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5.19 Water Resources

The following substantive changes have been made to this section after the Draft Environmental Impact Statement (DEIS) was published:

- Refined Preferred Alternative (RPA) impacts have been added to all impact calculations.
- A full delineation of wetlands impacted by the RPA has been completed, and wetland acreages have been revised.
- Stream flow regime designations have been updated to maintain consistency throughout each stream reach.
- Descriptions of floodplain impacts have been revised to include impacts of the RPA.
- Wetland mitigation requirements have been updated to reflect impacts to delineated wetland acreage.
- Mitigation commitments have been revised based on agency comments on the DEIS.

The analysis of water resource impacts includes an assessment of the existing condition of water bodies affected by this project and an assessment of the project's potential impact on those resources. This analysis considers both surface water resources and groundwater resources. The field survey study area for I-69 Section 6 (see **Section 4.1**) is used throughout this section unless otherwise noted.

I-69 Section 6 entails upgrading an existing multi-lane, divided transportation facility to a full freeway design. Much of the right of way for the I-69 Section 6 project is already devoted to transportation use. Accordingly, the impacts to most natural resources in I-69 Section 6 will be less (on a per-mile basis) in comparison with I-69 Sections 1 through 4 that were constructed on new terrain. The analysis in this chapter distinguishes resource impacts which occur within right of way of existing transportation facilities from those which occur elsewhere.

Many of the streams discussed in this chapter have been previously modified and impacted (i.e., captured and redirected by ditches, concrete channels, pipes, culverts, and/or bridges). Alterations to stream segments through existing SR 37 structures for I-69 Section 6 are considered minor impacts since these waterways were modified during the original construction of SR 37. Many of the remaining impacts would be from extensions to existing structures through lengthening of culverts, widening of bridges, and rerouting of roadside ditches.

5.19.1 Surface Water Types

Surface waters are reviewed in three categories: wetlands, rivers and streams, and floodplains. Each of these resources is discussed below.

5.19.1.1 Wetlands

Wetlands cover about 813,000 acres or 3.5 percent of Indiana. Wetlands are an important natural resource as they support rich and diverse biological communities across the state. Due to their functions and values, there are several federal and state laws that regulate activities that affect wetlands. The major laws protecting wetlands include the Clean Water Act (CWA), the Rivers and Harbors Act, and the Indiana Flood Control Act. There are many definitions for a wetland; however, all definitions have three common criteria that define whether an area is a wetland. These criteria are:

- Wetland vegetation—plants that are adapted to grow in a wet environment;
- Hydric soils—soils that are characterized by low oxygen conditions; and
- Hydrology—an area that is inundated or saturated for at least 5 percent of the growing season in most years.

Wetlands benefit Indiana ecologically and socially. Wetlands support the health of the environment by providing habitat and breeding refuge, water purification, groundwater recharge, peak storm flow reduction, and hydrologic support for surrounding communities. Residents of Indiana benefit from wetlands through recreational activities such as hunting, fishing, and swimming. Other benefits include agricultural and forestry products as well as commercial fisheries.

5.19.1.2 Rivers and Streams

The I-69 Tier 1 FEIS listed the names of all streams and rivers identified on the United States Geological Survey (USGS) quadrangle maps impacted by the Tier 1 preferred alternative. The Tier 2 streams and rivers evaluation includes a more detailed analysis of the streams and rivers impacted by the I-69 Section 6 alternatives. This analysis identifies all streams and rivers that may be impacted, including small streams that are not on the USGS quadrangle maps. The analysis includes the flow regime of the rivers and streams (perennial, intermittent, or ephemeral), the ordinary high water mark (OHWM), the amount of riparian corridor, a quality assessment, and a photographic record at the point of impact. This information provides a more complete description of impacted rivers and streams than the Tier 1 FEIS. This FEIS also identifies measures to minimize impacts to rivers and streams.

5.19.1.3 Floodplains

Floodplains are a vital part of a river or stream ecosystem. Floodplains can support particularly rich ecosystems and the seasonal nature of the floodplain can support greater biodiversity than the river itself. Floodplains are important to the flora and fauna of the riparian area, and they act as flood buffers and natural water filtration systems. Floodplains are also important for maintenance of water quality, as they provide access for fresh water to reach wetlands and backwaters, dilute salts and nutrients, and improve the overall health of the habitat used by many

species of birds, fish, and plants. They are vital biologically, because they represent areas where many species reproduce and are important for breeding and regeneration cycles.

The Tier 1 FEIS evaluated the potential impacts to floodplains using Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) maps and estimating the total area of floodplain impacts. The Tier 2 FEIS for I-69 Section 6 refines potential floodplain impacts from the Tier 1 preferred alternative by estimating the total amount of impacts for each of the Tier 2 alternatives. This FEIS quantifies and describes the floodplains being crossed and describes efforts being made to reduce floodplain impacts for I-69 Section 6.

Floodplains are described in terms of their location established by the FIRM. These are official maps of a community on which FEMA has delineated floodplains in terms of risk premium zones applicable within the fixed mapping area. Risk premium zones describe flood risk from low, to moderate, to high risk of flooding. Zones of particular interest are the 100-year floodplain (Zone A*X*) which is said to have a one percent chance annually of flooding. FIRM maps are designated with a 9-digit alphanumeric code per map panel (FIRMette) and are searchable on the FEMA flood map service center.[1]

5.19.2 Surface Water Resource Methodology

Several sources of information were used to evaluate potential impacts of I-69 Section 6 to existing surface water resources, as described below.

- A geographic information system (GIS) stream layer derived from the National Hydrography Dataset was used to identify the main streams impacted by the alternatives.
- The USGS StreamStats Program (Version 4.0) was used as the basis for determining the watershed of several of the major streams impacted by the alternatives.
- The Natural Resources Conservation Service (NRCS) Web Soil Survey was used to identify small headwater streams within the project corridor in accordance with Headwater Habitat Evaluation Index (HHEI) protocol. The Ohio Environmental Protection Agency (OEPA) Field Evaluation Manual for Ohio Primary Headwater Habitat Streams (OEPA, 2009) was used as guidance for conducting the HHEI assessments. The Indiana Department of Environmental Management (IDEM) Qualitative Habitat Evaluation Index (QHEI) - Standard Operating Procedure (IDEM, 2006) provided guidance for the QHEI analysis.
- Field observations provided information on small drainage ways and streams as well as the width, depth, and substrate of the streams.
- The 2016 Draft IDEM 303(d) Impaired Streams list was reviewed to identify impaired streams impacted by the alternatives.

[1] *https://msc.fema.gov/portal*

- General water quality information about the watershed basins was taken from publications by Indiana Department of Natural Resources (IDNR), USGS, and the Indiana Geological Survey (IGS).
- Marion, Johnson, and Morgan county officials were contacted to identify legal drains in the area.
- Interagency water resource meetings were held December 14, 2004, February 23, 2005, February 9, 2007, and April 29, 2015, to establish procedures for coordinating with resource agencies regarding water related issues and to identify guidelines for evaluating and mitigating impacts to water resources. Agencies with representatives at the meetings, in addition to FHWA and INDOT, included the United States Environmental Protection Agency (USEPA) Region 5, United States Army Corps of Engineers (USACE), IDEM, and IDNR. The minutes of the meetings are included in **Appendix C**.

Methods employed in the analysis and evaluation of wetlands, streams, floodplains, and surface water are identified in this section. The **Water Resources Map Series** provided at the end of this section shows water resource impacts of each alternative.

5.19.2.1 Wetland Assessment

Several information sources were consulted to identify potential wetlands and hydric soils in the I-69 Section 6 field survey study area. The primary source is the United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI). Hydric soils within the field survey study area were identified using the NRCS Soil Survey Geographic database for Indiana. Potential wetland areas were identified to be in areas in or near hydric soils and NWI wetlands.

The determination of wetlands and other "waters of the US" within the I-69 Section 6 field survey study area is based on the methodology described in the regional supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0, Environmental Laboratory, 2010). Prior to the fieldwork, background information was reviewed to establish the likelihood and approximate location of wetlands. Next, a general reconnaissance of the project area was conducted to determine site conditions.

The I-69 Section 6 field survey study area was walked with the intent of determining wetland boundaries. Areas exhibiting wetland characteristics such as hydrophytic vegetation, hydric soils, or signs of hydrology were examined to determine if the characteristics met those outlined in the USACE Wetland Delineation Manual. The approximate boundary between the wetland and surrounding upland areas was identified and defined using a global positioning system (GPS). General characteristics of the site were recorded using Indiana Wetland Rapid Assessment Protocol (InWRAP) methodology. A full delineation of wetland resources was completed in 2017, after the DEIS was published.

The I-69 Section 6 field survey of surface water resources was initiated in 2005 and 2006. In 2015, 2016, and 2017, field investigations were completed to re-examine previously identified

water resources and identify additional water resources within the field survey study area. A complete wetland assessment report was prepared as a separate report, titled, *Wetland Technical Report, I-69 Section 6: Martinsville to Indianapolis* (HNTB, 2016), located in **Appendix E**. In addition to descriptions of each wetland within the right of way of the alternatives, the report includes photographs of identified wetlands and associated InWRAP assessment profile sheets.

InWRAP

The InWRAP methodology was developed by Taylor University Environmental Research Group in response to a need by state and federal agencies to quickly and accurately depict the quality of a wetland. This methodology was identified in a February 22, 2005, interagency water resource meeting for assessing the quality of wetlands impacted by I-69 Tier 2 alternatives. Agency attendees and meeting minutes can be found in **Appendix C**.

The InWRAP methodology documents wetland characteristics using the following three-tiered approach:

- An assessment overview records information on the size of the wetland complex and its associated wetland polygons, general classification, surrounding land use, setting, and connection relative to other wetlands on the landscape. The investigation date, field personnel, and other identification data are documented.
- Eleven preliminary assessment features are recorded for each individual wetland polygon including presence of standing water, soil type, hydrologic disturbances, presence of exotic species, and the presence of "red flag" indicators such as threatened and endangered species.
- A detailed account of the hydrology (water quality and flood/stormwater storage) and vegetative structure of the individual wetland polygons within the complex is recorded.

The quality of wetlands is related to the wetland community type. InWRAP uses 13 different community types to differentiate between common and ecologically rare wetlands. Indiana wetland community types are:

- Floodplain Forest
- Shallow Marsh
- Swamp Forest
- Sedge Meadow
- Bog
- Wet Prairie
- Fen
- Wet Meadow
- Shrub-scrub
- Sand/Muck Flat
- Seeps
- Seasonally Flooded Basin
- Deep Marsh/Shallow Open Water

The InWRAP Indiana wetland community type descriptions, site descriptions and quality scores, and data sheets are provided in the *Wetland Technical Report* provided in **Appendix E**.

5.19.2.2 Stream Assessment

Qualitative Habitat Evaluation Index (QHEI)

Streams with drainage areas larger than one square mile or with natural maximum pool depths greater than 40 centimeters (15.75 inches) were evaluated using the IDEM QHEI protocol (IDEM, 2006). While the OEPA originally developed the QHEI to evaluate fish habitat in streams, the IDEM Biological Studies Section and other agencies routinely use the QHEI as a measure of general habitat health. QHEI was selected as the methodology for this study because it was currently being used by IDEM to assess habitat quality. In a letter dated February 16, 2005 (see **Appendix C**), IDEM requested that stream habitat assessments be completed using OEPA QHEI and HHEI (discussed below).

Various attributes of habitat within the survey reach were scored based on the overall importance of each to the maintenance of viable, diverse, and functional aquatic faunas. The type(s) and quality of substrate; amount and quality of in-stream cover; channel morphology; extent and quality of riparian vegetation; pool, riffle, and run development and quality; and gradient are the metrics used to determine the QHEI score. Each metric was scored individually and then summed to provide the total QHEI score. This score typically ranges from 20 to 100.

The QHEI is used to evaluate the characteristics of a stream segment or reach, as opposed to the characteristics of a single sampling site. An individual sampling site may have poor physical habitat due to a localized disturbance yet still support aquatic communities closely resembling an adjacent site with better habitat and similar water quality conditions. QHEI scores above 64 suggest that the habitat is capable of supporting a balanced warm water community; scores between 51 and 64 suggest the stream is partially supportive of an aquatic life use designation; and scores less than 51 suggest the stream is non-supporting for aquatic life use (IDEM, 2006).[2]

QHEI metrics and their corresponding component are outlined below.

Substrate

- Type - Measures the size and characteristics of channel bottom material to include bedrock, boulders, cobble, gravel, sand, silt, detritus, and muck.
- Quality - Includes two components:
  - Origin - identifies the parent material of the substrate, and:
  - Embeddedness - measures the degree that cobble, gravel, and boulder substrates are surrounded, impacted in, or covered by fine materials such as sand and silt.

[2] *A supporting/non-supporting designation indicates that a stream may or may not provide suitable habitat to sustain the flora (plants) and fauna (animals) typically found in this region of Indiana.*

Instream Cover

- Type - Measures the presence of instream cover to include structures such as root wads, shallows, oxbows, boulders, overhanging vegetation, pools, undercut banks, and aquatic macrophytes.
- Amount - Categorizes the amount and quality of cover (none, sparse, moderate, or extensive).

Channel Morphology

- Sinuosity - Measures the degree to which the stream meanders (i.e., bends).
- Development - Measures the development of riffle/pool complexes by scoring the pool, glide, riffle, and run characteristics of the stream segment.
- Channelization - Identifies man-made channel modifications and classifies them as natural, recovered, recovering, and recent or no recovery.
- Stability - Classifies channels as low, moderate, and high stability. A low stability channel has unstable and eroding banks and a changing bedload. A high stability channel has stable banks, bedload, and little erosion. A concrete stream channel would receive a high score.

Riparian Zone and Bank Erosion

- Riparian Width - Measures the width of the riparian (stream side) vegetation.
- Floodplain Quality - Identifies land use(s) within floodplain that can minimize direct runoff and erosional effects or those that might deliver harmful runoff to the stream. Floodplain refers to areas that are immediately outside of the riparian zone or greater than 100 feet from the stream, whichever is wider.
- Bank Erosion - Measures the degree of stability of the stream banks. Instability may be caused by natural water flows or animals (e.g., livestock). The erosion is classified as none/little, moderate, or heavy/severe.

Pool/Glide and Riffle/Run Quality

- Maximum Depth of Pool/Glide
- Morphology - Measures shape of pools when compared with riffles, or the relative widths of pools and riffles.
- Current Type - Measures current type present in the stream to include pools and riffles. Examples include torrential, fast, moderate, slow, and intermittent.
- Riffle/Run Quality - Describes the depth of best riffle and best run, the substrate stability and embeddedness.

Map Gradient

- USGS 7.5-minute topographic map is used to measure the elevation drop through the sampling area.

Headwater Habitat Evaluation Index (HHEI)

Primary headwater streams[3] were assessed using the OEPA's HHEI. As discussed above, QHEI was selected as the methodology used in this study because it was currently being used by IDEM to assess habitat quality. The use of HHEI is a logical step for smaller streams since it was developed by OEPA for smaller headwater streams. In a letter dated February 16, 2005 (see **Appendix C**), IDEM requested that stream habitat assessments be completed using OEPA QHEI and HHEI. The use of the Ohio HHEI was reviewed by the Interagency Water Resource Team, which included USEPA, for use on the I-69 project to assess all stream channels that did not meet the criteria for the QHEI. See **Appendix C** for the February 23, 2005 meeting summary.

The HHEI was used to determine the stream quality of the smaller headwater streams. Each stream with a drainage area less than one square mile and pool depth of less than 40 cm identified within the field survey study area was inspected for its ability to provide primary headwaters habitat. Habitat stations represent the entirety of the habitat available along a representative 200-foot reach of stream (or the entire distance of that specific stream segment if less than 200 feet). Each time the habitat changed along the length of the tributary within the right of way, another assessment was completed. Habitat changes were considered to be segment changes and thus, each segment and unique tributary was assessed individually.

The HHEI method of stream habitat assessment classifies streams as Class I, II, or III, and also categorizes them according to whether their channels have been modified (Modified Class I or II). For perennial or intermittent natural channels, HHEI scores of Class III streams are 70 or greater out of a maximum of 100 points. These scores indicate a potential to support a unique assemblage of headwater species. One of the criteria for a Class III stream is that its channel be in its "natural" state. No modified primary headwater streams may be classified as Class III streams.

Class II streams have scores that range between 50 and 69. Modified Class II streams typically score less than 70. Class I streams, with scores less than 30, represent reaches that are normally dry (ephemeral) and do not support a diversity of aquatic life. Scores less than 30 for Modified Class I streams range have the lowest potential to support a diverse array of aquatic fauna typically found in stream environments.

[3] *As described in detail in the Field Evaluation Manual for Ohio Primary Headwater Habitat Streams (OEPA, January 2012), a primary headwater habitat stream is "a surface water of the state, having a defined bed and bank, with either continuous or periodical flowing water, with watershed area less than or equal to 1.0 square mile (259 hectares), and a maximum depth of water pools equal to or less than 40 cm." Primary headwater habitat streams are defined based on substrate type, quality, maximum pool depth, and bank full width, i.e., the total width of the stream at the boundary line of terrestrial vegetation.*

The scores were developed specifically for the I-69 Section 6 project to aid in the interpretation of information obtained in the HHEI assessments. The general theory is that the higher the HHEI score, the higher the probability that the stream supports a more diverse aquatic fauna community. In addition, a stream expected to support a more diverse aquatic community is a higher quality stream compared to one that would not be expected to support a diverse aquatic community.

This stream quality interpretation was developed based on input from the Tier 2 I-69 Water Resources Technical Committee composed of representatives of FHWA, INDOT, USEPA Region 5, USACE, USFWS, IDEM, and IDNR. This committee discussed water resource concerns related to all I-69 Sections at the onset of Tier 2.

The QHEI/HHEI evaluations and supporting data are presented in a separate report, which includes a brief description of each stream segment surveyed. The report and associated maps are provided in the *Stream Assessment Report* in **Appendix L**. Tributary and segment data sheets for each unique stream or unique habitat (i.e., segment) are included in this report.

In addition to the above, each stream was classified as ephemeral, intermittent, or perennial. The classification was based upon USGS map designations. These designations are described below.

Ephemeral Streams: An ephemeral stream flows only during precipitation or for short periods following precipitation. Ephemeral streams flow for less than 30 percent of the time in low areas that may or may not have a well-defined channel. Some commonly used names for ephemeral streams include stormwater channel, drain, swale, gully, hollow, or saddle.

Since ephemeral streams are often headwater streams, it is typically recommended that roads, site preparation, and other soil disturbing activities be minimized in ephemeral stream areas to avoid erosion and sedimentation that will flow downstream into larger streams or water bodies. All streams identified in the field that were not represented on the USGS maps were classified as ephemeral streams for this study.

Intermittent Streams: An intermittent stream flows only during wet periods of the year or 30 to 90 percent of the time, in a continuous well-defined channel. During dry periods, especially in summer months, intermittent streams may go down to a “trickle of water” and appear dry when, in fact, there is water flowing through the stream bottom or “substrate.”

Perennial Streams: Perennial streams flow throughout most of the year or greater than 90 percent of the time, in a well-defined channel. Perennial streams can “dry up,” particularly during extended periods of drought.

5.19.2.3 Floodplains Assessment

FEMA flood insurance rate maps for Marion, Johnson, and Morgan counties[4] were reviewed to identify floodplains within the right of way of the alternatives. The floodplain area within each alternative right of way footprint was calculated in order to quantify potential impacts.

5.19.2.4 Surface Water Quality Assessment

The main regional study used to evaluate water quality in the project corridor was IDNR, Division of Water "Ground-Water Resources in the White and West Fork White River Basin" (Beaty, 2002).

5.19.3 Surface Water Analysis

5.19.3.1 Wetlands Analysis

USFWS NWI mapping was used for initial identification of potential wetland impacts within the field survey study area. The wetland resources were then field identified. The difference between the aerial based NWI mapping and field survey results can be considerable. Wetlands in the NWI are identified using aerial photographs and topographic mapping and are rarely field verified. Wetlands are sometimes incorrectly identified, incorrectly classified, or not identified. In addition, the criteria used to identify NWI wetlands differ from those currently used by the USACE. **Table 5.19-1** compares NWI identified wetlands with those wetlands identified during field investigations.

Wetland types are based on the Cowardin classification system outlined in *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979). Classifications describe the habitat and taxa of wetlands and deepwater habitats using a series of systems and subsystems. Wetlands types commonly found in the field survey study area are palustrine wetlands. Other wetland types found within the field survey study area include lacustrine and riverine.

The palustrine classification includes non-tidal wetlands that are dominated by a variety of vegetation and tidal wetlands that have a low salinity. This includes swamp, marsh, bog, fen, and prairie wetlands (Cowardin et al., 1979). The lacustrine classification applies to bodies of water that are permanently flooded (lakes and reservoirs), intermittent lakes, and tidal lakes (Cowardin et al., 1979). The riverine classification is used for all wetlands and deepwater habitats that are contained in the channel regardless of whether water is flowing (Cowardin et. al., 1979).

[4] *FIRM ID Numbers 18097C0228F, 18097C0229F, 18097C0233F, 18097C240G, 18081C0105D, 181909C0170E, 18109C0165E, 18109C0280E, 18109C0259E, and 18109C0266E*

Table 5.19-1: Wetlands in I-69 Section 6 Field Survey Study Area

Wetland Type	Number of NWI Wetlands*	NWI Wetland Acreage*	Number of Field Identified Wetlands	Field Identified Acreage
Palustrine Emergent (PEM)	9	14.95	41	19.95
Palustrine Scrub-Shrub (PSS)	--	--	7	1.12
Palustrine Forested (PFO)	12	125.51	14	3.48
Palustrine Unconsolidated Bottom (PUB)	36	125.94	33	100.16
Lacustrine Limnetic Unconsolidated Bottom (L1UB)	3	189.47	2	66.60
Riverine Lower Perennial Unconsolidated shore (R2US)	3	3.05	--	-
Totals	**63**	**458.92**	**97**	**191.31**

** Information obtained from USFWS NWI mapping dated 10/20/2014*

Palustrine Emergent Wetlands (PEM)

Palustrine emergent wetlands are dominated by erect and rooted herbaceous species that are present for most of the growing season and maintain the same appearance year to year, barring extreme climatic conditions. Commonly known PEM wetland types include marsh, wet meadow, and fen (Cowardin et al., 1979). The NWI indicates approximately 14.95 acres of palustrine emergent wetlands within or intersected by the field survey study area. Field investigations identified 41 potential PEM wetlands totaling 19.95 acres. PEM wetlands are commonly found within roadside ditches and medians, fallow areas, and agricultural fields.

Palustrine Scrub-Shrub Wetlands (PSS)

Palustrine scrub-shrub wetlands are the mid-successional wetland community between emergent and forested wetlands, although in some instances the scrub-shrub community may represent the persistent mature community type. Vegetation is dominated by shrubs, young trees, and woody species that have been stunted due to adverse environmental settings (Cowardin et al., 1979). The NWI does not indicate any PSS wetland communities within or intersected by the field survey study area, but field investigations identified seven PSS wetlands totaling 1.12 acres. Within the field survey study area, PSS wetlands were found in areas with a presence of alluviums, such as cropland within floodplains, as well as on the borders of reservoirs and lakes.

Palustrine Forested Wetlands (PFO)

Palustrine forested wetlands are dominated by trees over six meters (19 feet) in height but generally also include additional shrub and herbaceous vegetation layers (Cowardin et al., 1979). The NWI identified approximately 125.51 acres of PFO wetlands within of intersected by the field survey study area. Field investigations identified 14 PFOs totaling 3.48 acres. PFOs are commonly found in floodplains, and they provide high quality animal habitat.

Palustrine Unconsolidated Bottom Wetlands (PUB)

Palustrine unconsolidated bottom wetlands lack a stable substrate to anchor vegetation. At least 25 percent of the substrate cover is smaller than stones and there is less than 30 percent vegetation cover (Cowardin et al., 1979). The NWI identified approximately 125.94 acres of PUB wetlands within or intersected by the field survey study area. Field investigations identified 33 PUB wetlands totaling 100.16 acres. These field identified wetlands are associated with stormwater detention ponds, ponds associated with fisheries and quarries, and recreational ponds on private properties.

Lacustrine Limnetic Unconsolidated Bottom (L1UB)

Lacustrine limnetic waters occur in the deep-water areas of open water bodies. They are areas with depths greater than 2.5 meters (8.2 feet) at low water (Cowardin et al., 1979). The NWI identified approximately 189.47 acres within or intersected by the field survey study area. Field investigations identified two L1UB waters totaling 66.60 acres. These waters are associated with mining activities near the proposed I-69 Section 6 interchange with I-465.

Riverine Lower Perennial Unconsolidated shore (R2US)

The riverine lower perennial subsystem is characterized by low gradient, sand or mud substrate, and some amount of perennial flow (except in times of extreme drought) (Cowardin et al., 1979). The NWI identified approximately 3.05 acres within the field survey study area, but none were identified in field investigations. The White River was identified as a stream rather than a wetland.

5.19.3.2 Wetland Assessments within the Field Survey Study Area

Wetland resources within the field survey study area are identified through a combination of field reconnaissance surveys and GIS mapping. This section characterizes the field verified wetlands according to the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979). The complete wetland assessment can be found in the *Wetland Technical Report* provided in **Appendix E**. A summary of the report findings, including an evaluation of the potential impacts to the wetlands assessed within the field survey study area, is presented below.

As noted in **Table 5.19-1**, NWI data indicated approximately 458.92 acres of wetlands in the I-69 Section 6 field survey study area, comprised of 57 palustrine wetland systems (PEM, PFO, and PUB), three lacustrine wetland systems (L1UB), and three riverine wetland systems (R2US). The field reconnaissance identified and assessed a total of 97 wetlands in the field survey study area, comprised of 41 PEM wetlands (19.95 acres), seven PSS wetlands (1.12 acre), 14 PFO wetlands (3.48 acres), and 33 PUB wetlands (100.16 acres). In addition, 66.60 acres of L1UB wetlands were identified in the field survey study area. The **Water Resources Map Series,** provided at the end of this section, shows water resource impacts of the alternatives.

5.19.3.3 Potential Impacts to Wetlands

Ninety-seven individual wetlands or open waters were identified within the field survey study area which includes the proposed right of way of Alternatives C1, C2, C3, C4, and the Refined Preferred Alternative (RPA), plus approximate 50 additional feet. Within the proposed right of way of Alternatives C1, C2, C3, C4, and the RPA, there are 58 wetland and 29 open waters polygon features. These 87 wetland and open water features are potentially impacted by one or more alternatives and are discussed further in this document.

Most of the wetlands and open waters within the right of way of the I-69 Section 6 alternatives are preliminarily identified as "waters of the US" and would fall under USACE and IDEM jurisdiction.[5] The identification of wetlands as "waters of the US" is based on definitions and guidance found in 33 CFR §328.3, USACE regulatory guidance letters, the 1987 USACE wetland delineation manual, the Midwest regional supplement, and field observations.

IDEM and USACE will conduct preliminary field reviews to evaluate the potential jurisdiction of identified water resources within the I-69 Section 6 field survey study area. The USACE will make the final determinations regarding the jurisdictional status of wetlands during permitting. USEPA will review the USACE final federal jurisdiction determination as part of its responsibility for the joint administration of Section 404 of the CWA. USEPA has the ability to overturn the USACE determination.

[5] *Waters of the US" are within the jurisdiction of USACE under the CWA. The term includes waters that are used or could be used for interstate commerce. This includes wetlands, ponds, lakes, territorial seas, rivers, and tributary streams including any definable intermittent waterways, and some ditches below the "ordinary high water mark" (OHWM). Also included are manmade water bodies such as quarries and ponds, which are no longer actively being mined or constructed and are connected to other "waters." A specific, detailed definition of "waters of the US" can be found in the Federal Register (33 §CFR 328.3). In Indiana, "waters of the US" are also subject to regulation by IDEM, which maintains jurisdiction over the state's water quality issues.*

"Waters of the state" are within the jurisdiction of IDEM. They are generally defined as surface and underground water bodies that extend through or exist wholly in the state. They include, but are not limited to streams and both isolated and non-isolated wetlands. Private ponds, or any pond, reservoir, or facility built for reduction of pollutants prior to discharge are not included in this definition. In addition to "waters of the US," IDEM regulates and issues permits for isolated wetlands.

After the DEIS was published, wetlands within the right of way of the alternatives were delineated to provide a more accurate measurement of impacts. The resulting estimates of impacts to wetlands and open waters by alternative are summarized in **Table 5.19-2.**

Table 5.19-2: Wetland Impacts by Wetland Type and Alternative

Wetland Type	Alt C1		Alt C2		Alt C3		Alt C4		RPA	
	Number	Acres	Number	Acres	Number	Acres	Number	Acres	Number	Acres
Palustrine Emergent (PEM)	22	2.38	26	7.39	27	6.45	22	1.79	25	1.90
Palustrine Scrub-Shrub (PSS)	5	0.42	5	0.37	7	0.45	6	0.46	4	0.39
Palustrine Forested (PFO)	11	2.17	13	2.00	9	1.87	12	1.82	12	1.70
Total Wetlands	**38**	**4.97**	**44**	**9.76**	**43**	**8.77**	**40**	**4.07**	**41**	**3.99**
Open Water (PUB/L1UB)	18	47.19	25	22.48	17	17.22	21	18.18	17	2.78
Total Wetlands and Open Water	**56**	**52.16**	**69**	**32.24**	**60**	**25.99**	**61**	**22.25**	**58**	**6.77**

Note: Wetland calculations for the alternatives have been updated based on more precise data available from wetland delineations performed after the DEIS was published.

No single alternative impacts all 58 wetland or 29 open water polygon features. The total number of wetlands and open water features potentially impacted by Alternatives C1 through C4 and the RPA is 56, 69, 60, 61, and 58, respectively.

Table 5.19-3 through **Table 5.19-6** summarize wetlands and open waters in the right of way of the alternatives based on Cowardin classification (emergent, scrub-shrub, forested, and open waters). Open water features classified as ponds and lakes were evaluated to see if proposed activities would result in the need to drain or fill the entire pond or lake feature. Impacts discussed in this section reflect the entire pond area anticipated to be impacted, not exclusively the portion in the right of way. Since full identification of potential impacts is difficult at this stage of the NEPA process, this methodology was selected because it reflects the worst-case scenario.

A total of 87 wetland and open water polygon features would be impacted by at least one alternative. A total of 25 wetlands and eight open waters would potentially be impacted by all five alternatives. Ten wetlands and open waters identified within the field survey study area would not be impacted by any alternative. A complete description of each wetland and the potential impacts of the alternatives can be found in the *Wetland Technical Report* provided in **Appendix E**.

Anticipated indirect impacts for wetlands could include properties with wetlands purchased by a developer to build a facility such as a gas station or convenience store at an interchange. However, the federal "no net loss of wetlands" policy in the CWA permitting requirements nearly eliminates the possibility of future cumulative wetland acreage losses.[6] Therefore, no long-term indirect or direct loss of wetlands is anticipated due to I-69 Section 6.

Table 5.19-3: Emergent Wetlands within the Right of Way of Alternatives C1 through C4 and the RPA

Wetland ID	Impact Acreage				
	Alt C1	Alt C2	Alt C3	Alt C4	RPA
S6W001A	-	-	-	-	0.01
S6W002B	0.03	0.03	-	-	-
S6W003A	0.07	0.07	-	0.01	0.01
S6W004A	0.34	0.34	0.03	0.08	0.08
S6W005A	0.06	0.06	0.02	0.06	0.06
S6W009A	0.03	0.03	-	-	0.02
S6W020A	-	<0.01	-	-	-
S6W026A	-	-	-	-	0.01
S6W028A	-	-	-	-	<0.01
S6W034A	-	-	0.15	-	-
S6W037A	0.06	0.05	0.01	0.05	0.05
S6W039A	0.45		0.45	-	-
S6W040A	0.04	0.04	0.04	0.04	0.04
S6W041A	0.14	0.14	0.14	0.14	0.14
S6W046A	0.10	0.10	0.10	0.10	0.10
S6W047A	0.03	0.03	0.03	0.03	0.03
S6W048A	0.11	0.11	0.11	0.11	0.11
S6W048D	0.13	0.13	0.13	0.13	0.13
S6W057A	-	-	0.08	-	-
S6W057B	-	-	0.08	-	-
S6W057C	-	-	0.67	-	-
S6W057D	-	-	0.23	-	-
S6W058B	0.03	0.12	0.09	0.06	0.16

[6] *In 1993, the executive branch adopted the "no net loss" of wetlands strategy as a basic principle for Section 404 permitting. (Source: White House Office on Environmental Policy, "Protecting America's Wetlands: A Fair, Flexible and Effective Approach," August 24, 1993, http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/materials/wetland_policy1993.pdf.)*

Wetland ID	Impact Acreage				
	Alt C1	Alt C2	Alt C3	Alt C4	RPA
S6W059A	-	5.14	3.17	-	-
S6W063A	0.05	0.05	0.05	0.05	0.05
S6W066A	0.41	0.41	0.41	0.41	0.41
S6W070A	0.09	0.09	0.04	0.09	0.09
S6W071A	0.11	0.11	0.11	0.11	0.11
S6W082A	0.02	0.02	0.02	0.02	0.02
S6W085A	<0.01	<0.01	<0.01	<0.01	-
S6W089A	-	-	-	-	<0.01
S6W089C	-	0.02	-	0.02	-
S6W094A	-	0.04	0.04	-	-
S6W103A	0.04	0.04	0.04	0.04	0.04
S6W116A	0.04	0.04	0.04	0.04	0.04
S6W126A	-	-	-	0.01	0.01
S6W128A	-	0.18	0.18	0.18	0.18
Total	**2.38 Acres**	**7.39 Acres**	**6.45 Acres**	**1.79 Acres**	**1.90 Acres**

Table 5.19-4: Scrub-Shrub Wetlands within the Right of Way of Alternatives C1 through C4 and the RPA

Wetland Name	Impact Acreage				
	Alt C1	Alt C2	Alt C3	Alt C4	RPA
S6W021A	0.09	-	0.09	0.09	0.10
S6W025A	0.06	0.06	0.06	0.06	-
S6W035A	-	-	0.02	-	-
S6W077A	0.03	0.03	<0.01	0.03	0.03
S6W080A	0.02	0.02	0.02	0.02	-
S6W113A	0.22	0.05	0.05	0.05	0.05
S6W127A	-	0.21	0.21	0.21	0.21
Total	**0.42 Acres**	**0.37 Acres**	**0.45 Acres**	**0.46 Acres**	**0.39 Acres**

Table 5.19-5: Forested Wetlands within the Right of Way of Alternatives C1 through C4 and the RPA

Wetland Name	Impact Acreage				
	Alt C1	Alt C2	Alt C3	Alt C4	RPA
S6W002A	0.17	0.17	-	0.09	0.09
S6W007A	0.06	0.06	0.17	0.17	0.17
S6W048B	0.75	0.75	0.75	0.75	0.75
S6W053A	0.04	0.04	<0.01	0.04	0.02
S6W054A	0.28	0.26	0.12	0.26	0.19
S6W055A	0.07	0.07	-	0.07	0.08
S6W056A	0.13	0.13	-	0.13	0.11
S6W059B	-	0.21	0.34	-	0.01
S6W062A	0.03	0.03	0.03	0.03	-
S6W064A	-	<0.01	-	<0.01	<0.01
S6W065A	-	0.01	-	0.01	0.01
S6W067A	0.05	0.05	0.04	0.05	0.05
S6W068A	0.27	0.22	0.09	0.22	0.22
S6W069A	0.33	-	0.33	-	-
Total	**2.17 Acres**	**2.00 Acres**	**1.87 Acres**	**1.82 Acres**	**1.70 Acres**

Table 5.19-6: Open Waters within the Right of Way of Alternatives C1 through C4 and the RPA

Wetland Name	Impact Acreage				
	Alt C1	Alt C2	Alt C3	Alt C4	RPA
S6W008B	0.01	0.01	-	-	-
S6W025B	0.38	0.38	0.38	0.38	-
S6W027A	-	0.15	0.09	0.15	0.09
S6W048C	0.06	0.06	0.06	0.06	0.06
S6W050A	0.11	0.10	-	0.10	0.21
S6W051A	0.06	0.08	-	0.08	0.12
S6W052A	0.08	0.09	-	0.09	0.10
S6W058A	-	<0.01	0.05	0.01	0.10
S6W083A	-	-	-	-	<0.01
S6W087A	<0.01	-	-	-	-
S6W088A	-	0.02	-	0.02	0.02

Wetland Name	Impact Acreage				
	Alt C1	Alt C2	Alt C3	Alt C4	RPA
S6W089C	0.22	0.01	0.01	0.22	0.58
S6W090A	-	0.04	0.03	-	<0.01
S6W095A	-	0.05	-	-	-
S6W097A	0.37	0.34	0.48	0.83	0.89
S6W099A	-	3.12	-	-	-
S6W100A	2.78	-	-	-	-
S6W101A	-	1.82	-	<0.01	<0.01
S6W104A	-	1.13	1.13	1.13	-
S6W105A	37.91	8.68	8.68	8.68	0.16
S6W108A	-	0.67	0.67	0.67	-
S6W109A	0.20	1.64	1.64	1.64	-
S6W110A	4.22	3.51	3.51	3.51	-
S6W111A	0.27	0.10	0.10	0.10	0.10
S6W117A	0.10	0.10	-	0.12	-
S6W118A	0.10	0.10	0.10	0.10	0.10
S6W119A	0.08	0.03	0.03	0.03	<0.01
S6W120A	0.26	0.26	0.26	0.26	0.26
S6W123A	-	-	0.03	-	-
Total	**47.19 Acres**	**22.48 Acres**	**17.22 Acres**	**18.18 Acres**	**2.78 Acres**

5.19.3.4 InWRAP Evaluation

The *Wetland Technical Report* provided in **Appendix E** contains detailed InWRAP data on the 53 wetland complexes (67 individual polygons) potentially impacted by the alternatives including a description of each wetland and a rating for quality of animal habitat, botanical measures, and hydrology. No quality assessments were completed on the wetland complexes consisting entirely of open water ponds based on the InWRAP Indiana community type.

InWRAP evaluation of each of the 67 wetland polygons potentially impacted by the project yielded quality ratings for animal habitat, botanical measures, and hydrology. Each individual wetland unit was assigned a rating of poor, fair, or good. The majority of the wetlands scored as poor for both animal habitat and botanical measures. The hydrology measure score was generally fair. **Table 5.19-7** provides a summary of the ratings for the 53 wetland complexes (67 wetland polygons) evaluated using InWRAP.

Table 5.19-7: InWRAP Evaluation Ratings

InWRAP Evaluation Criteria	Poor	Fair	Good
Animal Habitat	33	30	4
Botanical	58	9	0
Hydrology	9	48	10

Although InWRAP quality scores were not assigned to complexes comprised solely of open water (PUB or L1UB Cowardin classification), quality scores were determined if a complex consisted of a non-open water wetland and an open water feature. In these cases, quality scores were given to both.

5.19.3.5 Farmed Wetlands

According to the U.S. Department of Agriculture (USDA) *National Food Security Act Manual*, (3rd Edition, September 2000), farmed wetlands are "wetlands that were drained, dredged, filled, leveled, or otherwise manipulated before December 23, 1985, for the purpose of, or to have the effect of, making the production of an agricultural commodity possible, and continue to meet specific wetland hydrology criteria."

All of these criteria must be met before an area can be considered "farmed wetland." If an existing agricultural wetland is not cultivated (left fallow) for five years or more, it becomes regulated as a wetland and farming cannot be reinitiated without the proper permits.

Farmed wetland is a term used by the USDA and not used by USACE, the federal agency that regulates impacts to wetlands. USEPA requested the analysis of farmed wetlands at the onset of I-69 Tier 2 studies. Technically, only the USDA can complete a farmed wetland determination at the request of the property owner. In a meeting on April 29, 2016, IDEM and USACE indicated that the term "farmed wetland" would not be used in I-69 Section 6. "Farmed wetlands" would be considered an atypical situation according to the USACE wetlands delineation manual. Atypical situation wetlands in agricultural fields were encountered during the I-69 Section 6 investigation and were considered emergent wetlands if they met all three wetland criteria.

5.19.3.6 Open Water

USGS topographic maps (1:24,000 series) of the I-69 Section 6 field survey study area were reviewed and no named lakes were identified. However, a review of the GIS data and 2015 aerial photography, combined with field observations, identified 35 open water bodies in the field survey study area. All the areas were artificially created for aesthetic purposes, recreational use, agricultural use, wildlife habitat, mining operations, or stormwater treatment. The water bodies are shown in the Water Resources Map Series provided at the end of this section as palustrine unconsolidated bottom wetlands (PUB) or lacustrine limnetic unconsolidated bottom (L1UB). The impacts to these water bodies are included in **Table 5.19-2**.

Of the 35 open water bodies found within the field survey study area, Alternative C1 would impact 18, Alternative C2 would impact 25, Alternative C3 would impact 17, Alternative C4 would impact 21, and the RPA would impact 17. Descriptions and explanations of their jurisdictional status assessment are found in the *Wetland Technical Report* provided in **Appendix E**.

5.19.3.7 Rivers and Streams

The only river identified in the I-69 Section 6 field survey study area is the White River. This river flows beneath I-465 at the northern extent of the alternatives, and flows parallel to existing SR 37 in Morgan and Johnson counties. It is closest to SR 37 at its confluence with Stotts Creek near Cragen Road.

A total of 275 stream segments, including existing culverts, were identified in the I-69 Section 6 field survey study area. QHEI or HHEI assessments were completed for potentially impacted segments, as appropriate. Concrete gutters and roadside ditches were assessed, but no assessments were completed for the bridged or culverted segments. Continuing coordination with the regulatory agencies will occur to identify any mitigation requirements for these previously impacted resources (i.e., culverts, concrete gutters, or roadside ditches).

A single stream impact may have more than one stream assessment segment if the habitat along the length of the stream changes. A separate assessment was made for each reach of distinct habitat. Only one assessment segment was completed where the habitat did not differ along the entire impact length of the stream. If two or more alternatives cross a stream in the same location and the habitat was consistent throughout the stream reach, then only one assessment was made.

Based on the QHEI/HHEI scores in the *Stream Assessment Report* in **Appendix L,** approximately eight percent of streams within the field survey study area have at least moderate water quality. The White River is the only one of the 49 stream segments assessed using QHEI with an excellent score. Two of the 132 (one percent) stream segments evaluated using HHEI have scores in the highest quality category (Class III).

The **Water Resources Map Series** provided at the end of this section shows the streams by type (perennial, intermittent, and ephemeral), location, and relationship to the alternatives in I-69 Section 6. Of the 275 stream segments, 83 were identified as perennial, 78 as intermittent, and 114 as ephemeral. Of the total segments, 77 are in existing culverts or pipes and 17 are bridged. Stream assessments were completed for artificial channels, such as roadway ditches, dump rock gutters (riprap lined channels), and concrete channels. QHEI and HHEI assessments were not completed for stream segments in existing pipes and/or culverts. As a result, only 181 stream segments were assessed using QHEI or HHEI assessment methods.

5.19.3.8 Perennial Streams

Most of the perennial streams in I-69 Section 6 met the criteria for evaluation using QHEI protocol. QHEI methodology was used when the streams had a mapped drainage area greater than one square mile. QHEI and HHEI scores for perennial streams are listed in **Table 5.19-11**. The following perennial streams and unnamed tributaries (UNTs) in the I-69 Section 6 field survey study area were identified as being potentially impacted by the alternatives:

- Indian Creek
- Sartor Ditch
- West Fork Clear Creek and UNTs
- Clear Creek
- White River and UNTs
- Stotts Creek
- Little Buck Creek
- Crooked Creek
- Bluff Creek and UNTs
- Travis Creek
- North Bluff Creek
- Honey Creek
- Pleasant Run Creek
- State Ditch
- Lick Creek

QHEI scores ranged from 18 for a segment of Sartor Ditch in Martinsville representing a stream that may be non-supporting of aquatic life to 64.5, for the White River near I-465 representing a stream that is capable of supporting a balanced warm water community. Scores for eight streams evaluated using HHEI ranged from 42 to 67, including four Class II, one Class III and three potential rheocrene habitats. Rheocrene springs have groundwater emerging at the surface into a defined channel. These features are important for providing stable conditions for stream fauna for microevolution within these discrete habitats. For the purposes of the HHEI evaluation, the designation of rheocrene potential is made if the stream has constantly flowing water, a well-defined bed and bank, and has a watershed size of less than 0.1 square mile.

Overall impacts to perennial streams (approximate linear feet in right of way), including bridged portions, for the alternatives are 14,766 linear feet for Alternative C1, 16,429 linear feet for Alternative C2, 16,024 linear feet for Alternative C3, 15,160 linear feet for Alternative C4, and 16,944 linear feet for the RPA.

Total stream impacts for the RPA are higher than the other alternatives due, in part, to increased local roadway lengths for Artesian Avenue, Huggin Hollow, and Jay Dee Lane. The increase is also due to refinements in drainage design in the RPA. Drainage channels become deeper and wider as they approach streams, which increases the project footprint and increases stream impact. The effect of refined drainage design on stream impacts would occur with any of the alternatives. Total stream impacts are shown in **Table 5.19-8**.

Table 5.19-8: Stream and Riparian Corridor Impacts

Type	Alt C1	Alt C2	Alt C3	Alt C4	RPA
Ephemeral (Linear Feet)	17,142	17,336	16,877	17,242	18,512
Intermittent (Linear Feet)	10,778	10,731	9,413	11,031	11,797
Perennial (Linear Feet)	14,766	16,429	16,024	15,160	16,944
Total Impacts (Linear Feet)	**42,686**	**44,496**	**42,314**	**43,433**	**47,253**
Stream Relocation (Linear Feet)	25,591	25,882	25,507	27,066	27,641
Total Impacts Riparian Corridor (Acres)	34.46	34.39	29.91	34.91	40.47

5.19.3.9 Intermittent Streams

QHEI and HHEI evaluations were performed for intermittent streams to be impacted by the I-69 Section 6 alternatives. These intermittent streams include the following:

- Sartor Ditch UNTs
- Indian Creek UNTs
- West Fork of Clear Creek UNTs
- Stotts Creek UNTs
- White River UNTs
- Crooked Creek UNTs
- Bluff Creek UNTs
- Orme Ditch
- Haueisen Ditch

Nine QHEI evaluations were completed for intermittent streams. QHEI scores ranged from 23.5 for a segment of an UNT to Indian Creek to 48 for a segment of Orme Ditch. These scores indicate that the streams may be non-supporting of their aquatic life use designation.

From the 40 assessments of intermittent streams using HHEI protocol, four streams were identified as Modified Class I Primary Headwater Habitat (PHWH) streams. These previously impacted stream segments have a limited potential to support aquatic life. Eleven stream segments were identified as Class I PHWH with HHEI scores of 29 or lower. Fifteen stream segments had HHEI scores ranging from 30 to 49 and were identified as Class II PHWH. Eight stream segments with modified channels and HHEI scores between 30 and 69 were identified as Modified Class II PHWH. One modified channel with a score of 70 or greater was considered unclassified.

One stream segment had an HHEI score of 70 or greater (or from 50 to 69, with a flowing stream and greater than 10 percent substrate being boulder, boulder/slab, cobble, or bedrock) and was identified as Class III PHWH. Class III PHWH streams have the potential to support a diverse array of flora/fauna.

Overall impacts (approximate linear feet of stream within the right of way) to intermittent streams, including bridged portions, associated with the alternatives are 10,778 linear feet for Alternative C1, 10,731 linear feet for Alternative C2, 9,413 linear feet for Alternative C3, 11,031 linear feet for Alternative C4, and 11,797 linear feet for the RPA. Total stream impacts are shown in Table 5.19-9**.**

5.19.3.10 Ephemeral Streams

A total of 84 HHEI evaluations and one QHEI evaluations were performed for ephemeral stream segments intersected by the I-69 Section 6 alternatives. These ephemeral stream segments are as follows:

- Indian Creek UNTs
- An unidentified lake UNT
- Sartor Ditch and UNTs
- West Fork of Clear Creek UNTs
- White River UNTs
- Crooked Creek UNTs
- Bluff Creek UNTs
- Travis Creek UNTs
- Haueisen Ditch
- Little Buck Creek UNT
- State Ditch UNT

One ephemeral stream segment had a drainage areas or pools large enough to evaluate using QHEI protocol. Haueisen Ditch had a score of 37 indicating modified warm water habitat.

All remaining stream segments were evaluated using the HHEI protocol. Of the 84 HHEI assessments of ephemeral stream segments, 29 were identified as Class I PHWH streams with scores of 29 or lower. A total of 19 modified stream segments with scores of 29 or lower were identified as Modified Class I PHWH streams. These streams have the lowest potential to support a diverse array of flora/fauna.

A total of 20 stream segments with scores ranging from 50 to 69 were identified as Class II PHWH streams with moderate potential to support a diversity of stream flora/fauna. A total of 16 modified stream segments with scores between 30 and 69 were identified as Modified Class II PHWH streams.

Overall impacts (approximate linear feet of stream within the right of way) to ephemeral streams, including bridged portions, are 17,142 linear feet for Alternative C1, 17,336 linear feet for Alternative C2, 16,877 linear feet for Alternative C3, 17,242 linear feet for Alternative C4, and 18,512 linear feet for the RPA. Total stream impacts are shown in **Table 5.19-9.**

Table 5.19-9: Stream Impacts by Type

Type	Potential Impact (Linear Feet)				
	Alt C1	Alt C2	Alt C3	Alt C4	RPA
Channelized Ditch	6,644	6,886	6,988	7,241	7,833
Channelized Ditch Bridged	154	154	154	154	154
Concrete Gutter	778	778	676	780	733
Culvert	5,187	5,116	5,178	5,096	5,379
Rock Dump Gutter	87	87	87	87	87
Natural	11,105	12,931	10,649	11,464	14,069
Natural Bridged	1,620	1,580	1,626	1,619	1,621
Roadside Ditch	17,111	16,964	16,956	16,992	17,377
Total Impacts	**42,686**	**44,496**	**42,314**	**43,433**	**47,253**

5.19.3.11 Potential Stream and Riparian Impacts

Water body modification impacts affect wetlands and streams and their associated riparian communities. Riparian communities are plant communities such as upland forest areas adjacent to streams that are at least moderately affected by their proximity to water. These areas provide habitat for many species and provide functions similar to wetlands such as flood attenuation, sediment stabilization, and contaminant retention.

Streams

Larger stream crossings are generally accomplished using bridges or large culverts. Existing bridge crossings in I-69 Section 6 include the I-465 over the White River and SR 37 over Indian Creek, Clear Creek, Stotts Creek, Crooked Creek, Bluff Creek, Honey Creek, Pleasant Run Creek, and Little Buck Creek. Detailed bridge and large culvert design was not completed in this phase of the project. Structure size and type as well as specific design information for mitigation will not be determined until final design after the FEIS and Record of Decision (ROD).

For smaller waterways where bridges are not used, stream crossings would be accomplished using culverts, pipes, or channel relocations. These features would require an alteration to the natural shape of the stream. Such alterations—which could include a range of modifications—can trigger the following impacts:

- Channel widening - Reduction in stream velocity, allowing accumulation of sediments or altering riffle-pool complexes.
- Channel enclosure (pipes/culverts) - Restriction of flow during peak flood events; accumulation of backwater; and/or disruption of the natural ecology of a water body by

blocking sunlight, blocking natural aquatic and wildlife habitat, and destroying bottom substrate important to macro-invertebrate communities.

- Channel realignment/straightening - Increase in stream velocity and energy resulting in stream bank erosion, loss of stream bank vegetation, and destruction of riffle/pool habitats.
- Bank shaping and stabilization - Loss of habitat due to replacing natural vegetation with hard armoring (e.g., riprap).
- Placing bridge piers below ordinary high water - Loss of habitat and flow alterations in the area of the piers.

It is anticipated that most perennial stream crossings would require stability measures, with associated dredging and/or filling of streams and their banks. Exceptions may be where such streams are located in broad floodplains, where most of the floodplain would be bridged, and no bridge abutment or pier would be located in close proximity to the active stream channel. Where practicable, alternatives to riprap, such as bioengineering methods and new construction or retrofit of culverts for aquatic organism passage, would be considered.

Since this project is on existing alignment, stream crossings are dictated by the location of the current roadway. During the development and evaluation of plans for overpasses, interchanges, and local service roads, careful consideration was given to stream crossings to avoid or minimize impacts. Bridges are proposed for all alternatives along SR 37 at locations where there are existing bridges in place. Stream crossing locations were evaluated for design feasibility and environmental impact.

The total impacts, including existing roadside ditches, culverts or pipes, and bridges within the right of way of the alternatives would be 42,686 linear feet for Alternative C1, 44,496 linear feet for Alternative C2, 42,314 linear feet for Alternative C3, 43,433 linear feet for Alternative C4, and 47,253 linear feet for the RPA. Taking into consideration previously impacted lengths (i.e., existing concrete gutter, roadside ditches, channelized ditches, and/or culvert), the impacts to natural streams would be 11,105 linear feet for Alternative C1, 12,931 linear feet for Alternative C2, 10,649 linear feet for Alternative C3, 11,464 linear feet for Alternative C4, and 14,069 linear feet for the RPA. A summary of potential impacts to streams by type within the I-69 Section 6 right of way can be found in **Table 5.19-9**. A breakdown of the length of channel previously impacted is shown at the end of **Table 5.19-10.**

Table 5.19-10 summarizes the potential impacts to streams by alternative and provides a comparison for the existing right of way impacts as well as the percentage of new impacts. In addition to comparing linear feet of stream impacts associated with the alternatives, a weighted comparison of stream impacts was made. This approach was arrived at in consultation with resource agencies. The habitat evaluation scores for each stream were multiplied by the length of stream within each alternative right of way and added to get a total for each alternative. The higher the score, the higher the quality of streams impacted. **Table 5.19-11** provides a more detailed review of the QHEI and HHEI data and potential stream impacts.

Table 5.19-10: Stream Impacts by Stream Hydrologic Regime

Type	Potential Impact (Linear Feet)				
	Alt C1	Alt C2	Alt C3	Alt C4	RPA
Ephemeral	17,142	17,336	16,877	17,242	18,512
Intermittent	10,778	10,731	9,413	11,031	11,797
Perennial	14,766	16,429	16,024	15,160	16,944
Total	**42,686**	**44,496**	**42,314**	**43,433**	**47,253**
Impacts Outside Existing RW (NEW Impacts)	19,551	21,244	19,624	20,365	22,744
Percent New Impacts	46%	48%	46%	47%	48%

Table 5.19-11: Stream Impacts by Weighted Habitat Evaluation Score

Type	Potential Impact (Linear Feet)				
	Alt C1	Alt C2	Alt C3	Alt C4	RPA
HHEI Scores					
0 - 29	9,462	9,958	9,635	9,608	10,611
30 - 49	8,049	8,235	7,554	8,549	9,042
50 - 69	6,387	6,092	5,766	6,371	6,907
70 - 100	890	888	215	888	1,189
Total	**24,788**	**25,173**	**23,170**	**25,416**	**27,749**
QHEI Scores					
0 - 50	8,766	8,908	8,768	9,111	9,978
51 - 64	2,026	3,420	3,273	1,892	2,219
> 64	145	145	145	145	153
Total	**10,937**	**12,473**	**12,186**	**11,148**	**12,350**
Impact Lengths per stream Multiplied by Habitat Evaluation Score					
HHEI	905,067	910,536	806,086	931,236	1,026,698
QHEI	441,139	528,537	509,882	450,143	500,868

The I-69 Section 6 alternatives may require the relocation of many stream segments. As previously discussed, multiple segments (indicating a change in habitat) can make up one stream reach. Alternative C1 would relocate 68 stream segments, Alternative C2 would relocate 77 stream segments, Alternative C3 would relocate 75 stream segments, Alternative C4 would relocate 78 stream segments, and the RPA would relocate 71 stream segments. The lengths of relocations would be 25,591 linear feet for Alternative C1, 25,882 linear feet for Alternative C2, 25,507 linear feet for Alternative C3, 27,066 linear feet for Alternative C4, and 27,641 linear feet for the RPA. Many of these relocations are currently roadside ditches within existing transportation rights of way. Error! Not a valid bookmark self-reference. summarizes stream relocations by type. Natural stream relocations would be 3,052 linear feet for Alternative C1, 2,815 linear feet for Alternative C2, 2,161 linear feet for Alternative C3, 3,441 linear feet for Alternative C4, and 3,568 linear feet for the RPA.

Table 5.19-12: Stream Relocations by Type

Type	Potential Relocations (Linear Feet)				
	Alt C1	Alt C2	Alt C3	Alt C4	RPA
Channelized Ditch	5,062	4,825	5,812	5,851	5,492
Channelized Ditch Bridged	108	108	108	108	154
Concrete Gutter	778	778	676	647	733
Culvert	612	769	777	777	719
Dump Rock Gutter	87	87	87	87	87
Natural	3,052	2,815	2,161	3,441	3,568
Roadside Ditch	15,892	16,500	15,886	16,155	16,888
Total Relocation (LF)	**25,591**	**25,882**	**25,507**	**27,066**	**27,641**

Riparian Corridors

This analysis considers a riparian zone to be any forested area that is adjacent to the stream within 100 feet of the OHWM. The methodology used for calculating the riparian impacts in I-69 Sections 1 through 5 is used to remain consistent among the six sections.

A 100-foot riparian zone is determined based on information in the Habitat Management Sheet for Riparian Zones published by the IDNR Division of Fish and Wildlife in October 2004. It states, “Depending on the size and slope of the floodplain, riparian corridors should be at least 50 to 100 feet in width on each side of the watercourse to adequately address wildlife and water quality needs.”

Impacts to plant communities within the 100-foot riparian zone are identified by calculating the total area of the community within the zone and by measuring the linear feet that the community extends along the stream. While coordination with IDEM has determined that stream mitigation for impacts would be based on the linear feet measurement, knowing the total acres potentially impacted offers a better understanding of the potential impact of the project on flora and fauna in the vicinity of the streams.

Potential riparian corridor impacts would be 34.46 acres for Alternative C1, 34.39 acres for Alternative C2, 29.91 acres for Alternative C3, 34.91 acres for Alternative C4, and 40.47 acres for the RPA. All riparian areas within the right of way of an alternative are considered to be potentially impacted. **Table 5.19-13** summarizes the potential stream and riparian corridor impacts with each of the alternatives. This table identifies the streams having riparian corridors that could be impacted and the acres of potential impact by alternative.

Table 5.19-13: Riparian Habitat Impacts (Acres) by Alternative

Stream ID	Stream Name	USGS Stream Type	Drainage Area (sq miles)	Alt C1	Alt C2	Alt C3	Alt C4	RPA
S6S001a	Indian Creek	Perennial	92.99	0.35	0.34	0.07	0.33	0.33
S6S001c	Indian Creek	Perennial	92.99	0.15	0.52	0.11	0.16	0.16
S6S003b	UNT 2 Indian Creek	Ephemeral	0.01	0.00	0.00	0.07	0.07	0.50
S6S004a	UNT to lake	Ephemeral	0.01	0.04	0.01	<0.01	<0.01	0.05
S6S011g	UNT 3 Sartor Ditch	Ephemeral	0.39	0.00	0.00	0.00	0.00	<0.01
S6S013b	UNT 5 Indian Creek	Intermittent	0.27	0.00	0.00	0.00	0.00	0.17
S6S015e	UNT 6 Sartor Ditch	Ephemeral	0.36	0.02	0.02	0.02	0.02	0.02
S6S017i	UNT 8 Sartor Ditch	Ephemeral	0.05	0.52	0.13	0.13	0.51	0.60
S6S019a	UNT 10 Sartor Ditch	Ephemeral	0.04	0.38	0.38	0.38	0.38	0.38
S6S020a	UNT 11 Sartor Ditch	Ephemeral	0.01	0.22	0.21	0.21	0.21	0.21
S6S021d	Sartor Ditch	Ephemeral	0.05	0.18	0.18	0.18	0.18	0.34
S6S027a	UNT 1 West Fork Clear Creek	Ephemeral	0.01	0.15	0.15	0.08	0.15	0.15
S6S027b	UNT 1 West Fork Clear Creek	Ephemeral	0.01	0.33	0.33	0.22	0.33	0.33
S6S028a	UNT 2 West Fork Clear Creek	Intermittent	0.07	1.04	0.92	0.12	1.04	1.27
S6S028c	UNT 2 West Fork Clear Creek	Intermittent	0.05	0.63	0.66	0.06	0.63	0.52
S6S031a	West Fork Clear Creek	Perennial	6.54	0.00	0.00	0.78	0.00	0.00
S6S031b	West Fork Clear Creek	Perennial	5.74	0.00	0.00	0.79	0.00	0.00
S6S032a	UNT 5 West Fork Clear Creek	Ephemeral	0.01	0.00	0.00	0.42	0.00	0.00
S6S033a	UNT 6 West Fork Clear Creek	Ephemeral	0.08	0.00	0.00	1.02	0.00	0.00
S6S034a	UNT 7 West Fork Clear Creek	Ephemeral	0.39	0.00	0.00	0.32	0.00	0.00
S6S036a	UNT 9 West Fork Clear Creek	Intermittent	0.03	0.30	0.29	0.30	0.30	0.29
S6S036b	UNT 9 West Fork Clear Creek	Intermittent	0.03	0.48	0.47	0.46	0.47	0.47
S6S036d	UNT 9 West Fork Clear Creek	Intermittent	0.02	0.20	0.00	0.20	0.00	0.00
S6S037a	UNT 10 West Fork Clear Creek	Intermittent	0.02	0.18	0.17	0.17	0.17	0.17
S6S038a	UNT 11 West Fork Clear Creek	Ephemeral	0.01	0.26	0.26	0.26	0.26	0.26
S6S039a	UNT 12 West Fork Clear Creek	Ephemeral	0.00	0.01	0.01	0.01	0.01	0.12
S6S040b	West Fork Clear Creek	Perennial	7.21	0.00	0.00	0.00	0.00	0.27

Stream ID	Stream Name	USGS Stream Type	Drainage Area (sq miles)	Alt C1	Alt C2	Alt C3	Alt C4	RPA
S6S044a	UNT 16 West Fork Clear Creek	Intermittent	0.01	0.29	0.30	0.30	0.30	0.30
S6S045a	Clear Creek	Perennial	16.65	0.00	0.39	0.11	0.00	0.00
S6S045c	Clear Creek	Perennial	16.65	0.00	0.00	0.13	0.00	0.00
S6S045d	Clear Creek	Perennial	16.41	1.12	1.12	0.42	1.12	1.08
S6S046a	UNT 17 West Fork Clear Creek	Intermittent	0.00	0.81	0.82	0.82	0.82	0.85
S6S048a	UNT 18 West Fork Clear Creek	Perennial	0.04	0.18	0.17	<0.01	0.17	0.12
S6S050a	UNT 1 White River	Perennial	0.79	1.04	1.04	1.04	1.04	0.48
S6S050e	UNT 1 White River	Perennial	0.78	0.47	0.47	0.34	0.47	0.69
S6S050f	UNT 1 White River	Perennial	0.66	0.45	0.64	0.64	0.64	1.46
S6S052a	UNT 3 White River	Ephemeral	0.06	0.00	0.00	0.00	0.00	0.00
S6S053b	Stotts Creek	Perennial	60.03	0.47	0.41	0.42	0.41	0.41
S6S055a	UNT 8 White River	Perennial	0.30	0.09	0.09	0.06	0.09	0.23
S6S055c	UNT 4 White River	Perennial	0.21	0.25	0.23	0.23	0.23	0.25
S6S057a	UNT 6 White River	Ephemeral	0.06	0.40	0.40	0.26	0.40	0.40
S6S058a	UNT 7 White River	Ephemeral	0.05	0.81	0.81	0.51	0.81	0.97
S6S060a	UNT 9 White River	Ephemeral	0.05	0.10	0.10	0.04	0.10	0.10
S6S062a	UNT 11 White River	Intermittent	0.00	4.33	4.33	4.23	4.33	4.33
S6S062c	UNT 11 White River	Intermittent	0.00	0.15	0.15	0.15	0.15	0.15
S6S062e	UNT 11 White River	Intermittent	0.00	0.42	0.42	0.42	0.42	0.42
S6S062f	UNT 11 White River	Intermittent	0.00	0.10	0.10	0.11	0.10	0.10
S6S062h	UNT 11 White River	Intermittent	0.05	0.67	0.66	0.04	0.66	0.86
S6S064a	Crooked Creek	Perennial	15.53	1.17	1.17	0.73	1.17	1.79
S6S065a	UNT 1 Crooked Creek	Ephemeral	0.00	0.19	0.19	0.13	0.19	0.3
S6S068a	UNT 4 Crooked Creek	Ephemeral	0.04	0.31	0.31	0.09	0.31	0.31
S6S070b	UNT 13 White River	Ephemeral	0.00	0.38	0.38	0.11	0.38	0.38
S6S071a	UNT 14 White River	Ephemeral	0.00	0.32	0.32	0.07	0.32	0.31
S6S073a	UNT 16 White River	Ephemeral	0.04	0.06	0.06	0.01	0.06	0.06
S6S074a	UNT 17 White River	Ephemeral	0.04	0.12	0.12	0.01	0.12	0.12
S6S074b	UNT 17 White River	Ephemeral	0.04	0.41	0.41	0.34	0.41	0.52
S6S075a	UNT 18 White River	Intermittent	0.03	0.05	0.05	0.05	0.05	0.05
S6S075e	UNT 18 White River	Intermittent	0.00	<0.01	<0.01	<0.01	<0.01	<0.01
S6S075g	UNT 18 White River	Ephemeral	0.00	0.11	0.11	0.00	0.11	0.20
S6S083a	UNT 20 White River	Intermittent	0.04	0.26	0.26	<0.01	0.26	0.26
S6S084a	UNT 21 White River	Ephemeral	0.00	0.13	0.13	<0.01	0.13	0.13
S6S085a	UNT 22 White River	Intermittent	0.08	0.00	0.03	0.00	0.03	0.03
S6S086a	UNT 1 Bluff Creek	Perennial	0.17	0.01	0.07	0.00	0.07	0.14

Stream ID	Stream Name	USGS Stream Type	Drainage Area (sq miles)	Alt C1	Alt C2	Alt C3	Alt C4	RPA
S6S086b	UNT 1 Bluff Creek	Perennial	0.07	0.33	0.33	0.09	0.33	0.33
S6S086d	UNT 1 Bluff Creek	Perennial	0.05	0.25	0.18	0.03	0.18	0.48
S6S087a	UNT 2 Bluff Creek	Intermittent	0.08	0.94	0.91	0.39	0.91	1.10
S6S088a	UNT 3 Bluff Creek	Intermittent	0.00	0.02	0.02	<0.01	0.02	0.03
S6S090a	Bluff Creek	Perennial	3.69	0.95	0.85	0.95	0.85	1.37
S6S090d	Bluff Creek	Perennial	3.40	1.10	1.06	1.06	1.05	1.10
S6S091a	UNT 5 Bluff Creek	Ephemeral	0.01	0.04	0.04	0.04	0.04	0.04
S6S092a	UNT 6 Bluff Creek	Intermittent	0.14	0.00	0.00	0.00	0.00	0.08
S6S094b	UNT 8 Bluff Creek	Intermittent	0.24	0.22	0.22	0.22	0.22	0.22
S6S094d	UNT 8 Bluff Creek	Intermittent	0.22	1.22	1.15	1.16	1.16	1.57
S6S097a	UNT 1 Travis Creek	Ephemeral	0.00	0.05	0.05	0.05	0.05	0.06
S6S098a	UNT 2 Travis Creek	Ephemeral	0.25	0.35	0.37	0.35	0.37	0.38
S6S099a	Travis Creek	Perennial	1.91	1.10	0.75	0.43	0.75	0.72
S6S099c	Travis Creek	Perennial	1.51	0.00	0.03	0.00	0.03	0.09
S6S101a	Honey Creek	Perennial	17.90	0.94	0.80	0.56	1.25	0.82
S6S101c	Honey Creek	Perennial	17.90	0.00	0.17	0.15	0.00	0.03
S6S102a	Pleasant Run Creek	Perennial	20.92	1.71	1.29	1.26	1.71	2.23
S6S103a	Orme Ditch	Intermittent	3.65	0.77	0.56	0.58	0.77	0.88
S6S103c	Orme Ditch	Intermittent	3.53	0.29	0.39	0.39	0.27	0.37
S6S103j	Orme Ditch	Intermittent	3.37	0.00	0.06	0.00	0.00	0.00
S6S104a	Little Buck Creek	Perennial	17.06	1.60	2.17	2.33	2.18	2.77
S6S107a	White River	Perennial	1,904.00	0.02	0.02	0.02	0.02	0.02
S6S108a	UNT 23 White River	Perennial	4.08	0.07	0.09	0.09	0.09	0.01
S6S109a	UNT 24 White River	Ephemeral	0.00	1.14	1.33	1.33	1.33	1.12
S6S110a	UNT 25 White River	Intermittent	1.35	0.19	0.19	0.19	0.19	0.19
S6S113a	Lick Creek	Perennial	21.30	0.05	0.05	0.05	0.05	0.05
Total				34.46	34.39	29.91	34.91	40.47

NOTES:

UNT = Unnamed Tributary

Drainage areas less than 0.01 square mile were rounded to 0.01 to avoid showing a drainage area of 0 square mile.

Floodplains

White River Floodplain

The I-69 Section 6 project encroaches on the 100-year floodplain of the White River according to FIRM 18097C0228F, 18097C229F, 18097C0233F, 18097C0240G, 18081C0014D, 18081C105D, 18109C0170E, 18109C0165E, 18109C0280E, and 18109C0264E for Marion, Johnson, and Morgan counties.

The current SR 37 route is parallel to the White River for most of I-69 Section 6. Floodplain encroachment occurs mainly from the I-465 interchange area west to Mann Road, and south on SR 37 to Travis Creek. Existing SR 37 floodplain encroachment occurs at Crooked Creek, Stotts Creek, Clear Creek, and Indian Creek, all of which are major tributaries of the White River.

All the alternatives have both transverse and longitudinal crossings of floodplain; however, the main source of impacts would be transverse, resulting from bridge and roadway widening for conversion to an interstate. Additional impacts would occur at the I-465 interchange, Smith Valley Road, and Henderson Ford Road, as described below.

- **I-465 Interchange**. According to the FEMA maps (FIRM 18097C0228F, 18097C0233F, and 18097C024G), impacts to the White River 100-year floodplain would result from the construction of the I-69 interchange with I-465. All alternatives, including the RPA, would result in both transverse and longitudinal impacts to the floodplain along I-465.
- **Smith Valley Road**. According to FIRM 18081C0105D, floodplains impacted would include the White River and Honey Creek at this location. The RPA includes a planned interchange and local service roads that would result in transverse and longitudinal impacts to these floodplains. Alternatives C2, C4, and the RPA include a local service road to connect Fairview Road to Old SR 37, south of the new Smith Valley Road Interchange, which would cause greater impacts to the floodplain than other alternatives since the local service road is on a new alignment. With Alternatives C1 and C3, a local service road would connect Smith Valley Road with baseball fields west of I-69, which would result in less impact to the floodplain.
- **Henderson Ford Road**. According to FIRM 18109C0280E, impacts to the White River floodplain would result from the construction of an interchange at I-69 and Henderson Ford Road with any of the alternatives, including the RPA. This interchange would cause longitudinal impacts to the floodplain and regulatory floodway of the White River for approximately 0.17 mile. Longitudinal impacts to the 100-year floodplain of the White River occur also along the southbound lanes to the confluence with the Clear Creek floodplain, approximately 0.5 mile to the southwest.

Other locations where the alternatives have transverse and longitudinal impacts on floodplains are described below.

Little Buck Creek

According to FIRM 18097C0240G, all four alternatives would cross the 100-year floodplain and regulatory floodway of Little Buck Creek floodplain in a transverse manner. Impacts to the Little Buck Creek floodplain would occur as a result of added travel lanes and the interchange at Southport Road.

Pleasant Run Creek

According to FIRM 18097C0240G, the project crosses the 100-year floodplain and regulatory floodway of Pleasant Run Creek. Impacts to the Pleasant Run Creek floodplain within this FIRM would be transverse, as all alternatives, including the RPA, cross the floodplain at this location. Impacts to the floodplain would result from the widening of the existing SR 37 right of way for I-69. South and west of the existing SR 37 right of way, each Alternative will include an interchange at County Line Road and a local access road connecting County Line Road with Wicker Road to the north resulting in impacts to both the Pleasant Run Creek floodplain and the White River floodplain.

Honey Creek/Messersmith Creek

According to FIRM 18081C0105D, the project crosses the 100-year floodplain and regulatory floodway of Honey Creek and Messersmith Creek. All alternatives cross the floodplain in the same approximate location resulting in similar floodplain impacts. The construction of the local service roads from Fairview Road to Old SR 37 in Alternatives C2 and C4, and from Smith Valley Road to the baseball fields west of I-69 in Alternatives C1 and C3 would result in transverse and longitudinal impacts to the Honey Creek floodplain. The RPA would involve acquisition of right of way for improvement of local access north of Honey Creek and Messersmith Ditch. South of Honey Creek, the Smith Valley Road interchange would result in the same longitudinal impacts as the DEIS alternatives.

The Honey Creek floodplain extends east of SR 37, south to North Bluff Creek. Longitudinal impacts to this floodplain occur throughout this length of the project from the increased right of way required for upgrading SR 37 to an interstate highway. Additional impacts would occur to this floodplain with the construction of a cul-de-sac at West Olive Branch Road (W County Road 800) with Alternative C4 or a West Olive Branch overpass with Alterative C3. The RPA includes local service roads on the west side of I-69, from north of the Smith Valley interchange to Old State Road 37, south of West Olive Branch. On the east side, minor longitudinal impacts would result from construction of a cul-de-sac at West Olive Branch Road.

North Bluff Creek

According to FIRM 18081C0105D the project would impact the 100-year floodplain of North Bluff Creek approximately 0.65-mile north of Stones Crossing Road, resulting in a longitudinal impact to the floodplain of North Bluff Creek east of I-69. The Honey Creek and North Bluff Creek floodplains converge on the east side of SR 37 for approximately 2.2 miles along the SR 37 right of way. North Bluff Creek and White River floodplains converge on the west side of the existing SR 37 right of way. The RPA would impact the North Bluff Creek/White River floodplain west of I-69 through improvement of local access to Old State Road 37 at North Bluff Creek.

Crooked Creek

According to FIRM 18109C0170E, the project would cross the 100-year floodplain of Crooked Creek and the White River approximately 1.2 miles south of the current intersection with Big

Bend Road. Expansion of the current right of way for upgrading to I-69 would result in transverse impacts to the floodplain. The planned overpass and local service road west of I-69 linking Old SR 37 and Perry Road would cause additional longitudinal impacts within the floodplain. Alternatives C1, C2, C4, and the RPA have similar footprints for the overpass and would cause floodplain impacts northwest of I-69. Alternative C3 would close access to Perry Road, and impacts within the floodplain would result from a new local service road connecting to Old SR 37 northwest of I-69. South and west of Crooked Creek, all alternatives, including the RPA, would result in longitudinal impacts to the White River floodplain from the increased I-69 right of way.

Stotts Creek

According to FIRM 18109C0165E and 18109C0280E, the project would cross the 100-year floodplain of Stotts Creek and the White River. All the alternatives would have both transverse and longitudinal crossings of these floodplains. Proposed right of way increases for I-69 for approximately 1.3 miles north and south of Stotts Creek would result in longitudinal impacts to the 100-year floodplain and regulatory floodway of the White River.

Impacts to the Stotts Creek floodplain would vary depending on the alternative. Alternatives C1and C3 would include construction of a cul-de-sac, closing access to existing New Harmony Road, and a new bridge would be constructed over Stotts Creek to connect New Harmony Road east and west of Stotts Creek. This construction will result in transverse impacts to the Stotts Creek floodplain. Alternatives C2, C4, and the RPA would retain access to New Harmony Road by constructing a bridge across Stotts Creek and continuing New Harmony Road to the southwest. The floodplain encroachment with Alternatives C2, C4, and the RPA would also result in transverse impacts to the Stotts Creek floodplain.

Clear Creek

According to FIRM 18109C0280E, the project would cross the 100-year floodplain of Clear Creek at several locations. All alternatives would have both transverse and longitudinal crossings of this floodplain. The Clear Creek floodplain is approximately 4,000 feet wide at the intersection of SR 37 and Egbert Road. All alternatives, including the RPA, include a grade separation connecting Egbert Road to Old SR 37. For Alternatives C2 and C3, the footprints of the new local service road west of I-69 are larger resulting in greater impacts to the floodplain. Alternative C3 also would have greater impacts to the floodplain east of I-69 with a new local service road that would connect SR 44 with Twin Branch Road. As the West Fork of Clear Creek flows parallel to the proposed I-69 route, longitudinal impacts would occur where the roadway crosses the floodplain near Country Club Road and Teeters Road. Alternative C4 and the RPA would result in similar impacts to these floodplains due to the proposed overpass to convey Egbert Road over I-69. Additionally, the RPA includes upgrades to Willowbrook Drive that would increase transverse impacts to the floodplain.

Indian Creek

According to FIRM 18109C0266E, 18109C0262E, 18109C0268E, and 18109C0264E, the project crosses approximately three miles of the 100-year floodplain of Indian Creek, beginning at the south terminus of the project. Existing SR 37 crosses this same floodplain. All alternatives, including the RPA, would result in transverse and longitudinal crossings of this floodplain. This section of the project includes proposed interchanges at Ohio Street and SR 39, and a grade separation at Burton Lane. Impacts to the floodplain would differ depending on the alternative, as described below.

- **Ohio Street**. North of existing SR 37, the floodplain of Indian Creek is approximately 3,000 feet wide at its widest area. Alternatives C1, C3, C4, and the RPA include an interchange at Ohio Street, which would result in transverse and longitudinal impacts to the floodplain. The construction of a local service road would also cause longitudinal impacts north and south of I-69. Alternative C2 would also result in transverse and longitudinal impacts to the Indian Creek floodplain due to an Ohio Street overpass and local service roads connecting Mahalasville Road to Southview Drive, and Ohio Street to Bill's Boulevard.
- **Burton Lane**. Most construction at the intersection with Burton Lane would be outside of the 100-year floodplain of Indian Creek. Alternatives C2 and C4 would provide an overpass to connect Burton Lane over I-69, resulting in a small impact to the 100-year floodplain of Indian Creek south of existing SR 37. Alternative C1 would provide an underpass, which would impact the 100-year floodplain within the existing roadside ditch of SR 37. Alternative C3 and the RPA would close access to Burton Road with no impact to the 100-year floodplain.
- **SR 39**. All alternatives, including the RPA, have an interchange at SR 39, but the existing right of way at this interchange would remain relatively unchanged. The greatest impacts to the Indian Creek floodplain would occur with Alternative C1, which would include a local service road from SR 39 to Rogers Road on the west side of the interchange.
- **Old State Road 37 at South Project Terminus**. All alternatives, including the RPA, would impact the 100-year floodplain of Indian Creek. Alternative C2 would have the greatest impact, with a local service road linking to Old SR 37 via Rogers Road on the west, and a local service road along the east side of I-69 to link with Burton Lane near Rogers Road. Alternative C1 includes the same access to Rogers Road, but a cul-de-sac would be provided at the southern access to Old SR 37. Alternatives C3, C4, and the RPA are similar, though they differ slightly in right of way width, and would cut off access to Old SR 37 to the south, while creating a local access road to Rogers Road to the north. Alternatives C3, C4, and the RPA would result in transverse and longitudinal impacts within the floodplain.

A summary of impacts of the alternatives to floodplains is provided in **Table 5.19-14**. Floodplain impacts would be 475 acres for Alternative C1, 537 acres for Alternative C2, 479 acres for Alternative C3, 499 acres for Alternative C4, and 458 acres for the RPA. New floodplain impacts (outside of the existing right of way) account for 60 percent to 70 percent of the total acres of

floodplain impacts for the alternatives. The percentage of floodplain impacts outside of the existing right of way with the RPA are 60 percent, compared with 67 to 70 percent with the other alternatives.

Table 5.19-14: Floodplain Impacts

Impacts	Potential Impacts (Acres)				
	Alt C1	Alt C2	Alt C3	Alt C4	RPA
Within Existing Right of Way	154	161	159	154	182
Outside Existing Right of Way	321	376	320	345	276
Total Acres of Impact	**475**	**537**	**479**	**499**	**458**
Percent of Impacts Outside Existing Right of Way	68%	70%	67%	69%	60%

During design, hydraulic analysis will be performed in the vicinity of stream crossings that require bridges to ensure that the proposed crossings will not result in significant increases in flooding. The openings of the proposed bridges over these streams would be sized so that 100-year floodway elevations would not be substantially affected. There would be no significant change in flood risk due to implementation of I-69 Section 6, and there would be no increase in potential for interruption or termination of emergency service or emergency evacuation routes. Flood easements may be acquired if they are determined to be appropriate.

Surface Water Quality

IDEM publishes an annual Integrated Water Quality Monitoring and Assessment Report in accordance with Section 305(b) of the CWA. This report updates the Section 303(d) (CWA) List of Impaired Waters for the State of Indiana (IDEM, 2016) every two years. These are water bodies that do not or are not expected to meet applicable water quality standards with only federal technology based standards.

The Upper White River Watershed is the only eight-digit watershed[7] traversed by the I-69 Section 6 field survey study area. This watershed is briefly described in **Section 4.3.2**. Information regarding water quality in the Upper White River Watershed and its sub-watersheds within the field survey study area is summarized below.

All the streams identified in the project field survey study area are within the Upper White River Watershed. These streams are tributaries to the White River, which drains to the Wabash River. Several streams in the watershed are included in the State of Indiana Draft 2016 CWA Section

[7] *Watersheds in the United States and the Caribbean were delineated by the U.S. Geological Survey using a national standard hierarchical system based on surface hydrologic features and are classified into four types of hydrologic units: first-field (region), second-field (sub-region), third-field (accounting unit), and fourth-field (cataloguing unit). Eight-digit watersheds uniquely identify the four levels of classification within four, 2-digit fields. In this case, the 8-digit code Hydrologic Unit Code (HUC) represents the Upper White River unit that can be further classified into forks of the White River.*

303(d) list of impaired water bodies (IDEM, 2016), including the White River, State Ditch, Pleasant Run Creek, Crooked Creek, and Stotts Creek. The alternatives cross all of these impaired water bodies.

State Ditch is listed as impaired due to *Escherichia coli* (*E. coli*) bacteria and impaired biotic communities. The White River is listed as impaired due to nutrients, free cyanide, polychlorinated biphenyls (PCBs), and impaired biotic communities. Pleasant Run Creek is listed as impaired due to *E. coli* and impaired biotic communities. Crooked Creek and Stotts Creek are listed as impaired due to *E. coli*. **Table 5.19-14** identifies the streams impacts within the right of way of each alternative.

The I-69 Section 6 field survey study area crosses 16 sub-watersheds of the Upper White River Watershed. The 16 sub-watersheds are briefly described below (IGS GIS Atlas, 2012).

- State Ditch: The State Ditch sub-watershed encompasses approximately 6,863 acres. This sub-watershed drains the northwestern terminus of I-69 Section 6 east to just west of the White River along I-465. There are no National Pollutant Discharge Elimination System (NPDES) discharge points in this sub-watershed.
- Lick Creek–Beech Creek: The Lick Creek–Beech Creek sub-watershed encompasses approximately 9,765 acres. This sub-watershed drains the northeastern terminus of I-69 Section 6 west to just west of Bluff Road along I-465. There are no NPDES discharge points in this sub-watershed.
- White River–Hide Creek: The White River–Hide Creek sub-watershed encompasses approximately 10,128 acres. This sub-watershed drains the northern 1.57 miles of I-69 Section 6 from the I-465 interchange to Banta Road. There is one NPDES discharge point in this sub-watershed located on the White River.
- Little Buck Creek (Southport): The Little Buck Creek (Southport) sub-watershed encompasses approximately 11,073 acres. This sub-watershed drains I-69 Section 6 from Banta Road south to Southport Road. There is one NPDES discharge point in this sub-watershed located on Little Buck Creek.
- White River–Mann Creek/Harness Ditch: The White River–Mann Creek/Harness Ditch sub-watershed encompasses approximately 8,684 acres. This sub-watershed drains I-69 Section 6 from Southport Road south to just north of Wicker Road. There are no NPDES discharge points in this sub-watershed.
- Pleasant Run Creek–Buffalo Creek: The Pleasant Run Creek–Buffalo Creek sub-watershed encompasses approximately 15,111 acres. This sub-watershed drains I-69 Section 6 from just north of Wicker Road south to just south of Fairview Road. There are no NPDES discharge points in this sub-watershed.
- Honey Creek–Turkey Pen Creek: The Honey Creek–Turkey Pen Creek sub-watershed encompasses approximately 11,853 acres. This sub-watershed drains I-69 Section 6 from just south of Fairview Road south to Smith Valley Road. There are no NPDES discharge points in this sub-watershed.

- White River–North Bluff/Bluff Creeks: The White River–North Bluff/Bluff Creeks sub-watershed encompasses approximately 10,140 acres. This sub-watershed drains I-69 Section 6 from Smith Valley Road south to just north of Whiteland Road. There is one NPDES discharge point in this sub-watershed located on Travis Creek.
- White River–Sinking Creek: The White River–Sinking Creek sub-watershed encompasses approximately 8,976 acres. This sub-watershed drains I-69 Section 6 from just north of Whiteland Road south to just north of Crooked Creek. There are no NPDES discharge points in this sub-watershed.
- Crooked Creek–Banta Creek: The Crooked Creek–Banta Creek sub-watershed encompasses approximately 10,179 acres. This sub-watershed drains I-69 Section 6 from just north of Crooked Creek south to Perry Road. There are no NPDES discharge points in this sub-watershed.
- White River–North Trib (Centenary Church): The White River–North Trib (Centenary Church) sub-watershed encompasses approximately 4,533 acres. This sub-watershed drains I-69 Section 6 from Perry Road south to Stotts Creek. There are no NPDES discharge points in this sub-watershed.
- Stotts Creek–Exchange: The Stotts Creek–Exchange sub-watershed encompasses approximately 2,897 acres. This sub-watershed drains I-69 Section 6 at the confluence of Stotts Creek and the White River. There are no NPDES discharge points in this sub-watershed.
- White River–Henderson Bridge: The White River–Henderson Bridge sub-watershed encompasses approximately 3,743 acres. This sub-watershed drains I-69 Section 6 from Stotts Creek south to Egbert Road. There are no NPDES discharge points in this sub-watershed.
- Clear Creek–East/West/Grassy Forks: The Clear Creek–East/West/Grassy Forks sub-watershed encompasses approximately 14,666 acres. This sub-watershed drains I-69 Section 6 from Egbert Road south to SR 44. There are no NPDES discharge points in this sub-watershed.
- Indian Creek–Sand Creek: The Indian Creek–Sand Creek sub-watershed encompasses approximately 7,835 acres. This sub-watershed drains I-69 Section 6 from SR 44 south to the southern terminus of I-69 Section. There are no NPDES discharge points in this sub-watershed.
- White River–Martinsville: The White River–Martinsville sub-watershed encompasses approximately 10,072 acres. This sub-watershed drains I-69 Section west of SR 37 in Martinsville near proposed access roads adjacent to Rogers Road and Morton Avenue. There is one NPDES discharge point in this sub-watershed located south of Rogers Road.

5.19.4 Groundwater

The analysis of groundwater impacts includes an assessment of the existing groundwater conditions in the field survey study area as well as the potential impact of the project on groundwater resources. If project construction poses a potential impact to groundwater resources, mitigation measures are proposed.

Wellhead protection areas were authorized by the 1986 Amendments to the Safe Drinking Water Act. When a proposed project encroaches upon a wellhead protection area (WHPA), the delineated area is identified and coordination with the community wellhead protection program is documented.

Early coordination with USEPA is necessary if a proposed project potentially affects an area designated as the principal or sole source aquifer under Section 1414(e) of the Safe Drinking Water Act. Currently, only the St. Joseph Aquifer located near South Bend is designated as a sole source aquifer in Indiana (USEPA, 2016).

USEPA Region 5 requires Class V injection well permits when a Class V injection well is located within the karst region of the state, a sole source aquifer area, a state designated source water protection area for a public water supply, or any instance of untreated fluids discharged through a Class V injection well that may otherwise endanger an underground source of drinking water. INDOT does not anticipate requiring Class V injection well permits for this project as karst features are not present (see **Section 5.21**) and there are no existing designated sole source water protection areas within the project area. However, coordination with USEPA Region 5 should occur if project construction necessitates Class V injection wells within public wellhead protection areas.

5.19.4.1 Groundwater Methodology

The IDNR Water Well Record and Significant Water Withdrawal Facility (SWWF) Databases were queried to locate groundwater wells and SWWFs within 1,000 feet of the I-69 Section 6 alternatives through individual record retrievals and the IndianaMap.[8] The 1,000-foot search criterion for the water well database was established using the USEPA Calculated Fixed Radius method that determines a zone of concern around a well. Well record location descriptions varied in detail. If the reported location was within 1,000 feet of an alternative, the well was listed as a potential impact.

Additional groundwater information was obtained from IDNR, Division of Water publications, including *Ground-Water Resources in the White and West Fork White River Basin, Indiana* (Beaty, 2002), Morgan County (Maier, 2010) and Marion County (Schmidt, 2011), *Unconsolidated Aquifer Systems of Morgan County Indiana* (Maier, 2010) and Marion County

[8] *IndianaMap data layer accessed via:* http://inmap.indiana.edu/index.html

(Schmidt, 2011), and the *U.S. Geological Survey, Water Resources, Hydrogeologic Atlas of Aquifers in Indiana* (Fenelon and Bobay, 1994).

5.19.4.2 Groundwater Analysis

Private/Public Wells

Private wells and municipally owned systems supply drinking water in the project area. Privately owned groundwater wells generally service rural portions of the I-69 Section 6 field survey study area. In I-69 Section 6, most wells are developed in unconsolidated sand and gravel aquifers.

On May 18, 2015, INDOT met with the IDEM Division of Groundwater to review water utilities and WHPA areas within and adjacent to the field survey study area. Existing conditions associated with each of these areas were discussed as well as possible restrictions that would be required for future construction. IDEM noted that according to the NPDES Rule 13 stormwater permitting that infiltration stormwater best management practices (BMPs) within an MS4 area that were within a WHPA were prohibited.

Seven public water supply systems provide drinking water in the I-69 Section 6 field survey study area. They are: Painted Hills Utility Company, Martinsville Water Utility, Mapleturn Utilities, Inc., Morgan County Rural Water Corporation, Bargersville Water Utility, Indiana American-Johnson County, and Citizens Energy Group. Each of these entities was contacted on August 17, 2016, requesting service coverage information and input regarding foreseeable effects to their water systems associated with I-69 Section 6 project. Summaries of the responses are provided below.

Painted Hills Utility Company responded on August 19, 2016, indicating that the requested information was unavailable. Review of the WHPA mapping indicates the protection area is outside of the I-69 Section 6 field survey study area.

Martinsville Water Utility serves an area along the west side of SR 37 from Legendary Hills to the intersection of SR 37 and I-465. Martinsville Water Utility also serves an area along the east side of SR 37 from Pine Boulevard to the intersection of SR 37 and I-465. Martinsville Water Utility indicated that its nearest water wells to the I-69 Section 6 corridor lie 2.86 miles from the project area, across Indian Creek. These wells are located along the White River in Martinsville, in the White River Aquifer. While construction of I-69 Section 6 may require utility line relocations, Martinsville Water Utility does not anticipate impacts to these wells.

The Mapleturn Utilities, Inc. provides services to a small community located west of SR 37, approximately 3.5 miles north of Martinsville. The Mapleturn Utilities, Inc.'s five-year time of travel wellhead protection area borders the existing SR 37 corridor for a short distance near Mapleturn Road. The nearest pumping wells are located 1.1 miles from SR 37 and draw groundwater from the White River Aquifer.

Morgan County Rural Water Corporation (MCRW) provides coverage to an area west of the White River and generally west of SR 67 in Morgan and a small portion of Owen County. MCRW wells are located one mile north of Martinsville on the west side of the White River and east of SR 67. They draw groundwater from the White River Aquifer. MCRW anticipates that the I-69 Section 6 construction will not affect its facilities.

Indiana American Water-Johnson County services a 36 square-mile area including the city of Greenwood and the town of New Whiteland. The service area boundaries are SR 37 to the west, County Line Road to the north, County Road 825W (in Shelby County) to the east, and Earlywood Drive to the south. The Indiana American Water-Johnson County service network connects with the service area in Franklin, which is an emergency system. Indiana American Water Johnson-County serves a population of approximately 74,000 throughout Johnson County. Indiana American Water-Johnson County has nine wells in the general vicinity of the I-69 Section 6 corridor, the nearest being located approximately 600 feet from the corridor. Indiana American Water-Johnson County draws groundwater from the White River Aquifer and White River Tributaries Outwash Aquifer System. Additionally, Indiana American Water-Johnson County indicated they have wells and a treatment facility on the northwest corner of Fairview Drive and SR 37 and near the southeast quadrant of Fairview Drive and SR 37. These facilities are not manned but are checked daily and access to them should be maintained.

Citizen Energy Group provides service along SR 37 from Henderson Ford Road north to the Morgan County line. Citizen Energy Group also provides water service along the SR 37 corridor and along the I-465 corridor throughout Marion County. Citizen Energy Group draws groundwater from numerous wells, the closest of which lies approximately 1,000 feet from the existing center line of SR 37 near Southport Road.

Bargersville Water Utility serves an area west of SR 37 from SR 144 to Smith Valley Road and along Huggin Hollow Road and Old State Road 37. Water service is provided along the east side of SR 37 as well from SR 37 to approximately Smith Valley Road. The nearest Bargersville wells to the proposed I-69 Section 6 corridor are located west of the White River, roughly 3,000 feet from the existing SR 37 corridor. Bargersville Water Utility wells are developed in the White River Aquifer.

The IDNR Division of Water registers significant water withdrawal facilities (SWWF) in Indiana (Water Resource Management Act, 1982 (IC 14-25-7)). Significant water withdrawal facilities are defined as "the water withdrawal facilities of a person that, in the aggregate from all sources and by all methods, has the capability of withdrawing more than 100,000 gallons of groundwater, surface water, or ground and surface water combined in one (1) day." The SWWF facilities records include the original registration form, location map, and annual water use report for each facility (Division of Water, 2014).

The IDNR SWWF database indicates that 31 SWWFs are located within 1,000 feet of one or more of the four I-69 Section 6 alternatives. The potential number of SWWFs impacted is 27 with Alternative C1, 23 with Alternative C2, 27 with Alternative C3, 25 with Alternative C4, and 24 with the RPA. For reference see **Table 5.19-15**.

The IDNR water well database identified 727 groundwater wells located within 1,000 feet of one or more of the four I-69 Section 6 alternatives. The potential number of water wells that may be impacted are 641 with Alternative C1, 666 with Alternative C2, 652 with Alternative C3, 655 with Alternative C4, and 688 with the RPA. **Table 5.19-15** summarizes these potential effects on water wells for each alternative.

Table 5.19-15: Groundwater Wells, Water Withdraw Facilities, and Wellhead Protection Areas

	Quantity Type	Total Identified	Alt C1	Alt C2	Alt C3	Alt C4	RPA
IDNR Listed Wells within 1,000 feet of the right of way (excludes monitoring wells)	Number of wells	727	641	666	652	655	688
IDNR listed significant water withdrawal facilities within 1,000 feet of the right of way	Number of Facilities	31	27	23	27	25	24
IDNR listed Wellhead Protection Area within 1,000 feet of the right of way	Number of Areas	6	6	6	6	6	6

Wellhead Protection Areas (WHPAs)

Coordination with the public water supply system operators discussed above identified six Wellhead Protection Areas (WHPAs) in or adjacent to I-69 Section 6. These WHPAs draw groundwater from bedrock (consolidated) and unconsolidated aquifer systems, as described below.

Bedrock Aquifer Systems. The bedrock aquifers in I-69 Section 6 have generally limited groundwater availability. Where they are in use, most wells are completed in the Devonian and Mississippian/New Albany Shale Aquifer and the Mississippian/Borden aquifer system, both of which are considered aquitards and generally unproductive. Well production is typically low, in the range of less than two gallons per minute (gpm) to rarely as much as 10 gpm (Maier, 2010 and Schmidt, 2011). See **Section 4.3.2.1** for further information.

Unconsolidated Aquifer Systems. The White River and Tributaries Outwash aquifer system in Morgan County supplies most of the groundwater to the area. This system supports multiple high-capacity pumping wells at pumping rates up to 3000 gpm (Maier, 2005). The Dissected Till and Residuum Aquifer system also services groundwater wells within the project area, though with less productivity than the White River Aquifer system (Maier, 2010).

Groundwater Quality

Groundwater is available from both consolidated and unconsolidated aquifers in the study area. The principle bedrock aquifers in the southwestern portion of the project area are located in the siltstone, shale, and fine-grained sandstone of the Borden Group (Maier, 2010). The principal

bedrock aquifer in the northeastern portion of the field survey study area is located in the shales, dolomite and dolomite quartz sandstone of the New Albany Shale Aquifer System (Maier, 2005; Schmidt, 2011). The unconsolidated aquifer is located in multiple aquifer systems composed of glacial outwash sands and gravels (Maier, 2005; Maier, 2010; Schmidt, 2011). **Section 4.3.2** describes the aquifers in I-69 Section 6 in more detail.

Consequences of road construction can include excess sedimentation of surface water, increased surface runoff, and mounding of surface water, all of which may disrupt the natural groundwater cycle. Such disturbances can lead to decreased infiltration and a locally lowered groundwater table resulting in interruption of shallow rural water supplies. Groundwater sourced from the unconsolidated aquifer could be susceptible to contamination through road surface stormwater runoff or surface spills (e.g. by gasoline tankers, chemical transports, etc.) from the new roadway. Thus, both rural area private drinking water wells and public supply wells that source water from the unconsolidated aquifer are susceptible to contamination related to the proposed project.

As detailed above, the project area crosses several municipal wellfield areas. **Chapter 7, Mitigation, and Commitments** identifies BMPs considered for project implementation and includes additional information pertaining to mitigation of highway runoff and spill prevention with respect to wellfield areas.

The I-69 Section 6 field survey study area does not lie within a karst area (see **Section 5.21**) and no currently designated sole source aquifers exist within the project limits. The only sole source aquifer in Indiana is the St. Joseph Aquifer in South Bend.

5.19.5 Mitigation

Chapter 7, Mitigation, and Commitments, provides details on proposed measures to mitigate surface water resource impacts that may result from the project. The following paragraphs outline the proposed measures.

Within the I-69 Section 6 field survey study area, there are 14 palustrine forested (PFO) wetlands totaling approximately 3.48 acres, 41 palustrine emergent (PEM) wetlands totaling approximately 19.95 acres, seven palustrine shrub/scrub (PSS) wetlands totaling approximately 1.12 acres, 33 palustrine unconsolidated bottom (PUB) wetlands totaling approximately 100.16 acres, and two lacustrine unconsolidated (LUB) wetlands totaling approximately 66.60 acres. The total impacts to emergent, scrub-shrub, and forested wetlands are estimated to be 4.97 acres for Alternative C1, 9.76 acres for Alternative C2, 8.77 acres for Alternative C3, 4.07 for Alternative C4, and 3.99 acres for the RPA. PUB wetland impacts are included with open water impacts.

The following measures will be used to address impacts to wetlands:

- **Avoidance and Minimization**. Wetlands and wetland complexes will be avoided when possible and follow the Wetlands MOU dated January 28, 1991, between INDOT, IDNR,

and USFWS. (See **Appendix S**.) A commitment is made that wetlands and other water resources will be avoided where practicable and feasible through alignment shifts during design of the I-69 Section 6 roadway. All water resource areas within the right of way will be identified on the design plans, and these areas will be protected with IDEM approved erosion control measures as part of the overall erosion control plan for the roadway project. This will prevent contamination of these areas during construction of I-69 Section 6.

- **Revised Tier 1 Conceptual Forest and Wetland Mitigation and Enhancement Plan.** During Tier 1, INDOT and FHWA developed a Tier 1 Forest and Wetland Mitigation and Enhancement Plan ("Mitigation Plan") for the proposed project in consultation with the USFWS and other review agencies. An updated version of that Mitigation Plan has been developed, and its stipulations regarding wetland mitigation are included in USFWS revised Biological Opinion for Tier 1 issued on August 24, 2006 (as amended May 25, 2011). The revised Tier 1 Plan included a commitment to replace wetlands at a ratio of 3 to 1 for forested and scrub/shrub wetlands, and a ratio of 2 to 1 for emergent wetlands. The wetland mitigation sites will include an approximate 25 percent buffer area where appropriate.

  The updated Mitigation Plan identifies the general location of 13 potential mitigation areas along the Tier 1 Preferred Alternative 3C corridor from Evansville to Indianapolis for the design and construction of wetlands and upland forest. In the vicinity of I-69 Section 6, White River (Clear Creek), White River (Crooked Creek), and White River (Pleasant Run) were identified as potential mitigation areas. Potential mitigation sites are being investigated in these areas and within the White River floodplain. Additional mitigation sites may be identified in the remaining stages of project development.

Based on these mitigation ratios, I-69 Section 6 mitigation for wetland impacts would be 15.66 acres with Alternative C1, 27.36 acres with Alternative C2, 24.83 acres with Alternative C3, 13.03 acres with Alternative C4, and 12.59 acres with the RPA**. Table 5.19-16** identifies potential mitigation areas for each alternative.

Table 5.19-16: Acres of Wetland Mitigation

Acres of Mitigation	Alt C1	Alt C2	Alt C3	Alt C4	RPA
Total Emergent, Scrub/Shrub, Forested and Buffer*	15.66	27.36	24.83	13.03	12.59

** Acreage assumes 2 to 1 Ratio for Emergent, 3 to 1 Ratio for Scrub/Shrub, 3 to 1 Ratio for Forested, and a 25% Buffer*

Additional I-69 Section 6 mitigation actions associated with wetland impacts are listed below.

- **Wetland Pooling**. If appropriate, wetland mitigation may include wetland pooling, meaning efforts would be made to group mitigation sites together to create a more substantial and effective mitigation site.
- **Wetland Mitigation and Monitoring Plans**. Wetland Mitigation and Monitoring Plans will be prepared as required for Section 404 permitting. Additional measures to minimize

impacts to specific wetland sites will be considered, including narrowing the right of way, installing drainage features such as swales to ensure that roadway runoff does not enter wetland areas, and designing culverts to maintain the flow of water to a wetland area otherwise cut off from its existing water source. A more detailed conceptual mitigation plan is included in the I-69 Section 6 Tier 2 Biological Assessment (BA), which is included in Appendix GG.

Open Water

Open water impacts include impacts to palustrine unconsolidated bottom (PUB) wetlands and lacustrine unconsolidated (LUB) wetlands located within the I-69 Section 6 alternatives. The total acres of open water impacts are 47.19 acres for Alternative C1, 22.48 acres for Alternative C2, 17.22 acres for Alternative C3, 18.18 acres for Alternative C4, and 2.78 acres for the RPA. Mitigation will be accomplished using a 1 to 1 ratio and includes a 25 percent buffer, as previously agreed upon by the regulatory agencies. Borrow pit construction or preservation of existing open water areas may be considered for mitigating these open water impacts. The total amount of mitigation for impacts to open water, by alternative, is shown on **Table 5.19-17.**

Table 5.19-17: Open Water Impacts

Acres of Mitigation	Alt C1	Alt C2	Alt C3	Alt C4	RPA
Open Water Area for Mitigation	58.99	28.10	21.53	22.73	3.48

** Acreage assumes one to one ratio and 25% buffer*

Rivers and Streams

Since I-69 Section 6 is primarily on existing alignment, most proposed stream crossings have been previously disturbed. Where the project intersects a stream crossing structure of an existing local road, it may be necessary to modify or relocate that structure to accommodate the planned interstate construction. Where reasonable, the alternatives cross streams at their narrowest floodway width and use existing stream crossings.

The potential impacts to streams varies with the alternatives considered. The total length of streams, including culverts (perennial, intermittent, and ephemeral) within the proposed right of way are 42,686 linear feet with Alternative C1, 44,496 linear feet with Alternative C2, 42,314 linear feet with Alternative C3, 43,433 linear feet with Alternative C4, and 47,253 linear feet with the RPA. It is not anticipated that the regulatory agencies will require mitigation for concrete gutters, roadside ditches, or culverted stream segments.

IDEM and USACE criteria call for mitigating stream impacts based on the length of impact. A stream mitigation plan addressing the functions and values impacted by the construction as agreed upon by the regulatory agencies will be used to mitigate impacts to streams in I-69 Section 6. Stream impacts that require mitigation by IDEM and the USACE are 19,523 linear feet for Alternative C1, 21,551 linear feet for Alternative C2, 19,417 linear feet for Alternative

C3, 20,478 linear feet for Alternative C4, and 23,677 linear feet for the RPA. **Table 5.19-18** summarizes potential mitigation for stream impacts (excluding concrete gutters, rock dump gutter, roadside ditches, or culverted segments) for each of the alternatives.

Table 5.19-18: Mitigation for Stream Impacts

Stream* Mitigation**	Alt C1	Alt C2	Alt C3	Alt C4	RPA
Linear Feet in Existing and Proposed Right of Way	19,523	21,551	19,417	20,478	23,677
Acres in Existing and Proposed Right of Way	10.01	11.56	10.56	10.21	11.11

** Stream impacts anticipated to include mitigation include the following types: natural, natural bridged, channelized ditch and channelized ditch bridged. They do not include the following types: concrete gutter, culvert, rock dump gutter, and roadside ditch.*

*** Mitigation assumes a one to one ratio*

The mitigation concept being proposed for stream mitigation for I-69 Section 6 includes stream restoration, stream enhancement, and stream preservation by conservation easements as approved by the regulatory agencies. The realignment of surface streams or impacts to riffle-pool complexes and natural stream geomorphology will be avoided where possible or minimized and mitigated for if not possible.

Mitigation for streams will be determined during the permitting process in coordination with the regulatory agencies. The mitigation will be focused on replacing the functions and values impacted by the project based on a watershed approach. A quantitative ratio to mitigate the stream impacts will be determined from the functions and values evaluation in coordination with the regulatory agencies. Generally, the USACE and IDEM require a 1:1 mitigation ratio for streams.

Stream relocations within Indiana bat and northern long-eared bat maternity colony areas will be completed using the natural channel design features that are identified through coordination with the resource agencies. Stream mitigation will be completed to compensate for linear feet of stream impacts in coordination with USACE and IDEM during the permitting process. Where possible, both banks of stream mitigation areas will be protected. If both banks cannot be protected, coordination with IDEM and USACE will be completed to identify the amount of mitigation credits that INDOT may receive based on the proposed mitigation site. Consideration will be given in the design phase to planting trees and shrubs along relocated streams and outside the edge of the right of way.

Water bodies, wetlands, and other natural areas outside the construction limits but within the right of way will be delineated and posted with “Environmentally Sensitive Area” or other appropriate signs. Tree clearing and snag removal will be kept to a minimum and limited to areas within the construction limits and scheduled to meet calendar requirements. Approximately 20 feet of cleared space around a bridge would be permitted to allow sufficient room for bridge maintenance and inspection.

Coordination with USACE and IDEM has been initiated and will continue throughout the development of the proposed mitigation sites that will be offered for compensatory mitigation for

I-69 Section 6 impacts. Natural channel stream designs for perennial and larger intermittent stream relocations within the Indiana bat maternity colony areas may include stream designs that incorporate riffle/run/pool/glide or step/pool sequences and sinuosity to replicate natural channel geomorphology, in-stream structures (log and rock vanes) to help prevent stream bank erosion and provide fish habitat, and riparian buffer plantings outside the clear zone of the roadway. Off-site channel restoration for compensatory mitigation will also be completed including the same natural stream channel design features.

Continued efforts will be made during final design to identify design features that would minimize impacts at stream crossings, including identifying measures to keep channel and bank modifications to a minimum and, where feasible, to avoid channel alterations below the ordinary high water elevation. Mitigation of stream impacts could include installing three-sided culverts or oversized box culverts sunk into the streambed that would retain the natural channel bottom, thereby facilitating the migration of aquatic organisms through the culverts and reducing impacts to the flow rate. The culverts should be sized to prevent upstream bed instability and erosion of downstream banks.

During the design phase, consideration will be given to using alternative armoring materials and to including portions of dry land under bridge openings that are not armored with riprap. The use of bioengineering techniques to provide natural protection of stream banks will be considered and implemented, where practicable. Installation of riprap will be limited to areas necessary to protect the integrity of structures being installed. Alternative materials, other than rip rap, will be reviewed for areas above the OHWM that require placement of scour protection measures and if feasible, the alternative measures will be considered.

If riprap is required, it will be installed outside the lowest points of the flow line and between the toe of slope and the OHWM, where possible. In some instances, such as culvert inlets and outlets, riprap may need to be placed at low points to prevent scour. Riprap will be installed at the same elevation as the lowest points of the flow line to avoid impairing fish passage. Riprap may also be required above the OHWM to protect bridge piers and abutments from scour where bioengineering will not sufficiently withstand high flow velocities. The construction plans will clearly note the dimensions and depth of rip rap to be installed. It will be the responsibility of the contractor and the construction inspection team to make sure the rip rap and culverts are installed per the final approved roadway plans.

Erosion and sediment control and other measures will be used to avoid or minimize the temporary impacts to streams during construction activities. Implementation of an approved stormwater pollution prevention plan (SWPPP) will aid in the control of erosion and sedimentation. All construction activities must comply with federal and state soil erosion and sedimentation regulations, including a SWPPP for the installation and maintenance of BMPs. This plan will be developed in conjunction with final construction plans. INDOT Standard Specifications, Special Provisions, and the IDEM Stormwater Quality Manual will govern construction activities to control erosion and water pollution.

Other mitigation details will be coordinated with the regulatory agencies with jurisdiction during the permitting process. Any stream relocations required within an Indiana bat maternity colony area in I-69 Section 6 will be completed with a natural stream design. USFWS will be included in the coordination regarding the relocation during the permitting process to assure that any concerns relative to the Indiana bat and northern long-eared bat are addressed as part of the stream relocation. For additional discussion of mitigation measures, see **Chapter 7, Mitigation, and Commitments**.

Floodplain

A final hydraulic design study that analyzes structure size and types will be completed during the final design phase of I-69 Section 6, and a summary will be included with the Field Check Plans and Design Summary. Longitudinal and transverse floodplain encroachments will be minimized, where reasonable, through re-use of existing bridges and design practices such as longer bridges and perpendicular stream crossings where new bridges are required. The study will determine the length of the bridge spans. Flood easements may be acquired if they are appropriate.

INDOT will submit a permit application to IDNR Division of Water during the design phase for all areas that require a "Construction in a Floodway" permit. All floodway mitigation required for Construction in a Floodway permits will follow the IDNR Mitigation Guidelines.

Drainage Control

Roadway runoff can have significant impacts to the water quality of receiving streams. Numerous contaminants can be found in roadway runoff. These contaminants include: particulates, nitrogen, phosphorus, metals, salts, petroleum, pesticides, PCBs, rubber, pathogenic bacteria, and asbestos. These contaminants originate through many sources. Some of the primary sources include: deicing chemicals, tire wear, wear of engine and other moving parts, exhaust, lubricant leaks and blow-by, roadside spraying, and precipitation. The build-up of deicing chemicals in the atmosphere is a primary concern. This is due to the seasonally large volumes of this contaminant. Salting of a highway in winter and drainage from the road could cause changes in stream water quality, especially those with little volume or flow. Salting of any road may lead to adverse effects for aquatic, and terrestrial organisms.

A variety of environmental consequences have been associated with the use of deicing chemicals. Road salt affects water quality, soil properties, plants, and animals. Salt inhibits plant growth by changing soil structure, changing the osmotic gradient and through chloride ion toxicity. Excess salinity causes moisture stress in plants, suppresses proper nutrient uptake, and leads to deficiencies in plant nutrition. Deicing additives can contribute to eutrophication in wetlands and toxicity to its inhabitants.

Where appropriate, roadside ditches will be grass-lined and connected to filter strips and containment basins. Efforts will be made to minimize the amount of salt used on the bridges and roads to that which is necessary to maintain a safe roadway. Alternative substances (e.g., sand) or low salt will be used as much as possible.

BMPs will be used to prevent non-point source pollution, to control storm water runoff, and to minimize sediment damage to water and aquatic habitats (see **Section 7.3**).

Hazardous Material Spill Response

The release of hazardous materials into surface and subsurface waters from spills along highways is a concern both during and after construction. It is anticipated that the highway will be used by a large number of trucks transporting a wide variety of hazardous materials. The potential for hazardous material contamination of surface and subsurface waters exists for each I-69 Section 6 alternative.

During construction of I-69 Section 6, contractors will be required to provide a spill response plan. This response plan will include telephone numbers for emergency response personnel and copies of agreements with agencies that are part of the spill-response effort. is Special measures including diversion of highway runoff from direct discharge from bridge decks into streams and containment basins to detain accidental spills, will be incorporated into final design plans for any structure located over a regulated waterway.

Following construction of I-69 Section 6, emergency spill response for hazardous materials transported on the highway will be handled by local fire departments and regional hazardous materials units coordinated through the deputy state fire marshals. If called upon, INDOT state highway equipment and resources can also be deployed to assist in containment anywhere along the proposed interstate facility.

The Indiana Emergency Response Commission has established 11 Regional Response Teams throughout the state which have full Level A hazardous materials response capabilities. Currently, the hazardous materials units of Bloomington Township and Marion County/Indianapolis are the regional units with Level A capabilities closest to I-69 Section 6. Evansville, Vincennes, Terre Haute, and Crane Naval Surface Warfare Center (NSWC) are the other regional units with Level A capabilities in the area. The I-69 Section 6 project will help accelerate emergency response to incidents on routes served by these units.

Groundwater

INDOT will implement mitigation measures to reduce groundwater impacts where necessary. Mitigation measures include the installation of grassy swales to facilitate infiltration and associated recharge of groundwater supplies, as well as implementation of construction methods to reduce the erosion, sedimentation, and turbidity typically attributed to road construction.

INDOT has made a mitigation commitment to prevent drainage from increasing above the existing SR 37 levels at areas with known or potential hazardous materials concerns. See **Section 4.5** and **Appendix G** for details regarding known or potential hazardous waste concerns within the project area. Coordination with USEPA and IDEM has occurred throughout the I-69 Section 6 Tier 2 study and will continue through the design phase.

See **Chapter 7, Mitigation, and Commitments**, for additional discussion of mitigation for water quality impacts.

5.19.6 Summary

Since I-69 Section 6 entails upgrading an existing multi-lane, divided transportation facility to a full freeway design, most of the right of way used for the I-69 Section 6 project is already devoted to transportation use. Accordingly, the impacts to most natural resources in I-69 Section 6 will be less (on a per-mile basis) in comparison with Sections 1 through 4, which were constructed on new terrain.

Table 5.19-19 provides a summary of potential impacts to surface waters by I-69 Section 6 alternative. With respect to non-open water wetland impacts, there is limited variation among the alternatives, with only a 5.77-acre difference between the greatest wetland impacts (Alternative C2) and the least impacts (RPA). Wetland impacts for each alternative are 4.97 acres for Alternative C1, 9.76 acres for Alternative C2, 8.77 acres for Alternative C3, 4.07 acres for Alternative C4, and 3.99 acres for the RPA. The InWRAP evaluations rated most of the wetlands as poor for animal habitat and botanical quality, and fair for hydrology.

The variation in impacts to streams is also relatively small among the alternatives, with a difference of 4,939 linear feet between the greatest and least impacts. The estimated impact on linear feet of streams within the right of way of the alternatives are 42,686 for Alternative C1, 44,496 for Alternative C2, 42,314 for Alternative C3, 43,433 for Alternative C4, and 47,253 for the RPA. The estimated linear feet of stream relocation would be 25,591 for Alternative C1, 25,882 for Alternative C2, 25,507 for Alternative C3, 27,066 for Alternative C4 and 27,641 for the RPA. The acres of stream impact (linear feet x width of stream's OHWM divided by 43,560) outside of the existing right of way would be 12.94 for Alternative C1, 14.50 for Alternative C2, 13.50 for Alternative C3,13.15 for Alternative C4, and 14.14 for the RPA. The habitat evaluations determined that most of the smaller streams in the project corridor are of poor quality.

Wetlands within the existing right of way account for 29 percent of the total acres of wetland impacts for Alternative C1, 18 percent for Alternative C2, 21 percent for Alternative C3, 46 percent for Alternative C4, and 47 percent for the RPA.

Existing right of way accounts for 46 percent to 48 percent of the total linear feet of stream impacts included in the alternatives. The percentage of new impacts to streams from the build alternatives are 48 percent for Alternatives C2 and the RPA, 47 percent for Alternative C4, and 46 percent for Alternatives C1 and C3.

Existing right of way accounts for 32 percent of floodplain impacts for Alternative C1, 30 percent for Alternative C2, 33 percent for Alternative C3, 31 percent for Alternative C4, and 40 percent for the RPA.

Early coordination has occurred and consultation is ongoing with the regulatory agencies. It is anticipated that a USACE 404 Permit, an IDEM 401 Water Quality Certification, an IDEM Isolated Wetlands Permit, an IDEM Rule 5 Permit, IDNR Construction in a Floodway Permit, and Section 9 U.S. Coast Guard Permit may be needed with any of the proposed alternatives.

Detailed permit coordination would occur before or during the final design phase of the project. The permits would include a detailed mitigation and monitoring plan for wetland, forest, and stream impacts, as appropriate. **Section 5.23** provides more detailed information about permits that may be required. **Chapter 7, Mitigation, and Commitments** provides a detailed discussion of measures to mitigate surface water resource impacts.

With respect to groundwater, no karst areas, water supply impoundments, or sole source aquifers are located in or adjacent to the project corridor. There are six WHPAs, between 23 and 27 significant water withdrawal facilities, and between 641 and 688 private groundwater wells within 1,000 feet of the right of way limits of any of the alternatives. Operators of seven public water supply systems were contacted, and they anticipate no impacts to their wells from I-69 Section 6. INDOT *Standard Specifications* and BMPs will be used during construction to minimize the temporary impacts that roadway construction can cause to groundwater.

Table 5.19-19: Summary of Impacts to Surface Waters, by Alternative

Impacted Resource	Alt C1	Alt C2	Alt C3	Alt C4	RPA
Wetlands (Acres)[1]					
Emergent	2.38	7.39	6.45	1.79	1.90
Scrub-Shrub	0.42	0.37	0.45	0.46	0.39
Forested	2.17	2.00	1.87	1.82	1.70
Total Wetland Impacts	4.97	9.76	8.77	4.07	3.99
Wetland Impacts in Existing Right of Way	1.44	1.77	1.82	1.88	1.88
New Right of Way Wetland Impacts	3.53	7.99	6.95	2.19	2.11
Percent New Impacts	71%	82%	79%	54%	53%
Streams (Linear Feet and Acres)					
Total Stream Impacts in Right of Way (linear feet)	42,686	44,496	42,314	43,433	47,253
Stream Impacts in Existing Right of Way (linear feet)	23,135	23,252	22,690	23,068	24,509
Percent New Impacts	46%	48%	46%	47%	48%
Total Stream Impacts in Right of Way (acres)	12.94	14.50	13.50	13.15	14.14
Total Stream Relocations (linear feet)	25,591	25,882	25,507	27,066	27,641
Stream Relocations in Existing Right of Way (linear feet)	14,251	14,854	14,331	14,329	15,855
Percent New Impacts	44%	43%	44%	47%	43%
Riparian Corridor: Acres of Impact	34.46	34.39	29.91	34.91	40.47
Open Water (Acres)					
Open Water in New Right of Way: (PUBs, L1UB)	47.19	22.48	17.22	18.18	2.78
Open Water in Existing Right of Way: (PUBs, L1UB)	0.24	--	--	--	-
Percent New Impacts	99%	100%	100%	100%	100%
Floodplain (Acres)					
Floodplain in New Right of Way	475	537	479	499	458
Floodplain in Existing Right of Way	154	161	159	154	182
Percent New Impacts	68%	70%	67%	69%	60%

[1]Wetland calculations for the alternatives have been updated based on more precise data available from wetland delineations performed after the DEIS was published.