transit stops would ever be located directly on U.S. 23 – transit vehicles would turn off and on U.S. 23 to access future transit stops.

K-12 PUBLIC SCHOOL ACCESS

Several K-12 public schools, including Buckeye Valley High School and Buckeye Valley Middle School are located on Coover Road about ½ mile west of U.S. 23. Concepts 6C and 6D would have the fewest impacts to circulation of vehicles and buses accessing these schools, as a signal would remain at Coover Road. Concept 6A and 6B would require school traffic to use a new connector road interchange to access the schools if coming from U.S. 23. Feedback from Buckeye Valley Local Schools during public engagement indicated that the existing signal is perceived as a safety concern for students driving to/from school and that the grade separation in Concepts 6A and 6B would be beneficial. Further coordination with Buckeye Valley Local Schools will occur as any concepts are advanced into further project development.

There are existing Delaware City Schools bus stops located on U.S. 23. Concept 6D would widen U.S. 23 to three lanes in each direction, which would make these locations no longer legal for school bus stops per state law. Concept 6A would convert this segment into a fully limited-access facility, which would likely eliminate the bus stops. But the construction of frontage/backage roads may allow for a safer alternative stop locations than the current stops on U.S. 23. Further coordination with Delaware City Schools will occur as any concepts are advanced into further project development.

ACCESS TO/FROM U.S. 23 FOR EMERGENCY SERVICES

The only emergency service located within Segment 6 is the Delaware County EMS Station 1, located on U.S. 23 just north of Sandusky Street. Concepts 6A and 6B would relocate the EMS station access onto a frontage road. Concepts 6C and 6D would have a raised median in front of this station, which could limit access to right-in/right-out only. If any concepts are advanced into further development, refinements to the concepts could be considered to minimize impacts to emergency service access, including a traversable median break to allow for left turns by first responder vehicles.

A Tri-Township fire station is located on Coover Road about ½ mile west of U.S. 23. All Build concepts would retain full access at Coover Road, either via an improved intersection or an interchange.

Infrastructure Impacts

MAINTENANCE OF TRAFFIC (MOT)

The No-Build concept would have no impacts to traffic, as no construction would occur. Minimal MOT effects to U.S. 23 are anticipated with any Build concepts. Off-peak hour lane closures on U.S. 23 may be required for the widening in Concept 6D. Long-term closures and/or restrictions of side streets may be needed for construction of the new grade separations in Concepts 6A, 6B, or 6C.

DESIGN STANDARDS

Many locations in this segment have outside shoulder widths that are less than current ODOT Location & Design Manual design criteria. However, it does not appear that the shoulder widths are contributing to crash patterns. All Build concepts would replace some or all of the existing two-way left-turn lane on U.S. 23 with a raised median. In Concepts 6A, 6B, and 6C, the raised median could result in an inside shoulder width that is less than ODOT design criteria for such a facility, unless U.S. 23 were widened for additional pavement width. Concept 3D is less likely to have substandard shoulder widths, as a wider median would be required in many areas due to the need for double left turn lanes. If any Build concept is advanced, the ODOT Performance-Based Practical Design policy would be used to assess the need to widen for larger shoulder widths.

MAJOR UTILITIES

There are no known major utilities located within Segment 6. All Build concepts would involve impacts to various overhead and underground utilities located within the right-of-way.

RAILROADS

A bridge carrying a Norfolk-Southern railroad line over U.S. 23 exists at the northern end of Segment 6. None of the proposed concepts are anticipated to impact this bridge or any other railroad facility.

Costs

RIGHT-OF-WAY (PARCELS, ACRES, AND COSTS)

Concepts 6C and 6D are expected to require the least amount of right-of-way. Concepts 6A and 6B are expected to require much larger right-of-way footprints, largely attributed to the additional interchanges and frontage/backage roads. Concept 6A is expected to have the largest right-of-way impact because of the frontage roads north of Hills-Miller Road and the traditional freeway interchange at Merrick Parkway/Panhandle Road.

USER BENEFITS

Concepts 6A and 6B are expected to have the greatest user benefits, with delays for U.S. 23 through traffic eliminated and the greatest predicted crash reduction due to many fewer conflicting movements. Concept 6C is expected to have slightly lower user benefits than 6A and 6B, primarily due to the Coover Road signal. Concept 6D is expected to have the least user benefits of Build concepts due to the delays and expected crashes associated with the multiple signals.

BENEFIT-COST RATIO

All Build concepts are anticipated to have a benefit-cost ratio greater than 1.0, with projected user benefits exceeding projected costs. Concepts 6C and 6D are expected to have the highest benefit-cost ratios, with benefits more than quadruple the costs. Concept 6A and 6B have somewhat lower benefit-cost ratios, with Concept 6A just over 1.00.

PROJECT COSTS (2030)

Concepts 6C and 6D have similar projected costs at approximately $100 million. Concept 6B is expected to have nearly triple the cost, due to the expense of additional interchanges and frontage/backage roads. Concept 6A would have the highest cost, at over $400 million, as the traditional freeway interchange at Merrick Parkway/Panhandle Road and the lengthy frontage/backage roads north of Hills-Miller Road would be quite expensive to construct.

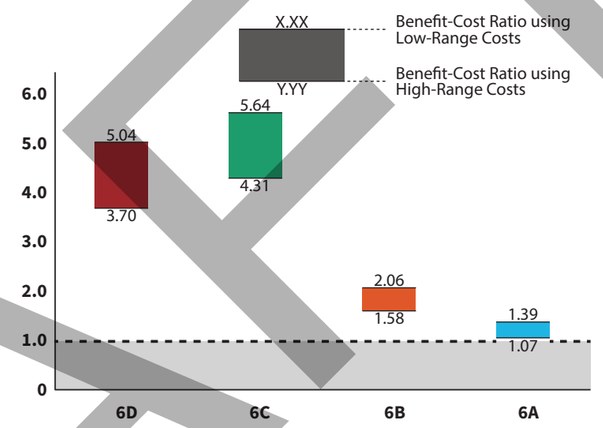


Figure 37: Segment 6 Benefit-Cost Ratios

Table 37: Segment 6 - Infrastructure Impacts & Costs

		NO-BUILD	CONCEPT 6D	CONCEPT 6C	CONCEPT 6B	CONCEPT 6A
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected
	Design Standards	No impacts	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23
	Major Utilities	No impacts	No impacts to major utilities expected	No impacts to major utilities expected	No impacts to major utilities expected	No impacts to major utilities expected
	Railroads	No impacts	No impacts to railroads expected	No impacts to railroads expected	No impacts to railroads expected	No impacts to railroads expected
Costs	**Right-of-Way (parcels & acres)**	No impacts	25-100 parcels 10-30 acres	50-100 parcels 30-60 acres	100-200 parcels 80-150 acres	100-200 parcels 140-250 acres
	Right-of-Way Costs (2030)	None	$15 - 25M	$10 - 20M	$40 - 70M	$50 - 90M
	User Benefit (20-year)	None	$280M	$370M	$400M	$400M
	Benefit-Cost Ratio	N/A	3.70 - 5.04	4.31 - 5.64	1.58 - 2.06	1.07 - 1.39
	Projected Costs (2030)	Routine maintenance	$75 - 105M	$90 - 115M	$265 - 345M	$390 - 510M

Key Intersection Analysis

Some key intersections have been analyzed in greater detail, as they are among the larger intersections in the corridor. Improvements selected for the key intersections are also likely to impact the selection of concepts for adjacent locations. Matrices for the key intersections for this segment are presented below.

Table 38: Segment 6 - Hills-Miller Road

		NO-BUILD	CONCEPT 6D	CONCEPT 6C	CONCEPT 6B	CONCEPT 6A
Primary Needs	**Safety - Forecasted Crashes**	7 expected annual crashes 4 expected fatal/serious injury crashes over 20 years	11 predicted annual crashes 5 predicted fatal/serious injury crashes over 20 years	4 predicted annual crashes 4 predicted fatal/serious injury crashes over 20 years	3 predicted annual crashes 3 predicted fatal/serious injury crashes over 20 years	2 predicted annual crashes 3 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	6 conflicting movements	12 conflicting movements	4 conflicting movements	4 conflicting movements	4 conflicting movements
	Intersection Capacity (all movements)	LOS E 75 seconds of delay/vehicle	LOS E 75 seconds of delay/vehicle	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
	Travel Time Reliability for U.S. 23	1 signal	2 northbound signals 2 southbound signals	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
Costs	**Projected Costs (2030)**	Routine maintenance	$20M	$50M	$75M	$125M

Table 39: Segment 6 - Merrick Parkway/Panhandle Road

		NO-BUILD	CONCEPT 6D	CONCEPT 6C	CONCEPT 6B	CONCEPT 6A
Primary Needs	**Safety - Forecasted Crashes**	6 expected annual crashes 4 expected fatal/serious injury crashes over 20 years	9 predicted annual crashes 4 predicted fatal/serious injury crashes over 20 years	4 predicted annual crashes 3 predicted fatal/serious injury crashes over 20 years	2 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years	3 predicted annual crashes 1 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	16 conflicting movements	12 conflicting movements	4 conflicting movements	2 conflicting movements	4 conflicting movements
	Intersection Capacity (all movements)	LOS F 120 seconds of delay/vehicle	LOS D 45 seconds of delay/vehicle	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
	Travel Time Reliability for U.S. 23	1 signal	2 northbound signals 2 southbound signals	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
Costs	**Projected Costs (2030)**	Routine maintenance	$25M	$10M	$75M	$125M

Table 40: Segment 6 - Pennsylvania Avenue

		NO-BUILD	CONCEPT 6D	CONCEPT 6C	CONCEPT 6B	CONCEPT 6A
Primary Needs	**Safety - Forecasted Crashes**	9 expected annual crashes 6 expected fatal/serious injury crashes over 20 years	8 predicted annual crashes 3 predicted fatal/serious injury crashes over 20 years	8 predicted annual crashes 3 predicted fatal/serious injury crashes over 20 years	6 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years	6 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	5 conflicting movements	4 conflicting movements	4 conflicting movements	4 conflicting movements	4 conflicting movements
	Intersection Capacity (all movements)	LOS D 50 seconds of delay/vehicle	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
	Travel Time Reliability for U.S. 23	1 northbound signal	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
Costs	**Projected Costs (2030)**	Routine maintenance	$25M	$25M	$70M	$70M

Community Engagement Results

Community engagement indicated substantial support for a grade separation at Coover Road. Commenters were concerned about the safety of the existing signal, particularly with the young drivers travelling to/from the adjacent Buckeye Valley School buildings.

Community engagement indicated some concern about how properties, businesses and the Delaware County Board of Elections would be accessible, as all concepts would remove the full-access signal at the retail plaza south of Hills-Miller Road.

The City of Delaware reiterated support for providing all movements at the Merrick Parkway/Panhandle Road intersection with U.S. 23. This includes east-west through movements across U.S. 23.

There was limited public support for a full interchange at Pennsylvania Avenue. Many commenters were concerned about concepts that might impact the historic district and/or residential areas. The City of Delaware indicated that the future eastward extension of Pennsylvania Avenue across the Olentangy River, as indicated in the City's thoroughfare plan, is being explored for future consideration. A full interchange (Concepts 6A, 6B) at this location would make a future eastward extension very challenging to implement, whereas Concepts 6C, 6D, and the No-Build would be more consistent with a future eastern extension.

Conclusions

A combination of improvements from several concepts in Segment 6 should be used as a baseline and starting point for further study.

PENNSYLVANIA AVENUE

At Pennsylvania Avenue, construction of traditional freeway interchange ramps for northbound U.S. 23 (Concepts 3C and 3D) should be used as the baseline and starting point for further study. While Concept 3C/3D would have sizable cost, it would remove a signal for U.S. 23 southbound without disrupting the existing neighborhoods and historic district. The No-Build concept was also a high-performing concept. The No-Build condition and Concept 6C/6D would also be conducive to a future eastern extension of Pennsylvania Avenue, which is shown on the City of Delaware's current thoroughfare plan. A traditional freeway interchange for both northbound and southbound directions (Concept 6A/6B) would have nearly triple the costs, would impact adjacent residents and historic district, have minimal added safety and operational benefit compared with Concept 6C/6D, and would be less compatible with a future eastern extension of Pennsylvania Avenue.

PINECREST DRIVE

At Pinecrest Drive, conversion of the intersection to right-in/right-out operation (Concepts 6C, 6D) should be the baseline and starting point for further study. This would improve safety by removing unsignalized left turns to/from U.S. 23. Pinecrest Drive has connectivity to Pennsylvania Avenue and future connectivity to Merrick Parkway and Hills-Miller Road, so residents would be able to access U.S. 23 northbound.

MERRICK PARKWAY/PANHANDLE ROAD

At Merrick Parkway/Panhandle Road, Concept 6B which includes a southbound U.S. 23 connector road interchange should be the baseline and starting point carried forward for further study. Although it doesn't include a direct northbound connection, drivers can make indirect connections via Hills-Miller Road. Concept 6A, a traditional interchange, would likely significantly impact the Olentangy scenic river and underrepresented populations, with higher costs. A southbound connector interchange offers similar safety benefits at lower costs and impacts. Concept 6C's right-in/right-out operation does not meet the City of Delaware's connectivity goals. Concept 6D, an RCUT, would also heavily impact the scenic river and retain multiple signals on U.S. 23 without major safety improvements.

SEGMENT BETWEEN MERRICK PARKWAY/PANHANDLE ROAD AND HILLS-MILLER ROAD

For the segment in between Merrick Parkway/Panhandle Road and Hills-Miller Road, a raised median with no signals (Concept 6C) should be used as the baseline and starting point for further study. Maintaining right-in/right-out access points along this segment is expected to have similar safety and operational benefits as removal of access. With this concept, connections would be needed to Merrick Parkway and/or Hills-Miller Road so that properties could have access to both directions of U.S. 23. Having no direct access to U.S. 23 (Concept 6A, Concept 6B) is expected to have much higher costs and property impacts. Retaining the existing signal at the retail plaza would not help to improve safety or congestion in the area.

HILLS-MILLER ROAD

At Hills-Miller Road, a connector road interchange (Concept 6C) should be used as the baseline and starting point for further study. Concept 6C is expected to provide the greatest safety and operational benefits, while having lower costs and impacts than other interchange concepts. The additional frontage/backage roads in Concept 6A or Concept 6B would have substantial cost and impacts without providing much safety or operational benefit. An RCUT intersection (Concept 6D) is expected to operate at LOS E, increase the number of signals, and experience a slight increase in crashes. Based on the findings of this study, it appears that Hills-Miller Road would be the most practical location for a future arterial connection east of U.S. 23. The alignment of this eastern connection, if pursued by Delaware County/City of Delaware, would be determined by a future study.

SEGMENT BETWEEN HILLS-MILLER ROAD AND COOVER ROAD

For the segment in between Hills-Miller and Coover Road, a raised median with right-in/right-out only driveway accesses (Concept 6B) should be used as the baseline and starting point for further study. This concept would improve safety by eliminating left turns, which would be redirected via U-turns at adjacent interchanges. Retaining the existing condition (No-Build, Concept 6C, Concept 6D) would not address purpose and need elements. Eliminating direct access (Concept 6A) would result in high cost and high potential for displacements due to the construction of new service roads on both sides of U.S. 23.

COOVER ROAD

At Coover Road, a connector road interchange (Concepts 6A, 6B) should be used as the baseline and starting point for further study. A connector road interchange would maximize safety and operational benefits. There is also public support, including by local jurisdictions and Buckeye Valley Local School District, for a grade separation to improve safety for traffic accessing the Buckeye Valley schools. Widening the existing intersection for more turn lanes (Concepts 6C, 6D) would provide much less safety and operational benefits.

In summary, the baseline concept and starting point that should be used for further study includes:

- Construction of northbound ramps at Pennsylvania Avenue to eliminate the existing signal
- Construction of a connector road interchange for U.S. 23 southbound at Merrick Parkway/Panhandle Road
- Construction of a raised median, converting driveways to right-in/right-out operation between Panhandle Road and Hills-Miller Road
- Construction of a connector road interchange at Hills-Miller Road, with potential for a future arterial connection to the east
- Construction a raised median, converting driveways to right-in/right-out operation between Hills-Miller Road and Coover Road
- Construction of a connector road interchange at Coover Road

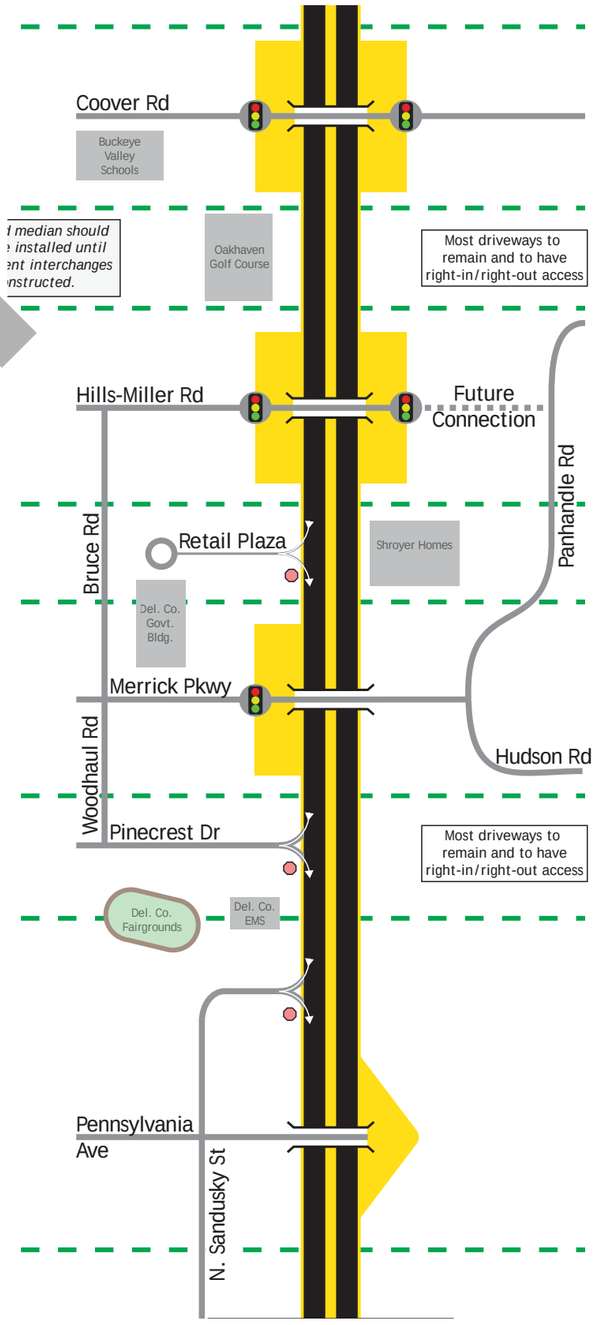


Figure 38: Segment 6 High-Performing Concept

SEGMENT 7

Segment Overview

GENERAL/LAND USES

Segment 7 extends from the Norfolk Southern Railroad bridge south of Main Road to SR 229 in Waldo. This section includes unincorporated portions of both Troy Township and Marlboro Township. The unincorporated hamlet of Norton is located on the west side of U.S. 23 at SR 229. Segment 7 is primarily rural with agricultural and residential land uses. Along the east side of U.S. 23 is Delaware State Park, with several driveways and a signalized intersection. This area has seen stable growth in recent decades, with little or no known proposed development at this time.

U.S. 23 ROADWAY

In Segment 7, U.S. 23 is a four-lane divided highway with a grass median. There are median breaks at intersections and some driveways. North of the Delaware State Park signal, there are two-lane, one-way frontage roads on either side of U.S. 23. These frontage roads were used as “experimental test pavement” for an ODOT research project, but the project is completed. These frontage roads are now typically only used for local access and serve very low traffic volumes. Through U.S. 23 traffic does not typically use the frontage roads. Segment 7 sees the highest percentage of truck traffic of any segment in the corridor.

OTHER ROADWAYS

There are two signalized intersections in Segment 7 – at the Delaware State Park entrance and at SR 229. SR 229 extends east from U.S. 23 toward the Village of Ashley and the I-71/SR 61 interchange. However, SR 229 is a longer route to I-71 and is thus infrequently used by through U.S. 23 traffic. Two county roads intersect U.S. 23 in this segment – Main Road and Radnor Road. Main Road is located south of the Delaware State Park and Delaware Dam, connecting to agricultural areas to the east. Radnor Road extends westward from U.S. 23 toward the unincorporated hamlet of Radnor. South of the Delaware State Park signal there are several unsignalized intersections with low-volume township roadways serving rural residential and agricultural land uses.

Figure 39: Segment 7 Study Area

Proposed Concepts

Four Build condition concepts have been developed for Segment 7, in addition to the No-Build condition. Consistent with other segments, Concept A is most freeway-like, while Concept D is most like the existing signalized corridor. The Segment 7 concepts are shown on **Figure 40**.

CONCEPT 7A

Concept 7A would remove both signals on U.S. 23. South of Troutman Road, the existing unsignalized intersections would be converted to right-in/right-out only with U-turn locations provided to allow for indirect turns. The existing one-way frontage roads would be converted to two-way frontage roads, making U.S. 23 a freeway facility north of Delaware State Park with no intersections or driveways. The frontage roads would be extended to Troutman Road and Delaware State Park. Additionally, an overpass would be constructed south of Irwin Road to provide east-west connectivity across U.S. 23. A traditional freeway interchange would be constructed at SR 229.

CONCEPT 7B

Concept 7B would also remove both signals on U.S. 23. Similar to Concept 7A, the existing unsignalized intersections south of Troutman Road would be converted to right-in/right-out only with U-turn locations provided to allow for indirect turns. However, southbound left turns would be allowed into the Delaware State Park. Similar to Concept 7A, the existing one-way frontage roads would be converted to two-way frontage roads, making U.S. 23 a freeway-like facility north of Delaware State Park with no median breaks. A new intersection would be created at the southern end of the two-way frontage roads to provide access to/from U.S. 23, however left turns onto U.S. 23 would not be permitted. A connector road interchange would be constructed at SR 229.

CONCEPT 7C

Concept 7C would also remove both signals on U.S. 23. South of Troutman Road, left turns onto U.S. 23 would be prohibited, with drivers instead having to make indirect left turns via U-turn locations. The existing one-way frontage roads would be removed, resulting in all public streets and private driveways having direct access to U.S. 23. Access in the northern part of Segment 7 would be converted to right-in/right-out access only, except for Radnor Road where northbound left turns from U.S. 23 would be permitted. Similar to Concept 7B, a connector road interchange would be constructed at SR 229.

CONCEPT 7D

Concept 7D is the only Build concept without any grade separations. The southern portion of the corridor would be the same as Concept 7C, with left turns onto U.S. 23 being prohibited and diverted to U-turn locations. The existing one-way frontage roads would remain unchanged from the No-Build condition, with one-way operation. An RCUT intersection would be constructed at SR 229.

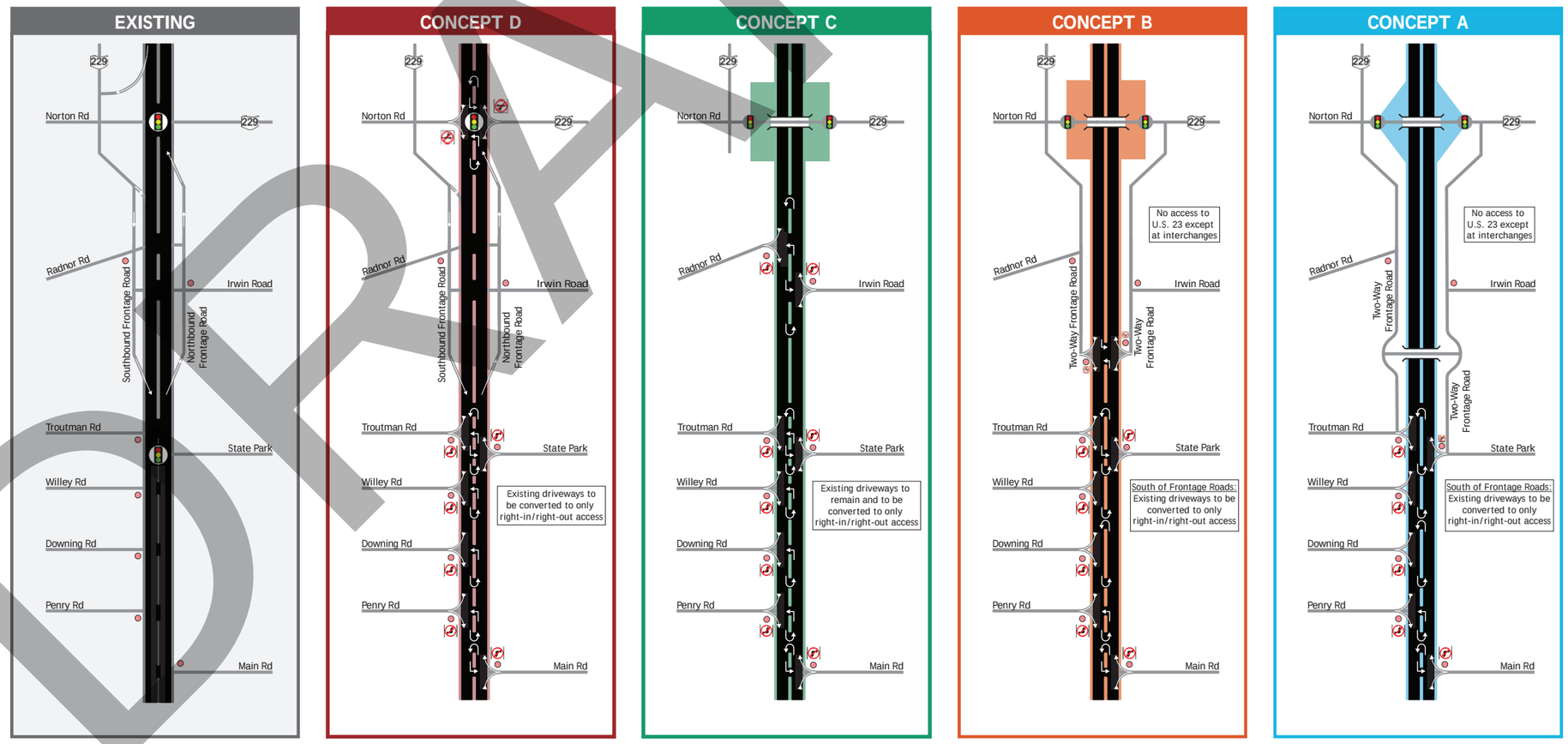


Figure 40: Segment 7 Concepts

**Includes signals at some U-turn locations*

Primary Needs

U.S. 23 THROUGH TRAVEL TIMES THROUGH SEGMENT

In 2050, it is projected that it will take vehicles 6-8 minutes to travel through Segment 7 during peak hours. The Build concepts are anticipated to reduce the travel time by 1 minute. The majority of Segment 7 is already free-flow, therefore there is minimal opportunity for travel time reduction.

TRAVEL TIME RELIABILITY – NUMBER OF SIGNALS ON U.S. 23

There are two signals in the No-Build condition in Segment 7. Concepts 7A, 7B, and 7C would remove both signals, resulting in free-flow operation for U.S. 23 through traffic in the segment and thus the greatest travel time reliability. In Concept 7D, the RCUT at SR 229 would result in two signals for through travelers in each direction of U.S. 23 at SR 229.

TRAVEL TIME RELIABILITY – INTERSECTIONS AT LOS E OR WORSE

Both existing signals in Segment 7 are expected to operate at LOS D or better by 2050. The RCUT signals at SR 229 in Concept 7D are also expected to operate at LOS D or better. Concepts 7A, 7B, and 7C would remove all signals, resulting in free-flow operation for U.S. 23 through traffic.

SAFETY – FORECASTED CRASHES

Concepts 7B and 7C are anticipated to have the greatest effects on crash frequency, reducing crashes by about 40% compared to the No-Build condition. Concept 7A is predicted to have the least amount of crash reduction, which is primarily attributed to the northern portion of U.S. 23 that would be converted to a freeway facility, for which the ODOT ECAT tool often predicts higher crash rates than arterials. However, all Build concepts are predicted to have similar reductions in serious injury/fatal crash types.

It should be noted that Concept 7C would introduce several private driveway access points onto U.S. 23 that currently only access the one-way frontage roads. Direct private access points would increase the risk of angle collisions with vehicles entering the highway or rear-end collisions with vehicles unexpectedly slowing to enter these driveways. The ECAT analysis does not account for the number of driveway access points along a rural arterial. Thus, the anticipated crash reduction for Concept 7C is likely overestimated.

SAFETY – CONFLICTING MOVEMENTS FOR U.S. 23 THROUGH TRAFFIC

U.S. 23 through traffic travelling in Segment 7 encounters 63 conflicting movements today in the No-Build condition. Concept 7A would result in the greatest reduction in conflicting movements, eliminating over half of existing conflicts. Concept 7C and Concept 7D would reduce the number of conflicting movements by less than 25%. It should be noted that this calculation does not include the additional private driveway direct access points that would occur in Concept 7C.

Secondary Need

CONSISTENCY WITH LOCAL PLANS

The 2002 Troy Township Comprehensive Plan indicates commercial and office uses are planned for the areas immediately adjacent to U.S. 23 north of Troutman Road. Comments received from Delaware County during public engagement also indicated that commercial development may occur along U.S. 23 in the northern portion of Segment 7. While the vast majority of Troy and Marlboro Townships are planned to remain rural in character, there is a desire that the transportation system plan for possible commercial or office land uses. The two-way frontage roads proposed in Concept 7A and 7B are likely most consistent with this goal. The overpass near Irwin Road proposed in Concept 7A would also accommodate future commercial development, allowing for easier access across U.S. 23. The removal of frontage roads in Concept 7C is least consistent with this township and county goal.

Table 41: Segment 7 - Primary & Secondary Needs

		NO-BUILD	CONCEPT 7D	CONCEPT 7C	CONCEPT 7B	CONCEPT 7A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	6-8 minutes	5-7 minutes	5-7 minutes	5-7 minutes	5-7 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	2 signals	2 signals	No signals (free-flow)	No signals (free-flow)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	0 signals	0 signals	0 signals	0 signals	0 signals
	Safety - Forecasted Crashes	36 expected annual crashes 29 expected fatal/serious injury crashes over 20 years	24 predicted annual crashes 19 predicted fatal/serious injury crashes over 20 years	21 predicted annual crashes 16 predicted fatal/serious injury crashes over 20 years	20 predicted annual crashes 18 predicted fatal/serious injury crashes over 20 years	31 predicted annual crashes 17 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	63 conflicting movements	56 conflicting movements	48 conflicting movements	42 conflicting movements	34 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	Existing one-way frontage roads likely less compatible for commercial development in U.S. 23 corridor	Inconsistent with Township goal of having fewer direct access points on U.S. 23	Would result in frontage roads becoming County/Township maintained Two-way frontage roads may enhance ability for commercial development in U.S. 23 corridor	Would result in frontage roads becoming County/Township maintained New grade separation and two-way frontage roads may enhance ability for commercial development in U.S. 23 corridor

Natural & Cultural Resource Impacts

PARK & RECREATIONAL RESOURCES

All Build concepts for Segment 7 are likely to have minor impact to Delaware State Park due to widening for U-turn locations at various intersections in the southern portion of the segment. All Build concepts would require outbound left turning vehicles from the State Park entrances to make an indirect left turn via a U-turn. Concept 7A would also require that inbound left turning vehicles at the northern State Park entrance make an indirect movement via U-turn.

STREAMS & WATERWAYS

Concepts 7A, 7B, and 7C would likely have minor impacts to streams and waterways due to construction of an interchange at SR 229, plus possible minimal impacts due to construction of U-turn locations in the segment. Concept 7D would likely have minimal impacts to streams and waterways due to construction of U-turn locations.

ENDANGERED SPECIES HABITAT

Concepts 7A, 7B, and 7C would likely have minor impacts to suitable wooded habitat (SWH) for Indiana Bats and Northern Long-eared Bats due to construction of new ramps for a proposed SR 229 interchange. Concept 7D would likely have minimal impacts to suitable wooded habitat (SWH) for Indiana Bats and Northern Long-eared Bats due to construction of U-turn locations.

REGULATED MATERIALS

All Build concepts could potentially have minor impacts to regulated materials sites due to U-turn locations south of Troutman Road.

FARMLAND

Concepts 7A could have possible minor farmland impacts primarily due to construction of a grade separation near Irwin Road and frontage road extensions. Concepts 7B, 7C, and 7D are likely to have minimal impacts farmland.

NOT APPLICABLE

There are no historic sites or Scenic Rivers located within this segment.

Table 42: Segment 7 - Natural & Cultural Resource Impacts

		NO-BUILD	CONCEPT 7D	CONCEPT 7C	CONCEPT 7B	CONCEPT 7A
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	Minor impact likely to Delaware State Park due to widening for U-turn locations and access change for left turns out of park driveways	Minor impact likely to Delaware State Park due to widening for U-turn locations and access change for left turns out of park driveways	Minor impact likely to Delaware State Park due to widening for U-turn locations and access change for left turns to/from park driveways	Minor impact likely to Delaware State Park due to new frontage road east of U.S. 23 Minor impact likely to Delaware State Park due to widening for U-turn locations and access change for left turns to/from park driveways
	Historic Sites	No impacts	No impacts to historic sites expected	No impacts to historic sites expected	No impacts to historic sites expected	No impacts to historic sites expected
	Scenic River (Olentangy River)	No impacts	No impacts to Scenic River expected	No impacts to Scenic River expected	No impacts to Scenic River expected	No impacts to Scenic River expected
	Streams & Waterways	No impacts	Minimal impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Minimal impacts to Indiana and Northern Long-eared Bat habitat likely	Minor impacts to Indiana and Northern Long-eared Bat habitat likely	Minor impacts to Indiana and Northern Long-eared Bat habitat likely	Minor impacts to Indiana and Northern Long-eared Bat habitat likely
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No impacts	Minimal farmland impacts expected	Minimal farmland impacts expected	Minimal farmland impacts expected	Minor farmland impacts expected

Community Impacts

RESIDENTIAL & COMMERCIAL DISPLACEMENTS

Residential displacements are expected to be minimal in Concepts 7A, 7B, and 7C. No residential displacements are anticipated for Concept 7D. No commercial displacements are anticipated for any of the Build concepts. If any Build concept is advanced, further study would evaluate to minimize potential displacements and other impacts.

AIR QUALITY

All Build concepts are likely to have similar and minor air quality impacts.

NOISE SENSITIVE AREAS

Concepts 7A, 7B, and 7C are likely to have minor impacts to noise sensitive receptors due to the proposed interchange at SR 229. Concept 7D is not expected to impact noise sensitive receptors.

BICYCLE/PEDESTRIAN CONNECTIVITY FOR EAST-WEST MOVEMENTS

There are no bicycle/pedestrian facilities in Segment 7, along either U.S. 23 or cross streets. Concept 7A would provide a grade separation to connect the adjacent frontage roads, offering an opportunity of bicycle/pedestrian connectivity across U.S. 23. However, due to the rural/low-density nature of this area, any bicycle/pedestrian facilities are unlikely to be utilized unless large-scale development occurs. Concepts 7A, 7B, and 7C would provide a grade separation at SR 229, which could allow for bicycle/pedestrian connectivity between the hamlet of Norton and Delaware State Park.

VEHICULAR CONNECTIVITY FOR EAST-WEST TRAFFIC

Due to the Delaware State Park on the east side of U.S. 23, there is limited demand or opportunity for east-west connectivity in Segment 7. The No-Build condition has only one direct east-west vehicular connection across U.S. 23, which is at the SR 229 signal. All other intersections in this segment are three-legged intersections. Concept 7A would provide an additional east-west connection via the proposed overpass near Irwin Road. Concept 7B and Concept 7C would maintain the direct connection at SR 229. Concept 7D would eliminate the east-west connection at SR 229, as the RCUT would require east-west through traffic to make an indirect movement.

CIRCUITY/BACKTRACKING TO PUBLIC STREETS

All Build concepts would affect the circulation patterns in the area. South of the frontage roads, all unsignalized intersections in the Build concepts would restrict left turning movements onto U.S. 23. Concepts 7A and 7B would redirect most left turn movements from U.S. 23 to U-turn locations. Concepts 7C and 7D would allow for left turn movements from U.S. 23 at all public street intersections.

Concepts 7A and 7B would eliminate direct access to U.S. 23 in the northern portion of the segment but would convert the frontage roads to two-way operation which would minimize added circuity. Concept 7C would redirect left turning vehicles entering U.S. 23 to U-turn locations. Concept 7D is not expected to have any major effect on circuity to/from public streets in the frontage road area.

PRIVATE DRIVEWAY ACCESS TO U.S. 23

In each of the Build concepts, all median breaks at private driveways south of Troutman Road would be eliminated, converting all driveways to right-in/right-out only access. Concept 7A and Concept 7B would eliminate all median breaks and access points on U.S. 23 in the frontage road area. With the conversion of frontage roads to two-way operation in Concepts 7A and 7B, private driveways on the frontage roads would have access to both directions of travel. For many driveways, Concepts 7A and 7B may result in a decrease in circuity for many trips. Concept 7C would introduce over a dozen new private driveways with direct access to U.S. 23, creating a potential degradation in safety in the current frontage road section.

Table 43: Segment 7 - Community Impacts

		NO-BUILD	CONCEPT 7D	CONCEPT 7C	CONCEPT 7B	CONCEPT 7A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Special Land Uses	No special land uses in segment	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Residential Displacements	No impacts	No residential parcels with displacements expected	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements
	Commercial Displacements	No impacts	No commercial parcels with displacements expected	No commercial parcels with displacements expected	No commercial parcels with displacements expected	No commercial parcels with displacements expected
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected
	Bicycle/Pedestrian Connectivity for East-West Movements	No bicycle/pedestrian facilities in segment	No bicycle/pedestrian facilities	Potential bicycle/pedestrian connection at new SR 229 grade separation	Potential bicycle/pedestrian connection at new SR 229 grade separation	Potential bicycle/pedestrian connection at two new grade separations - at SR 229 and near Irwin Road
	Vehicular Connectivity for East-West Traffic	One direct east-west vehicular connection	No direct east-west vehicle connections	One direct east-west vehicular connection	One direct east-west vehicular connection	One direct east-west vehicular connection
	Circuity/Back-tracking to Public Streets	No impacts	Indirect left turns onto U.S. 23 south of Troutman Road	Indirect left turns onto U.S. 23 south of Troutman Road and at Radnor Road	Indirect left turns to and from U.S. 23 south of Troutman Road Minimal change in circuity in frontage road area due to two-way conversion	Indirect left turns to and from U.S. 23 south of Troutman Road Minimal change in circuity in frontage road area due to two-way conversion
	Private Driveway Access to U.S. 23	No impacts	South of Troutman Road: Driveways to be converted to right-in/right-out only North of Troutman Road: No change in access for private driveways	South of Troutman Road: Driveways to be converted to right-in/right-out only North of Troutman Road: Over a dozen private access drives with direct access on U.S. 23	South of Troutman Road: Driveways to be converted to right-in/right-out only North of Troutman Road: Closure of all median breaks and U.S. 23 access points. Driveways will access two-way frontage road.	South of Troutman Road: Driveways to be converted to right-in/right-out only North of Troutman Road: Closure of all median breaks and U.S. 23 access points. Driveways will access two-way frontage road.
	Public Transportation	No impacts	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected
	K-12 Public School Access	No K-12 schools in segment	No impacts to K-12 school access expected	No impacts to K-12 school access expected	No impacts to K-12 school access expected	No impacts to K-12 school access expected
	Access to/from U.S. 23 for Emergency Services	No emergency service providers or first responders in segment	No impacts to emergency services expected	No impacts to emergency services expected	No impacts to emergency services expected	No impacts to emergency services expected

PUBLIC TRANSPORTATION

Delaware County Transit service in this segment would be minimally affected by any of the concepts. Due to the rural nature of Segment 7, it is unlikely that fixed-route transit service would occur in this area in the foreseeable future.

NOT APPLICABLE

There are no special land uses, K-12 public schools, or emergency service providers in this segment. No Environmental Justice and other traditionally underserved populations are anticipated in this segment.

Infrastructure Impacts

MAINTENANCE OF TRAFFIC (MOT)

The No-Build concept would have no impacts to traffic, as no construction would occur. Minimal MOT effects are anticipated with any Build concepts. Lane closures on U.S. 23 and/or side streets may be needed for widening or construction of new grade separations.

DESIGN STANDARDS

Some locations in the southern part of this segment have outside shoulder widths that are less than current ODOT Location & Design Manual design criteria. However, it does not appear that the shoulder widths are contributing to crash patterns. Performance-based practical design policy would be considered with any Build concept to reduce impacts and costs with any concept.

RAILROADS

There is a Norfolk Southern Railroad bridge located south of Main Road. None of the Build concepts are anticipated to have impacts to the bridge.

NOT APPLICABLE

No major utility infrastructure is present in this segment.

Costs

RIGHT-OF-WAY (PARCELS, ACRES, AND COSTS)

Concept 7A is expected to affect the greatest number of parcels for additional right-of-way, due to the traditional freeway interchange at SR 229 and the new grade separation near Irwin Road. Concepts 7B and 7C are expected to have similar amounts of right-of-way impacts, with much of the impacts associated with the proposed connector road interchange at SR 229. Concept 7D is expected to have the least amount of right-of-way impact, with less than 10 acres expected to be affected. In all concepts, right-of-way impacts are expected to be minimal south of Troutman Road. For all Build concepts, right-of-way costs are expected to be near $1 million or less.

USER BENEFITS

Concepts 7A, 7B, and 7C are expected to have the greatest user benefits, due to the removal of all traffic signals in the corridor, which will eliminate delays and increase safety. The user benefits for Concept 7D are about 40% less than other concepts, mostly due to the signalized RCUT intersection at SR 229 which is expected to have much less benefit compared to the interchanges in other Build concepts.

BENEFIT-COST RATIO

Despite the lowest user benefit amount, Concept 7D is the only concept with a benefit-cost ratio over 1.00. This is mostly due to the lower costs as there are no grade separations included in Concept 7D. Concept 7C is expected to have a benefit-cost ratio very close to 1.00. Concept 7A has a benefit-cost ratio of less than 0.50, which means the projected user benefits are less than half of the anticipated project costs.

PROJECT COSTS (2030)

Segment 7 has a wide range of costs between the concepts. Due to the limited number of improvements for Concept 7D, the projected costs are less than $30 million. Concepts 7B and 7C have similar projected costs, less than $100 million. Concept 7A is projected to have the highest cost, primarily due to the two grade separation locations.

It should be noted that Concept 7A and 7B would likely result in the maintenance of the frontage roads shifting from ODOT responsibility to county and/or township responsibility. The project costs for these concepts include resurfacing and preparation for turning over to local agency maintenance.

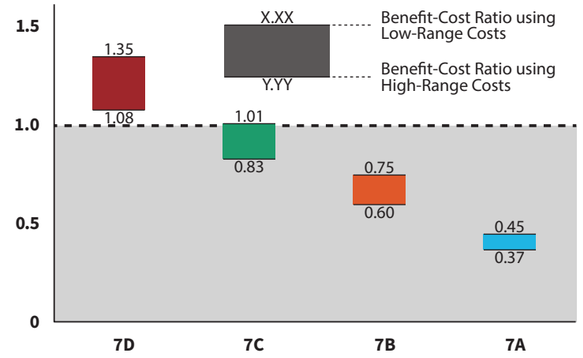


Figure 41: Segment 7 Benefit-Cost Ratios

Table 44: Segment 7 - Infrastructure Impacts & Costs

		NO-BUILD	CONCEPT 7D	CONCEPT 7C	CONCEPT 7B	CONCEPT 7A
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts to U.S. 23	Minimal MOT impacts to U.S. 23 Potential long-term closure for grade separation of SR 229	Minimal MOT impacts to U.S. 23 Potential long-term closure for grade separation of SR 229	Minimal MOT impacts to U.S. 23 Potential long-term closure for grade separation of SR 229
	Design Standards	Some shoulder widths less than current design standards	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Major Utilities	No impacts	No impacts to major utilities expected	No impacts to major utilities expected	No impacts to major utilities expected	No impacts to major utilities expected
	Railroads	No impacts	No impacts to railroads expected	No impacts to railroads expected	No impacts to railroads expected	No impacts to railroads expected
Costs	**Right-of-Way (parcels & acres)**	No impacts	0-25 parcels 0-10 acres	0-50 parcels 10-30 acres	0-50 parcels 10-30 acres	25-50 parcels 10-30 acres
	Right-of-Way Costs (2030)	None	$0.1 - 0.2M	$0.7 - 1.2M	$0.8 - 1.3M	$1.2 - 1.9M
	User Benefit (20-year)	None	$25M	$45M	$45M	$40M
	Benefit-Cost Ratio	N/A	1.08 - 1.35	0.83 - 1.01	0.60 - 0.75	0.37 - 0.45
	Projected Costs (2030)	Routine maintenance	$25 - 30M	$60 -75M	$80 - 100M	$125 - 160M

Key Intersection Analysis

Some key intersections have been analyzed in greater detail, as they are among the larger intersections in the corridor. Improvements selected for the key intersections are also likely to impact the selection of concepts for adjacent locations. Matrices for the key intersections for this segment are presented below.

Community Engagement Results

Many comments were received regarding the ability of recreational vehicles and/or vehicles towing boats to access Delaware State Park with RCUTs or U-turn concepts. This would be addressed in design if a concept is advanced. Several residents in Delaware County indicated that an overpass north of Troutman Road (Concept 7A) might be desirable if/when future commercial development occurs along U.S. 23 in this area. Local residents generally seemed supportive of the idea of converting the one-way frontage roads to two-way operation (Concepts 7A and 7B) for improved connectivity. Residents in the SR 229 area were generally supportive of concepts that removed the signal at SR 229, citing their safety concerns of the signal and/or desire for an overpass/underpass for better connectivity across U.S. 23. Residents in the SR 229 area suggested using existing roadways (Weiser Road, Brundage Road) to provide ramp connections for Concepts 7B and 7C to help minimize impacts.

Conclusions

Concept 7B will be used as a baseline and starting point for further study. The connector road interchange at SR 229 would eliminate the congestion and safety issues associated with the existing signal, while maintaining connectivity and minimizing costs and potential community impacts. The RCUTs proposed south of Troutman Road would improve safety, eliminate the signal at the State Park entrance, provide for all movements, and minimize cost and need for additional right-of-way. Conversion of the frontage roads to two-way roads would enhance connectivity for parcels in the northern part of Segment 7 and potentially make this area more attractive for commercial development.

Concept 7A would have very similar benefits, but would have greater costs and right-of-way needs, particularly from Delaware State Park. Concept 7C would introduce multiple new direct access points and conflict points on U.S. 23, thus degrading safety in the area of the existing frontage roads. Concept 7D would provide lower safety and travel time benefits at SR 229, and the existing one-way frontage roads are less consistent with possible future commercial development identified in current plans.

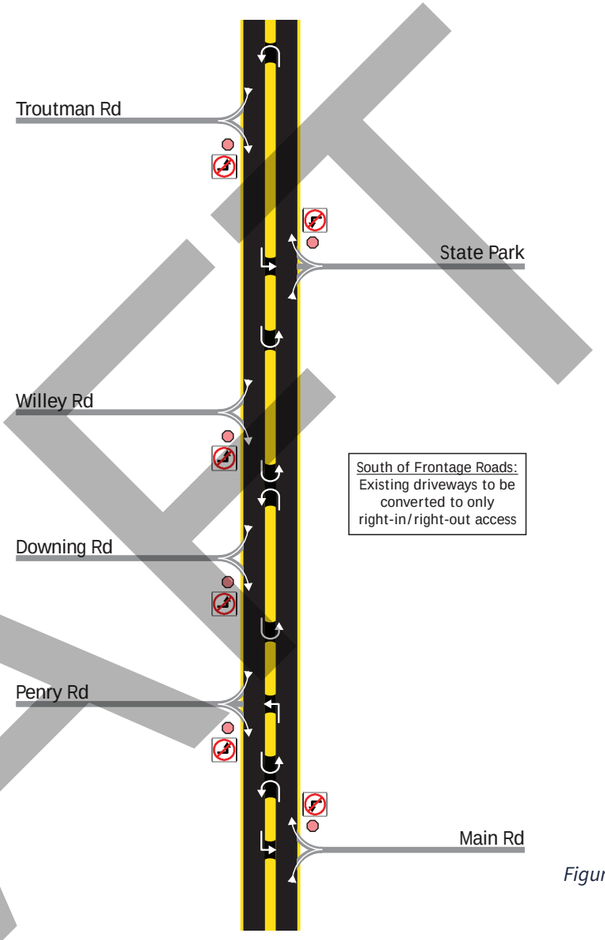


Figure 42: Segment 7 High-Performing Concept (south half)

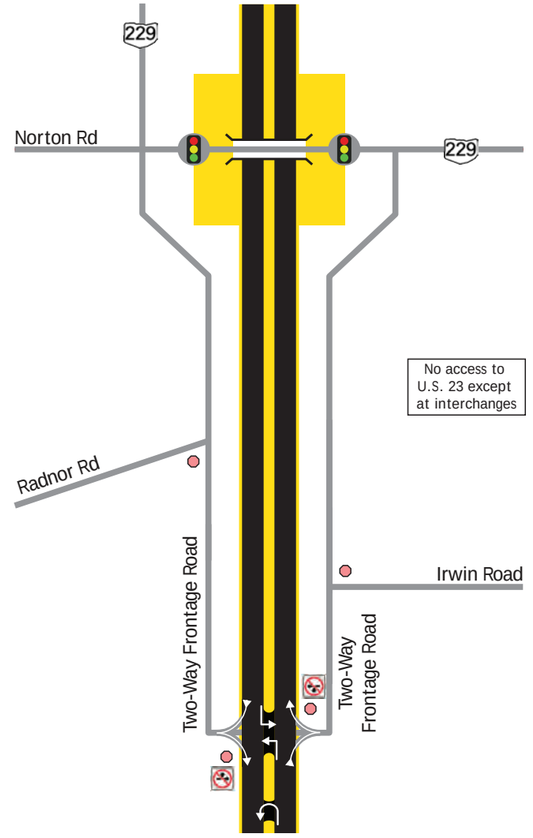


Figure 43: Segment 7 High-Performing Concept (north half)

Table 45: Segment 7 - SR 229

		NO-BUILD	CONCEPT 7D	CONCEPT 7C	CONCEPT 7B	CONCEPT 7A
Primary Needs	**Safety - Forecasted Crashes**	9 expected annual crashes 5 expected fatal/serious injury crashes over 20 years	7 predicted annual crashes 4 predicted fatal/serious injury crashes over 20 years	3 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years	2 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years	5 predicted annual crashes 2 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	19 conflicting movements	10 conflicting movements	4 conflicting movements	4 conflicting movements	4 conflicting movements
	Intersection Capacity (all movements)	LOS D 35 seconds of delay/vehicle	LOS B 20 seconds of delay/vehicle	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
	Travel Time Reliability for U.S. 23	1 signal	2 northbound signals 2 southbound signals	No signal (free-flow)	No signal (free-flow)	No signal (free-flow)
Costs	**Projected Costs (2030)**	Routine maintenance	$15M	$45M	$45M	$70M

CONCLUSION/NEXT STEPS

This study has evaluated improvements to address congestion and safety issues on U.S. 23 between Waldo and I-270. The study has evaluated a variety of concepts for each segment, ranging from options similar to the existing stop-and-go conditions to more freeway-like conditions. High-performing concepts have been identified for each portion of the U.S. 23 study area, based on their ability to improve safety, improve travel times and travel time reliability, be consistent with community plans, minimize costs, minimize additional right-of-way, and minimize/avoid impacts to natural and community resources.

The high-performing concepts in this study offer a long-term vision for the U.S. 23 corridor. These concepts should be used as a baseline and starting point for further study, as individual projects are identified and advanced into the ODOT project development process. Once in project development, further study would evaluate these concepts against other concepts and the No-Build via the NEPA process. While it is possible that some concepts may eventually be changed during further evaluation, this study provides a roadmap of where the major access points should be located, what type of access should be provided in the corridor, and how the system should connect with local roads.

This study is a forward-thinking approach to address specific congestion and safety issues on existing U.S. 23 between Waldo and I-270.

Figures 44 and **45** summarize the concepts that should be carried forward for further study.

The improvements in Figures 44 and 45 are expected to have a total cost of $1.6 billion, in 2030 dollars.

If implemented as shown in Figures 44 and 45, the improvements are expected to do the following:

- Reduce more than 300 crashes per year
- Reduce more than 150 fatal/serious injury crashes over a 20-year period
- Address 25 locations ranked on the HSIP statewide list
- Reduce travel times between I-270 and Waldo by nearly 35 minutes in the Design Year
- Eliminate 32 signals for northbound traffic between I-270 and Waldo, resulting in 2 signals remaining
- Eliminate 34 signals for southbound traffic between I-270 and Waldo, resulting in 3 signals remaining

Figure 44: High-Performing Concept (south half)

Figure 45: High-Performing Concept (north half)

Table 46: Segment 1S - Evaluation Matrix

		NO-BUILD	CONCEPT 1S-B	CONCEPT 1S-A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	4-8 minutes	2-3 minutes	1 minute
	Travel Time Reliability - Number of Signals on U.S. 23	4 signals (2 NB, 2 SB)	2 signals (2 NB, 0 SB)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	3 signals (2 NB, 1 SB)	1 signal (1 NB, 0 SB)	0 signals
	Safety - Forecasted Crashes	55 expected annual crashes 34 expected fatal/serious injury crashes over 20 years	43 predicted annual crashes 32 predicted fatal/serious injury crashes over 20 years	35 predicted annual crashes 31 predicted fatal serious/injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	17 conflicting movements	9 conflicting movements	4 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	No effects anticipated	I-270/U.S. 23 interchange modifications could disrupt commercial areas in Crosswoods area and in City of Worthington
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	No park or recreational resource impacts expected	Possible impacts to Olentangy Parklands due to modified I-270 eastbound ramps to U.S. 23 Possible impacts to Olentangy Trail due to modified I-270 eastbound ramps to U.S. 23
	Historic Sites	No impacts	Minor impacts likely due to widening adjacent to Pontifical College of the Josephinum	Minor impacts likely due to widening adjacent to Pontifical College of the Josephinum
	Scenic River (Olentangy River)	No impacts	No impacts to Scenic Rivers expected	Possible impacts to Olentangy River due to modified I-270 eastbound ramps to U.S. 23
	Streams & Waterways	No impacts	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Possible impacts to Indiana and Long-eared Bat habitat due to construction of express lanes adjacent to U.S. 23	Possible impacts to mussel habitat due to potential work in Olentangy River Possible impacts to Indiana and Long-eared Bat habitat due to construction of express lanes adjacent to U.S. 23
	Regulated Materials	No impacts	No regulated materials impacts expected	No regulated materials impacts expected
	Farmland	No impacts	No farmland in segment	No farmland in segment

Table 46 continued: Segment 1S - Evaluation Matrix

		NO-BUILD	CONCEPT 1S-B	CONCEPT 1S-A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	No impacts to Environmental Justice and other traditionally underrepresented populations expected	Potential impacts to multi-family complexes on the east side of U.S. 23
	Special Land Uses	No impacts	Minor impacts likely to Camp Mary Orton due to adjacent U.S. 23 widening	Minor impacts likely to Camp Mary Orton due to adjacent U.S. 23 widening
	Residential Displacements	No impacts	0-10 residential parcels with displacements	0-10 residential parcels with displacements
	Commercial Displacements	No impacts	0-10 commercial parcels with displacements	10-30 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected
	Bicycle/Pedestrian Connectivity for East-West Movements	No impacts	Minimal impacts to pedestrian/bicycle connectivity expected	Minimal impacts to pedestrian/bicycle connectivity expected
	Vehicular Connectivity for East-West Traffic	No impacts	No impacts to east-west vehicle connections expected	No impacts to east-west vehicle connections expected
	Circuity/Back-tracking to Public Streets	No impacts	No impacts to public street connectivity expected	No impacts to public street connectivity expected
	Private Driveway Access to U.S. 23	No impacts	Minimal impacts to existing driveways expected	Minimal impacts to existing driveways expected
	Public Transportation	No impacts	Minimal impacts to transit service expected	Minimal impacts to transit service expected
	K-12 Public School Access	No schools in segment	No schools in segment	No schools in segment
	Access to/from U.S. 23 for Emergency Services	No emergency service providers/first response facilities in segment	No impacts to access for emergency service/ first response facilities	No impacts to access for emergency service/ first response facilities
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minor MOT impacts expected	Minor MOT impacts expected
	Design Standards	No impacts	No deviations from design standards expected	No deviations from design standards expected
	Major Utilities	No impacts	No impacts to major utilities expected	Likely impacts to high-voltage transmission lines south of I-270
	Railroads	No railroads in segment	No railroads in segment	No railroads in segment
Costs	**Right-of-Way (parcels & acres)**	No impacts	0-25 parcels 10-30 acres	25-75 parcels 30-70 acres
	Right-of-Way Costs (2030)	None	$5 - 15M	$180 - 310M
	User Benefit (20-year)	None	$95M	$200M
	Benefit-Cost Ratio	N/A	1.12 - 1.47	0.36 - 0.50
	Projected Costs (2030)	Routine maintenance	$90 - 115M	$535 - 750M

Table 47: Segment 1N - Evaluation Matrix

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		NO-BUILD	CONCEPT 1N-D	CONCEPT 1N-C	CONCEPT 1N-B	CONCEPT 1N-A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	5-8 minutes	2-3 minutes	2 minutes	2 minutes	1-2 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	4 signals	5 signals (4 NB, 5 SB)	1 signal (0 NB, 1 SB)	No signals (free-flow)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	2 signals	0 signals	0 signals	0 signals	0 signals
	Safety - Forecasted Crashes	89 expected annual crashes 53 expected fatal/serious injury crashes over 20 years	66 predicted annual crashes 30 predicted fatal/serious injury crashes over 20 years	45 predicted annual crashes 23 predicted fatal/serious injury crashes over 20 years	40 predicted annual crashes 23 predicted fatal/serious injury crashes over 20 years	22 predicted annual crashes 16 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	68 conflicting movements	48 conflicting movements	20 conflicting movements	18 conflicting movements	12 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	Least desirable pedestrian connection across U.S. 23 for future trail connection to Highbanks Metro Park	Improved pedestrian connection across U.S. 23 for future trail connection to Highbanks Metro Park	Improved pedestrian connection across U.S. 23 for future trail connection to Highbanks Metro Park	Would greatly reduce access points on U.S. 23, consistent with Township goal Improved pedestrian connection across U.S. 23 for future trail connection to Highbanks Metro Park
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	Minor impacts likely to Highbluffs Park due to U.S. 23 widening	Minor impacts likely to Highbluffs Park due to U.S. 23 widening	Minor impacts likely to Highbluffs Park due to U.S. 23 widening	Substantial impacts likely to Highbluffs Park due to U.S. 23 widening and new frontage road
	Historic Sites	No impacts	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District
	Scenic River (Olentangy River)	No impacts	No impacts to Scenic River expected	No impacts to Scenic River expected	No impacts to Scenic River expected	No impacts to Scenic River expected
	Streams & Waterways	No impacts	No stream/waterway impacts expected	No stream/waterway impacts expected	No stream/waterway impacts expected	No stream/waterway impacts expected
	Endangered Species Habitat	No impacts	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No impacts	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected

Table 47 continued: Segment 1N - Evaluation Matrix

		NO-BUILD	CONCEPT 1N-D	CONCEPT 1N-C	CONCEPT 1N-B	CONCEPT 1N-A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected	Potential impacts to multi-family complex near Orchard Knoll Drive
	Special Land Uses	No impacts	No impacts to special land uses expected	No impacts to special land uses expected	No impacts to special land uses expected	No impacts to special land uses expected
	Residential Displacements	No impacts	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements	10-30 residential parcels with displacements
	Commercial Displacements	No impacts	0-10 commercial parcels with displacements	0-20 commercial parcels with displacements	0-20 commercial parcels with displacements	10-40 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected
	Bicycle/Pedestrian Connectivity for East-West Movements	3 signalized crossing locations	3 signalized crossing locations, each with longer crossing distances	2 grade-separated crossing locations	3 grade-separated crossing locations	1 grade-separated crossing location
	Vehicular Connectivity for East-West Traffic	3 direct east-west signalized connections	1 direct east-west signalized connection	2 grade-separated east-west connections	3 grade-separated east-west connections	1 grade-separated east-west connection
	Circuity/Back-tracking to Public Streets	5 public street intersections with left turn access	3 public streets with left turn access	1 public street with left turn access	2 public streets with left turn access	1 public street with left turn access
	Private Driveway Access to U.S. 23	No impacts	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	Some existing driveways would remain All private driveways would be right-in/right-out only	No direct private access points All access to private properties via frontage/backage roads
	Public Transportation	No impacts	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected
	K-12 Public School Access	No impacts	No impacts to K-12 school access expected	No impacts to K-12 school access expected	No impacts to K-12 school access expected	No impacts to K-12 school access expected
	Access to/from U.S. 23 for Emergency Services	No impacts	No impacts to emergency services expected	No impacts to emergency services expected	No impacts to emergency services expected	No impacts to emergency services expected
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected
	Design Standards	No impacts	Shoulder widths likely increased to current design criteria	Some shoulder widths less than current design criteria likely would remain	Some shoulder widths less than current design criteria likely would remain	Some shoulder widths less than current design criteria likely would remain
	Major Utilities	No known major utilities present	No impacts to major utilities expected	No impacts to major utilities expected	No impacts to major utilities expected	No impacts to major utilities expected
	Railroads	No railroads in segment	No impacts to railroads expected	No impacts to railroads expected	No impacts to railroads expected	No impacts to railroads expected
Costs	**Right-of-Way (parcels & acres)**	No impacts	25-75 parcels 30-60 acres	25-100 parcels 40-80 acres	25-100 parcels 50-100 acres	75-125 parcels 70-140 acres
	Right-of-Way Costs (2030)	None	$50 - 90M	$75 - 130M	$95 - 165M	$230 - 400M
	User Benefit (20-year)	None	$125M	$155M	$180M	$180M
	Benefit-Cost Ratio	N/A	1.11 - 1.56	1.01 - 1.44	0.92 - 1.35	0.46 - 0.71
	Projected Costs (2030)	Routine maintenance	$115 - 165M	$165 - 235M	$190 - 275M	$375 - 565M

Table 48: Segment 2 - Evaluation Matrix

		NO-BUILD	CONCEPT 2D	CONCEPT 2C	CONCEPT 2B	CONCEPT 2A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	12-25 minutes	5-7 minutes	3-5 minutes	2-3 minutes	2-3 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	6 signals	5 signals	3 signals (3 NB, 2 SB)	No signals (free-flow)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	6 signals	2 signals	1 signal	0 signals	0 signals
	Safety - Forecasted Crashes	115 expected annual crashes 66 expected fatal/serious injury crashes over 20 years	91 predicted annual crashes 42 predicted fatal/serious injury crashes over 20 years	45 predicted annual crashes 24 predicted fatal/serious injury crashes over 20 years	27 predicted annual crashes 19 predicted fatal/serious injury crashes over 20 years	25 predicted annual crashes 12 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	106 conflicting movements	50 conflicting movements	30 conflicting movements	16 conflicting movements	8 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	No new dead-end public streets, consistent with Township goal U.S. 23/SR 750 turning movements diverted to multiple Township/local roadways such as Neverland Drive, Owenfield Drive, and Green Meadows Drive	Creates some additional dead-end streets, inconsistent with Township goal U.S. 23/SR 750 turning movements diverted to Green Meadows Drive	Creates some new dead-end public streets, inconsistent with Township goal Interchanges may negatively impact existing businesses/tax base Some U.S. 23/SR 750 turning movements diverted to Green Meadows Drive	Creates most additional dead-end streets, inconsistent with Township goal Interchanges may negatively impact existing businesses/tax base Would eliminate all U.S. 23 access points, consistent with Township goal to reduce direct U.S. 23 access
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	Minor impacts likely to Highbanks Metro Park due to adjacent U.S. 23 widening, plus change of existing U.S. 23 access point to right-in/right-out only	Moderate impacts likely to Highbanks Metro Park due to removal of U.S. 23 access point and construction of new park access point on SR 750, plus adjacent U.S. 23 widening	Moderate impacts likely to Highbanks Metro Park due to interchanges/overpasses at SR 750 and at Green Meadows Drive and adjacent U.S. 23 widening	Moderate impacts likely to Highbanks Metro Park due to interchanges/overpasses at SR 750 and at Green Meadows Drive and adjacent U.S. 23 widening
	Historic Sites	No impacts	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District	Minor impacts likely due to U.S. 23 widening adjacent to Highbanks Metropolitan Mounds I & II Historic District
	Scenic River (Olentangy River)	No impacts	No impacts to Scenic Rivers expected	Possible minor impacts to Olentangy River near relocated Highbanks Metro Park access point on SR 750	No impacts to Scenic Rivers expected	No impacts to Scenic Rivers expected
	Streams & Waterways	No impacts	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected	Minor impacts to potential Indiana and Northern Long-eared bat habitat expected	Least minor impacts to potential Indiana and Northern Long-eared bat habitat expected
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No farmland in segment	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected

Table 48 continued: Segment 2 - Evaluation Matrix

		NO-BUILD	CONCEPT 2D	CONCEPT 2C	CONCEPT 2B	CONCEPT 2A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected
	Special Land Uses	No special land uses in segment	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Residential Displacements	No impacts	No residential parcel displacements expected	No residential parcel displacements expected	No residential parcel displacements expected	No residential parcel displacements expected
	Commercial Displacements	No impacts	0-10 commercial parcels with displacements	0-10 commercial parcels with displacements	10-20 commercial parcels with displacements	10-30 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected
	Bicycle/Pedestrian Connectivity for East-West Movements	4 signalized crossing locations	3 signalized crossing locations, each with longer crossing distances	2 signalized crossing locations, each with longer crossing distances 2 grade-separated crossing locations	4 grade-separated crossing locations	4 grade-separated crossing locations
	Vehicular Connectivity for East-West Traffic	6 direct east-west signalized connections	1 direct east-west signalized connection	2 grade-separated east-west crossings	4 grade-separated crossing locations	4 grade-separated crossing locations
	Circuity/Back-tracking to Public Streets	6 public streets with left turn access	2 public streets with left turn access	3 public streets with northbound left turn access 4 public streets with southbound left turn access	3 public streets with left turn access	2 public streets with left turn access
	Private Driveway Access to U.S. 23	No impacts	Most existing private driveways would remain All private driveways would be right-in/right-out only, except for driveway across from Windbrush Avenue	Most existing private driveways would remain, except for driveway across from Windbrush Avenue All private driveways would be right-in/right-out only	Driveway across from Windbrush Avenue (right-in/right-out only) would be only direct private access on U.S. 23	No direct private access points
	Public Transportation	No impacts	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected
	K-12 Public School Access	No K-12 public schools in segment	No impacts to K-12 school access expected	No impacts to K-12 school access expected	No impacts to K-12 school access expected	No impacts to K-12 school access expected
	Access to/from U.S. 23 for Emergency Services	No emergency service providers or first responders in segment	No impacts to emergency services expected	No impacts to emergency services expected	No impacts to emergency services expected	No impacts to emergency services expected
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected
	Design Standards	No impacts	Shoulder widths likely increased to current design criteria	Shoulder widths likely increased to current design criteria	Some shoulder widths less than current design criteria likely would remain	Some shoulder widths less than current design criteria likely would remain
	Major Utilities	No known major utilities present	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Railroads	No railroads present	No impacts expected	No impacts expected	No impacts expected	No impacts expected
Costs	**Right-of-Way (parcels & acres)**	No impacts	75-150 parcels 40-80 acres	75-175 parcels 50-100 acres	100-175 parcels 70-130 acres	75-175 parcels 70-130 acres
	Right-of-Way Costs (2030)	None	$50 - 90M	$55 - 95M	$95 - 160M	$105 - 180M
	User Benefit (20-year)	None	$450M	$520M	$650M	$660M
	Benefit-Cost Ratio	N/A	2.63 - 3.58	2.72 - 3.83	2.40 - 3.32	2.17 - 3.03
	Projected Costs (2030)	Routine maintenance	$170 - 230M	$185 - 255M	$260 - 365M	$290 - 405M

Table 49: Segment 3 - Evaluation Matrix

		NO-BUILD	CONCEPT 3D	CONCEPT 3C	CONCEPT 3B	CONCEPT 3A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	10-17 minutes	4-8 minutes	3-4 minutes	2-3 minutes	2-3 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	5 signals	5 signals	5 signals (4 NB, 5 SB)	No signals (free-flow)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	5 signals	1 signal	0 signals	0 signals	0 signals
	Safety - Forecasted Crashes	80 expected annual crashes 42 expected fatal/serious injury crashes over 20 years	50 predicted annual crashes 23 predicted fatal/serious injury crashes over 20 years	49 predicted annual crashes 27 predicted fatal/serious injury crashes over 20 years	26 predicted annual crashes 18 predicted fatal/serious injury crashes over 20 years	24 predicted annual crashes 14 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	90 conflicting movements	44 conflicting movements	48 conflicting movements	22 conflicting movements	18 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	Restricted/diverted east-west through movements at Home Road is inconsistent with Delaware County's goal of making Home Road/Lewis Center Road/Big Walnut Road a cross-county arterial Would create more dead-end streets, which is inconsistent with Township goal No reduction in number of U.S. 23 access points	Minimal reduction in number of U.S. 23 access points	Would reduce number of U.S. 23 access points, consistent with Orange Township goal Halfway Lane overpass/underpass may make adjacent parcels less attractive to develop	Most robust connection to Home Road/ Lewis Center corridor - consistent with County support of Home Road/Lewis Center as key arterial & Orange Township support of I-71/Big Walnut Road interchange Would reduce number of U.S. 23 access points, consistent with Orange Township goal Halfway Lane grade separation may make adjacent parcels less attractive to develop
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	Minor impacts likely to Orange Bridge Park due to adjacent U.S. 23 widening Minor impacts likely to Shale Hollow Park due to adjacent U.S. 23 widening	Minor impacts likely to Orange Bridge Park due to adjacent U.S. 23 widening Minor impacts likely to Shale Hollow Park due to adjacent U.S. 23 widening	No impacts to parks or recreational resources expected	No impacts to parks or recreational resources expected
	Historic Sites	No impacts	Possible minor impacts to 7630 Columbus Pike due to adjacent U.S. 23 widening	Minor impacts likely to 7630 Columbus Pike due to adjacent U.S. 23 widening and U-turn location	No impacts to historic sites expected	Possible minor impacts to unnamed historic site on Artesian Run
	Scenic River (Olentangy River)	No impacts	No impacts to Scenic Rivers expected	No impacts to Scenic Rivers expected	No impacts to Scenic Rivers expected	No impacts to Scenic Rivers expected
	Streams & Waterways	No impacts	Minor impacts to streams and waterways likely	Possible moderate impacts to streams and waterways	Possible moderate impacts to streams and waterways	Moderate impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Minor impacts to Indiana and Northern Long-eared Bat habitat likely	Moderate impacts to Indiana and Northern Long-eared Bat habitat likely	Moderate impacts to Indiana and Northern Long-eared Bat habitat likely	Moderate impacts to Indiana and Northern Long-eared Bat habitat likely
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No farmland in segment	No impacts to farmland expected	No impacts to farmland expected	No impacts to farmland expected	No impacts to farmland expected

Table 49 continued: Segment 3 - Evaluation Matrix

		NO-BUILD	CONCEPT 3D	CONCEPT 3C	CONCEPT 3B	CONCEPT 3A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Special Land Uses	No impacts	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Residential Displacements	No impacts	No residential parcel displacements expected	No residential parcel displacements expected	No residential parcel displacements expected	No residential parcel displacements expected
	Commercial Displacements	No impacts	0-10 commercial parcels with displacements	0-10 commercial parcels with displacements	0-10 commercial parcels with displacements	0-10 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected
	Bicycle/Pedestrian Connectivity for East-West Movements	1 existing grade-separated pedestrian/ bicycle crossing	Minimal to no change	1 new grade-separated crossing	3 new grade-separated crossings	3 new grade-separated crossings
	Vehicular Connectivity for East-West Traffic	5 direct east-west vehicular connections	0 direct east-west vehicular connections	1 direct east-west vehicular connection	3 direct east-west vehicular connections	3 direct east-west vehicular connections
	Circuity/Back-tracking to Public Streets	5 public streets with left turn access	3 public streets with northbound left turn access 2 public streets with southbound left turn access	3 public streets with left turn access	1 public street with left turn access	1 public street with left turn access
	Private Driveway Access to U.S. 23	No impacts	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	No direct private access points, except for northbound Kroger plaza driveway
	Public Transportation	No impacts	No impacts expected	No impacts expected	No impacts expected	No impacted expected
	K-12 Public School Access	No impacts	Moderate impact to school access expected	Low impacts to school access expected	Moderate impact to school access expected.	Moderate impact to school access expected
	Access to/from U.S. 23 for Emergency Services	No impacts	Orange Township EMS: Low impact Nationwide Children's: Low impact OhioHealth: Low impact Mount Carmel: Medium impact	Orange Township EMS: Medium impact Nationwide Children's: Low impact OhioHealth: Low impact Mount Carmel: Medium impact	Orange Township EMS: High impact Nationwide Children's: High impact OhioHealth: High impact Mount Carmel: Medium impact	Orange Township EMS: High impact Nationwide Children's: High impact OhioHealth: High impact Mount Carmel: Medium impact
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts	Minimal MOT impacts	Minimal MOT impacts	Minimal MOT impacts
	Design Standards	No impacts	Shoulder widths likely increased to current design criteria	Shoulder widths likely increased to current design criteria	Some shoulder widths less than current design criteria likely would remain	Some shoulder widths less than current design criteria likely would remain
	Major Utilities	No impacts	No impacts to major utilities expected	No impacts to major utilities expected	Possible impact to high-voltage transmission lines/towers	Possible impact to high-voltage transmission lines/towers
	Railroads	No impacts	No railroad impacts	No railroad impacts	No railroad impacts	No railroad impacts
Costs	**Right-of-Way (parcels & acres)**	No impacts	50-100 parcels 10-40 acres	50-125 parcels 20-50 acres	50-125 parcels 30-70 acres	75-150 parcels 40-80 acres
	Right-of-Way Costs (2030)	None	$10 - 25M	$15 - 30M	$10 - 25M	$25 - 45M
	User Benefit (20-year)	None	$180M	$340M	$390M	$390M
	Benefit-Cost Ratio	N/A	1.51 - 2.02	2.46 - 3.13	2.34 - 2.97	1.85 - 2.42
	Projected Costs (2030)	Routine maintenance	$125 - 160M	$145 - 190M	$175 - 220M	$220 - 285M

Table 50: Segment 4 - Evaluation Matrix

		NO-BUILD	CONCEPT 4D	CONCEPT 4C	CONCEPT 4B	CONCEPT 4A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	6-9 minutes	4-6 minutes	4-5 minutes	3-4 minutes	3-4 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	5 signals	5 signals	4 signals	No signals (free-flow)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	2 signals	0 signals	0 signals	0 signals	0 signals
	Safety - Forecasted Crashes	64 expected annual crashes 38 expected fatal/serious injury crashes over 20 years	56 predicted annual crashes 25 predicted fatal/serious injury crashes over 20 years	47 predicted annual crashes 22 predicted fatal/serious injury crashes over 20 years	24 predicted annual crashes 15 predicted fatal/serious injury crashes over 20 years	28 predicted annual crashes 14 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	92 conflicting movements	62 conflicting movements	43 conflicting movements	24 conflicting movements	12 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	No disruption to planned Cheshire Road realignment	Minimal disruption to planned Cheshire Road realignment	Greatest disruption to planned Cheshire Road realignment New connector between Cheshire Road and Pollock Road not consistent with City/ County plans	Greatest disruption to planned Cheshire Road realignment New connector between Cheshire Road and Pollock Road not consistent with City/ County plans
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	No impacts to existing parks or recreational resources expected. Possible impacts to parks under development.	No impacts to existing parks or recreational resources expected. Possible impacts to parks under development.	No impacts to existing parks or recreational resources expected. Possible impacts to parks under development.	No impacts to existing parks or recreational resources expected. Possible impacts to parks under development.
	Historic Sites	No impacts	Access point to Perkins Observatory (Ohio Wesleyan University) to change to right-in/ right-out only	Access point to Perkins Observatory (Ohio Wesleyan University) to change to right-in/ right-out only	Access point to Perkins Observatory (Ohio Wesleyan University) to change to right-in/ right-out only	Access to Perkins Observatory (Ohio Wesleyan University) would be via frontage road
	Scenic River (Olentangy River)	No impacts	Minor impacts likely due to widening of U.S. 23 bridge over Olentangy River for additional through lanes	Minor impacts likely due to widening of U.S. 23 bridge over Olentangy River for additional through lanes	No impacts to Scenic River expected	No impacts to Scenic River expected
	Streams & Waterways	No impacts	Minor impacts to streams and waterways likely	Moderate impacts to streams and waterways likely	Moderate impacts to streams and waterways likely	Moderate impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Minor impacts to Indiana and Northern Long-eared Bat habitat likely	Moderate impacts to Indiana and Northern Long-eared Bat habitat likely	Moderate impacts to Indiana and Northern Long-eared Bat habitat likely	Moderate impacts to Indiana and Northern Long-eared Bat habitat likely
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No impacts	No impacts to farmland expected	No impacts to farmland expected	No impacts to farmland expected	No impacts to farmland expected

Table 50 continued: Segment 4 - Evaluation Matrix

		NO-BUILD	CONCEPT 4D	CONCEPT 4C	CONCEPT 4B	CONCEPT 4A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	Possible right-of-way impact due to U.S. 23 widening Left turn access to Worthington Arms manufactured home park would be indirect via adjacent interchanges	Possible right-of-way impact due to U.S. 23 widening Left turn access to Worthington Arms manufactured home park would be indirect via adjacent interchanges	Left turn access to Worthington Arms manufactured home park would be indirect via adjacent interchanges	Direct access eliminated from Worthington Arms manufactured home park
	Special Land Uses	No impacts	Minor impacts likely to Camp Lazarus (Boy Scouts of America) due to widening of U.S. 23 and conversion of access point to right-in/right-out only	Minor impacts likely to Camp Lazarus (Boy Scouts of America) due to widening of U.S. 23 and conversion of access point to right-in/right-out only	Minor impacts likely to Camp Lazarus (Boy Scouts of America) due to widening of U.S. 23 and conversion of access point to right-in/right-out only	Minor impacts likely to Camp Lazarus (Boy Scouts of America) due to widening of U.S. 23 and construction of frontage road/ relocation of access point
	Residential Displacements	No impacts	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements
	Commercial Displacements	No impacts	0-20 commercial parcels with displacements	10-20 commercial parcels with displacements	10-30 commercial parcels with displacements	10-30 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected
	Bicycle/Pedestrian Connectivty for East-West Movements	3 signalized crossing locations	2 signalized crossing locations	1 grade-separated crossing	3 grade-separated crossings	3 grade-separated crossings
	Vehicular Connectivity for East-West Traffic	5 locations with direct crossing at signal	2 locations with direct crossing at signal	1 location with direct crossing at signal	3 grade-separated crossings	3 grade-separated crossings
	Circuity/Back-tracking to Public Streets	No impacts	5 public streets with left turn access	3 public streets with left turn access	3 public streets with left turn access	3 public streets with left turn access
	Private Driveway Access to U.S. 23	No impacts	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	No direct private access points
	Public Transportation	No impacts	Minimal impacts expected	Minimal impacts expected	Minimal impacts expected	Minimal impacts expected
	K-12 Public School Access	No impacts	Minimal impact due to removal of west leg of Glenn Parkway	Minimal impact due to replacement of Glenn Parkway signal with interchange	Minimal impact due to replacement of Glenn Parkway signal with interchange	Minimal impact due to replacement of Glenn Parkway signal with interchange
	Access to/from U.S. 23 for Emergency Services	No emergency service providers/first responder facilities in segment	No impacts to access for emergency service/ first response facilities	No impacts to access for emergency service/ first response facilities	No impacts to access for emergency service/ first response facilities	No impacts to access for emergency service/ first response facilities
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected
	Design Standards	No impacts	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23
	Major Utilities	No impacts	Potential minor Impacts to high-voltage transmission lines due to widening at Hyatts Road/Shanahan Road intersection	Potential minor Impacts to high-voltage transmission lines due to widening at Hyatts Road/Shanahan Road intersection	Substantial Impacts to high-voltage transmission lines likely due for grade separation and interchange at Hyatts Road/ Shanahan Road intersection	Substantial Impacts to high-voltage transmission lines likely due for grade separation and interchange at Hyatts Road/ Shanahan Road intersection
	Railroads	No railroad facilities in segment	No impacts	No impacts	No impacts	No impacts
Costs	**Right-of-Way (parcels & acres)**	No impacts	50-125 parcels 50-100 acres	50-125 parcels 70-120 acres	50-125 parcels 80-140 acres	50-125 parcels 120-210 acres
	Right-of-Way Costs (2030)	None	$20 - 40M	$25 - 50M	$40 - 70M	$45 - 85M
	User Benefit (20-year)	None	$65M	$105M	$155M	$150M
	Benefit-Cost Ratio	N/A	0.54 - 0.72	0.65 - 0.87	0.79 - 1.06	0.49 -0.65
	Projected Costs (2030)	Routine maintenance	$120 - 160M	$160 - 215M	$200 - 265M	$320 - 420M

Table 51: Segment 5 - Evaluation Matrix

		NO-BUILD	CONCEPT 5E	CONCEPT 5D	CONCEPT 5C	CONCEPT 5B	CONCEPT 5A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	5-8 minutes	3-4 minutes	3-5 minutes	2-3 minutes	2-3 minutes	2 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	8 signals (7 NB, 8 SB)	7 signals (4 NB, 7 SB)	5 signals	2 signals	1 signal	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	1 signal	0 signals	0 signals	0 signals	0 signals	0 signals
	Safety - Forecasted Crashes	78 expected annual crashes 43 expected fatal/serious injury crashes over 20 years	66 predicted annual crashes 34 predicted fatal/serious injury crashes over 20 years	53 predicted annual crashes 31 predicted fatal/serious injury crashes over 20 years	39 predicted annual crashes 20 predicted fatal/serious injury crashes over 20 years	36 predicted annual crashes 22 predicted fatal/serious injury crashes over 20 years	22 predicted annual crashes 10 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	76 conflicting movements	70 conflicting movements	62 conflicting movements	34 conflicting movements	32 conflicting movements	8 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	Retains full S. Sandusky Street connection to/from U.S. 23 Unlikely to be compatible with City of Delaware planned Southeast Connector Existing traffic patterns to/across U.S. 23 generally remain unchanged	Partial connection to/from S. Sandusky Street and U.S. 23 will remain Unlikely to be compatible with City of Delaware planned Southeast Connector Existing traffic patterns to/across U.S. 23 generally remain unchanged	Partial connection to/from S. Sandusky Street and U.S. 23 will remain Unlikely to be compatible with City of Delaware planned Southeast Connector Increased traffic on southernmost portion of Stratford Road	Loss of S. Sandusky Street connection to/from U.S. 23 Most compatible with City of Delware planned Southeast Connector Increased traffic volumes on Stratford Road Rerouting of traffic to/from retail centers and local roads	Loss of S. Sandusky Street connection to/from U.S. 23 Most compatible with City of Delaware planned Southeast Connector Greatest rerouting of traffic to/from retail centers and local roads
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	No impacts to public parks or recreation areas expected	No impacts to public parks or recreation areas expected	No impacts to public parks or recreation areas expected	No impacts to public parks or recreation areas expected	No impacts to public parks or recreation areas expected
	Historic Sites	No impacts	Minor impacts likely to Forrest Meeker House & Farm Substantial impacts likely to former Stratford Methodist Episcopal Church. Minor impact likely at other historic site west of SR 315 No impacts expected to historic sites on east side of Stratford Road	Minor impacts likely to Forrest Meeker House & Farm Moderate impacts likely to former Stratford Methodist Episcopal Church. Minimal impact likely at other historic site west of SR 315 No impacts expected to historic sites on east side of Stratford Road	Moderate impacts likely to Forrest Meeker House & Farm Substantial impacts likely to former Stratford Methodist Episocpal Chruch and other historic site on west side of U.S. 23 and SR 315 Minor impacts likely to multiple historic sites on east side of Stratford Road expected	Moderate impacts likely to Forrest Meeker House & Farm Moderate impacts likely to former Stratford Methodist Episcopal Church and other historic site on west side of U.S. 23 at SR 315 Minor impacts likely to multiple historic sites on east side of Stratford Road expected	Moderate impacts likely to Forrest Meeker House & Farm Substantial impacts likely to former Stratford Methodist Episcopal Church and other historic site on west side of U.S. 23 at SR 315 Minor impacts likely to multiple historic sites on east side of Stratford Road expected
	Scenic River (Olentangy River)	No impacts	Minor impacts likely Widening of existing U.S. 23 bridge over Olentangy River is likely	Minor impacts likely Widening of existing U.S. 23 bridge over Olentangy River is likely	Moderate impacts likely Potential for one new bridge over Olentangy River at SR 315, depending on connector road alignment Potential for widening of existing U.S. 23 bridge over Olentangy River	Minor impacts possible Potential widening of existing U.S. 23 bridge over Olentangy River	Major impacts likely Two new Olentangy River crossings likely needed for SR 315 interchange Replacement or removal of dam structure east of U.S. 23 bridge is likely
	Streams & Waterways	No impacts	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Moderate impacts to streams and waterways likely	Moderate impacts to streams and waterways likely	Moderate impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Minimal impacts to Indiana and Northern Long-eared Bat habitat likely	Minimal impacts to Indiana and Northern Long-eared Bat habitat likely	Minor impacts to Indiana and Northern Long-eared Bat habitat likely	Minor impacts to Indiana and Northern Long-eared Bat habitat likely	Minor impacts to Indiana and Northern Long-eared Bat habitat likely
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No farmland in segment	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected	No farmland impacts expected

Table 51 continued: Segment 5 - Evaluation Matrix

		NO-BUILD	CONCEPT 5E	CONCEPT 5D	CONCEPT 5C	CONCEPT 5B	CONCEPT 5A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected	No impacts to Environmental Justice and other traditionally underrepresented populations expected	Minimal impacts possible to multi-family complexes along Stratford Road, which could be impacted by U.S. 42 interchange	Minimal impacts possible to multi-family complexes along Stratford Road, which could be impacted by U.S. 42 interchange
	Special Land Uses	No impacts	Minor impacts likely to Stratford Ecological Center for U.S. 23 widening	Minor impacts likely to Stratford Ecological Center for U.S. 23 widening	Moderate impacts likely to Stratford Ecological Center for U.S. 23 widening and potential SR 315 connector road	Minor impacts likely to Stratford Ecological Center for U.S. 23 widening	Moderate impacts likely to Stratford Ecological Center for interchange at SR 315
	Residential Displacements	No impacts	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements
	Commercial Displacements	No impacts	0-10 commercial parcels with displacements	0-10 commercial parcels with displacements	10-30 commercial parcels with displacements	10-30 commercial parcels with displacements	10-30 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected	Moderate noise impacts likely	Moderate noise impacts likely	Moderate noise impacts likely
	Bicycle/Pedestrian Connectivty for East-West Movements	4 signalized crossing locations	3 signalized crossing locations	4 signalized crossing locations	2 grade-separated crossing locations 2 signalized crossing locations	3 grade-separated crossing locations 1 signalized crossing location	4 grade-separated crossing locations
	Vehicular Connectivity for East-West Traffic	2 locations with direct crossing at signal	2 locations with direct crossing at signal	2 locations with direct crossing at signal	2 grade-separated crossings	4 grade-separated crossings 1 location with direct crossing at signal	5 grade-separated crossings
	Circuity/Back-tracking to Public Streets	No impacts	Minimal impacts expected	Left turn restrictions at many intersections	Left turn restrictions at many intersections Removal of Delaware Plaza North intersection	Nearly all left turns to/from U.S. 23 would be indirect movements Removal of Delaware Plaza North & Cottswold Drive intersections	No public street access between SR 315 and U.S. 42 Stratford Road and other local roads used for connectivity
	Private Driveway Access to U.S. 23	No impacts	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	Most existing driveways would remain All private driveways would be right-in/right-out only	No direct private access points
	Public Transportation	No impacts	Minimal impacts expected	Minimal impacts expected	Minimal impacts expected	Minimal impacts expected	Moderate impacts expected due to limited U.S. 23 access points
	K-12 Public School Access	No K-12 public schools in segment	No impacts to K-12 public schools	No impacts to K-12 public schools	No impacts to K-12 public schools	No impacts to K-12 public schools	No impacts to K-12 public schools
	Access to/from U.S. 23 for Emergency Services	No impacts	Minimal potential impacts on access to/from OSHP outpost	Minimal potential impacts on access to/from OSHP outpost	Minimal potential impacts on access to/from OSHP outpost	Potential impacts on access to/from OSHP outpost	Potential impacts on access to/from OSHP outpost
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected
	Design Standards	Some shoulder widths less than current design standards	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23
	Major Utilities	No impacts	Impacts to major utilities unlikely	Impacts to major utilities unlikely	Impacts to major utilities unlikely	Potential impacts to high-voltage lines at Cottswold Drive due to overpass	Likely impacts to Olentangy River dam Potential impacts to high-voltage lines at Cottswold Drive due to overpass
	Railroads	No railroads in segment	No impacts	No impacts	No impacts	No impacts	No impacts
Costs	**Right-of-Way (parcels & acres)**	No impacts	25-100 parcels 10-40 acres	50-100 parcels 20-40 acres	75-150 parcels 40-90 acres	75-175 parcels 40-80 acres	100-200 parcels 60-110 acres
	Right-of-Way Costs (2030)	None	$15 - 30M	$20 - 40M	$45 - 80M	$55 -95M	$70 - 115M
	User Benefit (20-year)	None	$165M	$165M	$245M	$255M	$280M
	Benefit-Cost Ratio	N/A	1.42 - 1.93	1.06 - 1.42	1.08 - 1.43	0.99 - 1.33	0.86 - 1.15
	Projected Costs (2030)	Routine maintenance	$115 - 155M	$160 - 210M	$230 - 305M	$260 - 345M	$335 - 445M

Table 52: Segment 6 - Evaluation Matrix

		NO-BUILD	CONCEPT 6D	CONCEPT 6C	CONCEPT 6B	CONCEPT 6A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	10-18 minutes	5-7 minutes	4-5 minutes	3-4 minutes	3 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	5 signals (4 NB, 5 SB)	5 signals	1 signal	No signals (free-flow)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	4 signals	1 signal	0 signals	0 signals	0 signals
	Safety - Forecasted Crashes	50 expected annual crashes 33 expected fatal/serious injury crashes over 20 years	23 predicted annual crashes 12 predicted fatal/serious injury crashes over 20 years	34 predicted annual crashes 18 predicted fatal/serious injury crashes over 20 years	25 predicted annual crashes 14 predicted fatal/serious injury crashes over 20 years	23 predicted annual crashes 12 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	55 conflicting movements	48 conflicting movements	32 conflicting movements	14 conflicting movements	16 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	Can most easily accommodate a potential future Pennsylvania Avenue extension Full movements at U.S. 23 for new Merrick Parkway arterial Future eastern connection would be at Hills-Miller Road	Can most easily accommodate a potential future Pennsylvania Avenue extension New Merrick Parkway arterial would only have right-in/right-out movements Future eastern connection would be at Hills-Miller Road	More challenging to accommodate a potential future Pennsylvania Avenue extension Restricted movements to/from northbound U.S. 23 for new Merrick Parkway arterial Future eastern connection would be at Hills-Miller Road	More challenging to accommodate a potential future Pennsylvania Avenue extension Full movements at U.S. 23 for new Merrick Parkway arterial Future eastern connection would be at Panhandle Road
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	Minor impacts likely at Mingo Park due to new northbound ramp to Pennsylvania Avenue Minor impact likley to Riverview Park due to U.S. 23 widening	Minor impact likely at Mingo Park due to northbound ramp addition Minor impact likely to Riverview Park due to U.S. 23 widening	Minor impact likely at Mingo Park due to northbound ramp addition Minor impact likely to Riverview Park due to U.S. 23 widening. Driveway will be converted to right-in/right-out operation	Minor impact likely at Mingo Park due to northbound ramp addition Access to Riverview Park will be from frontage road only
	Historic Sites	No impacts	Minimal potential impact to Historic Northwest District	Minimal potential impact to Historic Northwest District	Moderate impact likely to properties in Historic Northwest District due to southbound ramps	Moderate Impact likely to properties in Historic Northwest District due to southbound ramps Minor impact likely to 175 Hudson Road property due to interchange ramps at Merrick Parkway/Panhandle Road
	Scenic River (Olentangy River)	No impacts	Substantial impact likely near Panhandle Road due to U.S. 23 widening Moderate impact likely near Pennsylvania Avenue due to new northbound interchange ramps	Moderate impact likely near Pennsylvania Avenue due to new northbound interchange ramps	Possible impact near Panhandle Road due to overpass/underpass Moderate impact likely near Pennsylvania Avenue due to new northbound interchange ramps	Substantial impact likely near Panhandle Road due to likelihood of multiple new bridge crossings for interchange ramps Moderate impact likely near Pennsylvania Avenue due to new northbound interchange ramps
	Streams & Waterways	No impacts	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Substantial impacts likely to Indiana and Northern Long-eared Bat habitat at Pennsylvania Avenue interchange	Substantial impacts likely to Indiana and Northern Long-eared Bat habitat at Pennsylvania Avenue interchange	Substantial impacts likely to Indiana and Northern Long-eared Bat habitat at Pennsylvania Avenue interchange	Substantial impacts likely to Indiana and Northern Long-eared Bat habitat at Pennsylvania Avenue interchange and Merrick Parkway/Panhandle Road interchange
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No impacts	No farmland impacts expected	No farmland impacts expected	Minor impact to farmland likely near Coover Road	Major impact to farmland likely in vicinity of Merrick Parkway/Panhandle Road interchange

Table 52 continued: Segment 6 - Evaluation Matrix

		NO-BUILD	CONCEPT 6D	CONCEPT 6C	CONCEPT 6B	CONCEPT 6A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	Possible displacements in manufactured home park due to U.S. 23 widening	Least potential for displacements in manufactured home park	Possible manufactured home displacements due to revised access system	Greatest displacements likely in manufactured home park due to Panhandle Road interchange and revised access system
	Special Land Uses	No impacts	Minor impact likely to Delaware County Fairgrounds due to relocation of U.S. 23 access point to frontage road	Minor impact likely to Delaware County Fairgrounds due to relocation of U.S. 23 access point to frontage road	Minor impact likely to Delaware County Fairgrounds due to conversion of U.S. 23 access point to right-in/right-out only	Minor impact likely to Delaware County Fairgrounds due to adjacent U.S. 23 widening and conversion of access point to right-in/right-out only
	Residential Displacements	No impacts	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements
	Commercial Displacements	No impacts	0-10 commercial parcels with displacements	0-10 commercial parcels with displacements	10-30 commercial parcels with displacements	10-40 commercial parcels with displacements
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor noise impacts likely	Minor noise impacts likely	Moderate noise impacts likely	Moderate noise impacts likely
	Bicycle/Pedestrian Connectivty for East-West Movements	No bicycle/pedestrian facilities	1 signalized crossing location	2 grade-separated crossings 1 signalized crossing location	4 grade-separated crossings	4 grade-separated crossings
	Vehicular Connectivity for East-West Traffic	Direct signalized east-west connection at Merrick Pkwy./Panhandle Rd.	No direct east-west connecttion at Merrick Pkwy./Panhandle Rd.	No direct east-west connecttion at Merrick Pkwy./Panhandle Rd.	Grade-separated east-west connection at Merrick Pkwy./Panhandle Rd.	Grade-separated east-west connection at Merrick Pkwy./Panhandle Rd.
	Circuity/Back-tracking to Public Streets	Full access at all public street intersections	Indirect left turns onto U.S. 23 from public streets south of Hills-Miller Road No change to public street access north of Hills-Miller Road	Public streets converted to right-in/right-out access south of Hills-Miller Road No change to public street access north of Hills-Miller Road	Direct access to U.S. 23 only at interchanges south of Hills-Miller Road Public streets converted to right-in/right-out access north of Hills-Miller Road	Direct access to U.S. 23 only at interchanges
	Private Driveway Access to U.S. 23	No impacts	<u>South of Hills-Miller Road:</u> Most existing driveways would remain. All private driveways would be right-in/right-out only <u>North of Hills-Miller Road:</u> No change in access for private driveways	<u>South of Hills-Miller Road:</u> Most existing driveways would remain All private driveways would be right-in/right-out only <u>North of Hills-Miller Road:</u> No change in access for private driveways	<u>South of Hills-Miller Road:</u> No direct private access points. All access via frontage/backage roads <u>North of Hills-Miller Road:</u> Most existing driveways would remain. All private driveways would be right-in/right-out only	No direct private access points. All access via frontage/backage roads
	Public Transportation	No impacts	No impacts to public transportation expected	No impacts to public transportation expected	No impacts to public transportation expected	No impacts to public transportation expected
	K-12 Public School Access	No impacts	Existing school bus stops on U.S. 23 within area of widening would have to be relocated	Minimal impacts to K-12 public school access	Grade-separation at Coover Road could improve safety for Buckeye Valley students School bus stops on U.S. 23 south of Hills-Miller Road would have to be relocated	Grade-separation at Coover Road could improve safety for Buckeye Valley students School bus stops on U.S. 23 would have to be relocated
	Access to/from U.S. 23 for Emergency Services	No impacts	County EMS Station 1 would have right-in/right-out only access	County EMS Station 1 would have right-in/right-out only access	County EMS Station 1 would access frontage road instead of U.S. 23	County EMS Station 1 would access frontage road instead of U.S. 23
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected	Minimal MOT impacts expected
	Design Standards	No impacts	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23	Potential for substandard shoulder widths on U.S. 23
	Major Utilities	No impacts	No impacts to major utilities expected	No impacts to major utilities expected	No impacts to major utilities expected	No impacts to major utilities expected
	Railroads	No impacts	No impacts to railroads expected	No impacts to railroads expected	No impacts to railroads expected	No impacts to railroads expected
Costs	**Right-of-Way (parcels & acres)**	No impacts	25-100 parcels 10-30 acres	50-100 parcels 30-60 acres	100-200 parcels 80-150 acres	100-200 parcels 140-250 acres
	Right-of-Way Costs (2030)	None	$15 - 25M	$10 - 20M	$40 - 70M	$50 - 90M
	User Benefit (20-year)	None	$280M	$370M	$400M	$400M
	Benefit-Cost Ratio	N/A	3.70 - 5.04	4.31 - 5.64	1.58 - 2.06	1.07 - 1.39
	Projected Costs (2030)	Routine maintenance	$75 - 105M	$90 - 115M	$265 - 345M	$390 - 510M

Table 53: Segment 7 - Evaluation Matrix

		NO-BUILD	CONCEPT 7D	CONCEPT 7C	CONCEPT 7B	CONCEPT 7A
Primary Needs	**U.S. 23 Through Travel Times Through Segment**	6-8 minutes	5-7 minutes	5-7 minutes	5-7 minutes	5-7 minutes
	Travel Time Reliability - Number of Signals on U.S. 23	2 signals	2 signals	No signals (free-flow)	No signals (free-flow)	No signals (free-flow)
	Travel Time Reliability - Intersections at LOS E or Worse	0 signals	0 signals	0 signals	0 signals	0 signals
	Safety - Forecasted Crashes	36 expected annual crashes 29 expected fatal/serious injury crashes over 20 years	24 predicted annual crashes 19 predicted fatal/serious injury crashes over 20 years	21 predicted annual crashes 16 predicted fatal/serious injury crashes over 20 years	20 predicted annual crashes 18 predicted fatal/serious injury crashes over 20 years	31 predicted annual crashes 17 predicted fatal/serious injury crashes over 20 years
	Safety - Conflicting Movements for U.S. 23 Through Traffic	63 conflicting movements	56 conflicting movements	48 conflicting movements	42 conflicting movements	34 conflicting movements
Secondary Need	**Consistency with Local Plans**	No change	Existing one-way frontage roads likely less compatible for commercial development in U.S. 23 corridor	Inconsistent with Township goal of having fewer direct access points on U.S. 23	Would result in frontage roads becoming County/Township maintained Two-way frontage roads may enhance ability for commercial development in U.S. 23 corridor	Would result in frontage roads becoming County/Township maintained New grade separation and two-way frontage roads may enhance ability for commercial development in U.S. 23 corridor
Natural & Cultural Resource Impacts	**Park & Recreational Resources**	No impacts	Minor impact likely to Delaware State Park due to widening for U-turn locations and access change for left turns out of park driveways	Minor impact likely to Delaware State Park due to widening for U-turn locations and access change for left turns out of park driveways	Minor impact likely to Delaware State Park due to widening for U-turn locations and access change for left turns to/from park driveways	Minor impact likely to Delaware State Park due to new frontage road east of U.S. 23 Minor impact likely to Delaware State Park due to widening for U-turn locations and access change for left turns to/from park driveways
	Historic Sites	No impacts	No impacts to historic sites expected	No impacts to historic sites expected	No impacts to historic sites expected	No impacts to historic sites expected
	Scenic River (Olentangy River)	No impacts	No impacts to Scenic River expected	No impacts to Scenic River expected	No impacts to Scenic River expected	No impacts to Scenic River expected
	Streams & Waterways	No impacts	Minimal impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely	Minor impacts to streams and waterways likely
	Endangered Species Habitat	No impacts	Minimal impacts to Indiana and Northern Long-eared Bat habitat likely	Minor impacts to Indiana and Northern Long-eared Bat habitat likely	Minor impacts to Indiana and Northern Long-eared Bat habitat likely	Minor impacts to Indiana and Northern Long-eared Bat habitat likely
	Regulated Materials	No impacts	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected	Minor potential regulated materials impacts expected
	Farmland	No impacts	Minimal farmland impacts expected	Minimal farmland impacts expected	Minimal farmland impacts expected	Minor farmland impacts expected

Table 53 continued: Segment 7 - Evaluation Matrix

		NO-BUILD	CONCEPT 7D	CONCEPT 7C	CONCEPT 7B	CONCEPT 7A
Community Impacts	**Environmental Justice and Other Traditionally Underrepresented Populations**	No impacts	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Special Land Uses	No special land uses in segment	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Residential Displacements	No impacts	No residential parcels with displacements expected	0-10 residential parcels with displacements	0-10 residential parcels with displacements	0-10 residential parcels with displacements
	Commercial Displacements	No impacts	No commercial parcels with displacements expected	No commercial parcels with displacements expected	No commercial parcels with displacements expected	No commercial parcels with displacements expected
	Air Quality	No impacts	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected	Minor air quality impacts expected
	Noise Sensitive Areas	No impacts	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected	Minor or no noise impacts expected
	Bicycle/Pedestrian Connectivty for East-West Movements	No bicycle/pedestrian facilities in segment	No bicycle/pedestrian facilities	Potential bicycle/pedestrian connection at new SR 229 grade separation	Potential bicycle/pedestrian connection at new SR 229 grade separation	Potential bicycle/pedestrian connection at two new grade separations - at SR 229 and near Irwin Road
	Vehicular Connectivity for East-West Traffic	One direct east-west vehicular connection	No direct east-west vehicle connections	One direct east-west vehicular connection	One direct east-west vehicular connection	One direct east-west vehicular connection
	Circuity/Back-tracking to Public Streets	No impacts	Indirect left turns onto U.S. 23 south of Troutman Road	Indirect left turns onto U.S. 23 south of Troutman Road and at Radnor Road	Indirect left turns to and from U.S. 23 south of Troutman Road Minimal change in circuity in frontage road area due to two-way conversion	Indirect left turns to and from U.S. 23 south of Troutman Road Minimal change in circuity in frontage road area due to two-way conversion
	Private Driveway Access to U.S. 23	No impacts	<u>South of Troutman Road:</u> Driveways to be converted to right-in/right-out only <u>North of Troutman Road:</u> No change in access for private driveways	<u>South of Troutman Road:</u> Driveways to be converted to right-in/right-out only <u>North of Troutman Road:</u> Over a dozen private access drives with direct access on U.S. 23	<u>South of Troutman Road:</u> Driveways to be converted to right-in/right-out only <u>North of Troutman Road:</u> Closure of all median breaks and U.S. 23 access points. Driveways will access two-way frontage road.	<u>South of Troutman Road:</u> Driveways to be converted to right-in/right-out only <u>North of Troutman Road:</u> Closure of all median breaks and U.S. 23 access points. Driveways will access two-way frontage road.
	Public Transportation	No impacts	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected	Minimal or no impacts to public transportation expected
	K-12 Public School Access	No K-12 schools in semgent	No impacts to K-12 school access expected	No impacts to K-12 school access expected	No impacts to K-12 school access expected	No impacts to K-12 school access expected
	Access to/from U.S. 23 for Emergency Services	No emergency service providers or first repsonders in segment	No impacts to emergency services expected	No impacts to emergency services expected	No impacts to emergency services expected	No impacts to emergency services expected
Infrastructure Impacts	**Maintenance of Traffic (MOT)**	No impacts	Minimal MOT impacts to U.S. 23	Minimal MOT impacts to U.S. 23 Potential long-term closure for grade separation of SR 229	Minimal MOT impacts to U.S. 23 Potential long-term closure for grade separation of SR 229	Minimal MOT impacts to U.S. 23 Potential long-term closure for grade separation of SR 229
	Design Standards	Some shoulder widths less than current design standards	No impacts expected	No impacts expected	No impacts expected	No impacts expected
	Major Utilities	No impacts	No impacts to major utilities expected	No impacts to major utilities expected	No impacts to major utilities expected	No impacts to major utilities expected
	Railroads	No impacts	No impacts to railroads expected	No impacts to railroads expected	No impacts to railroads expected	No impacts to railroads expected
Costs	**Right-of-Way (parcels & acres)**	No impacts	0-25 parcels 0-10 acres	0-50 parcels 10-30 acres	0-50 parcels 10-30 acres	25-50 parcels 10-30 acres
	Right-of-Way Costs (2030)	None	$0.1 - 0.2M	$0.7 - 1.2M	$0.8 - 1.3M	$1.2 - 1.9M
	User Benefit (20-year)	None	$25M	$45M	$45M	$40M
	Benefit-Cost Ratio	N/A	1.08 - 1.35	0.83 - 1.01	0.60 - 0.75	0.37 - 0.45
	Projected Costs (2030)	Routine maintenance	$25 - 30M	$60 -75M	$80 - 100M	$125 - 160M