Assessment of Feasible Alternatives

GRE-35-4.26
PID 80468

Prepared for

Ohio Department of Transportation

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Contents

Exhibits

Appendices

Volume 1

Volume 2 (included on CD at the back of this document)

T Maintenance of Traffic Alternative Analysis (MOTAA)
U Highway Lighting Considerations and Warrant Analysis Technical Memorandum
V Drainage Criteria (Form LD-35 and Addendum)
W Drainage Technical Memorandum
X Value Engineering Study and Recommendations
Y Culvert Inspection Report
Z Preliminary Geotechnical Exploration Report
AA Evaluation of Geological and Geotechnical Concerns and Preliminary Recommendations
BB Retaining Wall Justification Issues Technical Memorandum
CC Bridge Geometry Evaluation Technical Memorandum
DD Environmental Site Assessment Screening Addendum
EE Environmental Site Assessment Phase I
FF Environmental Site Assessment Phase I Addendum
GG Phase I Historical/Architecture Addendum
HH Phase II Historical/Architecture Report
II Section 4(f) Determination Report
JJ Preliminary Noise Analysis Report
KK Estimated Project Right of Way Costs

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1. Introduction

1.1. History of Project

In 2004, the Miami Valley Regional Planning Commission (MVRPC) in cooperation with the Ohio Department of Transportation (ODOT) completed the *Greene 35 Corridor Study*, to recommend a strategy to convert the section of US 35 between the North Fairfield Interchange and the Xenia Bypass to a controlled access highway facility. This section of US 35 carries 39,000 vehicles per day, has five at-grade intersections, including three that are signalized, and is the only segment of US 35 between I-75 and West Virginia that is not a fully controlled access highway facility. Designated a "macro" corridor by the Ohio Department of Transportation, US 35 is primarily intended to carry long distance trips and facilitate the movement of people and goods on a regional and statewide level. Two previous studies (ODOT, 1982 and MVRPC, 1998) also recommended conversion of US 35 to a limited-access facility. In 2009, ODOT completed the Conceptual Alternatives Study. Based on the findings from the study, two alternatives for both the Factory-Orchard and Valley-Trebein sections were recommended for further evaluation as part of the Assessment of Feasible Alternatives Study). It is possible to combine either alternative at Factory-Orchard with either alternative at Valley-Trebein to provide a complete solution.

The *Greene 35 Corridor Study* is the planning level study envisioned by Steps 1-4 and the Conceptual Alternatives Study (CAS) is Step 5 of the ODOT Project Development Process (PDP) for a Major Project. In the PDP, the current study is Step 6 – Assessment of Feasible Alternatives (AFA).

ODOT completed a draft of the AFA study In June 2010. This draft study examined two alternatives for the Factory-Orchard section and two alternatives for Valley-Trebein section. A value engineering study was subsequently conducted to identify opportunities to enhance the value of the traffic and construction improvements. In June 2011, based on these findings, and with additional input from the stakeholders, a total of four alternatives for the Factory Road section and three alternatives for the Valley-Trebein section were recommended, for further evaluation to facilitate the selection of a preferred alternative for the corridor.

1.2. Purpose and Need

The purpose of the GRE-35-4.26 project is to improve safety and travel efficiency within the study area on a freeway level highway that considers impacts on local businesses to the

degree consistent with the safety, travel efficiency, system linkage goals and fiscal responsibility.

The main transportation needs for the area were identified in the *Greene 35 Corridor Study*:

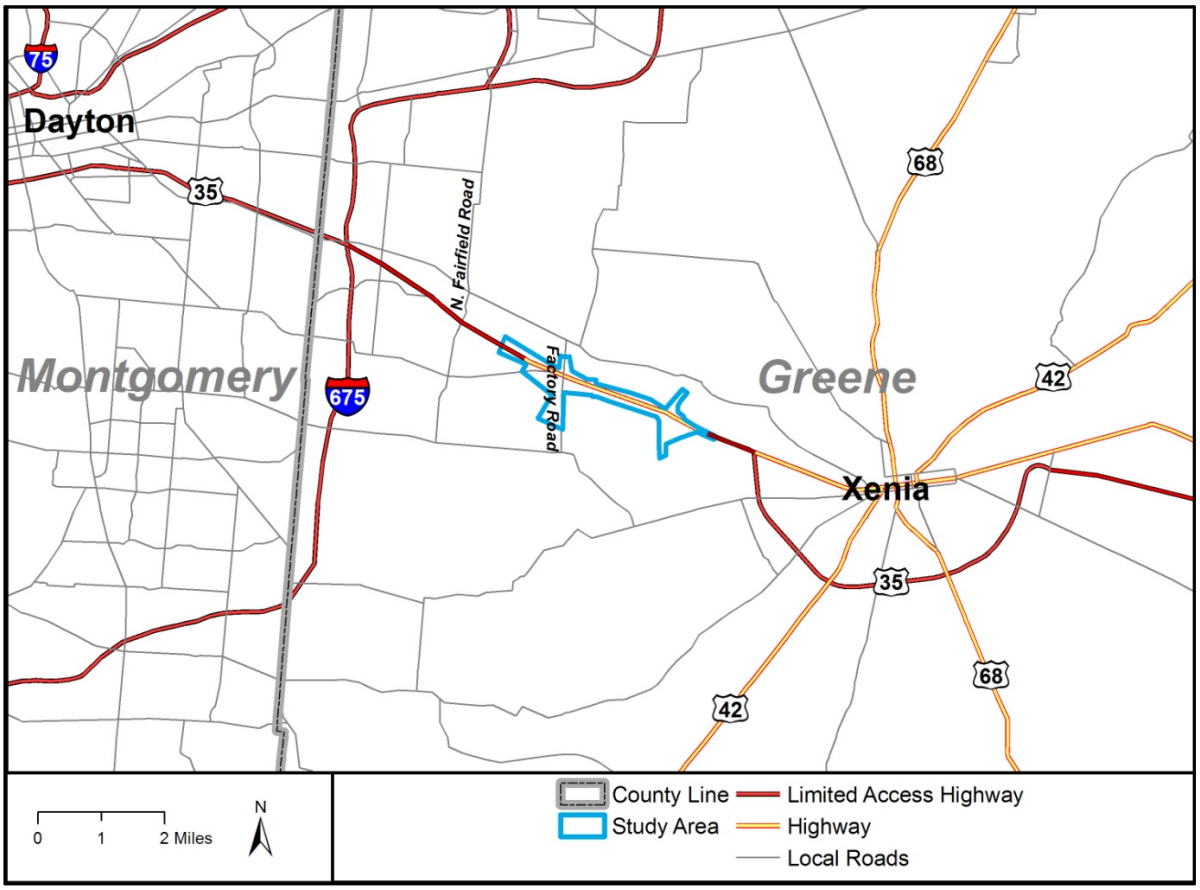
- Travel efficiency
- Traffic safety
- System linkage

Travel efficiency is the predominant transportation issue in the project area. US 35, with five at-grade intersections in the study area, does not have enough capacity to serve existing transportation demands. The 2003 levels of service reported in the conceptual alternative study indicated the conditions were at or close to failing at the US 35/ Factory Road intersection. By 2038, the signalized intersections on US 35 at Factory and Valley-Trebein are forecast to be Level of Service (LOS) F.

Safety and congestion are some of the primary problems noted in this section of US 35. The area has been historically identified both locally and statewide as a high crash area. The segment targeted for improvement with this project is currently ranked on both the 2008 High Crash List (#736) and 2008 Congestion list (#59) for non-freeway roadway segments under the Highway Safety Program.

Access Ohio – Macro Phase is Ohio's long-range transportation plan. In that study, US 35 is designated as a macro corridor, a corridor with statewide significance for Ohio's economic vitality. A macro corridor is intended primarily to carry longer distance trips and not to provide closely spaced access points to service adjacent land. The section of US 35 between North Fairfield Road and the Xenia Bypass currently has five at-grade intersections that are inconsistent with the macro-corridor designation (Exhibit 1A). Following the *Access Ohio* plan, converting US 35 to an expressway system with interchanges at Factory Road and Valley-Trebein Road was evaluated as possible alternatives in the CAS. Adding capacity to the existing intersection was not evaluated as it does not follow the *Access Ohio – Marco Phase* plan.

EXHIBIT 1A
US 35 Vicinity Map

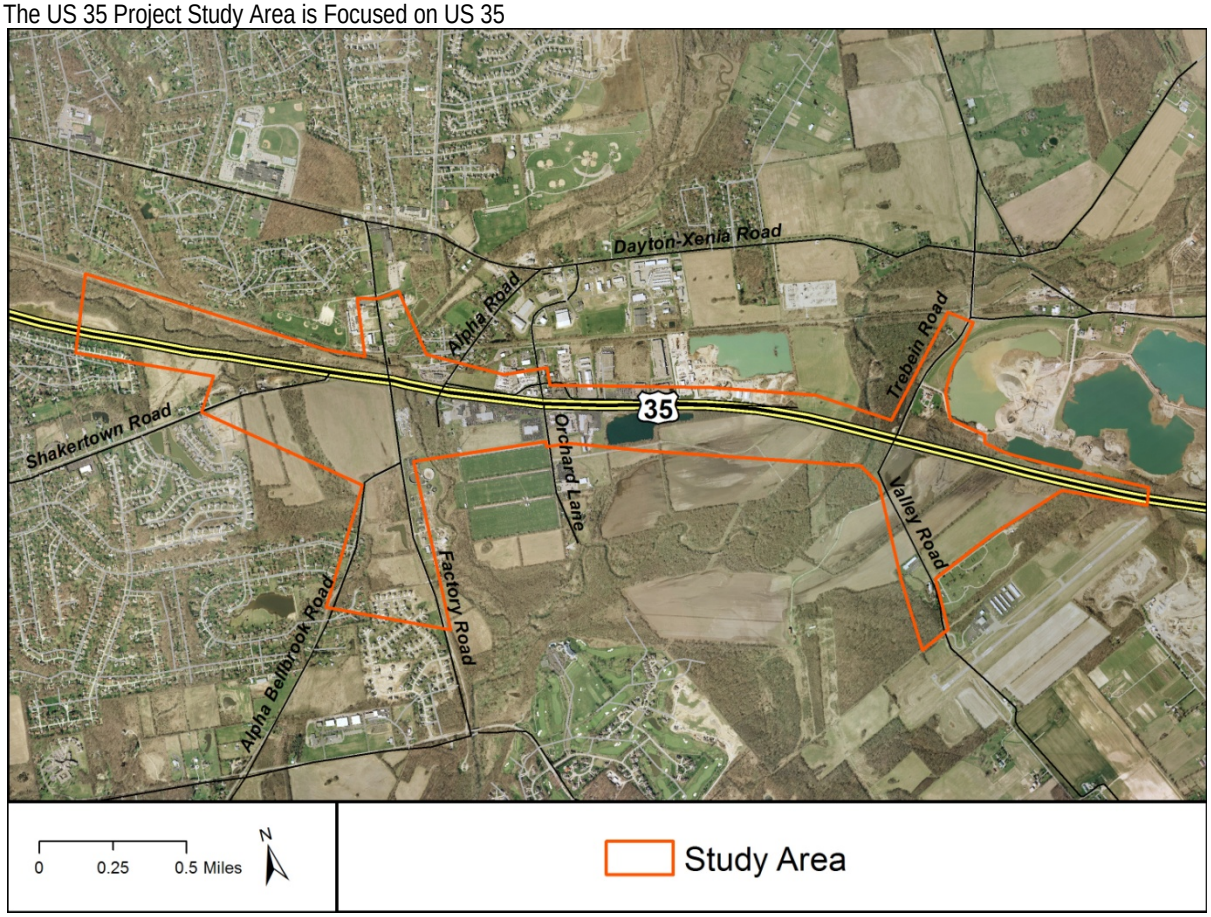


1.3. Study Area Limits

The study area is centered on the section of US 35 between North Fairfield Road and the Xenia Bypass (Exhibit 1B). This is the one remaining segment of US 35 between I-75 and West Virginia that is not a fully controlled access highway facility.

The study area extends along Shakertown Road, Alpha-Bellbrook Road, Factory Road, Valley Road, and Trebein Road a distance sufficient to accommodate improvements to those roads that might also be required by the conversion of the segment of US 35 to an expressway.

EXHIBIT 1B
The US 35 Project Study Area is Focused on US 35



2. Traffic Engineering Baseline

2.1. Design and Legal Speeds

Legal speeds in the study area will be unchanged by the implementation of the project. Design and posted (legal) speeds limits are shown in Exhibit 2.

EXHIBIT 2
Design Speed and Posted Speed on Select Roadway Segments

Roadway	Design Speed	Posted (Legal) Speed
US 35	65 mph	55 mph
Trebein Road	60 mph	55 mph
Shakertown Road	45 mph	40 mph
Factory Road	45 mph	40 mph
Alpha-Bellbrook Road	45 mph	40 mph
Valley Road	60 mph	55 mph
Frontage roads	35 mph	30 mph
Orchard Lane	25 mph	25 mph
Heller Drive	25 mph	25 mph

2.2. Functional Classification

US 35 between North Fairfield Road and the Xenia Bypass is currently classified as a Principal Arterial. The portion of US 35 at either end of this segment is classified as expressway. The proposed project will result in the reclassification of the principal arterial segment of US 35 to an expressway consistent with the classification at either terminus.

Also in the study area, Fairfield Road, Dayton-Xenia Road, Indian-Ripple Road, and Upper Bellbrook Road are classified as Minor Arterials. Shakertown Road, Alpha-Bellbrook Road, Factory Road, and Valley Road are classified as Collectors. All other roads in the study area are classified Local Roads.

2.3. Projected Traffic Volumes

Exhibit 3A shows opening day and design year traffic along US 35 and within the study area. The existing safety and operational problems identified within the study area are not expected to improve with traffic volumes projected to steadily increase under the existing conditions. On both the east and west limits of the study area, the average daily traffic (ADT) is projected to grow on average by approximately 0.7 percent annually between 2018 and 2038. Between Factory Road and Valley-Trebein the average annual growth for that same period is close to 0.7 percent as well. Similarly, as shown by the representative traffic for Factory and Valley-Trebein, at locations immediately north and south of US 35, the local roadway system growth parallels the US 35 traffic growth. Comprehensive traffic data, including ODOT Certified Traffic Forecasts, is included in Appendix A.

EXHIBIT 3A
Opening Day and Projected Design Year Traffic on US 35 – No-Build Alternative[1]

Roadway/Segment	ADT		AM Peak		PM Peak	
Year	2018	2038	2018	2038	2018	2038
US 35 Westbound						
West of Factory	19,500	23,600	2,290	2,780	1,630	2,000
Factory to Alpha	17,080	20,660	1,650	2,010	1,570	1,920
Alpha to Orchard	16,510	19,890	1,620	1,960	1,530	1,860
Orchard to Valley-Trebein	16,050	19,340	1,560	1,890	1,440	1,760
East of Valley-Trebein	16,750	20,160	1,610	1,930	1,660	2,010
US 35 Eastbound						
West of Factory	17,310	20,930	1,650	1,990	2,220	2,660
Factory to Alpha	15,510	18,690	1,470	1,760	1,900	2,290
Alpha to Orchard	14,450	17,360	1,340	1,610	1,780	2,120
Orchard to Valley-Trebein	14,730	17,670	1,290	1,550	1,870	2,240
East of Valley-Trebein	15,020	18,070	1,270	1,540	1,940	2,330
Factory Road Northbound						
North of US 35	3,220	3,530	380	420	530	570
South of US 35	2,940	3,510	460	550	330	390
Factory Road Southbound						
North of US 35	3,690	4,050	570	630	410	440
South of US 35	2,790	3,330	190	220	470	550
Valley-Trebein Northbound						
North of US 35	3,600	3,870	390	400	450	480
South of US 35	810	990	110	120	70	70
Valley-Trebein Southbound						
North of US 35	3,160	3,410	270	290	380	410
South of US 35	780	950	60	60	150	160

2.4. Opening Day and Design Year Level of Service - Existing Conditions

Exhibit 3B shows LOS for the intersections along US 35 for Opening Day and Design Year traffic volumes under existing conditions. The intersection of US 35 and Factory Road currently experiences, and is projected to continue to experience, lengthy delays during both AM and PM traffic peaks. While the intersections of Alpha and Valley-Trebein will operate within acceptable levels of service based on analysis of 2018 traffic volumes, by 2038 the operation of these intersections during both the AM and PM peak periods will degrade to

[1] Source: ODOT Certified Traffic Forecasts April 30, 2010 (See Appendix A)

unacceptable levels at or near failure. Under these conditions, all approaches will experience lengthy delays during at least one peak period of the day and affect the operation of the adjacent roadway network.

EXHIBIT 3B
Opening Day and Projected Design Year LOS on US 35 – No-Build Alternative

Roadway/Segment	AM Peak		PM Peak	
	2018	2038	2018	2038
US 35 Study Area Intersections*				
Shakertown	C/C	E/E	F/E	F/F
Factory	F	F	F	F
Alpha	C/C	E/F	C/C	E/F
Orchard	C	C	C	D
Valley-Trebein	C	D	D	F

Alpha Road is stop controlled with EB and WB through movements free flowing and with NB and SB approaches stop controlled. These results reflect the critical (worst) movement LOS for EB or WB left-turns and critical approach LOS for NB or SB.

Shakertown Road is stop controlled with EB and WB through movements free flowing and with NB approach stop controlled. These results reflect the LOS for EB left-turns and LOS for NB approach.

Factory, Orchard, and Valley-Trebein are signal controlled and these results reflect the overall intersection LOS.

3. Introduction to the Feasible Alternatives

3.1. No-Build Alternative

The no-build alternative would retain the current configuration of the stretch of US 35 between North Fairfield Road and the Xenia Bypass. This would include 2 lanes of traffic in each direction and signalized intersections at Factory, Orchard, and Valley-Trebein.

3.2. Build Alternatives

In order to meet the purpose and need of this project, the alternatives must improve travel efficiency, traffic safety, and system linkage. Although travel efficiency and traffic safety can be improved in many ways, to meet system linkage requirements, the US 35 corridor needs to be upgraded to a freeway facility to be consistent with the *Access Ohio – Macro Phase* transportation plan. This requires alternatives to replace at-grade intersections with grade-separated intersections. Therefore, build alternatives were developed to create a fully controlled access facility for US 35 within the study area while maintaining accessibility to local street networks and land uses. Two build interchange alternatives were developed in the Conceptual Alternatives Study (CAS).

As a result of a project stakeholder's meetings, along with ODOT review comments, refinements were made to the two build interchange alternatives from the CAS. These refined alternatives were evaluated, as part of the *draft* Assessment of Feasible Alternatives (June 2010). As part of the evaluation, a value engineering study was conducted to identify opportunities to enhance the value of the traffic and construction improvements. Based on these findings, with additional input from the stakeholders and ODOT review comments, two additional alternatives for the Factory-Orchard section and one additional alternative for the Valley-Trebein section were recommended, yielding a total of four alternatives at the Factory-Orchard section and three alternatives at the Trebein-Valley sections, for further evaluation to facilitate the selection of a preferred alternative for the corridor. For additional details from the stakeholder's meetings and ODOT review comments, refer to Section 5.

Brief descriptions of the alternatives at Factory-Orchard section follow:

- Feasible Alternative 1A is a refinement of Conceptual Alternative 1. It provides a tight diamond interchange at Factory Road. US 35 would bridge over Factory Road. Since Orchard Lane would not cross US 35, there would be a T-intersection at Orchard Lane and Heller Drive north of US 35 and a second T-intersection at Orchard and the new frontage road south of US 35. There would be no direct connection between Orchard Lane and US 35.
- Feasible Alternative 2A is similar to Feasible Alternative 1A but an elevated US 35 would bridge over Orchard Lane and T-intersections would not be required. There would be no direct connection between Orchard Lane and US 35.

- Feasible Alternative 2 is a refinement of Conceptual Alternative 2. It provides a split diamond interchange at Factory Road-Orchard Lane and has Factory Road bridging over US 35.
- Feasible Alternative 3B is similar to Feasible Alternative 1A except Factory Road would bridge over US 35. The interchange at Factory Road would be a tight diamond. Since Orchard Lane would not cross US 35, there would be a T-intersection at Orchard Lane and Heller Drive north of US 35; and Orchard Lane would connect to the new frontage road south of US 35. There would be no direct connection between Orchard Lane and US 35.

Brief descriptions of the alternatives at Valley-Trebein section follow:

- Feasible Alternative 1A is a refinement of Conceptual Alternative 1. It provides a tight diamond interchange at Valley Road-Trebein Road and a loop ramp in the southwest quadrant.
- Feasible Alternative 2A is a refinement of Conceptual Alternative 1. It provides a tight diamond ramp configuration, north of US 35, and conventional diamond interchange configuration south of US 35, at Valley Road-Trebein Road.
- Feasible Alternative 5B is similar to Feasible Alternative 1A in that it provides a tight diamond interchange at Valley Road-Trebein Road but the loop ramp is in the southeast quadrant.

To provide a complete solution, it is possible to combine any of the four feasible alternatives at Factory Road-Orchard Lane with any of the feasible alternatives at Valley Road-Trebein Road. For example, the tight diamond interchange at Factory-Orchard (Alternative 1A) could be paired with the tight diamond with loop ramp in the southwest quadrant interchange at Valley-Trebein (Alternative 1A), as depicted in Exhibit 5. Exhibit 6A shows a possible pairing of Alternative 2A Factory-Orchard section with Alternative 2A Valley-Trebein section. An overview of the split diamond interchange (Alternative 2) at Factory-Orchard paired with the tight diamond with loop ramp in the southeast quadrant configuration (Alternative 5B) at Valley-Trebein is shown in Exhibit 6B. These possible combinations would result in a total of 12 full feasible alternatives for US 35 within the project limits.

Exhibit 4 shows the distance between the interchanges. A minimum spacing of 1.47miles (between the intersecting streets with ramps) is derived from these interchange pairings, and also when compared to the existing interchanges (at North Fairfield Road, and Old US 35/Xenia Bypass) at either terminus. When appropriate, this study looks at effects at each interchange rather than for the full alternatives.

EXHIBIT 4
Interchange Spacing (Distance shown in miles)

North Fairfield Road	Factory	Valley-Trebein	US 35 Xenia Bypass
1.90	1.77	1.47	

Typical cross sections of the roadway segments are included in Appendix C. Typical sections have been included for US 35 depicting both the at-grade section and the elevated section where US 35 would bridge Factory Road and Orchard Lane (Alternative 2A only). The existing roadway has a 30-foot depressed median (with 4 feet of paved shoulder in each direction) that does not meet a 65 mph design speed. The proposed US 35 will maintain two 12-foot travel lanes in each direction but will be converted to an urban-like roadway section with a median concrete barrier to address the substandard median width. The median would be fully paved to provide 13.59 feet of paved median shoulders to eliminate the need of maintaining a grassed median and to facilitate maintenance of traffic during construction. A 6-foot paved shoulder could be provided at bridge crossing locations to minimize the footprint of the bridges (Section 3.3.9). Retaining the 30-foot median with the median barrier eliminates the need to shift lanes at the project limits to match existing conditions. Also, 12 feet wide paved right shoulders would be provided to meet current ODOT standards, in lieu of the substandard existing 8-foot paved shoulders.

Within the elevated section, retaining walls will minimize the project footprint and limit impacts on local businesses adjacent to US 35. Also refer to Section 3.3.8 for retaining wall justification issues.

In the typical sections, the grading shown is for clear zone grading. One illustrative typical section was developed for US 35 in a normal section and elevation section. The roadside grading will be a combination of safety, clear zone, common and barrier grading. Refer to Appendix S for Conceptual Cross Sections showing the limits of the grading.

The alternatives have several commonalities including the following:

- Converting the stretch of US 35 between North Fairfield Road and the Xenia Bypass into a freeway facility with two lanes of traffic in each direction.
- Providing a diamond configuration along the west half of the interchange at US 35 and Factory Road.
- Reconstruction of Heller Drive (also designated as the North Frontage Road) from Alpha Road through Orchard Lane to Hidy Hyundai.
- Improving the intersection of Alpha Road with Heller Drive north of US 35.
- Providing a tight diamond configuration along the north half of the interchange at US 35 and Valley-Trebein.

3.2.1. Factory-Orchard Interchange – Feasible Alternative 1A

A detailed view of Factory-Orchard Interchange for Feasible Alternative 1A is in Appendix D. The interchange would be a tight diamond configuration with US 35 bridging over Factory Road.

US 35 would have two through lanes in each direction with an interchange at Factory Road. The existing intersection of Shakertown Road with US 35 would be closed. Traffic from Shakertown Road would use a new extension of Shakertown Road that would connect to Alpha-Bellbrook Road and to Factory Road. Traffic headed to US 35 would go north on Alpha-Bellbrook to merge onto Factory Road and access US 35.

The intersection of Factory Road and Alpha-Bellbrook will be modified so the south segment of Factory Road aligns with the Shakertown Road extension. Through traffic will use Alpha-Bellbrook Road. Local traffic will reach roadside businesses along the remaining segment of existing Factory Road.

The recently constructed Yellow Brick Road will connect the extension of the Shakertown Road/Factory Road intersection to Orchard Lane. The new county road follows the northern boundary of the John Ankeney Soccer Complex.

A new frontage road south of US 35 will connect Alpha Road to Orchard Lane and continue to a cul-de-sac east of Rite Rug. A new extension, part of the US 35 reconstruction project, would extend Alpha Road to the south where it would connect to Yellow Brick Road.

Feasible Alternative 1A would extend Heller Drive, north of US 35, to Factory Road. Short of Beaver Creek, Heller Road would turn northward to cross over the bike path, then bridge over Beaver Creek before trending westward again to link with Factory Road. Heller Drive would have one travel lane in each direction. The intersection of Alpha Road and Heller Drive would be improved and Heller Drive would be realigned to the east.

US 35 will remain at existing grade at the Orchard Lane intersection but with no direct access to Orchard Lane. Orchard Lane will be discontinuous at US 35 and will be connected to the Factory Road interchange by the frontage roads along US 35.

A segment of the existing bike path will be realigned to cross under the bridge on Factory Road that goes over Little Beaver Creek. Extensions of this crossing will reconnect to the existing bike path on either side of Factory Road. The at-grade intersection of the bike path and Factory Road will be replaced by this underpass. The bike path is the same in both Feasible Alternative 1A and Feasible Alternative 2A.

The Factory Road bridge over Little Beaver Creek will impact access to approximately two high mast utility towers and seven utility poles. Access issues need to be resolved with utility owners.

Current Plan when compared to Conceptual Alternative 1:

1. Eliminate the US 35 Overpass at Orchard Lane.
2. Add frontage road south of US 35.

3. Reconstruct Heller Drive from Alpha Road through Orchard Lane
4. Extend Alpha Road to south to connect with Yellow Brick Road.
5. Realign of Factory Road from south of US 35to Yellow Brick Road.
6. Convert frontage roads to two-way traffic.

Conceptual Alternative 1 is shown in Exhibit 7, for ease of reference, and to highlight the differences when compared to Feasible Alternative 1A.

3.2.2. Factory-Orchard Interchange – Feasible Alternative 2A

Appendix E includes a detailed view for Factory-Orchard Interchange for Feasible Alternative 2A. The interchange configuration for Feasible Alternative 2A is identical to Feasible Alternative 1A.

The side roads and frontage roads are identical to Feasible Alternative 1A except for Orchard Lane at US 35. The redeveloped US 35 will be elevated and bridge over Orchard Lane allowing through access on Orchard Lane. No direct access from US 35 to Orchard Lane is provided. The proposed profile of mainline US 35 will be different, in the vicinity of Orchard Lane, for Feasible Alternative 2A when compared to Feasible Alternative 1A. Refer to Appendix R for Preliminary Profile Sheets.

Current Plan when compared to Conceptual Alternative 2:

1. Eliminate the split-diamond interchange at Orchard Lane.
2. Provides full grade-separation of US 35 at Orchard Lane.
3. Add frontage roads, independent of entrance and exit ramps, on both sides of US 35.
4. Reduce reconstruction work along Orchard Lane and adjacent side streets.
5. Extend Alpha Road to south to connect with Yellow Brick Road.
6. Realign Factory Road south of US 35 to Yellow Brick Road.
7. Convert frontage roads to two-way traffic.

3.2.3. Factory-Orchard Interchange – Feasible Alternative 2

Appendix E-1 includes a detailed view of the Factory-Orchard Lane Interchange for Feasible Alternative 2. The interchange would be a split diamond configuration with Factory Road bridging over US 35, and US 35 bridging over Orchard Lane. Traffic would exit westbound US 35 before Orchard Lane. East of Orchard Lane, Heller Drive would be realigned to the north to provide separation from the Ramp D exit. A signal would be warranted on Orchard at the end of Ramp D. West of Orchard Lane, Heller Drive would be extended and converted to a one-way frontage road with two lanes for westbound traffic only. Entrance ramp (Ramp A) would align with the Heller Road extension for westbound traffic. A traffic signal would be warranted at the intersection with Factory Road.

EXHIBIT 5
Overview of Alternative 1A (Factory-Orchard) paired with Alternative 1A (Valley-Trebein) including Environmental Features

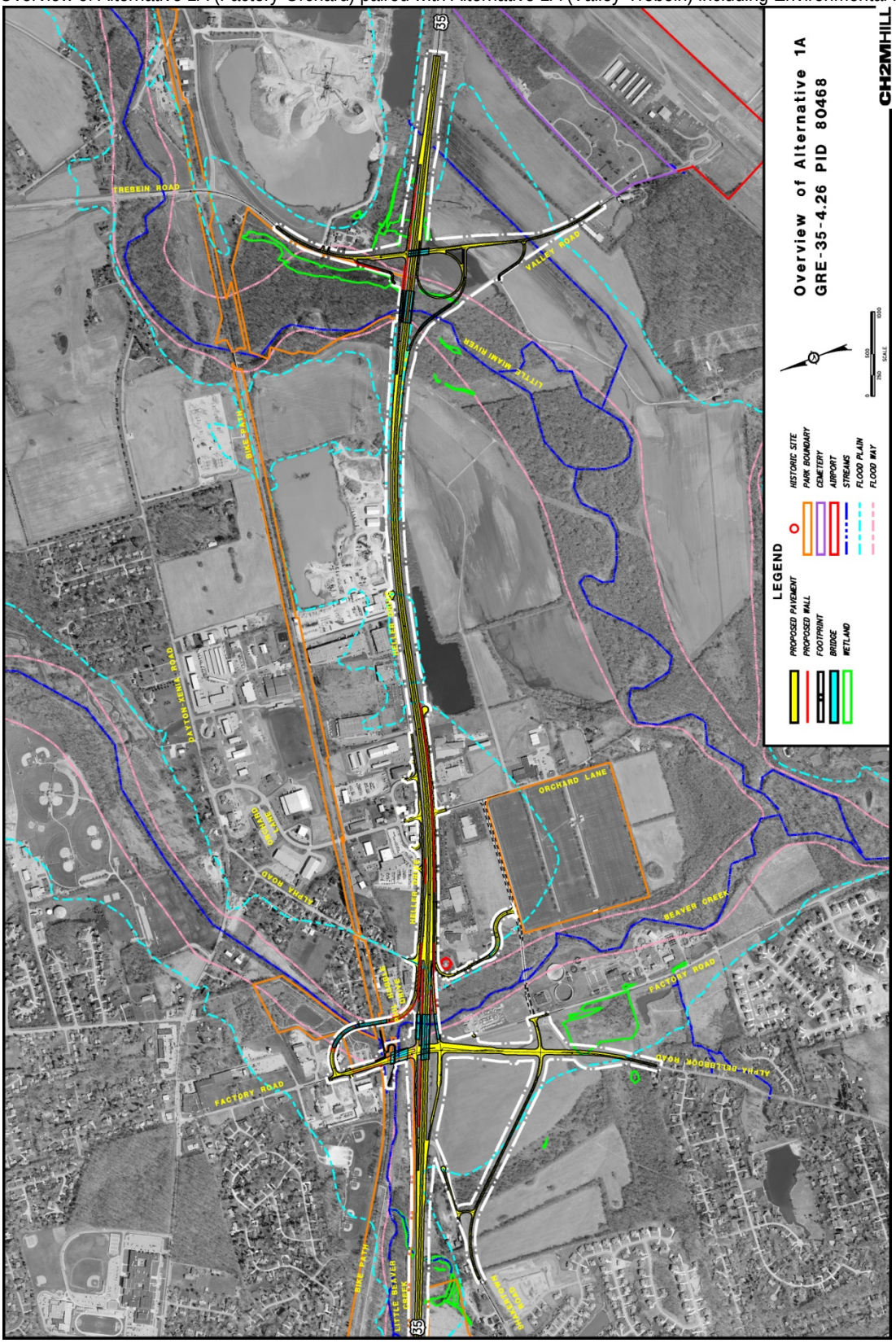


EXHIBIT 6A
Overview of Alternative 2A (Factory-Orchard) paired with Alternative 2A (Valley-Trebein) including Environmental Features

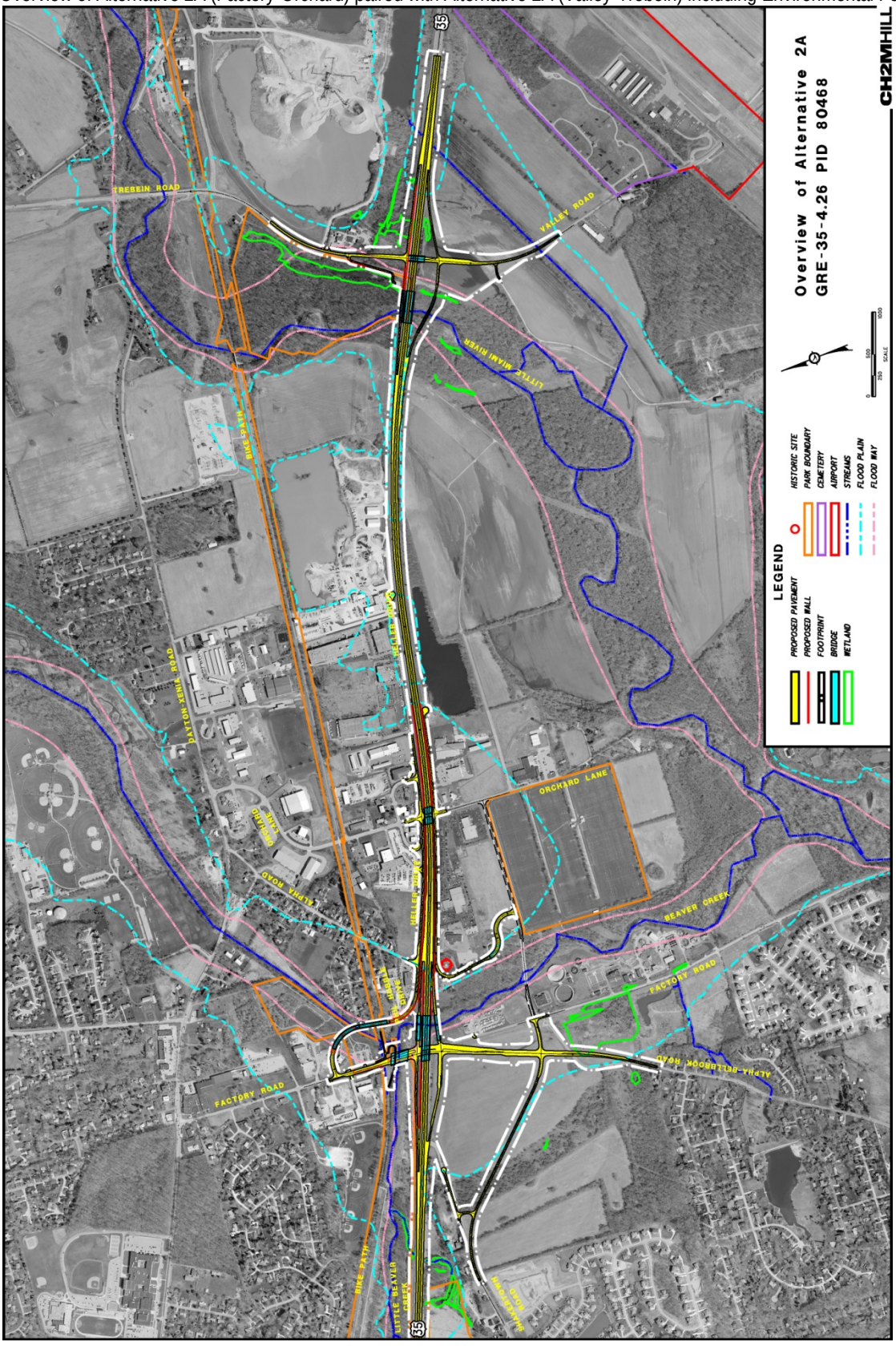
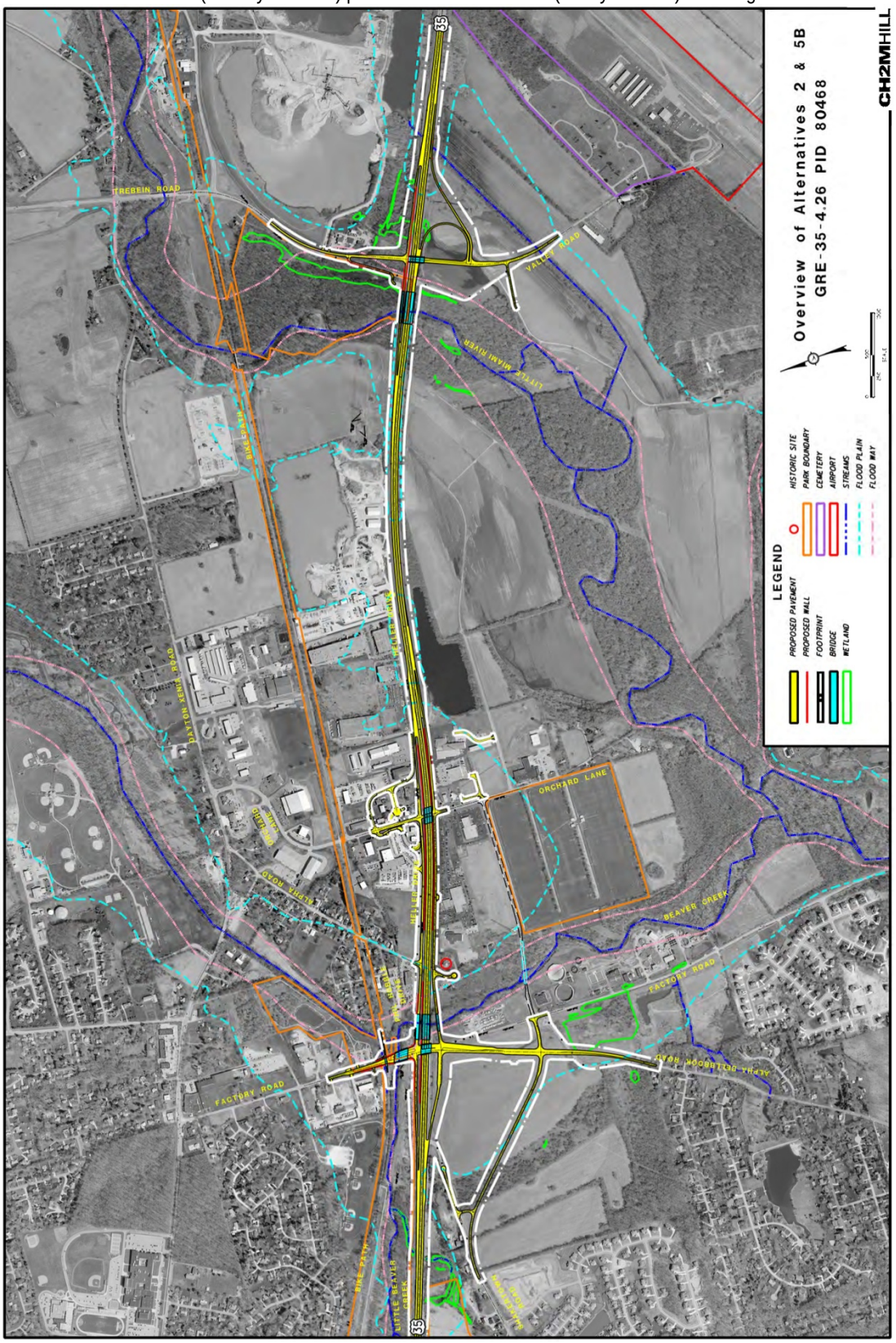


EXHIBIT 6B
Overview of Alternative 2 (Factory-Orchard) paired with Alternative 5B (Valley-Trebein) including Environmental Features



The eastbound exit ramp (Ramp B) at Factory Road is identical for Feasible Alternatives 1A and Feasible Alternative 2A. A traffic signal would be warranted at the intersection with Factory Road. For Feasible Alternative 2, a two-lane one-way eastbound frontage will align with Ramp B at Factory Road and connect to Orchard Lane. The frontage road will connect to the segment of Alpha Road south of US 35 and provide access to properties along the southern side of US 35.

Unique to Feasible Alternative 2, the eastbound entrance ramp (Ramp C) and the westbound entrance ramp (Ramp A) will originate at Orchard Lane. Ramp C and Ramp A will align with the north and south frontage roads, respectively. US 35 will be elevated over Orchard Lane to maintain through traffic along Orchard lane.

Access drives along Orchard Lane will be closed where appropriate for limited-access facilities control. Access to the Food Mart would be provided via a new service road, paralleling Orchard Lane. Access to the Aamco would be located on the north side of the property.

The westbound exit ramp from US 35 (Ramp D) will intersect with Orchard Lane rather than Factory Road as with Alternative 1A and Alternative 2A. Heller Drive will become a one-way two-lane frontage road extending to Factory Road where it aligns with Ramp A. A portion of Heller Drive will be relocated closer to US 35 and the intersection with Alpha Road will be improved.

Factory Road will bridge over US 35. US 35 will remain at existing elevations over the Beaver Creek. Within the elevated section of Factory Road, retaining walls will minimize the project footprint and limit impacts on local businesses, and the Beavercreek Community Park adjacent to Factory Road. The impact of these walls is discussed in Section 3.3.7.

A segment of the existing bike path will be grade-separated at Factory Road to cross under the elevated Factory Road. This underpass will replace the existing at-grade intersection of the bike path and Factory Road. The bike path will remain on existing alignment.

Current Plan when compared to Conceptual Alternative 2:

1. Bridge Factory Road over US 35.
2. Eliminate Heller Drive extension through the Beavercreek Community Park.
3. Retain bike path on existing alignment
4. Increase construction of retaining walls along Factory Road
5. Potential right-of-way acquisition along Factory Road including CRG Industries and property in the northeast quadrant of the north frontage road.

Conceptual Alternative 2 is shown in Exhibit 8, for ease of reference, and to highlight the differences when compared to Feasible Alternative 2A and Feasible Alternative 3B.

3.2.4. Factory-Orchard Interchange – Feasible Alternative 3B

Appendix E-2 includes a detailed view for Factory-Orchard Interchange for Feasible Alternative 3B. The interchange configuration for Feasible Alternative 3B is identical to Feasible Alternative 1A, except Factory Road would bridge over US 35. The impacts along Factory Road within the elevated Factory Road over US 35 are identical to Feasible Alternative 2. Retaining walls will minimize the project footprint and limit impacts on the bike path, local businesses, and the Beavercreek Community Park adjacent to Factory Road.

3.2.5. Valley-Trebein Interchange – Feasible Alternative 1A

Appendix F includes a detailed view of Valley-Trebein Interchange for Feasible Alternative 1A. The interchange would include a loop ramp in the southwest quadrant and a tight diamond on the north side of US 35. US 35 will clearspan the Little Miami River on the same alignment as the existing bridge. Valley-Trebein will bridge over US 35.

Exit Ramp F would diverge from US 35, span the Little Miami River, then curve around the loop of Entrance Ramp G, and terminate at the realigned Valley Road. Because the eastbound entrance -ramp (Ramp G) is a loop in the southwest quadrant, there is no ramp in the southeast quadrant. Ramp G is a 260- foot radius loop with a design speed of 30 mph.

Trebein Road and Valley Road would be realigned to the east, eliminating the sharp curve in Valley Road just south of US 35. The new alignment will be pushed to the east to provide room for the loop ramp, balancing the impacts on the two businesses in the northeast quadrant. The drive to the south and the access to the park will be more than 600 feet from the ramps as required for limited-access at interchange facilities.

To minimize impacts to Glenn Thompson Reserve, and to align with one another, Ramps E and H, serving westbound entrance and exit traffic respectively, will be located close to US 35. Retaining walls along Ramp E will minimize the potential impact on Glenn Thompson Reserve. Ramp E will clearspan the Little Miami River before merging with US 35.

A short access road will be retained along the existing alignment of Trebein Road to maintain access to the Glen Thompson Reserve parking lot that serves a trail system and canoe launch area.

Current Plan when compared to Conceptual Alternative 1:

1. Eliminates one northbound lane along Trebein Road.
2. Refinements of horizontal alignments and profiles to minimize potential impacts on local businesses.

Conceptual Alternative 1 is shown in Exhibit 7, for ease of reference, and to highlight the differences when compared to Feasible Alternative 1A.

3.2.6. Valley-Trebein Interchange – Feasible Alternative 2A

Appendix G includes a detailed view of Valley-Trebein Interchange for Feasible Alternative 2A. The interchange would be a diamond configuration with a ramp in all four quadrants.

US 35 will clearspan the Little Miami River on the same alignment as the existing bridge. Valley-Trebein will bridge over US 35.

Ramp F would divert from US 35 eastbound, clearspan the Little Miami River, and terminate at relocated Valley Road. It will align with Ramp G that will serve traffic onto US 35 eastbound.

Trebein Road will be relocated to the east to align with the relocated Valley Road. This will eliminate the sharp curve in Valley Road just south of US 35.

To minimize impacts to Glenn Thompson Reserve, and to align with one another, Ramps E and H, serving westbound entrance and exit traffic respectively, will be located close to US 35. Retaining walls along Ramp E will minimize the potential impact on Glenn Thompson Reserve. Ramp E will clearspan the Little Miami River before merging with US 35.

A short access road will be retained along the existing alignment of Trebein Road to maintain access to the Glenn Thompson Reserve parking lot that serves a trail system and canoe launch area.

Current Plan when compared to Conceptual Alternative 2:

1. Eliminates one northbound lane along Trebein Road.
2. Refinements to horizontal alignments and profiles minimize impacts on local businesses.

Conceptual Alternative 2 is shown in Exhibit 8, for ease of reference, and to highlight the differences when compared to Feasible Alternative 2A.

3.2.7. Valley-Trebein Interchange– Feasible Alternative 5B

Appendix G-1 includes a detailed view of Valley-Trebein Interchange for Feasible Alternative 5B. Feasible Alternative 5B is similar to Feasible Alternative 1A except the loop ramp would be in the southeast quadrant rather than in the southwest quadrant, and would provide for an exit from US 35 eastbound (Ramp F). US 35 will clearspan the Little Miami River on the same alignment as the existing bridge. Valley-Trebein will bridge over US 35.

Entrance Ramp G would enter US 35 eastbound from a realigned Valley Road, just south of the loop of Exit Ramp F. Ramp F is a 260- foot radius loop with a design speed of 30 mph. The deceleration lane of exiting Ramp F would be on the same US 35 alignment as the existing bridge to minimize impacts to the Little Miami River. Since Ramp F is a loop in the southeast quadrant, there is no ramp in the southwest quadrant.

Trebein Road and Valley Road would be realigned to the east, to eliminate the sharp curve in Valley Road just south of US 35. The new alignment will be pushed to the east to provide room for the loop ramp, balancing the impacts on the two businesses in the northeast quadrant.

North of US 35, Ramps E and H, serving westbound entrance and exit traffic respectively, are identical to the westbound entrance and exit ramps of Feasible Alternative 1A and Feasible Alternative 2A at the Valley-Trebein interchange.

Current Plan when compared to Conceptual Alternative 1:

1. Relocates loop ramp to the southeast quadrant, as an exit ramp.
2. Removes new bridge structure crossing over the Little Miami River.
3. Relocates entrance ramp to the southeast quadrant.
4. Eliminates one northbound lane along Trebein Road.
5. Refinements to horizontal alignments and profiles minimize potential impacts on local businesses.

Conceptual Alternative 1 is shown in Exhibit 7, for ease of reference, and to highlight the differences when compared to Feasible Alternative 1A and Feasible Alternative 5B.

EXHIBIT 7
Overview of Conceptual Alternative 1 including Environmental Features

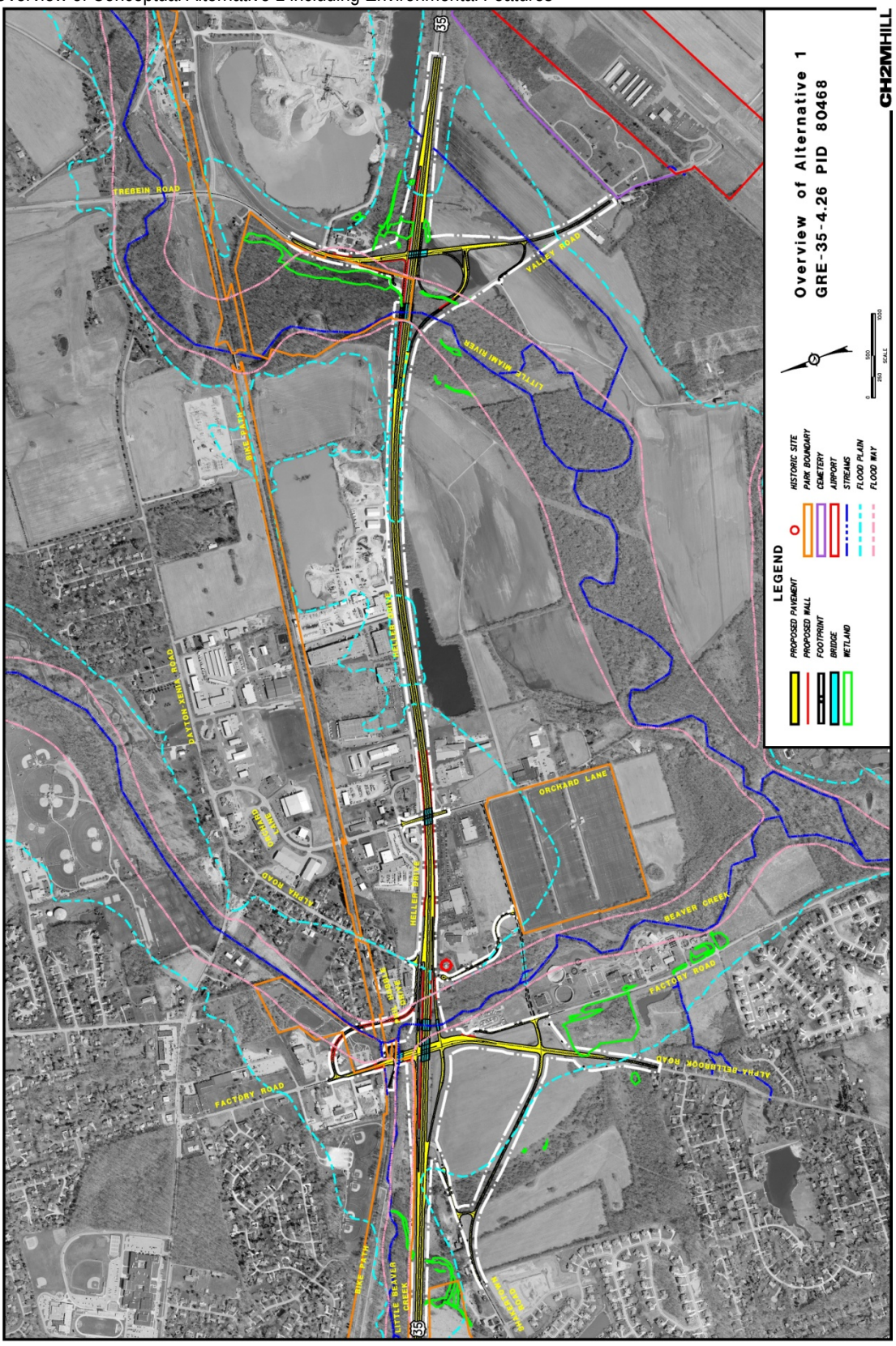
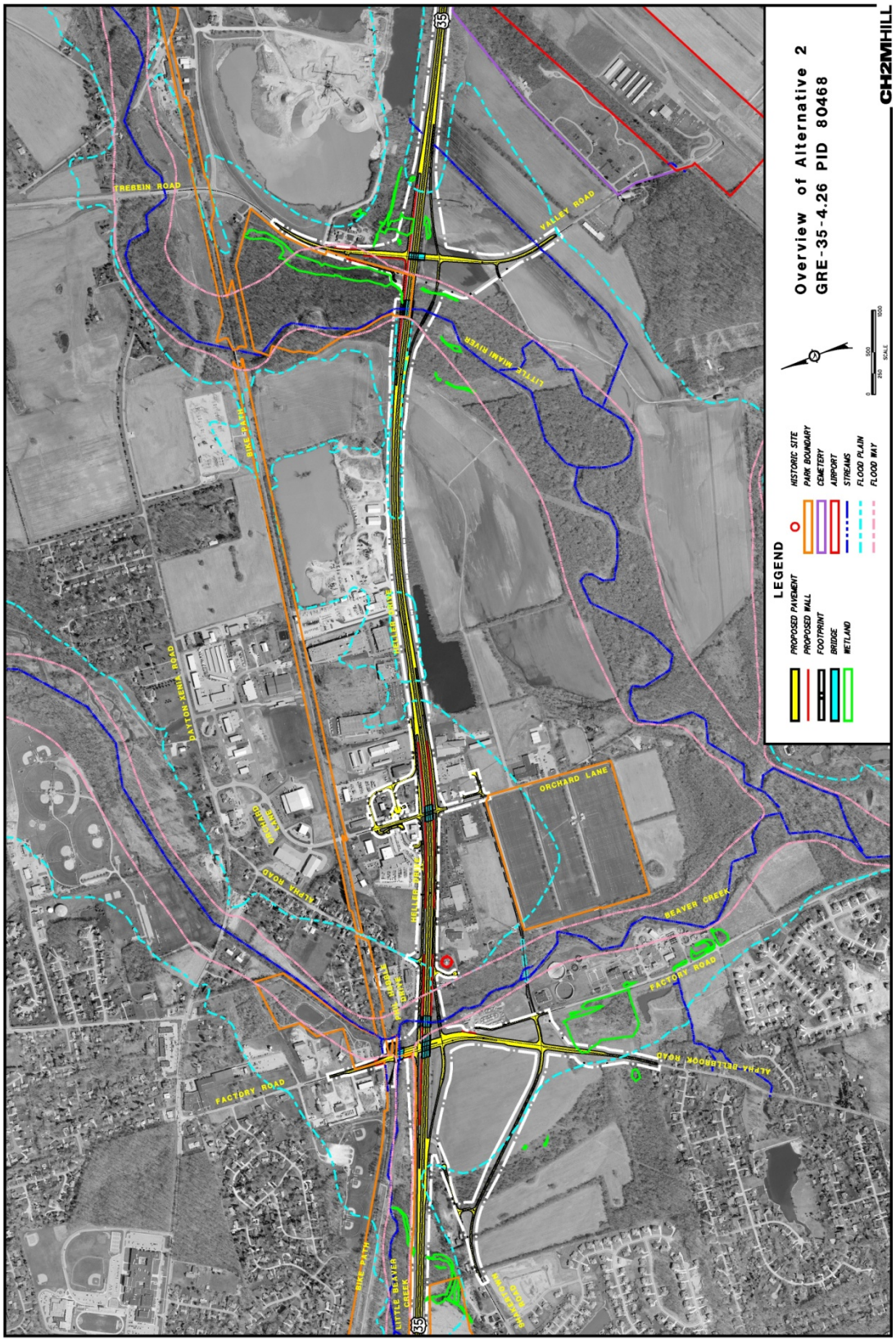


EXHIBIT 8
Overview of Conceptual Alternative 2 including Environmental Features



3.3. Assessment of the Feasible Alternatives

To obtain a better understanding of each alternative, many design items were evaluated. Traffic analysis, maintenance of traffic and retaining wall justification issues are some of the key items discussed in more detail below.

3.3.1. Utility Facilities

As part of the CAS, the following existing utility companies and public entities were contacted and several utility lines of potential concern were identified. No additional contacts were made after the CAS submission.

- AT& T Ohio
- Beavercreek Township
- Cinergy
- Dayton Power & Light
- Greene County Department of Public Works
- HLG Engineering
- KLD Fiber
- Ohio Department of Transportation
- Qwest
- Time-Warner Cable
- Time-Warner Telecom
- Vectren

Within the Factory Road and Orchard Lane vicinity, there are a few major utilities of particular concern. There is a fiber optic line that runs parallel to Orchard Lane on the east side. The line should be unaffected by construction. There is also a fiber optic line that runs parallel to the north side of US 35. The existing location would run under Heller Drive, Heller Drive extension, and under the Ramp D bridge to Factory Road. This line potentially would be relocated outside the limits of the pavement. A third fiber optic line runs under the Heller Drive extension and under Factory Road. This utility might need to be moved outside of the limits of the pavement.

At the northwest corner of Factory Road and US 35, there is a high mast tower. A bridge and short wingwall are proposed along the west side of Factory Road as the profile for Factory Road is raised. The tower should be unaffected by construction for Feasible Alternative 1A and Feasible Alternative 2A.

For Feasible Alternative 2 and Feasible Alternative 3B, where Factory Road is elevated to cross over US 35, access to two high mast utility towers and seven utility poles would be impacted. Providing access will need to be resolved with utility owners.

Located between Orchard Lane and Valley-Trebein, just east of Phillips Gravel, are two series of overhead utility lines. One series is two lines and the other series is five lines. These utility lines should be unaffected by the project.

3.3.2. Traffic Analysis

Following the completion of the CAS, traffic volumes were updated to account for the refined Feasible Alternatives. ODOT provided the certified traffic forecasts data for use in the traffic operational and capacity analysis. A copy of the traffic plates is contained in Appendix A.

3.3.2.1. Future Level of Service – Build Condition

Traffic analyses were performed for the two build interchange alternatives developed in the Conceptual Alternatives Study (CAS) with the aid of the Highway Capacity Software (HCS) to evaluate and update the feasible build alternatives. The 2038 design year traffic model, as provided by ODOT, was used in the analyses contained in this AFA document. The results of this analysis shows existing and projected traffic along US 35 and within the study area and have been included in Appendix A. Exhibits 9 through 10 reflect the capacity analysis and resulting Level of Service for each of the primary interchange elements (intersections, ramps, and segment) for the alternatives.

Analysis for Feasible Alternatives 1A (Factory-Orchard and Valley-Trebein sections) and Feasible 2A (Factory-Orchard and Valley-Trebein sections) reflect the current geometry described in this report and as shown in plan sheets in Appendices D through G-1. Feasible Alternative 2 (Factory-Orchard section), Feasible Alternative 3B (Factory-Orchard section), and Feasible Alternative 5B (Valley-Trebein section) were introduced as a result of comments received for the draft AFA including results of a value engineering study and additional project stakeholder's meetings and input.

Feasible Alternative 5B for the Valley-Trebein section alters the geometry of the interchange by placing the loop in the southeast quadrant of the interchange in lieu of the southwest quadrant which affects the eastbound ramp intersection.

Exhibits 9 and 10 provide a summary of the intersection, freeway segment, and ramp merge/diverge capacity analyses for Feasible Alternative 1A or 3B (Factory-Orchard section) and Feasible Alternative 1A (Valley-Trebein section), and US 35. The Feasible Alternative 5B (Valley-Trebein section) with the loop ramp in the southeast quadrant, which affects the results of the eastbound ramp analysis is shown in the tables as options for the eastbound ramp intersections. A detailed summary of the study area intersections analyzed for this document has been included in tabular and graphic form in Appendix A.

These summary results show acceptable ranges of level of service for nearly all components of the roadway system regardless of alternative. One location, Trebein Road at the eastbound ramp intersection, reflects LOS F during the PM peak hour design year traffic under stop-control conditions for Feasible Alternative 1A (Valley-Trebein section). Preliminary signal warrant analysis indicates that this intersection would not warrant a signal by design year. Additional signal warrant investigation and refinement of the feasible alternatives will be made during the next step of the PDP.

Feasible Alternative 2, is an alternative originally discussed as part of the CAS, which has been reinstated as part of this AFA, following the completion of a value engineering study and the results of additional project stakeholder's meetings and input. This analysis performed, as part of the CAS showed acceptable ranges of level of services for Feasible Alternative 2. No new analysis was performed for this AFA. Additional analysis will be performed for Feasible Alternative 2 with updated certified traffic during subsequent steps of the PDP process.

EXHIBIT 9
HCS Analysis of the 2038 Volumes on Feasible Alternative 1A (Factory-Orchard; and Valley-Trebein)

Location	Type of Analysis	AM		PM	
		LOS	Delay	LOS	Delay
EB Factory	Signalized Intersection	B	18.1	B	18.5
WB Factory	Signalized Intersection	B	19.8	B	17.8
EB Trebein *(Feasible Alternative 1A Option)*	Two-Way Stop Controlled Intersection				
	NB Left	A	7.3	A	7.7
	EB	B	10.1	B	10.2
EB Trebein *(Feasible Alternative 5B option)*	Two-Way Stop Controlled Intersection				
	SB Left	A	7.8	A	8.1
	WB	B	10.2	B	14.8
WB Trebein	Signalized Intersection	B	13.6	B	14.6
EB West	Freeway	B	--	C	--
EB Factory	Freeway	B	--	B	--
EB Mid	Freeway	B	--	C	--
EB Trebein	Freeway	B	--	C	--
EB East	Freeway	B	--	C	--
WB East	Freeway	C	--	C	--
WB Trebein	Freeway	B	--	B	--
WB Mid	Freeway	C	--	B	--
WB Factory	Freeway	B	--	B	--
WB West	Freeway	C	--	B	--
EB Factory Exit	Ramp Diverge	B	--	B	--
EB Factory Entrance	Ramp Merge	B	--	B	--
EB Trebein Exit	Ramp Diverge	B	--	B	--
EB Trebein Entrance	Ramp Merge	B	--	B	--
WB Trebein Exit	Ramp Diverge	B	--	B	--
WB Trebein Entrance	Ramp Merge	B	--	B	--
WB Factory Exit	Ramp Diverge	B	--	B	--
WB Factory Entrance	Ramp Merge	C	--	B	--

EXHIBIT 10
HCS Analysis of the 2038 Volumes on Feasible Alternative 2A (Factory-Orchard; and Valley-Trebein)

Location	Type of Analysis	AM		PM	
		LOS	Delay	LOS	Delay
EB Factory	Signalized Intersection	B	18.4	B	18.7
WB Factory	Signalized Intersection	C	20.4	B	17.7
EB Trebein *(Feasible Alternative 2A Option)*	Two-Way Stop Controlled Intersection				
	SB Left	A	7.9	A	8.8
	EB	C	15.9	F	62.9
EB Trebein *(Feasible Alternative 5B option)*	Two-Way Stop Controlled Intersection				
	SB Left	A	7.9	A	8.2
	WB	A	10.0	B	15.5
WB Trebein	Signalized Intersection	B	13.6	B	14.5
EB West	Freeway	B	--	C	--
EB Factory	Freeway	B	--	B	--
EB Mid	Freeway	B	--	C	--
EB Trebein	Freeway	B	--	C	--
EB East	Freeway	B	--	C	--
WB East	Freeway	C	--	C	--
WB Trebein	Freeway	B	--	B	--
WB Mid	Freeway	C	--	B	--
WB Factory	Freeway	B	--	B	--
WB West	Freeway	C	--	B	--
EB Factory Exit	Ramp Diverge	B	--	B	--
EB Factory Entrance	Ramp Merge	B	--	B	--
EB Trebein Exit	Ramp Diverge	B	--	B	--
EB Trebein Entrance	Ramp Merge	B	--	B	--
WB Trebein Exit	Ramp Diverge	B	--	B	--
WB Trebein Entrance	Ramp Merge	B	--	B	--
WB Factory Exit	Ramp Diverge	B	--	B	--
WB Factory Entrance	Ramp Merge	C	--	B	--

3.3.2.2. Signal Warrant Analysis

A signal warrant analysis was completed for key intersections within the study area to determine intersection control needs under opening (2018) and design year (2038) conditions. The 8-hour warrants were evaluated using 8th highest hour factors applied to ADTs obtained from certified traffic volumes. Signalized intersection analysis was applied for the Feasible Alternatives, as long as at least one of the alternatives met the warrant under 2018 opening year traffic volumes. If an intersection did not meet the 8-hour signal warrant

under opening year volumes for the majority of the alternatives, stop-control was utilized as the design intersection control for that location.

This methodology was used for the purpose of standardizing the analysis, recognizing that more detailed warrant analysis will be performed for all intersections in the preferred alternative during Step 7, Verification of Preferred Alternative. Final disposition of each intersection, whether stop or signal control will be made during Step 7. This allows for a reasonable comparison of alternatives, since more information is needed to fully assess the need for a signal, and will be performed in the next phase of the analysis.

Two exceptions to the aforementioned warrant analysis methodology were the proposed intersection of Alpha Bellbrook Road and Factory Road and the US 35 westbound ramps intersection with Valley-Trebein. The capacity analysis under this approach demonstrated poor operating conditions (E or worse) for the stop controlled conditions at these intersections. Therefore, four-hour and peak hour warrants were analyzed in addition to the 8-hour warrants, making a clear determination of whether a signal would be warranted. This intersection met both warrants, so a signal is recommended for the design. Based on these warrants, signalized control was applied at both intersections.

Exhibit 11 shows the intersections for which the signal warrant analysis was performed, as well as the existing and recommended traffic control at each location.

EXHIBIT 11
Signal Warrant Analysis Results

Intersection	Existing Intersection Control	Recommended Intersection Control for Alternative Analysis
South Frontage Road & Orchard	N/A	Stop
Upper Bellbrook & Valley	Stop	Stop
Orchard & Shakertown/ Yellow Brick	Stop	Signal
Heller & Orchard	Stop	Stop
Dayton-Xenia & Orchard	Stop	Stop
Trebein & Dayton-Xenia/ Hilltop	Signal	Signal
Shakertown/ Yellow Brick & Old Factory	Stop	Stop
Factory & Alpha Bellbrook/ Shakertown	N/A	Signal
Factory & Heller	N/A	Signal
Dayton-Xenia & Factory	Signal	Signal
Trebein & Dayton-Xenia (East Leg)	Stop	Signal
Trebein & US 35 WB Ramp	N/A	Stop
Trebein & US 35 EB Ramp (Loop Ramp – Alt 1A)	N/A	Stop
Trebein & US 35 EB Ramp (Directional Ramp – Alt 2A)	N/A	Stop

3.3.3. Potential Design Exceptions

Project Design Criteria are in Appendix B. Three (3) potential design exceptions, Stopping Sight Distance (SSD) - Horizontal, and paved right shoulder width have been identified for Feasible Alternatives 1A or 3B and 2A at the Factory Road-Orchard Lane interchange, and the US 35 corridor (Feasible Alternatives 1A; 2A; 2; or 3B), respectively.

3.3.3.1. Horizontal SSD

The North Frontage Road (Heller Drive Extension) from Factory Road to Alpha Road has reversed curves with a tangent length of 365 feet between the two curves. Both curves have a degree of curvature of 15°00′00″ (382-foot radius). This segment of the North Frontage Road (Heller Drive Extension) is elevated to clearspan the Beaver Creek and the bike path. It is supported on retaining walls to minimize impacts to adjacent businesses, and the floodway/floodplain. The proposed roadway curbed/barrier typical section consists of two 17-foot lanes (lane widening through the curves) and 4-foot shoulders. The bridge and retaining wall parapet along the inside of each curve limits Horizontal SSD. For a design speed of 35 mph, 250 feet is needed for full Horizontal SSD. A SSD of 193 feet is achieved for the standard shoulder width, as currently designed, which corresponds to a 29 mph Design Speed. In order to provide the required 250-foot SSD with the current typical section, a 9°00′00″ (637-foot radius) would be needed. Alternatively, a wider shoulder width of 12.25 feet would be required to provide full SSD. Providing full SSD for this low speed facility would adversely impact adjacent businesses, would require additional right-of-way acquisition, and would increase the overall project footprint. The additional costs including impacts to adjacent properties and environmental constraints, to provide full SSD, are not expected to produce additional safety and or operational benefits. The two design exceptions for SSD are summarized in Exhibit 14.

EXHIBIT 14
Potential Design Exceptions - Horizontal Stopping Sight Distance

Alignment	Design Speed	Location	Element	Criteria (Feet)	Designed (Feet)	Equivalent Design Speed
North Frontage Rd.	35 mph	Curve 1	SSD - Horizontal	250	193	29 mph
North Frontage Rd.	35 mph	Curve 2	SSD - Horizontal	250	193	29 mph

3.3.3.2. Paved Right Shoulder Width

ODOT current standards require a barrier offset of 2 feet for barrier sections of freeway facilities that would result in a minimum paved right shoulder with of 14 feet to face of barrier. As currently designed, a right paved shoulder with of 12 feet is provided throughout the project limits including the elevated and bridge sections requiring barriers. An exception for right paved shoulder along 4000 feet of barrier length would be required. A 13.59-foot paved left shoulder to face of barrier is provided. Total paved shoulder width (left and right) provided is 25.59 feet. Providing the full right shoulder width of 14 feet (12 feet plus 2 feet for barrier offset), would adversely impact adjacent businesses and require additional right-of-way take acquisitions. The additional costs including impacts to

adjacent properties and businesses, to provide full paved shoulder width at barrier offset, would not produce additional safety and or operational benefits.

3.3.4. Maintenance of Traffic

The ability to maintain two lanes of traffic in each direction on US 35 during construction, while maintaining local access and with minimal disruption to the surrounding environment requires a systematic and workable approach to determining and analyzing the construction stages, traffic phasing, and construction operations and schedule.

As stated in Section 3.2, there are two feasible interchange alternatives each for Factory Road and Valley-Trebein. Part-width and crossover construction strategies were studied for these locations, yielding a total of eight Maintenance of Traffic (MOT) schemes. A summary of each MOT alternative is included with the Maintenance of Traffic Alternative Analysis (MOTAA) in Appendix T. Rolled plans are provided with the MOTAA to show each MOT scheme including construction staging, color-coded traffic phasing, and critical cross sections.

A central strategy for each MOT alternative is to use the proposed new interchange ramps to maintain US 35 through traffic. The horizontal and vertical geometry for the proposed ramps, except for the loop ramp at Valley-Trebein Road, have been designed for 45 mph minimum design speed, which would satisfy the MOT design criteria. This approach would also enhance the ability to provide safe work zones and acceptable traffic operations, assure a constructible project, and contain the overall project cost.

The MOT schemes for the feasible interchange build alternatives also provide opportunities for potential project phasing, preliminary construction scheduling, and project cost comparisons. Coordination between the MOT schemes for each interchange build alternative is critical for overall implementation of the MOT plan.

The construction of Factory Road interchange and Valley-Trebein interchange, and the corresponding reconstruction of US 35 mainline, can be built independent of each other, or as a single construction contract. Available funding will dictate the construction of these interchanges.

Upon ODOT's review of the MOTAA findings, a preferred MOT strategy will be selected for further development in subsequent steps.

3.3.5. Highway Lighting

Continuous Freeway Lighting (CFL) and Complete Interchange Lighting (CIL) are warranted within the project limits. However, the adjacent existing US 35 sections have no continuous lighting and have partial interchange lighting at the existing interchanges. Therefore at the proposed interchanges at Factory Road and Trebien-Valley Road, Partial Interchange Lighting (PIL) is justifiable and should be provided at a minimum. A technical memorandum summarizing the highway lighting considerations and warrant analysis is in Appendix U. ODOT should determine the provision and scope of highway lighting for the GRE-35-4.26 during the detailed design steps of the PDP process (Steps 8 through 14). The project cost estimation includes a cost contingency for highway lighting (CFL and CIL).

3.3.6. Drainage

The proposed project crosses the Little Miami River at the confluence of the Beaver Creek and Little Beaver Creek. These three streams are within a FEMA designated 100-year floodplain as shown in the current Flood Insurance Study (FIS) mapping, dated August 18, 1992 (Appendix I). FEMA is in the process of completing a revised FIS. How the pending revisions to FIS will affect the designated floodplain is unknown.

Currently flood events overtop portions of US 35, Factory Road and Trebein Road. For further discussion concerning project drainage issues refer to Appendix W - *Drainage Technical Memorandum*.

A drainage design criteria (Form LD-35) was prepared to facilitate the development of a conceptual storm drainage layout, and to determine preliminary culvert location, size and requirements. A complete listing of the drainage criteria can be found in Appendix V. In addition, an ODOT-District 8 Bridge Department Inter-office Communication (IOC) letter (Appendix J) indicated work to complete on the existing culverts located under US 35. Work in the IOC will be addressed during subsequent steps.

Raising the US 35 profile or providing median barrier may result in "damming" flood waters that would otherwise overtop the highway. Blocking the flood flows may result in either increasing the water surface elevation upstream or diversion of flood flows. Mitigation measures such as increasing the bridge spans and providing flood plain culverts may be necessary to minimize diversion of flood waters due to blocking flood flows overtopping US 35. Inclusion of flood plain culverts will be investigated in subsequent stages of plan development.

US 35 is currently drained by catch basins in the median with lateral storm sewer pipes outlets into roadside ditches and a series of culverts. Inspection of mainline culverts resulted in satisfactory to poor ratings for the majority of the culverts. Refer to Appendix Y – Culvert Inspection Report, for additional information. Approximately half the culverts impacted by the project will need to be replaced due to geometric changes or their existing poor condition. Most of the remaining culverts will need to be extended or repaired.

Projects with a project earth disturbed area greater than 5 acres require incorporating post construction Best Management Practices (BMP). The US 35 reconstruction will exceed the 5 acre limit, therefore BMPs will be provided to treat storm water runoff.

BMPs can be incorporated into a project to provide water quality (pollutant removal) and water quantity (stream protection and volume control) treatment. BMPs to treat water quantity (volume control) are not required if the site discharges into a large river (watershed greater than 100 square miles) or fourth order or greater streams. The Little Miami River watershed at US 35 exceeds 240 square miles. The water shed for Beaver Creek is approximately 44 square miles (less than the 100 square mile threshold) but it is a forth order or greater stream. Outfalls into the Little Miami River or Beaver Creek will require water quality treatment but not water quantity (volume control) treatment.

Water quality (pollutant removal) will generally be treated by incorporating exfiltration trenches and vegetated biofilters; but are not limited to these methods. Other BMPs will be investigated based on site conditions.

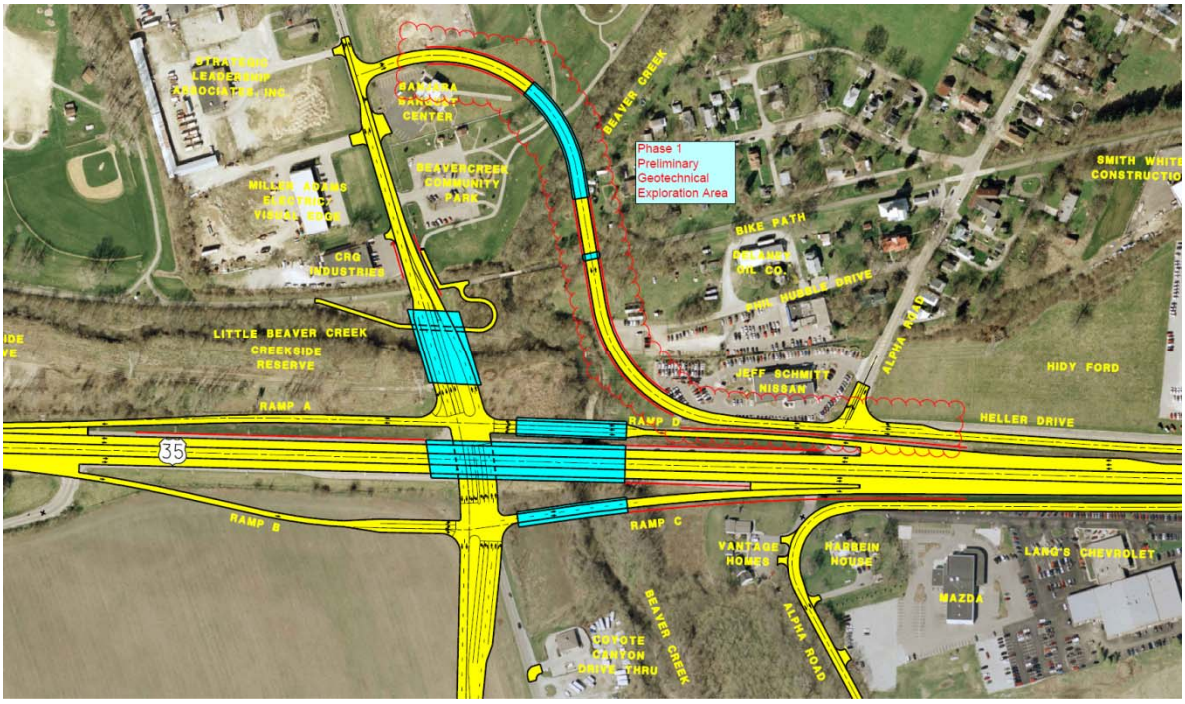
Water quantity (stream protection) treatment will also be incorporated into the project. BMPs providing stream protection include designing for bankfull discharge, providing depressed culvert inlets and depressed approach aprons and inclusion of flood plain culverts.

3.3.7. Geology and Soils

Drilling and laboratory testing were performed, as part of the phase 1 preliminary geotechnical exploration. The phase 1 preliminary geotechnical exploration focused on the proposed North Frontage Road (Heller Road Extension), from Alpha Road to the Factory Road as shown in Exhibit 15.

The phase 1 boring program primarily focused on areas of difference between alternatives developed in the CAS to facilitate the selection of a preferred alternative, taking in account potential geotechnical major cost differentials. Only Conceptual Alternative 1 included the North Frontage Road connecting Alpha Road to Factory Road in the CAS report. However, as a result of a stakeholder meeting following the completion of CAS report, the alternatives were revised and the North Frontage Road alignment became similar for both alternatives.

EXHIBIT 15
Phase 1 Preliminary Geotechnical Exploration Area

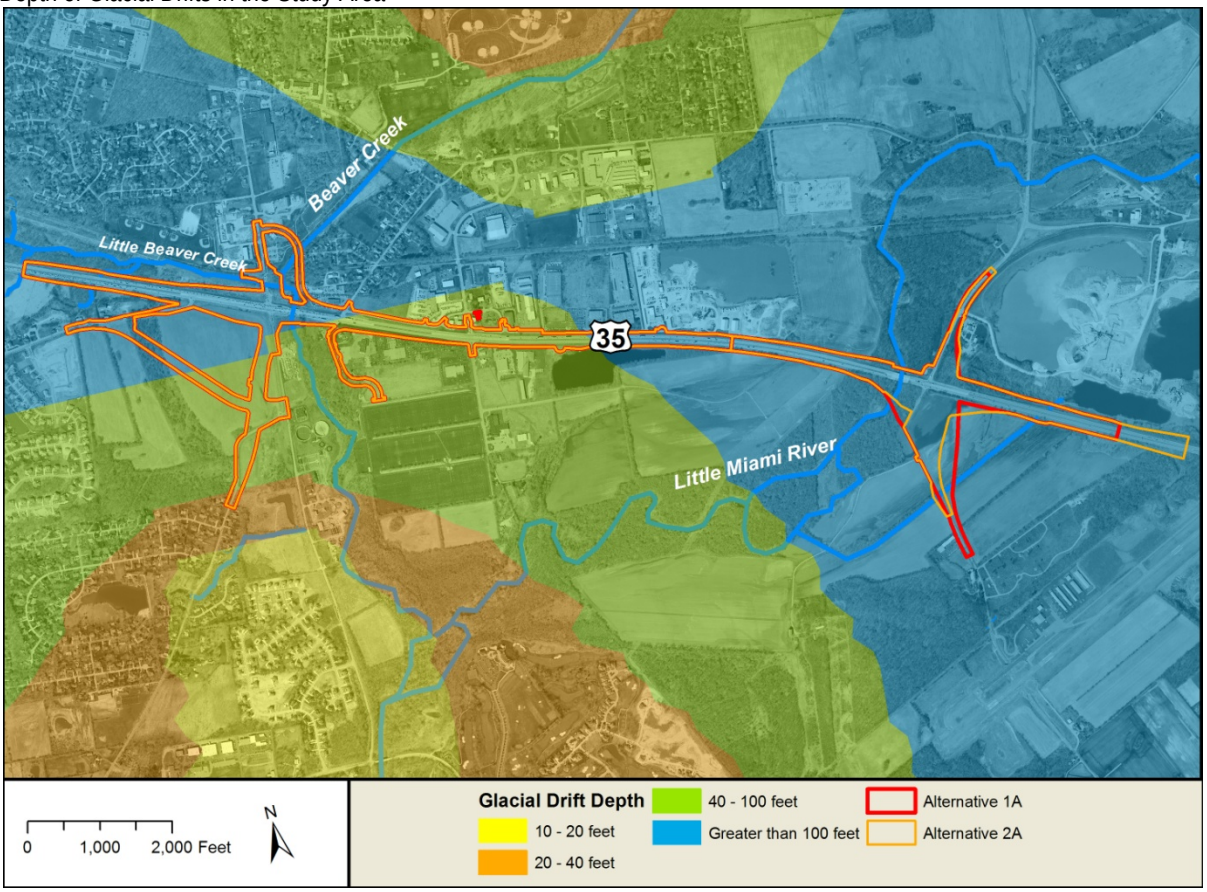


A total of 12 borings were drilled to a depth of 15 to 50 feet between January 7th and 21st, 2010. A summary of the soil boring plan and profiles, is contained in Appendix AA, is provided as an attachment to a technical memorandum titled *Evaluation of Geological and*

Geotechnical Concerns and Preliminary Recommendations. Also refer to Appendix Z – Preliminary Geotechnical Exploration Report, for additional details.

No rock was encountered within the termination depth of the borings. However, according to the Ohio Department of Natural Resources (ODNR) bedrock topography and geology maps of the Bellbrook Quadrangle, Ohio, the underlying bedrock at the site consists of the Ordovician undivided/Ordovician undifferentiated formation. This formation is comprised of shale interbedded with dolomite and limestone and is approximately 145 feet thick. According to the Preliminary Geotechnical Exploration Report, the bedrock surface along the proposed North Frontage Road slopes downward from north to south towards Beaver Creek with a depth between 180 and 300 feet. For the entire project area, the glacial drift depth (unconsolidated materials over bedrock) map for Greene County shows most of the project is located in a region where bedrock is 40 to more than 100 feet below the surface as shown in Exhibit 16.

EXHIBIT 16
Depth of Glacial Drifts in the Study Area

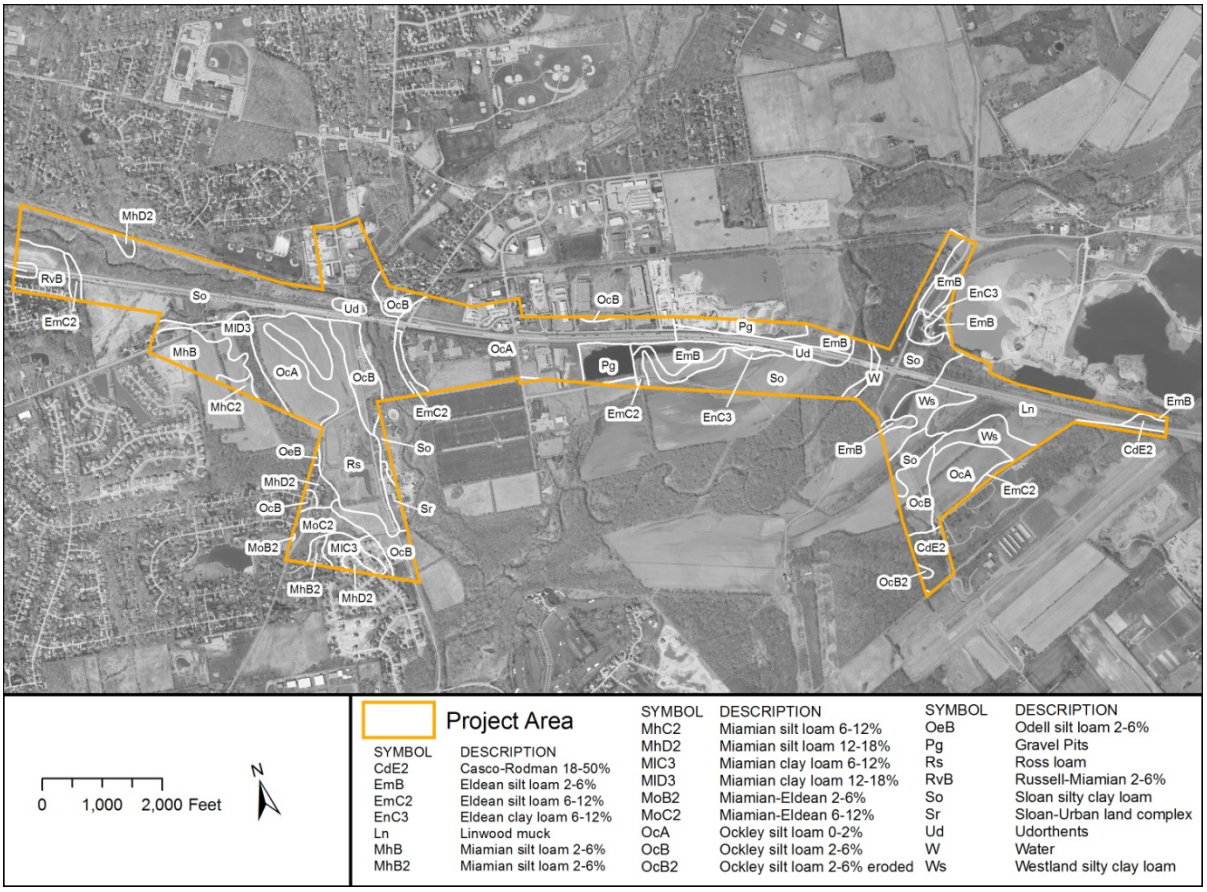


The boring drilling operations encountered the presence of groundwater at depths ranging from 3.0 feet up to 21.7 feet below existing ground surface. The presence of soft cohesive soils and loose granular soils in the upper 3 to 10 feet below the ground surface were also noted. Slightly organic to moderately organic materials are also encountered within the upper 10 feet at some borings. Additionally, the Red Flag Summary, included in the *Greene 35 Corridor Study* prepared by MVRPC, identified unsuitable materials in the vicinity south of Orchard Lane.

For the remaining area of this corridor, soft unsuitable soils should be expected within the upper portion of the existing subsurface profile. The ecological survey conducted within the project area identified more than 10 water crossings and wetlands, and a large portion of the corridor is within the 100-year flood plain.

As shown in Exhibit 17, the borings are located within the area containing soil types of So (Sloan silty clay loam), OcA (Ockley silt loam 0-2%), and OcB (Ockley silt loam 2-6%). The majority of the project study area consists of soil types of So, OcA, and OcB. Therefore, this correlation provides another indication of the potential presence of soft soils within the project limits, especially locations near/within the water crossings, wetlands, or 100-year flood plain.

EXHIBIT 17
Soils in the Study Area



SYMBOL	DESCRIPTION
CdE2	Casco-Rodman 18-50%
EmB	Eldean silt loam 2-6%
EmC2	Eldean silt loam 6-12%
EnC3	Eldean clay loam 6-12%
Ln	Linwood muck
MhB	Miamian silt loam 2-6%
MhB2	Miamian silt loam 2-6%

SYMBOL	DESCRIPTION
MhC2	Miamian silt loam 6-12%
MhD2	Miamian silt loam 12-18%
MIC3	Miamian clay loam 6-12%
MID3	Miamian clay loam 12-18%
MoB2	Miamian-Eldean 2-6%
MoC2	Miamian-Eldean 6-12%
OcA	Ockley silt loam 0-2%
OcB	Ockley silt loam 2-6%
OcB2	Ockley silt loam 2-6% eroded

SYMBOL	DESCRIPTION
OeB	Odell silt loam 2-6%
Pg	Gravel Pits
Rs	Ross loam
RvB	Russell-Miamian 2-6%
So	Sloan silty clay loam
Sr	Sloan-Urban land complex
Ud	Udorthents
W	Water
Ws	Westland silty clay loam

Soft soils will have negative impacts, including soft subgrade, inadequate bearing capacity, and excessive total and differential settlement to pavement, bridge foundations, noise barrier foundations, and more significantly to the embankment and retaining walls. This is of particular concern for the proposed elevated US 35 section over Orchard Lane and the two grade separated interchanges that will require approach and ramp embankments of up to 30 feet. In general, the larger the extent and height of the embankment/retaining walls, the higher the cost for the remediation associated with known and potential soft soils.

There are no known karst areas in the project area. A field inspection of the project area performed, as reported in the Red Flag Summary also found no natural karst features. The nearest known karst areas are more than 5 miles northwest of the project area.

There are no known faults in the project area or in Greene County. Most faults in Ohio are in Precambrian rock, overlaid by later layers, do not reach the surface and have not been active in recent times (Hansen, 2005).

Using Method B presented in Table C3.10.3.1-1 of *AASHTO LRFD Bridge Design Specifications*, the preliminary classification of the project site, based on borings B-003 and B-005, is Site Class D. However, the preliminary site class should be confirmed after additional geotechnical exploration is performed. Liquefaction may be concerned for the very loose and loose gravel and sand after they are saturated with either groundwater or flooding water. However, these loose granular layers are generally very thin (approximate 2 feet or less) according to the preliminary geotechnical exploration borings. Additionally, these loose layers are expected to be remediated for other reasons, such as bearing capacity and excessive settlement. Therefore, in general, liquefaction is not a concern at this point.

3.3.8. Retaining Wall Justification Issues

Possible retaining wall types and the issues related to the retaining walls are based on existing geotechnical and geological data, and initial results of the Preliminary Geotechnical Exploration. Several of the proposed retaining walls are within the existing 100-year floodway and consequently could impact the upstream hydraulics. Flood impacts should be considered in the retaining wall design. An effective drainage system is essential to the stability of the walls. The use of ODOT No. 3 stones or similar open graded coarse gravel as backfill, along with subsurface drainage, may be necessary to quickly drain water during a flood event. Furthermore, scour due to flooding and rapid flow of the creeks/rivers could also undermine the retaining walls.

The retaining walls for this project are to be fill walls, with most as high as 30 feet. Based on this maximum wall height and potential issues listed above, the following retaining wall types may be considered: Mechanically Stabilized Earth (MSE) wall with Ohio Department of Transportation (ODOT) No. 3 stone or similar open graded coarse gravel as backfill, cast-in-place (CIP) concrete wall, and CIP concrete wall with lightweight backfill.

Ground improvement is required for the retaining walls along the proposed North Frontage Road (Heller Drive Extension). The required improvement depth is expected to be within 10 feet of the existing ground surface. For the remaining locations, it is expected that similar

ground improvements would be required. However, additional subsurface explorations are required to evaluate the potential depth of ground improvement needed.

Several ground improvement options may be considered, such as over-excavation and replacement, ground reinforcement using intrusions (such as stone columns, controlled modulus columns (CMCs), and Combined Soil Stabilization with Vertical Columns (CSV)), or staged construction of MSE wall with wick drains. Refer to Appendix BB for additional details on retaining wall issues including potential retaining wall types and ground improvements.

Since minimal geotechnical information is currently available, a detailed evaluation and cost estimate for ground improvement was not completed as part of the AFA. A cost contingency for potential ground improvements, is included in the project costs.

3.3.9. Bridge Geometry

The proposed bridges for each interchange alternative are as follows:

Factory-Orchard Feasible Alternative 1A – 6 Bridges

- US 35 over Factory Road and Beaver Creek (L&R)
- Ramp C over Beaver Creek
- Ramp D over Beaver Creek
- Factory Road over Little Beaver Creek
- North Frontage Road over Bike Path and Beaver Creek
- Bike Path over Beaver Creek

Factory-Orchard Feasible Alternative 2 - 8 Bridges

- US 35 over Beaver Creek (L&R)
- North Frontage Road over Beaver Creek
- South Frontage Road over Beaver Creek
- Factory Road over US 35
- Factory Road over Little Beaver Creek
- Factory Road over Bike Path
- Bike Path over Beaver Creek
- US 35 over Orchard Lane

Factory-Orchard Feasible Alternative 2A – 7 Bridges

- Same bridges as Factory-Orchard Alternative 1A plus;
- US 35 over Orchard Lane (L&R)

Factory-Orchard Feasible Alternative 3 – 7 Bridges

- Same bridges as Factory-Orchard Alternative 2, except no bridge at US 35 and Orchard Lane.

Valley-Trebein Feasible Alternative 1A – 4 Bridges

- US 35 over Little Miami River (L&R)
- Ramp E over Little Miami River
- Ramp F over Little Miami River
- Valley-Trebein Road over US 35

Valley-Trebein Feasible Alternative 2A – 4 Bridges

- Same bridges as Valley-Trebein Alternative 1A
- Ramp F over Little Miami River and Valley-Trebein Road over US 35 bridges have different geometry than Alternative 1A to accommodate the different interchange configurations.

Valley-Trebein Feasible Alternative 5B – 3 Bridges

- Same bridges as Valley-Trebein Alternative 1A, except no bridge at Ramp F over Little Miami River.

For the proposed bridges, several parameters that may have the greatest influence on roadway and bridge geometric design, impact project costs, and facilitate the selection of a preferred alternative were evaluated. These parameters include horizontal curvature, span length, skew, vertical clearance, lateral offset, type of superstructure, and constructability.

To estimate vertical clearances, non-horizontal curved bridges were assumed to have a concrete girder superstructure, with the exception of the bike path over Beaver Creek bridge which was assumed to be tangent steel beams. Those bridges that contain a horizontal curve were assumed to be curved steel plate girders. To estimate the total bridge length, the bridges, with the exception of the Valley-Trebein over US 35 bridge, were assumed to be constructed behind spill through slopes (see below discussion in Drainage Assumptions). To accommodate either concrete or steel superstructures, an approximate end span ratio of 70% was used to estimate total bridge length. See Exhibit 18 below for a detailed description of the assumed geometry for each bridge for each of the alternatives.

Due to the proposed partial tight diamond configuration at Valley-Trebein, a MSE abutment wall is assumed adjacent to the westbound US 35 outside travel lane. Replacement of spill through end spans with MSE abutment walls to optimize bridge limits will be evaluated as part of the PDP Step 7 Structures Type Studies. As noted in Section 3.3.8, the potential use of MSE walls within the project limits will depend on several factors including hydraulic analysis and scour assessment.

The following drainage assumptions were used to develop conceptual bridge geometry passing over waterways.

- 100-year flood elevations at waterway crossings were determined using the FEMA Insurance Rate Maps dated August 18, 1992 (Appendix I).
- The existing bridges at US 35 over Beaver Creek, Factory Road over Little Beaver Creek, and US 35 over Little Miami River are located within the 100-year floodway. Existing low chords (lowest bottom of beam elevation) for the bridges are below the 100-year flood elevations shown on the FEMA maps. Increased overall bridge lengths reduce the flow restriction at bridge locations during a flood event. By opening up the bridges through more spans, the potential exists to lower both the 100-year flood elevations and existing backwater elevations.

Several of the waterway crossings show the low chord elevation of the proposed bridge below the 100-year flood elevation and many have at least one abutment within the estimated floodway area. The existing bike path bridge over Beaver Creek acts as a pinch point during a flood event along Beaver Creek. It is assumed this bridge will be replaced with a much longer span bridge, to increase the hydraulic capacity. It is expected that a detailed evaluation of the bridge geometry including related hydraulic implications will be performed in the PDP Step 7 Structures Type Studies. For additional details, refer to Appendix CC.

3.3.10. Railroads

No railroads are located within the project area.

3.3.11. Aesthetic Options

No aesthetic treatments have been developed for the project at this time.

3.3.12. Value Engineering Study

A joint Preliminary Engineering Phase Value Engineering Study and Constructability Review study was held on June 22-24, 2010. A multidisciplinary team of highway design, construction, and right-of-way specialists from ODOT District 8 and Central Office, FHWA, and a certified Value Specialist participated in the joint review study. The study presented nine alternatives and seven design suggestions to enhance the value of traffic and construction improvements, including a new partial cloverleaf interchange at Valley-Trebein Road; a reduced cross section of US 35; and a single combined interchange for Factory Road and Valley-Trebein Road. Refer to Appendix X for the Value Engineering Study Report (September 2010) and ODOT District 8 review comments.

Based on these findings including ODOT review comments, and with additional input from the stakeholders, Feasible Alternatives 2, 3B and 5B for the Factory-Orchard section and Alternative 5B for the Valley-Trebein section were recommended, in June 2011, for further evaluation to facilitate the selection of a recommended alternative.

Factory-Orchard and Valley-Trebein - Alternative 1A

Structure	Skew	Super-elevated	Horizontal Alignment	Assumed Bridge Width	Assumed Bridge Length	Assumed Max. Span	Assumed Structure Type	Vertical Clearance
US-35 over Factory Road and Beaver Creek (L&R)	10 degrees @ Factory Rd	No	Tangent	52.5' (L) 52.5' (R)	535'	120'	Concrete I-Girders	Factory Rd: VC > 15' Beaver Cr.: Low Chord El 17.0' above 100-Yr Flood El
Ramp C over Beaver Creek	No	No	6230' Radius @ Middle Bridge	45'	300'	110'	Concrete I-Girders	Beaver Cr.: Low Chord El 0.1' above 100-Yr Flood El
Ramp D over Beaver Creek	No	No	Tangent	53'	300'	120'	Concrete I-Girders	Beaver Cr.: Low Chord El 1.5' below 100-Yr Flood El
Factory Road over Bike Path and Little Beaver Creek	20 degrees	Constant +1.3% (RT)	Tangent	137'	210'	90'	Concrete I-Girders	Bike Path: VC > 10' Little Beaver Cr.: Low Chord El 6.0' below 100-Yr Flood El
North Frontage Road over Bike Path and Beaver Creek	45 degrees @ Beaver Cr.	Transition, Max. -3.5% (RT)	382' Radius @ Begin Bridge	49'	750'	110'	Curved Steel Girders	Bike Path: VC > 10' Beaver Cr.: Low Chord El 12.0' below 100-Yr Flood El
Bike Path over Beaver Creek	No	No	Tangent	12'	225'	90	Steel Girders	Beaver Cr.: Low Chord El 6.0' below 100-Yr Flood El
US-35 over Little Miami River (L&R)	No	No	Tangent	52.5' (L) 52.5' (R)	380'	125'	Concrete I-Girders	Little Miami: Low Chord El 4.0' below 100-Yr Flood El
Ramp E over Little Miami River	No	No	11459' Radius	33'	380'	125'	Concrete I-Girders	Little Miami: Low Chord El 1.5' below 100-Yr Flood El
Ramp F over Little Miami River	25 degrees @ Little Miami	Transition, Max. -6.0% (RT)	716' Radius @ Begin Bridge	33'	490'	150'	Curved Steel Girders	Little Miami: Low Chord El 3.5' below 100-Yr Flood El
Valley-Trebein over US-35	15 degrees	No	Tangent	79'	240'	100'	Concrete I-Girders	US-35: VC > 17'

Factory-Orchard and Valley-Trebein - Alternative 2A

Structure	Skew	Super-elevated	Horizontal Alignment	Assumed Bridge Width	Assumed Bridge Length	Assumed Max. Span	Assumed Structure Type	Vertical Clearance
US-35 over Factory Road and Beaver Creek (L&R)	SAME AS ALTERNATIVE 1A							
Ramp C over Beaver Creek	SAME AS ALTERNATIVE 1A							
Ramp D over Beaver Creek	SAME AS ALTERNATIVE 1A							
Factory Road over Bike Path and Little Beaver Creek	SAME AS ALTERNATIVE 1A							
North Frontage Road over Bike Path and Beaver Creek	SAME AS ALTERNATIVE 1A							
Bike Path over Beaver Creek	SAME AS ALTERNATIVE 1A							
US-35 over Orchard Lane (L&R)	10 degrees	Crown Removal	Tangent	52.5' (L) 52.5' (R)	200'	85'	Concrete I-Girders	Orchard Lane: VC > 15'
US-35 over Little Miami River (L&R)	SAME AS ALTERNATIVE 1A							
Ramp E over Little Miami River	No	No	11459' Radius	33'	380'	125'	Concrete I-Girders	Little Miami: Low Chord El 1.5' below 100-Yr Flood El
Ramp F over Little Miami River	No	Transition, Max. -6.0% (RT)	819' Radius @ End Bridge	33'	480'	140'	Curved Steel Girders	Little Miami: Low Chord El 1.5' below 100-Yr Flood El
Valley-Trebein over US-35	< 5 degrees	No	Tangent	79'	190'	75'	Concrete I-Girders	US-35: VC > 17'

4. Affected Environment and Environmental Consequences

4.1. Natural Environment

4.1.1. Groundwater Resources

Data from the ODNR Geographic Information Management System and maps of the Miami Buried Valley Aquifer from Ohio EPA show that all alternatives are almost entirely within a Class 1 sole source aquifer area. The Class 1 area is the central part of the aquifer, and generally has high potential groundwater productivity based on the aquifer characteristics and the proximity to recharge.

Based on the Ohio EPA mapping of drinking water sources[2], the Greene County Northwest Regional Water Treatment plant draws its water from the Buried Valley Aquifer via well fields along the west side of the Little Miami River and Shakertown Road within the project area, and along Beaver Valley Road north of Dayton Xenia Road. These well fields are considered moderately susceptible to contamination.

The analysis tabulated the areas of the footprint of each alternative, regardless of land use, that is beyond the existing right-of-way. The alternatives would cover nearly identical areas of the Class 1 aquifer area. None would directly impact existing wells, but improvements along Shakertown Road and US 35 west of Shakertown Road would be within the protection zones of three wells, and improvement of US 35 near the Little Miami River would be within the protection zone of five wells.

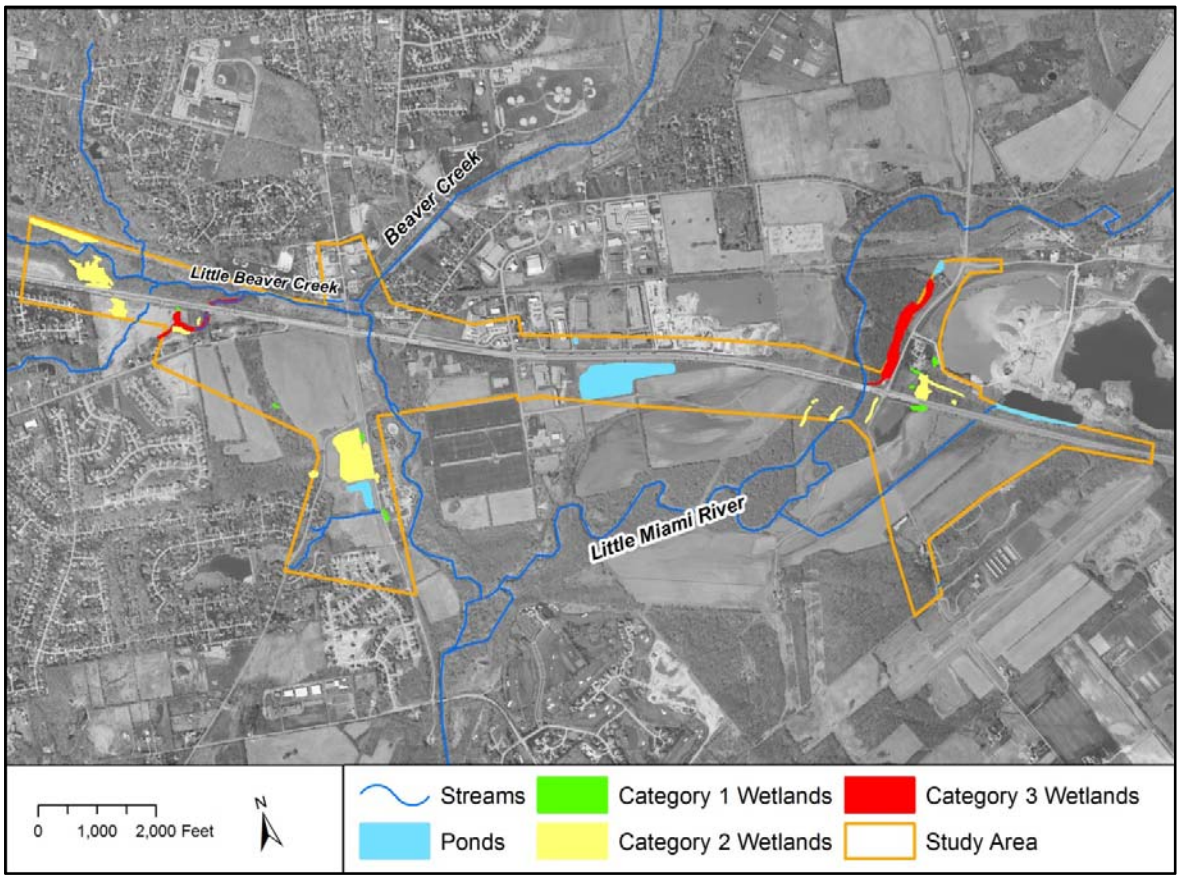
There are two non-community public water systems in the study area: the Econo Lodge at Orchard Lane and US 35, and the Homecroft Building (Systech Environmental) on Valley Road. All alternatives would include roadway improvements within the Econo Lodge protection zone. At Valley-Trebein, Alternative 1A will improve Valley Road near or within the Homecroft Building protection zone, while Alternatives 2A and 5B would not.

4.1.2. Stream and Aquatic Resources

Level 1 Ecological Survey field investigations performed in July through August 2007 identified water bodies in the project area (Exhibit 19). The US Army Corps of Engineers assessed the streams during a site visit in January 2009 and summarized their findings in their letter of May 19, 2009 (see Appendix K). The characteristics of the wetlands and waters in the project area and the pertinent regulations, as determined by the USACE, are summarized in the following paragraphs.

[2] Source: The OEPA Drinking Water Source Assessment website: http://www.epa.ohio.gov/ddagw/swap_assessments.aspx, accessed 5/26/2010.

EXHIBIT 19
Streams and Wetlands in the Project Area



The major aquatic habitats in the study area are the Little Miami River, Beaver Creek, and Little Beaver Creek. The Little Miami River is considered a traditionally navigable waterway regulated under the Clean Water Act. It is a navigable waterway in accordance with Section 10 of the Rivers and Harbors Act, under the jurisdiction of the Corps of Engineers, but it is not a Section 9 navigable waterway under the jurisdiction of the US Coast Guard. The reach of the Little Miami River through the study area is assigned a use designation as an Exceptional Warm Water Habitat (EWH), and is designated a State Resource Water, a State Scenic River, and a National Wild and Scenic River. The habitat of the river upstream of US 35 is good, but lacks the characteristics and diversity that are typically associated with a EWH. The primary substrates are cobble and gravel, with sandbars along the banks in shallow areas. The river is partially shaded by riparian vegetation, although it is relatively straight (little to no sinuosity) with mostly glide/pool habitats. Some riffle habitat is present near the southern boundary of the study area. Visual inspection of the banks of the river for native mussels found only a moderate number of the invasive Asian clam. Water quality (as indicated by field measurements of pH, dissolved oxygen, temperature, and conductivity) is generally good in the river.

Beaver Creek and Little Beaver Creek are located near the US 35 and Factory Road intersection. US 35 bridges Beaver Creek just east of Factory Road; Factory Road bridges

Little Beaver Creek just north of US 35. These streams are relatively permanent waters that are tributary to the Little Miami River, and therefore regulated under the Clean Water Act. Both of these streams are designated Warmwater Habitats (WWH). The habitat conditions found in these streams within the study area were consistent with that designation. Like the Little Miami River, both streams have little sinuosity, and largely comprise moderately stable riffle/run/pool habitats. Water quality is generally good in both streams.

Seven other small stream systems in the study area are tributary to the Little Miami River, Beaver Creek, or Little Beaver Creek.

The alternatives would have similar impacts to streams (Exhibit 20). The US 35 bridge over the Little Miami River would be widened for Alternatives 1A, 2A and 5B. For Alternatives 1A and 2A, one bridge crossing would be added to the south for the eastbound off ramp to Valley-Trebein Road. While these bridges would clearspan the river, with no in-stream piers or other structures, this additional bridge crossing is an issue because of the National and State Scenic River status of the Little Miami River. For Alternative 5B, the existing bridge would be widened to accommodate the new ramps, without the need for the additional bridge crossing.

The existing bridges across Beaver Creek and Little Beaver Creek would also be widened for all alternatives. Alternatives 1A/3B and 2A would have an additional bridge crossing of Beaver Creek north of US 35 and east of Factory Road to accommodate the extension of Heller Drive. Alternative 2 would avoid the Heller Drive bridge, although another bridge will be required just south of US 35 for the frontage road between Factory Road and Orchard Lane. All alternatives would also replace the existing bridge along the bike path over Beaver Creek to improve hydraulics and reduce the potential for flooding.

Three other small streams would be affected. One is a tributary to the Little Miami River east of the Valley-Trebein intersection. This is a channelized stream through a gravel pit and agricultural area; its habitat conditions are indicative of a Modified Warmwater Habitat. This stream currently flows in a culvert under US 35 and Valley Road. All alternatives would require widening or relocating these existing culverts. The second stream is a small, intermittent Class II headwater that is tributary to Beaver Creek. This stream is in a culvert beneath Factory Road. All alternatives would require widening this crossing. Lastly, a culvert extension would be required for a Class III headwater that crosses beneath US 35 west of Factory Road for all alternatives.

Exhibit 20
Stream Impacts of the Feasible Alternatives

			Impact Length (feet)						
			Factory-Orchard Alternatives				Valley-Trebein Alternatives		
Stream	**Classification**	**Flow Regime**	**1A**	**3B**	**2A**	**2**	**1A**	**2A**	**5B**
Little Miami River*	Exceptional Warmwater Habitat	Perennial					513	435	230
Unnamed tributary to Little Miami River	Modified Warmwater Habitat	Perennial					400	293	295
Beaver Creek*	Warmwater Habitat	Perennial	437	437	437	350			
Little Beaver Creek	Warmwater Habitat	Perennial	277	277	277	277			
Unnamed tributary to Beaver Creek	Class II headwater	Intermittent	337	337	337	337			
Unnamed Tributary to Little Beaver Creek	Class III headwater	Perennial	107	107	107	107			
TOTAL			**1,158**	**1,158**	**1,158**	**1,071**	**913**	**728**	**525**

*For each alternative, the Little Miami River, Beaver Creek and Little Beaver Creek would be bridged, with no piers in the streams. The stated impact lengths are those beneath the proposed bridges. These would be temporary impacts during bridge construction.

Five ponds, either borrow pits, farm ponds, or stormwater ponds, are present within the study area. The USACE found only one of the ponds, northeast of the Trebein Road/US 35 intersection, is regulated under the Clean Water Act. The other ponds are isolated borrow pits or stormwater detention basins. None of the ponds would be affected by any of the alternatives.

4.1.3. Wetland Resources

Level 1 Ecological Survey field investigations performed in July through August 2007 identified wetlands in the project area (Exhibit 21). The US Army Corps of Engineers assessed the wetlands during a site visit in January 2009 and summarized their findings in a letter dated May 19, 2009 (see Appendix K).

The Corps of Engineers confirmed 22 wetlands in the study area. Two appear to meet the criteria of Category 3 wetlands, the highest ranking, according the Ohio EPA's Rapid Assessment Method (ORAM): one located in the riparian woodlands of the Little Miami River in the ODNR's Glen Thompson Reserve, and the other is a former channel/oxbow of the Little Beaver Creek. Twelve wetlands are Category 2 (the "average" ranking), and ten are Category 1 (the lowest ranking). The USACE determined that ten of the wetlands were isolated waters not regulated under the Clean Water Act. Ohio EPA does regulate these wetlands pursuant to the Ohio Isolated Wetlands Law.

The build alternatives would have similar impacts to a common set of nine wetlands (Exhibit 21). The total impact would be slightly less than one half acre at the Factory-Orchard interchange, and slightly under one acre at the Valley-Trebein interchange. Either alternative would have minor, peripheral impacts on the two Category 3 wetlands adjacent to existing US 35. Either alternative would affect four Category 2 wetlands and three Category 1 wetlands. The difference between the alternatives is the impact to Category 1 and 2 wetlands at the Valley-Trebein interchange.

EXHIBIT 21
Wetland Impacts of the Feasible Alternatives

Wetland Category	Jurisdictional or Isolated	Impact Area (acres)						
		Factory-Orchard Alternatives				Valley-Trebein Alternatives		
		1A	3B	2A	2	1A	2A	5B
3	Jurisdictional	0.06	0.06	0.06	0.06	0.02	0.02	0.02
2	Jurisdictional					0.69	0.65	0.56
2	Isolated	0.41	0.41	0.41	0.41			
1	Isolated	0.02	0.02	0.02	0.02	0.20	0.25	0.24
TOTAL		**0.49**	**0.49**	**0.49**	**0.49**	**0.91**	**0.92**	**0.82**

Impacts to jurisdictional wetlands and streams by the Preferred Alternative will require a Clean Water Act Section 404 permit from the USACE, and possibly a Section 401 Water Quality Certification from the Ohio EPA, depending on whether the project qualifies for

authorization under a Nationwide Permit (the Nationwide Permits are scheduled for re-authorization in 2012, and the conditions of the permits may change). Impacts to isolated wetlands will require a permit from the Ohio EPA separate from the Clean Water Act permits. Typically, impacts require mitigation in the form of replacement, enhancement or preservation of comparable or better resources. The details of mitigation will be determined during the permitting process.

4.1.4. Rare, Threatened, and Endangered Species

There are no records of federally listed species within a one-mile radius of the study area, based on records from the U.S. Fish and Wildlife Service and the Ohio Natural Heritage Database. Several federally listed species have been recorded in Greene County: the Indiana bat (*Myotis sodalis*, federal endangered), the eastern massasauga rattlesnake (*Sistrurus catenatus*, federal candidate, state endangered), and the clubshell mussel (*Pleurobema clava*, federal endangered). The nearest record of the Indiana bat and the eastern massasauga rattlesnake are from Wright-Patterson Air Force Base, approximately 6 miles north of the study area. The nearest recorded downstream location of the clubshell mussel is in northern Warren County, some 14 river miles downstream of the study area.

Woodlands are categorically potentially suitable summer habitats for the Indiana bat throughout Ohio. In particular, living or standing dead trees with peeling or loose bark, split trunks and/or branches, or cavities are considered preferred summer roosting and brood-rearing habitats. While a number of these trees were identified in field studies, the Valley-Trebein interchange alternatives affect only one site (two trees). Neither of the Factory Road interchange alternatives would affect any bat trees. Impacts to woodlands would largely be adjacent to existing US 35, and would be comparable for each alternative. A seasonal restriction for tree clearing between April 1 and September 30 is often enforced to limit potential impact to the Indiana bat. The impact to potential Indiana bat habitat will be evaluated by the ODOT Office of Environmental Services, in accordance with the Indiana bat Programmatic Consultation between the USFWS, the FHWA and ODOT (September 1, 2006), to determine the likelihood of impact to the species and appropriate mitigation measures.

The eastern massasauga is a docile rattlesnake often found in or near wet areas including wetlands, wet prairies, nearby woodlands, or shrub edge habitat. Dry upland areas up to 1.5 miles away are used during the summer, if available. Some of the wetlands and adjacent habitats in the study area may be suitable for the eastern massasauga. Each alternative would have comparable impacts on these habitats. Capture studies were not performed for this project. In their correspondence following review of the Ecological Survey Report, the ODNR Division of Wildlife states that no impact to the eastern massasauga is likely, based on the location of the project relative to recorded habitats of this species.

The habitat of the clubshell mussel is not well described, but the species occurs in small rivers and streams in clean sweep sand and gravel. Some portions of the Little Miami River, Beaver Creek, and Little Beaver Creek in the study area may provide suitable habitat,

although no mussels were found during field studies in any of these streams. Either alternative would bridge all of these streams.

The ODNR has record of two state listed species within a 2-mile radius of the study area: the snuff box mussel (*Epioblasma triquetra*, state endangered) in the Little Miami River about 2 miles downstream of US 35, and the plant species "fen Indian-plantain" (*Cacalia plantaginea*, state potentially threatened) southeast of the study area. There is no record or either of these species in the study area, nor was any found during field studies.

The ODNR Division of Wildlife notes three other state listed species that are known from Greene County and that may occur in the project area: seepage dancer (*Argia bipunctulata*), a state endangered damselfly, Northern harrier (*Circus cyaneus*), a state endangered bird, and the loggerhead shrike (*Lanius ludovicianus*), a state endangered bird. Impacts to the seepage dancer are unlikely, although impacts to grasslands, prairies and wetlands could affect the bird species. ODNR proposes a seasonal construction restriction from April 1 to August 1 in these habitats to limit potential impacts to these species during their nesting season.

The Preferred Alternative, when selected, will be coordinated with the ODNR and the USFWS to obtain a final assessment of potential impact to protected species, and to determine appropriate mitigation measures.

4.1.5. Terrestrial Resources

Approximately 61 percent of the study area is composed of managed lands, namely: existing right-of-way, developed lands (including commercial lands, parking lots, residential areas, and gravel pits) and adjacent mowed open fields, and active agriculture. Standing forest (successional/riparian) comprises approximately 20 percent of the study area. Woodlands occur adjacent to the Little Miami River, Beaver Creek, and Little Beaver Creek, and as several scattered woodlots in the study area. Approximately 7 percent of the study area is scrub-shrub vegetation, 10 percent is open fields, and 2 percent is open water.

At the Factory Road interchange, Feasible Alternatives 1A, 3B and 2A would have similar impacts to terrestrial habitats. About 60 percent of the improvements would occur in existing right-of-way and developed lands, and about 20 percent would be in cropland. Total impact to natural communities (woods, scrub and open fields) would be around 15.5 acres for Alternatives 1A, 3B and 2A: 5.5 acres of woodland, 2 acres of open fields, and 8 acres of scrub. The impacts to natural communities for Alternative 2 would be slightly less (about 14 acres) because there would be no Heller Road extension. Given their vegetative composition and historical disturbance, these habitats are not regionally significant.

At the Valley-Trebein interchange, around 45 to 50 percent of the improvements would be in existing right-of-way and developed lands. Alternative 2A would affect the least amount of cropland at about 15 acres, Alternative 1A at 19 acres, and Alternative 5B the most at about 22 acres. On the other hand, Alternatives 1A and 2A would have the most impact on natural communities: 12-14 acres of woodland, 1 acre of open fields, and 1 acre of scrub. Alternative 5B would have only 9 acres of impact on woodland, in particular, less impact on riparian woodlands along the Little Miami River than the other alternatives.

4.1.6. Floodplains

The extent of Federal Emergency Management Agency (FEMA) mapped floodways and floodplains in the study area were determined based on GIS transcription of FEMA mapping, as provided by the Ohio Geographic Information Management System. These areas were checked against the FEMA Floodway and Floodplain maps (Community Panel 390193 0050 and 390193 0055, effective 4/1/1981). The floodway and floodplains are shown on Exhibits 5, 6A and 6B and in Appendices D through G-1. The 100-year floodplain extends along the Little Miami River, Beaver Creek, and Little Beaver Creek and covers much of the project area. The floodway extends along the Little Miami River, Beaver Creek and Little Beaver Creek, and covers areas adjacent to the waterways, in many cases extending across the existing roadways.

The analysis tabulated the areas of floodplain and floodway within the footprint of each alternative, regardless of land use, but excludes areas that would be bridged by the new roadways. Bridging the Little Miami River, Beaver Creek and Little Beaver Creek avoids much of the potential impact to the floodways. However, the floodplain extends widely adjacent to the streams, and therefore encompasses a large portion of all of the alternatives.

The impacts of the alternatives are similar. At Factory Road, Alternative 2 would have the least impact at 53 acres of floodplain and 5 acres of floodway. Alternatives 1A, 3B and 2A will have a greater impact to the floodplain, around 55 to 56 acres, and floodway, around 7 acres, because of the Heller Road extension. At Valley-Trebein, Alternative 5B would have the greatest impact to floodplains at 54 acres, with a floodway impact of about 6 acres. Alternative 2A would impact the least area of floodplain at 45 acres, but a larger area of the floodway at about 10 acres. Alternative 1A would affect about 49 acres of floodplain, and the greatest area of floodway at 11 acres.

A federally funded project is subject to compliance with Federal Executive Order 11988 – Floodplain Management and approval by the FHWA. ODOT will engage the Greene County floodplain coordinator to discuss the feasible alternatives and requirements for compliance with local floodplain regulations.

4.1.7. Farmlands

The Farmland Protection Policy Act (FPPA), requires Federal agencies: (a) to use the criteria established by the USDA to identify and take into account the adverse effects of their programs on the preservation of farmland, (b) to consider alternative actions, as appropriate, that could lessen adverse effects, and (c) to ensure that their programs, to the extent practicable, are compatible with State and units of local government and private programs and policies to protect farmland. The US Department of Agriculture in cooperation with other Federal agencies has developed guidelines to assist agencies in making this assessment that are laid out in the Code of Federal Regulations (7 CFR 658).

One consideration is the impact on prime farmlands. Prime farmlands are defined by the soil types defined and mapped by the Natural Resources Conservation Service (NRCS). Much of the soil in the project area is prime farmland soil.

Exhibit 22 is a summary of the USDA Farmland Conversion Impact Rating form completed for Alternatives 1A and 2A in cooperation with the NRCS and in accordance with the guideline established by the USDA. The analysis evaluated each of these alternatives for the Factory-Orchard interchange section and the Valley-Trebein Road interchange section separately. The completed FCIR form is in Appendix L.

The effect on farmland is assessed in two parts. The NRCS assesses the relative value of the site for agricultural production compared to other farmland in the same local government jurisdiction. This rating, on a scale of 0 to 100, is based on the soil productivity ratings, land capability classifications, and important farmland determinations. The second part is completed by ODOT (on behalf of FHWA) and considers the amount of the site in nonurban use, the amount of the site that is actively farmed, the sizes of the farms affected, location of the site relative to urban areas, effect on farm services, and peripheral impacts to farmlands. This rating is on a scale of 0 to 160 points.

EXHIBIT 22
Available Farmland Conversion Impact Ratings For the Feasible Alternatives

	Factory-Orchard Alternatives		Valley-Trebein Alternatives	
Evaluation Component	**1A**	**2A**	**1A**	**2A**
Relative Value of Farmland to be Affected	77	77	72	78
Corridor Assessment Criteria	35	35	52	50
TOTAL RATING	**112**	**112**	**124**	**128**

According to USDA rating criteria, sites receiving a total score of less than 160 need not be given further consideration for protection and no additional sites need to be evaluated. The combined score for the alternatives range from 112 to 128, indicating no additional alternatives need to be considered.

Alternatives 2, 3B and 5B have not yet been scored by the NRCS. At the Factory Road interchange, Alternatives 2 and 3B would have nearly identical impacts to farmlands as Alternatives 1A and 2A, and therefore the farmland conversion impact rating for these alternatives would be the same. At Valley-Trebein, Alternative 5B would affect about three acres more active farmland than the other alternatives. Therefore, it would have a slightly higher relative value score, but the total score would still not approach 160.

4.1.8. Hazardous Materials

An Environmental Site Assessment (ESA) Screening in 2007 reviewed historic and current land use information and regulatory databases to identify parcels that may require additional environmental assessment. The ESA Screening Report recommended thirteen parcels for additional environmental assessment (Appendix DD). A later additional screening identified one additional parcel for a Phase 1 ESA (site #14). In 2010, Phase 1 Environmental Site Assessments (Appendices EE and FF) of these 14 parcels recommended two parcels for Phase II subsurface sampling to determine if the portions of these sites that

would be acquired for right-of-way are contaminated. All of the Factory Road alternatives would require right-of-way from both of these two parcels, as listed in Exhibit 23 and mapped on Exhibit 24.

EXHIBIT 23
Parcels Evaluated in Phase 1 Environmental Site Assessment

Site Number	Description	Address	Recommended for Phase II Study
1	Homecroft Building	245 North Valley	No
2	Jeff Schmitt Cadillac	631 Orchard Lane	No
3	Lang's Chevrolet	635 Orchard Lane	No
4	Greene County Regional Laboratory	422 Factory Road	No
5	Unknown parcel ownership	West of US 35 and Shakertown Road	No
6	Valley Asphalt Corp.	790 North Valley Road	No
7	Benedict Slurry Seal, Inc.	556 North Valley Road	No
8	Site Food Mart	2260 Heller Drive	**Yes**
9	Delaney Oil Company	2396 Phil Hubble Drive	**Yes**
10	Elano Plant 1	1010 Factory Road or 2455 Dayton-Xenia Road	No
11	Duncan Oil Company	849 Factory Road	No
12	Unknown parcel ownership with monitoring well, GM-BS	Adjacent to 785 Factory Road	No
13	Elano Division of Unison Industries	2060/2070 Heller Drive	No
14	Beavercreek Commerce Center	680 N Orchard Lane	No

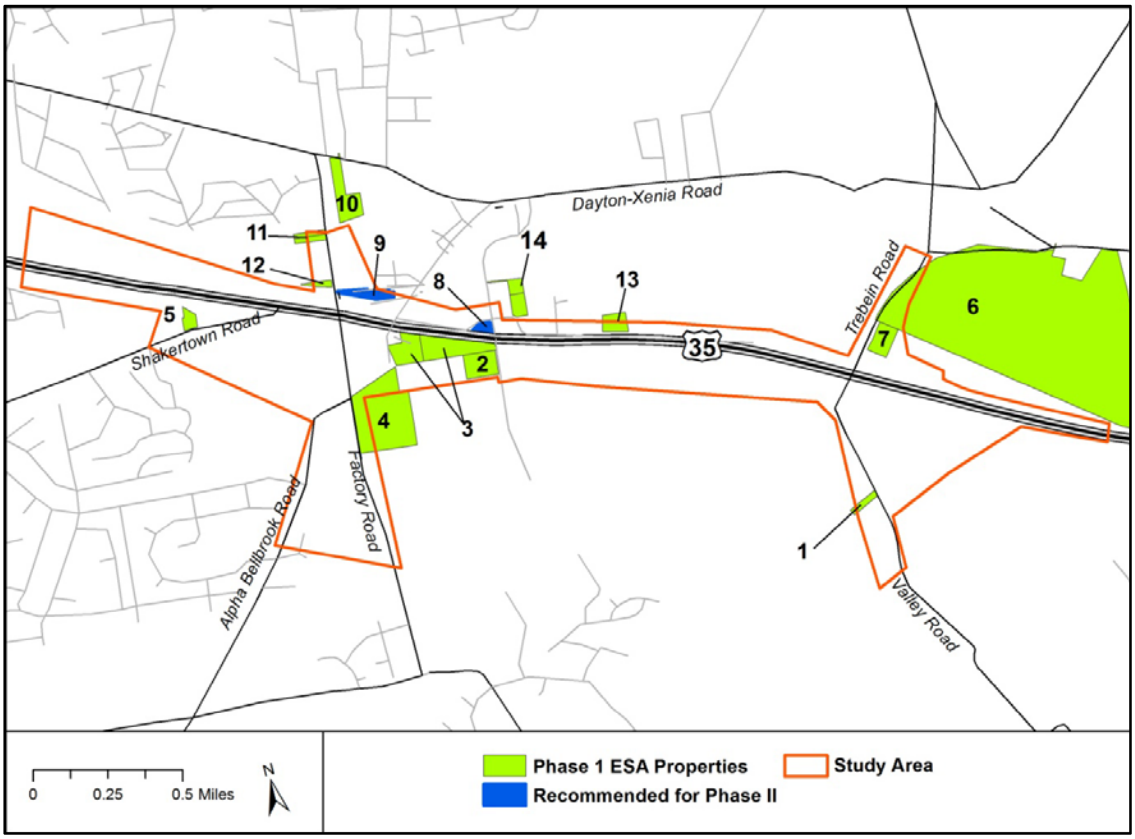
4.2. Social Environment

4.2.1. Land Use

The area surrounding the Factory Road/Orchard Lane intersections is largely characterized by commercial and industrial development along Factory Road, and along US 35 from Factory Road to east of Orchard Lane. North of the commercial development, there is a residential area (village of Alpha) between Factory Road and Alpha Road. The Beavercreek Community Park and the Creekside Reserve (county parkland) are located north of US 35 at Factory Road. There are a few residences along Shakertown Road west of Factory Road. Dense residential areas occur just west of the project area along Shakertown Road, and just south along Alpha-Bellbrook Road.

The area surrounding the Valley-Trebein intersection is largely undeveloped. The Glenn Thompson Reserve (state parkland) occurs in the northwest quadrant of the intersection. A gravel quarry and excavating company are located in the northeast quadrant. A small office building, a cemetery, and one residence occur along Valley Road at the southern end of the project area.

EXHIBIT 24
Phase 1 Environmental Site Assessment Parcels



The proposed improvement of US 35 is generally consistent with the current land uses. Access to most businesses, residences and parklands will remain. However, there are concerns for the accessibility and visibility of numerous auto dealerships and gasoline/convenience stores that are located along US 35, Orchard Lane and Factory Road, and that are currently readily accessible from US 35. Access will be provided to these businesses along service roads. There will also be some involvement with parklands around the Factory Road interchange that will need to be coordinated with the officials who have jurisdiction over these properties (see Section 4.2.7).

The relocation of Shakertown Road will slightly modify access to a few homes. The existing Shakertown Road will be maintained as a cul-de-sac for these homes.

There are two large, vacant properties (currently used for agriculture) that have been proposed for development in the project area, although site plans have not been approved.

1) The Valley Springs Farm is a 670-acre tract located along both sides of Valley Road just south of US 35. This property has been proposed for mixed development, including office and residential, and may include other uses. Alternative 5B for the Valley-Trebein interchange would require about 20 acres of the property, while Alternative 1A would require 21 acres and Alternative 2A would require about 16 acres. The alternatives would realign Valley Road, but otherwise access to the

property would remain intact, except that there would be limited access along Valley Road within 600 feet of the ramp terminals.

2) The Eastbelle property is a 160-acre tract located in the southwest quadrant of the Factory Road intersection. Existing Alpha-Bellbrook Road occupies about 2 acres of the parcel, and separates a 14-acre section from the remainder. The City of Beavercreek has zoned this parcel for business planned urban development. The city's land use map shows the 160-acre site as partially office development (east side along Factory Road), and partially single family residential (west side). The proposed realignment of Shakertown and Alpha-Bellbrook Roads for all alternatives would acquire in the range of 23 to 26 acres of the site for right-of-way, and divide the property into four parcels ranging from 2 acres to 92 acres.

4.2.2. Residential and Business Relocations

More than 80 percent of the acquisition for the project would be from vacant lands, including most of the property that would be acquired for both interchanges, the relocation of Shakertown Road, Alpha-Bellbrook Road, and Valley Road, and the extension of Alpha Court to Yellow Brick Road.

A number of parcels would be affected by strip takes from their frontage along US 35, Factory Road, and Trebein Road to accommodate the improvements along these roadways.

The proposed north and south service roads for all of the Factory Road alternatives, between Orchard Lane and Factory Road, would require acquisition of frontage currently used for displaying their vehicle inventories from several of the adjacent automobile dealerships, notably Jeff Schmidt Cadillac, Lang's Chevrolet and Jeff Schmidt Mazda on the south side, and Jeff Schmidt Nissan on the north side. The northern section of the Heller Road extension (Alternatives 1A, 2A and 3B) would cross commercial, residential, and park properties, and would divide some parcels. No residential or commercial buildings would be removed, although some outbuildings and parking areas would likely be affected.

Alternative 3B poses the greatest potential for relocation impacts. With this alternative, Factory Road would pass over US 35 and the Creekside Trail, and its profile would gradually decline to meet the existing roadway about a quarter mile north of the trail. Because of the elevation of the roadway, and design standards to limit any entrances or driveways within 600 feet of a ramp terminal, access to at least one industrial property along the west side of Factory Road could not be maintained, requiring relocation of this business.

4.2.3. Demographics/Environmental Justice

Results of Census 2010 for the project area were not available when this analysis was prepared. The analysis will be updated in subsequent steps but the results are not expected to change in any meaningful way.

A review of Census 2000 was performed to identify environmental justice populations (low-income level or racial minority) and persons who may be at a disadvantage because of

language, lack of personal transportation, disability, or age, pursuant to Title VI of the Civil Rights Act. The Census reports data only at levels of aggregation needed to protect individual privacy. For the study area this is the Census Block level for racial and age characteristics and the Census Block Group level for other characteristics of interest.

Exhibit 25 shows the racial and age distribution for Census Blocks in the study area. The minority population data are mapped in Exhibit 26. Three Census Blocks have a higher proportion minority than the county as a whole, 210500-1024, 210603-1050, and 210603-1051. Of these three Census Blocks, only 210500-1024 has a population of more than 10 people. On the whole, the study area has a much smaller proportion of minority population than Greene County.

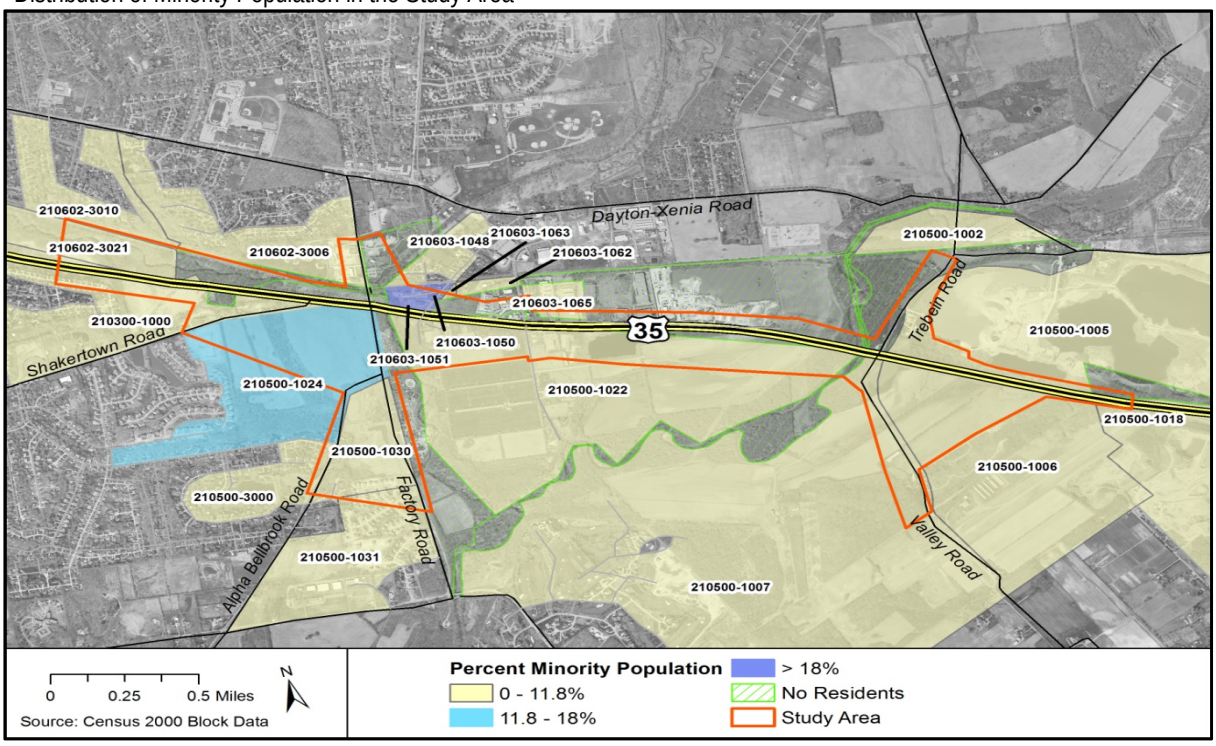
EXHIBIT 25
Racial and Age Characteristics in Study Area

Tract-Block	Total Population	Minority Population	Percent Minority	Population Age 65+	Percent Age 65+
210300-1000	466	26	5.6%	39	8.4%
210500-1002	10	0	0.0%	0	0.0%
210500-1005	3	0	0.0%	0	0.0%
210500-1006	3	0	0.0%	0	0.0%
210500-1007	91	2	2.2%	17	18.7%
210500-1018	7	0	0.0%	0	0.0%
210500-1022	12	0	0.0%	2	16.7%
210500-1024	120	21	17.5%	15	12.5%
210500-1030	41	0	0.0%	2	4.9%
210500-1031	16	0	0.0%	2	12.5%
210500-3000	153	12	7.8%	12	7.8%
210602-3006	215	5	2.3%	47	21.9%
210602-3010	131	6	4.6%	24	18.3%
210602-3021	2	0	0.0%	0	0.0%
210603-1048	81	1	1.2%	16	19.8%
210603-1050	4	3	75.0%	0	0.0%
210603-1051	9	2	22.2%	3	33.3%
210603-1062	3	0	0.0%	3	100.0%
210603-1063	11	0	0.0%	1	9.1%
210603-1065	2	0	0.0%	1	50.0%
Study Area	1380	78	5.7%	184	13.3%
Greene County	147,886	15,911	10.8%	17,492	11.8%

The Census Blocks are mapped in Exhibit 26. The data show that the limited minority population in the study area is concentrated near the intersection of Factory Road and US 35. Data for the two blocks northeast of the intersection have a population of only 13 individuals, of whom 5 or 38 percent are classified minority. Census Block 210500-1024 to the southwest of the intersection has a high number and proportion of minorities.

Development patterns suggest that they are more likely to live in the south west portion of the block.

EXHIBIT 26
Distribution of Minority Population in the Study Area

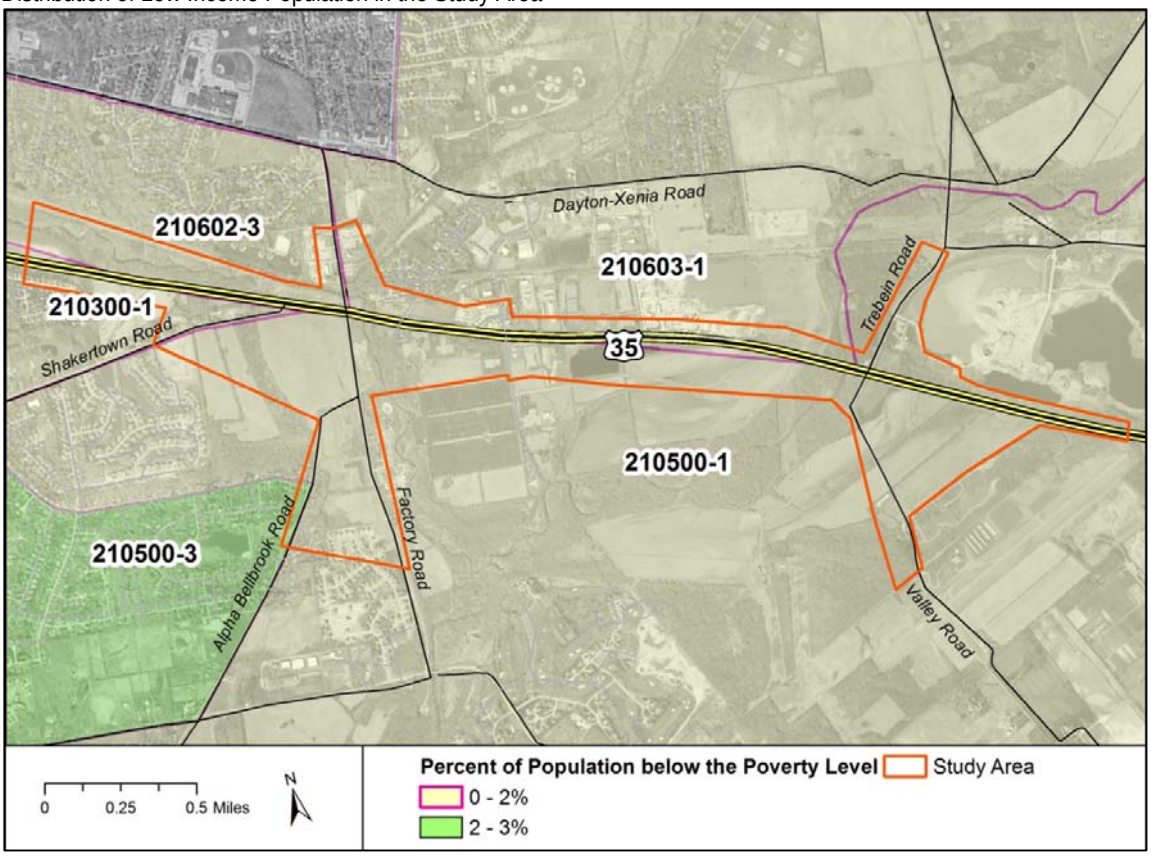


Income, and other indicators of potentially disadvantaged populations, is available for the Census Block Group level of aggregation. The data are reported in Exhibit 27 and mapped in Exhibit 28. There are no Census Block Groups with concentrations of low-income populations in the study area. The residential areas of the Census Block Groups that have higher proportions than the countywide averages of those who speak English less than well, who are in no vehicle households, or who are disabled are not adjacent to the study area.

EXHIBIT 27
Low Income and Other Indicators of Potentially Disadvantaged Populations

Tract-Group	Below Poverty Level		Speak English Less than Well		No Vehicle Households		Disabled	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
210300-1	9	0.8%	17	1.5%	0	0.0%	160	14.0%
210500-1	0	0.0%	12	0.6%	19	2.4%	416	19.6%
210500-3	49	2.3%	0	0.0%	6	0.8%	264	11.7%
210602-3	8	0.5%	0	0.0%	8	1.2%	480	32.9%
210603-1	53	1.7%	52	1.8%	5	0.5%	390	13.8%
Greene County	11,847	8.5%	1,089	0.8%	2,897	5.2%	36,395	26.1%

EXHIBIT 28
Distribution of Low Income Population in the Study Area



4.2.4. Community Facilities and Services

The Beavercreek Township fire department provides emergency fire and emergency medical service throughout the project area. The fire department headquarters and nearest fire station to the project area is located is located on Dayton-Xenia Road just west of Orchard Lane, north of the project area.

The Beavercreek City Police serve the project area. The nearest police station is co-located on Dayton-Xenia Road with the fire station.

Beavercreek City Schools serve the residents in the project area. These schools are located along Dayton-Xenia Road west of Factory Road.

There are no fire stations, ambulance service, police stations, churches, or schools within the project area or that would be directly affected by the project. Emergency service access to areas south of US 35 from the stations located along Dayton-Xenia Road would be maintained during construction and permanently. However, closing Orchard Lane to through traffic in Factory Road Alternatives 1A and 3B would detour emergency vehicles that are destined for points along South Orchard Lane. Emergency vehicles would travel along Factory Road and Yellow Brick Road, an increase in travel distance of approximately 1.5 miles.

Access to schools and churches from residences south of US 35 is not expected to be affected.

There are a number of park properties and a bike trail that could be temporarily affected during construction (see Section 4.2.7). Access to these properties would be not be permanently affected by most alternatives. However, Alternative 5B could preclude access to the Beavercreek Community Park and the Creekside Trail from Factory Road due to the profile of the roadway passing over US 35 and design standards that limit driveways within 600 feet of a ramp terminal.

4.2.5. Community Cohesion/Neighborhood

The proposed project would be located along existing roadways, largely in commercial, light industrial or undeveloped areas. No residential areas would be divided by the project.

4.2.6. Cultural Resources

Preliminary studies identified cultural resources in the study area that are regulated under Section 106 of the National Historic Preservation Act and under Section 4(f) of the Transportation Act (see Section 4.2.7).

The Phase 1 History/Architecture Survey (Appendix GG) of buildings and structures in the study area found only one historical structure eligible for the National Register of Historic Places within the Area of Potential Effect (APE) of the feasible alternatives. This Greek/ Federal Revival house located about 150 feet south of US 35 at the Alpha Road intersection is owned by Greene County. A Phase II Architectural Survey (Appendix HH) further documents the eligibility of the site for the NRHP. The parcel where this structure is located partially falls within the APE of the Factory Road interchange feasible alternatives. The eligibility of the property will continue to be evaluated as the project progresses by the ODOT Office of Environmental Services in consultation with the Ohio Historic Preservation Office (OHPO).

Research on the historical context of the project area (Appendix GG) identifies potential archaeological sites in the project area. A number of previously identified archaeological sites fall within the APE of all feasible alternatives and may require additional study to determine if they are eligible for the NRHP. Additional coordination with the OHPO may be necessary for this determination.

4.2.7. Section 4(f), Section 6(f), and Scenic Rivers

49 USC 303 (generally known as Section 4(f) of the Department of Transportation Act) provides protection from conversion to a transportation use for publicly owned parks and recreation areas; historic sites (regardless of ownership) of national, State, or local significance; and wildlife or waterfowl refuges.

A property ownership search, initial cultural resources investigations, and field visits identified a number of recreational properties that are potentially subject to Section 4(f) (Appendix II). These are shown on Exhibit 29 and listed in Exhibit 30.

One historical building, eligible for listing on the National Register of Historic Places (NRHP), is located in the study area, just south of US 35 at Alpha Road (section 4.3.5). This historical building would be protected under Section 4(f). The current plans show encroachment of about one third acre into the parcel where the historic house is located for either alternative, including modifications to the existing drive. ODOT is currently evaluating this property as to its eligibility for the National Register of Historic Places, and the limits of the eligible property will be defined. The potential impact to the property from the alternatives will also be evaluated in the Phase II report.

As noted in Section 4.2.6, a number of archaeological sites in the study area require additional study to determine if they are eligible for listing on the NRHP. Even if eligible, these sites are not necessarily Section 4(f) sites. Section 4(f) does not apply to archeological sites where the FHWA, after consultation with the OHPO and the Advisory Council, determines that the archeological resource is important chiefly because of what can be learned by data recovery and has minimal value for preservation in place.

EXHIBIT 29

Section 4(f) Properties In the Project Area

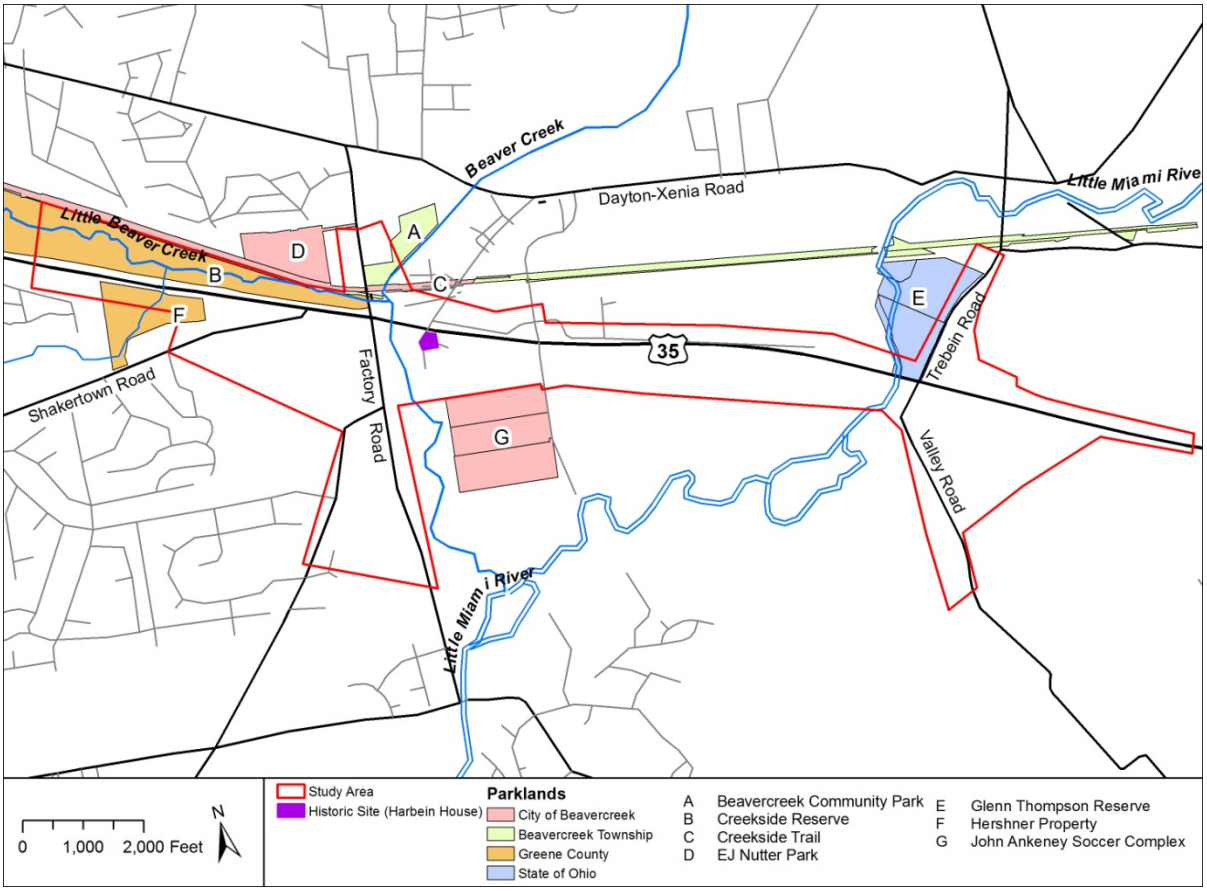


EXHIBIT 30
Section 4(f) Properties in the Study area

			Area of Section 4(f) Property within Alternative Footprint (acres)						
			Factory-Orchard Alternatives				Valley-Trebein Alternatives		
Name	**Official with Jurisdiction**	**Location**	**1A**	**3B**	**2A**	**2**	**1A**	**2A**	**5B**
Recreational Properties									
Beavercreek Community Park	Beavercreek Township	North of US 35 and east of Factory Road	0.68	0.68	0.68	0.45			
Creekside Reserve	Greene County Park District	North of US 35 and west of Factory Road	2.55	2.1	2.55	2.1			
Creekside Trail	City of Beavercreek, Beavercreek Township	Parallel and north of US 35; Section at Factory Road	1.48	1.48	1.48	1.51			
EJ Nutter Park	City of Beavercreek	North of US 35 and west of Factory Road	None	None	None				
Glenn Thompson Reserve	Ohio DNR (leased by Greene County Park District)	Trebein Road, Northwest of US 35					0.45	0.37	0.37
Hershner Property	Greene County Park District	Between Shakertown Road and US 35	None	None	None				
John Ankeney Soccer Complex	City of Beavercreek	South Orchard Lane	None	None	None				
Little Miami River	Ohio Department of Natural Resources, National Park Service	West of Valley-Trebein Road					0.5 (beyond R/W and easements)	0.4 (beyond R/W and easements)	0 (beyond R/W and easements)
Historical Properties[1]									
GRE-431-1/AL016, Greek/Federal Revival residence	Greene County Board of Commissioners	South of US 35 at Alpha Road intersection	0.37 acres	0.37 acres	0.37 acres	0.22 acres			

[1] Includes historical structures on or eligible for the National Register of Historic Places

The Little Miami River is a National and State Wild and Scenic River. Wild and Scenic Rivers are protected by Section 4(f) where they are publically owned and are administered for recreation. The area of the river north of US 35 is state-owned and a Section 4(f) resource. Private property borders the river to the northwest, and all of the land adjacent to the river south of the US 35 crossing is private land. The ODOT Office of Environmental Services will contact the ODNR Scenic Rivers coordinator to obtain information regarding the current management plan and use of the river for recreation to determine if the proposed river crossings will constitute a use under Section 4(f).

Projects crossing a National Wild and Scenic River that require a federal permit or license require a review of potential impacts under Section 7 of the National Wild and Scenic River Act. A similar stipulation is codified for state projects. ODNR is the regulatory agency that administers the State Scenic River program, and the National Park Service administers the National program. Typically, these agencies review impacts of projects within a 1000-foot buffer surrounding scenic rivers.

Six of these properties are partially within the preliminary construction footprints of the feasible alternatives (Exhibit 29). The officials with jurisdiction need to verify the limits of the sites that qualify as Section 4(f) property, and whether proposed impacts to these properties constitute a permanent use, a temporary use, a constructive use, or no use under Section 4(f):

1) Beavercreek Community Park – Alternatives 1A, 2A and 3B would locate an extension of Heller Drive as a bridge over a portion of the park to meet Factory Road. This crossing would occupy park property but would not require the acquisition of any developed recreational facilities. The road would bridge the bike trail spur and walking trails in the park. Alternative 3B could limit access to the park from Factory Road, because of the profile of Factory Road overpassing US 35 and the Creekside Trail.

2) Creekside Trail - The Creekside Trail runs from Dayton to Xenia, along a former railroad bed north of and parallel to US 35. In the project area, it is located on properties owned by the City of Beavercreek and Beavercreek Township. The trail is asphalt paved and 6 feet wide, with an at-grade crossing of Factory Road and a bridge over Beaver Creek. This is a multi-use trail designed for bikers, walkers, joggers, and skaters. The city of Beavercreek Department of Parks, Recreation and Culture website describes it as a "linear park." An existing parking lot at the Beavercreek Community Park serves users of the trail. The Factory Road interchange would require modification of the profile of Factory Road and replacement of the bridge over Little Beaver Creek. Therefore, the at-grade crossing of the trail at Factory Road would be replaced for all alternatives. For all alternatives, the Creekside Trail would be realigned to pass under the new bridge.

3) Creekside Reserve: The portion of the reserve adjacent to US 35 (south of Little Beaver Creek) has no improvements or trails, no connections to the Creekside Trail, no parking, and no public access. The total impact to this parcel would be about 2.55 acres for all alternatives. This area includes an excepted portion of the park property that extends 100 feet from the centerline of Factory Road and 50 feet from the US 35 right-of-way line that was reserved specifically for future roadway right-of-way when the property was transferred to the Greene County Park District. Although the existence of this exception was identified by Greene County Parks District, the extent of this exception has not yet been confirmed with the parks district. As currently planned, more than one acre of the improvements at the Factory Road interchange would extend beyond the exception, although in an area with no improvements and no public access. The status of the exception and recreational use of the property must be verified with the Greene County Park District.

4) Glenn Thompson Reserve: All of the alternatives for the Valley Road-Trebein Road interchange would encroach into the Glenn Thompson Reserve. Most of the impact to the park property for all Valley-Trebein alternatives would be within existing drainage and slope easements, primarily to construct a retaining wall along the westbound on-ramp and to reconstruct the driveway to the parking lot. Impacts beyond the existing easements would be about 0.14 acre. Depending on the area of construction and maintenance of access to the park facilities, work in the park may be a temporary use or no use of this property. A small area of the preliminary construction footprint of the alternatives encroaches slightly into the park property along Trebein Road. This footprint represents the worst case; it is likely that this impact can be avoided with minor design revisions.

5) Little Miami River: US 35 would clearspan the Little Miami River on the same alignment as the existing bridge. South of existing US 35, a new eastbound off-ramp would be installed that would cross the river at approximately the same location for Alternatives 1A and 2A. This is a new crossing that would be separate from the existing bridge and would also clearspan the river. Alternative 5B would avoid this additional crossing; the mainline bridge would be widened to accommodate the eastbound off-ramp. The ODOT-Office of Environmental Services will contact the ODNR Scenic Rivers Coordinator regarding the current management plans for this reach of the river and the potential impact of the reconstruction of US 35. Final plans will be coordinated with the ODNR Scenic Rivers coordinator. Any impacts to the river or its tributaries occur within the river will require a Section 7 review and approval from the National Park Service.

6) Harbein House: All Factory Road alternatives would include strip takes from the property to improve the existing dead-end Alpha Court either as a two lane roadway connecting to Yellow Brick Road (Alternatives 1A, 2A and 3B) or a standard cul-de-sac (Alternative 2), and for frontage roads/service roads along

US 35 for each alternative. There would be no direct impact to any of the buildings. However, the limits of the historic site have not yet been determined, pending review by the OES and the Ohio Historic Preservation Office.

There are no properties in or adjacent to the study area that were purchased or improved with funds provided under Section 6(f) of the Land and Water Conservation Act according to information obtained from the National Park Service, the ODNR, and Greene County Park District.

4.3. Technical Issues

4.3.1. Air Quality

Under the Clean Air Act, the USEPA monitors and regulates a number of "criteria air pollutants." For each of these pollutants, the USEPA has established two levels of standards for limiting air pollution: primary standards protect health, and secondary standards prevent environmental and property damage. An area that does not meet the primary standard is said to be a nonattainment area. The criteria air pollutants are:

- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO2)
- Sulfur Dioxide (SO2)
- Ozone (O3)
- Particulate Matter (PM10 and PM2.5)
- Lead (Pb)

Greene County is in attainment for all of the criteria air pollutants, except PM2.5, which is particulate matter that is 2.5 microns or less in size. Clean Air Act section 176(c)(l)(B) requires that transportation projects in nonattainment and maintenance areas must not "cause or contribute to any new violation of any standard in any area; increase the frequency or severity of any existing violation of any standard in any area; or delay timely attainment of any standard or any required interim emission reductions or other milestones in any area."

Transportation projects are evaluated for air quality impacts as part of the regional Transportation Improvement Plan (TIP) or the Statewide Transportation Improvement Program (STIP), and on an individual basis, depending on the elements of the project and expected traffic levels. Projects are generally required to be evaluated for Mobile Source Air Toxics (MSAT), Particulate Matter (PM2.5), Ozone (O3), and Carbon Monoxide (CO).

1) An MSAT analysis is required for any project that has sensitive land uses within 500' of the project area and the project involves adding capacity, adding a new interchange, or a new road on new alignment. This project may require an MSAT analysis.

2) A PM2.5 “hotspot” analysis is required for projects that:

a. Are located in a PM2.5 nonattainment area,
b. Have an average daily traffic (ADT) of greater than 125,000 in the design year, and
c. Have a diesel truck volume greater than 10,000 in the design year.

The combined ADT of US 35 and intersecting roadways is 67,440 for the opening year (2018) and 80,350 for the design year (2038). Therefore, a PM 2.5 hotspot analysis is not required. The ODOT-OES will determine if the project is exempt from air quality conformity for PM 2.5, or the project will require a conformity determination approval letter from FHWA. The OES-Noise and Air Quality Unit will be responsible for obtaining the conformity determination from FHWA.

3) Planned projects are evaluated for potential ozone impacts as part of the regional TIP or Statewide TIP (STIP) air quality analysis. The US 35 reconstruction project is listed in the STIP. Greene County is in attainment for ozone. There is no requirement to perform project level ozone analysis at this time.

4) A Quantitative CO analysis is required if the project would result in an increase in the ADT of more than 10,000 vehicles within 10 years of construction. The project is listed in the STIP as "CO Air Quality Nonexempt." Based on the current traffic projections a CO analysis will not be required.

4.3.2. Noise Analysis

The potential traffic noise impacts associated with the feasible alternatives were analyzed in accordance with 23 CFR Part 772 – Procedure for Abatement of Highway Noise and Construction Noise and Ohio Department of Transportation (ODOT) Standard Procedure for Analysis and Abatement of Highway Traffic Noise (September 2001). An ambient noise survey conducted in the project area determined current baseline noise levels. FHWA's Traffic Noise Model (TNM version 2.5) predicted design year (2038) traffic noise levels for Feasible Alternative 1A and 2A. The impacts associated with Feasible Alternatives 2, 3B and 5B were developed in accordance with how they compared to the modeled conditions.

Noise impacts occur when traffic noise levels at outdoor activity areas approach or exceed the Noise Abatement Criteria – in this case 66 decibels (dBA). Noise impacts also occur when a substantial increase is predicted between existing and design year levels – in this case an increase of ten (10) dBA. When traffic noise impacts occur, an investigation of abatement measures is required.

Noise abatement often takes the form of a noise barrier. In accordance with the ODOT Noise Abatement Policy, barriers are installed if the cost is considered to be reasonable, based on the size of the barrier and the number of dwelling units that are benefitted. The reasonable cost per dwelling unit is $35,000, including front row dwelling units receiving a minimum reduction of 5 dBA reduction in average noise level, plus other benefited units that would receive 3 dBA or more reduction in the average noise level.

The results of the traffic noise analysis are summarized in Exhibit 31. The location of the receivers used for this analysis is shown in Exhibit 32. The analysis found that relatively few sensitive receptors will experience a traffic noise impact. The design year traffic noise levels increase only modestly compared to existing conditions. There is very little meaningful difference between the feasible alternatives relative to traffic noise impacts.

The results of the traffic noise analysis can be summarized as follows:

- Few receivers experience noise levels that approach the Noise Abatement Criteria (NAC). For the most part, those modeled receivers that do experience a noise impact, will exceed the NAC under all modeled conditions (existing configuration, opening year (2018), future No-Build (2038), Feasible Alternative 1A (2038) and Feasible Alterative 2A (2038)).
- No receivers are predicted to experience a substantial increase in traffic noise. The highest modeled increase (as compared to existing conditions) is expected to be 5.1 dBA.
- The noise levels associated with the modeled feasible alternatives are nearly indistinguishable. Even the increases between the no-build and the feasible alternatives are small. Most increases over the no-build are less than 3 dBA, with no modeled increases greater than 4 dBA.
- Noise levels at the Glenn Thompson Reserve will decrease, under all of the feasible alternatives, because of the relocation of Trebein Road.
- The only receiver portraying an existing residential land use expected to experience a traffic noise impact as a result of the feasible alternatives (#11 on Shakertown Road) represents a single dwelling unit. Noise barriers for single dwelling units are rarely found to be reasonable to construct. The roadway configuration at Shakertown Road is nearly identical for all feasible alternatives.
- The noise analysis included a large vacant property near the Valley/Trebein interchange that is proposed for mixed use development, known as the Valley Springs Farm development. The site has not yet been platted or permitted. Speculative receivers were located within the site to model the potential noise impacts. Some of the assumed receivers would experience a traffic noise impact. Among the modeled alternatives, the impacted receivers represent potential first row dwelling units (#18 and #21). The predicted noise levels exceed the NAC in all cases studied. Depending on the configuration and number of dwelling units, noise barriers may be reasonable. The differences among the feasible alternatives are primarily the location of the eastbound on- and off-ramps. Feasible Alternative 1A uses a loop ramp in the southwestern quadrant. Feasible Alternative 2A uses a diamond interchange. Feasible Alternative 5B uses a loop ramp in the southeastern quadrant. Since the primary noise source is US 35, the differences in the overall traffic noise levels are expected to be limited amongst these additional configurations. The actual specification for noise barriers at this property will depend on the actual land uses/layout of the development and

when the property is permitted for building, relative to the construction of the GRE-35 project.

EXHIBIT 31
Estimated Noise Levels

Site	Description	Existing (2018) (dBA)	No Build Alternative (2038) (dBA)	Alternative 1A (2038) (dBA)	Alternative 2A (2038) (dBA)
1	Residence at Blue Rock Road	54.8	55.6	56.7	56.4
2	Ballfields at Nutter Park, west of Factory Road	56.8	57.6	59.6	59.0
3	Bike path at Nutter Park, west of Factory Road	60.6	61.5	62.6	62.2
4	Beavercreek Community Park - Memorial	57.3	58.1	61.4	60.6
5	Beavercreek Community Park - Pond	54.1	54.9	57.6	57.5
6	Bike path at BC Park, east of Factory Road	57.8	58.6	62.3	62.0
7	Residence at Maple Road – at Beaver Creek	53.2	54.0	57.9	57.6
8	Residence at Maple Road – at Alpha Road	54.5	55.4	58.9	58.6
9	Residence at Alpha Road	60.8	61.7	64.4	64.1
10	Residence at Shakertown Road	55.7	56.6	57.4	57.0
11	Residence at Shakertown Rd – nearest to US 35	65.5	**66.3**	**68.8**	**68.5**
12	Residence at Alpha-Bellbrook Road	59.6	60.3	62.2	62.4
13	Harbein House	**68.2**	**69.1**	**70.9**	**70.7**
14	John Ankeney Soccer Complex	54.5	55.4	58.9	58.6
15	Valley Springs Farm (west) - second row	55.0	55.9	57.2	57.0
16	Valley Springs Farm (west) - third row	51.4	52.2	53.0	52.8
17	Valley Springs Farm (west) - second row	57.5	58.3	60.2	59.8
18	Valley Springs Farm (west) - first row	**67.7**	**68.5**	**68.4**	**68.2**
19	Valley Springs Farm (east) - first row	62.8	63.6	65.5	59.5
20	Valley Springs Farm (east) - second row	51.8	52.4	56.9	52.6
21	Valley Springs Farm (east) - first row	**70.6**	**71.4**	**71.3**	**71.0**
22	Valley Springs Farm (east) - second row	55.7	56.5	58.2	57.8
23	Valley View Memorial Gardens – nearest US 35	52.4	53.3	54.6	54.6
24	Valley View Memorial Gardens - entrance	60.4	60.5	60.5	60.5
25	Valley Springs Farm (east) - first row	63.4	64.3	64.2	64.3
26	Glenn Thompson Reserve – picnic area	**68.8**	**69.5**	59.2	60.0

Noise Impacts are in **Bold**.

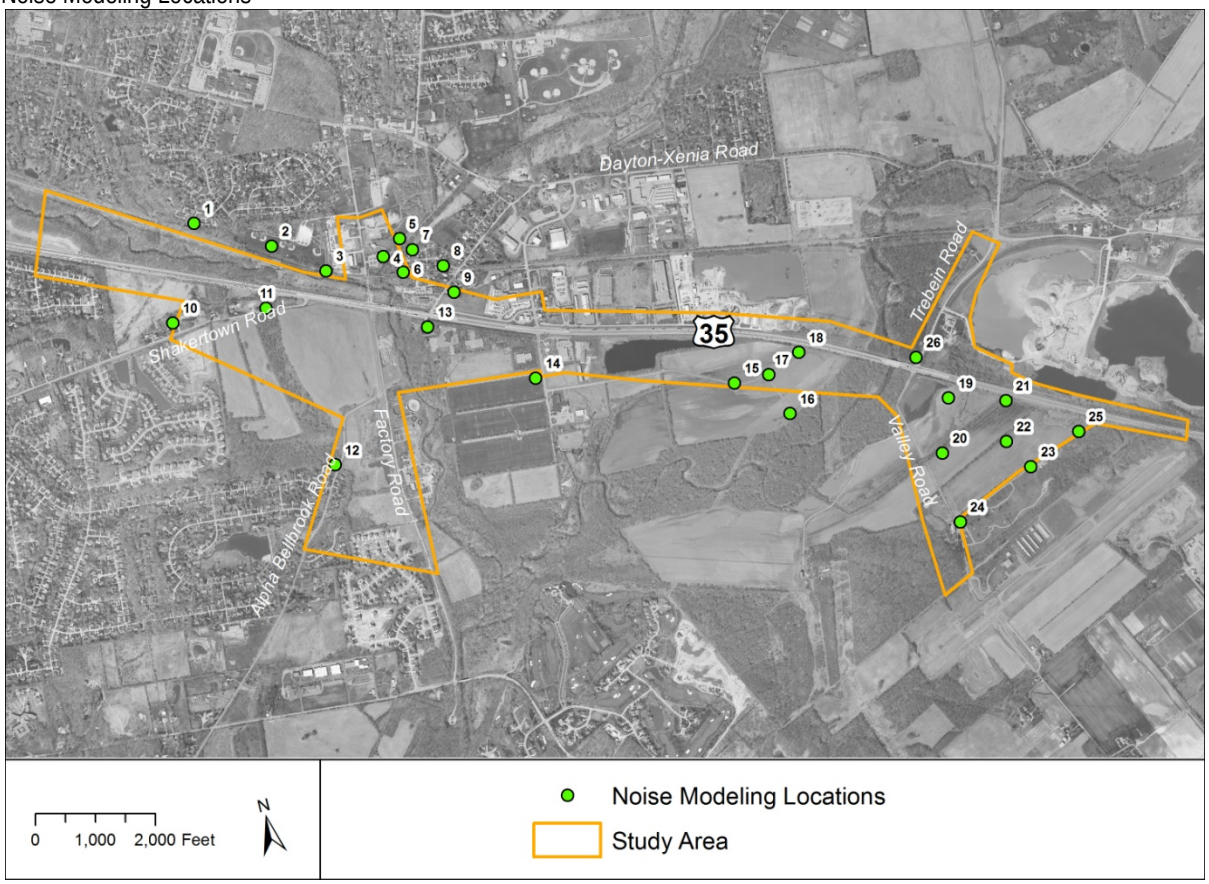
- The receiver representing the Harbein House is expected to receive a traffic noise impact (#13 on Exhibit 32). This Greek/Federal Revival house is located just south of US 35 at the Alpha Road intersection. It is owned by Greene County and used for official business. It may be eligible for the National Register of Historic Places (eligibility status is under review by ODOT-OES in cooperation with OHPO). All surrounding land uses are commercial. The predicted noise levels

exceed the NAC in all modeled cases (existing/no-build/1A/2A). The consequences of moving Factory Road over US 35 (Feasible Alternative 3B) is expected to be negligible at reducing the possibility of a noise impact. The split diamond configuration (Feasible Alternative 2) will combine the US 35 off-ramps and Alpha Road used in 1A and 2A. This will increase the distance between vehicles and the Harbein House. This may have the result of somewhat lower noises levels – but an impact is still expected. While a noise barrier could abate noise at this location, its commercial neighbors may see this as a negative impact to their operations. ODOT, in consultation with OHPO and the stakeholders, will determine the feasibility and reasonableness of a barrier at this location for the preferred alternative.

- The only feasible alternative that does not use a Heller Drive extension adjacent to the Beavercreek Community Park (#s 4, 5, 6 and 7) is Feasible Alternative 2. The split diamond configuration combines the frontage road and the off-ramp proposed in the other feasible alternatives. Although none of the feasible alternatives are expected to result in a traffic noise impact within the park, the split diamond configuration will remove a highly visible noise source from the immediate vicinity of the park.

Refer to Appendix JJ for the complete Preliminary Noise Analysis Report. The feasibility of structural noise barriers, in those areas with noise impacts, will be investigated for the preferred alternative in subsequent stages of the Project Development Process.

EXHIBIT 32
Noise Modeling Locations



4.3.3. Energy

Over the long term, the project should have a positive impact on vehicle fuel usage by improving the flow of traffic.

The Level of Service (LOS) is a measure of the traffic flow expected at each of the intersections (see Section 2.4). Current LOS at Factory Road intersection is LOS F, and other intersections are expected to degrade to LOS F by 2030. With the project, the LOS throughout the corridor is expected to be between LOS A to LOS C, which indicates an improvement in traffic flow at the intersecting roadways. Simply put, replacing the at-grade intersections with separated grade interchanges will improve traffic flow along US 35 throughout the corridor, with no routine queuing of idling vehicles along the mainline at traffic lights, and reduced queuing along intersecting roadways, which would result in greater fuel efficiency.

The construction of the project will require fuel and electrical energy. Long term, additional electrical energy will be required for additional lighting at the new interchanges. This use of energy is considered a prudent investment in developing a safe and efficient transportation project.

4.3.4. Construction Impacts

Construction will disrupt normal traffic flows. However, traffic will be maintained along US 35, Factory Road and Valley-Trebein Road in accordance with the maintenance of traffic plan (see Section 3.3.4).

Earthwork will expose soils to potential erosive forces, which could cause sedimentation in nearby streams. For this reason, a National Pollutant Discharge Elimination System (NPDES) construction storm water permit from OEPA is required for projects that disturb an earth area of more than one acre. A Stormwater Pollution Prevention Plan (SWPPP) for control of sedimentation into waters during construction will be developed for each phase of construction, in accordance with the ODOT *Construction and Material Specifications Manual, Location and Design Manual* and the *Authorization for Storm Water Discharges Associated with Construction Activity* from Ohio EPA. A Notice of Intent pursuant to the NPDES General Permit for Construction must be submitted to the Ohio EPA for approval prior to construction. The construction contractor will become a co-permittee and will be responsible for implementing sediment and erosion control best management practices during construction. Permanent vegetation will be re-established as soon as possible after construction to minimize water quality impacts in nearby streams.

Other potential impacts include fugitive dust. Dust control will be implemented, such as watering equipment paths, to minimize the impacts offset.

To minimize impacts to waterways, no fuels or other hazardous materials or idle equipment will be stored adjacent to streams or flood prone areas. ODOT standard construction specifications include having a spill contingency plan.

5. Comments and Coordination

5.1. Project Stakeholder Meetings

A project stakeholders meeting was held on January 12, 2010, at the Beavercreek City Hall. The purpose of the meeting was to provide the stakeholders with a project status update and discuss the additional modifications to the alternatives based on comments received from the April 20, 2009 meeting with the business representatives, along with the comments received from the two public meetings. The minutes from the April 20, 2009, and January 12, 2010 meetings are included in Appendix M.

The outcome of the project meeting resulted in the following modifications to the Conceptual Alternatives:

- Modify Conceptual Alternative 2 to include a full diamond interchange at Factory Road with two-way frontage road on north side of US 35 connecting to Factory Road north of the ramps and terminating near Phillips Gravel. This eliminated the split diamond interchange configuration at the Factory-Orchard section. US 35 will remain at grade at Orchard Lane with Orchard terminating on both sides of US 35.
- Investigate a two-way frontage road on the south side of US 35.
- Investigate if extending frontage roads to Valley-Trebein would be justified based on Certified Traffic.

A project stakeholders meeting was held on May 11, 2011 to provide the stakeholders a project status update and to discuss the feasible alternatives. The outcome of the project meeting resulted in the following additional modification:

- Conceptual Alternative 2, split diamond interchange at Factory-Orchard, previously eliminated, was reinstated as Feasible Alternative 2.

Additional stakeholder meetings were held on June 20, 2011 and June 22, 2011 to provide the stakeholders an update of Feasible Alternative 2, in addition to Feasible Alternatives 2A, 3B and 5B.

5.2. Public Involvement Meeting

ODOT sponsored one additional public meeting to present updated project plans and collect public comment. The meeting was held July 14, 2011 in the Maintenance Facility, 789 Orchard Lane, Beavercreek, Ohio which is in the project area. The sign-in sheets included in Appendix M-1 show that 87 people attended the meeting.

Large displays of the alternatives at Factory/Orchard and at Valley/Trebein and a display that summarized the key features of each alternative were available for review at the meeting. The same content is available in Exhibit 34 and Appendices E, E-1, E-2 and G-1 of this report. These displays were successful in stimulating comment and discussions among participants and between project staff and participants.

While project staff answered comments they encouraged participants wishing to comment on the record to provide written comments through any of several mechanisms. A total of 29 written comments were provided. These have been summarized in Exhibit 33 along with responses. A tally of the comments shows that approximately 90 percent of comments received expressed support for the project and 10 percent opposed the project with a preference for No-build. Appendix M-2 contains a summary of the tallies for each feasible alternative.

EXHIBIT 33
Public Comments and Responses for GRE-35-4.26

Category	Comment	Response
General	Instead of the project, consider adjusting the timing to the stop lights and providing "Prepare to Stop" flashing lights to alert traffic of an upcoming traffic light.	Changing signal timing would not meet the purpose and need of the project which includes the elimination of the signalized intersections along US 35.
General	Retain the existing at-grade intersections and traffic lights.	Retaining the existing at-grade intersections and traffic lights would not meet the purpose and need of the project which includes the elimination of the signalized intersections along US 35.
General	Consider revisiting the long range plan of replacing at-grade intersections with interchanges.	While transportation plans are reviewed frequently, it is unlikely that local officials or MVRPC would reverse their decision on the need to eliminate the congested and dangerous signalized intersections along US 35.
Beaver Valley Rd.	Extend Beaver Valley Road, south of Dayton-Xenia, to intersect Factory Road.	This is outside the scope of the GRE-35-4.26 project and, if implemented, it would be a local project, not an ODOT project.
Alpha-Bellbrook Rd	Close off Alpha-Bellbrook Road.	Eliminating access from Alpha-Bellbrook to Factory Road and therefore US 35 would adversely affect a large number of residents and is not an alternative for this project.
Alpha-Bellbrook Rd	Realign Alpha-Bellbrook Road to match Yellow Brick Road.	This will be evaluated during Step 7, the next step in the Project Development Process.
Alpha Road	Remove cul-de-sac at Alpha Road on the south side of US 35 and extend Alpha Road to property at 620 Alpha Road.	This will be evaluated during Step 7, the next step in the Project Development Process.
Bicycles	Provide bike lanes on the North Frontage Road (Heller Drive Extension) and the South Frontage Road to facilitate pedestrian and bicycle access to the Creekside Trail.	The addition of bicycle facilities will be considered during Step 7, the next step in the Project Development Process. The facilities mentioned are not part of the MVRPC long-range plan
Bicycles	Add bicycle facilities along Factory Road connecting the subdivisions south of US 35 along with Shakertown Road to Creekside Trail located north of US 35.	The addition of bicycle facilities will be considered during Step 7, the next step in the Project Development Process. The facilities mentioned are not part of the MVRPC long-range plan.

EXHIBIT 33
Public Comments and Responses for GRE-35-4.26

Category	Comment	Response
Bicycles	Provide bicycle access from the south side of US 35 and along Orchard Lane connecting the soccer field to Creekside Trail.	The addition of bicycle facilities will be considered during Step 7, the next step in the Project Development Process. The facilities mentioned are not part of the MVRPC long-range plan.
Business Impacts	Provide direct access to the Canyon Drive Thru and Storage Units are limited.	This will be evaluated during Step 7, the next step in the Project Development Process.
Business Impacts	Other possible solutions should be given due consideration that would limit the affects to local businesses.	Considerable effort has gone into minimizing impacts on local businesses consistent with meeting the overall purpose and need for the project. While additional specific proposals are welcome and would be given due consideration, the project already incorporates such measures identified.
Business Impacts	The businesses along US 35 corridor represent approximately 500 to 700 jobs. These jobs will be impacted, and many eliminated, should the project proceed as planned.	Minimizing impacts to local businesses, to the degree that is consistent with the purpose and need for the project, has been a consideration throughout the project.
Business Impacts	Consider the impacts to the local businesses.	Minimizing impacts to local businesses, to the degree that is consistent with the purpose and need for the project, has been a consideration throughout the project.
Design	Add one additional lane in each direction of US 35 to increase through traffic capacity.	Adding additional lanes on US 35 would not meet the purpose and need of the project which includes the elimination of the at-grade and signalized intersections along US 35.
Design	Keep US 35 at-grade and have Factory Road and Orchard Lane be elevated.	US 35 will be elevated, where appropriate, to minimize impacts to local businesses. For example, if Orchard were elevated, access to several businesses along Orchard would be eliminated before Orchard returned to the existing elevation. Having US 35 elevated at Orchard Lane and keeping the local roads at their current grade minimizes access impacts to these businesses. At Factory Road, feasible alternatives with both US 35 at-grade and elevated have been developed.
Design	Consider painted traffic Islands instead of raised traffic medians.	The types of traffic islands (raised and or painted) will be evaluated during Step 7, the next step in the Project Development Process.
Design	Design the Factory road interchange for full access with entrance and exit ramps (eastbound and westbound) at Factory Road instead of a split diamond interchange with only westbound entrance ramp and eastbound exit ramp at Factory Road and the other ramps further east at Orchard Lane.	The split diamond interchange with access at Factory Road and Orchard Lane is shown as Feasible Alternative 2, and the Factory Road tight diamond interchange is shown in Feasible Alternatives 1A, 2A and 3B.

EXHIBIT 33
Public Comments and Responses for GRE-35-4.26

Category	Comment	Response
Design	Design the Factory Road interchange to provide direct access to businesses south of US 35.	Feasible Alternative 2, the split diamond configuration, provides access to both north and south of US 35.
Design	Extend the ramps from Orchard Lane further east to open up access to additional properties for development.	This suggestion is outside the scope of the current project.
Design	Consider one interchange located between Trebein Road and Orchard Lane instead of two interchanges provided at both Orchard Lane and Trebein Road. This would eliminate the interchange at Orchard, minimize impacts to businesses and Right-of-Way, and provide lower construction costs.	The interchange locations at Factory Road / Orchard Lane and Trebein Road were selected taking into account interchange spacing requirements, environmental constraints and impacts, and cost factors.
Design	Design interchange at Orchard Lane instead of Factory Road, since more businesses are located along Orchard Lane.	The interchange locations at Factory Road / Orchard Lane and Trebein Road were selected taking into account interchange spacing requirements, environmental constraints and impacts, and cost factors.
Design	Extend the eastbound entrance lane from Valley-Trebein interchange to merge with the Xenia Bypass exit lane.	This suggestion is outside the scope of the GRE-35-4.26 project.
Frontage Roads	Design the frontage roads for two-way traffic.	This will be evaluated during Step 7, the next step in the Project Development Process.
Hydrology	Consider drainage and detention due to the flood plain areas. Construction could greatly affect the hydrology at both Factory and Trebein.	Drainage, detention, and hydrology have been considered throughout the project to date. More detailed evaluations will focus on these issues in future steps.
Roundabouts	Use roundabouts at intersections, particularly the Factory Road/Yellow Brick Road and Shakertown Road/Factory Road.	As part of the design process, the ODOT will evaluate different configurations including stop, controlled signalized, and a roundabout intersection.
Texas “U” Turn	Consider Texas “U” Turn at Factory Road underpass for Feasible Alternative 2.	This will be evaluated during Step 7, the next step in the Project Development Process.
Sidewalks	Add sidewalks to local roads.	The addition of pedestrian facilities will be considered during Step 7, the next step in the Project Development Process.
Soccer complex access	Add a rear entrance from the soccer complex to Yellow Brick Road.	This is outside the scope of the GRE-35-4.26 project and, if implemented, it would be a local project, not an ODOT project.
Beavercreek City schools	Consider traffic to be generated and new traffic flow patterns from two new Beavercreek City School properties under construction.	The design traffic volumes will be evaluated during Step 7, the next step in the Project Development Process.

EXHIBIT 33
Public Comments and Responses for GRE-35-4.26

Category	Comment	Response
Beavercreek Community Park	Avoid constructing Heller Drive extension through the Beavercreek Community Park.	Feasible Alternative 2, the split diamond interchange does not extend Heller Drive through the park.
Speed Limit	Reduce the speed limit on US 35 as a first measure before proceeding with the project.	Changing the speed limit would not meet the purpose and need of the project which includes the elimination of the signalized intersections along US 35.

5.3. Agency Coordination

The following agencies have been contacted in the course of project planning to date:

1) US Army Corps of Engineers, letter of 5/19/2009.
2) US Fish and Wildlife Service, letter of 9/30/2008.
3) Ohio Department of Natural Resources, Division of Natural Areas and Preserves, letter of 5/16/2007.
4) Ohio Department of Natural Resources, Division of Wildlife, email of 10/7/2008.
5) Ohio Department of Natural Resources, Division of Real Estate and Land Management, email of 2/11/2008.
6) Ohio Environmental Protection Agency, letter of 10/1/2008.
7) Natural Resources Conservation Service, email of 5/5/2010.
8) Greene County Park District, email of 2/28/2008.

Agency coordination letters are included in Appendix N.

Other agencies that will be engaged in the review of this project are:

1) The FHWA will be partner in the project development and must specifically approve the project for impacts under various federal regulations, including Section 106 of the Historic Preservation Act, Section 4(f), and Executive Order 11988 (Floodplain Management).
2) As noted in Section 4.2.7 (Section 4(f), Section 6(f) and Scenic Rivers), the project has the potential to affect a number of parks or parklands.
    a. ODNR, Division of Parks and Recreation (Glenn Thompson Reserve)
    b. ODNR, Scenic Rivers (Little Miami River as a State Scenic River)
    c. National Park Service (Little Miami River as a National Scenic River)

d. Greene County Park District (Glenn Thompson Reserve and Creekside Reserve)

e. Beavercreek Township Parks and Recreation (Beavercreek Community Park and Creekside Trail)

f. The City of Beavercreek Parks and Recreation (Creekside Trail).

3) The ODOT will engage the Greene County floodplain coordinator and the city of Beavercreek floodplain coordinator to discuss the feasible alternatives and requirements for compliance with local floodplain regulations.

4) The ODOT will correspond with the Ohio Historic Preservation Office to determine the eligibility of the Harbein House for the National Register of Historic Places. This correspondence will continue after the selection of the preferred alternative and additional archaeological studies to determine if any archaeological resources are eligible.

6. Comparative Evaluation of Alternatives

Exhibit 34 highlights the criteria used to evaluate the alternatives. Where practical at this stage of the analysis, quantitative variables have been used in the evaluation. Where necessary or appropriate, qualitative variable have been used. Most of the criteria are discussed earlier in this report although a few (e.g., cost) are so common that they are provided without elaboration. For a more detailed breakdown of the cost opinion, refer to Appendix O. Additionally, for specific cost detail for right-of-way acquisitions is included in Appendix KK.

6.1. Cost Opinion

The opinion of probable cost provides an estimate commensurate with the level of design development through PDP Step 6. The methodology for estimating follows general procedures for this level of design, and the ODOT's Office of Estimation procedures for conceptual construction costs. Items that could be quantified were calculated and unit prices applied. Some form of allowance was provided for other items that could not be quantified.

Notable changes from the 2008 CAS opinion of cost include the following:

- The opinion of cost is based on June 2011 dollars
- Earthwork quantities have been computed from conceptual cross sections
- Drainage quantities have been computed from conceptual drainage layout for similar feasible alternatives
- Location and size of retaining walls have been refined, and related wall quantities have been computed from preliminary roadway profiles and conceptual cross sections
- New bridges have been significantly lengthened to span the floodway
- MOT costs have been updated based on the MOTAA for similar feasible alternatives
- Highway Lighting costs have been updated based on warrant for complete interchange lighting and continuous freeway lighting
- Costs for the Valley-Trebein Road interchange Feasible Alternative (1A or 2A) increased from $ 35.3 million to $40.5 million. The cost for Feasible Alternative 5B is estimated at $37.4 million. At the Factory-Orchard interchange, Feasible Alternative 1A increased from $66.4 million to $72.7 million, and Feasible Alternative 2A increased to $94.1million. The split-diamond interchange configuration (Feasible Alternative 2) increased from $67.1 million to $77.0 million. Feasible Alternative 3B is estimated at $64.6 million.

EXHIBIT 34
Comparative Evaluation of Alternatives

	Alternatives						
	Factory-Orchard				Valley-Trebein		
Evaluation Factors	**1A**	**3B**	**2A**	**2**	**1A**	**2A**	**5B**
Engineering							
Convert US35 to a limited access facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Interchange Configuration – south side	Tight diamond	Tight diamond	Tight diamond	Split Diamond	Diamond w/loop in SW	Diamond	Diamond w/loop in SE
Interchange Configuration – north side	Tight diamond	Tight diamond	Tight diamond	Split Diamond	Tight diamond	Tight diamond	Tight diamond
US 35 LOS for Year 2038	C	C	C	C	C	C	C
US 35 Mainline Elevated at Factory Road	Yes	No	Yes	No	N/A	N/A	N/A
US 35 Mainline Elevated at Orchard Lane	No	No	Yes	Yes	N/A	N/A	N/A
US 35 Mainline Elevated at Valley-Trebein	N/A	N/A	N/A	N/A	No	No	No
Direct Access to Orchard from US 35	No	No	No	Yes	N/A	N/A	N/A
Through Access on Orchard Lane	No	No	Yes	Yes	N/A	N/A	N/A
Frontage Road from Factory to Orchard	Yes	No	Yes	Yes	N/A	N/A	N/A
Excavation/Embankment (cu yd)	405,025	432,175	526,398	583,817	364,633	366,618	385,617
Total Area of New Structures (sq ft)	153,777	110,905	174,685	119,845	87,797	83,316	71,546
Total Retaining Wall Construction (sq ft)	79,547	73,474	160,458	133,508	34,343	35,430	34,343
Total Right-of-Way Acres	38.4	39.5	38.3	39.6	31.9	26.8	31.3
Total Right-of-Way Cost	$3,040,800	$3,767,900	$3,022,800	$4,387,000	$244,700	$158,000	$244,700
Total Construction Cost	$65,500,000	$57,231,000	$85,600,000	$69,322,000	$37,900,000	$36,600,000	$36,933,000
Total Project Cost	$72,700,000	$64,600,000	$94,100,000	$77,000,000	$40,500,000	$39,100,000	$37,400,000
Business Displacements (#)	0	0	0	0	0	0	0
Residential Displacements (#)	0	0	0	0	0	0	0

EXHIBIT 34
Comparative Evaluation of Alternatives

	Alternatives						
	Factory-Orchard				Valley-Trebein		
Evaluation Factors	**1A**	**3B**	**2A**	**2**	**1A**	**2A**	**5B**
Environmental							
Major geotechnical issues	No	No	No	No	No	No	No
Unsuitable soft soils potential	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Floodway Acres	4.5	4	4.5	2.2	7.6	6.8	3.8
Floodplain Acres	58.2	58.2	58.2	57.3	46.5	42.5	52.1
Wetlands (#)	3	3	3	3	6	6	6
Wetlands (acres)	0.49	0.49	0.49	0.49	0.91	0.91	0.81
Little Miami River (linear feet)	---	---	---	---	513	435	230
Other Streams (crossings)	5	6	5	5	2	2	2
Other Streams (linear feet)	1,085	1,158	1,089	1,071	400	293	295
Prime Farmland (acres)	64.0	68.5	64.0	66.0	28.7	25.9	26.9
Phase II ESA Properties (#)	2	2	2	2	-	-	-
Section 4(f) properties[1] (#)	4	4	4	4	2	2	1
Potential Section 106 Properties (#)	10	10	10	7	6	5	6
Potential historical sites (#)	1	1	1	1	-	-	-
Previously recorded archaeological sites (#)	9	9	9	6	6	5	6
Sole Source Aquifer Area, excluding existing R/W (acres)	40.7	40	40	39	30.3	25.0	30.5
Socioeconomic							
Business Accessibility at Orchard	Less Desirable	Less Desirable	Preferred	Preferred	No Issue	No Issue	No issue
Environmental Justice	No issue	No issue	No issue	No issue	No issue	No issue	No issue
Potential Noise Impacts (locations)	2	2	2	2	1	1	1

[1] Includes historical structure that appears to be eligible for the National Register of Historic Places, but excludes archaeological sites, which have not yet been investigated.

7. Recommendations

A pairing of Feasible Alternative 1A, Feasible Alternative 2A, Feasible Alternative 2 or Feasible Alternative 3 at Factory-Orchard section, when combined with Feasible Alternative 5B at Valley-Trebein section would meet the project purpose and need.

7.1. Valley-Trebein

Feasible Alternative 5B at Valley-Trebein would have a lower cost and would require a fewer number of crossings over the Little Miami River, with significantly less impact to the floodway. Feasible Alternative 1A at Valley-Trebein may require a significant portion of the loop ramp to be built on structure instead of embankment to avoid encroachment into the floodway. This would further increase the costs of Alternative 1A at Valley-Trebein beyond the costs shown in this analysis. Feasible Alternative 1A and Feasible Alternative 2A at Valley-Trebein will require additional new crossing over the Little Miami River, south of US 35, for the eastbound exit ramp. For these reasons, Alternative 5B at Valley-Trebein, a tight-diamond configuration with the loop ramp in the south east quadrant, is the Recommended Alternative.

7.2. Factory Road/Orchard Lane

Feasible Alternative 2 at Factory Road/Orchard Lane would have a significantly lower cost when compared to Feasible Alternative 2A and would be more responsive to the needs of adjacent businesses for access and visibility. It also would require less crossing of existing streams (Little Beaver Creek and Beaver Creek) with significantly less impact to the floodways; and lower number of potential Section 106 properties impacts.

Although Feasible Alternative 1A and Feasible Alternative 3B would cost about 6 percent and 16 percent less than Feasible Alternative 2, respectively, they are less responsive to the needs of adjacent businesses for access and visibility. They would provide no direct access to and from US 35 at Orchard Lane, and also with no through traffic on Orchard Lane. They would require slightly more stream crossings and potentially higher impacts to the floodways.

Feasible Alternative 2A would be the most costly for the Factory Road/Orchard Lane section, and would be less responsive to the needs of adjacent businesses for visibility.

For these reasons, Feasible Alternative 2 at Factory Road/Orchard Lane, the split-diamond diamond configuration with Factory Road over US 35, and US 35 elevated at Orchard Lane to bridge over Orchard Lane, is the Recommended Alternative.

Appendices

VOLUME 1

Appendix A Traffic Data

- A.1 ODOT Certified Traffic Forecasts
- A.2 Intersection Analysis Summary Tables
  - 2018 Build
  - 2038 Build
  - 2018 No Build
  - 2038 No Build
- A.3 Freeway Segment/Ramp Analysis Summary Tables
  - 2018 Build
  - 2038 Build
- A.4 2038 No Build LOS Exhibits
- A.5 2038 Build LOS Exhibits
- A.6 Signal Warrant Analysis
- A.7 Signalized Intersection Analysis
- A.8 Stop Controlled Intersection Analysis
- A.9 Freeway Segment Analysis
- A.10 Freeway Ramp Merge/Diverge Analysis

Appendix B Design Criteria

Appendix C Typical Sections (3 sheets)

Appendix D Factory/Orchard Alternative 1A (4 sheets)

Appendix E Factory/Orchard Alternative 2A (4 sheets)

Appendix E-1 Factory/Orchard Alternative 2 (4 sheets)

Appendix E-2 Factory/Orchard Alternative 3B (4 sheets)

Appendix F Valley/Trebein Alternative 1A (5 sheets)

Appendix G Valley/Trebein Alternative 2A (5 sheets)

Appendix G-1 Valley/Trebein Alternative 5B (5 sheets)

Appendix H Ownership Table

Appendix I FEMA Flood Maps

Appendix J ODOT – District 8 Bridge Department Inter-office Communication (IOC) Letter

Appendix K US Army Corps of Engineers Letter

Appendix L USDA Farmland Conversion Impact Rating Form

Appendix M Project Stakeholders Meeting Minutes

Appendix N Agency Coordination Letters

Appendix O Preliminary Cost Opinion Summary