



**MID-STATES
CORRIDOR**

APPENDIX G: CUMULATIVE IMPACTS ANALYSIS TECHNICAL REPORT

Mid-States Corridor Tier 1 Environmental Impact Statement

Prepared for
Indiana Department of Transportation
Mid-States Regional Development Authority

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Prepared by
Mid-States Corridor Project Consultant



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INTRODUCTION

Purpose of the Technical Report

This technical report is **Appendix G** of the Mid-States Corridor Tier 1 EIS. This technical report documents the approach to the analysis of reasonably foreseeable impacts in **Section 3.6 – Indirect and Cumulative Impacts**.

Project Description

The Indiana Department of Transportation (INDOT) is conducting an Environmental Impact Statement (EIS) for the Mid-States Corridor project. This project will include alternatives that consider the construction of a multi-county road on a combination of new and existing alignments. Its termini are US 231 at the Ohio River (SR 66) and I-69.

Format of the Technical Report

This appendix is organized using the handbook “Considering Cumulative Effects Under the National Environmental Policy Act” (Council of Environmental Quality, January 1997), referred to “CEQ Handbook” in this report.

The National Environmental Policy Act (NEPA) requires major federal actions to consider the relationship between short-term uses and long-term productivity of the environment. The 1978 CEQ regulations for NEPA established means for considering these impacts by defining three types of effects: direct, indirect, and cumulative. Direct effects are those that are caused by the actions and occur at the same time and place; indirect effects are those that are caused by the action but occur later in time and/or farther removed in distance but are reasonably foreseeable; cumulative impacts are those which result from the sum of incremental effects when added to past, present, and reasonably foreseeable actions.

Amendments occurred in July 2020 (85 Federal Register 43375) which attempted to simplify and clarify the policy by merging terminology in reference to indirect and cumulative effects. The term cumulative was eliminated and the definition of indirect effects was adjusted to “...changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives, including those effects that occur at the same time and place as the proposed action or alternatives and may include effects that are later in time or farther removed in distance....” (CEQ 2020 – 40 CFR 1508.1).

In October of 2021, notification was released (85 Federal Register 43375) the agency is reviewing the changes to the definitions and is anticipated to restore some of the prior language. Regardless of whether the original language or the 2020 revisions are in effect, evaluation of reasonably foreseeable effects is the primary goal of this section. The 2020 revisions did not eliminate consideration of cumulative effects, rather it instructed the NEPA preparer to increase focus on causal relationships in terms of incremental effects. For consistency with the initiation of the Mid-States Corridor study, the use of terminology for cumulative will follow the 1978 definitions.



Although there are independent definitions for direct, indirect, and cumulative, cumulative is the sum of direct, indirect, and incremental effects. To parse the subtleties of these terms, the comparisons are as follows:

- **Direct:** This is the most apparent and easily considered. These are the effects immediately caused by the chosen action when implemented and include such impacts as the purchase of right-of-way, relocating residential and commercial entities, and filling of wetlands, crossing of streams, removal of trees, etc. when the project goes to construction. These are limited to the actions for which the project sponsor is responsible for implementing.
- **Indirect:** As indicated in the 1978 definition, these are “caused by the action”. However, these are effects that are directly attributed to the implementation of an action but exist outside of the control of the project sponsor. An example of this type of effect would be the construction of a new interchange near the edge of a growing metropolitan area. For this example, the area prior to the interchange was predominantly in agricultural land use but the presence of the new interchange induces development growth that converts several hundred acres of farmland into commercial properties within a few years of completion. Whether the land use surrounding the interchange remained unchanged or not is outside of the control of the project sponsor but analysis at the time of project development should provide an indication if this type of effect is reasonably foreseeable.
- **Incremental:** The critical factor separating indirect from incremental is the independence of other actions from the action being considered. Using the example for indirect, the new interchange would be the cause of the commercial growth, without it the development would occur elsewhere or not at all. Adjusting the prior example, instead of agricultural lands the roadway construction would cause the clearing of 35 acres of forest. During the NEPA phase it was identified a private company planned to construct a new manufacturing plant near the project area; however, the location of the plant was determined without regard to and is not contingent on the project. The combined actions for the construction of the manufacturing plant, the roadway, and other induced commercial growth could be estimated to exceed 1,000 acres and severely fragment the community’s largest contiguous woodland area. The cumulative effect includes the sum of the direct impacts caused during construction of the road, the indirect impacts from the induced commercial growth caused as result of the road providing new access, and the incremental impacts resulting from independent industrial development.

This cumulative effects analysis will disclose impacts to the following key resources the study area: agriculture, forests, wetlands, streams, and karst. When considering cumulative impacts, the analysis must be relevant to the resource in question. For example, if noise was selected as a resource of concern, then analysis must consider proximity to areas of sensitivity and not distribute sound level across a county area. Conversely, the incremental loss of wetlands over a county wide area may have both a localized and larger systemic effect.

Actions considered in this analysis include the Mid-States Corridor and other transportation projects, other public works projects and major private projects that are within the 12 County Study Area (**Figure 1**). Analysis of general trends are documented in **Appendix F – Cumulative Impacts Baseline Trends**. Designs developed in greater detail during any Tier 2 study would require further analysis to these resources.



Table 1 outlines this technical report, highlighting the three traditional components to the assessment and their relationship to the analysis. These include the Scoping phase, the description of the Affected Environment and the determination of the Environmental Consequences. **Table 1** highlights the three traditional components and provides the corresponding 11 steps for a cumulative effects analysis.

TABLE 1: STEPS IN THE CUMULATIVE EFFECTS ANALYSIS

EIA Components	CEA Steps
Scoping	<ol style="list-style-type: none"> 1. Identify the significant cumulative effects issues associated with the Mid-States Corridor. 2. Establish the geographic scope for the analysis. 3. Establish the time frame for the analysis. 4. Identify other actions affecting the resources, ecosystems and human communities of concern.
Describing the Affected Environment	<ol style="list-style-type: none"> 5. Characterize the resources, ecosystems and human communities identified in scoping and explain how they have historically changed. 6. Characterize the stresses affecting these resources, ecosystems and human communities and their relation to regulatory thresholds. 7. Define a baseline condition for these resources, ecosystems and human communities.
Determining the Environmental Consequences	<ol style="list-style-type: none"> 8. Identify the important cause and effect relationships between human activities and resources, impacts and human communities. 9. Determine the magnitude and significance of cumulative effects by identifying the changes as a result of the Mid-States Corridor. 10. Modify or add alternatives to avoid, minimize or mitigate significant cumulative effects. 11. Monitor the cumulative effects of the alternatives and provide documentation.

SCOPING (STEPS 1 TO 4)

Scoping includes collecting data for the study area. These efforts began at the study’s initiation and have continued. The scoping phase of this EIA follow steps 1 – 4 in **Table 1**.

Step 1 – Identify Significant Cumulative Effects Issues

The first step of the scoping process is to identify the major resources, ecosystems and human communities where cumulative effects will be a major issue. Key studies which were consulted to identify resources of concern were the I-69 Tier 1 and Tier 2 EISs. The I-69 Tier 1 Study and all Tier 2 studies considered farmland, forest and wetlands as resources of concern. All I-69 Tier 2 studies also considered streams as a resource of concern. Tier 2 studies in I-69 Sections 4 and 5 also considered karst as a resource of concern. Cumulative impacts also were briefly discussed at the March 3, 2020 agency coordination meeting.

The five resources of concern identified in the Study Area include farmland, forests, wetlands, streams and karst features.



Step 2 – Establish geographic scope

The Study Area for the Mid-States Corridor project is shown in **Figure 1**. It encompasses 12 counties in Southwestern Indiana. This is the geographic area within which alternatives may be located, and within which indirect effects due to induced development may occur.

Step 3 – Establish the Time Frame

The retrospective time frame for considering resource trends is dependent upon available data. See **Appendix F**. The analysis extends to the forecast year for traffic assignments for the project, which is 2045. The TREDIS economic forecasting tool provides estimates of induced growth within this analysis period. See **Appendix B – Economic Development Performance Measures Analysis** for additional details about the TREDIS tool.

Step 4 – Identify Other Actions

The scoping process identifies present and reasonably foreseeable actions by government agencies, private organizations or individuals that should be considered in the cumulative effects analysis. Close coordination with agencies, private organizations and individuals during this process have been used to identify present and future actions. Planned transportation projects by INDOT and other government agencies have been identified. Information from local government planning agencies was reviewed to provide information on future development of the region such as land use plans, economic development plans, water supply plans, local zoning requirements, etc. This coordination is documented in **Appendix U – Land Use Plan Review**.

These impacts to key resources from other actions include:

- **Coal to Diesel Plant in Dale:** This plant is being developed in Dale and would encompass approximately 300 acres in the southeast quadrant of the I-64/US 231 interchange east of US 231. This plant will impact approximately 232 acres of farmland, 66 acres of forest, two acres of wetlands, and 7,000 linear feet of streams near the southern terminus of the Mid-States Corridor. These stream impacts will occur within the study region of the Mid-States Corridor and may impact similar streams depending on which alternative is chosen. The action would occur within the HUC-8 basin Lower Ohio River and HUC-10 watershed Barren Fork-Little Pigeon Creek. The impaired water in closest proximity to the plant is the North Fork Little Pigeon Creek which is impaired for biotic communities (IBC). The watershed is not part of either an approved Total Maximum Daily Load (TMDL) or Watershed Management Plan (WMP).
- **Washington Convention Center:** This is being developed in Washington near the I-69 interchange with US 50. The convention center will impact approximately 33 acres of farmland in Washington, which would be occurring in the Mid-States Corridor study region. Similar acres of farmland may be impacted by the Mid-States Corridor if alternative B or C is chosen. The action would occur within the HUC-8 basin Lower White River and HUC-10 watershed Kessinger Ditch-White River. The impaired water in closest proximity to the center is Veale Creek which is impaired for E. Coli. The watershed is not part of either an approved TMDL or WMP.
- **Huntingburg Solar Field:** This is being developed on agricultural land near Huntingburg and will impact approximately 680 acres of farmland due to the installation of solar panels. As a result,



this land will no longer be utilized for agricultural purposes. Huntingburg is located near each potential alternative, and incremental impacts with the Mid-States Corridor with this solar field vary depending on the alternative chosen. Although this action will convert farmland to non-agricultural uses, unlike other forms of development, solar farms do not cause the irretrievable loss of farmland as the soils remain in place; however, for the purposes of this report will be presented as a permanent loss of farmland. The action would occur within the HUC-8 basin Patoka River and HUC-10 watershed Hunley Creek. Several tributaries of Hunley Creek in proximity to the project are impaired; the impairments include dissolved oxygen, E. Coli, IBC, and nutrients. The watershed is not part of an approved TMDL but is part of the Middle Patoka WMP.

- **Lehigh Cement Plant Expansion.** This is an expansion of the existing Lehigh Cement plant in Mitchell. This expansion will result in the loss of approximately 20 acres of farmland, 40 acres of forest, and construction will occur within 10 acres of karst features. The action would occur within the HUC-8 basin Lower East Fork White River and HUC-10 watershed Lick Branch-East Fork White River. No impaired waters are in close proximity to the plant. The watershed is not part of either an approved TMDL or WMP.
- **Loogootee Trail System:** This project includes the construction of County Line Trail to West Boggs Park, which is designed to connect Loogootee to West Boggs Park. This project can be found in the Indiana Parks and Recreation Master Plan 2021-2025. the Loogootee Trail System is anticipated to impact approximately 0.22 acre of farmland and 1.6 acres of forest. The Mid-States Corridor is anticipated to impact managed lands in this area, including West Boggs Park. These impacts from the new trail would be happening in conjunction with impacts from the chosen alternative if alternative P or M is chosen. The action would occur within the HUC-8 basin Lower East Fork White River and HUC-10 watershed Boggs Creek. No impaired waters are in close proximity to the trail. The watershed is not part of either an approved TMDL or WMP.
- **Milwaukee Road Trail:** This trail is a 10.9-mile public trail extending from Williams to Bedford, through the Hoosier National Forest in Lawrence County. There are currently plans to extend the trail from Williams to Indian Springs in Martin County. There will be some impacts to forested land due to the construction of the trail, but it will be minimal so as to keep the aesthetics of the region and the purpose of the trail. This trail is located east of all the Mid-States alternatives and will not be impacting the same forest acres as the alternatives. The action would occur within the HUC-8 basin Lower East Fork White River and cross two HUC-10 watersheds: Leatherwood Creek and Salt Creek. The Salt Creek Watershed is part of an approved TMDL (Lower Salt Creek Watershed TMDL). Salt Creek and the East Fork White River are both in proximity to the project and have segments impaired for PCB and/or Mercury.
- **State Road 54 Added Travel Lanes:** INDOT is constructing 11 miles of added travel lanes on SR 54 under the Designation Number (DES No.) 1801375. These travel lanes extend from 1.7 miles east of US 231 to SR 43. This added travel lanes project is anticipated to impact approximately 15 acres of farmland and 6.5 acres of forest. This project is taking place in the northern portion of the study area and is not likely to be impacting the same farmland and forest acres of the Mid-States alternatives. The action would occur within the HUC-8 basin Lower East Fork White River and HUC-10 watershed Indian Creek. The impaired water in closest proximity to the



roadway is Indian Creek which is impaired for E. Coli. The watershed is not part of either an approved TMDL or WMP.

- **State Road 37 Added Travel Lanes:** INDOT is constructing new added travel lanes and turn lanes to SR 37 at John Williams Blvd. in Bedford under the DES No. 1500061. The action would occur within the HUC-8 basin Lower East Fork White River and HUC-10 watershed Salt Creek. The Salt Creek Watershed is part of an approved TMDL (Lower Salt Creek Watershed TMDL). Salt Creek is in proximity to the project and where segments are impaired for PCB and Mercury.
- **Lincoln Boyhood-Santa Claus Discovery Trail:** Santa Claus is constructing a bike/pedestrian trail under DES No. 1297252. This will be a 12-foot-wide multi-modal trail and supporting facilities in and around the Lincoln Boyhood National Monument and Lincoln State Park. The trail will extend through the town of Santa Claus to the intersection of SR 162 and SR 245. The trail will provide better access for residents and tourists to the various attractions and features of the town. This trail is anticipated to impact approximately seven acres of forest, and this project is located in the southern portion of the Mid-States Corridor study area. The action would occur within the HUC-8 basin Lower Ohio River and HUC-10 watershed Crooked Creek. No impaired waters are in close proximity to the trail. The watershed is not part of either an approved TMDL or WMP.
- **Eastside Trail in Santa Claus:** The town of Santa Claus has planned and designed the Eastside Trail under DES No. 1902108. It will connect Ray Yellig Trail to the American Discovery Trail. The trail currently is under construction. This project is anticipated to impact approximately 2.45 acres of farmland and is located in the southern portion of the Mid-States Corridor study area. The action would occur within the HUC-8 basin Lower Ohio River and HUC-10 watershed Crooked Creek. No impaired waters are in close proximity to the trail. The watershed is not part of either an approved TMDL or WMP.
- **Warrick Trail:** Warrick County has planned an extension to the Warrick Trail under DES No. 1592154. The trail will start on Vann Road between SR 261 and Casey Road and end at Oak Grove Road. This project is anticipated to impact approximately 1.33 acres of farmland and four acres of forest, and it is located in the southern portion of the Mid-States Corridor study area. The action would occur within the HUC-8 basin Lower Ohio River and HUC-10 watershed Cypress Creek. No impaired waters are in close proximity to the trail. The watershed is not part of either an approved TMDL or WMP.

The impacts from these “Other Actions/Projects” as described above and the Mid-States Corridor alternatives will be evaluated further in the Tier 2 study.

Scoping Summary (Steps 1 to 4)

Scoping for the cumulative effects analysis provides a thorough evaluation of the environmental context of the proposed action. The following steps have been completed:

- Identifying farmland, forested land, wetlands, streams and karst features as the resources for which the proposed action will be evaluated for potential cumulative effects
- Identifying the 12-County Study Area (**Figure 1**) as the geographic scope for the analysis
- Establishing the time timeframe as extending to 2045



- Identifying 11 “other actions” which may affect the resources of concern

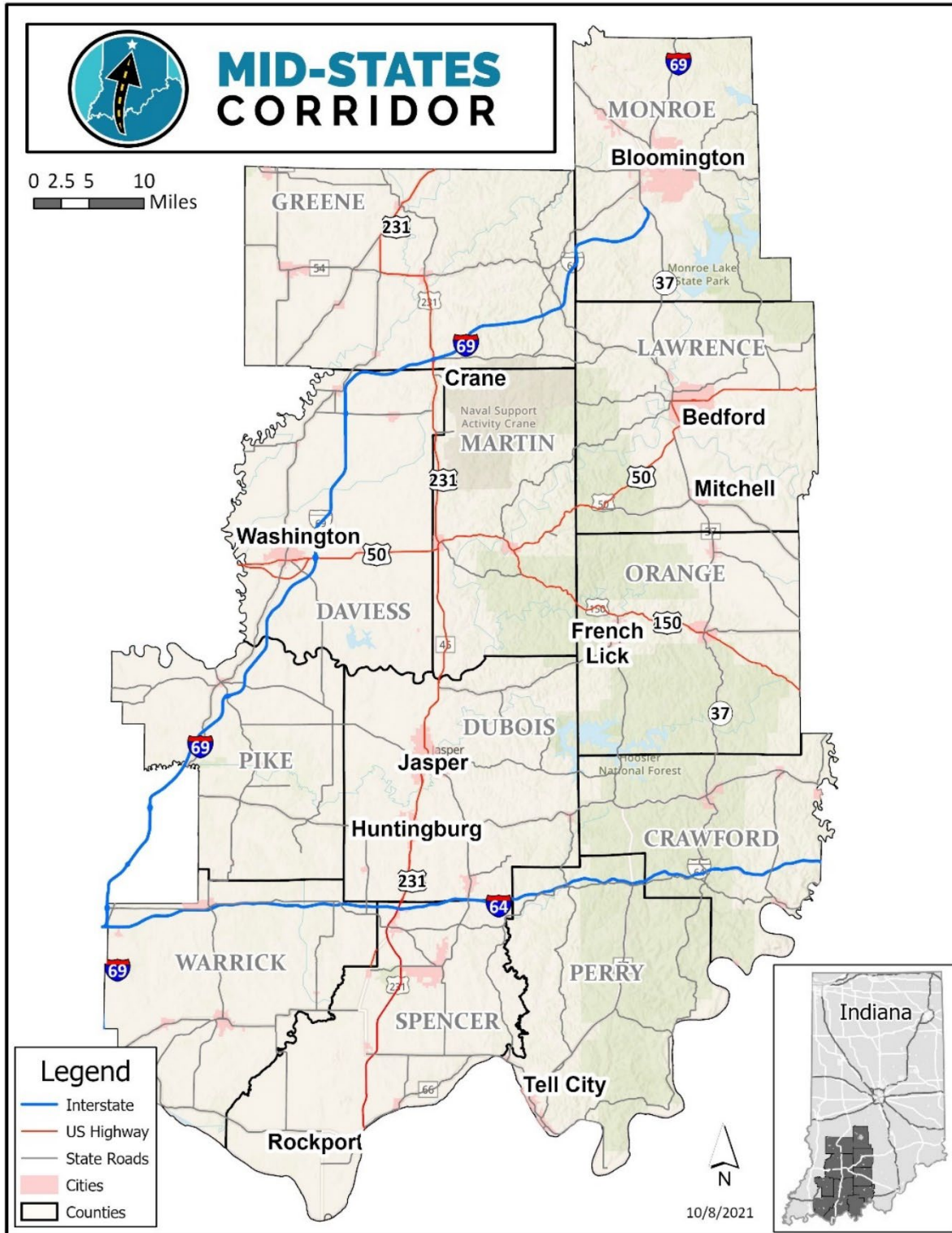


FIGURE 1: MID-STATES CORRIDOR STUDY AREA



AFFECTED ENVIRONMENT (STEPS 5 TO 7)

Appendix F – Cumulative Impacts Baseline Trends provides the details of the analysis described in Steps 5 through 7.

Step 5 – Describe the Current Status and History of Identified Resources

A baseline evaluation of resources of concern is provided in **Appendix F**. The summary of its findings related to historical conditions of resources of concern are as follows:

- **Farmland.** Farmland use between 1974 and 2017 for the study area was evaluated to establish the historical trends. During this period, farmland acreage declined from approximately 1,750,000 to 1,420,000 (a 19% decline). The decline of farmland in the study area is not an equivalent of farmland irretrievably lost. The trends driving the agricultural sector are diverse and specific to a given area. For example, loss of farmland surrounding the greater Indianapolis area is driven substantially by population growth and conversion of land use from rural to urban settings. For the Mid-States Corridor, the predominant reduction of farmland is driven by removal of marginal soils from row crop production. The lands within the study area removed from agricultural production generally remain undeveloped or converted to timberland.
- **Forests.** Forest lands were evaluated in detail for the period between 1986 and 2019 but longer-term data was considered for context. Forested land in Indiana reached a low in the 1960s falling below four million acres. Changes in public sentiment, property taxation (incentives), and farming practices contributed to substantial increases of land set aside as forest or fallowed and allowed to reforest between the 1960s and 1990s. Statewide the amount of forested land is nearly five million acres currently. The study area contains some of the historically densest areas of forest in the state. The combined 12 counties had a three percent increase in forest between 1986 and 2019; however, annual data varied greatly within the counties influenced by timber harvest and reforestation.
- **Wetland.** Evaluation for historical conditions of wetlands was conducted qualitatively. Remote sensing data related to wetlands is updated by federal agencies every 2-5 years for the National Wetland Inventory (NWI) and National Land Cover Dataset (NLCD), but changes in methodology and sensitivities between sample years prevent the direct analysis between years of data without substantial effort to normalize the datasets to evaluate discrete localized trends. Forested wetlands account for approximately 82 percent of the wetland type within the study area. On a national level, wetlands have historically exhibited a decreasing trend. The state of Indiana was estimated to have converted approximately 4.7 million acres of wetlands to non-wetland lands for agriculture use and urban development by the 1980s. Based on the general consistency of the broader scale land use of the study area since the 1980s (i.e., steady conversion of farmland to non-farmland use), it is anticipated the localized wetlands in the study area have been trending even or slightly gaining even though there is a broader negative trend for wetland loss statewide. NLCD data was used for reference only, and not for quantitative



analysis, but between 2001 and 2016 wetlands in the study area trended positive. Significant reclassification of cover types and methodology occurred which may obscure actual changes.

- **Streams.** A total of 41,300 miles of streams are present in the study area. Canals and Ditches compose a portion of the types of streams, but no actions were identified where significant changes to stream morphology have occurred in the recent past (e.g., new major segments of channelization, levee creation, or dam construction). Regarding water quality, review of the 303(d) list identified impaired stream segments throughout the study area. Further review of various watershed plans identified historically consistent issues related to the various impairments. Most impairments were found to be associated with agricultural sources. No impairments observed were associated with a roadway transportation source.
- **Karst Features.** Karst is a geologic formation and the presence or absence of the underlying lithology which creates karst features is consistent over time. Identification of exposed karst features such as sinkholes, springs, and cave entrances may change, but these do not change the risk associated with being within a karst region. The eastern portion of the study area contains the densest volume of karst.

Step 6 – Characterize the Stresses

Stresses to the resources of concern were reviewed to determine if known issues are present in the study area. Items such as land use or population changes were considered. A summary of these stressors area as follows:

- **Farmland.** Stressors to agriculture can occur from several sources, including but not limited to urbanization, changes in commodity prices and costs of farming inputs, soil health, and weather. The amount of agricultural land in every county of the study area has been decreasing steadily for decades; however, farm productivity has been steadily increasing as technological innovations have improved yields year-over-year. Farming has transitioned to a more industrialized sector with fewer and larger farming operations. Marginal soils produce smaller yields which has shifted the economic decisions for row crop production. The steady decline of total farmland aligns with consolidation around properties with prime farmland soils and distance from/access to ports. The study area is not experiencing an issue of irretrievable loss of farmland, rather a conversion or fallowing of land to other uses. Urbanization is not a significant issue in the study area.
- **Forests.** Stressors to forested land include conversion to urban or residential settings, transportation corridors, unmanaged timber harvests, and agricultural use. Statewide, the volume of forested lands has been increasing at various rates since the 1960s. The study area contains some of the counties with the most forest cover in Indiana and the annual survey data collected by the U.S. Forest Service (USFS) has identified constant fluctuations in the rate of reforestation and conversion to non-forest habitat over time in this area. On the whole of the study area, the trend has been increasing forest land but counties such as Warrick and Perry trended downward. The discussion of stressors should be considered regarding both their commercial (timber and gaming) and ecological value. Maintaining sections of old growth forest and large contiguous blocks of forest land is important to ecosystems. Forest fragmentation reduces wildlife corridors and availability of core forest habitat which can be crucial to the life cycles of various species.



- **Wetlands.** Stressors to wetlands in the study area are predominantly from human alterations to hydrology. These include ditching, installation of underground drain tiles, construction of levees and dams, urbanization, and redirecting stormwater runoff. The study area is predominantly rural thus urbanization is highly localized and not a significant stressor on the landscape level within his region. The hydrologic alterations with respect to projects which conducted major channelization, ditching, and dam and levee construction for agricultural lands were conducted decades ago. Localized ditching and installation of underground drain tiles continues on active farmland, but the trend has been for more farmland in the study area to be removed from production which reduces this stressor.
- **Streams.** Stressors to streams are from similar sources as wetlands. Channelization, ditching, installation of drain tiles, construction of dams and levees, and land use changes all can have effects on the stream morphology and water quality. As noted with wetlands, the landscape level alterations to were completed decades ago and the stream systems have been in an adaptive phase since. With respect to water quality, pollutants (either as point sources or as non-point sources from stormwater runoff) are the primary stressors. These include discharges from point sources such as wastewater treatment facilities or non-point sources such as E. Coli. and excess nutrients from agricultural lands. The Study Area contains a number of former surface mines that have created a limited amount of legacy pollutants such as heavy metals in segments of streams that can remain persistent in the environment.
- **Karst Features.** Similar to streams, stressors to karst can be considered from the perspective of a physical effect and a water quality effect. A physical effect would be the closure or modification of an existing cave entrance; an effect regarding water quality would be the introduction of a pollutant source into a karst environment that contaminates the groundwater and sensitive habitat within the underground features. Of the two stressors, the risks to water quality are greater. Sources of pollutants may include point or non-point sources, including accidental releases of hazardous waste.

Step 7 – Identify Baseline Conditions

The baseline condition identifies the forecasted effects of the “No Build” alternative within the Study Area if the Mid-States Corridor will not be built. The time frame selected is 2045. This analysis forecasts the impacts to these major resources, ecosystems and human communities over this period.

- **Farmland.** This resource is forecasted to decrease an additional 23% (to approximately 1,080,000 acres) by 2045 in the study area. The decline of farmland in the study area is not an equivalent of farmland irretrievably lost. The trends driving the agricultural sector are diverse and specific to a given area. For example, loss of farmland surrounding the greater Indianapolis area is driven substantially by population growth and conversion of land use from rural to urban settings. For the Mid-States Corridor, the predominant reduction of farmland is driven by removal of marginal soils from row crop production. The lands within the study area removed from agricultural production generally remain undeveloped.
- **Forest.** Forecasting the acreage of forests in the study area is partially connected to the trends observed in farmland. The study area is in a rural setting and located in an ecological region



containing some to the state's highest concentrations of forest. Changes in property taxation (incentives) and changes in farming practices have contributed to increases of land set aside as forest or fallowed and allowed to reforest. The annual variations present within the counties in the study area regarding timber clearing and reforestation prevent a predictable level of growth, but the trend is for a net gain of forest by 2045 for the region. On a county level, some may exhibit losses in a given year or for several years.

- **Wetlands.** As noted in the historical trend analysis, remote sensing data related to wetlands was unable to be used to generate a meaningful quantitative prediction. Forested wetlands accounted for approximately 82 percent of the wetland type within the study area. Agricultural lands on marginal grounds, which include low-lying fields in floodplains, are predicted to be converted to other land uses through the forecast year (2045). Although no quantitative measurement was able to be generated, it is anticipated there will be a minor upward trend in emergent and forested wetlands.
- **Streams.** No other actions were identified which would result in a substantive morphological change to any of the higher order streams within the major watersheds of the study area (e.g., major segments of channelization, levee creation, or dam construction). Additionally, all projects impacting a waterway are required to be permitted and conditions associated with these permits require offsetting mitigation actions to maintain channel stability. No substantive change in length of streambeds is forecasted. Review of the 303(d) list identified impaired stream segments throughout the Study Area; however, none of the impairments were associated with transportation related sources. The impairments were predominantly associated with agricultural sources and many of the watersheds in the Study Area have approved Total Maximum Daily Loading (TMDL) and Watershed Management Plans (WMP). The implementation of these and future watershed plans in combination with the predicted reduction of farmland and increase of forest land during the forecast period indicate that water quality should trend upward.
- **Karst.** Surface indications of karst include cave entrances, springs, sinkholes, and sinking stream basins. The study area is located within a region of karst, the highest concentrations of the underlying geology which produces karst features are in Crawford, Greene, Lawrence, Monroe, and Orange counties. Karst is a geologic formation, and the presence or absence of karst was not estimated to change although the number of exposed features such as sinkholes may vary over time. A key concern regarding karst features is their sensitivity to groundwater contamination. The analysis considered whether land use activities in karst areas during the forecast period were likely to increase or decrease risks to groundwater contamination. The trend for farmland reduction will result in the reduction of non-point pollutant sources, but the areas of the study area with the highest karst resources tend to have the least farmland. No substantive changes to land use were identified thus risk to groundwater was predicted to remain consistent (no upward or downward trend).

Further detail on the baseline trends of these five resources can be found in **Appendix F**.



Affected Environment Summary (Steps 5 to 7)

The analysis identifies and defines the current conditions, historical context, stresses and baseline conditions of the farmland, forested land, wetlands, streams and karst features in the study area. The following analyses were completed in **Appendix F** and are summarized here:

- Characterize the current status and historical trends of farmland, forest land, wetlands, streams and karst features within the twelve-county Study Area.
- Identify the levels of stress on farmland, forest land, wetlands, streams and karst features.
- Define a baseline condition for the farmland, forest land, wetlands, streams and karst features in the Study Area if the Mid-States Corridor is not built.

ENVIRONMENTAL CONSEQUENCES (STEPS 8 TO 11)

The Environmental Consequences stage of this assessment follows Steps 8 through 11 in **Table 1**.

Step 8 - Identify Important Cause and Effect Relationships

The five resources of concern considered in this analysis are farmland, forests, wetlands, streams and karst features. The analysis identified connection between all five with respect to influence between the baseline and forecast trends. Drivers for these trends are interconnected, but ultimately can be traced back to socioeconomic circumstances. The region has experienced population growth between 1900-2020, but the Monroe, Warrick, Dubois, and Lawrence counties have been the primary growth centers. Crawford, Martin, Perry, and Spencer each have experienced a steady decline in population while Daviess, Greene, Perry, and Orange counties have held relatively steady. The largest growth period for the region was between 1950-2000, during this period only Martin and Pike counties experienced population loss. The period between 2000-2020 had a reversing trend from the prior 50 years. Half of the counties during this period experienced a population decline. Currently (2020 data) the 12-county study area has a population of approximately 448,000 with Monroe, Lawrence, and Warrick counties accounting for more than 50 percent.

Following national trends, population growth in the study area has typically occurred around major regional population centers with smaller communities declining. Farming has historically been a primary economic driver for the Midwest. While farming will remain a key economic driver, this sector has become industrialized and shifted from a high number of producers with low commodity volume to a low number of producers with high commodity volume. Innovations in equipment and technology have maintained consistent year-over-year improvements in productivity, but these maintain the highest margins for row crops on prime farmland soils. As productivity increases, supply increases and drives down the price of a commodity. Technology has provided improvements, but the cost of equipment associated with the technological gains has required larger farming operations to support the asset investment. These combinations have served to consolidate farms and shift the price point for planting



lands with marginal soils. Between 1960 and 2015 the total number of farmers in the U.S. fell by half while the average farm size grew significantly.

The study area was historically forested with those lands cleared for agricultural purposes as settlement occurred. A substantial portion of the soils in the study area are marginal (not prime farmland) and occur on relatively small plots. The historical and forecast trends for further reduction of agricultural lands fit within this profile. Alternatively, the price for timber has steadily increased. Allowing marginal grounds to reforest provides other financial opportunities for landowners including tax incentives, hunting leases, and eventual timber harvest.

The connection between each of these resources are connected socioeconomically in the following ways:

- **Agriculture.** Farms are reducing in size as individual operations are becoming larger and consolidating around properties with prime farmland soils. Marginal lands are being converted to other uses and taken out of production. As less opportunities are available for smaller operators, population movement for employment is incentivized and rural areas become 'more rural'. The net effect is the reduction of agricultural lands.
- **Forest.** The consolidation of farming operations away from historically forested lands incentivizes either the active planting or allowing natural succession to reforest lands formerly in row crop production. The net effect is the opportunity for the increase in forested lands.
- **Wetlands.** Many of the agricultural lands in the study area occur on active or formerly active floodplains (formerly due to the construction of levees to protect the land from flooding). The floodplain areas typically were modified and require various management activities to provide proper drainage to use in row crop production. As these floodplain areas are removed from production, the maintenance activities are stopped and the opportunity for hydric conditions to return increase. The reduction in active farms and employment opportunities outside of regional metropolitan centers remove the threat of residential development or other urbanization actions. The net effect is the opportunity for the increase in wetlands.
- **Streams.** The study area is in a low population density setting with limited potential for urbanization activities. The rural setting has limited manufacturing/industrial point sources for pollutants. Farming operations are currently providing the dominant non-point pollutant sources. The reduction of farms, removal of marginal grounds from production, and the corresponding potential for an increase in forest land and wetlands reduce the non-point source pollutant loads. The net effect is the opportunity for an increase in water quality of surface water runoff reaching the receiving streams.
- **Karst.** This resource is highly sensitive to surface water runoff infiltrating and polluting groundwater. Identical to streams, the opportunity for improvement of surface water runoff is positive overall; however, the risks for a specific incident of accidental release of pollutants to any single karst feature remains consistent.



Step 9 – Determine the Cumulative Effects of the Mid-States Project

Forecasted direct and indirect impacts of the Mid-States Corridor are calculated as changes to the “No-Build” alternative. Incremental “other actions” were evaluated and added to the direct and indirect impacts to calculate the reasonably foreseeable cumulative effects. These were reviewed to determine whether these effects are significant (either as beneficial or adverse). **Appendix Q – Cumulative Impacts Calculation Appendix** provides the calculations of direct and indirect impacts for all alternatives. These are used in **Table 3.6-1** in **Section 3.6** as part of the cumulative impacts analysis for this project. These cumulative impacts can be summarized as:

- **Farmland.** Direct impacts ranged from approximately 1,100 acres from Alternatives C and O, to 1,800 from B, M, and P. Very minimal acreage was estimated to be lost as a result from induced growth from any of the alternatives. Alternatives B, C, M, and O each had less than 10 acres of indirect impacts; Alternative P had the most indirect impacts but yielded only a range of 14-17 acres. Incremental impacts from “Other Projects” were estimated at 1,000 acres and were applied evenly to all alternatives. The cumulative impacts ranged from near 2,100 to 3,000 acres of impacts with Alternatives C and O performing similarly and Alternatives B, M, and P performing similarly. The forecast for farmland in the study area is to be reduced by an additional 300,000 acres by 2045; the cumulative impacts for farmland are not significant in relationship to the Mid-States Corridor.
- **Forests.** Direct impacts ranged from approximately 300 acres from Alternative B to nearly 2,300 acres from Alternative M. Very minimal acreage was estimated to be lost as a result from induced growth from any of the alternatives. Alternatives B, C, M, and O each had five or less acres of indirect impacts and Alternative P only had approximately 10 acres. Incremental impacts from “Other Projects” were estimated to incur an additional 150 acres of forest; these were applied evenly to all alternatives. The cumulative impacts ranged from near 500 to 2,400 acres of impacts with Alternatives performing from best to worst in the order of B, C, P, O, and M. The forecast for forest land in the study area was not able to be quantified but was projected to increase for the region. The direct impacts far exceed those associated with the indirect and incremental (Other Projects). Although Alternative M and O have the most impact by measurement of total acreage, this metric may be less important in separating them from the other alternatives than for the impacts they have on core forests and the value of certain impacted forest areas to protected species along their routes (core forests will be further discussed in **Section 3.21**). The cumulative effects for forests do not generate significantly more impacts than the direct impacts.
- **Wetlands.** Direct impacts ranged from approximately 40 acres from Alternative P to more than 100 acres for Alternative M. No wetland impacts were attributed to indirect effects. Incremental impacts from “Other Projects” were estimated to incur less than an additional 10 acres; these were applied evenly to all alternatives. Alternative P has the potential to create the fewest wetland impacts but performs similarly to Alternatives O and C. Alternative B has the potential to impact between 83-91 acres while Alternative M may impact 105-118 acres. The forecast for wetlands in the study area was not able to be quantified but predicted to have the potential to increase along floodplains where marginal agricultural lands are removed from production and



drainage maintenance is reduced on those properties. Regulatory requirements in Indiana will result in mitigation for direct impacts to wetlands as part of any selected build alternative. This action will generate an offset for the direct impacts caused by the Mid-State Corridor. The cumulative impacts for wetlands are not significant in relationship to the Mid-States Corridor.

- **Streams.** Direct impacts ranged from approximately 23 miles of stream channel from Alternative C to 45 miles for Alternative M. No stream impacts were attributed to indirect effects. Incremental impacts from “Other Projects” were estimated to incur less than an additional 2 miles of stream channel; these were applied evenly to all alternatives. Performance related to impacts to length of stream channel from best to worst for the Alternatives was C, B, P, O, and M. Under current regulatory requirements, channelization or other physical modification of waterways will not be allowed without demonstrating the appropriate length, slope, and channel shape proposed will maintain stream stability. Proper Best Management Practices must also be deployed during construction to prevent construction sediments from entering the waterways. Some physical disturbance to the streams will occur and some additional sedimentation may be released during storm events during the construction phases, but these impacts are not anticipated to produce a cumulative degradation of water quality to any of the existing 303(d) streams. Regarding the broader water quality of the Study Area, it is forecasted to have farmland removed from production, for forest land to increase numerous watershed management/improvement projects to be implemented. These actions should reduce non-point pollutant loads and result in a positive trend for water quality across much of the Study Area. The cumulative impacts for streams are not significant in relationship to the Mid-States Corridor.
- **Karst.** Direct impacts ranged from 0 to nearly 100 karst features. Karst areas are limited to the eastern side of the study area thus are generally confined to the portions of Alternatives O and M after they break away from the shared alignment with Alternatives C and P. Although Alternative B is the westernmost alignment and has one karst feature associated with it (sinkhole), this sinkhole is located outside of karst lithology. No karst impacts were attributed to indirect effects. Incremental impacts from “Other Projects” were not associated with any specific karst features but were estimated occur within 10 acres of karst; these were applied evenly to all alternatives. The cumulative impacts for karst are not significant in relationship to the Mid-States Corridor.

Step 10 – Avoidance, Minimization, and/or Mitigation

Efforts to avoid and minimize impacts to resources of concern have been incorporated throughout the development of corridors. Refinement of this process will occur throughout this and any subsequent Tier 2 NEPA study and post-NEPA design. These efforts are discussed in the respective resource sections of **Chapter 3** as well as **Chapter 5 – Comparison of Alternatives**, and **Chapter 6 – Mitigation and Commitments**. A summary of avoidance and minimization is as follows:

- **Farmland.** Agricultural impacts are not limited to within the physical footprint of a roadway project. Alternatives must consider maintaining access for equipment and machinery, maximize perpendicular crossings to reduce creating point rows, evaluate for landlocked and uneconomic remnants, and minimize conversion of prime farmland soils. Each of these considerations were



made in balance with avoidance of other resources within the study area for direct impacts. Evaluation of land use plans and potential areas of induced growth occurred to consider access management plans which minimize agricultural impacts. “Other Projects” were evaluated to determine if the incremental actions would produce significant cumulative impacts. None of the incremental actions were identified as having the potential to produce significant cumulative effects. No specific mitigation was developed for this Tier 1 study for farmland.

- **Forest.** Land cover data and remote sensing techniques were used to develop an inventory of contiguous blocks of forest which had the probability of behaving as core forest habitat. Areas of core forest were avoided to the extent practicable in balance with avoidance of other resources. Indirect impacts were minimized by limiting access point within forested blocks. “Other Projects” were evaluated to determine if the incremental actions would produce significant cumulative impacts. None of the incremental actions were identified as having the potential to produce significant cumulative effects. Consideration of forest mitigation will be deferred and in consultation with USFWS during formal consultation on protected species.
- **Wetlands.** Land cover data and wetlands inventory data were used to identify potential locations of wetlands. Areas of wetland were avoided to the extent practicable in balance with avoidance of other resources. Indirect impacts were minimized by limiting access point in or near wetland areas. “Other Projects” were evaluated to determine if the incremental actions would produce significant cumulative impacts. None of the incremental actions were identified as having the potential to produce significant cumulative effects. Consideration of mitigation will occur during the Tier 2 NEPA studies and during the Clean Water Act Section 404/401 permitting process.
- **Streams.** Hydrographic data was used to identify the locations of potential waterways. Stream channels were avoided to the extent practicable in balance with avoidance of other resources. Where avoidance wasn’t practicable, alignments were oriented to impact the channel as close to a perpendicular angle as possible and relocations were minimized. Indirect impacts were minimized by limiting access point in or near stream channels. “Other Projects” were evaluated to determine if the incremental actions would produce significant cumulative impacts. None of the incremental actions were identified as having the potential to produce significant cumulative effects. Mitigation plans will be developed during the Tier 2 NEPA studies where a detailed compensatory mitigation plan for impacted streams will be completed as part of the Clean Water Act Section 404/401 permitting process.
- **Karst.** Lithology and resource agency data were used to identify areas of potential karst and known karst features. Karst features were avoided to the extent practicable in balance with avoidance of other resources. Indirect impacts were minimized by limiting access point in or near karst features. “Other Projects” were evaluated to determine if the incremental actions would produce significant cumulative impacts. None of the incremental actions were identified as having the potential to produce significant cumulative effects. Alternative P, the Preferred Alternative, does not occur within areas of karst. No mitigation for karst is anticipated; however, further detailed studies will occur during Tier 2.



Step 11 - Document the Cumulative Effects

This analysis has determined that there will be no significant indirect or cumulative impacts to key resources. Accordingly, no monitoring system is anticipated for these resources. It should be noted that some mitigation commitments detailed in **Chapter 6 – Mitigation and Commitments** will provide for ongoing monitoring of resources associated with commitments.

Environmental Consequences Summary (Steps 8 to 11)

Determining the environmental, social, and economic consequences of cumulative effects will involve:

- Identifying important cause-and-effect relationships between human activities and resources of concern
- Determining the cumulative effects of the Mid-States project
- Modifying or adding alternatives to avoid and minimize cumulative impacts
- Documenting the cumulative effects of alternatives