

Appendix I

INDIRECT AND CUMULATIVE IMPACT ANALYSIS

**U.S. 50 NORTH VERNON BYPASS – EAST
DES. NO. 1173374
INDIRECT AND CUMULATIVE IMPACT ANALYSIS**

INTRODUCTION

The U.S. 50 North Vernon Bypass project involves construction of a highway bypass around the city of North Vernon in Jennings County. Construction on the western half of the bypass (developed under a separate project), which consists of a new two-lane road from U.S. 50 northeast to State Route (S.R.) 3 north of North Vernon, began in March 2012 and is anticipated to be completed in December 2013. The approximate length of this roadway is 4.5 miles.

The current project is a proposed extension of the new roadway currently under construction between C.R. 400W and S.R. 3. This extension to the east would run from S.R. 3 on the north side of North Vernon east and south to rejoin existing U.S. 50 east of North Vernon, thus completing a northern bypass of North Vernon. When completed, the project would reduce congestion in and around North Vernon, improve safety, improve accessibility, and meet local and state planning objectives.

The Build Alternatives (4NB2 and 6D) for this project include a two-lane limited access roadway on new location. Although only two lanes would be initially built, enough right-of-way would be acquired to accommodate the future construction of two additional lanes resulting in a four-lane divided highway. The project's direct impacts that are presented are based on the right-of-way for the four-lane divided highway. This mirrors the approach that was utilized on the recently completed U.S. 50 North Vernon Bypass –West project environmental documentation.

The purpose of this document is to evaluate the project's potential indirect and cumulative impacts. Indirect impacts are defined as the effects of the proposed project that occur at a different time or location from the direct impacts of the project. Typically, indirect impacts are associated with a project's potential to induce development. For transportation projects, this usually involves the creation of new or significantly improved access to areas that are relatively undeveloped. The new/improved access then has the potential to induce commercial,

residential, and/or business development. The potential future impacts to natural resources that may be associated with the induced development are then considered indirect impacts.

Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR § 1508.7).

Direct impacts, which will be documented fully in the project’s Environmental Assessment, are included in this document at a summary level for comparative purposes.

METHODOLOGY

The indirect and cumulative impact analysis for the U.S. 50 North Vernon Bypass – East Environmental Assessment (EA) was conducted in accordance with the guidelines in the following documents:

- *Procedural Manual for Preparing Environmental Documents* (INDOT, 2008);
- *Assessing Indirect Effects and Cumulative Impacts under NEPA* (Center for Environmental Excellence by AASHTO, 2011);
- *Considering Cumulative Effects Under the National Environmental Policy Act* (Council on Environmental Quality, 1997);
- *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* (NCHRP Report 466, 2002);
- *Indirect and Cumulative Impact Assessment in the Highway Project Development Process* (FHWA Position Paper, HEP-32, April 1992); and
- *Consideration of Cumulative Impacts in EPA Review of NEPA Documents* (US EPA 315-R-99-002, May 1999).

Indirect and cumulative impacts were evaluated for the two Build Alternatives being considered for the U.S. 50 North Bypass – East project: 4NB2 and 6D. A memorandum was created that outlined the methodology that would be used to document the indirect and cumulative impacts for this project (see Appendix A). The memorandum was distributed to all agencies that

attended the Resource Agency meeting held on October 5, 2012. Comments were received from the U.S. Environmental Protection Agency (US EPA) requesting that an impact category of “aquatic resources” should be used, which would include “wetlands,” “streams,” and “lakes” as a subcategories. The analysis was modified to include these subcategories. The US EPA also recommended that the study area for the cumulative impact of aquatic resources be the watershed (12 digit Hydrologic Unit Code (HUC) or HUCs as applicable) that the aquatic resources are located in. After reviewing the geographic boundaries of the watershed, it was determined that a larger watershed-based study area would dilute the cumulative effects of the proposed bypass and that, for this project, the cumulative effects are better realized on a more localized level. The originally proposed two-mile buffer area was expanded to include a proposed industrial area, and two Long Term Growth Areas (see the Cumulative Impacts subsection under Methodology). No other comments were received.

Indirect Impacts

The indirect impacts from the U.S. 50 North Vernon Bypass – West project’s Preferred Alternative are included with the indirect impacts from the US 50 North Vernon Bypass – East project to determine the combined/total indirect impacts from both projects.

The study area for the indirect analysis includes the area around the proposed new county road intersections with the bypass. This is based on the assumption that project-related induced development would be limited to these new intersection areas. When proposed intersections are located in close proximity (approximately one mile apart or closer), the study area includes the area connecting the two intersections. The inclusion of these connecting segments recognizes the likely surface street interaction between the two intersections.

Based on an assessment of rural, “bypass” route interchanges located throughout central Indiana and previous studies (Hartgetn, D.T. et. Al., 1992), the area used for this analysis is represented by a circle with an approximately one-quarter mile radius from the center of the intersections. For the segments that include intersections that are less than or equal to one mile apart, a one-quarter mile buffer extends along both sides of the mainline to connect with the circular study areas associated with the two intersections, creating an oval shape.

For Alternative 4NB2, intersections are proposed at:

- State Route 3 (western terminus)
- N. County Road (CR) 75 W
- N CR 20 W
- E. CR 350 N (at east end of Selmier State Forest)
- E. CR 300 N
- Existing US 50 (eastern terminus) near E. CR 175 N

Intersections at State Route 3, N. CR 75 W, and N CR 20 W were connected because they are located less than one mile apart. E. CR 350 N and E. CR 300 N were also joined. The study area and the intersections for Alternative 4NB2 are illustrated in Figure 1.

For Alternative 6D, intersections are proposed at:

- S.R. 3 (western terminus)
- N. CR 75W
- Existing US 50 (eastern terminus) near E. CR 200 N

Intersections at S.R. 3 and N. CR 75 West were connected. The study area and the intersections for Alternative 6D are illustrated in Figure 2. Note that under Alternative 6D, a bridge would be constructed to carry N. CR 20 W up and over the bypass roadway. No access would be provided at this location; therefore, there is no potential for indirect impacts.

Current land uses were mapped within these indirect study areas. In addition, recent development trends (i.e., within the last 10 years) were evaluated to determine if these areas would likely experience growth and development regardless of the project. If so, these areas were not considered for indirect impacts. Local zoning and comprehensive land use plans were reviewed to determine any areas that are currently designated for development. The areas that were evaluated for potential indirect impacts are currently undeveloped and zoned/planned for agricultural or other undeveloped land uses. Areas that are currently developed and/or zoned/planned for development were not evaluated for indirect impacts.

The areas designated for indirect impacts were reviewed for the presence of farmland, forests, and aquatic resources (wetlands, streams, open water) using cursory field surveys, secondary

source data, and GIS. These resources were selected for the indirect impact analysis due to their prevalence within the project area and their likelihood of being directly and indirectly impacted. The indirect impacts to these resources will be compared to their direct impacts in order to present the potential total amount of impacts from both and the differences in the relative magnitude of their impacts.

Cumulative Impacts

The cumulative impacts from the U.S. 50 North Vernon Bypass – West project's Preferred Alternative have been included with the cumulative impacts from the US 50 North Vernon Bypass – East project to determine the combined/total cumulative impacts from both projects.

The proposed study area for the cumulative analysis is a one-mile wide buffer from the centerline of the Build Alternatives (two mile total width). The study area was expanded to include future development and growth areas identified in the Jennings County Comprehensive Plan. The boundary incorporates a proposed industrial area, and two Long Term Growth Areas (See Figures 3 and 4). This area is based on the existing land uses, zoning, and comprehensive plans. According to the Jennings County Comprehensive Plan, these Long Term Growth Areas have been identified as the two areas that have the highest potential for future development and the areas that will likely receive the highest amount of pressure for future greenfield development (previously undeveloped land).

The Jennings County Comprehensive Plan discusses the US 50 bypass as a critical sub area. The Comprehensive Plan acknowledges that the bypass may act as a catalyst for increased development, which can lead to a positive economic climate. However, it is noted that proper controls will be needed to ensure appropriate development that will benefit the businesses and residents in Jennings County.

The industrial area is the Muscatatuck Technology Park which was designated as a Certified Technology Park in 2012. The new technology park incorporates the airport and would be limited to tenants involved in the defense industry and similar military alliances.

Areas north, east, and west of the bypass corridors (i.e., outside the bypass), except for the Country Square Lake residential development, are very rural, have experienced limited

development in the past, and there are no known current plans for immediate development. Nor is development in the near future called for in the local zoning and Comprehensive Plans. The area south of the corridors (i.e., inside the bypass) includes the densely developed downtown area.

The resources that were evaluated for cumulative impacts are the same as the indirect impacts: farmland, forests, and aquatic resources (wetlands, streams, and open water). These resources have been identified and mapped within the study area based on available secondary source data and GIS. As part of the analysis of cumulative impacts, the regional/local historic trends associated with the presence and condition of these resources was determined. The timeframe and level of historic information collected was based on available secondary source data.

The analysis also included the identification of past, present, and reasonably foreseeable future projects and the estimation of their impacts to the designated resources. Through coordination with INDOT and local planning officials and review of historic aerial photos, past developments (i.e., within the last ten years) were identified and their impacts to the designated resources estimated. Similarly, current development projects (i.e., projects under construction) were also identified and their impacts estimated. Future developments included any projects that have been recently submitted to and/or approved by the local planning departments. In addition, undeveloped areas that are currently zoned for development are considered potential future development areas. For transportation projects, INDOT's Statewide Transportation Improvement Program (STIP) FY 2012-2015 was reviewed along with local transportation improvement plans to identify any future transportation projects that are planned within the study area.

The impacts to the designated resources from all these past, present, and future projects were calculated and compared to the project's direct and indirect impacts.

The following resources were reviewed for purposes of the Indirect and Cumulative Analysis:

- Jennings County Economic Development Commission website – www.jenningsedc.com
- *The Status of Wetlands in Indiana* - <http://www.in.gov/dnr/fishwild/files/statusof.pdf>
- *Jennings County Comprehensive Plan*, December 2012, SDG & HWC Engineering

- <http://www.jenningsedc.com/2012/12/mayor-tech-park-to-bring-jobs/>
- *2007 Census of Agriculture, County Profile, Jennings County, Indiana*, US Department of Agriculture, www.agcensus.usda.gov
- *North Vernon Municipal Airport Airport Layout Plan Report, July 27, 2011.*
- *Statewide Transportation Improvement Program FY 2012 – 2015, Indiana Department of Transportation*

Data Sources

The following data sources were used to identify resources and anticipated development:

Data Type	Sources
Planned Development	Jennings County Comprehensive Plan Jennings County Economic Development Commission website North Vernon Municipal Airport Layout Plan Report Indiana State Transportation Improvement Program
Wetlands	Status of Wetlands in Indiana National Wetland Inventory Maps
Land Use	GoogleEarth USDA Census of Agriculture

ANALYSIS

Indirect Impacts

Most vacant parcels within the study area for both alternatives are currently zoned agricultural. Impacts in these areas are considered “indirect,” influenced directly and solely by the U.S. 50 North Vernon Bypass project in an area that is unlikely to be developed in the reasonably foreseeable future.

4NB2

Based on the intersections discussed in the methodology section, the direct and indirect impacts for Alternative 4NB2 are summarized in Table 1.

TABLE 1: SUMMARY OF IMPACTS – ALTERNATIVE 4NB2

RESOURCE	U.S. 50 NORTH VERNON BYPASS				TOTAL		TOTAL IMPACTS
	4NB2		WEST		Direct	Indirect	
	Direct	Indirect	Direct	Indirect			
FARMLAND (ac)	90.9	24.1	132	255	222.9	279.1	502.0
FOREST (ac)	40.3	1.8	27	88	67.3	89.8	157.1
AQUATIC RESOURCES							
Wetlands (ac)	21.1	0.7	1.4	9.3	22.5	10.0	32.5
Open Water (ac)	1.1	0.0	2.5	n/a	3.6	0.0	3.6
Streams (ft)	5,433	1,116	3,465	n/a	8,898	1,116	10,014

This alternative would result in indirect impacts to approximately 24.1 acres of farmland, 1.8 acres of forest, 0.7 acre of wetlands, 0 acre of open water, and 1,116 linear feet of streams. These indirect impacts from Alternative 4NB2 were combined with the direct impacts from this alternative along with the direct and indirect impacts from the U.S. 50 North Vernon Bypass – West project to determine the total impacts from the proposed bypass. Total impacts, both direct and indirect, include approximately 502.0 acres of farmland, 157.1 acres of forest, 32.5 acres of wetland, 3.6 acres of open water, and 10,014 linear feet of streams. The direct and indirect impacts from Alternative 4NB2 are illustrated in Figure 5.

6D

Based on the intersections discussed in the methodology section, the direct and indirect impacts resulting from Alternative 6D are summarized in Table 2.

TABLE 2: SUMMARY OF IMPACTS – ALTERNATIVE 6D

RESOURCE	U.S. 50 NORTH VERNON BYPASS				TOTAL		TOTAL IMPACTS
	6D		WEST		Direct	Indirect	
	Direct	Indirect	Direct	Indirect			
FARMLAND (ac)	51.6	33.0	132	255	183.6	288.0	471.6
FOREST (ac)	36.4	33.0	27	88	63.4	121.0	184.4
AQUATIC RESOURCES							
Wetlands (ac)	16.6	0.8	1.4	9.3	18.0	10.1	28.1
Open Water (ac)	1.1	0.1	2.5	n/a	3.6	0.1	3.7
Streams (ft)	2,923	2,977	3,465	n/a	6,388	2,977	9,365

Alternative 6D would result in indirect impacts to approximately 33.0 acres of farmland, 33.0 acres of forest, 0.8 acres of wetlands, 0.1 acres of open water, and 2,977 linear feet of streams. These indirect impacts from Alternative 6D were combined with the direct impacts from this alternative and then combined with the direct and indirect impacts from the U.S. 50 North Vernon Bypass – West project to determine the total impacts from the proposed bypass. Total impacts, both direct and indirect, are approximately 471.6 acres of farmland, 184.4 acres of forest, 28.1 acres of wetlands, 3.7 acres of open water, and 9,365 linear feet of streams. The direct and indirect impacts from Alternative 6D are illustrated in Figure 6.

Cumulative Impacts

Historic Development

Jennings County is predominately rural with much of its land use agricultural. North Vernon is the largest city in Jennings County. Available historic aerial photography from 1998 was reviewed to assess impacts from past projects. Over the past 15 years, very few new buildings or structures have been constructed in the study area. The new construction that did occur was located in areas of existing development and appeared to be an expansion of existing commercial/industrial areas. There were no new large commercial, industrial, or residential developments since 1998.

Historic Farm Use/Loss: According to the 1910 US Census of Agriculture, there were 226,014 acres of farmland in 1900 in Jennings County. The 2007 Census of Agriculture states that the amount of farmland in Jennings County decreased to 138,331 acres in 2007, a net loss of approximately 39 percent from 1900. This is above the state average of 30 percent for the same time period.

Forest: The 1930 US Census of Agriculture reported that 13,982 acres of Jennings County is forested. This is the earliest record of forested acreage in Jennings County. Data from the 2007 US Census of Agriculture indicates that forested acreage has increased to 21,571 acres. These represent mostly fragmented wood lots scattered throughout the county with large forested tracts within Big Oaks National Wildlife Refuge and Muscatatuck National Wildlife Refuge.

Wetlands: According to the document, *The Status of Wetlands in Indiana*, at the start of the 1800's there were approximately 5,600,000 acres of wetlands in Indiana. At that time, wetlands accounted for 24% of the land surface area. By the mid 1980's, wetlands totaled approximately 813,000 acres, which is 3.5% of the land surface area. Wetlands are being lost due to a variety of activities including residential and commercial development, road construction, farm drainage, etc.

Potential Future Development

The area east of S.R. 3 to N. CR 20 W along the proposed bypass is zoned industrial. This area is identified by Jennings County for future potential industrial growth. The eastern portion of the bypass would pass through two of the sites identified by Jennings County as future industrial parks.

Potential future development sites within the study area that have been identified by the Jennings County Economic Development Commission (JEDC) include:

- Apsley Site – This 80 acre site is located on Deer Creek Road, north of U.S. 50/CR 175 N, south of CSX railroad, and west of CR 75 E. The site, which is zoned as agricultural, is listed for sale on the JEDC website.
- Montrow Site – This industrial park site is located at the intersection of CR 350 N and CR 75 W. The 40 acre site is listed for sale on the JEDC website.
- Miller Site – This 180 acre site, which is zoned industrial, is located along S.R. 3, north of CR 350 N.
- North Vernon Municipal Airport Site – This 200 acre site is currently an agricultural field that is located adjacent to the airport. The site is bordered on the north by CR 450 N, on the south by CR 350 N, on the west by CR 75 W, and on the east by Betsey Cull Drive.
- North Vernon Park 3 – This is a 54 acre shovel ready industrial park site located in the southwest corner of CR 350 N and CR 75 W.

Transportation Improvement Projects

INDOT and/or local transportation improvements planned in or near the project area include:

- INDOT's programmed auxiliary lanes project on S.R. 3 from Smith Street to U.S. 50.
- INDOT's programmed intersection improvement with added turn lanes at the intersection of S.R. 3 and Madison Avenue.
- INDOT's programmed extension of the southbound left turn lane on S.R. 3 at JFK Drive.
- INDOT's surface treatment of S.R. 7 from S.R. 3 to U.S. 31.
- INDOT's pavement replacement of S.R. 3/S.R. 7.
- INDOT's planned completion of the bypass around North Vernon from U.S. 50 to S.R. 3.
- INDOT's planned downtown revitalization from a Stellar grant includes streetscape improvements, brownfield redevelopment, improvements to roads and building facades, and creation of a new events center and outdoor plaza.

North Vernon Airport

The North Vernon Airport, as shown in their most current Airport Layout Plan (ALP), plans to extend Runway 5-23 from 5,002 feet to 6,002 feet to meet the needs of the current aircraft operating at the airport. The proposed development in the ALP is identified to occur in three major phases: Phase I (one to five years), Phase II (five to 10 years), and Phase III (10 to 20 years). The runway extension is planned for Phase II. Extending the runway would require that CR 450 N be either closed or relocated.

4NB2

Alternative 4NB2 would result in cumulative impacts to approximately 3,656 acres of forest, 3,208 acres of farmland, 232 acres of wetlands, 77 acres of open water, and 111,612 linear feet of streams. Table 3 provides a summary of the cumulative impacts for Alternative 4NB2. A portion of the cumulative impact areas for Alternative 4NB2 and the West Bypass overlap. To avoid counting these impacts twice, the impact calculations for the West Bypass do not include the overlap area.

TABLE 3: SUMMARY OF CUMULATIVE IMPACTS – ALTERNATIVE 4NB2

RESOURCE	U.S. 50 NORTH VERNON BYPASS		TOTAL
	4NB2	WEST	
FARMLAND (ac)	3,208	2,149	5,357
FOREST (ac)	3,656	3,459	7,115
AQUATIC RESOURCES			
Wetlands (ac)	232	65	297
Open Water (ac)	77	156	233
Streams (ft)	111,612	104,846	216,458

Alternative 4NB2 combined with the West Bypass would result in cumulative impacts to approximately 7,115 acres of forest, 5,357 acres of farmland, 297 acres of wetlands, 233 acres of open water, and 216,458 linear feet of streams. The cumulative impacts from Alternative 4NB2 are illustrated in Figure 7.

6D

Alternative 6D would result in cumulative impacts to approximately 2,706 acres of forest, 2,694 acres of farmland, 196 acres of wetlands, 61 acres of open water, and 103,099 linear feet of streams. Table 4 provides a summary of the cumulative impacts for Alternative 6D. A portion of the cumulative impact areas for Alternative 6D and the West Bypass overlap. To avoid counting these impacts twice, the impact calculations for the West Bypass do not include the overlap area.

The total cumulative impacts from Alternative 6D combined with the West Bypass would result in impacts to approximately 6,164 acres of forest, 4,843 acres of farmland, 261 acres of wetlands, 217 acres of open water, and 207,945 linear feet of streams. The cumulative impacts from Alternative 6D are illustrated in Figure 8.

TABLE 4: SUMMARY OF CUMULATIVE IMPACTS – ALTERNATIVE 6D

RESOURCE	U.S. 50 NORTH VERNON BYPASS		TOTAL
	6D	WEST	
FARMLAND (ac)	2,694	2,149	4,843
FOREST (ac)	2,706	3,458	6,164
AQUATIC RESOURCES			
Wetlands (ac)	196	65	261
Open Water (ac)	61	156	217
Streams (ft)	103,099	104,846	207,945

CONCLUSIONS

Jennings County has maintained its rural character over the years, with the majority of the existing land use surrounding North Vernon remaining as agricultural. Development has been concentrated in North Vernon and along major roadways. Construction of U.S. 50 would result in the direct loss of farmland, forest, wetlands, open water, and streams. It is anticipated that the new bypass would encourage development at the new intersections. A number of vacant parcels with no indication of development exist within these new intersection locations. These areas may experience indirect impacts as a result of the proposed bypass. Comparatively, cumulative impacts are substantially greater than direct impacts.

Overall, the indirect impacts are less than the direct impacts. Because Alternative 4NB2 is the longer alternative (5.6 miles compared to 3.3 miles for Alternative 6D) and would have a greater number of intersections, it is expected that this alternative would have the higher direct impacts. The impacts for both alternatives are summarized in Table 5.

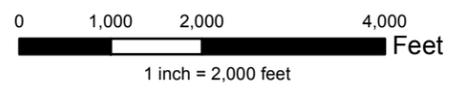
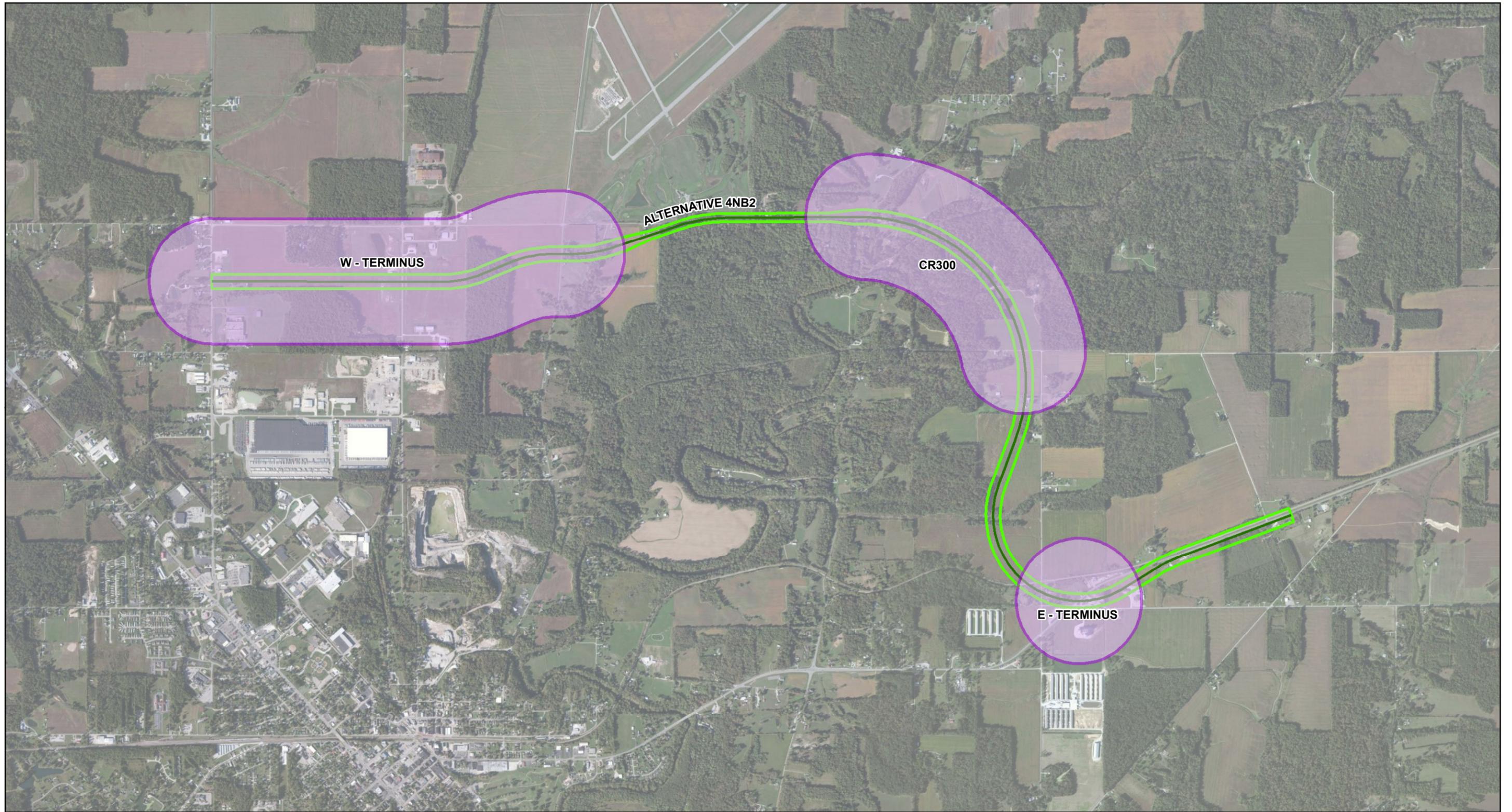
TABLE 5: SUMMARY OF IMPACTS – ALTERNATIVES 4NB2 AND 6D

RESOURCE	DIRECT AND INDIRECT IMPACTS		CUMULATIVE IMPACTS	
	4NB2	6D	4NB2	6D
FARMLAND (ac)	115.0	84.6	3,208	2,694
FOREST (ac)	42.1	69.4	3,656	2,706
AQUATIC RESOURCES				
Wetlands (ac)	21.8	17.4	232	196
Open Water (ac)	1.1	1.2	77	61
Streams (ft)	6,559	5,900	111,612	103,099

When considering both direct and indirect impacts to specific natural resources, impacts as a result of Alternative 4NB2 are similar to Alternative 6D. Alternative 4NB2 would result in 21.8 acres of impacts to wetlands (direct and indirect combined) and 6D would result in 17.4 acres of impact. Alternative 4NB2 would result in greater impacts (direct and indirect) to farmland than Alternative 6D, 115 acres compared to 84.6, respectively. Alternative 6D would result in more impacts (direct and indirect) to forest at 69.4 acres than Alternative 4NB2, which impacts 42.1 acres. Impacts to open water are minor for both Alternative 4NB2 and 6D at 1.7 acres and 1.2 acres respectively. Alternative 4NB2 impacts (direct and indirect) a total of 6,559 feet of streams and Alternative 6D impacts 5,900 feet of streams.

Alternative 4NB2, which is the longer route, would result in the greatest cumulative impacts to all natural resources evaluated. The East Bypass alternatives would result in higher cumulative wetland impacts than the West Bypass, whereas the West Bypass would have greater cumulative impacts to open water than the East Bypass alternatives. Alternative 4NB2 would result in 1,059 more acres of cumulative impact to farmland than the West Bypass and Alternative 6D would result in 545 more acres of cumulative impact. Cumulative impacts to forest are similar for Alternative 4NB2 and the West Bypass, with 4NB2 resulting in 197 more acres. However, the West Bypass would impact 752 more acres of forest than Alternative 6D. Alternative 4NB2 would exceed the West Bypass in cumulative impacts to streams by 6,766 feet, but Alternative 6D would result in fewer impacts by 1,747 feet.

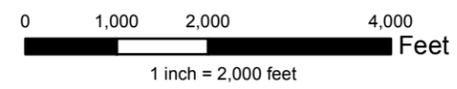
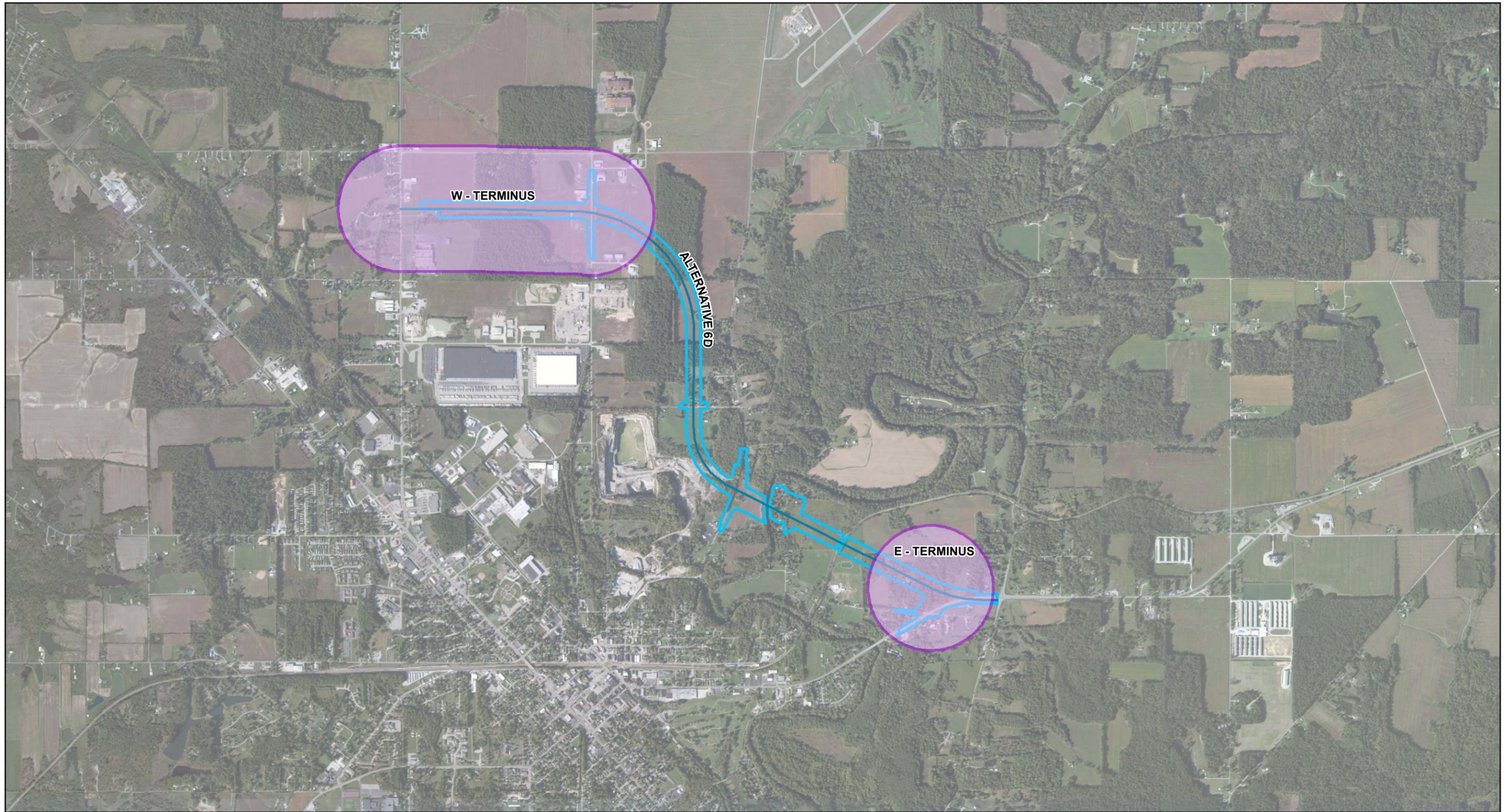
The alternatives were developed and refined with the goal of minimizing impacts to natural (and other) resources. Direct impacts to wetlands, streams, farmland and forest, and any required mitigation, will be described in the Environmental Assessment. This analysis demonstrates that there are limited differences in terms of indirect and cumulative impacts between the two alternatives evaluated. Because no significant indirect or cumulative impacts were identified, no additional mitigation or modifications to the alternatives are recommended.



Legend

- Centerline 4NB2
- ROW 4NB2
- 4NB2 Indirect Impact Area

FIGURE 1
Indirect Impact Analysis: Alternative 4NB2

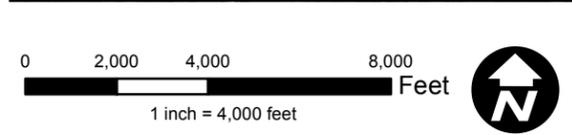
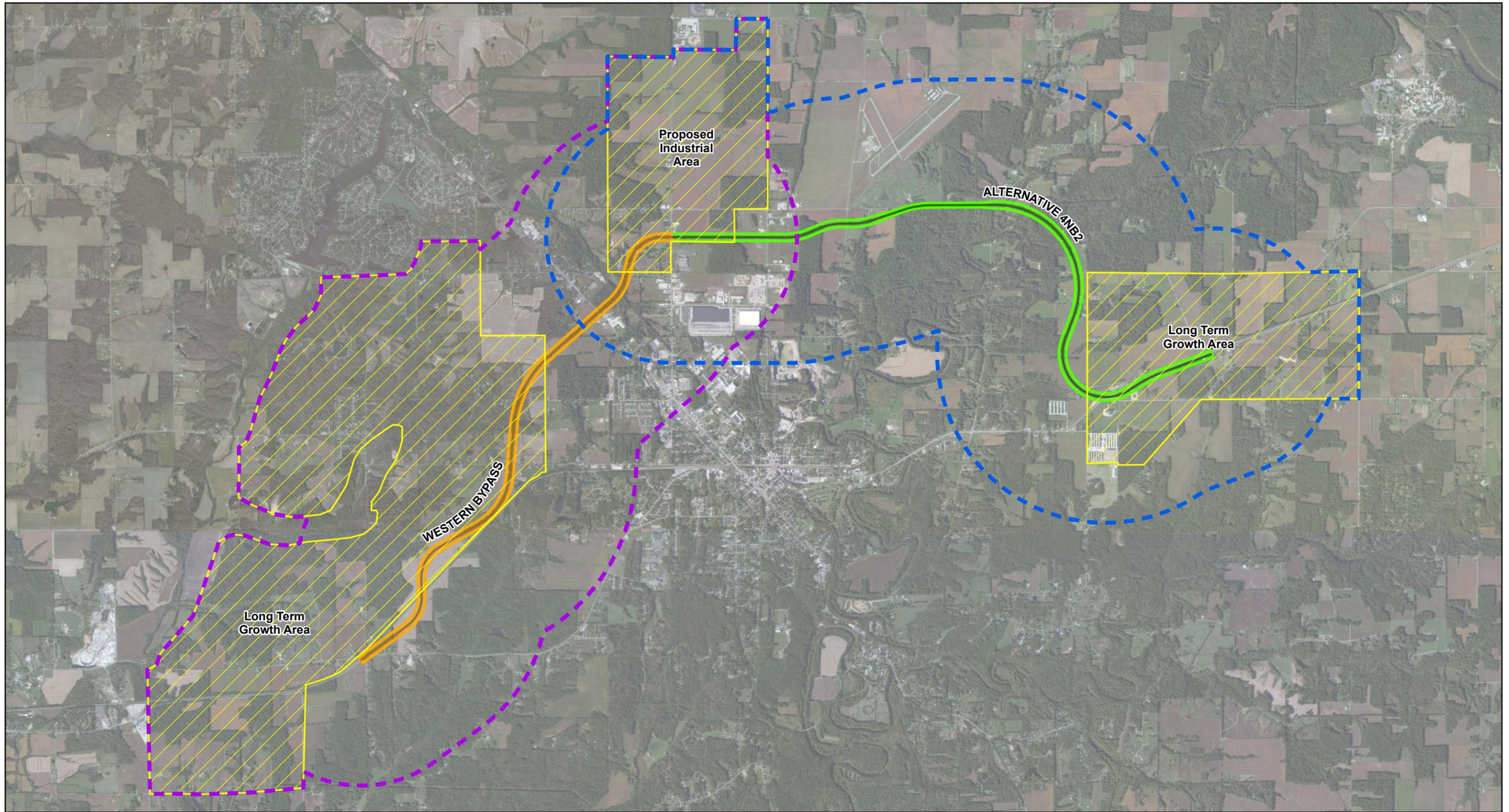


Legend

- Centerline 6D
- ROW 6D - Permanent
- 6D Indirect Impact Area

FIGURE 2
Indirect Impact Analysis: Alternative 6D

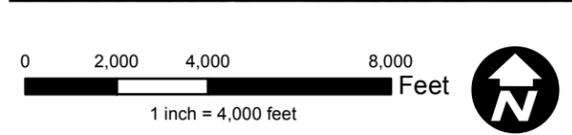
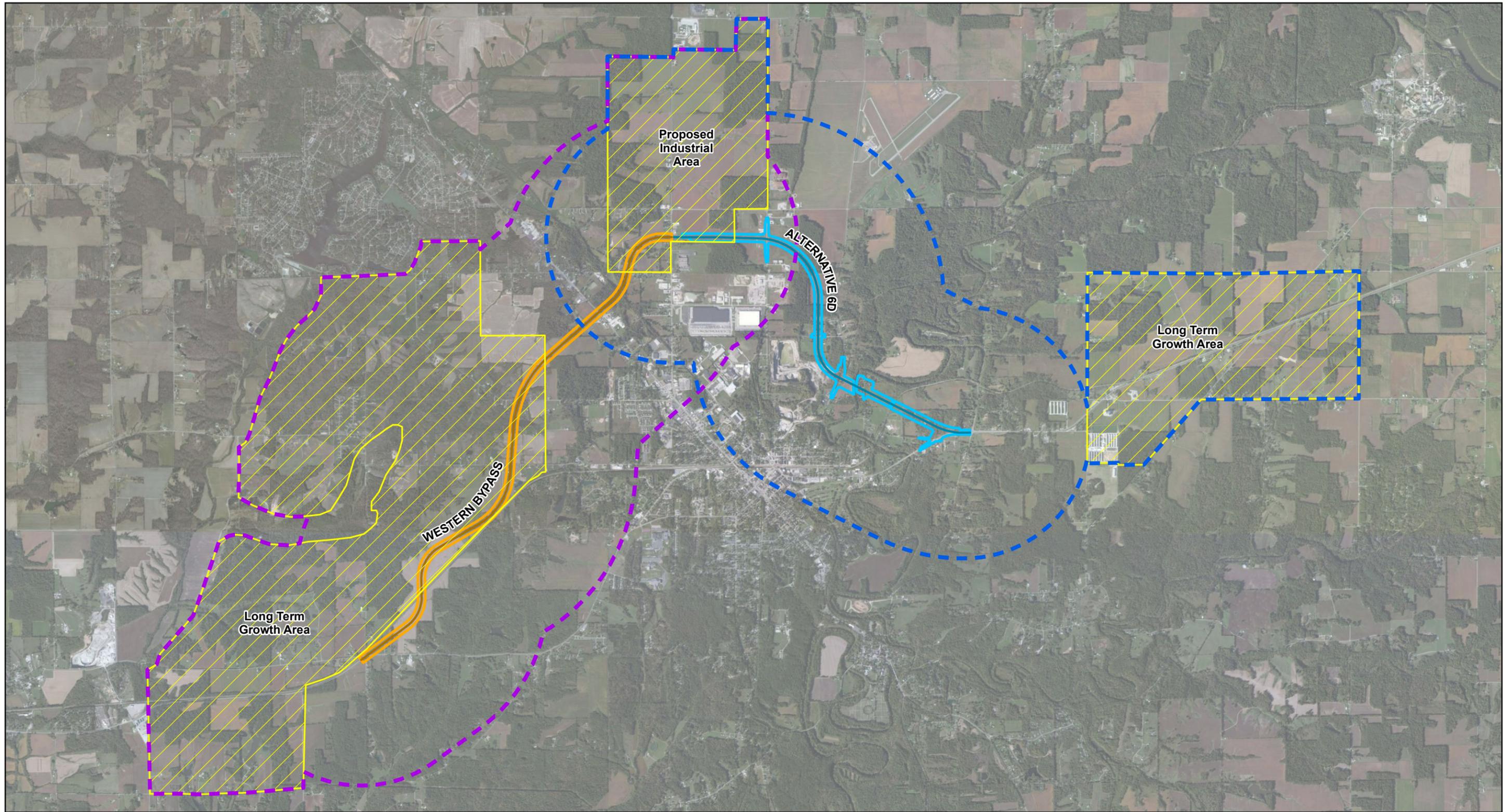




- Legend**
- Centerline 4NB2
 - ROW 4NB2
 - Centerline Western Bypass
 - ROW Western Bypass
 - Growth Areas
 - 4NB2 Cumulative Impact Area
 - Western Bypass Cumulative Impact Area

FIGURE 3
Cumulative Impact Analysis: Alternative 4NB2 and Western Bypass





- Legend**
- Centerline 6D
 - ROW 6D - Permanent
 - Centerline Western Bypass
 - ROW Western Bypass
 - Growth Areas
 - 6D Cumulative Impact Area
 - Western Bypass Cumulative Impact Area

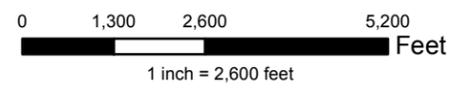
FIGURE 4
Cumulative Impact Analysis: Alternative 6D and Western Bypass





Direct Impact

Indirect Impact

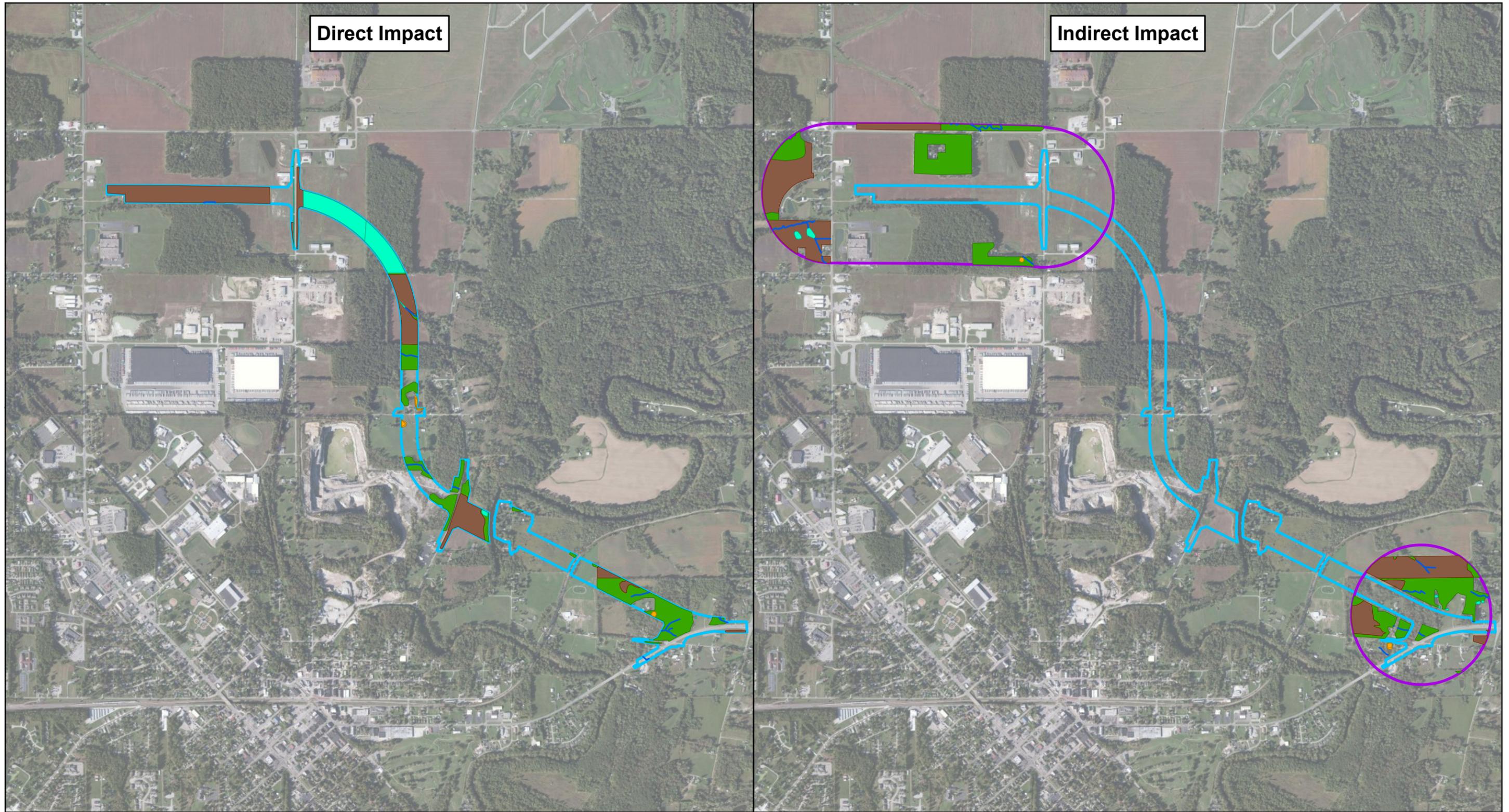


Legend

- ROW/Direct Impact Area - 4NB2
- Indirect Impact Area - 4NB2
- Streams
- Open Water
- Wetlands
- Farmland
- Forest

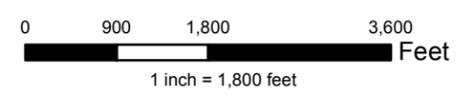
FIGURE 5
Direct & Indirect Impact Analysis: Alternative 4NB2





Direct Impact

Indirect Impact

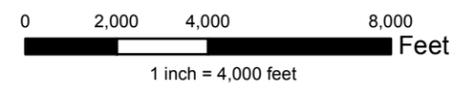
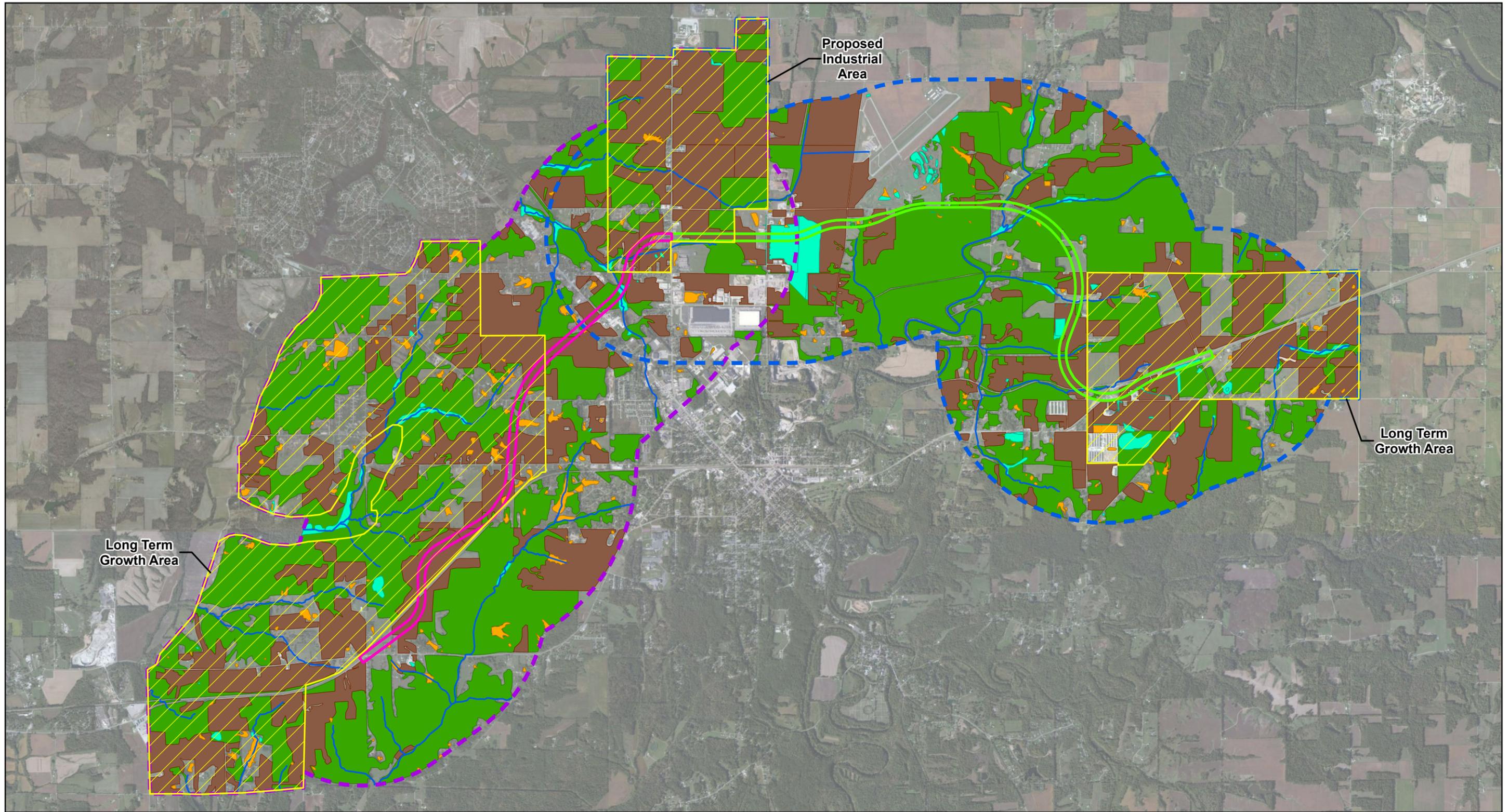


Legend

- ROW/Direct Impact Area - 6D
- Indirect Impact Area - 6D
- Streams
- Open Water
- Wetlands
- Farmland
- Forest

FIGURE 6
Direct & Indirect Impact Analysis: Alternative 6D





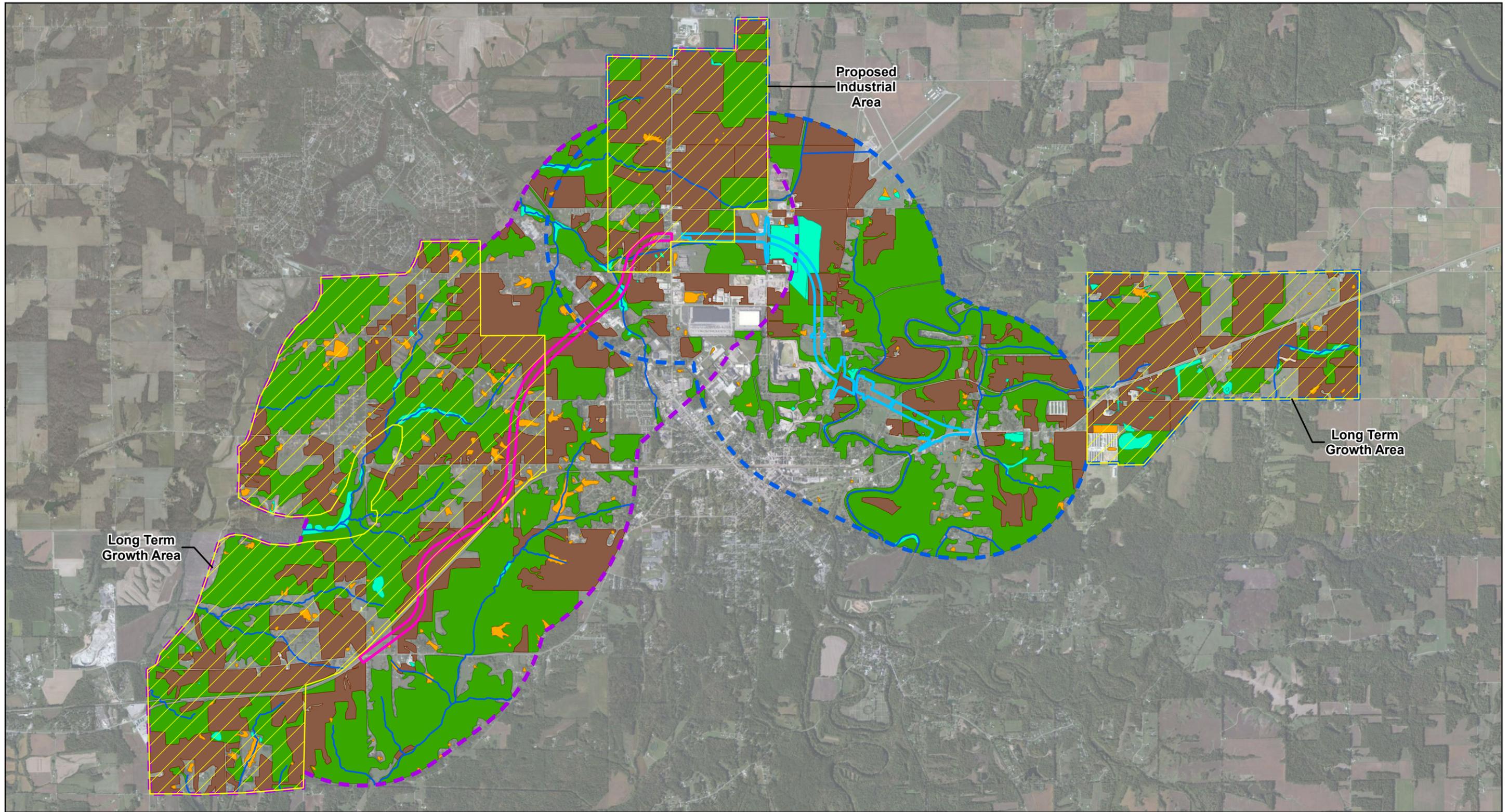
Legend

- ROW - 4NB2
- ROW - Western Bypass

- Growth Areas
- Cumulative Impact Area - 4NB2
- Cumulative Impact Area - Western Bypass
- Streams

- Open Water
- Wetlands
- Farmland
- Forest

FIGURE 7
Cumulative Impact Analysis: Alternative 4NB2 and Western Bypass



Legend

- | | | |
|----------------------|---|------------|
| ROW - 6D | Growth Areas | Open Water |
| ROW - Western Bypass | Cumulative Impact Area - 6D | Wetlands |
| | Cumulative Impact Area - Western Bypass | Farmland |
| | Streams | Forest |

FIGURE 8
Cumulative Impact Analysis: Alternative 6D and Western Bypass

APPENDIX A



Memorandum

To: Jim Earl, PE – INDOT Project Management
From: Cory Grayburn - Parsons
CC: Laura Hilden – INDOT OES
Date: September 20, 2012
Re: Indirect and Cumulative Impact Analysis Methodology

The purpose of this memo is to seek concurrence from INDOT, FHWA and relevant resource agencies on the methodology to be used to document indirect and cumulative impacts for the project.

Guidance Sources

The indirect and cumulative impact analysis for the US 50 North Vernon Bypass – East Environmental Assessment (EA) will be conducted in accordance with the guidelines in the following documents:

- *Procedural Manual for Preparing Environmental Documents* (INDOT, 2008);
- *Assessing Indirect Effects and Cumulative Impacts under NEPA* (Center for Environmental Excellence by AASHTO, 2011);
- *Considering Cumulative Effects Under the National Environmental Policy Act* (Council on Environmental Quality, 1997);
- *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* (NCHRP Report 466, 2002);
- *Indirect and Cumulative Impact Assessment in the Highway Project Development Process* (FHWA Position Paper, HEP-32, April 1992); and
- *Consideration of Cumulative Impacts in EPA Review of NEPA Documents* (US EPA 315-R-99-002, May 1999).

Project Background and Direct Impact Assessment

The Build Alternatives for this project represent a northeastern bypass of North Vernon and include a 2-lane limited access roadway on new location with at-grade intersections at existing county roads (locations to be determined). Although only two lanes will be initially built, enough right-of-way will be acquired to accommodate the future construction of two additional lanes resulting in a 4-lane divided highway. The project's direct impacts that will be presented in the EA will be based on the right-of-way for the 4-lane divided highway. This mirrors the approach that was utilized on the recently-completed US 50 North Vernon Bypass – West project.

Indirect Impacts Methodology

The indirect impacts from no more than two Build Alternatives for the US 50 North Vernon Bypass – East project will be evaluated. In addition, the indirect impacts from the US 50 North Vernon Bypass – West project's Preferred Alternative, as documented in that project's EA, will be included with the indirect impacts from the US 50 North Vernon Bypass – East project in order to determine the combined/total indirect impacts from both projects.

The study area for the indirect analysis will include the area around the proposed new county road intersections with the bypass. This is based on the assumption that project-related induced

development will be limited to these new intersection areas. Where intersections are proposed in close proximity (approximately one mile apart or closer), the study area will include the area connecting the two intersections. The inclusion of these connecting segments recognizes the likely surface street interaction between the two intersections.

Based on an assessment of rural, “bypass” route interchanges located throughout central Indiana and previous studies (Hartgen, D.T. et. Al., 1992), the area used for this analysis will be represented by a circle with an approximately one-quarter mile radius from the center of the intersections. For the segments that include intersections that are less than or equal to one mile apart, a one-quarter mile buffer will extend along both sides of the mainline and connect with the circular study areas associated with the two intersections (creating an “oval” shape).

Current land uses will be mapped within these indirect study areas. In addition, recent development trends (i.e., within the last ten years) will be evaluated to determine if these areas would likely experience growth and development regardless of the project. If so, these areas will not be considered for indirect impacts. Local zoning and comprehensive land use plans will be reviewed to determine any areas that are currently designated for development. The areas that will be evaluated for potential indirect impacts will currently be undeveloped and zoned/planned for agricultural or other undeveloped land uses. Areas that are currently developed and/or zoned/planned for development will not be evaluated for indirect impacts.

Using cursory field surveys, secondary source data, and GIS, the areas designated for indirect impacts will be reviewed for the presence of wetlands, forests, and farmland. These resources have been selected for indirect impact analysis due to their prevalence within the project area and their likelihood of being directly and indirectly impacted.

The indirect impacts to these resources will then be compared to their direct impacts in order to present the potential total amount of impacts from both and the differences in the relative magnitude of their impacts.

Cumulative Impacts Methodology

The cumulative impacts from no more than two Build Alternatives from the US 50 North Vernon Bypass – East project and the Preferred Alternative from the US 50 North Vernon Bypass – West project EA will be evaluated. The proposed study area for the cumulative analysis will be a one-mile wide buffer from the centerline of the Build Alternatives (two mile total width). This area is based on the existing land uses, zoning, and comprehensive plans. Areas north, east, and, west of these corridors (i.e., outside the bypass), except for the Country Squire Lake residential development, are very rural and generally have not experienced any development in the past and there are no current or future plans for development in the local zoning and Comprehensive Plans. The area south of the corridors (i.e., inside the bypass) includes the densely developed downtown area.

The resources that will be evaluated for cumulative impacts will be the same as the indirect impacts: wetlands, forests, and farmland. These resources will be identified and mapped within the study area based on available secondary source data and GIS. As part of the analysis of cumulative impacts, the regional/local historic trends associated with the presence and condition of these resources will be determined. The timeframe and level of historic information collected will be based on available secondary source data.

The analysis will also include the identification of past, present, and reasonably foreseeable future projects and the estimation of their impacts to the designated resources. Through coordination with

INDOT and local planning officials and review of historic aerial photos, past developments (i.e., within the last ten years) will be identified and their impacts to the designated resources estimated. Similarly, current development projects (i.e., projects under construction) will also be identified and their impacts estimated. Future developments will include any projects that have been recently submitted to and/or approved by the local planning departments. In addition, undeveloped areas that are currently zoned for development will be considered potential future development areas. For transportation projects, INDOT's Statewide Transportation Improvement Program (STIP) FY 2012-2015 will be reviewed along with local transportation improvement plans to identify any future transportation projects that are planned within the study area.

The impacts to the designated resources from all of these past, present, and future projects will be calculated and compared to the project's direct and indirect impacts.