Chapter 5: Environmental Consequences

This chapter discusses the social, economic, and environmental impacts of the Alternatives Cs, Es, and G-C as directed by the National Environmental Policy Act of 1969 (NEPA). Table 5.1.1 is a summary table showing these impacts. The following sections discuss these impacts in detail.

5.1 Traffic and Transportation

This section examines the traffic impacts of the No-Build Alternative, the Transportation System Management Alternative (involving travel demand management strategies, transportation system management actions, intelligent transportation system applications and transit service improvements), and the Build Alternatives.

5.1.1 No-Build Alternative

The No-Build (No Action or Do Nothing) Alternative is represented by the existing roadway network plus programmed or committed major roadway improvements in the South Bend Metropolitan Area. By definition the No-Build Alternative excludes any major investment in US 31. (See 3.1.2 for additional No-Build discussion.) However, the No-Build Alternative includes "capacity expansion" projects in the South Bend Metropolitan Area (St. Joseph, Marshall and Elkhart counties) as reported in the MACOG Transportation Improvement Program (2004-2006 TIP) and the balance of Indiana as reported in the Indiana Statewide Transportation Improvement Program (INSTIP). The most significant programmed capacity expansion projects include the following:

- SR 331 (Capital Avenue) new construction from the US 20 Bypass to SR 23 (Edwardsburg Highway) as a six-lane divided arterial.
- Ironwood Road widening to four lanes from Ridgedale Road to Randolph Street (completed).
- SR 23 widening to four lanes from Campeau Street to Edison Road and from Cleveland Road to Brick Road.

Along the US 31 Corridor, INDOT has programmed traffic-operational (safety) improvements to intersections at Kern Road (completed), Roosevelt Road, Madison Road, New Road, and SR 4. The new traffic signal at New Road is the most significant of these "capacity preservation" projects. As these projects do not involve major capital investments that alter the through lane traffic carrying capacity of US 31, these projects will proceed regardless of the decision to improve the US 31 corridor. A pavement-resurfacing project that would have added a continuous center left-turn lane from Madison Road to Kern Road has been suspended until the completion of this NEPA document.

Table 5.1.1: Comparison of Alternatives

Socio-Economic/Environmental Measure	ALTERNATIVE		
	Cs	Es	G-C
COSTS (Total) (Mil. Of $) (year 2003 dollars)	209.1 to 228.9	241.1 to 262.0	224.4 to 244.9
Length (Miles)	19.4	19.9	20.4
No. of New Interchanges (Total Interchanges)	5 (7)	4 (6)	5 (7)
No. of Grade Separations (Overpass/Underpass)	10	11	10

Table 5.1.1: Continued: Comparison of Alternatives

Socio-Economic/Environmental Measure	ALTERNATIVE		
	Cs	Es	G-C
COSTS (Total) (Mil. Of $) (year 2003 dollars)	209.1 to 228.9	241.1 to 262.0	224.4 to 244.9
CONSTRUCTION COSTS (Mil. of $)	152.3 to 171.5	165.8 to 185.9	163.5 to 183.2
RIGHT-OF-WAY COSTS (Mil. of $)	45.6	61.4	48.4
ENGINEERING COSTS (Mil. of $)	11.1 to 11.8	13.9 to 14.7	12.5 to 13.2
TRAFFIC PERFORMANCE			
Meet Purpose and Need	Yes	Yes	Yes
Performance (Compared to Other Alternatives)	Medium	High	Low
LAND USE	960 Ac.	901 Ac.	998 Ac.
Agricultural (row crop)	403 Ac.	406 Ac.	485 Ac.
Commercial	22 Ac.	20 Ac.	21 Ac.
Church/Religious	2 Ac.	2 Ac.	2 Ac.
Herbaceous Cover	41 Ac.	39 Ac.	56 Ac.
Open Water	1 Ac.	1 Ac.	2 Ac.
Pasture	14 Ac.	12 Ac.	3 Ac.
Transportation	187 Ac.	174 Ac.	187 Ac.
Residential	51 Ac.	70 Ac.	61 Ac.
Scrub/Shrub	43 Ac.	38 Ac.	42 Ac.
Woodland	196 Ac.	139 Ac.	139 Ac.
RELOCATIONS			
Residences Acquired	49	90	58
Businesses Acquired	8	32	6
Businesses Damaged	5	2	5
Churches Acquired	1	1	1
HISTORIC PROPERTIES	Medium	Low	High
SECTION 4(f)	0	0	0
ARCHAEOLOGICAL SITES			
Within Alignment	2	3	2
TOTAL WETLANDS (NWI + FARMED)	57.7 Ac.	40.5 Ac.	45.3 Ac.

Table 5.1.1: Continued: Comparison of Alternatives

Socio-Economic/Environmental Measure	ALTERNATIVE		
	Cs	Es	G-C
COSTS (Total) (Mil. Of $) (year 2003 dollars)	209.1 to 228.9	241.1 to 262.0	224.4 to 244.9
Forested	25.8 Ac.	20.8 Ac.	24.7 Ac.
Scrub/Shrub	3.0 Ac.	1.6 Ac.	1.4 Ac.
Emergent	26.3 Ac.	15.7 Ac.	15.6 Ac.
Aquatic Bed	0.8 Ac.	0.7 Ac.	1.0 Ac.
ESTIMATED FARMED WETLANDS	1.8 Ac.	1.7 Ac.	2.6 Ac.
STREAM IMPACTS (No. of Impact Locations)	14	13	10
WILDLIFE HABITAT AREAS			
Potato Creek State Park & Swamp Rose Nature Preserve	0	0	0
Notable Wildlife Habitat (IDNR)	2	1	0
Classified Wildlife Habitat (IDNR)	4	3	1
Classified Forest (IDNR)	2-3	2-3	1-2
Conservation Reserve Program (CRP) (NRCS)	1	2	2
Wetland Reserve Program (WRP) (NRCS)	1	1	0
Partners for Fish and Wildlife Program (USFWS)	3	2	1
INDIRECT IMPACTS			
Farmland	45 Ac.	35 Ac.	85 Ac.
Wetland	2 Ac.	2 Ac.	0 Ac.
Forest	25 Ac.	20 Ac.	5 Ac.

As previously reported in Tables 4.1.1 and 4.1.2, the No-Build Alternative fails to address existing and future congestion in the US 31 Corridor. Further, traffic growth over the next 30 years results in deterioration of the LOS along all roadway segments, signalized intersections and major unsignalized (two-way stop-controlled) intersections. In fact, while LOS C is the minimum acceptable standard, an LOS of E or F results on all roadway segments from Michigan Road to the US 20 Bypass, all signalized intersections, and all but one unsignalized intersection.

5.1.2 Transportation System Management Alternative

This alternative includes a combination travel demand management strategies, transportation system management actions, intelligent transportation system applications and public transportation service improvements.

Travel Demand Management (TDM) strategies involve actions to spread the peak-hours of travel or to encourage the shift to alternative modes of travel to the single-occupancy vehicle. These include such actions as flexible work

hours or workdays, trip-reduction ordinances, employer-based trip reduction programs, vanpooling/carpooling, improved transit services and improved bicyclist and pedestrian facilities. With no major employment centers in the corridor, most development being residential or supportive retail/service uses, and no existing or viable transit service, viable TDM strategies cannot be successfully implemented in the US 31 corridor to reduce trip making.

Transportation System Management (TSM) strategies involve low-cost capital investments to reduce congestion, improve traffic flow, and measures to optimize performance of the existing transportation infrastructure. These strategies involve intersection improvements, signal coordination and timing, lane control (reversible lanes) and high-occupancy vehicle (HOV) lanes, among others. Present signalized intersections in the US 31 Corridor have separate left-turn bays. INDOT has already programmed the improvement of most traffic signals in the corridor including the installation of a traffic signal at New Road. However, three of the four existing signalized intersections operate at an unacceptable level-of-service today, and the fourth signalized intersection will operate at an unacceptable level-of-service before the year 2030. Even with further improvements to the lane configurations and signal timings at these four intersections, the temporary improvements in traffic flow will soon disappear as traffic grows over 40% over the next 30 years in the corridor. Except for the spacing between the Johnson Road and Kern Road traffic signals, the spacing to adjacent traffic signals is more than a mile apart. Thus, traffic signal interconnection, real-time traffic flow monitoring at the traffic signals and traffic signal coordination are not viable options, and provide only a temporary improvement to traffic flow over the next 30 years. Finally, adding a continuous center left-turn lane from Miller Road to Kern Road as part of a resurfacing project may be considered a TSM strategy; however, while this action clearly improves safety, a four-lane divided facility is inadequate to handle the forecasted traffic load. In conclusion, improving traffic signals and adding a continuous center left-turn lane northward from Lakeville, results in about a 5% improvement in capacity carrying capability; yet, the increased capacity remains insufficient to handle current traffic volumes at an acceptable LOS, let alone future forecasted traffic.

Intelligent Transportation System (ITS) options include a variety of technology-based programs to actively manage the roadway system. The most common systems provide travel information on roadway conditions to daily commuters. This enables commuters to adjust travel routes to changing travel conditions. Incident management programs are also part of the ITS toolbox to reduce the effect of accidents and vehicle breakdowns on traffic flow. In light of the rural character, length of the corridor, and lack of adequate alternative north-south routes, ITS options cannot be effectively applied in the US 31 Corridor to solve congestion problems.

As previously noted, the bus ridership is characterized by a transit-dependent population, and served only 1.2% of the work trips in St. Joseph County and 0.4% of the work trips in Marshall County in the year 2000. Significant transit service is not a viable option in the US 31 Corridor for the following reasons.

- Nearly half of the travel in the corridor is through traffic (without a trip origin or destination within the corridor).
- Trips with an origin or destination within the corridor are characterized by dispersed trip-ends inside and outside the corridor.
- Less than 5% of the corridor will have sufficient population densities in the year 2030 to meet the minimum threshold considered necessary for the provision of transit service.

In conclusion, a combination of viable travel demand management strategies, transportation system management actions, intelligent transportation system applications, and public transportation service improvements, is inadequate to address existing, let alone, future congestion in the corridor.

5.1.3 Alternatives

5.1.3.1 Traffic Conditions

Table 5.1.2 shows the extent to which the alternatives relieve traffic congestion along the existing US 31 Corridor.

Referring to Table 5.1.2, Alternatives Cs, Es, and G-C relieve traffic congestion on existing US 31 achieving an acceptable LOS in the year 2030. This is in contrast to the No-Build Alternative in the year 2030 that results in an unacceptable LOS on existing US 31 from Michigan Road to the US 20 Bypass. With a reduction of 30% or more over year 2000 traffic volumes and 50% or more over year 2030 traffic volumes for the No-Build condition, an acceptable LOS may be achieved for both the present and the year 2030 for all segments, signalized intersection and major unsignalized (two-way stop-controlled) intersections in the existing US 31 corridor.

Table 5.1.2: Future Traffic and Level-of-Service on Existing US 31 for the Alternatives
(Daily Traffic Volumes (LOS) in Year 2030 – Unacceptable LOS* shaded)

		Segments							
		Rural	Rural	Rural	Rural	Rural	Rural	Rural	Urban
Alternatives	Year	US 30 to Michigan Road	Michigan Road to US 6	US 6 to Tyler Road	Tyler Road to Lake Trail	Lake Trail to SR 4	SR 4 to New Road	New Road to Roosevelt Road	Roosevelt Road to US 20 Bypass
No-Build	2000	16,989(B)	24,232(C)	19,845(E)	21,400(C)	27,217(F)	24,240(E)	26,419(E)	31,526(F)
No-Build	2030	21,504(C)	28,707(E)	25,687(F)	25,911(D)	28,279(F)	29,714(F)	32,485(F)	43,512(F)
Cs	2030	2,532(A)	5,542(A)	3,002(A)	3,285(A)	4,793(A)	3,775(A)	7,568(A)	21,932(D)
Es	2030	2,546(A)	5,467(A)	2,827(A)	3,103(A)	4,699(A)	2,291(A)	5,659(A)	7,002(B)
G-C	2030	3,139(A)	6,249(A)	3,748(A)	3,993(A)	5,844(B)	7,221(A)	10,212(B)	19,409(D)

*An LOS C is the minimum acceptable for rural segments. An LOS D is the minimum acceptable for urban segments.
Source: US 31 Improvement Project Travel Demand Model for 2030 daily volumes; for year 2000, actual traffic counts adjusted to year 2000.

The Alternatives Cs, Es, and G-C have no significant impact on existing and future daily traffic volumes on Michigan Street (Business US 31) north of the US 20 Bypass. These traffic volumes are the same as the No-Build Alternative daily traffic volume for Alternative Es and are within 2% of the No-Build Alternative for Alternatives Cs and G-C.

Table 5.1.3 shows the forecasted traffic volumes for the alternatives for the year 2030 and the associated LOS. For the alternatives, a four-lane freeway is proposed from US 30 to Kern Road with operating speed of 65 mph (LOS C = 46,800 vpd), and a six-lane freeway is proposed from Kern Road to the US 20 Bypass with an operating speed of 55 mph (LOS C = 70,200 vpd). As the alternatives result in an LOS C or better, the minimum acceptable standards of LOS C in rural areas and LOS D in urban areas are met.

Table 5.1.3: Future Traffic and Level-of-Service for the Alternatives
(Daily Traffic Volumes (LOS) in Year 2030 – Unacceptable LOS* shaded)

	Alternatives			
Segment	No-Build	Cs	Es	G-C
US 30 to CR W5A	18,242 (C)	30,330 (B)	28,830 (B)	27,520 (B)
CR W5A to Michigan Road	15,974 (C)	42,130 (C)	40,740 (C)	38,160 (C)
Michigan Road to US 6	28,707 (E)	39,500 (C)	38,090 (C)	35,030 (C)
US 6 to SR 4	28,279 (F)	36,590 (C)	35,370 (C)	30,000 (B)
SR 4 to New Road	29,714 (F)	40,360 (C)	41,110 (C)	32,190 (B)
New Road to Kern Road	32,485 (F)	40,220 (C)	41,710 (C)	29,060 (B)
Kern Road to US 20 Bypass	43,512 (F)	42,940 (B)	58,170 (C)	34,210 (B)

*An LOS C is the minimum acceptable for rural segments. An LOS D is the minimum acceptable for urban segments.
Source: US 31 Improvement Project Travel Demand Model for 2030 daily volumes.

The ramp-crossroad intersections created at interchanges along the freeway alternatives would be designed to meet the INDOT standard of LOS C or better for rural areas and LOS D or better for urban areas. One lane on and off-ramps appear sufficient to handle the year 2030 peak-hour traffic at the interchanges along the alternatives. At the possible Kern Road interchange, the off-ramps must widen to two lanes on the approach to the Kern Road for adequate storage capacity and functioning of the ramp-crossroad intersections in the case of Alternative Es. Also, in the case of Alternative Es, Kern Road must be widened to five lanes from the existing US 31 intersection to the west interchange ramp-crossroad intersection to accommodate peak-hour shifting from existing US 31 to the new freeway. In the case of Alternatives Cs and G-C at the possible Kern Road interchange and the balance of the possible interchanges on all alternatives, the widening of the crossroad to three lanes through the interchange area to accommodate left-turn appears sufficient.

In addition to the widening of Kern Road from the interchange to existing US 31 in the case of Alternative Es, improvements (two-lane roadway with 12-foot lanes and 10-foot paved shoulders) will be needed for County Road W5A from the US 31 interchange to Michigan Road in order for all build alternatives to handle the high access traffic volumes, which range from 10,740 vpd for Alternative G-C to 11,930 vpd for Alternative Es. In the case of Alternative G-C, Pierce Road should also be reconstructed from existing US 31 to the new freeway interchange due to significantly higher traffic volumes on this section of Pierce Road.

5.1.3.2 Access

Table 5.1.4 shows the preliminary treatment of roads that intersect with the alternative corridors. Table 5.1.5 shows the forecasted interchange daily ramp volumes for the year 2030.

Interchanges. The INDOT Design Manual establishes a minimum interchange spacing of one mile in urban areas and two miles in rural areas for non-Interstate freeways. [For the Interstate Highway System, the FHWA interchange spacing guidelines establish an average five-mile spacing with a minimum spacing of two miles in rural areas and an average two-mile spacing with a minimum spacing of one mile in urban areas.] All alternatives involve six interchanges that will be refined in later phases. These include two system-interchanges at US 30 and US 20 Bypass, and possibly four service-interchanges (West 5A Road, US 6, SR 4/Pierce Road, and Kern Road). While the interchanges

Table 5.1.4: Possible Access for the Alternatives

	Alternatives		
Crossroad	Cs	Es	G-C
US 30	Existing Interchange	Existing Interchange	Existing Interchange
Plymouth-Goshen Trail	grade separation	grade separation	grade separation
West 7B Road	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced
Lilac Road/West 6th Road	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced
West 5A Road	Diamond Interchange	Diamond Interchange	Diamond Interchange
Existing US 31	closed southeast of Maple Rd./West 4A Rd. intersec-tion	closed southeast of Maple Rd./West 4A Rd. intersection	closed southeast of Maple Rd./West 4A Rd. intersection
West 4A Road	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced
West 3A Road	grade separation	grade separation	grade separation
Maple Road	relocated	relocated	Relocated
West 2C Road	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced
US 6	Diamond Interchange	Diamond Interchange	Diamond Interchange
West 1B Road	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced
CSX Railroad	grade separation	grade separation	grade separation
East 1st Road	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced
North Lilac Road			closed and cul-de-saced
Tyler Road	grade separation	grade separation	grade separation
Shively Road	closed and cul-de-saced	closed and cul-de-saced	
Linden Road			closed and cul-de-saced
Rockstroh Road			closed and cul-de-saced
Kenilworth Road			grade separation
Leeper Road	grade separation	grade separation	
US 31	grade separation	grade separation	
Quinn Trail	relocated	relocated	
Lake Trail			grade separation
Quinn Road	grade separation	grade separation	closed and cul-de-saced
SR 4 (Pierce Road)	Diamond Interchange	Diamond Interchange	Diamond Interchange
Osborne Road	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced

Table 5.1.4: Continued: Possible Access for the Alternatives

	Alternatives		
Crossroad	Cs	Es	G-C
New Road	grade separation	grade separation	grade separation
Miller Road			grade separation
Madison Road	grade separation	grade separation	
Louise Dr.		closed	
Roycroft Road		closed	
Existing US 31			grade separation
Roosevelt Road	grade separation	grade separation	grade separation
Kern Road	Diamond Interchange	Diamond Interchange	Diamond Interchange
Main Street		grade separation	
Linden Road	relocated		Relocated
Johnson Road	grade separation	grade separation	grade separation
US 20 Bypass	Trumpet Interchange	Existing Interchange	Trumpet Interchange
Interchanges	6	6	6
Road Grade Separations	10	11	11
Railroad Grade Separations	1	1	1
Road Relocations	3	2	2
Road Closures	9	11	11

at US and State designated roadways are usually built to ensure state highway network continuity, the interchanges at local roads are not a certainty. Because the movement from Plymouth via Michigan Road to existing US 31 near West 4A Road involves 13,000 vpd at present and 15,000 vpd in the future, the flow of this Michigan Road traffic to the new freeway is very important for access to the north side of Plymouth and involves nearly 12,000 vpd in the year 2030. Because the alternatives depart the existing alignment of existing US 31 south of the current Michigan Road interchange and just east of the Maple Road/West 4A Road intersection, an interchange is proposed at West 5A Road (about 3.5 miles north of US 30) to accommodate the heavy traffic movement from Michigan Road to the freeway. Excluding the system-interchanges, the interchange at West 5A Road carries the second highest daily volumes in the case if Alternatives Cs, Es, and G-C.

The draft Plymouth Comprehensive Plan (2003) proposes an interchange on US 31 at East 7th Road when US 31 is upgraded to a freeway. However, an interchange at East 7th Road in lieu of West 5A Road would not serve the Michigan Road to freeway traffic. Further, an interchange at East 7th Road (about 1.6 miles north of US 30) in addition to the interchange at West 5A would not meet minimum rural interchange spacing guidelines. Moreover, at East 7th Road no public rights-of-way currently exist from existing US 31 to Michigan Road, and no significant traffic generators currently exist in the vicinity of East 7th Road. Accordingly, an interchange on US 31 at East 7th Road

Table 5.1.5: Interchange Ramp Volumes in Year 2030 for the Alternatives

Interchanges	Ramps	Alternatives (daily volumes)		
		Cs	Es	G-C
West 5A Road	NB off	395	379	405
	NB on	5,969	6,164	5,544
	SB off	5,756	5,919	5,276
	SB on	324	320	337
	Total	12,444	12,782	11,562
US 6	NB off	4,523	4,494	4,909
	NB on	1,874	2,014	1,141
	SB off	1,867	1,921	1,118
	SB on	4,348	4,267	4,762
	Total	12,612	12,696	11,930
SR 4	NB off	1,563	1,192	2,418
	NB on	2,339	3,590	1,359
	SB off	2,701	3,480	1,327
	SB on	1,602	1,217	2,144
	Total	8,205	9,497	7,248
Kern Road	NB off	770	1,236	532
	NB on	2,266	10,934	2,866
	SB off	2,005	9,530	3,216
	SB on	793	1,359	539
	Total	5,834	23,059	7,153

Source: US 31 Improvement Project Travel Demand Model for 2030 daily volumes.

may be appropriate in the future when the facility exists, the surrounding area has an urban land use density, and traffic generation warrants access to the freeway.

Serving LaPaz, the proposed US 6 interchange carries the highest service-interchange daily traffic volumes in the case of Alternatives Cs and G-C, and the third highest daily traffic volume in the case of Alternative Es.

In the case of Alternatives Cs and Es, an interchange with existing US 31 south of Lakeville is not proposed because of minimum interchange spacing guidelines for rural areas and adverse impacts on the human and natural environment. The proposed SR 4 interchange is only 6,500 feet north of the existing US 31 crossover, and handles the heavier traffic movements to the north from Lakeville than traffic movements to the south from Lakeville.

In the case of Alternative G-C, an interchange with existing US 31 south of Roosevelt Road is not proposed because significant freeway traffic would get off at the interchange to use existing US 31 to the US 20 Bypass, thereby, negating the purpose of constructing the freeway. Such an interchange would be less than two miles from the proposed Kern Road interchange contrary to minimum interchange spacing guidelines for rural areas.

With the highest service-interchange volumes in the case of Alternative Es, an interchange is proposed at Kern Road for all build alternatives to provide access to the existing suburban commercial and residential development on the south side of the US 20 Bypass. This would be the first service interchange on the US 31 Improvement Project south of the US 20 Bypass. In the case of Alternative Es, the Kern Road interchange siphons off traffic from existing US 31, provides access to several highway-oriented businesses on US 31 near Kern Road (two gas station/convenient stores, two motels and restaurants) that would not be displaced, and provides access to remaining and relocated businesses along existing US 31 from Kern Road to the US 20 Bypass.

Grade Separations and Local Service (Frontage) Roads. In general, grade separations are proposed on all alternatives at roadways functionally classified as collectors or arterials and at public roads so as to achieve a freeway crossover spacing of not more than two miles in rural areas and not more than one mile in urban areas. When two public roads are close to one another, the grade separation may be provided at one road and the other road relocated to use the same grade separation. Frontage or service roads may be provided where land may be landlocked by full access control of the alternative. The determination of grade separations and frontage/service roads may not be finalized until final design.

From US 30 to Michigan Road, existing US 31 already has partial access control and provides no direct access to private property. Thus, no frontage/service roads are necessary for landlocked property. The draft *Plymouth Comprehensive Plan* (2003) recommends an interchange at East 7th Road, a grade separation of Plymouth-Goshen Trail and no access to US 31 at 7B Road and 6th Road (Lilac Road). As presently proposed, all alternatives would provide a grade separation at Plymouth-Goshen Trail (a rural major collector), and close and cul-de-sac West 7B Road and West 6th Road (Lilac Road).

Between the West 5A Road interchange and the US 6 interchange, a grade separation is proposed at West 3A Road. Due to the proximity of Maple Road to the freeway near West 2C Road, Maple Road may be relocated along the east side of the freeway to maintain its intersection with West 2C.

Between the US 6 interchange and the SR 4 (Pierce Road) interchange, Alternatives Cs and Es share a common alignment with four roadway grade separations (Tyler Road, Leeper Road, US 31, and Quinn Road). Quinn Trail in Lakeville may be relocated on the northeast side of the proposed freeway to maintain continuity of the street system in Lakeville. North of East 1st Road, Alternative G-C departs the common alignment of the other two alternatives. Alternative G-C has three roadway grade separations (Tyler Road, Kenilworth Road (a rural major collector), and Lake Trail).

From the SR 4 (Pierce Road) interchange to the Kern Road interchange, Alternatives Cs and Es provide grade separations at New Road, Madison Road and Roosevelt Road. Cutting through a residential subdivision north of Madison Road, Louise Drive and Roycroft Road would be closed on the east side of the freeway as residential structures are displaced west of the freeway. In the case of Alternative G-C, grade separations are proposed at New Road, Miller Road, US 31 and Roosevelt Road.

From Kern Road to the US 20 Bypass, Alternatives Cs and G-C are on a similar alignment, and would have a grade separation of Johnson Road. Linden Road may have to be relocated along the west side of the freeway to Johnson Road to provide continuity for this roadway that is also grade-separated at the US 20 Bypass.

In the case of Alternative Es, the alignment north of Kern Road joins the existing alignment of US 31 near Dice Street. From Kern Road to Jackson Street a frontage road would be provided on both sides of the proposed freeway with a grade separation at Johnson Road. Main Street may serve as the frontage road on the west side of the freeway, and Main Street or the west side frontage road would be grade separated to rejoin existing US 31 north of Kern Road. Local service (frontage) road and grade separation detail will be resolved in final roadway design.

5.2 Pedestrian and Bicyclist Access

There are no bicycle or pedestrian trails impacted by any of the proposed alternates. The proposed highway is designated a freeway. Bicycle and pedestrian path access at interchange and grade separation (overpass/underpass) locations will be given due consideration as this study progresses.

Various resources were used to investigate pedestrian and bicyclists paths. They were the IDNR Outdoor Recreation Indiana Bicycling Facilities (Indiana Department of Natural Resources, 2002); *Indiana Outdoor Recreation* (Indiana Department of Natural Resources, 1989), The Hoosier Rails to Trails website, The MACOG website, and *Mountain Bike America-Indiana* (Cameron, 2000). GIS data on the trails came from the Indiana Department of Natural Resources, Division of Outdoor Recreation. The data included the routes taken by existing trails and if they were county roads, natural trails, or single lane paved trails. The information was then compared with the proposed alternatives to determine if any of these trails would be impacted by the proposed US 31 Plymouth to South Bend project.

5.3 Social/Economic Impacts

The improvement of US 31 to a freeway facility whether on new terrain or utilizing existing right-of-way will have both negative and positive social impacts to communities within the limits of the relocated highway. In general, the changes in accessibility along the new facility will create a number of social impacts to local communities. Local residents wanting to access the new facility will have to use the interchanges to reach the proposed highway. This will alter existing travel patterns, increasing local travel times in some instances and decreasing travel times for longer north-south trips.

With any large highway project such as this, one of the main impacts is the relocation of homes and businesses. It is often difficult and emotional for people affected by the process of land acquisition. The following sections discuss the possible displacements resulting from this project.

5.3.1 Relocations

Impacts were assessed using alignments depicted on aerial photos for the alternatives. Generally, a 300 to 350-foot total right-of-way width was used for assessing impacts; however, right-of-way width variations were made depending on terrain and accessibility. Some properties that were close but outside of the working alignment were assumed to be acquired. The actual right-of-way width will vary depending on terrain, stream crossings, and placement of frontage roads.

The numbers shown for relocations are based on the working alignment for the alternatives. The homes and businesses were field checked. Neighborhoods and communities that were impacted by the roadway or through lost access were also evaluated in the field.

As a fully limited access facility, no direct access to the new facility will be allowed. Any build alternative on a new alignment would likely cause some properties to become landlocked. The right-of-way and relocation costs shown in Table 5.3.6 do not include damages to landlocked or severed properties that have not yet been identified.

The projected relocation and right-of-way acquisition costs include right-of-way costs for acreage and improvements required for actual construction, relocation costs, costs for acquiring structures and improvements due to lost access, and administrative fees. These costs are estimates only and are based on a field survey. An INDOT approved appraiser evaluated the properties that would be impacted by the various working alignments and categorized properties into a range of values. Utility facility relocation costs have not been included in these estimates. Final right-of-way requirements have not yet been determined and are only estimated at this time. These costs are for comparison purposes only. They could change after more precise right-of-way requirements have been determined.

Table 5.3.6: Right-of-way and Relocation Costs by Alternative

Alternatives	Costs
Alternative Cs	$45,646,000
Alternative Es	$61,390,000
Alternative G-C	$48,387,000

Residential Displacements

Residential displacements for the alternatives are shown in the Table 5.3.7. There will be no displacements for the No-Build Alternative. Alternative Es has the greatest number of residential displacements because it would utilize existing right-of-way along US 31 north of Kern Road, thus requiring the acquisition of homes on either side of existing US 31. Impacts to individual neighborhoods are discussed in Section 5.3.4, Neighborhoods and Community Cohesion.

A home was considered displaced if it was located within the project right-of-way or if reasonable access to the property could not be maintained. The displacement of residences is estimated based upon predicted right-of-way requirements. Right-of-way requirements may be revised during the design phase when more detailed engineering decisions are made.

Table 5.3.7: Residential Displacements by Alternative

Price Range	Alternative Cs	Alternative Es	Alternative G-C
$0 – 50,000	2	2	2
$50,000 – 100,000	5	13	7
$100,000 – 150,000	15	27	15
$150,000 – 200,000	10	19	12
$200,000 – 250,000	8	13	10
$250,000 +	9	16	12
Total Residences	49	90	58

Commercial and Institutional Displacements

The greatest impacts to commercial enterprises would occur with any alternative that utilizes the existing US 31 corridor. The No-Build Alternative would have no impacts to commercial establishments. Table 5.3.8 depicts the alternatives and shows that Alternative Es has the greatest impacts to commercial establishments. Alternative Es follows the same new terrain alignment as Alternative Cs in the southern portion of the project area, but begins to curve back to the east toward existing US 31 in the area north of New Road. Alternative Es would then join the existing US 31 alignment just north of Kern Road and follow existing right-of-way until the northern terminus at US 20. This would require the acquisition of most of the businesses and residences located on either side of US 31 north of Kern Road. Mitigation of commercial displacements is discussed in Section 6.1, Mitigation.

A business was considered displaced if it was located within the project right-of-way or if reasonable access to the property could not be maintained. A business was considered damaged if the proposed right-of-way took a good portion of the property, but did not acquire the main building used for business operations. The displacement of commercial establishments is estimated based upon predicted right-of-way requirements. Right-of-way requirements may be revised during the design phase when more detailed engineering decisions are made.

Table 5.3.8: Commercial Displacements by Alternative

Type of Business	Alternative Cs	Alternative Es	Alternative G-C
Retail or Restaurant	1 displaced 1 damaged	11 displaced 2 damaged	1 displaced
Industrial	1 displaced 3 damaged	3 displaced	1 displaced 3 damaged
Office	1 damaged	8 displaced	1 damaged
Agriculture - related	5 displaced	5 displaced	3 displaced 1 damaged
Gas or Auto related		4 displaced	
Church	1 displaced	1 displaced	1 displaced
Total	8 displaced 5 damaged	32 displaced 2 damaged	6 displaced 5 damaged

5.3.2 Economic

5.3.2.1 Local Tax Revenue Impacts

The acquisition of right-of-way for a new US 31 facility will result in a loss of property tax revenues. Projected taxes and tax losses were estimated using current tax rates and actual assessments when available. Due to the changing property tax structure in Indiana, some assessments were unavailable. Assessments from similar properties were sometimes used to estimate the potential loss in property tax revenue. The resulting property tax loss as shown in Tables 5.3.9 and 5.3.10, is a small percentage of the total tax base for the townships impacted. The No-Build Alternative would not impact property tax revenue.

Table 5.3.9: Potential Tax Revenue Loss – Marshall County

	Alternative Cs	Alternative Es	Alternative G-C
Center and North Townships – Projected Tax Loss	$32,350	$32,350	$32,350
Center and North Townships – Total Tax Revenue*	$14,730,800	$14,730,800	$14,730,800
Percent of Tax Base	0.22%	0.22%	0.22%

* Projected revenue – taxes payable 2003

Table 5.3.10: Potential Tax Revenue Loss – St. Joseph County

	Alternative Cs	Alternative Es	Alternative G-C
Union and Centre Townships – Projected Tax Loss	$116,600	$167,900	$111,900
Union and Centre Townships – Total Tax Revenue*	$25,472,400	$25,472,400	$25,472,400
Percent of Tax Base	0.46%	0.66%	0.44%

* Projected revenue – taxes payable 2003

5.3.2.2 Local Business Economic Impacts

The US 31 project will also have an impact on local businesses and on highway users. The alternatives will impact businesses that are dependent on pass-by traffic.

There are two possible impacts on highway-oriented businesses within a community as a result of a major transportation investment:

- **Nearby Roadside Business Impacts,** which relate to the effects of the alternatives on abutting businesses, and
- **Remote Roadside Business Impacts,** which relate to the effects on businesses along other major transportation corridors as a result of traffic diversion.

US 31 is the primary north-south corridor in St. Joseph and Marshall counties, and there are no other parallel Statewide Mobility Corridors. Accordingly, the diversion of traffic from parallel Statewide Mobility Corridors is not possible, and remote roadside business impacts were not considered an issue.

On the other hand, Nearby Roadside Business Impacts are of concern in the US 31 corridor. Accordingly, this impact analysis focuses on the potential change in sales for businesses abutting the route of each alternative. The measure accounts for two potentially offsetting effects:

- **Access restrictions** – Businesses along a two-lane or four-lane highway that is converted to a fully access controlled highway may experience losses in sales because access from passing traffic is made more difficult.

- **Increased traffic** – Businesses along the new fully access controlled freeway may experience gains in sales because of increases in pass-by traffic volumes.

The specific impact on abutting businesses will depend heavily upon the actual alignment of the new freeway as well as the location of interchanges. Thus, two distinct scenarios are evaluated:

- **Adjacent Scenario** - Assumes the new freeway is built directly adjacent to all or portions of existing four-lane US 31. The impact on businesses along such segments would be an increase in pass-by traffic volume combined with a decrease in access.

- **Non-Adjacent Scenario** - Assumes the new freeway is built at enough of a distance (1/4 mile away or more) from the existing road that businesses will not benefit from increased traffic volume on the freeway. The primary impact on business sales will be due to a diversion of traffic from the existing roadway to the parallel facility.

The impacts on specific businesses will vary based on the dependence of the business on pass-by traffic. Gas stations and convenience stores, for example, are heavily dependent upon pass-by traffic and may benefit from greater traffic volumes but also may be impacted more by access restrictions. More specialized stores are less dependent on highway visibility. Specific business impacts may also vary widely depending upon other factors, such as the local population base served.

The methodology to estimate impacts on nearby businesses of the proposed US 31 Improvement Project was based on research conducted for National Cooperative Highway Research Program Project (NCHRP) 25-4[1], as follows:

- Businesses along existing US 31 were inventoried through field surveys and the American Business Directory, and were classified into eight establishment types with common characteristics, including their dependence on pass-by traffic. The percentage change in business sales due to reduced highway access was calculated for each establishment type based on the relative importance of convenient customer access to each type of business.

- The percent change in business sales due to increased or decreased average daily traffic volume was calculated for establishment type based on the percent change in traffic volume along each route segment adjustment for the relative dependence of each type of business on pass-by traffic.

- Finally, the percentage change in business sales due to access restrictions and the percentage change in business sales due to changes in traffic volume were combined to determine an overall percentage impact on sales for each type of business along the proposed alignment.

For the segment of US 31 from the US 30 interchange to the intersection with Michigan Road, existing US 31 with partial access control will be upgraded to a freeway with a possible intermediate interchange between US 30 and

[1] Highway Access Restriction Estimator (HARE) model , by Glen Weisbrod, December 1997.

Michigan Road. Because only one bar and three business services are in the vicinity of this segment of US 31 and none directly abut US 31, local business impacts were considered minimal as a result of the potential conversion of this segment of US 31 from partial to full access control.

For the segment of US 31 from Michigan Road to Roosevelt Road, the Build Alternatives are located a distance of ¼-mile or more away from the existing US 31, and divert significant traffic away from highway-oriented business along existing US 31.

For the segment of US 31 from Roosevelt Road to the US 20 Bypass, highway-oriented business impacts may be a result of traffic diversion from existing US 31 in the case of Alternatives Cs and GC or the result of access restrictions in the case of Alternative Es which follows existing US 31 from north of Kern Road to the US 20 Bypass.

The result of the impact analysis on sales for each of the alternatives appears in Table 5.3.11. For the segment of US 31 from the US 31 interchange to Michigan Road (about 5 miles), there are few businesses that partially depend on pass-by traffic. While business access is further reduced by conversion of this portion of US 31 to full access control, a significant increase in traffic on US 31 (particularly at the intermediate interchange between US 30 and Michigan Road) and minor growth (3%) over 30 years result in a significant sales benefit for highway-oriented uses.

From Michigan Road to Roosevelt Road (about 13 miles), the impact on highway-oriented business sales depends on the extent to which traffic is diverted from existing US 31 by each Build Alternative and the offset by area growth of 33% over 30 years for all alternatives. Alternative Cs results in the greatest diversion of traffic through LaPaz and Lakeville, and has the greatest adverse impact on pass-by traffic dependent businesses, a 50% decline. On the other hand, Alternative G-C is the least effective in diverting traffic through LaPaz and Lakeville, and has the least impact on highway-oriented businesses, a 28% decline. Alternative Es results in a 36% decline in sales for highway-oriented businesses.

From Roosevelt to the US 20 Bypass (about two miles), the impact on highway-oriented business sales is radically different due to the Build Alternative alignments that divert different amounts of traffic from existing US 31 businesses. Growth in this segment of US 31 at 36% over 30 years offsets much of the loss of traffic to businesses. Alternative G-C diverts the most traffic from existing US 31, and has the greatest adverse impact on highway-oriented businesses, a 10% decline. Alternative Cs results in about a 7% decline in sales for highway-oriented businesses.

In the case of Alternative Es, several highway-oriented businesses along existing US 31 will be displaced, and these businesses are assumed to relocate in the immediate area with little or no loss in business in the long-term. For those highway-oriented businesses not displaced (such as Wendys, Phillips 66, Sunoco, Drake Motel and Shirley Motel), the loss of immediate access to these business will be offset by proximity to the proposed Kern Road interchange, and greater traffic flows are likely near these remaining businesses than the No-Build Alternative. As a result of these assumptions, Alternative Es is anticipated to have no adverse impact on highway-oriented businesses on the stretch of existing US 31 from Roosevelt Road to the US 20 bypass.

5.3.2.3 Highway User Benefits

The alternatives will also impact user travel benefits. These savings in user benefits typically result in reductions in the cost of doing business and thereby stimulate business development.

To examine highway user benefits associated with the US 31 Improvement Project, the net benefit-cost program Net_BC was applied to the US 31 Improvement Program Travel Demand Model traffic assignments for the Build Alternatives in comparison to the No-Build Alternative. The benefit-cost program generates the net present value of user benefits (travel time, vehicle operating cost and accident cost reductions) compared to the net present value of

Table 5.3.11: Nearby Business Sales Impacts by Alternative
(total estimated sales shown, a comparison to the No-Build reveals the impact)

Segment	Option/Use	No-Build	Alt. Cs	Alt. Es	Alt. G-C
US 30 to Michigan Road (5 miles)	Restaurant/Bar	$250,000	$389,000	$389,000	$389,000
	Services	$1,250,000	$1,718,000	$1,718,000	$1,718,000
	Subtotal	$1,500,000	$2,107,000	$2,107,000	$2,107,000
Michigan Road to Roosevelt Road (13 miles)	Grocery-Convenience	$2, 000,000	$153,000	$156,000	$263,000
	Non-Durables Retail	$23,000,000	$9,829,000	$11,953,000	$14,510,000
	Durables Retail	$1,000,000	$724,000	$939,000	$996,000
	Gas Station	$8,250,000	$631,000	$644,000	$1,086,000
	Restaurant/Bar	$7,250,000	$4,029,000	$5,074,000	$5,731,000
	Services	$16,000,000	$11,712,000	$15,189,000	$16,107,000
	Specialty Retail	$7,250,000	$5,834	$7,646,000	$7,923,000
	Subtotal	$64,750,000	$32,912,000	$41,603,000	$46,616,000
Roosevelt Road to US 20 Bypass (2 miles)	Grocery-Convenience	$0	$0	$0	$0
	Grocery-Supermarket	$0	$0	$0	$0
	Non-Durables Retail	$13,750,000	$10,729,000	$13,750,000	$10,137,000
	Durables Retail	$11,000,000	$11,928,000	$11,000,000	$11,686,000
	Gas Station	$3,750,000	$752,000	$3,750,000	$674,000
	Restaurant/Bar	$1,500,000	$1,376,000	$1,500,000	$1,323,000
	Hotel	$2,000,000	$1,220,000	$2,000,000	$1,145,000
	Services	$17,500,000	$19,178,000	$17,500,000	$18,790,000
	Specialty Retail	$4,250,000	$4,929,000	$4,250,000	$4,866,000
	Subtotal	$53,750,000	$50,113,000	$53,750,000	$48,622,000
All	Total	$120,000,000	$85,132,000	$97,460,000	$97,345,000

the capital investment and maintenance costs for each Build Alternative. Examining a period of 30 years of benefits, basic assumptions include a discount rate of 7%, the initiation of improvement construction in the year 2011 and the opening of the facility to traffic in the year 2015. As shown in Table 5.3.12, Alternative Es generated the most user benefits, followed by Alternative Cs and Alternative G-C.

The benefits of the Build Alternatives over the No-Build Alternative result in substantial benefits that directly accrue to the highway user in terms for travel time, vehicle-operating cost and accident cost reductions. These savings to the highway user also translate into reductions in the cost of doing business, and result in business expansions and attractions as a result of the reduced transportation costs associated with business.

Table 5.3.12: Highway User Benefits Over No-Build Alternative

Alternative	Cs	Es	G-C
Mobility (travel time savings)	$17,880,875	$37,021,712	$30,768,497
Vehicle Operating Benefit	-$21,528,184	-$15,766,984	-$29,613,914
Safety Benefit	$14,334,287	$19,310,662	$4,436,453

Note: Positive numbers represent a cost benefit and negative numbers represent a cost expenditure.

5.3.3 Land Use and Zoning

Table 5.3.13 shows the direct land use impacts of Alternatives Cs, Es, and G-C. Alternative G-C would require the most land for right-of-way with an estimated 998 acres while Alternative Es would require the least land with an estimated 901 acres. Alternative G-C would require the most acres of agricultural land with an estimated 485 acres while alternatives Cs and Es would require an estimated 403 and 406 acres of agricultural land, respectively. Transportation acres refer to land that is presently used for right-of-way for transportation facilities like US 20 and US 31. The No-Build Alternative would have no direct impacts to land use in the area.

Table 5.3.13: Land Use by Alternatives

Land Uses	Alternative Cs (acres)	Alternative Es (acres)	Alternative G-C (acres)
Agricultural (row crop)	403	406	485
Commercial	22	20	21
Church/Religious	2	2	2
Herbaceous Cover	41	39	5656
Open Water	1	1	2
Pasture	14	12	3
Transportation	187	174	187
Residential	51	70	61
Scrub/Shrub	43	38	42
Woodland	196	139	139
Total	960	901	998

5.3.4 Neighborhoods and Community Cohesion

5.3.4.1 Neighborhoods

Impacts to the various neighborhoods and subdivisions by the alternatives are discussed below. Varying levels of noise impacts will occur to neighborhoods along the length of any new facility, with those neighborhoods closest to the highway seeing the highest noise levels. A complete discussion of Noise Impacts can be found in Section 5.8, Highway Noise.

- *LaPaz incorporated area* – This town is located approximately one mile west of the alternatives. It is not expected that the new facility will have negative impacts to the LaPaz community.

- *Meadow Lane Subdivision* – This small subdivision (ten homes) located on the south side of US 6 approximately 1500 feet west of Alternatives Cs, Es and G-C. There will be no displaced homes or lost access from this neighborhood.

- *Lakeville incorporated area* – The alternatives will not involve any displacements from the incorporated area of Lakeville. Alternatives Cs and Es pass just south and west of the Town, while Alternative G-C stays approximately one mile east of Lakeville.

- *Riddles Lake Subdivisions* – There are several subdivisions located south of Lake Trail and west of Kenilworth Road along the north side of Riddles Lake near the Town of Lakeville. Alternative G-C would cross Lake Trail approximately 1,600 feet east of this subdivision. There would be no relocations or lost access from the Riddles Lake Subdivisions.

- *Robin Hood Subdivision* – This small subdivision is located north of New Road less than one mile east of existing US 31. Alternative G-C would likely require the acquisition of four out of seven homes from this subdivision.

- *Colburn Subdivision* – This subdivision is located north of Lakeville and south of Osborne Road just west of US 31. Alternatives Cs and Es will cross Osborne Road approximately 500 feet west of this neighborhood. There will be no displacements or lost access.

- *Southern Acres Subdivision* – This subdivision is located north of Madison Road and just west of US 31 in St. Joseph County (Centre Township). Alternative Cs will cross Madison Road approximately 600 feet west of this subdivision, but would require no relocations or lost access.

  Alternative Es would cut through the western portion of Southern Acres Subdivision taking approximately twelve homes along the west end of the neighborhood. Southern Acres Drive would be eliminated and Roycroft Drive and Louise Drive would dead-end at the new facility. Access would still be available to Madison Road from the middle north-south drive which T's onto Madison Road. Madison Avenue will cross over the new facility at this location.

- *Sun Communities Mobile Home Park* – This mobile home park is located along the east side of Locust Road between Madison and Roosevelt Road. Alternative Cs will pass immediately east of the back of this mobile home park. There will be no relocations or lost access. Alternative Es will pass approximately 1600 feet east of this mobile home park.

- *Barber Mobile Home Park* – This small mobile home park is located on the west side of Locust Road between Roosevelt and Kern Road. Alternative Cs passes approximately 300 feet east of this mobile home park. There will be no relocations or lost access.

- *Kern Road Subdivision* – This subdivision is located on the south side of Kern Road between Locust Road and US 31 across from Whispering Hills Subdivision. Alternative Cs will cross Kern Road approximately 700 feet west of this subdivision and it is expected that an interchange will be provided at this location. There will be no relocations or lost access from the Kern Road Subdivision.

- *Sycamore Hills Subdivision* – This subdivision is located along the east side of Lilac Road between Kern and Johnson Road. Alternative Cs cuts just east of this subdivision and may require one residential relocation due to interchange construction at Kern Road. The access point at Lilac and Kern Road should remain unchanged.

- *Whispering Hills Subdivision* – This large subdivision is located between Johnson Road and Kern Road less than one mile west of existing US 31. Alternatives Cs and G-C will cut across the western edge of this subdivision with impacts on Quiet Ridge Court, Soft Wind Court and Hush Breeze Court. Alternative Cs

will displace a total of five homes and Alternative G-C will displace approximately nine homes out of this neighborhood of approximately 125 homes. The access point at Whispering Hills Drive and Kern Road should remain unchanged.

- *Baneberry Hills Subdivision* – This subdivision with approximately 80 homes is located adjacent and south of US 20 on the west side of Linden Road. Alternative Cs and G-C will tie into US 20 approximately 1000 feet east of this subdivision of approximately 80 homes. There will be no displacements or lost access from this neighborhood.

- *Weller's Heights Subdivision* – This is a small subdivision located adjacent and west of US 31 just north of Roosevelt Road. Alternative Es will pass approximately 300 feet west of the northwest corner of this subdivision. Alternative G-C would cross Roosevelt Road at the southwest corner of the neighborhood. Neither of these alternatives would displace any homes within the boundaries of this subdivision. The access point on existing US 31 is expected to remain unchanged.

- *Gilmer South Michigan Subdivision* – This neighborhood is located just west of US 31 between Kern and Johnson Road. Alternative Es crosses the southeast corner of this subdivision as it begins to converge onto the existing US 31 corridor. It is expected that approximately 6 homes from this subdivision will be acquired. Gilmer Street and Pulling Street will likely have new access to a proposed frontage road that will run along the new US 31 facility.

- *Gilmer Park Neighborhoods* – These subdivisions include Gilmer Park, Forest Park, and Hartman Terrace, all located east of US 31 and north of Kern Road. Alternative Es utilizes the existing US 31 right-of-way in this area and will therefore require the acquisition of all residences on either side of US 31 north of Dice Street. Approximately 11 homes will be acquired along the east side of existing US 31 in this area.

- *Jewell's Dixie Gardens Subdivision* – This older neighborhood is located west of US 31 and north of Johnson Road and has approximately 120 homes. Alternative Es utilizes the existing US 31 right-of-way in this area and will therefore require the acquisition of all residences on either side of US 31 north of Dice Street. Approximately nine homes will be acquired along the west side of existing US 31 in this area

5.3.4.2 Community Cohesion

The No-Build Alternative would result in no impacts to community cohesion within the project area. None of the alternatives would divide or isolate any of the neighborhoods within the project area. The main impacts will result from the acquisition of homes from the outer perimeter of the various subdivisions. Based upon field observations and available US Census data, there are no low-income or minority populations that would be impacted by the alternatives.

Alternative Cs would have community cohesion impacts to Sycamore Hills Subdivision and Whispering Hills Subdivision. This alternative would pass between these two subdivisions resulting in the possible acquisition of one home from Sycamore Hills and five homes from the western edge of Whispering Hills. It is not anticipated that this would result in a significant change in community cohesion since the majority of both neighborhoods would remain intact and the subdivisions would not be bisected. The setting of both neighborhoods would change with the placement of a freeway facility along the perimeter of the subdivision.

Alternative Es would have community cohesion impacts to Southern Acres Subdivision. This alternative would cut through the western portion of Southern Acres Subdivision taking approximately twelve homes along the west end of the neighborhood. It is not anticipated that this would result in a significant change in community cohesion since the remainder of the neighborhood would remain intact and the subdivision would not be bisected. The setting of this neighborhood would change with the placement of a freeway facility on the western perimeter.

Alternative Es would also acquire homes from the Gilmer South Michigan Subdivision, the Jewell's Dixie Gardens Subdivision and the Gilmer Park Subdivisions along existing US 31 north of Kern Road. These subdivisions will not be bisected, and will essentially remain intact. Therefore community cohesion impacts are not expected to be significant. The setting of these neighborhoods should not change significantly since they already border the US 31 corridor.

Alternative G-C would require the acquisition of four homes from the small Robin Hood Subdivision on New Road (7 homes). The community cohesion of this small neighborhood will be severely disrupted. Alternative G-C would also have community cohesion impacts to Whispering Hills Subdivision. This alternative passes between Sycamore Hills and Whispering Hills subdivisions in a similar fashion as Alternative Cs. Alternative G-C displaces nine homes from Whispering Hills Subdivision, but should not directly impact Sycamore Hills. It is not anticipated that this would result in a significant change in community cohesion since the majority of this neighborhood would remain intact and the subdivision would not be bisected. The setting of the neighborhood would change with the placement of a freeway facility along the perimeter of the subdivision.

5.3.5 Environmental Justice

The purpose of Executive Order 12898 (February 11, 1994) is to identify, address and avoid disproportionately high and adverse human health or environmental effects on minority and low-income populations. Environmental Justice has three fundamental principles:

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations,
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process, and
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

As per Executive Order 12898, the study area was assessed for compliance with Environmental Justice. Information on low-income and minority populations was used to assess the impacts of the proposed alternatives on these populations. Target areas with concentrations of low-income and minority populations were identified as part of the analysis for St. Joseph County and Marshall County combined. Alternatives Cs, Es, and G-C were overlaid onto the low income and minority maps respectively, to show the relationship between the proposed routes and the target populations. On each figure, the maximum percentage of minority and low-income population is noted in the legend.

Figure 5.3.1 illustrates the distribution of low-income households in relation to the proposed alternatives recommended in the US 31 Improvement Project. Based on 2000 Census data, overall representation of low-income populations along the proposed alternatives are within or below the range of 9.83%.

Figure 5.3.2 identifies the proposed alternatives in relation to areas with concentrations of minorities, which includes all other non-white populations combined in the St. Joseph and Marshall counties areas. Based on 2000 Census data, overall representation of minorities along the proposed alternatives are within or below the range of 15.7%.

According to census data, there are no disproportionate impacts to minority or low-income communities within the project area. The census block located at the northern terminus of US 31 contains a total population of eight residents, four non-minority and four minority, this resulted in 50% minority for that area. However, these residents will not be negatively impacted by the US 31 Improvement Project because they currently have no direct access to US 31

and will not have direct access in the future. The census block north of US 20 is outside the study area. Data from the census reports were verified by discussion with St Joseph and Marshall counties planning staff and field observations. Based on this information, the residential displacements from any of the alternatives do not disproportionately impact any minority or low-income populations. Moreover, based upon this information, none of the neighborhoods or communities identified in or adjacent to Alternatives Cs, Es and G-C have been recognized as containing a high percentage of low-income or minority populations.

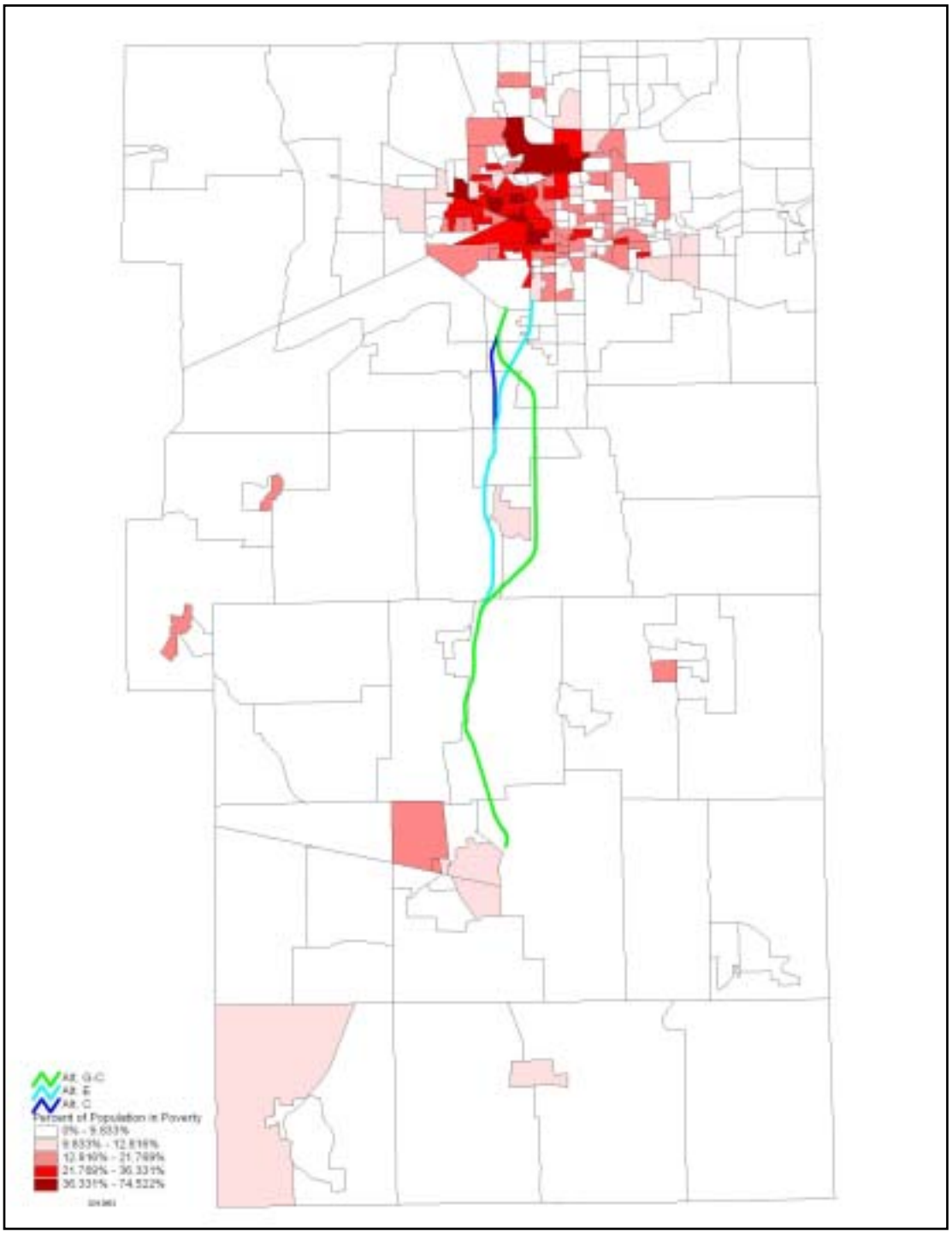


Figure 5.3.1: Low-income Households in Relation to the Proposed Alternatives

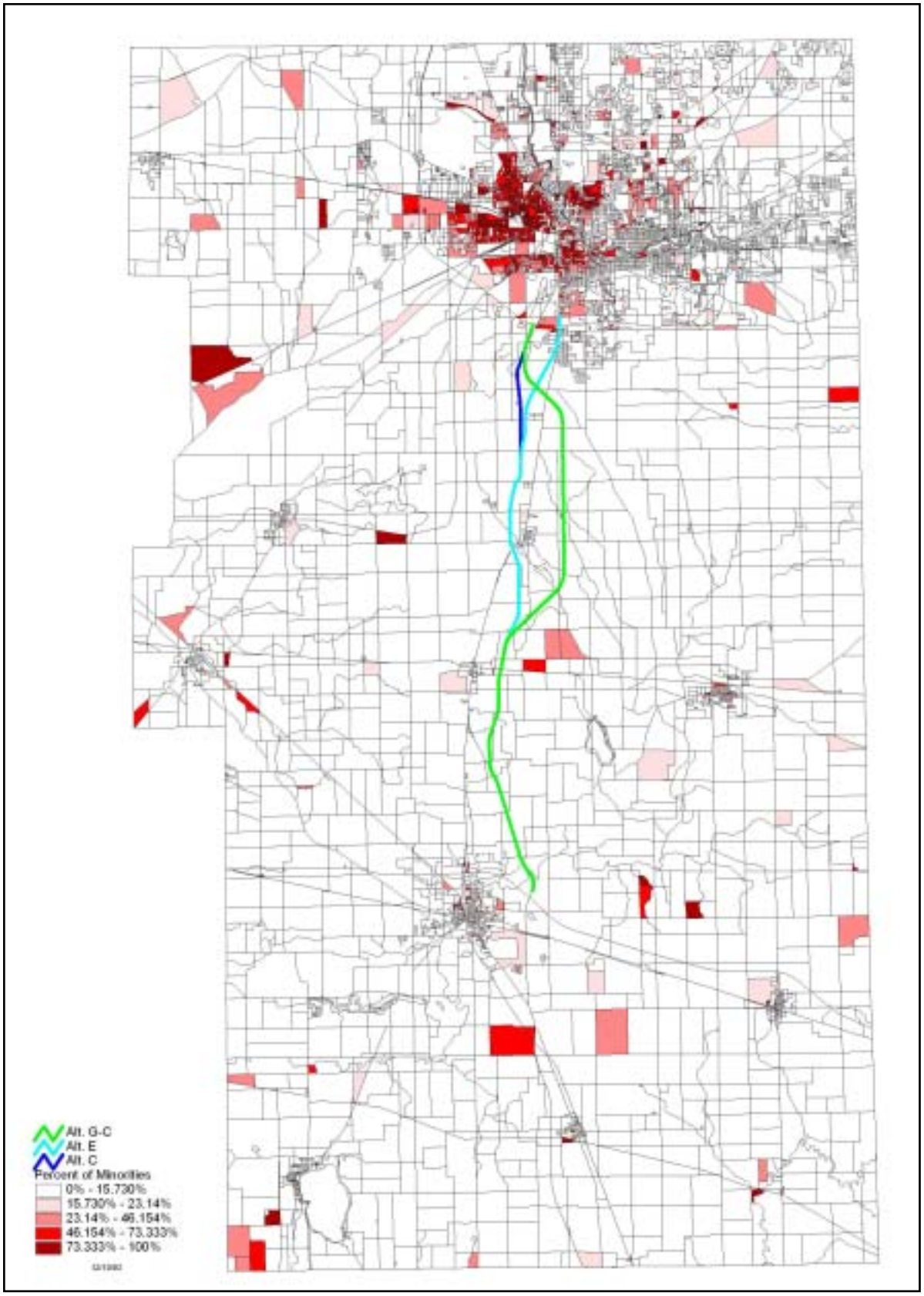


Figure 5.3.2: Proposed Alternatives in Relation to Areas with Concentrations of Minorities

5.4 Community Facilities and Services

5.4.1 Schools

The No-Build Alternative will have no impact on the various schools within the project area. Impacts to the school systems and specific schools from the alternatives are discussed below:

Plymouth Community School Corporation

Alternatives Cs, Es, G-C: The loss of access to US 31 at West 7B Road and Plymouth-Goshen Trail may result in the rerouting of some school bus routes. Buses will continue to have access across US 31 at this location.

Coordination with the Superintendent of the Plymouth Community School Corporation indicates all of the US 31 alternatives are east of the City of Plymouth and would have no impact on the school system's facilities or bus routes. The school system is planning expansions in the future, but all expansions will be in the greater Plymouth area and have no effect on the US 31 project.

Union-North United School Corporation

Alternatives Cs, Es, G-C: The alternatives pass approximately one mile east of the Laville Elementary and Laville Junior/Senior High School. There are not expected to be any direct impacts to these schools. Indirect impacts would include the alteration of bus routes and changes in access to the new facility. An interchange is not proposed at Tyler Road at this time, although buses will be able to cross US 31 on Tyler Road. Access to the new facility for school buses would be at US 6 or at Pierce Road.

Coordination with the Superintendent of the United-North United School Corporation indicates there are no plans to add or improve the Laville Elementary School or Jr.-Sr. High School. None of the alternatives would result in direct impacts to any of the school buildings in this school system; however, there will be indirect impacts associated with the current bus routes. The buses for this school system gain access to and from the schools via crossing US 31. They rely heavily on most of the existing access roads. The Superintendent expressed concern that access would no longer be available at some of the existing roads and stressed the need for access to both the east and west sides of US 31. Following construction of the new facility, the existing US 31 would still be available to school buses for use as a local road in the areas where the new facility follows a different alignment. Interchanges or overpasses will be available at the major east-west roads along the freeway facility. While there are no direct impacts to any of the Union-North United School Corporation buildings, bus routes would likely need to be revised following construction of the new facility.

South Bend Community School Corporation

Alternative Cs and G-C are both located approximately one mile west of Forest Hay Elementary and Andrew Jackson Middle School. Indirect impacts would include the alteration of bus routes and changes in access to the new facility. Access to the new facility for school buses would be at Kern Road.

Alternative Es will utilize existing US 31 right-of-way between Kern Road and US 20. It is expected that the new US 31 facility would have frontage roads on either side in the area north of Kern Road. This should reduce some of the indirect impacts to Forest G. Hay Elementary, which is located approximately 1,300 feet east of US 31 on Johnson Road. Buses will have access to the new facility at Kern Road and will be able to cross US 31 on other major roadways.

Coordination with the Assistant Superintendent of the South Bend Community School Corporation indicates that no new school buildings are currently planned. However, that based on development trends in the South Bend area, it is anticipated that sometime in the future the school system may consider the construction of a new school. The US 31 project would not interfere with the placement of this building. The Assistant Superintendent anticipates there will be no more than minimal impact on bus transportation routes, regardless of the alternative selected, and it appears there will be sufficient east-west traffic routes across the proposed US 31.

St. Jude School

St. Jude School is located directly across from Forest G. Hay Elementary School on Johnson Road. Impacts to the school will be the same as those described above for Hay Elementary. St. Jude is a private catholic school and does not provide bus service to the school at this time.

5.4.2 Churches

The No-Build Alternative will not have any impacts to area churches. There is one church that will likely be acquired by all alternatives. The New Philadelphia Church located on the south side of US 6 approximately one mile east of US 31 would likely be acquired by the placement of an interchange at this location. This church is housed in a former office building and it appears that they may have sufficient acreage at this site to construct a new church facility just west of the existing building.

The Southlawn United Methodist Church located on the east side of US 31 north of Kern Road is not expected to be displaced by Alternative Es. The new facility will tie into the existing US 31 right-of-way just north of the church property. Access to the church would still be available from the proposed frontage roads along the new facility.

5.4.3 Cemeteries

There would be no impacts to cemeteries within the project area from any of the alternatives or from the No-Build Alternative. Some of the preliminary alternatives that were considered for this project impacted Southlawn Cemetery on US 31 south of Kern Road and White Cemetery in Marshall County. The alternatives have been shifted to avoid impacting these cemeteries.

5.4.4 Libraries

There would be no impacts to libraries within the project area from any of the alternatives or from the No-Build Alternative.

5.4.5 Fire Stations, Police Stations, and EMS

There are no police or sheriff offices that would be impacted by any of the alternatives or by the No-Build Alternative. None of the alternatives would require the acquisition of any fire station or EMS facility. With any of the alternatives, there is potential for changes in emergency response times for police, fire and EMS. Overall, there is likely to be some improvement in response times along US 31 with the elimination of the traffic signals and back-ups along existing US 31. Any of the alternatives should improve safety along US 31 and result in a reduction in emergency calls.

The one fire station that would be indirectly impacted by this project is the Centre Township Fire Station located at Kern Road and US 31. Alternative Es would cross Kern Road approximately 1,000 feet west of the fire station.

An interchange would likely be constructed at this location, which should improve emergency response times for highway related accidents. Many of the emergency calls for the Centre Township Fire Department are directed to the west of the fire station since they serve portions of Greene Township. It would therefore be important for Kern Road to remain open for emergency vehicles during construction of the new facility.

5.4.6 Hospitals

There would be no impacts to hospitals within the project area from any of the alternatives or from the No-Build Alternative.

5.4.7 Public Parks and Recreation Areas

There are not expected to be any impacts to any public parks or recreation areas resulting from the alternatives. Alternatives Cs and Es will pass approximately 1,700 feet west of Newton Park on Pierce Road. This should not negatively impact this park, since it is currently located adjacent to US 31 and is already subjected to traffic noise from the existing facility. A more detailed discussion of Section 4(f) Resources can be found in Chapter 7.

5.4.8 Major Utilities

The No-Build Alternative would result in no impacts to major utilities within the project area. The alternatives will cross major electrical transmission lines, natural gas pipelines and petroleum pipelines. Most of the project area is not serviced by sanitary sewer systems or public water supplies, however there are sewer and water mains located near the north terminus and within the incorporated areas of Lakeville and LaPaz. In general, any of the alternatives would require the relocation of public and private utilities located above and below ground.

The locations of the major utility lines are depicted in Appendix A. Alternative Cs crosses five electrical transmission lines and three gas or petroleum pipelines. Alternative Es crosses three electrical transmission lines and two gas or petroleum pipelines. Alternative Es also crosses sewer and water mains in the area north of Kern Road. Alternative G-C crosses six electrical transmission lines and three gas or petroleum pipelines.

5.5 Farmland

Impacts to agricultural lands resulting from direct conversion to transportation use were assessed in terms of prime farmland impacts (Farmland Conversion Impact Rating system), total number of existing farmland acres converted, and the potential annual loss in crop cash receipts.

The U.S. Department of Agriculture oversees the Farmland Protection Policy Act (FPPA). The Act's ultimate goal is to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to non-agricultural uses. The FPPA establishes the protocol and criteria to be used by federal agencies to (a) identify and take into account the adverse effects of their programs on the preservation of farmland, (b) consider alternative actions, as appropriate, that could lessen adverse effects, and (c) ensure that their programs are compatible with state and units of local government and private programs and policies to protect farmland. The FPPA does not provide authority to withhold Federal assistance for projects that convert farmland to non-agricultural uses.

For the purposes of implementing the FPPA, farmland is defined as prime or unique farmlands or farmland that is determined by the State or unit of local government agency to be farmland of statewide or local importance (7 CFR 658.2(a)). The USDA, NRCS defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and that is available for these uses (i.e., land that could be cropland, pastureland, rangeland, forest land or other land). The NRCS generally identifies prime farmland in terms of the soil series and phase depicted as map units in each of the county soil surveys. In some instances, the series or a phase of the series is considered to be conditionally prime farmland only if it is drained, irrigated, or protected from frequent flooding.

Prime farmland does not include land already in or committed to urban development or water storage. Land utilized or designated for commercial, industrial or residential purposes is therefore, categorically excluded from consideration. However, since this land is not available for agricultural production, it is not regarded as prime farmland. In such cases, expansion of the existing right-of-way would not be considered an impact to prime farmland, regardless of the soil type.

The guidelines for evaluation of program or project compliance with the FPPA using the Farmland Conversion Impact Rating (Form AD 1006) system are outlined in 7 CFR 658.4. The NRCS is designated as the USDA agency responsible for providing assistance in the evaluation. Section 7 CFR 658.4(e) states that "[I]t is advisable that evaluations and analyses of prospective farmland conversion impacts be made early in the planning process before a site or design is selected, and that, where possible, agencies make the FPPA evaluations part of the National Environmental Policy Act (NEPA) process."

The methodology employed to assess the impact of each alternative on agricultural crop cash receipts follows the general outline provided in INDOT's Procedural Manual for Preparing Environmental Studies (1996). This approach looks at each county as an agricultural unit for which statistical data for production, cultivation, and commodity sales price can be averaged and used to calculate an annual crop loss estimate for acreages of farmland within each working alignment. All raw data used in this analysis was taken directly from the most recent three issues of the Indiana Agricultural Statistics (2000-2001 2001-2002 and 2002-2003). The latest three years of data available for acres of corn, soybean, wheat, popcorn and hay harvested in Marshall and St. Joseph counties was averaged as were the latest three years of production data (Table 5.5.14). Using the average acreage harvested and the average production, the average yield for each commodity was calculated. Average sale prices (dollars/bushel, dollars/pound or dollars/ton) were determined by averaging three years of statewide annual averages for each commodity (Table 5.5.15).

Table 5.5.14: Agricultural Harvest and Production Statistics for US31 Counties

		Harvested Area (acres) x1000				Production* X1000				Average Yield**
		2000	2001	2002	Average	2000	2001	2002	Average	
Marshall	corn	84.3	89.5	85.9	86.57	11167.4	13537.1	11014.5	11906.33	137.54
	soybeans	70.7	72.5	74.5	72.57	2989.5	3382.9	3201.7	3191.37	43.98
	wheat	4.3	3.0	3.0	3.43	263.3	177.1	148.4	196.27	57.17
	popcorn	2.3	2.3	2.3	2.34	6416.7	6416.4	6416.4	6416.51	2738.59
	hay	10.6	10.0	9.9	10.17	45.8	37.6	29.0	37.47	3.69
St. Joseph	corn	69.4	68.1	68.7	68.73	8994.1	9484.2	8640.6	9039.63	131.52
	soybeans	56.0	57.4	54.1	55.83	2256.5	2693.9	2144.5	2364.97	42.36
	wheat	3.5	0.0	0.0	1.17	230.8	0.0	0.0	76.93	65.94
	popcorn	0.2	0.2	0.2	0.24	620.2	620.2	620.2	620.20	2627.97
	hay	6.0	4.7	5.0	5.23	23.6	16.7	16.8	19.03	3.64

* corn, soybeans and wheat reported in bushels; popcorn reported in pounds; hay reported in tons

** corn, soybeans and wheat reported in bushels/acre; popcorn reported in pounds/acre; hay reported in tons/acre

Table 5.5.15: Average Crop Sales Prices for Indiana

Crop Type	1998-1999	1999-2000	2000-2001	Average
Corn	$2.11/bushel	$1.88/bushel	$1.85/bushel	$1.95/bushel
Soybean	$5.05/bushel	$4.71/bushel	$4.75/bushel	$4.84/bushel
Wheat	$2.36/bushel	$2.13/bushel	$2.10/bushel	$2.20/bushel
Popcorn	$0.091/pound	$0.090/pound	$0.098/pound	$0.093/pound
Hay	$88.00/ton	$91.00/ton	$86.00/ton	$88.33/ton

Because a certain percentage of farmland in a county is harvested as corn, a certain percentage is harvested as soybean and so on for wheat, popcorn and hay, these percentages for each county were applied to the farmland within the alignment of each alternative to reflect a proportional impact to each of these five principal farmland commodities. The five prorated percentages were calculated by taking the three-year average harvest acreage for each crop commodity and dividing it by the total three-year average harvest acreage for all four crops. Added together, the five prorated percentages for these crops within each county equal 100%. Calculating the dollar loss for each commodity within an individual county based on a specific farmland acreage purchase can then be achieved through the following equation:

$CCL_{com} = CFA \times CPF_{com} \times CYR_{com} \times SAP_{com}$

where:

CCL_{com} is the county crop loss for a specific commodity (dollars)

CFA is the county farmland area within the right-of-way (acres)

CPF_{com} is the county prorate factor for a specific commodity

CYR_{com} is the county yield rate for a specific commodity (bushels/acre of tons/acre)

SAP_{com} is the state average price for a specific commodity (dollars/bushel or dollars/ton)

Finally, the total crop cash receipt loss in dollars for each alternative was achieved by adding the appropriate commodity subtotals for each county and then adding the county subtotals (Table 5.5.16). To determine the annual percent loss in crop cash receipts for each county, the average annual crop cash receipts for Marshall and St. Joseph counties was determined using three years of recent data (Table 5.5.17). Using this county average data, the loss of crop cash receipts resulting from the direct purchase of farmland by each alternative can be translated into a percent loss for each county (Table 5.5.18).

Table 5.5.16: Agricultural Crop Cash Receipt Loss Estimates for US 31 Alternatives

County	Crop	Yield	Sales Price	Prorate Factor	Alternative Cs		Alternative Es		Alternative C-G	
					Acreage	Crop Loss (in dollars)	Acreage	Crop Loss (in dollars)	Acreage	Crop Loss (in dollars)
Marshall	Corn	137.54	$2.11	0.4945	220	$32,000	220	$32,000	232	$33,000
	Soybeans	43.98	$4.81	0.4145		$19,000		$19,000		$20,000
	Wheat	57.17	$2.57	0.0196		$630		$630		$670
	popcorn	2738.59	$0.09	0.0134		$750		$750		$790
	hay	3.69	$99.67	0.0581		$4,700		$4,700		$5,000
St. Joseph	corn	131.52	$2.11	0.5239	183	$27,000	186	$27,000	253	$37,000
	soybeans	42.36	$4.81	0.4256		$16,000		$16,000		$22,000
	wheat	65.94	$2.57	0.0089		$280		$280		$380
	popcorn	2627.97	$0.09	0.0018		$80		$81		$110
	hay	3.64	$99.67	0.0399		$2,600		$2,700		$3,700
County Subtotals	Marshall				220	$57,000	220	$57,000	232	$59,000
	St. Joseph				183	$46,000	186	$46,000	253	$63,000
Alternative Totals					403	$103,000	406	$103,000	485	$122,000

Table 5.5.17: Average Crop Cash Receipts for US 31 Counties

County	1999	2000	2001	Average
Marshall	$34,715,000	$33,481,000	$39,127,000	$35,774,333
St. Joseph	$39,770,000	$40,179,000	$43,939,000	$41,296,000

Table 5.5.18: Percent of Annual Crop Cash Receipt Loss for US 31 Alternatives

County	Average	Percent of Crop Cash Receipt Loss Through Direct Right-of-Way Conversion		
		Alternative Cs	Alternative Es	Alternative C-G
Marshall	$35,774,333	0.16	0.16	0.17
St. Joseph	$41,296,000	0.11	0.11	0.15
0 – 0.5%	0.5 – 1.0%	1.0 – 2.0%	2.0 – 3.0%	3.0%

Table 5.5.19 includes an itemized list of farmland acreage that would be impacted within each county and a summary of total estimated farmland, prime farmland, and crop cash receipt loss for each alternative. Figure 5.5.3 illustrates farmland acreage loss for each of the alternatives. Figure 5.5.4 illustrates the assessment of prime and statewide important farmland impacts. Figure 5.5.5 illustrates estimated crop cash receipt loss in dollars per year.

Table 5.5.19: Summary of Farmland Impacts for US 31 Alternatives

Counties	Farmland Conversions by County (acres)		
	Alternative Cs	Alternative Es	Alternative C-G
Marshall	220	220	232
St. Joseph	183	186	253
Total Farmland Acreage (acres)	**403**	**406**	**485**
Total Prime and State Important Farmland Acreage (acres)	**499**	**467**	**597**
Annual Crop Cash Receipt Loss (dollars)	**$103,000**	**$103,000**	**$122,000**

The No-Build alternative will have no impacts on agricultural resources. As is required by the Farmland Protection Policy Act, Form AD-1006 has been completed (Appendix K). The NRCS evaluation revealed that Alternative G-C would have the greatest impact to prime and statewide important farmland acreage (596.8 acres combined). Prime and state important farmland impacts for Alternative Es (467.1 acres combined) are slightly less than that for Alternative Cs (499.2 acres combined) by virtue of the fact that the alignment of Alternative Es connects back into the existing US 31 alignment south of US 20 in South Bend where the extent of land development in the area precludes consideration of the prime farmland soil types along US 31 as prime farmland. Combining the Land Evaluation Criterion and Site Assessment Criteria scores on Form AD-1006 yielded total point scores of 135 for Alternative Cs, 133 for Alternative Es and 138 for Alternative C-G. As stated in 7 CFR Part 658.3, the USDA recommends that "sites receiving a total score of less than 160 be given a minimal level of consideration for protection and no additional sites be evaluated." Since each of the alternatives considered in the project received a total point value less

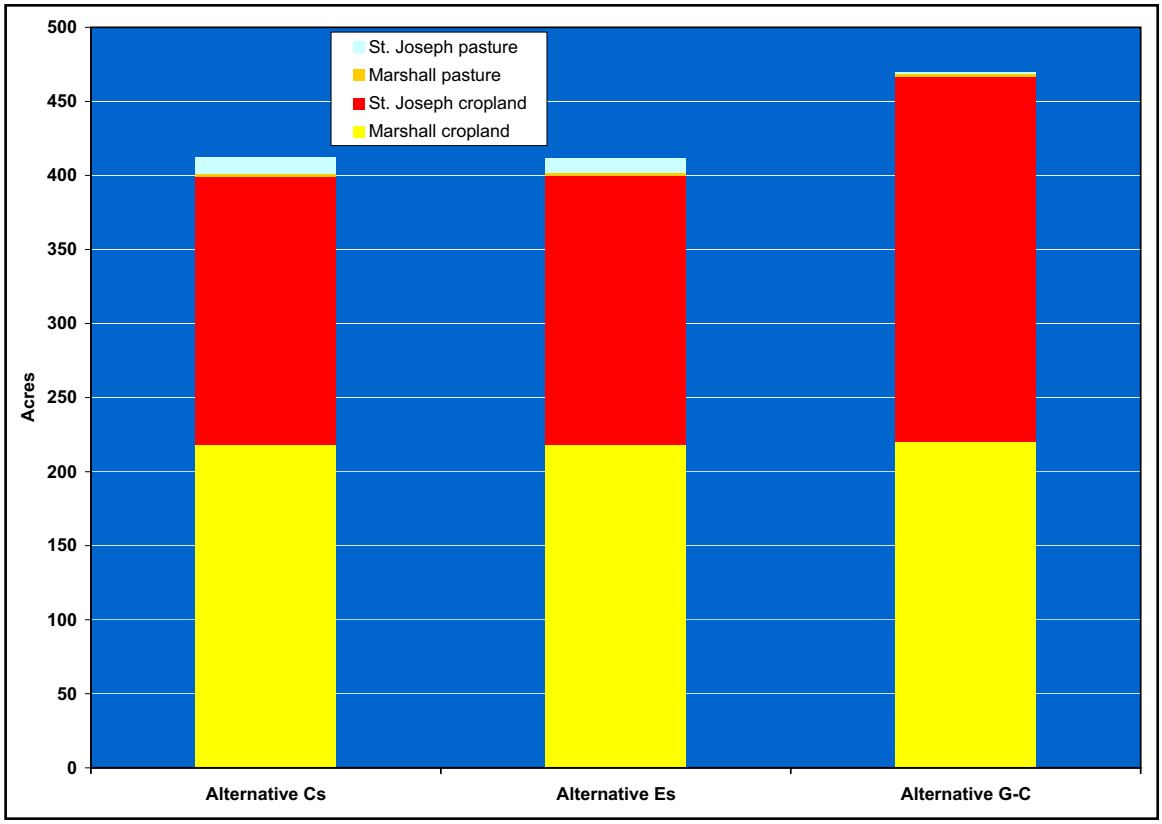


Figure 5.5.3: Total Farmland for US 31 Alternatives

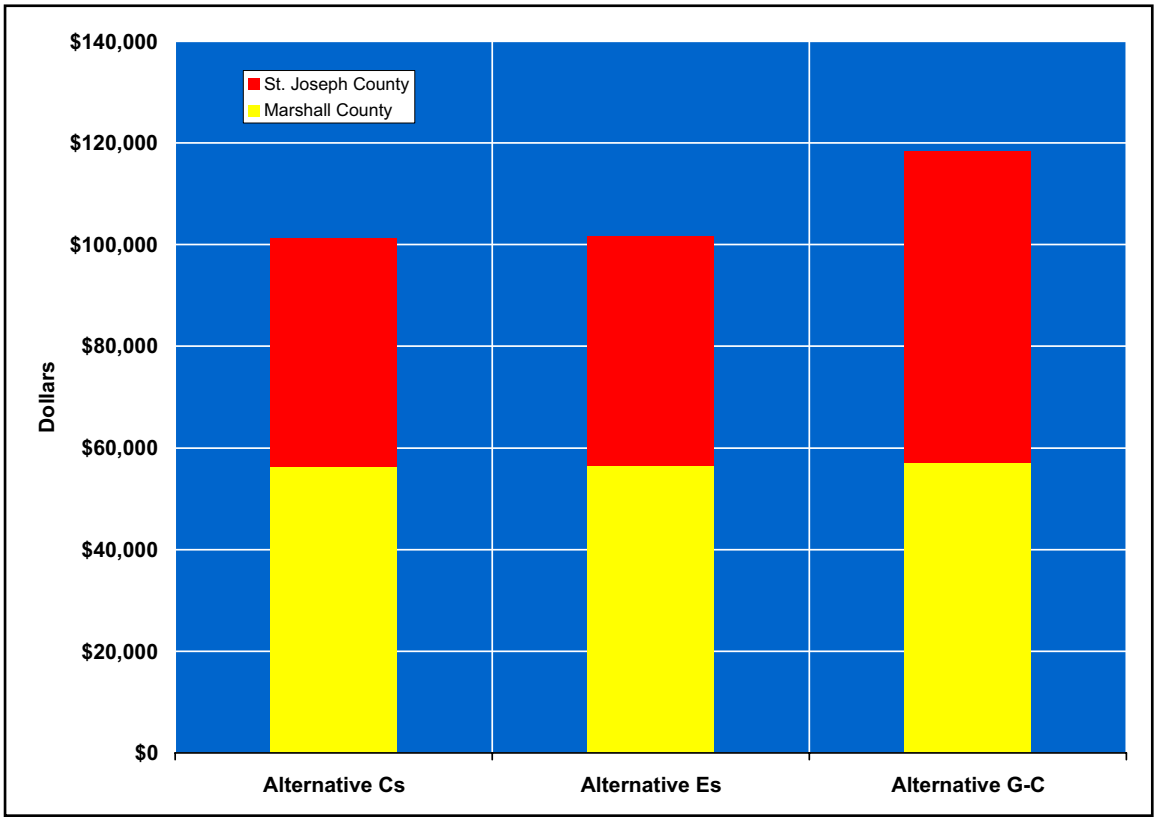


Figure 5.5.4: Total Prime Farmland Area for US 31 Alternatives

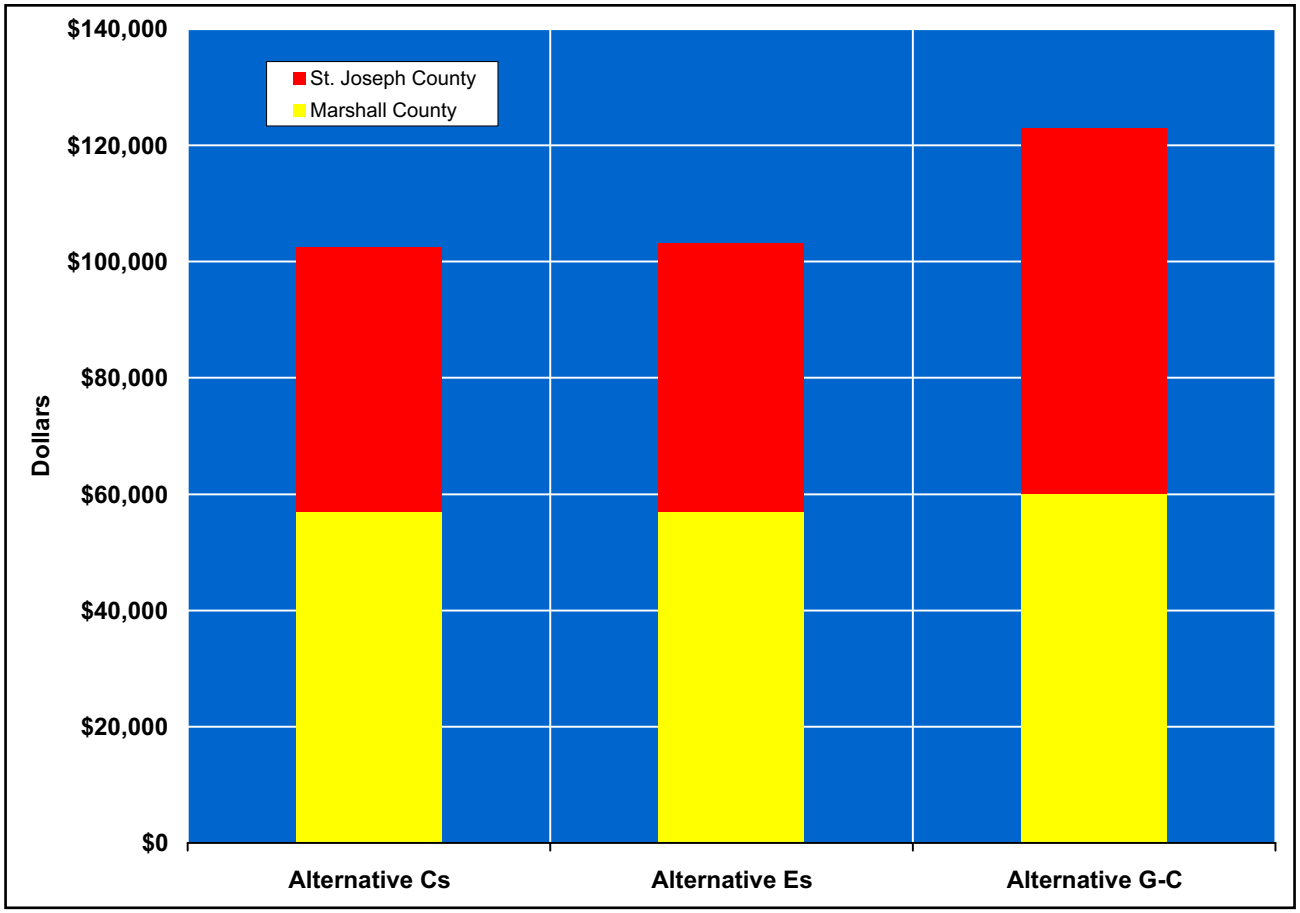


Figure 5.5.5: Annual Crop Cash Receipts Loss for Marshall and St. Joseph Counties for US 31 Alternatives

than 160 points, none will receive any further consideration for farmland protection. No other alternatives other than those already discussed in this study will be considered without a re-evaluation of the project's potential impacts upon farmland.

Based on a field assessment of land use and photo interpretation, it was determined that Alternative G-C would directly impact an estimated 485 acres of cropland and approximately two acres of pasture. This constitutes 49% of the proposed estimated right-of-way (998 acres) for this alternative. Alternatives Cs and Es would require approximately 403 and 406 acres of cropland, respectively, and roughly 12 to 14 acres of pasture. Although the impacted acreage for Alternatives Cs and Es is 16% to 17% less than that expected for Alternative G-C, it still represents 42% to 45% of the total require right-of-way for these alignments.

For the southern 4.4 miles of each alternative from US 30 up to just south of 4A Road in Marshall County the alignment follows along US 31 and is therefore expected to require only narrow linear strips of farmland property along both sides of existing facility. From this point northward to just south of the county line (Tyler Road) all three alternatives continue to share a common alignment on new terrain through Marshall County crossing portions of an estimated 18 farm fields, 16 of which would be bisected. In several instances these fields would be crossed at skewed angles to the property boundaries, increasing the potential for point rows. As Alternative Cs continues northward across existing US 31 and up to the proposed interchange with US 20, this alignment would cross an additional 26 farm fields, 12 of which would be fragmented or bisected to some degree. Likewise, Alternative Es would involve an additional 30 farm field encroachments in St. Joseph County up to the proposed Kern Road interchange. Sixteen

of these fields would be split by the alignment. Alternative G-C would cross an additional 34 farm fields along its alignment up to the proposed US 20 interchange, 22 of which involve fragmenting. Despite the higher farmland acreage estimate for Alternative G-C, this route would reduce the creation of point rows along a 5-mile segment of the alignment paralleling Kenilworth Road between Riley Road and just north of Madison Road.

The total estimated annual loss in crop cash receipts for Marshall and St. Joseph counties would be greatest for Alternative G-C at approximately $122,000 a year. The reductions anticipated as a result of Alternatives Cs and Es are the same at $103,000 each. Since all three alternatives share nearly all of their alignment through Marshall County, the annual crop cash receipt loss for this county would essentially be the same in this county regardless of alternative.

5.6 Historic and Archeological Resources

5.6.1 Historic Resources

An effect is defined as the "alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility to the National Register" [36CFR 800.16(i)]. A finding may be: no historic properties affected (no historic properties present or there are historic properties but none are affected) or historic properties affected (no adverse effects or adverse effects) [36CFR Part 800.4(d)].

According to CFR 800.5 (a)(2), "adverse effects include but are not limited to:

i. Physical destruction or damage to all or part of the property;

ii. Alteration of the property including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's standards for the treatment of historic properties and applicable guidelines;

iii. Removal of a property from its historic location;

iv. Change of the character of the property's use or of physical features within the property's setting that contribute to its historic features;

v. Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;

vi. Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and

vii. Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance."

National Register Properties

There are two properties in the study area already listed in the National Register of Historic Places (NR): Evergreen Hill and Lakeville High School.

Evergreen Hill (circa 1873) 59449 Keria Trail
Architectural Style: Italianate **Criteria:** A and C

Evergreen Hill includes an Italianate-style residence (circa 1873) that has both an older rear portion which may have been the original building and a modern addition, an English barn, a large frame shed, smaller frame structure, smokehouse, and an additional outbuilding that was once a corncrib and is now a small cottage. There is also a cemetery just west of the house and a new, non-contributing garage. The thirty-eight acre farm retains its original rural context. The two-story Italianate residence has a cruciform plan, low-pitched hipped roof, original two-over-two windows, wood storm windows, window hoods, paired cornice brackets, and porch trim. The house has had additions, but they do not detract from the integrity of the building. The interior of the house has a number of original features, including original wood flooring, window shutters, stairway, interior doors, and wood trim.

The English barn rests on a stone foundation on one side and a newer concrete block foundation on the western half. It is covered in vertical wood siding and has several arched, louvered openings on its façade.

Peter Rupel purchased the property in 1831 and both he and his wife Christena are buried in the cemetery behind the house. The Rupels were St. Joseph County pioneers who settled on this farm, which was originally located near Rum Village, a Native American settlement. The original farm was eighty-acres but has been reduced over time to thirty-eight acres. Thirty-four acres are protected by a preservation easement held by Historic Landmarks Foundation of Indiana, Inc. Evergreen Hill was listed in the NR in 2001 and is shown in Figure 5.6.6.

Figure 5.6.6 Evergreen Hill National Register Property

Alternative Cs

Direct Effect: Evergreen Hill is located 1,110 feet from Alternative Cs at its nearest point; no permanent or temporary use of the property will be required.

Visual Effect: The interchange at US 20 will be lighted and may be elevated approximately 24 feet above grade of the present highway.

Evergreen Hill encompasses approximately 38 acres. From much of Evergreen Hill, even from the second floor of the residence, the undertaking likely will not be visible. Trees even mask Ireland Road from the much of the property. However, the undertaking (the ramps or maybe elevated interchange at US 20) will be seen from the eastern boundary of the property. Presently, the eastern property boundary overlooks industrial buildings, storage tanks, and the route of US 20.

At night, Evergreen Hill presently experiences light intrusion, especially to the south in the winter when trees in the wooded areas of Evergreen Hill and surrounding areas are barren of leaves. Many of the businesses along Ireland Road have security lighting; these lights are visible through the trees. The lights from the Clear Seal facility, which is located south of the intersection of Keria and Ireland, present the most prominent lighting intrusion at night. However, to the north of the property, there are only scattered lights, mostly from security lights at nearby homes and a church. There may be climatic conditions that affect lighting at various times.

Auditory Effect: Two points were modeled, one at the southeastern corner of the property and one at the southwestern corner of the property. From the southeastern point, with the centerline 1,646 feet away and the exit ramp 1,366 feet away, the predicted noise level (Leq) would be 56.8 dBA. From the southwestern point, with the centerline 1,981 feet away and the exit ramp 1,638 feet away, the predicted noise level would be 55.3 dBA.

Alternative Es

Direct Effect: The property is located more than 4,000 feet from Alternative Es; no permanent or temporary use of the property will be required.

Visual Effect: The undertaking is too far distant from the property to be seen; there are buildings and other natural features to obscure it.

Auditory Effect: With the undertaking more than 4,000 feet from the property, noise levels experienced at the property would not approach or exceed the 67 dBA Noise Abatement Criteria (NAC), nor result in a substantial increase of 15 dBA above ambient levels due to highway traffic on Alternative Es.

Alternative G-C

Direct Effect: The property is located more than 1,110 feet from the undertaking; no permanent or temporary use of the property will be required.

Visual Effect: The interchange at US 20 will be lighted and may be elevated approximately 24 feet above grade of the present highway.

Evergreen Hill encompasses approximately 38 acres. From much of Evergreen Hill, even from the second floor of the residence, the undertaking likely will not be visible. Trees even mask Ireland Road from the much of the property. However, the undertaking (the ramps or maybe elevated interchange at US 20) will be seen from the eastern boundary of the property. Presently, the eastern property boundary overlooks industrial buildings, storage tanks, and US 20.

At night, Evergreen Hill presently experiences light intrusion, especially to the south in the winter when trees in the wooded areas of Evergreen Hill and surrounding areas are barren of leaves. Many of the business along Ireland Road have security lighting; these lights are visible through the trees. The lights from the Clear Seal facility, which is located south of the intersection of Keria and Ireland, present the most prominent visual intrusion at night. However, to the north of the property, there are only scattered lights, mostly from security lights at nearby homes and a church. There may be climatic conditions that affect light intrusions at various times.

Auditory Effect: Two points were modeled, one at the southeastern corner of the property and one at the southwestern corner of the property. From the southeastern point, with the centerline 1,646 feet away and the exit ramp 1,366 feet away, the predicted noise level would be 60.0 dBA. From the southwestern point, with the centerline 1,981 feet away and the exit ramp 1,638 feet away, the predicted noise level would be 59.4 dBA.

Lakeville High School (1931) 601 North Michigan Street, Lakeville
Architectural Style: Gothic Revival **Criteria:** A and C

Constructed in 1931 Lakeville High School is a two-story, brick building in simple Collegiate Gothic style and a "T"-plan. The symmetrical façade has a centered, projecting entry bay with central tower and two long wings. Towers have stone quoins and stone caps along the roofline parapet. The central bay cap resembles an open book and above the central entry is bas-relief calligraphy that reads: "Lakeville High School."

The interior retains many of its original features, including terrazzo floors in hallways, and maple floors in classrooms, brick wainscoting, and wooden classroom doors with multi-pane glazing. Lakeville High School was built in 1931, following the school consolidation acts in 1899 and 1907; it is the most intact consolidated high school remaining in St. Joseph County. The building retains significant architectural integrity and represents an important period in Indiana education. The Lakeville High School, which was listed in the NR in 1991, is presently a community center known as the Old Lakeville School Project, and is shown on Figure 5.6.7.

Alternative Cs

Direct Effect: The property is 2,562 feet from the undertaking; according to present corridor location, no permanent or temporary use of the property will be required.

Visual Effect: Looking from the property to the undertaking, modern housing, trees, and an athletic field mask the undertaking. The undertaking, especially the elevated interchange at SR 4, will be visible, but less so than the present highway.

The interchange at SR 4 will be lighted but it will be somewhat attenuated by the lighting of the athletic field/community activity located between Lakeville High School and the interchange.

Auditory Effect: Modeling was not done for this site due to its distance of nearly one half mile from Alternative Cs. Reduction in residual traffic volumes on existing US 31 due to this alternate would in effect result in anticipated noise levels below the 68.2 dBA predicted for 2030 No-Build conditions.

Figure 5.6.7 Lakeville High School National Register Property

Alternative Es

Direct Effect: The property is 2,562 feet from the undertaking; no permanent or temporary use of the property will be required.

Visual Effect: Looking from the property to the undertaking, modern housing, trees, and an athletic field mask the undertaking. The undertaking, especially the elevated interchange at SR 4, will be visible, but less so than the present highway.

At night, the interchange at SR 4 will be lighted but it will be somewhat attenuated by the lighting of the athletic field/community activity located between Lakeville High School and the interchange.

Auditory Effect: Modeling was not done for this site, due to its distance of nearly one half mile from Alternative Es. Reduction in residual traffic volumes on existing US 31 due to this alternate would, in effect, result in anticipated noise levels below the 68.2 dBA predicted for 2030 No-Build conditions.

Alternative G-C

The property is not in the APE for Alternative G-C.

Eligible Properties:

Throughout the identification and evaluation efforts, project historians and consulting parties worked closely. Consultations included telephone calls and/or meetings with Jeanne Geyer in St. Joseph County, members of the South Bend and St. Joseph County Historic Preservation Commission (HPC), Historic Landmarks Foundation of Indiana, the Marshall County Historian, and the Wythougan Valley Preservation Council, Inc. Two consulting party meetings were held, the first on June 6, 2003 to discuss the Area of Potential Effects and to solicit input regarding historic properties, and the second on September 4, 2003 to discuss eligibility.

During the investigation of historic properties in the Study Area, consultants identified eight properties eligible for the NR. A Historic Property Report was submitted to the State Historic Preservation Office (SHPO) on August 19, 2003. (See the Appendix for letter of concurrence.) However, through subsequent changes to the route of the alternatives three of these properties, the Peter Schafer Farmstead, the Conrad Schafer Farmstead, and the Court Farm, are no longer located in the APE.

Cover House (circa 1920) 20909 Ireland Road
Architectural Style: Prairie **Criterion:** C

Rated Notable in the county *Indiana Historic Sites & Structures Inventory,* the Cover House is the best example of an architect-designed, Prairie-style house with significant architectural integrity in Centre Township. Other Prairie-style houses in the township are a more common version known as the American Foursquare. The Cover House demonstrates signature elements of the style developed by Frank Lloyd Wright. Upscale examples appear in Midwestern cities and vernacular versions became popular in the 1920s through the medium of pattern books. This style is one of only a few indigenous to American architecture.

Setting is not key to the eligibility of the Cover House; it was moved in 1975 from its original location at Chippewa and US 31. The Cover House was the home and laboratory of inventor Harvey S. Cover. Cover, who worked in a flourmill as a young man, developed a respirator for use in dust-saturated environments in 1894. The respirator became standard equipment in numerous factories around the world and in some diamond mines in South Africa. Cover helped develop a WWI gas mask and one of his ideas led to the development of the face shield used by firemen. The Cover House is shown in Figure 5.6.8.

Figure 5.6.8: Cover House Property

Alternative Cs

Direct Effect: The property is located 912 feet from the undertaking; no permanent or temporary use of the property will be required.

Visual Effect: Buildings and terrain may mask much of the undertaking, especially in the summer. In the evening, lights associated with modern industrial buildings along Ireland Road, especially from the Clear Seal facility, provide light intrusion to the present setting.

Auditory Effect: Modeling has not been done for this site. Traffic on US 20 and Ireland Road presently contributes to the ambient noise at this property.

Alternative Es

Direct Effect: The property is located nearly one mile from the undertaking; no permanent or temporary use of the property will be required.

Visual Effect: Buildings and terrain will mask much of the undertaking.

Auditory Effect: Modeling has not been done for this site since the undertaking is nearly one mile from the property.

Alternative G-C

Direct Effect: The property is located 912 feet from the undertaking; no permanent or temporary use of the property will be required.

Visual Effect: Buildings and terrain will mask much of the undertaking, especially in the summer. In the evening, lights associated with modern industrial buildings along Ireland, especially from the Clear Seal facility, provide light intrusion to the present setting.

Auditory Effect: Modeling has not been done for this site. Traffic on US 20 and Ireland Road presently contributes to the ambient noise at this property.

Emil Johnson House (circa 1914) 60717 Locust Road
Architectural Style: Tudor Revival **Criterion:** C

The Emil Johnson House is the best example of a Tudor Revival-style house of the three in Centre Township; it demonstrates distinctive characteristics of a type and period of construction. The Emil Johnson House is shown in Figure 5.6.9. Rated Outstanding in the *Indiana Historic Sites & Structures Inventory*, the house captures many of the design elements of the Arts and Crafts period in its leaded windows in geometric shapes and the use of contrasting colors and textures to accentuate those elements. An original iron fence separates the house from the road. Brick piers topped by lampposts that, purportedly, came from the Twickingham Bridge in South Bend define the entrance to the property. Setting is not key to the integrity of this property.

England's William Morris and his contemporaries influenced the Arts and Crafts style, which was popular in the United States from 1895 to around 1920. The Arts and Crafts movement in America resulted in a revival of simple English house styles, including Tudor Revival styles and the bungalow, as well as the introduction of the purely American Prairie School style and a wider distribution of the Spanish Mission style. Arts and Crafts era interiors were focused on the beauty inherent in the building materials rather than elaborate, but mass-produced, millwork of earlier periods. Interiors from this period usually featured dark-stained or fumed oak woodwork and floors intended to match perfectly the dark oak, mission-style furniture made popular in the era by Gustav Stickley and his brothers.

Alternative Cs

Direct Effect: The property is located 1,556 feet from an interchange; no permanent or temporary use of the property will be required.

Visual Effect: Modern housing and trees will obscure the undertaking somewhat; the elevated interchange at Kern Road will likely be visible. Kern Road will experience some increase in traffic.

Auditory Effect: The model point for this property was located on the eastern edge of the property at a distance of 1,918 feet to the centerline. Ambient noise was not taken at this exact location but at the nearest location, it was 44.6 dBA. According to noise modeling data, it appears that noise levels would range from 50.3 to 52.1 dBA in 2030 and would therefore be below 66 dBA and not represent a substantial increase (/15 dBA) above existing ambient levels.

Alternative Es

This property is not located in the APE of Alternative Es.

Figure 5.6.9: Emil Johnson House Property

Alternative G-C

Direct Effect: The property is located 2,116 feet from an interchange; no permanent or temporary use of the property will be required.

Visual Effect: Modern housing, trees, and rolling terrain will obscure the undertaking. Kern Road will experience some increase in traffic.

Auditory Effect: The model point for this property was located on the eastern edge of the property at a distance of 2,335 feet to the centerline. Ambient noise was not taken at this exact location but at the nearest location, the ambient noise level was 44.6 dBA. According to noise modeling data, it appears that noise levels would range from 46.1 to 47.8 dBA and would therefore be below 66 dBA and not represent a substantial increase (/15 dBA) above existing ambient levels.

Ullery/ Farneman House (circa 1855) 61191 U.S. Highway 31
Architectural Style: Italianate **Criterion:** A

The Ullery/ Farneman House is associated with the families of Ullery and Farneman and their role in the early history and settlement of the local community. Ullery and Farneman were notable figures in local history, both mentioned in a number of printed histories. Built circa 1855 and rated Notable in the county *Indiana Historic Sites & Structures Inventory*, the two-story, simple brick Italianate dwelling retains its integrity. True to its Italianate styling, second-floor rooms are decidedly shorter than are the more formal rooms on the first floor. A new kitchen and bathroom in the 1870s rear addition are modern alterations.

The attractive Italianate house, probably built by Ullery before deeding the property to his daughter Barbara and her husband Joseph Farneman, was undoubtedly a landmark on the Michigan Road. Joseph Ullery and his wife Catherine were pioneer settlers in St. -Joseph County who migrated from Pennsylvania to Ohio to Indiana. Ullery's family settled on land near current-day St. Mary's in St. Joseph County in 1836, the same year that St. Joseph County was formed. Ullery had purchased nearly 1,000 acres in the vicinity as early as 1831. He brought his family to Palmer's Prairie in 1838. South Bend was in proximity, only being a few miles distant so Ullery had a close and ready market for his crops. The first home on the property was likely a cabin; the extant home was built just before the Civil War and it was here that soldiers reportedly gathered before heading south to be mustered in at Indianapolis.

Figure 5.6.10: Ullery/Farneman House Property

The simple Italianate house is similar to those Andrew Jackson Downing popularized in his pattern books of the mid-nineteenth century. It was the style of choice for the upper middle class, such as a prosperous farmer, during the 1850s to the 1880s. This particular example of Italianate architecture is one of the earliest in a county ripe with Italianate houses. The Ullery/Farneman House is more modest in ornamentation than many of the other Italianate homes found in St. Joseph County. The location of this house is shown in Figure 5.6.10.

The Ullery and Farneman families continued to be prominent in the area during the nineteenth century. Records indicate that Joseph and Barbara Farneman were deeded the property in 1866. Ullery continued to live at the home until his death at over 90 years of age in 1869; the 1875 atlas shows Joseph Farneman as the owner of record. Farneman achieved some local renown. He was active in the first St. Joseph County Agricultural society along with Schuyler Colfax (the former vice-president of the United States) and others.

Alternative Cs

Direct Effect: The property is located more than one mile from the undertaking; no permanent or temporary use of the property will be required.

Visual Effect: Rolling terrain, trees, and buildings will prevent one from viewing the undertaking from the property.

Auditory Effect: Modeling was not done for this site, due to its distance of more than one mile from Alternative Cs.

Alternative Es

Direct Effect: There will be no direct effect since the undertaking is 288 feet from the property boundary.

Visual Effect: The property of the Ullery/ Farneman House currently abuts US 31. Automobile and truck traffic along US 31 are a feature of the present landscape. Currently in the evening rush hour, traffic (vehicles with lights) two lanes wide and traveling north backs up on US 31 south of the Ullery/ Farneman House.

With the proposed Alternative Es, trees and modern housing will obscure much of the undertaking as it passes to the rear of the property at a distance of 288 feet; according to current plans, a barrier of trees will not be removed as part of this project. However, even with these trees and modern housing, the interchange at Kern and the undertaking will be visible from some portions of the property.

There is some light intrusion presently from a gasoline station, a fast food franchise, and lighted intersection at the corner of Kern and US 31, as well as from nearby security lights and traffic along US 31.

Auditory Effect: Two model points were established for this property, one at the western side of the property boundary with the shortest distance to the centerline of 494 feet and the second model point, just to the east of the front door of the house. For the base year of 2002, the noise levels near the front door were modeled at 70.4 dBA (with US 31 at a distance of 130 feet from the front door); for the design year 2030 with the No-Build Alternative, the modeled noise levels at the front door location are predicted to be 72.1 dBA. For Alternative Es, the 2030 noise levels on the property would range from 64.8 dBA at the back of the property to 65.2 dBA near the front door.

Alternative G-C

Direct Effect: The property is located 4,605 feet from the undertaking; no permanent or temporary use of the property will be required.

Visual Effect: Rolling terrain, trees, and buildings will prevent one from viewing the undertaking from the property.

Auditory Effect: Modeling was not done for this site, due to its distance of nearly one mile from Alternative G-C.

Francis Donaghue Farmstead (circa 1861) 63049 Turkey Trail
Architectural Style: Italianate **Criterion:** C

The Francis Donaghue Farmstead contains an excellent example of a brick, high-style Italianate residence in a rural context in Centre Township. Rated Notable in the *Indiana Historic Sites & Structures Inventory*, the farmstead consists of a residence, barn, poultry house, garage, privy, windmill, and well house. The landscape of the agriculture-related portion of the property contains a poultry house, and a bank barn sited in an unusual fashion for this area. The barn and poultry house are situated closest to Turkey Trail, reportedly an old Native American trace, and the house farthest from the road.

The house a two-story, red brick dwelling with modern additions to the western (rear) and northern elevations, is noteworthy. Built circa 1870, the façade has three bays: a center bay containing the main entry and a paired window in the second story flanked by bays with windows in the first and second stories. A large one-story, full-width, porch dominates the façade. Large ornate brackets and dentil detail accentuate the roof-wall junction below the eaves. Paired porch columns and other elements of the porch replicate the bracket and dentil detail of the cornice. Single wreath-like elements connect the capitals of the columns to visually create three arches across the porch front; arches also appear in the second-story window units.

Like the Ullery/Farneman House, Donaghue's home embraces the Italianate style popularized by Andrew Jackson Downing in his pattern books of the mid-nineteenth century. Italianates were a high style choice for the upper middle class in the 1850s to the 1880s and especially popular among the more affluent farmers of St. Joseph County;

Donaghue would certainly have counted himself in that company. The farmstead projects his affluence.

Setting is important to the integrity of this farm. Presently, it is located along Turkey Trail in a rural, if not historic, context. The location of this property is shown in Figure 5.6.11.

Figure 5.6.11: Francis Donaghue House Property

Alternative Cs

This property is not located within the APE of Alternative Cs.

Alternative Es

This property is not located within the APE of Alternative Es.

Alternative G-C

Direct Effect: The undertaking will be located 2,231 feet from the nearest property boundary; no permanent or temporary use of the property will be required.

Visual Effect: This property is located along Turkey Trail, one of the oldest routes of travel through this area that likely dates to the Native American era. On this trail, Frances Donaghue chose to build his family farm. Today, to the east-southeast there is some scattered modern housing along Miller Road and a modern home across Turkey Trail, but the area retains much of its rural, if not historic, setting.

To the west of the property along the route of the proposed undertaking, the terrain is relatively flat. Tree lines marking fields may partially obscure the undertaking at ground level. However, the undertaking likely will be visible from the second level of the residence and from the barn, which is sited on a modest rise along Turkey Trail.

Ambient lighting at night is minimal. To the north, the glow from lights in South Bend is visible, especially on evenings of low cloud cover. Most of the rural properties have security lights, which dot the darkness.

Auditory Effect: Miller Road, which passes to the south of the property, will become a cul-de-sac; traffic may not substantially increase along that road. (See map 5.6-6.) Predicted noise levels will range from 45.6 to 48.7 dBA at the western edge of the property, approximately 2,337 feet from the centerline.

W. O. Bunch Farm (circa 1880) 20538 Pierce Road
Architectural Style: Greek Revival **Criterion:** A

The W. O. Bunch Farm is the best example of a late-nineteenth-century, general-purpose Hoosier farm in Union Township in terms of its inventory of extant buildings and historic field patterns. Rated Notable in the county *Indiana Historic Sites & Structures Inventory*, the farm consists of a residence, barn, and collection of nine outbuildings dedicated to different farm functions. The bank barn, in this case a Pennsylvania German barn, is the center-

piece of the working elements of the farm. Outlined in white paint between the doors is a sign with the inscription, "W. O. Bunch Family Farm." A historical atlas (1875) shows A. (Americus) Bunch as the owner of a 70-acre farm in the exact location as the present farm.

As early as 1875, Americus and Sarah Bunch lived on this farm of approximately 80 acres. On this small farm, they raised nine children. Their daughter Lena May Bunch married Andrew Kreiger at the house and a photo of that wedding shows the house in the background looking very much as it does now (with the exception of the enclosed porch). Another daughter, Flora, married the son of neighbors John and Sophia Walz. Americus Bunch was a township trustee from 1893 to 1894. Americus died in 1901 and his wife Sarah died in 1907. The house remains in the family; a Bunch family descendant, William Strope, resides there currently.

Figure 5.6.12: W. O. Bunch Farm Property

The style and substance of the farm demonstrates their economic status. The house, outbuildings, and field patterns evoke a sense of a turn-of-the-century, general-purpose farm that raised cattle and a variety of crops, including wheat, corn, eggs, honey, and fruits, both for cash and to sustain the family. Interestingly, there is less demarcation between the woman's functions (home, honey house, and chicken house) and man's functions (barns, granary, etc.) than in other farmsteads viewed in the Study Area. The two worlds seem more commingled, which is atypical of late-nineteenth century life, perhaps this is more an indication of function than of cultural thought.

The farm buildings and outbuildings demonstrate the patterns of use of a late-nineteenth century farm. Limitations imposed by horse-drawn equipment created smaller field patterns. St. Joseph County farmers, such as the Bunches, also grew clover to use as fodder and to revitalize the land and they began crop rotation for this purpose in the mid-1860s. In 1874, Union Township, where the Bunch farm is located, was second only to Penn Township in acres of land in pasturage or meadow. Still, that year the township harvested over 36,000 bushels of wheat and over 70,000 bushels of corn. After Penn Township, Union was the highest producer of fruit and cider in the county and the highest producer of vinegar. Like his neighbors on other general farms, and unlike the dairy farmers in the county, the lack of specialization decreed a multitude of utility buildings, many of which are still extant.

Setting is important to the integrity of this farm. Presently, it is located on asphalt roadway without dividing lines. The land surrounding the farm is rural, but not historic. With the introduction of the interchange on Pierce, the rural setting will change. Figure 5.6.12 shows the location of this property.

Alternative Cs

This property is not located within the APE of Alternative Cs.

Alternative Es

This property is not located within the APE of Alternative Es.

Alternative G-C

Direct Effect: The interchange is approximately 1,880 feet to the east of the property boundary. The planned local road improvement project, the widening of Pierce Road, will likely have no direct impact if the improvement occurs to the north--rather than the south--side of the road.

Visual Effect: Traffic will increase on Pierce Road from 900 vehicles per day to 5,000 vehicles per day in the year 2030. In addition, there will be a change in the viewshed of the property with the introduction of a modern highway and an elevated, lighted interchange approximately 1,880 feet from the edge of the property.

Presently, as one looks across the relatively flat terrain to the location of the undertaking from the Bunch Farm, one sees pastures and to the east of Kenilworth, a row of modern houses (perhaps four or five). North of the intersection of Pierce and Kenilworth on the west side of Kenilworth is a similar row of post-war houses. Therefore, the viewshed, while not historic, is rural with scattered modern housing. At night, this area is very dark with a few scattered security lights.

Auditory Effect: Modeling indicates that noise levels at the eastern edge of the property would range from 54.7 to 55.3 dBA at a distance of 2,306 feet from the centerline. Traffic will increase on Pierce Road from 900 vehicles per day to 5,000 vehicles per day in the year 2030.

5.6.2 Archaeological Resources

Thirty-one previously recorded archaeological sites were identified within an area extending one mile on either side of the alignment. Within the alignment, Alternative Cs would impact two sites; Alternative Es would impact three sites; and Alternative G-C would impact two sites. These sites include two prehistoric habitations of unidentified cultural affiliation (12-Mr-308 and 318) and one historic farmstead (12-Sj-26), neither of which is considered eligible for listing in the National Register of Historic Places. Appendix I includes the archaeological records check. In addition, none of the historic cemeteries documented during this project were located in the alignments of the alternatives.

No archaeological surveys were conducted as part of the DEIS. However, due to the large size of the Study Area and the fact that a professional archaeologist has not surveyed the vast majority of this area, it is felt that there is a high potential for additional archaeological sites to be found. Therefore, a Phase Ia archaeological field reconnaissance will be conducted on the final chosen alternative and will be included in the FEIS.

5.7 Air Quality Impacts

There are two objectives to the air quality analysis. First, in accordance with NEPA, the air quality analysis provides information on the mobile source emissions associated with each alternative. Second, in accordance with Section 176(c) of the Clear Air Act, the air quality analysis will be used to demonstrate that the selected alternative is in conformity with applicable air quality plans.

Air quality impacts are both regional (i.e., meso-scale concerns) and local (i.e., micro-scale concerns) in scope. This chapter addresses both regional and local air quality concerns for the alternatives. Once an alternative has been chosen for more detailed study, conformity with the applicable State Implementation Plan (SIP) ozone emission budgets and national carbon monoxide standards will be demonstrated in the FEIS.

5.7.1 Comparative Analysis of Alternatives

5.7.1.1 Methodology

To assess the regional air quality impacts and demonstrate US 31 Improvement Project conformity, vehicle-miles of travel (VMT) for each alternative in St. Joseph and Elkhart counties were converted to mobile source emissions and compared to the mobile source emission budgets from the SIP for the two counties.

The specific steps involved:

(1) Obtaining the VMT by Federal roadway functional classification for each alternative from the US 31 Improvement Project Travel Demand Model to determine the change in VMT from the No-Build Alternative for the year 2030;

(2) Adjusting the VMT by Federal roadway functional classification to the Highway Performance Monitoring System (HPMS) VMT for the year 2000 compared to the VMT for the US 31 Improvement Project Travel Demand Model for the year 2000;

(3) Applying the change for each Build Alternative from the No-Build alternative to the VMT for the adopted LRP in St. Joseph and Elkhart counties for the year 2025 to reflect changes of each Build Alternative to the adopted LRP network;

(4) Applying the unique emission rates per VMT from MOBILE 5 (with the Tier 2 Motor Vehicle Emissions Standards so as to generally approximate MOBILE 6 emissions) for each county to the VMT for the adopted LRP network with each of the Build Alternatives to get total daily emissions; and

(5) Comparing the daily emissions for each Build Alternative to the emission budgets established by the SIP for each county.

5.7.1.2 Analysis

The results of the comparative air quality analysis appear in Table 5.7.20 for the combination of St. Joseph and Elkhart counties. Excluding the carbon monoxide (CO) SIP budget that is informational only, all alternatives conform to the MACOG “maintenance area” SIP budgets using MOBILE 5 with Tier 2 estimates.

Table 5.7.20: Air Quality Emissions Year 2025

Option	Emission Model	VOC (tons/day)	CO ** (tons/day)	NOX (tons/day)
LRP*	Mobile 5	20.66	147.36	25.15
LPR	Mobile 5 + Tier II	19.570	147.360	17.172
Alternative Cs	Mobile 5 + Tier II	19.445	146.853	17.251
Alternative Es	Mobile 5 + Tier II	19.454	146.967	17.287
Alternative G-C	Mobile 5 + Tier II	19.449	146.834	17.221
SIP *Budget	Mobile 5	20.68	142.24	27.24

Notes: * *MACOG 2025 Transportation Plan Update* Air Quality Conformity Analysis
** Informational only as the MACOG Area was always in Attainment for the CO pollutant

The following observations were made concerning the comparative air quality impact analysis for St. Joseph and Elkhart counties:

(1) When changes over the No-Build Alternative VMT are applied to the LRP roadway network for the year 2025, all Build Alternatives result in less VMT than the No-Build Alternative and the adopted LRP (which includes the US 31 Improvement Project).

(2) Relative to total VMT, the Build Alternatives from least to most total VMT are Alternative G-C, Alternative Cs and Alternative Es.

(3) Relative to rural Interstate (i.e., the rural portion of US 31 Improvement Project) and to urban freeway (i.e., the urban portion of US 31 Improvement Project), the Build Alternatives from least to most total VMT are Alternative G-C, Alternative Es, and Alternative Cs.

(4) Because emission rates per VMT for VOCs and CO increase as one moves from the highest to lowest roadway functional class (except for rural Interstate), changes in the composition of the total VMT by roadway functional class affect total emissions. Alternative Cs had the lowest VOC emissions, and Alternative G-C has the lowest CO emission. With the greatest total VMT, Alternative Es had the highest VOC and CO emissions.

(5) Because the NOX emission rates per VMT increase as one moves from the lowest to the highest roadway functional class, the alternatives with a greater concentration of VMT in the highest functional classes (interstates and freeways) have the highest emissions. Thus, Alternative G-C had the lowest NOX emissions, and Alternative Es had the highest NOX emissions.

Because all Build Alternatives fall under the SIP emissions budgets for VOCs and NOX when applied to the MACOG LRP, the selection of any Build Alternative would not jeopardize conformity with the SIP.

5.7.2 Conformity Findings

The US 31 Improvement Project appears in the MACOG 2025 Transportation Plan Update (March 18, 2002) as New Road Construction from the US 20 Bypass to the St. Joseph County Line. It is further described as a limited access road with interchanges at several locations that would continue to US 30 in Marshall County. As part of the LRP Update, MACOG conducted transportation air quality conformity analyses (see Table 5.7.20), and FHWA/FTA jointly

determined the LRP met transportation conformity requirements. The US 31 Improvement Project has also been included in the MACOG TIP for 2003-2005, and the associated transportation conformity analysis has also been approved by FHWA/FTA. As the US 31 Improvement Project is in an adopted LRP and TIP that have met transportation conformity requirements, the project will not jeopardize MPO air quality conformity with the applicable mobile source emission budgets established in the SIP for St. Joseph and Elkhart counties.

After selection of a final alternative, regional ozone analyses will be performed to demonstrate compliance with applicable SIP emission budgets in the FEIS.

5.7.3 Micro-scale Carbon Monoxide Analysis

5.7.3.1 Setting

Carbon monoxide is a site-specific pollutant, and major concentrations generally are found adjacent to high volume urban roadway intersections. Thus, the micro-scale air quality concerns focus on potential CO "hotspot" (micro-scale) areas.

In the case of the US 31 Improvement Project, the No-Build Alternative results in traffic volume increases of almost 40% by the year 2030 at four signalized intersection (US 6, SR 4, Kern Road and Johnson Road) that have urban uses in all quadrants of the intersections. Most intersection quadrants have highway oriented commercial uses, but the existing intersections of SR 4 and Johnson Road have one or more quadrants with a residential use.

In the case of the Build Alternatives, the potential interchanges of the freeway are abutted by agricultural uses except for the possible interchange with Kern Road. In the case of Alternatives Cs and G-C, the possible Kern Road interchange is surrounded by a mixture of residential and vacant land uses. For the Alternative Cs Kern Road interchange, the approaches to the ramp-crossroad intersections are not less than 100 feet from residential structures that may remain in the northwest and southeast quadrant. For the Alternative G-C Kern Road interchange, the approaches to the ramp-crossroad intersections are not less than 100 feet residential structures that may remain in all quadrants.

For Alternative Es, the Kern Road interchange is abutted on the east by commercial uses and on the west by a mixture of residential and vacant land uses. For the Alternative Es Kern Road interchange, the approaches to the ramp-crossroad intersections are not less than 100 feet from a residential structure that may remain in the northwest quadrant, a fast-food restaurant in the southeast quadrant, and motel rooms on the northeast quadrant.

5.7.3.2 Methodology

Hot spot air quality analysis was completed along all of the proposed Build Alternatives and the No-Build Alternative using the CAL3QHC mobile source air dispersion model for the one-hour standard of 35 ppm. The areas analyzed along each of the alternatives were in five segments between the proposed interchanges: 1) US 30 to West 5A Road, 2) West 5A Road to US 6, 3) US 6 to SR 4, 4) SR 4 to Kern Road, and 5) Kern Road to the US 20 Bypass. This analysis was completed using 2025 CO emissions factors based on Mobile 5 data for St. Joseph and Elkhart counties (from the MACGO Transportation Air Quality Analysis for the 2025 Transportation Plan Update; March 18, 2002), and 2025 traffic data. The CO emissions factors used for this analysis were 12.5 grams per mile for all of the freeway Build Alternatives and 6.9 per mile for the rural arterial No-Build Alternative. Five receptors were set up along all of the alternatives in the areas described above. They were placed 1) 15 feet away from the edge of the pavement, 2) 30 feet away from the edge of pavement, 3) 45 feet from the edge of pavement, the 4) 60 feet from the edge of pavement, and 5) 75 feet away from the edge of the pavement.

5.7.3.3 Results

As shown in Table 5.7.21, the results of this analysis show that no alternative will exceed the 35.0 ppm hour emissions standard for the nearest receptor within 15 feet of the edge of pavement. Thus, the less stringent 8-hour emissions standard of 9.0 ppm will not be exceeded either. The maximum CO emissions calculated along the No-Build Alternative was 2.4 ppm between SR 4 and the US 20 Bypass. The maximum CO emission calculated for Alternative Cs was 2.7 ppm in all locations, except between US 30 and West 5A Road where the CO emissions were 2.5 ppm. The maximum CO emission calculated for Alternative Es was 2.9 between Kern Road and the US 20 Bypass. The maximum CO emission calculated for Alternative G-C was 2.7 ppm between SR 4 and Kern Road. A comparison of this analysis shows that the No-Build Alternative will have the lowest CO emissions and that Alternative Es will have the highest CO emissions calculated for the year 2025.

Table 5.7.21: Predicted Micro-Scale Carbon Monoxide One-Hour Concentrations for Year 2025 (in parts per million) (nearest receptor within 15 feet of the edge of pavement)

Alternative in the Year 2025	Segments				
	US 30 to West 5A Rd.	West 5A Road To US 6	US 6 To SR 4	SR 4 to Kern Road	Kern Road to US 20 Bypass
No-Build	2.1	2.3	2.3	2.4	2.4
Cs	2.5	2.7	2.7	2.7	2.7
Es	2.5	2.7	2.7	2.4	2.9
G-C	2.5	2.6	2.5	2.7	2.6

5.8 Highway Noise

The evaluation of highway noise impacts anticipated for each of the alternatives was conducted in accordance with the FHWA's "Highway Traffic Noise Analysis and Abatement: Policy and Guidance" and INDOT's Noise Policy using TNM 2.1 software.

No-Build Alternative: Under the No-Build scenario, the increased traffic volumes along the existing US 31 would continue to impact all front row receivers within 200 to 300 feet of the centerline depending upon location. The TNM 2.1 analysis using 2030 traffic forecasts indicates L_{eq} noise levels along US 31 would range from 55.7 to 79.1 dBA, and that approximately 535 of the 771 modeled sites would experience L_{eq} noise levels approaching or exceeding the 67 dBA Category B NAC (Appendix J-1). This represents an additional 69 sites to those currently estimated as impacted along existing US 31. Again, the majority of such impacts occur from Lakeville north up to US 20 at South Bend; however, local concentrations of residences which would continue to experience increased highway noise levels along US 31 also occur between Michigan Street and Lakeville at LaPaz and certain crossroad intersections. Figure 5.8.13 illustrates the number of sensitive receivers with predicted L_{eq} levels of 66 dBA or above for the design year 2030 relative to the base year 2002.

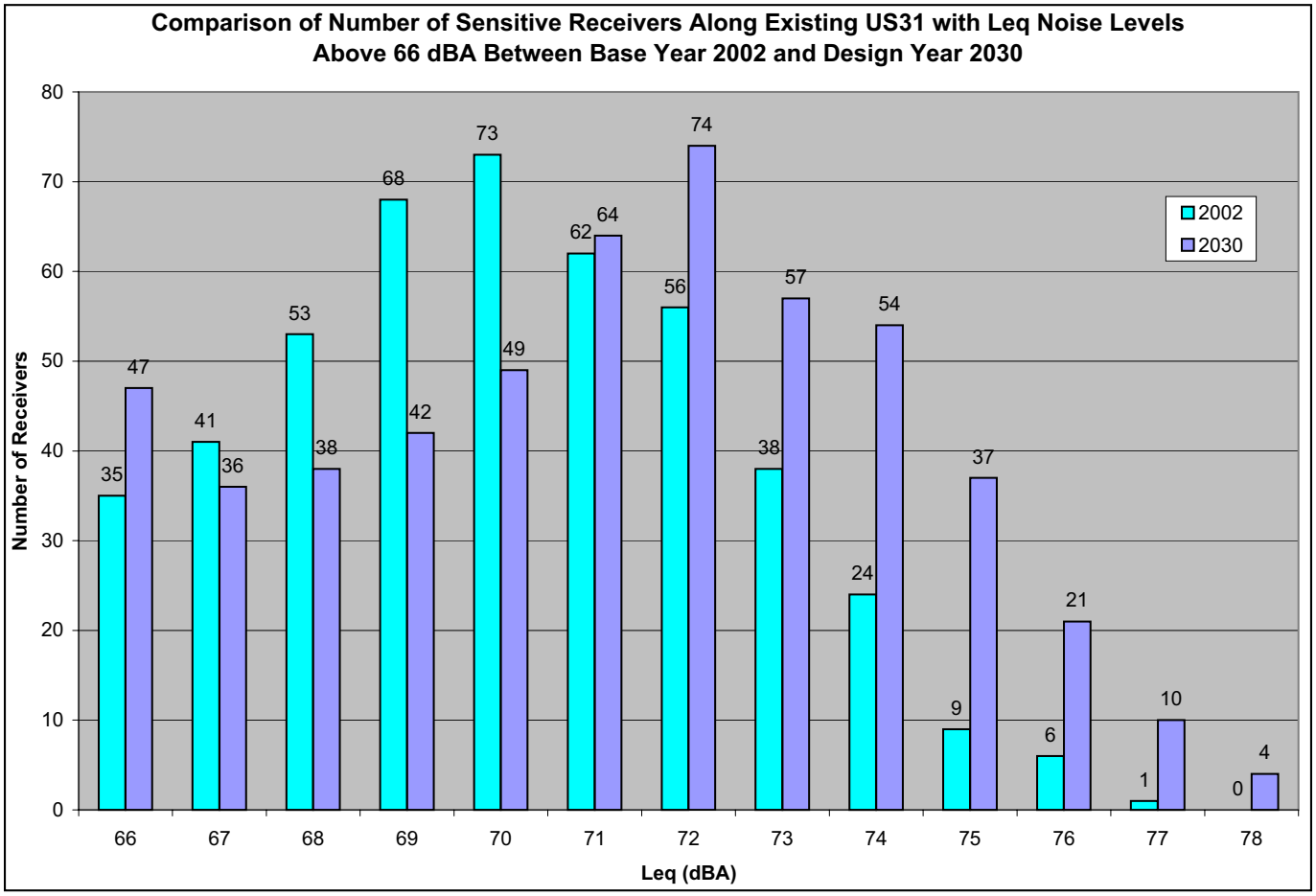


Figure 5.8.13: Comparison of Number of Sensitive Receivers Along Existing US 31 with L_{eq} Noise Levels Above 66 dBA Between Base Year 2002 and Design Year 2030 TNM

Alternative Cs: Predicted L_{eq} noise levels for 230 sites modeled along Alternative Cs range from 55.5 to 69.8 dBA (Appendix J-2). The 2030 design year analysis concluded that noise levels would approach or exceed the 67 dBA NAC, or result in a substantial increase (>15 dBA) at 113 single family residences throughout the project area for this alternative. One business site would potentially experience a substantial increase. Thirteen of the residential impacts occur in rural Marshall County and are generally scattered and isolated, although a small grouping of seven were identified in the vicinity of the Maple Road and 3A Road intersection. These residences would be impacted based on a substantial increase in predicted L_{eq} noise levels. The remaining 100 impacted receivers are located in St. Joseph County, primarily in two localized areas. Alternative Cs passes immediately east of Sun Communities mobile home park along Locust Road. An ambient measurement of 46 dBA along the eastern edge of this community indicates that a substantial increase of >15 dBA would occur when noise levels begin to exceed 61 dBA. Based on available design geometry for this alignment, 61 dBA levels would be experienced up to 490 feet from the centerline and encompass 46 residential units within the mobile home park. A second grouping of 47 impacted receivers occurs between Johnson Road and Kern Road where the alignment passes through the western portion of the Whispering Hills subdivision and the eastern portion of Sycamore Hills subdivision. Ambient measurements of 44 to 48 dBA indicate that a substantial increase would be experienced at 59 to 63 dBA.

Alternative Es: Predicted L_{eq} noise levels for 235 sites modeled along Alternative Es range from 55.5 to 80.2 dBA (Appendix J-2). The 2030 design year analysis for this alignment resulted in noise level impacts (>66 dBA or substantial) at 68 single family residences. An additional five business sites would also approach or exceed the 67 dBA criteria. For Marshall County the residential noise impacts are the same as those described for Alternative Cs,

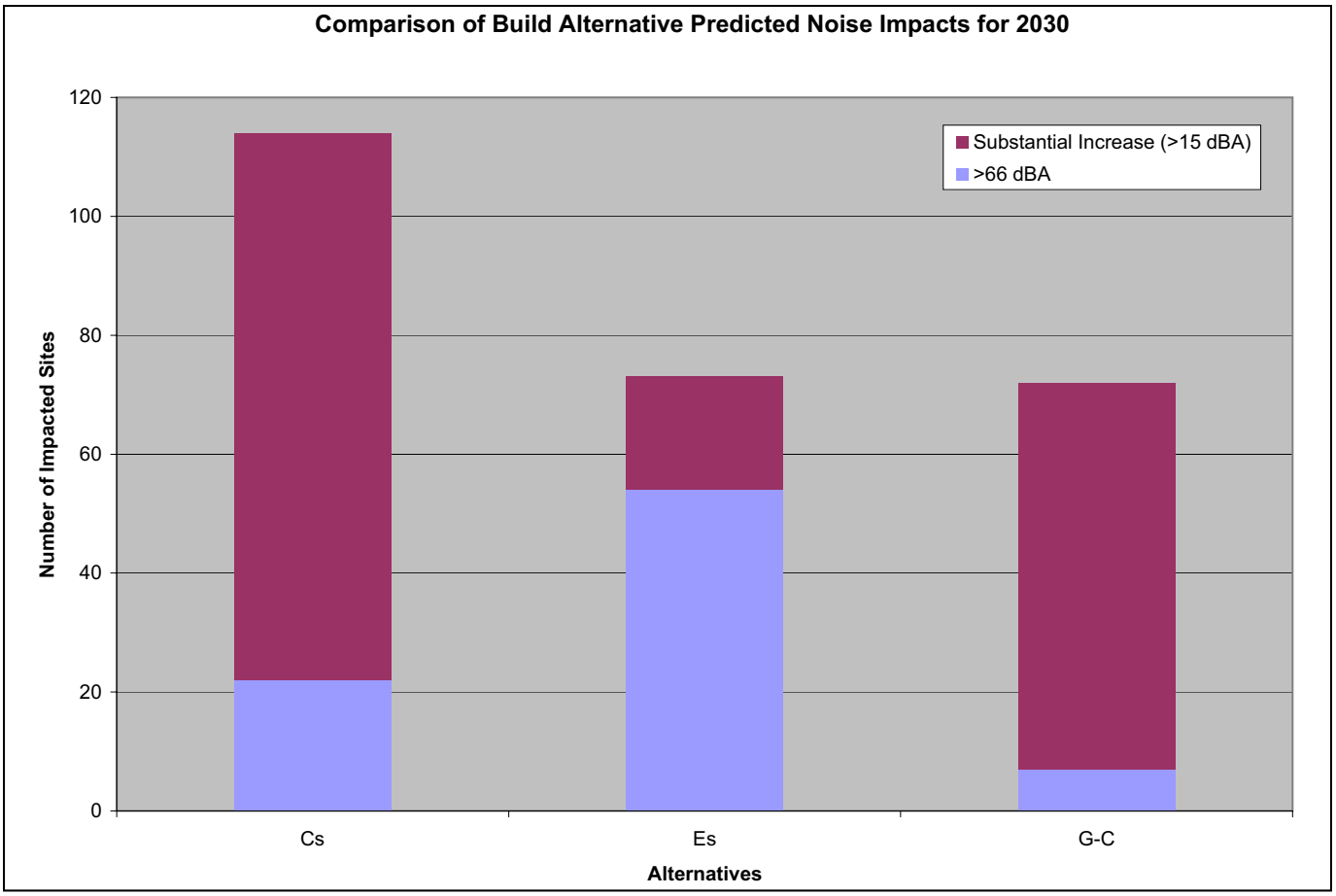


Figure 5.8.14: Comparison of Build Alternative Predicted Noise Impacts for 2030

including the seven residences in the vicinity of the Maple Road and 3A Road intersection. In St. Joseph County, this alignment avoids impacts to the Sun Communities mobile home park off of Locust Road and the Whispering Hills and Sycamore Hills subdivisions. A second small cluster of seven homes along Johnson Road are expected to experience a substantial increase in highway noise as a result of this alignment based on an existing ambient measurement of 45 dBA. North of the proposed Kern Road interchange Alternative Es converges back onto the existing US 31 alignment. Additional right-of-way anticipated for the reconstruction of this segment of US 31 will displace several of the existing first row receivers and establish other residences as new first row receivers. Between Kern Road and US 20, including the area southeast of the US 31/US 20 interchange, there would be 40 residential receivers that meet the 67 dBA NAC.

Alternative G-C: Predicted L_{eq} noise levels for 228 sites modeled along Alternative Cs range from 55.1 to 67.6 dBA (Appendix J-2). The 2030 design year analysis concluded that noise levels would approach or exceed the 67 dBA NAC, or result in a substantial increase (>15 dBA) at 72 single-family residences along this alternative. Similar to Alternatives Cs and Es, highway noise from Alternative G-C would affect 12 rural residences previously identified in Marshall County. It is predicted that just one other residence would be impacted along the St. Joseph County portion of Alternative G-C east of US 31. West of US 31 anticipated noise impacts would be limited to a small group of residences along Roosevelt Road, the Kern Road subdivision south of Kern Road and portions of the Whispering Hills subdivision between Kern Road and Johnson Road. Approximately eight first row receivers on the west side of Kern Road subdivision and as many as 41 residences within the Whispering Hills subdivision would experience noise levels that exceed the 67 dBA NAC and/or constitute a substantial increase over current ambient levels. Thirty-nine would be impacted based on anticipated substantial increases of 15 dBA or more above existing levels, while only two are predicted to equal the 67 dBA NAC criteria. Figure 5.8.14 illustrates the number of sensitive noise receiver impacts predicted for each of the study alternatives based on the Category B 67 dBA NAC and the substantial increase (>15 dBA) over existing conditions criteria.

5.9 Natural Resources

5.9.1 Physiographic Regions

All three alternatives are within the Northern Moraine and Lake physiographic region. Natural resources found in this region and potentially impacted by the alternatives include glacial features, wetlands, farmland, and small natural lakes and ponds. More detailed discussions of impacts to natural resources for each alternative are discussed in the subsections of Section 5.

5.9.2 Natural Regions

All three alternatives are within the Northern Lakes natural region. Natural communities found in this region may include bogs, fens, marshes, prairie, sedge meadows, swamps, seep springs, lakes, and various deciduous forest types. Preliminary field investigations have not uncovered bogs or fens impacted by this project. More detailed discussions of impacts to natural resources for each alternative are discussed in the subsections of Section 5.

Upon selection of a final alternative, detailed field studies will be completed that will determine the occurrence of any of the above communities, including the delineation of all wetlands impacted. Sampling for vertebrates and invertebrates will be a component of such field studies.

5.9.3 Soils and Geology

All alternatives pass through an area of complex glacial drift, formerly the Maxinkukee Moraine. This is a unique geological and ecological area. Figure 5.9.15 shows the alternatives and the complex glacial drift in the Study Area. Alternatives Cs and Es traverse a significant portion of this area, while Alternative G-C avoids the majority of the area, but does cross it in the very northern portion as it connects with US 20.

Appendix D contains tables showing the soils to be impacted by each alternative for each county. These tables show the acres of each soil map unit to be impacted, as well as the prime farmland codes, hydric soil classification, and muck soil classification of each map unit. All soils information is from the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO).

There are no apparent caves, sinkholes, coal mines, or oil or gas wells, impacted by any of the alternatives. Sand, gravel, peat, marl, and gypsum are the primary mineral resources with quarries and pits in Marshall and St. Joseph counties. No mineral resource operations will be impacted by the alternatives. A gravel pit is shown on the USGS topographic map, just south of Kern Road in the vicinity of Alternatives Cs and G-C. Coordination with the company owning this property indicates this is a borrow pit, and there is no sand or gravel extraction taking place.

5.9.4 Terrestrial Wildlife and Habitat

Terrestrial wildlife habitat in the study area will be discussed in two categories: General Habitat and Designated/Managed Habitat Areas. General habitat will refer to the general terrestrial habitat types found within the Study Area, while the Designated/Managed habitat areas are those that are designated or managed such that they provide habitat for wildlife. Habitat to be impacted within Designated/Managed Habitat Areas is discussed in the General Habitat section. For example, forest impact calculations also include forest within the Designated/Managed Habitat Areas. Wetlands and other aquatic habitats are discussed in separate sections in this document.

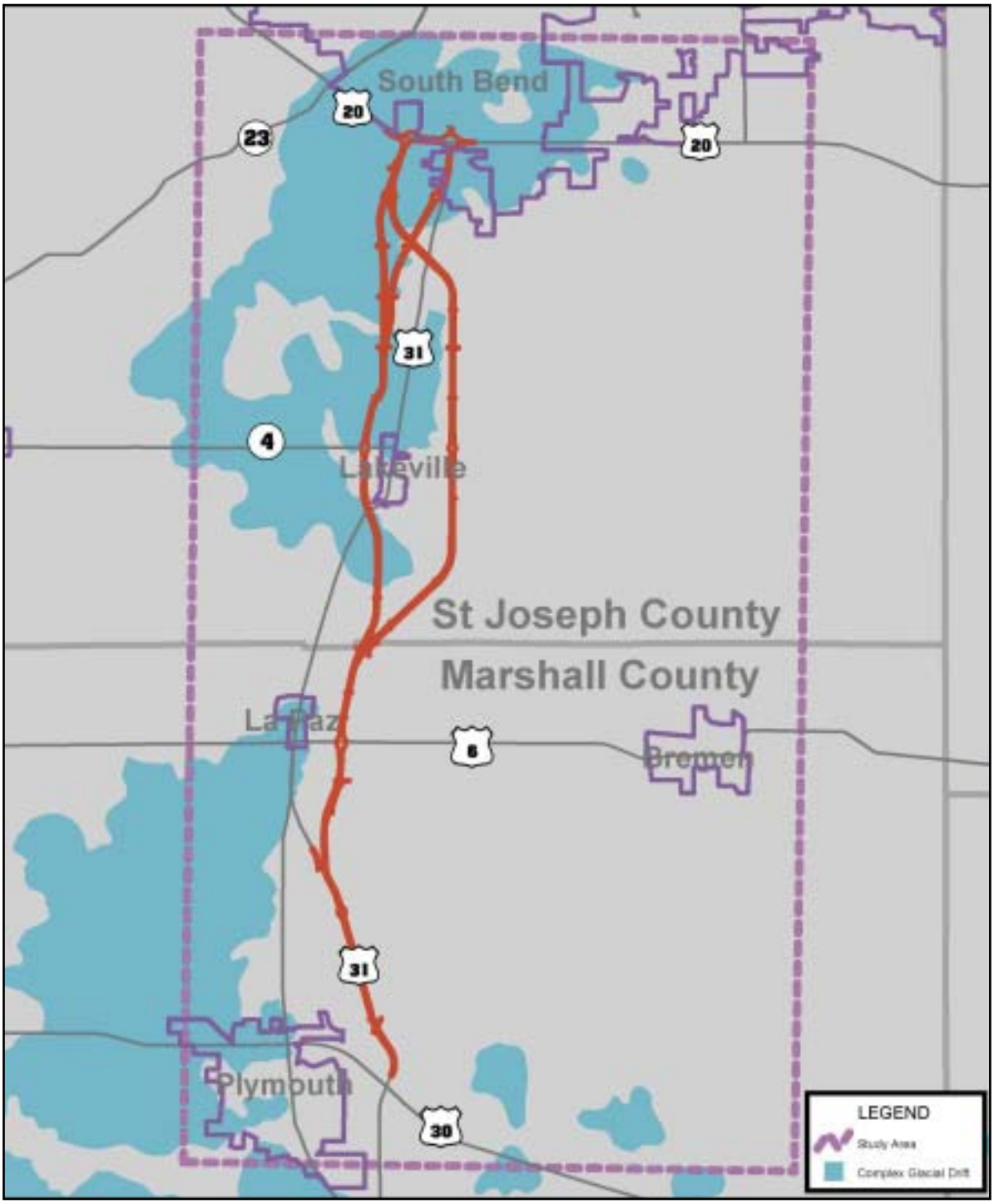


Figure 5.9.15: Complex Glacial Drift in the US 31 Study Area

Data Source: SURFICIAL_GEOLOGY_SW:
Quaternary Geologic Map of Indiana, ArcView shapfile created from published paper map: Gray, H.H., 1989, Quaternary Geological Map of Indiana, Indiana Geological Survey Miscellaneous Map 49.

General Habitat Impacts

Terrestrial habitats occurring within the project area include: forestland, shrub/scrub land, pasture/crop/fallow land.

Forestland

Table 5.9.22 summarizes the various forest impacts for each of the alternatives. Forest estimates were based on 2002 aerial photographs. The Direct Take row refers to the acres of both upland and bottomland forest directly within the working alignment right-of-way. Alternative Cs had the greatest acreage of forest directly taken with approximately 196 acres, while Alternatives Es and G-C tied with approximately 139 acres each. The number (#) of tracts split, or fragmented, refers to those forested tracts of land that would have portions of forest on either side of the proposed freeway. Alternatives Cs and Es will split 13 forest tracts, and G-C will split 9 forest tracts.

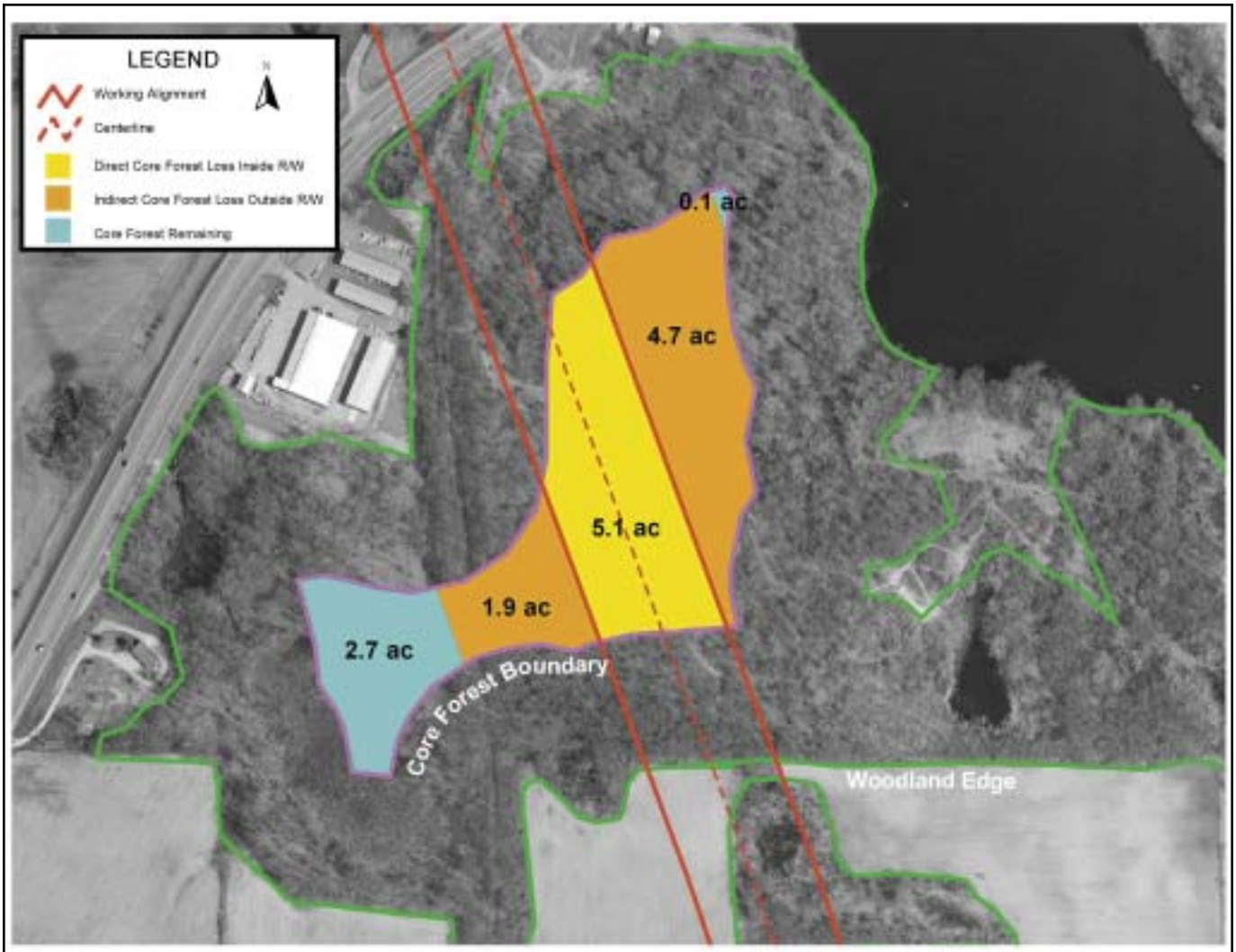
Table 5.9.22: Summary of Forest Impacts

Forest Impacts	Alternative		
	Cs	Es	G-C
Forest			
Direct Take (acres)	196	139	139
# of Tracts Split	13	13	9
Core Forest			
Direct Take (acres)	9	7	10
# Tracts Directly Impacted	5	5	4
Indirect Take (acres)	18	12	14
# Tracts Indirectly Impacted	8	6	6
TOTAL Core Forest Impacts (acres)	27	19	24

Core forest can be directly affected by impacting the core area, or indirectly affected by impacting the edge of the forest, which in turn redefines the core area. Direct impacts to core forest and the number of core forest tracts were estimated for each alternative in order to determine impacts to this resource (see Figure 5.9.16).

Impacts to core habitat were estimated by overlaying the working alignment right-of-way onto 2002 aerial photographs. The ground cover along each alignment was screened for wooded areas that measured 200 meters by 200 meters, the minimum dimensions needed to create core forest habitat based on a 100-meter wide edge habitat distance. When a forested area large enough to support core forest habitat was encountered along the alignment, the outer edge of the area was traced on the aerial using (Geographic Information System) GIS software. Large streams, rivers, and roads were used to delineate the edge of the area. Once the perimeter of the forested area was established, the core habitat was determined by delineating an area 100 meters from the edge. The area of this core habitat within the working alignment was calculated in order to estimate potential direct impacts.

Much of the forest within the study area exists as fragmented woodlots, and core forest is not extremely abundant.



Note: Portions of this material include intellectual property of St. Joseph/Marshall County, Indiana and are used herein by permission. Information shown on this map is not warranted for accuracy or merchantability. Reproduction of this material is not permitted without the written permission of St. Joseph/Marshall County, Indiana.

Figure 5.9.16: Diagram Showing: Working Alignment Right-of-Way and Core Forest Directly Impacted

Both direct and indirect (core redefined) impacts to core forest were calculated. Indirect impacts were greater than direct impacts for all three alternatives. Alternative Cs is estimated to directly impact nine acres (five tracts) and indirectly impact 18 acres (eight tracts) for a total of 27 acres of core forest impacts. Alternative G-C is estimated to directly impact ten acres (four tracts) and indirectly impact 14 acres (six tracts), for a total of 24 acres of core forest impacts. Alternative Es had the lowest relative core forest impacts with seven acres (five tracts) of direct impacts and 12 acres (six tracts) of indirect impacts, for a total of 19 acres of core forest impacts. These numbers are not relatively large; however, because not much core forest exists within the study area, any loss could be significant.

Many species that require continuous landscape are sensitive to edge habitat (the junction of two different habitat types). Studies have shown that birds requiring large tracts of forest are adversely affected by fragmentation because of nest predation and parasitism that follow the influx of edge species. Nest predators like raccoons, skunks, crows, and blue jays are often associated with edges, as well as the parasitic brown-headed cowbird which lays eggs in the nests of other birds, often to the detriment of the host's young.

There are a number of migratory bird species vulnerable to nest predation, brood parasitism, and competition from edge habitat. Some such species sensitive to forest fragmentation reported from within or near the study area are the broad-winged hawk (*Buteo playpterus)*, black-billed cuckoo (*Coccyzus erythrophthalmus)*, pileated woodpecker (*Dryocopus pileatus)*, hairy woodpecker (*Picoides villosus*), Acadian flycatcher (*Empidonax virescens*), least fly-catcher (*Empidonax minimus)*, tufted titmouse (*Baeolophus bicolor*), white-breasted nuthatch (*Sitta carolinensis*), brown creeper (*Certhia americana*), wood thrush (*Hylocichla mustelina*), veery (*Catharus fuscescens*), blue-gray gnatcatcher (*Polioptila caerulea*), yellow-throated vireo (*Vireo flavifrons*), red-eyed vireo (*Vireo olivaceus*), scarlet tanager (*P. olivacea*), northern parula (*Parula americana*), cerulean warbler (*Dendroica cerulea*), chestnut-sided warbler (*D. pensylvanica*), ovenbird (*Seiurus aurocapillus*), Louisiana waterthrush (*S. motacilla*), mourning warbler (*Oporornis philadelphia*), black-and-white warber (*Mniotilta varia*), and American redstart (*Setophaga ruticilla*).

Research in this area of study has shown neo-tropical migrant populations of interior woodland birds are adversely affected by fragmentation of large tracts of forests. These interior birds would be reduced and consequently may affect population densities. Neotropical migratory birds are those that breed in the U.S. and Canada, but migrate south to the southern U.S. and Mexico to spend the winter. The Migratory Bird Treaty Act of 1918 (MBTA) protects these birds and makes it unlawful to "take, capture, kill, attempt to take, capture or kill, possess… at any time, or in any manner, any migratory bird, including any part, nest, or egg of any such bird" (16 USC 703) without a permit. Habitat clearing during the non-nesting season (i.e., winter) is allowed under the MBTA.

Shrub/Scrub Land

Figure 5.9.17 shows the acres of shrub/scrub land directly within the working alignment right-of-way. There was not much variation between the alternatives in acreages of this habitat type directly impacted. Alternative Cs will impact approximately 43 acres, Alternative Es 38 acres, and Alternative G-C 42 acres.

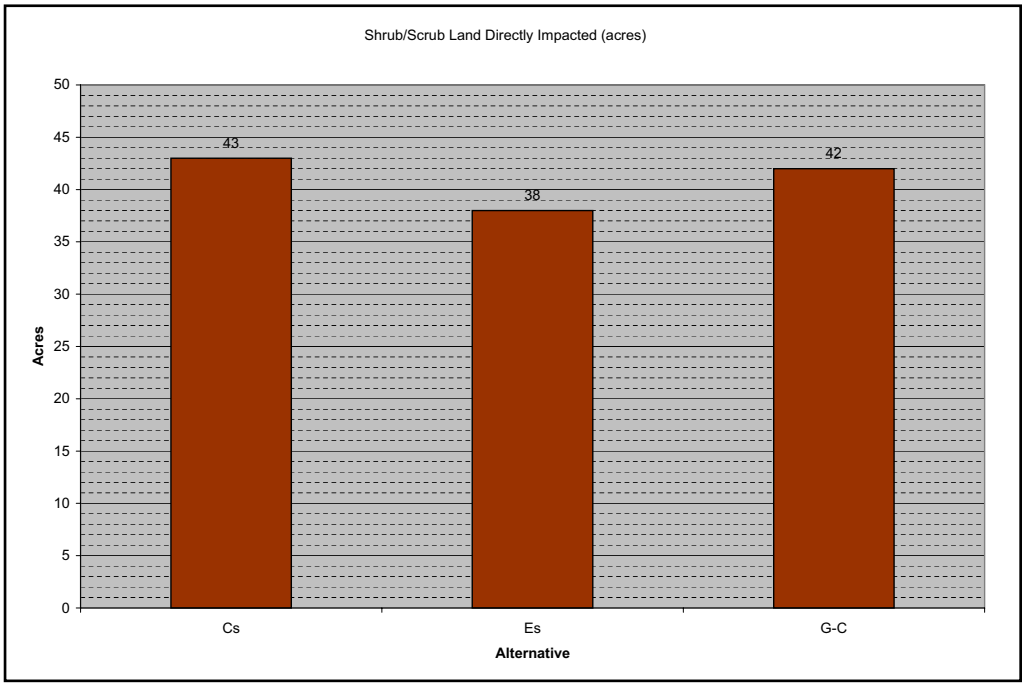


Figure 5.9.17: Shrub/Scrub Land Directly Impacted (acres)

Pasture/Crop/Fallow Land

Figure 5.9.18 shows the acres of pasture, crop and fallow land directly within

the working alignment right-of-way. Alternative G-C will impact the most of this habitat type with 544 acres. Alternative Cs and Es will impact approximately 458 and 457 acres, respectively.

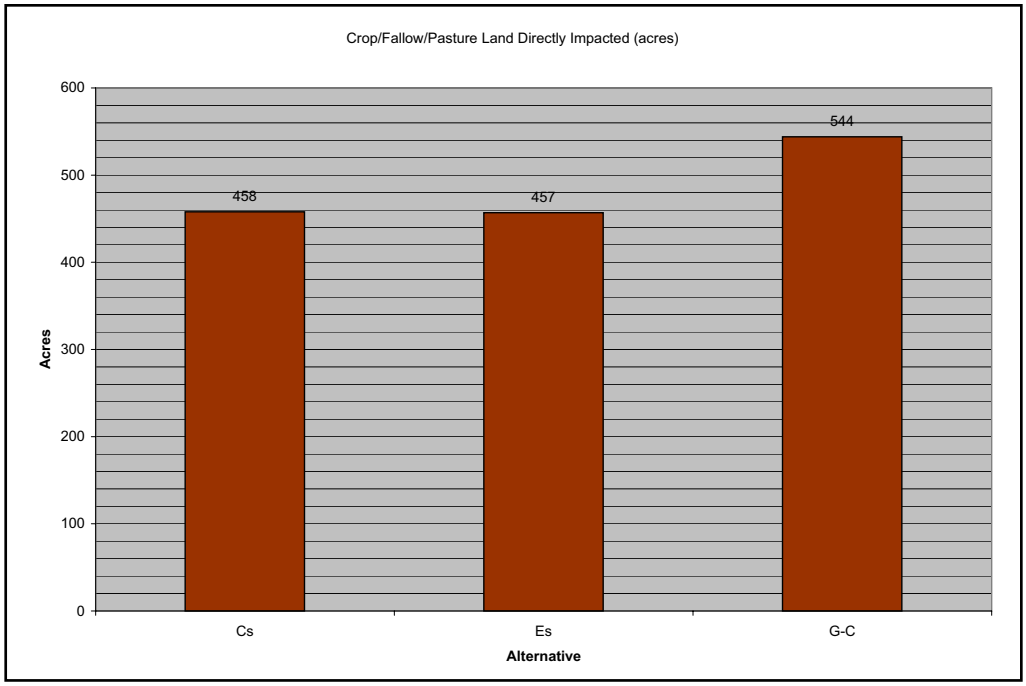


Figure 5.9.18: Pasture/Crop/Fallow Land Directly Impacted (acres)

Designated/ Managed Habitat Areas

In addition to general types of wildlife habitat, some areas have been identified by state agencies or managed such that they provide wildlife habitat. Such areas include Potato Creek State Park, IDNR Notable Wildlife Habitat Areas, Classified Wildlife Areas, Classified Forests, Partners for Fish and Wildlife, Conservation Reserve Program Lands, and Wetland Reserve Program Lands. Figure 5.9.19 shows a general view of these Designated/ Managed habitat areas within the study area. Areas shown include the entire property, not just the portion enrolled in a particular program. Also, some of these properties are enrolled in more than one program. Note that the majority of these areas are located north and west of Lakeville, and correspond with the complex glacial drift, formerly the Maxinkukee Moraine, in the northwestern portion of the Study Area. The unique glacial deposits in this area are also unique from a wildlife habitat perspective. These areas are also less conducive to agriculture, thus many forested and wetland communities remain.

Table 5.9.23 shows the number of each of the Designated/Managed areas directly impacted by each alternative.

Potato Creek State Park and Swamp Rose Nature Preserve. None of the alternatives will directly impact Potato Creek State Park or the Swamp Rose Nature Preserve. The alternatives closest to the park and nature preserve, Alternatives Cs and Es, are over 2.5 miles away.

Notable Wildlife Habitat (Identified by the IDNR). Alternative Cs would directly impact two Notable Wildlife Habitat areas, both are forested and in the vicinity of New Road. Alternative Es would directly impact one of these same properties, and is adjacent to the second. Alternative G-C would not directly impact any of these high quality areas.

Classified Wildlife Habitats. Alternatives Cs will directly impact four Classified Wildlife Habitats, and Es three of these Classified Wildlife Habitats. One of these Classified Wildlife Habitats is located just north of Osborne Road. This area includes approximately 55 acres of restored prairie and 14 acres of restored wetlands. A number of state endangered species have been reported from this restored habitat including the Blanding's turtle (*Emydoidea blandingii*), American bittern (*Botaurus lentiginosus*), sandhill crane (*Grus canadensis*), great egret (*Ardea alba)*, and northern harrier (*Circus cyaneus*). Numerous unlisted wildlife species also inhabit this area including redback salamanders (*Plethodon cinereus*), and grassland bird species such as the dickcissel (*Spiza americana*), bobolink

Table 5.9.23: Designated/Managed Wildlife Habitat Areas Directly Impacted

Wildlife Habitat Area*	Alternative		
	Cs	Es	G-C
Potato Creek State Park & Swamp Rose Nature Preserve	0	0	0
Notable Wildlife Habitat (IDNR)	2	1	0
Classified Wildlife Habitats (IDNR)	4	3	1
Classified Forests (IDNR)	2 -3	2 -3	1 –2
Conservation Reserve Program (CRP) (NRCS)	1	2	2
Wetland Reserve Program (WRP) (NRCS)	1	1	0
Partners for Fish and Wildlife Program (USFWS)	3	2	1

*Refers to entire property and not necessarily the portion enrolled in the program.

(*Dolichonyx oryzivorus*), meadow lark (*Sturnella* sp.), kestrels (*Falco sparverius*), and green herons (*Butorides virescens*). This area appears to be high quality habitat for migratory birds. It is also enrolled in the USFWS Partners for Fish and Wildlife Program, the IDNR Game Bird Habitat Development Program, and the NRCS Wetland Reserve Program. This property was awarded the Natural Resources Conservation Award from the St. Joseph County Soil and Water Conservation District in 2002 for accomplishments in Wildlife Habitat Development. The other two classified wildlife areas are located between Pierce Road (SR 4) and Osborne Road. The fourth Classified Wildlife Habitat to be impacted by Alternative Cs is located just north of Madison Road. This property will most likely only be impacted by the construction of an overpass, and not the main line of the freeway. In contrast, Alternative G-C would cross one Classified Wildlife Habitat. It is located south of Rockstroh Road which is south of Riddles Lake.

Classified Forests. Alternatives Cs and Es would directly impact two to three properties with land enrolled in the Classified Forest Program. Alternative G-C would impact one to two properties with land in this program. These numbers are reported as ranges because one property is located along the Yellow River, just west of the US 31 crossing. It is doubtful additional right-of-way will be necessary in this area, but it is a possibility.

Conservation Reserve Program (CRP) and Wetlands Reserve Program (WRP). Alternative Cs would impact one property with land enrolled in the Conservation Reserve Program, and Alternatives Es and G-C would each impact two properties. A CRP and WRP property impacted by Alternatives Cs and Es includes also a Classified Wildlife Habitat area as located north of Osborne Road. For a more detailed description of this area, refer to the Classified Wildlife section. This property is the only WRP property impacted by any alternative. Alternative Es and G-C would impact a CRP property located just north of Roosevelt Road. The location for the second CRP land impacted by Alternative G-C is north of Rockstroh Road and is south of Riddles Lake.

USFWS Partners for Fish and Wildlife Program. All three alternatives would impact a property with land enrolled in this program, just west of existing US 31 and south of West 5A Road. The property includes restored wetlands and impacts would be primarily from the proposed interchange at West 5A Road. In addition, Alternatives Cs and Es would impact one property with land enrolled in the USFWS Partners for Fish and Wildlife Program. This property is located north of Osborne road and includes both wetland and prairie restoration, and was discussed above in the Classified Wildlife Habitat section. Alternative Cs may impact a third property, just north of Madison Road. This property is also a Classified Wildlife Habitat and includes prairie restoration.

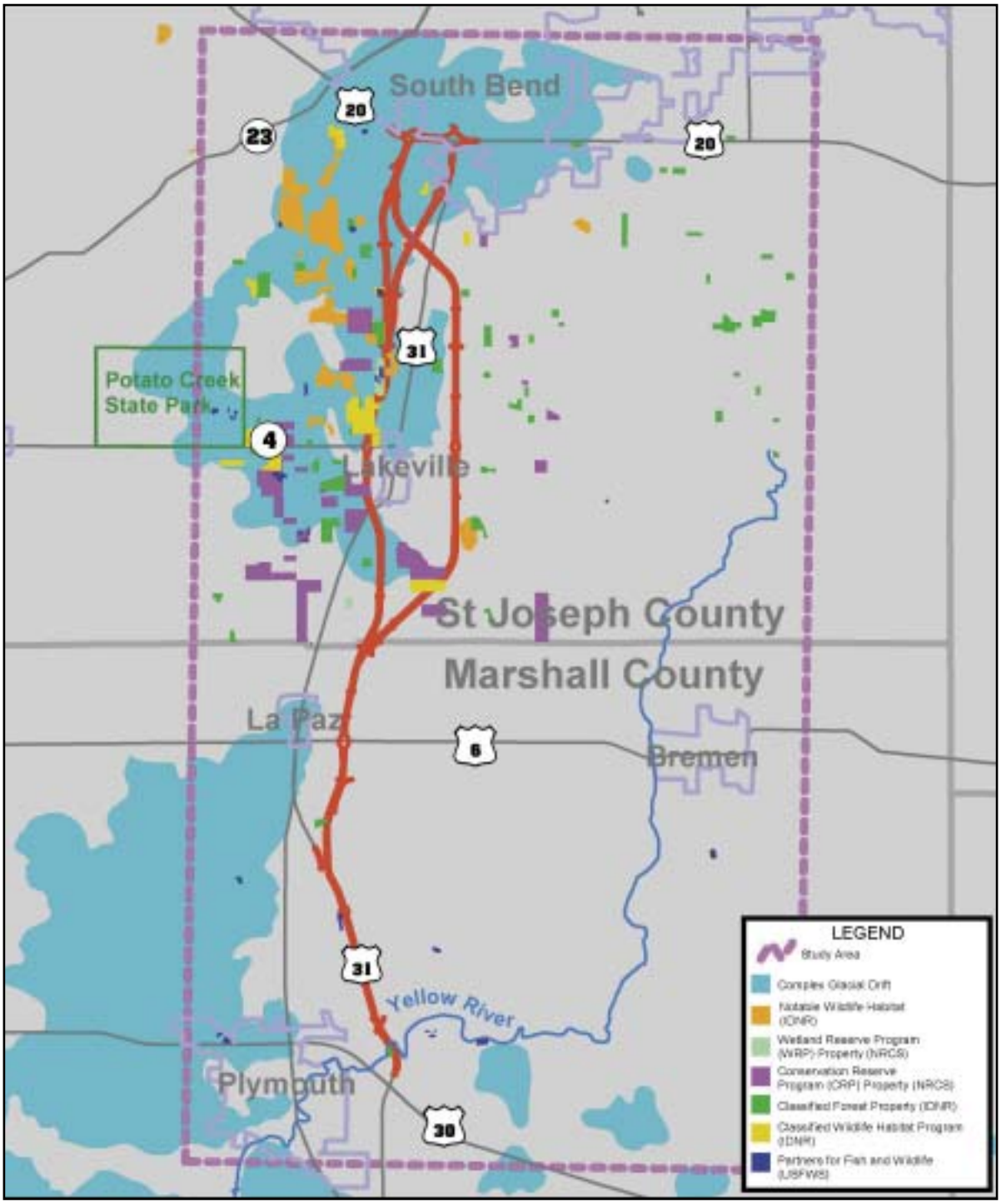


Figure 5.9.19: Designated/Managed Habitat Areas within the Study Area

Data Source: Coordination with IDNR, NRCS, & USFWS

General Wildlife Impacts

Highways have the potential to affect wildlife on several levels, including the individual animal, a particular species population, and the distribution of many species across the landscape. Jackson (2000) in an Overview of Wildlife Movements and Populations provides the following summary of wildlife impacts from highway development. Other references include Bissonette et al. (2000), Cain et al. (2000), FHWA (2001), Gunther et al. (2000), Jackson and Griffin (2000), Jacobson (2002a, 2002b), Messmer et al., (2000), and Rudolph (2000).

Highways, which become long linear features across a landscape, have impacts on wildlife and wildlife habitat that are disproportionate to the area of land that they occupy. Impacts do not occur only at the time of construction, but also accumulate over time. However, appropriate planning and mitigation at construction can be effective in preventing long-term degradation of populations and ecosystems in which wildlife are important components.

Highways impact wildlife directly by their effects on habitat and mortality, and indirectly by increasing human exploitation of wildlife and wildlife avoidance of roads. Highways have the potential to affect ecological processes in a landscape by fragmenting the wildlife population, restricting wildlife movement, and disrupting gene flow and metapopulation dynamics. Metapopulations are a set of local populations held together by migrating individuals. These impacts of highways on local/regional populations, habitat fragmentation, and metapopulation dynamics are important factors affecting the long-term persistence of populations. Highways do not affect all wildlife species equally and may act as filters, which stop some individuals while letting others through. Over time, this filtering of species based on habitat barriers can have important impacts on species distribution across a landscape.

Potential wildlife impacts are listed below.

- ***Habitat Impacts*** - Highway development results in the direct loss of habitat for wildlife species. Roadways can represent discontinuities in forested landscapes and serve to facilitate the spread of undesirable plants and animals. Impacts associated with storm water discharges, changing hydrology, and air emissions can degrade habitat some distance from the actual right-of-way. The dissection of habitat causes fragmentation reducing large habitat areas to smaller patch sizes with higher edge to interior ratios. Higher edge in habitat can increase predators and parasites and create unsuitable conditions for interior species.

- ***Movement Impacts*** - Roads can act as barriers to wildlife movement and may restrict access to vital habitats. Highways may also disrupt wildlife migrations, access to important resources (mineral licks, water source etc.), or separate important seasonal areas such as aquatic habitat from nesting habitat. Maintaining wildlife dispersal is important to maintain the local population gene flow, supplement a small or declining population, or re-colonize a local population lost to an extinction event.

- ***Population Impacts*** - Roads directly affect wildlife populations by the increased danger of mortality from vehicle-wildlife collisions. Population survival rates can be affected by increased mortality and sex ratios. Social organization could also be affected. Dispersal of animals or tendencies for one sex to avoid the road can result in imbalance in the local population. Some species will avoid the road because of increased light and noise impacts and well as human activity. Roads increase human access into wildlife habitats for hunting and poaching. Restrictions in animal movement can drastically reduce or cause extinction of a small local population due to random genetic and demographic events, environmental variability and natural catastrophes. Smaller more isolated populations are more vulnerable to genetic change from genetic drift and inbreeding depression.

All three of the proposed build alternatives are expected to have wildlife impacts to some degree. Direct impacts to forest, shrub/scrub, and pasture/crop/fallow land habitats are discussed in the preceding section. Direct impacts of each alternative to wetland habitats are discussed in Section 5.12. One of INDOT's "Strategic Objectives for the Environment" is to plan, construct, and operate Indiana's transportation system to minimize the effects on the environment. The freeway designers will work with appropriate agencies to determine the most feasible and practical conservation measures for the maintenance of wildlife movements and landscape connectivity.

5.9.5 Threatened and Endangered Species

Information about threatened and endangered species (TES) within the study area was provided by the United States Fish and Wildlife Service (USFWS) (letter dated May 2, 2002), the IDNR (letter dated June 3, 2003), experts in related fields of study, and property owners in the area. Information provided by the IDNR included a GIS shapefile of recorded occurrences of endangered, threatened, or rare species and high quality natural communities as found in the Indiana Natural Heritage Data Center database. This report includes data provided by the Indiana Natural Heritage Data Center. These data are not based on a comprehensive inventory of the state. The lack of data for any geographic area should not be construed to mean that no significant species or natural features are present. IDNR is not responsible for any inaccuracies in the data and does not necessarily endorse any interpretations or products derived from the data. Only recent (1980+) records from the Indiana Natural Heritage Data Center were used.

Threatened, endangered, special concern, and rare species potentially within the vicinity of the three alternatives are discussed in the section below. Table 4.9.12 in Section 4.9, Natural Resources, lists these species and their probability of being impacted by this project. Due to the close proximity of the alternatives to one another, potential impacts could occur from any of the three alternatives. Additional field work completed for the FEIS, will be important to further evaluate these species and possible impacts.

Figure 5.9.20 shows the locations of the recent (1980+) TES records from the Indiana Natural Heritage Data Center. The majority of these records occur in the area of complex glacial drift west and northwest of Lakeville. Alternatives Cs and Es pass through this area, while Alternative G-C avoids it except for the northern portion of the Alternative.

Also, the majority of the wading birds discussed below, as well the Blanding's turtle were observed in a high quality wetland/upland complex located just north of Osborne Road. A portion of this area is enrolled in a number of federal and state funded wildlife management programs, including the Classified Wildlife Habitats, Wetland Reserve Program, and Partners for Fish and Wildlife Program. This area is discussed in greater detail in the Classified Wildlife Habitat section, earlier in this chapter. Avoidance of this high quality area would minimize impacts to a number of species. Alternatives Cs and Es, would directly impact this complex, while Alternative G-C avoids it.

Upon selection of a Final Preferred Alternative, detailed field investigations will be conducted. Such investigations will include mist netting for bats, seining for aquatic organisms (fish, turtles, and some invertebrates), trapping for small mammals, amphibians, and reptiles (drift fence array, pitfall traps, box traps, shelter boards), sampling for invertebrates using appropriate methods, visual surveys for birds, and ground surveys for habitat for the star-nosed mole, bobcat, and American badger.

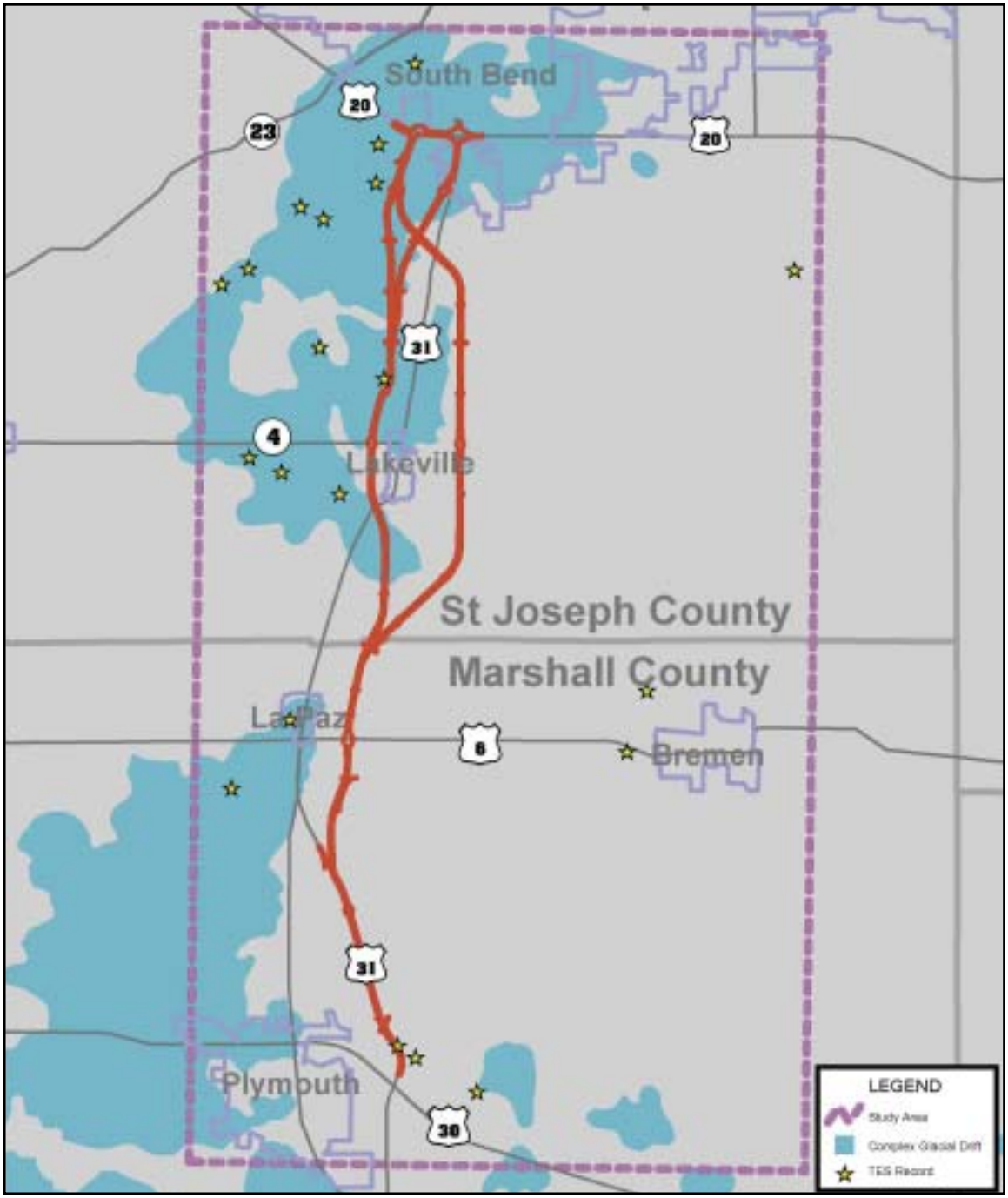


Figure 5.9.20: Recent (1980+) TES Records in the US 31 Study Area

Data Source: Indiana Natural Heritage Data Center. This Map includes data provided by the Indiana Natural Heritage Data Center. These data are not based on a comprehensive inventory of the state. The lack of data for any geographic area shall not be construed to mean that no significant natural features are present. Indiana DNR is not responsible for any inaccuracies in the data and does not necessarily endorse any interpretations or products derived from the data. Show only recent records dated 1980+.

Federally Listed or Candidate Threatened and Endangered Species

Reptiles

Northern Copperbelly Water Snake (*Nerodia erythrogaster neglecta*)

The **federally threatened copperbelly water snake (*Nerodia erythrogaster neglecta*)** is a subspecies of the more common plain-belly water snake (*Nerodia erythrogaster*). It has a dark back and is distinguished from other subspecies by its bright orange-red underside and proportionally larger head and eyes compared to other species. These snakes can grow to 40–50 inches in length (IPFW, 2003). The known historic range of the species is south central Michigan and northwestern Ohio, southwestward through Indiana to extreme southeastern Illinois and adjacent Kentucky. Copperbelly water snake wetland habitat loss from early settlement of the Midwest to the late 1900s has been attributed primarily to conversion to agricultural land. Current distributional data indicates that a hiatus of approximately 180 miles through central Indiana has divided the subspecies into two populations.

Figure 5.9.21: Northern Copperbelly Water Snake.

Photo Credit: B. Kingsbury

The northern distinct population segments for the species. In so doing, this enabled the USFWS to treat each population segment as a species and make separate determinations (FR 62 4183-4192). The northern segment is listed as federally threatened, while the southern segment is not currently listed. It is the northern segment that could be impacted by the proposed project, therefore only the northern segment of this species will be discussed further.

The northern segment has been listed as threatened because of extensive habitat loss and pronounced fragmentation and degradation impacts. The eight small clusters of the northern population are separated by incompatible land use, namely agriculture, rural residential sites, and roads. This isolation has forced the clusters to function independent of one another, thus increasing the likelihood of extirpation. Many of the clusters are located on property not owned by the state or private conservation organizations capable of providing protection. As of the late 1990s, it was uncertain as to whether the northern population was trending toward an increase or decrease. However, without additional protection, it was believed that the northern population may become extirpated within the next few decades.

The copperbelly water snake has been found in shallow ponds and ditches in moist wooded areas. It has also been found in more open areas, but almost always near ponds, sloughs, and ditches (Minton, 1972). Copperbelly water snakes use multiple wetlands, frequently moving between them (IPFW, 2003). In the spring, they migrate from their upland and bottomland hibernation sites to wetland areas such as ditches, river swamps, and woodland edges of streams, ponds, and lakes. The approach of summer and the drying of woodland swamps results in dispersal of the snakes through wooded or vegetated corridors to summer habitats, primarily forests and forest edges. Despite its wetland affinities, upland habitat is essential for the snake's summer foraging activities. In the fall, this species seeks out bottomland hibernation sites such as felled tree-root networks, crayfish burrows, brush piles, fieldstone piles, and mammal lodges. Upland hibernation sites are also critical to the long-term survival of copperbelly water snake populations when life threatening conditions such as mid-winter floods and freezing temperatures exist. Because they often travel long distances between habitat types, they are susceptible to human encounters, predation, and from being struck by vehicles while crossing roads (IPFW, 2003).

There are no known records of the copperbelly water snake within the study area. The closest record was from the mid 1980s, and approximately seven miles northwest of the study area in the vicinity of Deer and Mud Lakes on Lydick and Galien quadrangles. According to USFWS, the copperbelly water snake utilize forested and scrub-shrub wetlands with adjacent forested uplands. The northern copperbelly is not currently known within the vicinity of US 31, but there is a possibility that it might be present in suitable habitats. The probability of impacting this species is low since limited preferred habitat was found in the alternatives. The copperbelly water snake is an obligate wetland species, landscape dependent, and a generalist carnivore.

Eastern Massasauga Rattlesnake (*Sistrurus catenatus catenatus*)

The Study Area is within the range of the **Eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*)**, which has been listed as a **Candidate species** for listing as threatened or endangered under the ESA. Candidate species are those for which sufficient information on their biological status exists to warrant listing, but for which listing has not yet occurred.

Figure 5.9.22: Eastern Massasauga Rattlesnake
Photo Credit: G.J. Lipps, Jr.

The Eastern massasauga is a small, poisonous snake, with a thick body, heart-shaped head, and vertical pupils. Adult snakes can grow to 20 to 25 inches in length. Their backs are typically light grey to light brown, with one row of large dark brown spots to either side. These spots join together on the head to create stripes, and on the tail to create rings. The snake's belly is dark black with flecks of lighter color mixed in. These snakes can also be black in some geographic areas (IPFW, 2003).

The range of the Eastern massasauga extends from western New York and southern Ontario to southern Iowa, and a narrow band in northeastern Missouri. Historically, the snake's range covered a similar area, but the number of populations and individual snakes within the populations has shrunk. Today, it is generally found in small, isolated populations throughout its range (USFWS, 2003).

In Indiana, the Eastern massasauga has been found in rank grassland and undergrowth surrounding lakes or marshes, dry prairie, hay or grain fields, second growth swamp forest, and near buildings that were near the previously listed habitats (Minton, 1972). Massasaugas may use adjacent uplands for part of the year. They often hibernate in crayfish burrows, or under logs, tree roots, or in small mammal burrows. Typically the snakes are below the water table during hibernation, the water preventing them from freezing. They also often return to the same burrow to hibernate every year (IPFW, 2003). Massasaugas eat small rodents, frogs, birds or other snakes.

Habitat loss and fragmentation have lead to the decline of this species. Roads, towns, and farm fields can prevent these snakes from moving between the wetland and upland habitats they use. Also, because the massasauga is a poisonous rattlesnake, people tend to kill them out of fear. Much of this human behavior is only out of ignorance.

According to the USFWS, the study area is within the range of the Eastern massasauga rattlesnake. This species has been reported within the study area with the most recent record reported near Lakeville. The Indiana Natural Heritage Data Center shows one recent (1986) record of this species within the Study Area, on the Lakeville quadrangle in the vicinity of Wharton and Catfish Lakes. The probability of impacting this species is low since limited preferred habitat was found in the alternatives. Populations of the eastern massasauga are not expected to be impacted by

this project, and concentrations would be located in environmentally sensitive areas like Wharton Lake or Catfish Lake. Alternatives in these areas were discarded from further consideration. The eastern massasauga is an obligate wetland species, stenotypic specialist, and generalist carnivore.

Birds

Bald Eagle (*Haliaeetus leucocephalus*)

The **bald eagle (*Haliaeetus leucocephalus*)** is a **federally threatened** species in Indiana. The IDNR Non-game Wildlife Program is working to restore bald eagle populations in Indiana. Between 1985 and 1989, 73 young eagles were released at the Monroe Reservoir (Castrale, 1991). The number of active nests and young fledged has increased yearly since 1988 attesting to the program's success. Since 1988, a total of 67 eagles have been fledged in Indiana. In the 2001 breeding season, Indiana had 27 occupied territories, 27 active nests, and a total of 27 eagles fledged from 20 nests. In contrast, surveys in 1989 showed only two nesting territories, one active nest, and no young fledged. The number of bald eagles in Indiana has increased 35% since 1989. The 1992 winter state survey reported 101 bald eagles.

Figure 5.9.23: Bald Eagle
Photo Credit: Herb Lang

The adult bald eagle is named for its white head. The rest of the bird is dark brown with the exception of the tail feathers, which are white. Males and females are identical in color. Maturity is reached at four to five years. The body of an adult bird is three to three and one-half feet in length, and the wingspan is six to seven and one-half feet. Eagles mate for life and select nesting sites near where they were raised as young.

Adult bald eagles do not begin to nest until they are four to five years old. Eagles select nest sites close to where they were raised as young. The life span of a bald eagle is quite long, living up to 48 years in captivity and 21 years in the wild. Their nesting period is usually from October 1 to May 15 in the Southeast; however, in the northern portion of the range, nesting has occurred as late as August (USFWS, 1987).

Appropriate breeding habitat for bald eagles includes isolated large bodies of clear, clean water (i.e., lakes, bays, marshes, rivers) with adjacent mature, tall trees for nesting and roosting. Lakes with more than seven miles of shoreline have been reported as primary breeding habitat (Peterson, 1986). Nest trees may be living or dead and branches are added in the uppermost crotch year after year, prior to breeding. Eagles may also build nests in several trees and then alternate nest trees from year to year. Nests are usually located within one mile of water (Peterjohn and Rue, 1991) and within open forests.

There are no recorded bald eagle nests within the study area. According to USFWS, bald eagles may occasionally be found at area lakes during winter months, but there is no specific habitat available for them in the study area. The probability of impacting this species is very low since little preferred habitat was found within the alternatives. The bald eagle is an obligate wetland species, stenotypic specialist, carnivore generalist, and year-round resident.

Mammals

Indiana Bat (*Myotis sodalis*)

Figure 5.9.24: Indiana Bat
Photo Credit: Rich Fields

The **Indiana bat** (*Myotis sodalis*) is a **federally endangered** bat that occurs throughout much of the eastern United States. The Indiana bat is a medium-sized bat with usually a dull, dark pinkish gray color above and paler below. A few individuals have a brownish cast to the dorsal fur. It resembles the little brown bat, but differs in having a duller color to the dorsal fur, smaller feet, fewer and shorter hairs on the toes, and has a keeled calcar (Mumford and Whitaker, 1982).

They winter in a few large caves and mines for hibernation. Nearly 85% of the known population winters in only seven caves and mines in Missouri, Indiana, and Kentucky, and approximately one-half of the population uses only two of these hibernacula (Brady et al., 1983). The USFWS stated that the proposed project is within the range of this species. The Indiana bat has hibernacula (winter habitat) and a summer habitat. In spring, females migrate north from their hibernaculum and form maternity colonies in predominantly agricultural areas of Missouri, Iowa, Illinois, Indiana, and Michigan. These colonies consist of 50 to 150 adults and their young. They normally roost under the loose bark of dead, large-diameter trees throughout summer; however, living shagbark hickory (*Carya ovata*) and tree cavities are also used occasionally (Brack, 1988-1989; Brack and Tyrell, 1990; Brack and LaVal, 1985; Cope and Humphrey, 1977; Cope et al., 1974, 1977; Humphrey et al., 1977; Gardner et al., 1991; Garner et al., 1992; Callahan, 1993).

Upon returning to their hibernacula in the fall, they spend much of their time swarming in the vicinity of the cave entrance. The foraging range for the Indiana bat during fall and early spring is within five miles of the hibernacula. Bats mate at this time and females enter into hibernation as early as October. Males hibernate a little later (late November). The females store sperm through the winter and become pregnant in the spring. Females emerge from hibernation in late March or early April, followed by males. Females give birth to one young in June or early July, and at that time, they join together in nursery colonies beneath the loose bark of trees in riparian and floodplain areas (Humphrey et al., 1977; Cope et al., 1978; Sparling et al., 1979; Gardner and Gardner, 1980). A few Indiana bats have been captured in upland sites (Easterla and Watkins, 1969; Bowles, 1980). The young are capable of flight within a month of birth.

As a consequence of their limited distribution, specific summer and winter habitat requirements, and tendency to congregate in large numbers during winter, Indiana bats are particularly vulnerable to rapid population reductions resulting from habitat change, environmental contaminants, and other human disturbances (Brady et al., 1983). Additionally, because females produce only one young per year, recovery following a population reduction occurs slowly.

According to the USFWS, there have been no recent surveys for the Indiana bat within the study area. Summer habitat for this species consists of medium to large expanses of wooded land associated with water resources. The nearest recent record (1992) is from Potato Creek State Park, west of Lakeville. The USFWS states that it appears that sufficient habitat may be present to support a summer reproductive colony at some locations within the study area. The probability of impacting this species is moderate since suitable summer habitat was observed in the alternatives. Bat surveys will be conducted in 2004 for Indiana bats upon selection of a Final Preferred Alternative. The Indiana bat is a facultative wetland species, stenotypic specialist, and carnivore specialist.

State Listed Threatened, Endangered, or Special Concern Species

Gastropods

Pointed Campeloma (*Campeloma decisum*)

The **pointed campeloma** (***Campeloma decisum***) is a **state special concern** species reported within the study area. The pointed campeloma is a snail with a conic ovate shell that is olive green with some dark lines. It averages 25 mm in height and 15 mm in width. This species inhabits streams, lakes, and ponds, and burrows in the mud (Brosi, 2003). These snails are thought to be parthenogenic, meaning females can reproduce without males (SWCSMH, 2002). This species functional feeding designation is a scraper. It has a pollution tolerance value of 6.7 in the Southeast and 6.0 in the Northwest. The scale goes from 0 – 10, with 0 being for species that are ultra sensitive to pollution and 10 being extremely tolerant to pollution. It does not have a value for the Midwest or Upper Midwest (Rapid Bioassessment Protocols).

Figure 5.9.25: Pointed Campeloma
Photo Credit: Martin Kohl

The Indiana Natural Heritage Data Center shows three recent records (all 1988) of the pointed campeloma within the study area, and one just outside the study area in Potato Creek State Park. One record is associated with the Yellow River, over 10 miles upstream from the existing US 31 crossing. Another is associated with a pond, approximately 1.3 miles west of the existing US 31, just north of West 3D Road. All proposed alternatives are east of existing US 31 at this area. The third record within the study area is approximately 3.5 miles west of Alternative Cs, in a pond south of Layton Road. The probability of impacting this species is low since limited preferred habitat was found in the alternatives.

Swamp Lymneae (*Lymnaea stagnalis*)

The **swamp lymnaea (*Lymnaea stagnalis*)** is a **state special concern** species reported in the study area. The swamp lymnaea, also known as the great pond snail, has a relatively hard shell, often over five centimeters long. The shell is subject to great variations in form and appearance. For example, the shell is often shorter in strong water currents or becomes indented around the aperture in forms that inhabit areas with reeds and rushes. These adaptations may be caused by the external environment or the type of food ingested. Pond snails are omnivorous, feeding on animals and plants (Grzimek and Bernhard, 1974). The swamp lymnaea inhabit permanent and semipermanent aquatic habitats. This species functional feeding designation is a scraper. This snail is reasonably tolerant to pollution and has a tolerance value of 8 in the Northwest, but no value for the Midwest (Rapid Bioassessment Protocols).

Figure 5.9.26: Swamp Lymnaea
Photo Credit: Martin Kohl

The Indiana Natural Heritage Data Center shows two recent records (both 1988) of the swamp lymnaea within the Study Area, and one just outside the study area in Peter Sarber Ditch. One record is associated with a pond ap-

proximately 1.3 miles west of Alternative Cs, just south of New Road. The other was in Auten Ditch approximately 0.6 miles southwest of the proposed interchange of Alternatives Cs and G-C with US 20. The probability of impacting this species is low since limited preferred habitat was found in the alternatives.

Amphibians

Blanchard's Cricket Frog (*Acris crepitans blanchardi*)

The **Blanchard's cricket frog (*Acris* crepitans *blanchardi*)** is not a state listed species; however, its rarity warrants concern. This frog has warty skin with a pattern of alternating light and dark bars on the upper jaw and a dark triangle between the eyes. This frog also has a jagged stripe on the rear surface of its thigh and a broad stripe that runs down the middle of its back.

Figure 5.9.27: Blanchard's Cricket Frog
Photo Credit: B. Kingsbury

Blanchard's cricket frogs prefer sunny mud flats and shallow water with emergent vegetation, such as ponds, lakes, and larger creeks and rivers.

Habitat loss and fragmentation are believed to be the reasons for this species decline. Also, the average life span of an adult frog is only four months, with essentially one season to reproduce. If suitable breeding habitat is not available at that time, reproduction cannot occur. The frog's short life cycle makes it more susceptible to decline (IPFW, 2003).

There are no records of this frog within the study area, however it is of expert opinion that suitable habitat may be present. The probability of impacting this species is moderate since suitable habitat was observed in the alternatives. All efforts will be made to avoid and minimize potential impacts to this species by locating the Final Preferred Alternative outside their preferred habitat. Blanchard's cricket frog is a facultative wet species, generalist, and carnivore generalist.

Blue-spotted Salamander (*Ambystoma laterale*)

The **blue-spotted salamander** (***Ambystoma laterale***) is a **state special concern** species that may be impacted by this project.

Figure 5.9.28: Blue-Spotted Salamander
Photo Credit: B. Kingsbury

The blue-spotted salamander is a small, slender species, and bluish-black in coloring with large, bluish white blotches and flecks on its back and sides. This salamander has 12–14 grooves on its sides, and can grow to 7.5 – 13 centimeters. Males are often smaller than females, and have longer tails compared to their body (Petranka, 1998). This species can hybridize with other species, the Jefferson salamander (Ambystoma jeffersonianum) in particular (IPFW, 2003).

This species is secretive and lives in forested areas. Moist soil with small ponds are important elements. They can often be found beneath logs, rocks, leaf litter, or in small mammal burrows. The blue-spotted salamander eats earthworms, insects, spiders, snails, and other invertebrates.

The Indiana Natural Heritage Data Center shows one recent (1986), recorded occurrence in the study area, on the Lakeville quadrangle in the vicinity of Wharton and Catfish Lakes. The probability of impacting this species is moderate since there is suitable habitat within the alternatives. The blue-spotted salamander is a facultative wetland species, landscape dependent, and a carnivore generalist.

Reptiles

Spotted Turtle (*Clemmys guttata*)

The **spotted turtle** (***Clemmys guttata***) is a **state endangered** species that may be impacted by this project.

The spotted turtle can be identified by the yellow spots on its shell, head, neck, and limbs. Occasionally, spotted turtles will not have spots on their shells, but they will have yellow or orange markings on their head, neck, and limbs. These turtles can grow to 3.5 to 4.5 inches in length. These turtles have been reported to feed on frogs, earthworms, grubs, grass, tadpoles, and crayfish (Minton, 1972).

These turtles prefer shallow, well-vegetated wetlands with soft substrates such as marshes, wet pastures, bogs, fens, swamps, woodland streams, and drainage ditches. Although it prefers wetland habitats, the spotted turtle will travel across upland areas to other wetland complexes (IPFW, 2003). Habitat loss and fragmentation have been the major causes of decline, but this turtle also is subject to road mortality while traveling between wetlands.

Figure 5.9.29: Spotted Turtle
Photo Credit: B. Kingsbury

The Indiana Natural Heritage Data Center shows one recent (1998), recorded occurrence in the Study Area, on the Lakeville quadrangle in the vicinity of Wharton Lake. This species has also been identified at Potato Creek State Park. In environmentally attractive areas like Wharton Lake and Potato Creek State Park, preferred habitat for the spotted turtle occurs. In other areas, their habitat is lacking or marginal. The probability of impacting this species is low since limited preferred habitat was found in the alternatives. The spotted turtle is an obligate wetland species, landscape dependent, and an omnivore.

Kirtland's Snake (*Clonophis kirtlandii*)

The **Kirtland's Snake** (***Clonophis kirtlandii***) is a **state endangered** species. Kirtland's snake is small and slender, typically 14 – 18 inches in length. The back is usually brown to grey, with four rows of alternating dark spots. Its belly is generally red with a line of dark spots down each side (IPFW, 2003).

Kirtland's snake prefers wet meadows, wet prairies, fens and grasslands, near waterbodies such as ponds streams and marshes (IPFW, 2003). This snake is often found in association with crayfish burrows. If is also unique in that it will inhabit urban or residential areas. This snake is very secretive, and is often found under debris such as sheet metal or cardboard. Its diet consists primarily of earthworms (Minton, 1972).

Habitat loss and degradation, as well as collectors from the pet trade industry have lead to the decline of this snake's numbers. Most populations are now isolated in small areas of suitable habitat (IPFW, 2003).

The Indiana Natural Heritage Data Center shows one recent (1987), recorded occurrence of the Kirtland's snake in the study area, on the Lakeville quadrangle. The probability of impacting this species is low since there is a limited amount of preferred habitat in the alternatives. Kirtland's snake is a facultative wetland, landscape dependent, and, carnivore generalist.

Figure 5.9.30: Kirtland's Snake
Photo Credit: Ohio Public Library Information Network

Blanding's Turtle (*Emydoidea blandingii*)

The **Blanding's turtle** (**Emydoidea blandingii)** is a **state endangered** species reported within the study area. The USFWS states that the study area is within the range of the Blanding's turtle. This species is a federal Species of Special Concern and being considered for listing as federally threatened or endangered.

The Blanding's turtle is not afforded legal protection under the authorities of the ESA; however, the USFWS encourages consideration of this species in project planning because there is general concern among resource agencies for their status.

The Blanding's turtle is a medium sized turtle with an average shell length of 7 to 9 inches, the maximum of 10 inches. The upper shell is domed, but slightly flattened, and may be speckled with yellow or light colored specks or streaks. Its distinguishing feature is its bright yellow chin and throat.

Figure 5.9.31: Blanding's Turtle
Photo Credit: C. Barlow

Blanding's turtles prefer shallow, quiet, warm water surrounded by grassland. It has also been found in small prairie ponds and grassy marshes (Minton, 1972). During the active season, these turtles will often travel across uplands to other wetlands. During the winter, they hibernate underwater, partially buried in the bottom (IPFW, 2003).

Habitat loss and fragmentation is a major reason for the decline of the Blanding's turtle. Also, because they often travel to and from wetlands, road mortality is a considerable problem for this species.

Blanding's turtles have been observed at various wetlands in the general Lakeville area. The Indiana Natural Heritage Data Center shows three recent (1983, 1986, 1999) recorded occurrences of this species near the proposed alternatives. These occurrences are important because they may represent populations of the species in that area. The probability of impacting this species is moderate since suitable habitat was found in the alternatives. Blanding's turtle is an obligate wetland species, stenotypic specialist, and carnivore generalist. All efforts will be made to avoid and minimize potential impacts to this species by locating the Final Preferred Alternative outside their preferred habitat.

Butler's Garter Snake (*Thamnophis butleri*)

Butler's garter snake (***Thamnophis butleri***) is a state endangered species in Indiana.

It averages 15–20 inches in length, and is slender with three yellow to orange stripes along the length of its body. The matrix color can range from brown, black, or olive, and it may have two rows of dark spots between the side and back stripes. A distinguishing feature of this snake is that the lateral stripes are centered on the third scale row up from the ventral scales, and they overlap the adjacent second and forth scale rows, unlike other garter snakes (IPFW, 2003).

Figure 5.9.32: Butler's Garter Snake
Photo Credit: G.J. Lipps Jr., The Center for Reptile and Amphibian Conservation and Management

These snakes prefer moist, grassy, open canopy areas, such as meadows, wet prairies, marshes, savanna, and grasslands. They can also be found in urban or residential grassy areas, under rocks, logs, trash, and boards. Their diet consists mainly of earthworms, but they may also eat leeches, salamanders, and frogs (IPFW, 2003).

Habitat loss and fragmentation have lead to the decline of this snake. Most populations exist in isolated areas of suitable habitat.

There are no records of this snake within the study area; however, it is of expert opinion that suitable habitat may be present. The probability of impacting this species is low since it is unlikely that preferred habitat is present in the alternatives. Butler's garter snake is an upland species, landscape dependent, and carnivore generalist.

Birds

Great Egret (*Ardea alba*)

The **great egret *(Ardea alba)*** is a s**tate special concern** species. The great egret is the largest white heron seen in Indiana. Adults can range in height from 35 to 41 inches. This bird is all white with a yellow bill and black legs. It prefers the shores of lakes, ponds, and rivers, either freshwater or saltwater marshes, mudflats, shallow lagoons, and estuaries. The great egret requires trees or shrubs near the water for nesting. These birds build stick nests in trees, often in colonies with great blue herons or black-crowned night herons. Butler (1898) considered the great egret a locally common migrant and summer resident in Indiana with nesting possibly occurring in the northern and southwestern parts of the state. Keller et al. (1986) regarded this bird as a casual spring and rare fall migrant throughout Indiana (Castrale et al., 1998).

Figure 5.9.33: Great Egret
Photo Credit: Jim and Mildred Clark, *Refuge Reporter*

Historically, this bird was hunted for its plumage. Although it has recovered, wetland habitat loss and fragmentation have been and continue to be detrimental to the species.

The Indiana Natural Heritage Data Center shows no recorded occurrences for this bird within the study area. However, property owners in the area report that a great egret foraged in wetlands on their property. The probability of impacting this species is low since little to no preferred habitat was found in the alternatives. The great egret is an obligate wetland species, stenotypic specialist, carnivore generalist, and short-distance migrant.

American Bittern (*Botaurus lentiginosus*)

The **American bittern (*Botaurus lentiginosus*)** is a **state endangered** species that may be found in the study area. The American bittern is a medium-sized heron with a stout body. The back of the body is brown with fine black speckles. The underside is streaked with brown and white. There is a long black stripe that extends from below the eye down the neck.

These birds prefer wetlands with emergent vegetation such as marshes, and wetland fringe along lakes, ponds, rivers, and streams. Their diet consists of insects, amphibians, crayfish, and small fish and mammals. When foraging, it will often remain motionless, camouflaged by its coloration, then dart forward to capture prey.

Butler (1898) considered the American bittern a fairly common migrant and locally common summer resident in northern Indiana. Breeding bird surveys have shown a sharp decline of these birds in the north-central U.S. Loss of habitat is most likely responsible, although pesticide use and runoff may also be causes (Castrale et al., 1998).

Figure 5.9.34: American Bittern
Photo Credit: Mary Tremaine

The Indiana Natural Heritage Data Center shows no recent records for this species within the study area. It does show a reported occurrence in Potato Creek State Park. Also, property owners in this area reported that an American bittern stayed the summers of 1998, 1999, and 2001 in restored wetlands on their property. The probability of impacting this species is moderate since suitable habitat was observed in the alternatives. The American bittern is an obligate wetland species, landscape dependent, carnivore generalist, and breeding season resident/neotropical migrant.

Brown Creeper (*Certhia americana*)

The **brown creeper (Certhia americana)** is not a state listed species; however its rarity warrants concern. These are small, well camouflaged birds with brown plumage, streaked and spotted with white, cream, and grey. They inhabit large forested tracts, particularly large stands of dying trees, often in bottomland forests. Brown creepers prefer to build nests with large peeling slabs of bark. This bird has a distinctive foraging technique. It creeps along tree trunks and branches similar to a woodpecker. Brown creepers are most often encountered in this state during migration in the winter.

Figure 5.9.35: Brown Creeper
Photo Credit: USGS

Butler (1898) considered this bird a very common migrant and an irregular winter resident. Keller et al. (1986) listed it as a common migrant and rare to uncommon winter resident, as a casual breeder in the southern part of the state. Mumford and Keller (1984) considered it a permanent resident.

The Indiana Natural Heritage Data Center shows two recent records (1986, 1988) within the study area, both on the Lakeville quadrangle. One record was within Potato Creek State Park, and the other was in the vicinity of Wharton and Catfish Lakes. The probability of impacting this species is low since there is a limited amount of preferred habitat available in the alternatives. The brown creeper is a facultative wetland species, stenotypic specialist, carnivore generalist, and year-round resident.

Black Tern (*Childonias niger*)

The **black tern (*Childonias niger*)** is a **state endangered** species. The USFWS states that the study area is within the range of the black tern. This species is a federal Species of Special Concern and being considered for listing as federally threatened or endangered. The black tern is not afforded legal protection under the authorities of the ESA; however, the USFWS encourages consideration of these species in project planning because there is general concern among resource agencies for their status.

Figure 5.9.36: Black Tern
Photo Credit: Washtenaw Audubon Society

The black tern is a small tern, averaging 9 to 10 inches in length. During the breeding season in the summer, it has a black head and body, with the back, tail and wings gray. Young black terns and wintering adults have a white head and belly. Black terns are colonial-nesting and prefer to nest in large, shallow wetlands with dense emergent vegetation interspersed with open water (Castrale et al., 1998).

Butler (1898) considered this bird a regular migrant in southern Indiana, and a locally common summer resident and breeding bird of the Kanakakee River. Keller et al. (1986) considered it as an abundant (north) to uncommon migrant and rare summer resident in northern Indiana (Castrale et al., 1998).

Loss of wetland habitat due to development has contributed to the decline of this species.

According the USFWS, black terns have not been observed to nest within the area for many years but they migrate through. The probability of impacting this species is very low since it is a migratory species and has little to no preferred habitat within the proposed alternatives. Black terns are an obligate wetland species, landscape dependent, carnivore generalist, and breeding season resident/neotropical migrant.

Northern Harrier (*Circus cyaneus*)

The **northern harrier** (***Circus cyaneus***) is a **state endangered** species that has been reported in the study area. The northern harrier, or marsh hawk, is a slender-bodied hawk, 16 to 24 inches long, with a long tail and wings, and long yellow legs. This hawk has distinct facial disks, and a white patch on the rump. The male is silver-grey, and the female is larger and more brownish.

This bird prefers open habitats characterized by tall, dense vegetation, such as grasslands, marshes, fallow fields, harvested crop fields, hayfields, pastures, wet meadows, and the edges of ponds or lakes. Although cropland and fallow fields are sometimes used for nesting, most nests are found in undisturbed wetlands or grasslands dominated by thick vegetation (Duebbert and Lokemoen, 1977, Apfelbaum and Seelbach, 1983, Kantrud and Higgins, 1992).

Butler (1898) considered the northern harrier a permanent resident in northern Indiana and a winter resident farther south where it probably also nested in western Indiana. Mumford and Keller (1984) found that northern harriers had become less common and regarded them as uncommon migrants and rare permanent residents throughout the state (Castrale et al., 1998).

Figure 5.9.37: Adult Male Northern Harrier
Photo Credit: George Jameson, USGS

Habitat loss from intensive agricultural practices, wetland drainage, and conversion of grasslands to row crop fields have contributed to the decline of this species (Hands et al., 1989, Sweet, 1991).

The Indiana Natural Heritage Data Center shows no records of this species within the study area. However, property owners in the area report that a northern harrier forages in restored wetlands on their property in the late fall and early winter. The probability of impacting this species is moderate since suitable preferred habitat was found in the alternatives. The northern harrier is a facultative wetland species, landscape dependent, carnivore generalist, and year-round resident.

Sandhill Crane (*Grus canadensis*)

The **sandhill crane** (***Grus canadensis***) is a **state endangered** species reported within the study area. Sandhill cranes are tall birds with a relatively heavy body. Adults average 3.5 feet tall, and can weight between 7 – 12 pounds. These birds have a wingspan of 6 to 7 feet.

Figure 5.9.38: Sandhill Crane
Photo Credit: Wisconsin Department of Natural Resources

Sandhill cranes prefer to nest in large wetlands such as wet meadows, bogs, and open marshes dominated by cattails or sedges. They forage in upland areas, shallow marshes, or cultivated fields (Castrale et al., 1998).

Sandhill cranes are secretive during nesting season, and are often seen during fall staging. Fall staging occurs when the birds begin to flock together in preparation for migration.

Butler (1898) considered this bird a regular, sometimes common migrant and an occasional summer resident in northwestern Indiana. Historically it bred in the large marshes of the northern part of the state, but only since the mid-1980's have nests been reported in this area. Keller et al. (1986) regarded it as a rare migrant throughout the state and locally abundant near the Jasper-Pulaski Fish and Wildlife Area (fall staging area), with recent nesting in extreme northeastern Indiana (Castrale et al., 1998).

The Indiana Natural Heritage Data Center shows no records of the sandhill crane within the study area. It does show three recent records (2000, 2000, and 2001) just outside the study area, two in Potato Creek State Park and one in the vicinity of Chamberlain Lake. Property owners in the area report sandhill cranes forage in restored wetlands on their property almost every spring and occasionally in the summer. The probability of impacting this species is very low since it is a migratory species and little to no preferred habitat is available in the alternatives. The sandhill crane is an obligate wetland species, landscape dependent, omnivore, and migratory transient.

Black-and-White Warbler (*Mniotilta varia*)

The **black-and-white warbler** (***Mniotilta varia***) is a **state special concern** species reported within the study area. This bird is a neotropical migrant and has a black and white striped head and body. The males have a black throat, while the females throat is white. These birds forage by creeping along tree trunks and branches in search of insects, in a manner similar to that of a nuthatch.

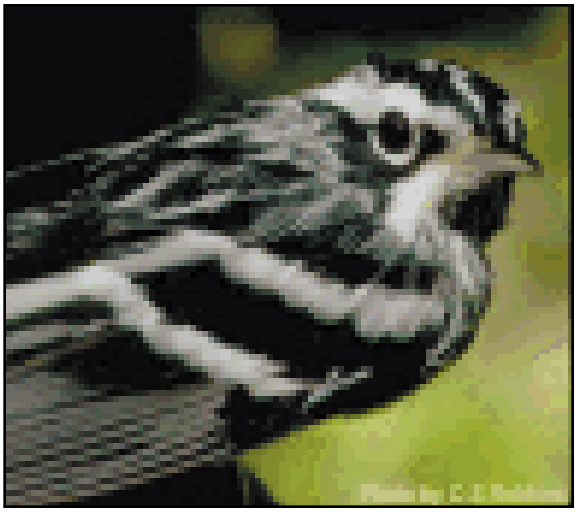


Figure 5.9.39: Black-and-White Warbler
Photo Credit: USGS

These birds prefer primary and secondary forests, but can also be found in more open areas with scattered trees during migration. It typically nests in more rugged sections of a forest, areas with dry hillsides, ridges, and deep ravines, although sometimes flat upland wooded areas are used. The nest is usually on the ground, at the base of a stump, rock, or other object. This species is a common host for the brown-headed cowbird (Castrale et al., 1998).

Buter (1898) considered this bird a common migrant in the state, with a few breeding in suitable areas. Mumford and Keller (1984) considered it as a fairly common migrant and very rare summer resident throughout Indiana (Castrale et al., 1998).

The Indiana Natural Heritage Data Center shows two recent records (1988, 1993) of this bird within the study area, one in Potato Creek State Park and the other in Rum Village Park in South Bend. The probability of impacting this species is low since there is a limited amount of preferred habitat in the alternatives. The black-and-white warbler is sensitive to forest fragmentation. It is an upland species, landscape dependent, carnivore generalist, and a breeding season resident/neotropical migrant.

Virginia Rail (*Rallus limicola*)

The **Virginia rail** (***Rallus limicola***) is a **state endangered** species reported within the study area. The Virginia rail is a medium sized rail, reddish in color with grey cheeks. The tail is short and upturned.

Figure 5.9.40: Virginia Rail
Photo Credit: Marcus Martin, USGS

The ideal habitat for this species consists of shallow marshes with muddy substrate and 40–70 % cover of emergent vegetation interspersed with open water or mudflats (Conway and Eddleman, 1994). Virginia rails may also be found along thick emergent vegetation of wetland fringe along lakes, rivers, or ponds.

Butler (1898) considered this bird a common migrant, especially in the spring, and a locally common summer resident, primarily in northern Indiana. Keller et al. (1986) considered it an uncommon migrant and summer resident in northern Indiana, and a rare migrant and possible summer resident elsewhere (Castrale et al., 1998). Loss of wetland habitat has caused populations of this species to decline.

The Indiana Natural Heritage Data Center shows one recent record (1994) for this species on Lakeville quadrangle, west of Lakeville. The probability of impacting this species is moderate since suitable habitat was found in the alternatives. The Virginia rail is an obligate wetland species, landscape dependent, omnivore, and breeding season resident/neotropical migrant.

Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)

The **yellow-headed blackbird** (***Xanthocephalus xanthocephalus***) is a **state endangered** species reported within the study area. The male of this species has a yellow head and throat and black body. The female is not as conspicuous, with a dull yellow throat and head, a gray-brown body with white streaks down her breast. Both sexes are about 9.5 inches in length with a pointed black bill.

Figure 5.9.41: Yellow Headed Blackbird
Photo Credit: George Jameson, USGS

The yellow-headed blackbird prefers freshwater marshes during the summer, particularly among cattails, bulrush, or other emergent vegetation. During migration they can be found in large, mixed flocks foraging in open, cultivated fields and pastures.

Butler (1898) considered this bird a local summer resident in northwestern Indiana. Mumford and Keller (1984) considered them a rare and local nester in Lake and Newton counties, and casual to very rare migrants elsewhere (Castrale et al., 1998).

Loss of suitable wetland, breeding habitat has caused populations of this species to decline.

The Indiana Natural Heritage Database shows one recent record (1987) of this species, located on the Plymouth quadrangle in the riparian corridor of the Yellow River. The probability of impacting this species is very low since little to no preferred habitat was found in the alternatives. The yellow-headed blackbird is a facultative wetland species, landscape dependent, omnivore, and occasional in the Study Area.

Mammals

Star-nosed Mole (*Condylura cristata*)

The **star-nosed mole (Condylura cristata)** is a **state special concern** species in Indiana. The star-nosed mole is blackish on its back and belly with dense fur that is soft and shiny. It has small eyes and ears, but its snout is long with 22 fleshy tentacles (star) around the tip. The tail is scaled with sparse, coarse hairs, and may swell in the winter as fat is deposited for storage. (Mumford and Whitaker Jr., 1982).

Figure 5.9.42: Star-nosed Mole
Photo Credit: Kenneth Catania

Star-nose moles prefer wetlands such as marshes, bogs, ditch and stream banks, and swampy areas. Areas of this type tend to have an abundant source of food, such as aquatic insects, crustaceans, small fish, and earthworms. Loose soil is also present, allowing the mole to burrow easily. This mole is semi-aquatic, spending much time in the water (Mumford and Whitaker Jr., 1982).

There are no records of the star-nosed mole within the Study Area, however it is of expert opinion that suitable habitat may be present. Mumford and Whitaker Jr. (1982) report a specimen from St. Joseph County. The probability of impacting this species is moderate since there was suitable habitat observed in the alternatives. The star-nosed mole is an obligate wetland species, a stenotypic specialist, and a carnivore generalist.

Bobcat (Lynx rufus)

The **bobcat** (***Lynx rufus***) is a **state endangered** species that has been reported in the study area. This cat is relatively long-legged with a stubby tail. The bobcat is a medium size wildcat with large cheek tufts. It is normally reddish-brown on its back and sides, and whitish below, with black spots throughout. These cats typically weigh from 16 to 25 pounds.

Figure 5.9.43: Bobcat
Photo Credit: Big Cats Online

Bobcats are reclusive animals, and mostly nocturnal. Most reported sightings in Indiana are from heavily forested areas. In neighboring states, it has been reported to prefer bottomland forests, hilly forested uplands, or brushy areas where the land is rocky or swampy. It feeds on rabbits, small mammals, and birds. Bobcat dens are often in rock crevices, hollow trees, or other protected areas (Mumford and Whitaker Jr., 1982).

The Indiana Natural Heritage Data Center shows one unconfirmed, recent record (1989), of the bobcat on Lakeville quadrangle, just south of Potato Creek State Park. The probability of impacting this species is very low since little to no preferred habitat was found in the alternatives. The bobcat is an upland species, landscape dependent, and a carnivore generalist.

American Badger (*Taxidea taxus*)

The **American badger** (*Taxidea taxus*) is a **state endangered** species reported within the study area. The American badger has short legs and tail, and flat body. Its nose is long, pointed and tipped up. Its fur is long and gray, brown, or black in color, with white stripes on its cheeks and one white stripe running from its nose to the back of its head. The badger's feet are black, the front feet with strong claws for digging.

Figure 5.9.44: American Badger
Photo Credit: NatureWorks

Badgers prefer open areas such as plains, prairies, fields, and the edge of woods. Badgers will excavate dens and burrows, and may have many different ones, often traveling between them. Burrows can be quite large and often have large amounts of soil piled at the entrance

The badger is not thought to have been common in Indiana. The greatest threats to this species are from humans illegally trapping or shooting them, and being killed by vehicles on the road.

The Indiana Natural Heritage Data Center shows five reported occurrences (1982, 1984, 1986, 1989, No Date) within the study area. These reports were scattered throughout the Study Area, four in Marshall County, and one in St. Joseph County. The reports were on the Plymouth, Inwood, Lakeville, La Paz, and Bremen quadrangles. The probability of impacting this species is moderate since suitable habitat was observed in the study area. The American badger is an upland species, landscape dependent, and carnivore generalist.

Plants

Herb-Robert (*Geranium robertianum*)

Herb-robert (*Geranium robertianum*) is a **state threatened** species reported within the study area. This species has paired pink to lavender flowers, with five petals, on stalks rising from the axils. The leaves are palmately divided into three to five lobes. This plant averages 6 – 18 inches tall.

This plant prefers rocky, upland, wooded areas. It has been found growing in woods dominated by sugar maple, American beech, and American elm (Swink and Wilhelm, 1994)

The Indiana Natural Heritage Data Center shows one recent report (1980) of this species within the study area. This report was on the Wakarusa quadrangle in the far eastern portion of the study area. The probability of impacting this species is very low since little to no preferred habitat was found in the alternatives.

Figure 5.9.45: Herb Robert
Photo Credit: Washington State Noxious Weed Control Board

5.10 Water Resources

Water resources impacts were evaluated by reviewing information from a number of sources. Information on public drinking water supply sites, both surface and underground water supplies, wellhead protection areas, and impaired streams was obtained through digital GIS files from IDEM. In addition to these GIS sources, the 2001 Indiana 305(b) Report on the Lower Wabash and Upper Illinois Basins, and a number of local studies and papers have been reviewed for ambient conditions.

Impacts to water resources were evaluated for both short term impacts resulting from the construction of the highway as well as potential long term impacts of runoff and continual maintenance of the highway.

5.10.1 Surface Water

The US 31 project area is primarily within the Yellow River drainage basin, of the Kankakee River watershed, and to a lesser extent of the St. Joseph River watershed. The Yellow River is crossed by all of the alternatives along the existing alignment of US 31. No impacts to the Yellow River are expected in construction of the proposed US 31 freeway since all of the alternatives would utilize the existing US 31 bridges. All of the streams crossed by each of the alternatives are reported in Tables 5.10.24 through 5.10.26.

Table 5.10.24: Alternative Cs (Estimated Stream Impacts)

Stream Name	Watershed	OHW Width(ft)	Length (ft)	Area (ft2)	Area (acres)
Elmer Seltenright Ditch	Kankakee	16.0	319	5004	0.11
Elmer Seltenright Ditch	Kankakee	16.0	583	6625	0.15
Lehman Ditch	Kankakee	8.0	307	2851	0.07
Mangun Arm of Lehman Ditch	Kankakee	6.0	303	2049	0.05
Unnamed Trib of Lehman Ditch	Kankakee	7.0	333	1361	0.03
Unnamed Trib of Riddles Lake	Kankakee	5.0	1170	8047	0.18
Unnamed Trib of Heston Ditch	Kankakee	10.0	907	8425	0.19
Heston Ditch	Kankakee	7.0	380	3494	0.08
Ditch (Dennis Schaeffer)	Kankakee	9.0	149	1272	0.03
Unnamed Trib of Shidler-Hoffman Ditch	Kankakee	2.0	338	1906	0.04
Unnamed Trib of Auten Ditch	St. Joseph	7.0	325	3115	0.07
Auten Ditch	St. Joseph	8.0	323	3636	0.08
Unnamed Trib of Phillips Ditch	St. Joseph	5.0	1386	6522	0.15
Phillips Ditch	St. Joseph	8.0	1588	13873	0.32
Source: Bernardin-Lochmueller & Associates, Inc. (2003)		Totals:	8411	68179	1.55

Table 5.10.25: Alternative Es (Estimated Stream Impacts)

Stream Name	Watershed	OHW Width (ft)	Length (ft)	Area (ft2)	Area (acres)
Elmer Seltenright Ditch	Kankakee	16.0	319	5004	0.11
Elmer Seltenright Ditch	Kankakee	16.0	583	6625	0.15
Lehman Ditch	Kankakee	8.0	307	2851	0.07
Mangun Arm of Lehman Ditch	Kankakee	6.0	303	2049	0.05
Unnamed Trib of Lehman Ditch	Kankakee	7.0	333	1361	0.03
Unnamed Trib of Riddles Lake	Kankakee	5.0	1170	8047	0.18
Unnamed Trib of Heston Ditch	Kankakee	10.0	907	8425	0.19
Heston Ditch	Kankakee	7.0	380	3494	0.08
Ditch (Dennis Schaeffer)	Kankakee	9.0	149	1272	0.03
Unnamed Trib of Shidler-Hoffman Ditch	Kankakee	2.0	338	1906	0.04
Unnamed Trib of Auten Ditch	St. Joseph	2.5	302	1270	0.03
Unnamed Trib of Auten Ditch	St. Joseph	6.0	303	1658	0.04
Unnamed Trib of Auten Ditch	St. Joseph	3.0	331	2739	0.06
Source: Bernardin-Lochmueller & Associates, Inc. (2003)		Totals:	5725	46700	1.06

Table 5.10.26: Alternative G-C (Estimated Stream Impacts)

Stream Name	Watershed	OHW Width (ft)	Length (ft)	Area (ft2)	Area (acres)
Elmer Seltenright Ditch	Kankakee	16.0	319	5004	0.11
Elmer Seltenright Ditch	Kankakee	16.0	583	6625	0.15
Lehman Ditch	Kankakee	8.0	307	2851	0.07
Mangun Arm of Lehman Ditch	Kankakee	6.0	303	2049	0.05
Unnamed Trib of Lehman Ditch	Kankakee	7.0	504	2973	0.07
Heston Ditch	Kankakee	13.0	463	5867	0.13
Shidler-Hoffman Ditch	Kankakee	6.0	435	2866	0.07
Unnamed Trib of Bunch Ditch (East Branch)	Kankakee	10.0	472	4716	0.11
Unnamed	Kankakee	5.0	949	10486	0.24
Phillips Ditch	St. Joseph	8.0	1588	13873	0.32
Source: Bernardin-Lochmueller & Associates, Inc. (2003)		Totals:	5923	57310	1.32

Tables 5.10.24 to 5.10.26 identify estimated stream impact lengths from 5,783 to 8,562 feet including 1.10 to 1.60 acres of impacts below ordinary high water (OHW) marks for the alternatives. Streams exhibiting an OHW and downstream connectivity to other waters of the U.S. (which all streams crossed by the project do) are under the jurisdiction of the USACE under Section 404 of the Clean Water Act. Any impacts to these streams below the OHW are subject to a USACE Section 404 permit as well as an IDEM Section 401 Water Quality Certification as described in Section 5.17, Permits. Ordinary high water mark widths were measured in the field. Impact lengths and areas were estimated based on aerial photography review. The field measured OHW marks were compared to aerial photo estimates for consistency in the evaluations.

Water resources impacts are not expected to be significant in crossing the above ditches. The majority of the streams crossed are intermittent or ephemeral in nature and do not contain substantial aquatic or riparian habitat. Fish kills have been reported in the Yellow River (1,500 fish) and Elmer Seltenright Ditch (25 fish) of Marshall County (305B Report, 1989). No fish kills have been reported in St. Joseph County. The aquatic habitat value is moderate to low in these ditches, while riparian habitat is moderate to negligible (The Water Resource, 1990). Section 303(d) of the Clean Water Act requires states to identify waters that do not or are not expected to meet applicable water quality standards. States also are required to develop a priority ranking for these waters, taking into account the severity of the pollution and the designated uses of the water. The list prepared pursuant to this requirement is known as the 303(d) List of Impaired Water Bodies.

Three streams within the project area are included on the 2002 303(d) list. These include the Yellow River-Milner Seltenright Ditch, Elmer Seltenright Ditch, and Aldrich Ditch-Schang Ditch (also identified as East Branch of Bunch Ditch). The Yellow River will be crossed by all alternatives along the existing alignment of US 31 and the existing bridges will be used. The Elmer Seltenright Ditch will be crossed by each alternative twice. One crossing will be at the location of the existing US 31 crossing; however, new bridges will be required, while the other crossing will be a new terrain location. The Elmer Seltenright Ditch is listed as partially supporting aquatic life for 3.85 miles with a moderate rating for the biotic community status.

Stream rechannelizations may be applicable. Alternative Cs would require three rechannelizations (unnamed tributary of Riddles Lake, unnamed tributary of Phillips Ditch, and Phillips Ditch), while Alternative Es would require only one rechannelization (unnamed tributary of Riddles Lake). Alternative G-C would require two rechannelizations (unnamed ditch and Phillips Ditch). All of the streams requiring rechannelization are excavated drainage ditches or previously channelized and straightened streams.

Open water impacts are limited for the alternatives. No large natural lakes within the project area will be directly impacted. The impacts are limited to relatively small open water bodies with impacts totaling only two, one, and three acres for Alternatives Cs, Es and G-C, respectively. However, while the open water impacts themselves are not necessarily significant, these open waters are often associated with larger wetland complexes where overall impacts to the complex may be more significant. See Section 5.12, Wetlands, for a detailed description of wetland impacts.

The release of hazardous and potentially harmful materials into adjacent surface and subsurface waters from spill events along highways is always a point of concern both during and subsequent to construction. This is especially true when the highway is anticipated to support a large volume of semi-trucks transporting a wide variety of such substances. Since each of the alternatives for US 31 would cross a number of streams, this potential exists for all of the alternatives.

During construction of US 31, any spill incidents on site will be handled in accordance with INDOT spill response protocol as outlined in their Construction Activity Environmental Manual and Field Operations Manual Procedure 20. The Environmental Manual states that:

Hazardous material releases, oil spills, fish/animal kills and radiological incidents must be reported to Office of Emergency Response, IDEM. This should occur as soon as action has been taken to either contain/control the extent of the release and protect persons, animals or fish from harm or further harm. Appropriate response actions for spills occurring on project sites, in order:

1) Identify the spilled material from a safe distance,

2) Contain the spilled material or block/restrict its flow using absorbent booms/pillow, dirt, sand or by other available means,

3) Cordon off the area of the spill,

4) Deny entry to the cordoned off area to all but response personnel, and

5) Contact OER/IDEM then Operations Support.

Following construction of US 31, emergency spill response concerning hazardous materials transported along the highway will be handled by local fire departments and regional hazardous materials units. Currently, law enforcement and nearly all fire departments within the project area possess either awareness level or operations level capabilities for responding to hazardous material spills or releases. Awareness includes the recognition of hazardous material placards and the means to cordon off an incident site. Operations level includes booms for diking spills, personal protection equipment to work within contaminated sites, and other basic containment equipment. If called upon, INDOT state highway equipment and resources can also be deployed to assist in containment anywhere along the proposed freeway.

Indiana's State Emergency Commission has recently established eleven Regional Response Teams throughout the state, each of which will have full Level A hazardous materials response capabilities. Currently, the South Bend Fire Department is the only regional unit with Level A capabilities within the project area.

5.10.2 Groundwater

Currently in Indiana, only the St. Joseph Aquifer has the designation of "sole source aquifer" (SSA). According to the "Water Resource Availability in the St. Joseph River Basin, Indiana" (IDNR Division of Water, 1987), the limits of the St. Joseph SSA are over two miles from the nearest alternative. (Figure 5.10.46) As such, the project will not have any direct impact on this aquifer.

Other aquifers underlie huge portions of the State of Indiana, including essentially all of the project area. The aquifer systems included within the project area are the Maxinkuckee Moraine Aquifer System, Nappanee Aquifer System, and the Hilltop Aquifer System. All of these aquifers have been developed to some degree for public drinking water use. Some of these areas have been designated by IDEM as "wellhead protection areas" (WHPA). There are currently six designated WHPAs in the project area.

It has been and continues to be INDOT's standard policy to design and construct roads to protect both surface and ground water supplies, regardless of where the project is located. INDOT also has emergency management procedures in place should a hazardous spill occur. These procedures can be activated very quickly to protect ground water.

IDEM's Office of Water Quality, Drinking Water Branch has developed a Capacity Development Strategy as required by the 1996 Amendments to the Safe Drinking Water Act (SDWA). The capacity development provisions of

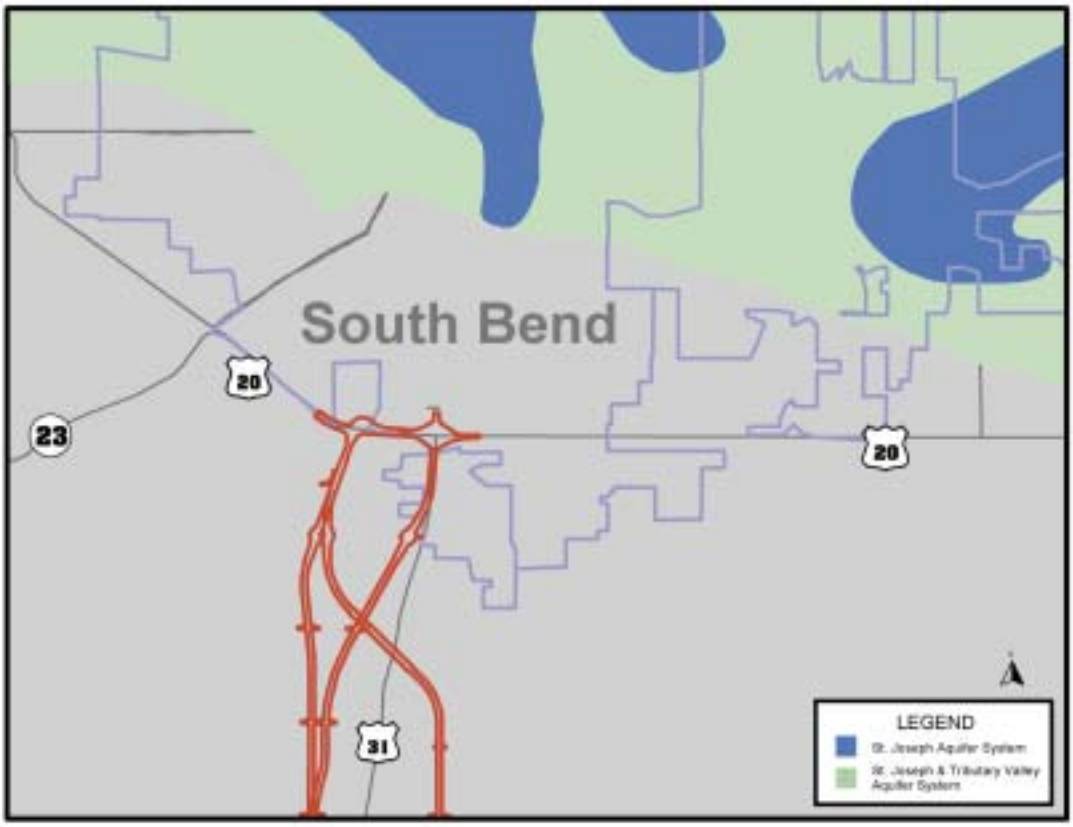


Figure 5.10.46: St. Joseph Aquifer System

the Act focus on the enhancement and maintenance of the technical, management, and financial capabilities of public water supplies. IDEM is required to assist existing public drinking water systems in acquiring and maintaining these capacities.

In order to accomplish this, public drinking water systems are evaluated by IDEM for compliance with Safe Drinking Water standards as set forth in 327 IAC 8. IDEM has developed a set of criteria to identify systems which are in need of further evaluation. IDEM has also developed a "Capacity Development – A Self-Assessment Manual for Indiana's Public Water Systems" to assist public water systems to identify any areas which need improvement to assure safe drinking water for existing and future customers. Development or expansion of community based public water systems requires a construction permit to be submitted, reviewed, and approved by the Permits Section of the Drinking Water Branch. The current regulations require that modifications or additions of facilities, equipment, or devices that will include new treatment plants, water storage tanks, booster stations, wells or chemical feed systems be designed and stamped by a Professional Engineer and submitted for a Construction Permit prior to starting construction.

The course of land development along the alternatives will vary according to existing and future activities in the area. An evaluation of the existing public water supply systems will be required and construction permits received from the regulatory agency prior to any additional expansion of customers.

The development of any of the alternatives is not likely to have a significant effect on drinking water supplies. While all alternatives cross public water supply wellhead protection areas, all but two of these areas are currently crossed

by the existing US 31 and US 20. The two additional wellhead protection areas are located southwest of the existing US 31/US 20 interchange in the vicinity of all three alternatives. Alternative Cs crosses both of these areas while Alternatives Es and G-C each cross one of the areas. Emergency spill response in these areas would be able to contain potential contamination before it could threaten the water supply. In addition, any typical roadway runoff would most likely be filtered out of the water as it infiltrates through the soil to the groundwater.

The aquifer systems crossed range from slightly susceptible to highly susceptible to contamination depending on local conditions. In highly susceptible areas where the potential exists for rapid movement of contaminants into the ground due to surficial sand and gravel deposits or the lack of a clay rich layer, special filtration and containment measures will be provided to address potential spills and runoff in these areas. These measures are identified in Chapter 6, Mitigation. Private water supply wells in proximity to the alternatives would also be protected by these measures.

5.10.3 Special Status Streams

No Wild and Scenic Rivers will be impacted by any of the alternatives. Additionally, no Outstanding State Resource Waters, Exceptional Use Streams, or streams on the Listing of Outstanding Rivers and Streams maintained by IDNR will be impacted by any of the alternatives. None of these resources are present in the project area as described in Section 4.10.3.

5.10.4 Summary

Each of the alternatives has the potential to cause impacts on water resources. In order to assess these potential impacts, this section identifies in broad terms the types of water resources crossed by each alternative, which includes the following.

- Open Water – lakes and ponds identified from field inspection and inspection of aerial photographs and USGS topographic quadrangles
- Streams – a watercourse exhibiting an ordinary high water mark identified during field inspection
- Wetlands – a wetland identified on National Wetland Inventory maps, excluding PUB designations
- Public Water Supplies – surface and underground public water supplies developed by the USEPA
- Public Wells – public water supply well sites located by GPS developed by IDEM
- Wellhead Protection Areas – the surface and subsurface area which contributes water to a public water supply well and through which contaminants are likely to move through and reach the well over a specified period of time

It is important to note that the number of crossings of a particular resource type do not necessarily correlate with the overall magnitude of impact. The actual impacts will depend on many factors, including the design of the roadway. The data presented in Table 5.10.27 is useful as a basis for identifying potential issues of concern related to water resources because it indicates the types of water resource issues that would need to be addressed for each alternative.

Water quality conditions in the project area range from moderately to severely degraded, with few exceptions. A review of the alternatives shows a high probability of impacts to wetlands. The No-Build Alternative will have no impact on these water resources.

Table 5.10.27: Comparison of Alternatives for Potential Water Resource Impacts.

Alternatives	Open Water (Acres)	Number of Streams	Stream Length (Feet)	Wetland Acres	Public Water Supplies	Public Wells*	Wellhead Protection Areas # (Acres)*
Cs	1	14	8411	57.7	0	0	5 (157)
Es	1	13	5725	40.5	0	0	4 (113)
G-C	2	10	5923	45.3	0	0	3 (97)

Note: This table identifies potential impacts for comparison; it does not incorporate mitigation potential.
*Public wells and wellhead protection areas were provided by IDEM.

The majority of water resources impacts would come from the loss of wetlands in the project area. Wetlands play a major role in maintaining Indiana's water quality. Wetlands absorb excess inorganic and organic nutrients such as farm fertilizers and septic system runoff, filter sediments such as eroded soil particles, and trap pollutants such as pesticides and some heavy metals. These materials can seriously degrade the quality of groundwater and surface water resources, but wetlands trap and hold them, "recycling" some of them within the wetland system. See Section 5.12, Wetlands for a detailed description of wetland impacts.

Mitigation measures for impacts to water resources will include, as appropriate, bridging floodplains and oxbows, minimizing channel clearing and relocations, especially for impaired streams, and utilizing erosion control devices. In areas highly susceptible to groundwater contamination, the use of special filtration and containment measures will address potential spills and runoff. INDOT will follow its emergency spill response procedures should any contaminate from the roadway threaten water resources. Implementation of the appropriate mitigation measures as identified here and in Chapter 6, Mitigation, will ensure that there will be no adverse effects on water resources from the project.

5.11 Floodplains

Floodplains are a vital part of the river or stream ecosystem. They are important because they act as flood buffers, water filters, nurseries, and are major centers of biological life in the river or stream ecosystem. They are important for maintenance of water quality as they provide fresh water to wetlands and backwaters, dilute salts and nutrients, and improve the overall health of the habitat of many species of birds, fish, and plants. They are important biologically as they represent areas where many species reproduce and are important for breeding and regeneration cycles.

Projects that directly cross or are adjacent to a stream or river will have some kind of floodplain encroachment. All of the alternatives will have floodplain encroachments. Impacts to floodplains require various permits, which are described in Section 5.17, Permits.

The approximate linear feet of each floodplain crossed by each of the alternatives was derived from measuring the approximate length of floodplain crossed by that alternative. In addition, each floodplain encroachment within the alternatives was analyzed to identify the potential amount of acres that may be impacted. For this analysis, digital data was used and created from The Indiana Water Resource: Availability, Uses and Needs, published by the Indiana Department of Natural Resources (Clark, 1980). Flood Insurance Rate Maps (FIRM) were also checked for floodplain impacts. A comparison of the digital floodplain data and the FIRM maps showed different floodplain impacts associated with Elmer Seltonright Ditch. The digital data showed approximately 1,990 feet of floodplain impacts along Elmer Seltonright Ditch and the FIRM maps showed no floodplain impacts along this ditch.

The three alternatives were compared using the digital floodplain data for 1) floodplain encroachments measured in linear feet and, 2) potential floodplain acres to be impacted. Table 5.11.28 shows the results of the analysis. Figure 5.11.47 shows a map of the alternatives and floodplain impacts. All of the alternatives will cross the floodplain of the Yellow River, but due to the fact that no changes to the existing bridges or approaches will accrue in this area, there will be no impacts to the Yellow River floodplain.

The results of this analysis show that Alternatives Cs and Es have the least amount of potential floodplain impacts. Alternative G-C will have the potential to have the highest amount of floodplain impacts. The No-Build Alternative would have no impacts on floodplains.

Table 5.11.28: Potential Floodplain Impacts

Floodplain Name	Alterative Cs	Alterative Es	Alternative G-C
Elmer Seltenright Ditch	1,990 feet	1,990 feet	1,990 feet
Heston Ditch	0	0	1,240 feet
Hoffman Ditch	0	0	1,075 feet
Total Feet	1,990 feet	1,990 feet	4,305 feet
Total Acres	18.4 acres	18.4 acres	27.9 acres

Mitigating impacts to floodplains may be completed by bridging the entire floodplains of streams or rivers impacted by the particular alternative. In addition, efforts will be made throughout the development of the final chosen alternative to avoid and minimize impacts on floodplains. Where floodplain impacts cannot be avoided, they will be minimized and mitigated by designing the project to ensure that waterway openings of structures crossing the floodplain provide sufficient capacity for floodwaters. All structures constructed as part of this project will be designed

to accommodate, at a minimum, a 100-year flood volume, in accordance with standard design practices. After the Record of Decision (ROD) and during design, permits will be obtained from appropriate resource agencies.

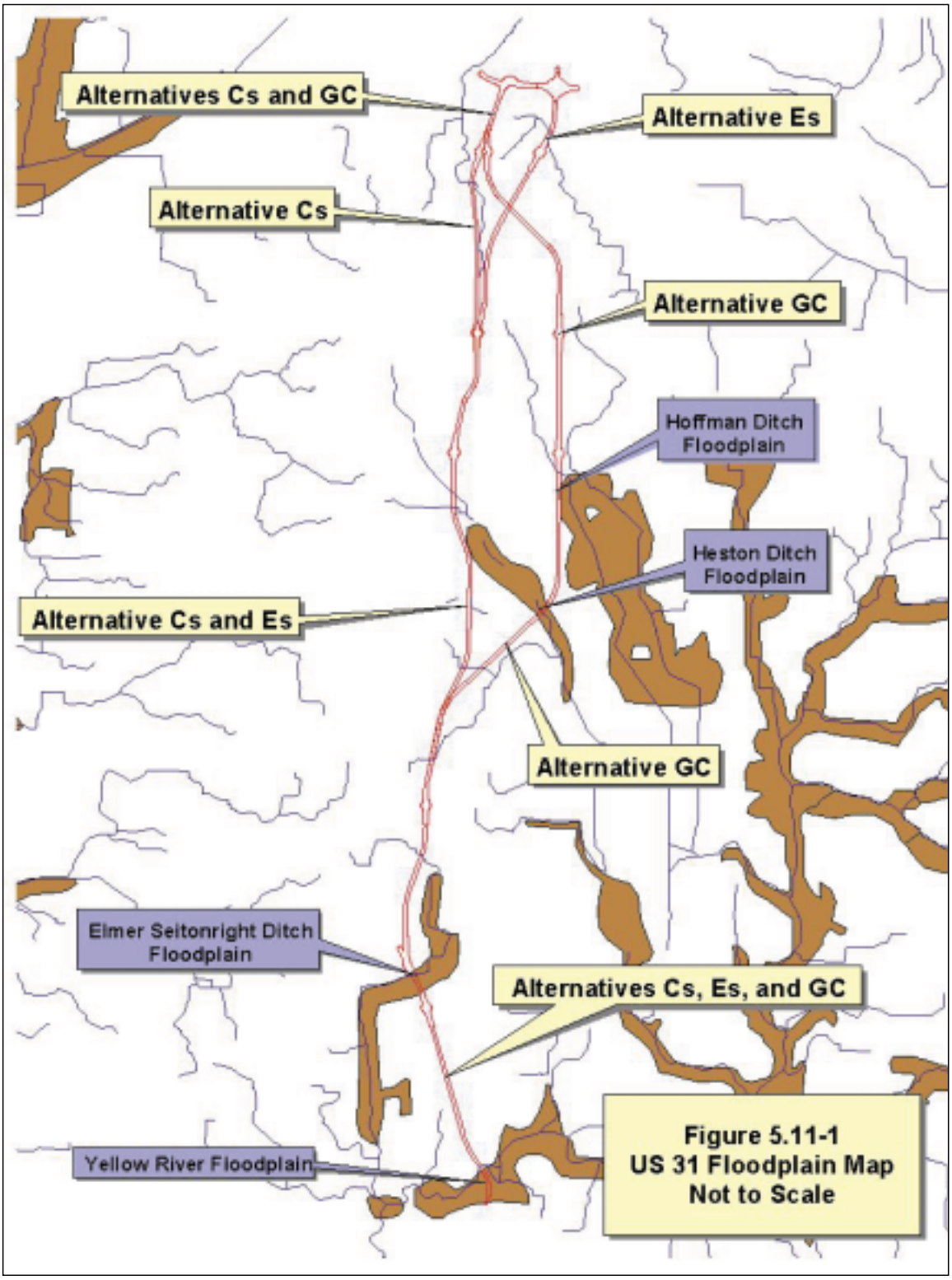


Figure 5.11.47: Floodplain Map

5.12 Wetlands

Wetlands as defined by the US Army Corps of Engineers (USACE) (33 CFR 328.3) and the US Environmental Protection Agency (USEPA) are "those areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions."

Wetland calculations for the DEIS were completed using digital NWI maps and verifying wetland locations during field reviews of each alternative. The digital NWI maps included wetland points (very small wetlands), lines (linear wetland areas), and polygons (any type of wetland shape). Wetland acres were calculated and summarized for various wetland types as discussed below. Calculations of wetland points were assumed to have an area of 0.1 acres, and wetland lines were assumed to have a width of 50 feet.

It is important to note that the NWI uses infrared aerial photography for classifying wetlands and such a methodology may not meet all of the criteria used by the Army Corps of Engineers for permitting decisions under Section 404 of the Clean Water Act. Therefore, the wetlands listed on the NWI maps may not necessarily be jurisdictional wetlands. NWI data was used in this DEIS analysis because it is the best available; however, the wetland acres given should be used for a general comparison of the alternatives, rather than as an exact calculation of jurisdictional wetlands. Jurisdictional wetlands require wetland delineations. Jurisdictional wetlands that are impacted will require the appropriate permit(s). Because NWI maps were used to identify wetlands in the DEIS, some small wetlands and lakes/ponds may not be included in this analysis. These smaller wetlands and lakes/ponds will be identified when a final alternative for more detailed study is selected and wetland delineations have been completed.

NWI maps were studied in order to determine the type and acreage of wetlands affected by each alternative. A preliminary field review of each alternative showed no bogs or fens present within the 300-foot working alignments.

The comparison of wetlands among the alternatives included: (1) palustrine emergent wetlands; (2) palustrine scrub/shrub wetlands; (3) palustrine forested wetlands; and (4) palustrine aquatic bed wetlands. In addition to these four wetland types, the alternatives were compared for farmed wetlands and unconsolidated bottom wetlands. The total amount of acres of each type of wetland that fell within the alternatives was calculated to compare each of the alternatives for potential wetland impacts. Table 5.12.29 shows the results of the analysis.

Wetland mitigation for this project includes the following replacement ratios: 2:1 for emergent wetlands, 3:1 for forested and scrub/shrub wetlands, and 1:1 for aquatic bed wetlands and farmed wetlands. Unconsolidated bottom wetlands may be replaced by the construction of borrow pits for the roadway.

Efforts will be made to avoid impacting wetlands during the development of the final chosen alternative and the amount of jurisdictional wetland impacts will be discussed in the FEIS. Where avoidance is not possible, the development of the alternative chosen for more detailed study will include all efforts to minimize the wetland impacts.

There are wetland impacts within all the alternatives, but the impacts have been minimized by efforts to avoid them. Each alternative was walked and modifications in the alignments were made to avoid wetlands. Many wetlands were avoided by such field efforts. Whenever possible, the alternatives were designed to affect only the edge of the larger wetland areas and not impact the core of these wetland areas. An estimate of the total wetland acres impacted for all the alternatives ranged from 4% to 6% of the total acres of land impacted by each alternative.

Table 5.12.29: US 31 NWI Wetland Acres Impacted by Alternatives

Wetland Type	Alternative Cs	Alternative Es	Alternative G-C
Aquatic Bed	0.8	0.7	1.0
Emergent	26.3	15.7	15.6
Scrub/Shrub	3.0	1.6	1.4
Forested	25.8	20.8	24.7
Totals	55.9	38.8	42.7
Farmed	1.8	1.7	2.7
Totals	57.7	40.5	45.3
Unconsolidated Bottom (Lakes and Ponds)	0.8	0.5	1.3
Totals	58.5	41.0	46.6

Appropriate wetland impacts will be mitigated by replacement. The replacement of wetlands will follow INDOT's MOU dated January 28, 1991 (Appendix H). The MOU was developed to ensure that compensatory wetlands would be appropriately designed, acquired, and constructed in such a manner as to ensure no net loss of this valuable habitat.

The results of this analysis indicate that Alternative Es impacts the least amount of NWI wetlands and Alternative Cs impacts the greatest amount of NWI wetlands. Close coordination with review agencies and other local agencies will be required to avoid and minimize wetland impacts during the development of the final alternative chosen for more detailed study. The No-Build Alternative will have no impacts on wetlands. For a discussion of cumulative wetland impacts refer to Section 5.20, Cumulative Impacts.

5.13 Visual and Aesthetic Resources

Visual impacts of the US 31 Plymouth to South Bend project include the "view from the road" and the "view of the road". Such impacts are assessed to design quality, art, and architecture in the project planning. These values are particularly important for facilities in sensitive environmental settings.

The US 31 Improvement Project will result in both temporary and permanent visual impacts. Temporary impacts are the sighting of construction equipment and the resulting clearing of areas to construct the highway. These will be mitigated by the control of clearing to the area within the construction limits and with quick re-vegetation upon completion of construction. Permanent impacts are the conversion of forests, wetlands, farmland, and urban/suburban landscapes to a freeway.

The following descriptions for each alternative provide a general review of possible visual impacts. Information was gathered from driving each of the alternatives and use of GIS layers. Commentaries on each alternative begin in the south, near Plymouth, and end near US 20 in South Bend. Photographs for selected areas have been provided to illustrate the current landscape condition known as "Before," and an artistic rendition of the landscape post construction known as "After."

5.13.1 View from the Road

Alternative Cs

Alternative Cs uses the existing US 31 Corridor for about 4.5 miles, and crosses flat agriculture/grazing lands of the Northern Lakes Natural Region and the Northern Moraine and Lake Physiographic Region. Alternative C is located in or near the towns/cities of Plymouth, Harris, LaPaz, Lakeville, Colburn, Nutwood, Gilmer Park, and South Bend.

From US 31/US 30 Intersection to LaPaz, there is the Yellow River, agricultural/grazing lands, Plymouth–Goshen Trail, homes, forested areas, businesses, lakes, commercial grain operation, a tributary of the Yellow River, overhead utility lines, New Philadelphia Church, an injection plastics business, and US 6.

From LaPaz to Lakeville, the roadway will pass on the east side of LaPaz, near LaPaz Junction. There are agricultural/grazing lands, homes, wooded areas, a tributary of the Yellow River, a pipeline, Riddles Lake, Pleasant Lake, an 84 Lumber, and an abandoned railroad.

From Lakeville to South Bend, the roadway will pass on the west side of Lakeville and continue to the north. There is an outdoor recreation sports complex, a tributary to Moon Lake, Colburn Subdivision, SR 4, homes, a business, gas stations, Southern Acres Subdivision, wooded areas, Sun Communities Mobile Home Park, Berliner Marx vacant industrial facility, Barber Mobile Home Park, Sycamore Hills Subdivision, Kern Road Subdivision, Whispering Hills Subdivision, and Mittler Distribution Company. An interchange is proposed for Alt Cs at Kern Road, (Figures 5.13.48 and 5.13.49). The roadway will connect to US 20 with an interchange.

Alternative G-C

Alternative G-C uses the existing US 31 Corridor for about 4.5 miles, and crosses flat agriculture/grazing lands of the Northern Lakes Natural Region and the Northern Moraine and Lake Physiographic Region.

Figure 5.13.48: (Before) Proposed Interchange Location for Alternative Es at Kern Road

Figure 5.13.49: (After) Proposed Interchange Location for Alternative Es at Kern Road

From US 31/US 30 Intersection to LaPaz, there is the Yellow River, agricultural/grazing lands, Plymouth–Goshen Trail, homes, forested areas, business's, lakes, commercial grain operation, a tributary of the Yellow River, overhead utility lines, New Philadelphia Church, an injection plastics business, and US 6.

From LaPaz to Lakeville, the roadway will pass on the east side of LaPaz, and near LaPaz Junction. There are agricultural/grazing lands, homes, forest areas, a tributary of the Yellow River, a high school, Riddles Lake, Riddle Lake Subdivision, and an abandoned railroad.

From Lakeville to South Bend, the roadway will pass on the east side of Lakeville and continue to the north. There are wooded areas, agricultural/grazing fields, homes, and Robin Hood Subdivision. The roadway continues north paralleling Kenilworth Road for approximately 4.5 miles then begins to turn towards the north-northwest just north of Miller Road. Through this area one would see an increasing amount of homes and subdivisions, increasing industrial activity, and some small ponds. The new roadway will cross the existing US 31. There is the Weller's Heights Subdivision, businesses, a historical home, gas stations, Kern Road Subdivision, and Whispering Hills Subdivision. There is an interchange proposed for Alternative G-C at US 20. (Figures 5.13.50 and 5.13.51) The roadway will terminate at intersection of US 20 where US 31/US 20 connect with an interchange.

Alternative Es

Alternative Es uses the existing US 31 Corridor for some 4.5 miles, and crosses flat agriculture/grazing lands of the Northern Lakes Natural Region and the Northern Moraine and Lake Physiographic Region.

From US 31/US 30 Intersection to LaPaz, there is the Yellow River, agricultural/grazing lands, Plymouth–Goshen Trail, homes, forested areas, business, lakes, commercial grain operation, a tributary of the Yellow River, overhead utility lines, New Philadelphia Church, an injection plastics business, and US 6.

From LaPaz to Lakeville, the roadway will pass on the east side of LaPaz, and near LaPaz Junction. At approximately Tyler Road, the roadway turns towards the northeast. There are agricultural/grazing lands, homes, forested areas, a tributary of the Yellow River, a high school, Riddles Lake, a very large wetland area, and Pleasant Lake.

From Lakeville to South Bend, the roadway will pass on the west side of Lakeville and continue to the north paralleling the existing US 31. There is SR 4, Colburn Subdivision, Southern Acres Subdivision, Sun Communities Mobile Home Park, Kern Road Subdivision, agricultural/grazing lands, Weller's Heights Subdivision, Southside Church of God, an unnamed stream and a small ditch, homes, an historic home, Southlawn Cemetery on the east side of the roadway, and the commercial business district that includes businesses, gas stations, small shops, and a restaurant. Just north of Madison Road, the roadway begins to turn towards the northeast. Through this area one would see homes and subdivisions, increasing industrial activity, some small ponds, and forest areas. There is an interchange proposed at Kern Road, approximately ¼ mile west of existing US 31 (Figures 5.13.52 and 5.13.53). The roadway will use the US 31 corridor until the termini at US 20.

5.13.2 View of the Road

Alternative Cs, Es, G-C

The Indiana Department of Transportation has a policy to incorporate context sensitive solutions into the development, construction, and maintenance process for improvements to the state jurisdictional transportation system (INDOT Design Memo No. 03-07). The establishment of context sensitive solutions incorporates accepted effective design practices. Context sensitive solutions allow ideas such as the preservation of historic places, scenic and

Figure 5.13.50: (Before) Proposed Interchange Location for Alternative Cs and G-C at US 20

Figure 5.13.51: (After) Proposed Interchange Location for Alternative Cs and G-C at US 20

Figure 5.13.52: (Before) Proposed Interchange Location for Alternative Cs at Kern Road

Figure 5.13.53: (After) Proposed Interchange Location for Alternative Cs at Kern Road

natural environmental enhancement, and community values to be considered with the objectives of mobility, safety, and economics.

Areas near the roadway would experience some loss of forested areas, loss of adjacent homes, and the conversion of agricultural/grazing lands to that of right-of-way corridor for the US 31 project. Every conceivable method shall be explored to mitigate the effects of road construction. Some visually pleasing natural habitat may also be lost for the roadway areas, particularly near and around the wetlands and the lake complex to the southeast of Lakeville. These areas shall be mitigated within close proximity of those areas converted.

Homes or areas adjacent or nearby may experience some form of light pollution after the roadway is constructed. However, methods of non-diffuse lighting will be explored to negate these effects during the engineering phase. The roadway will connect to US 20 with an interchange.

All routes considered for the upgrade and new construction of US 31 will involve the loss of some forested areas, wetlands, homes, and business.

All efforts will be made to appropriately enhance roadside areas for improvements to US 31. Some examples may be roadside ditch enhancements with wetland and wildflower plantings. Outside the clear zone, plantings of shrubs and trees will be considered in the project design.

In interchange areas (Figures 5.13.54 and 5.13.55), the use of non-diffuse lighting will be explored to negate the effects of light pollution in rural areas. These same lighting solutions shall be used in urban areas as well. Studies indicate that these lighting techniques aid in driver safety.

Figure 5.13.54: (Before) Proposed Interchange Location for Alternative G-C at SR 4 (Pierce Road)

Figure 5.13.55: (After) Proposed Interchange Location for Alternative G-C at SR 4 (Pierce Road)

5.14 Hazardous Material Sites

Information pertaining to hazardous material sites within the project area came from Geographical Information System (GIS) layers, which were provided by the U.S. Environmental Protection Agency (USEPA) and the Indiana Department of Environmental Management (IDEM). Other sources utilized were the IDEM hazardous waste notifiers; UST, and LUST lists from the IDEM website; EPA Enviromapper and archived CERCLIS information from the EPA website; and the Michiana Area Council of Governments (MACOG) groundwater contamination site maps and the *Potential Groundwater Contamination Sites Reference Guide* (MACOG, 1999). The IDEM central file room was also searched to retrieve information pertaining to the Archived CERCLIS sites located within the study area.

Superfund/CERCLIS Sites

There are seven sites located near the proposed alignments listed as archived sites in the CERCLIS for the US 31 Plymouth to South Bend Project. Archive status indicates that based on currently available information, EPA does not plan to take further steps under the federal Superfund program. None of these sites are directly within the right-of-way for any of the alternates except for the ARCO site and the Jackson Road County Landfill site. The ARCO site is slightly within the right-of-way of the new interchange at US 20, while the Jackson Road County Landfill will be within the right-of-way for the realignment of Linden Road along Alternatives G-C and Cs. The Ireland site is currently not located within any of the alternates, but is located adjacent to the interchange at US 31 and US 20. If this intersection is enlarged to the point where it will extend past its current right-of-way, it may encroach upon the Ireland Road Site.

The seven archived CERCLIS sites that will no longer require any further EPA actions include the following.

- Lakeville site (IND982073165)-This site was an open dump located on the west side of US 31 in the town of Lakeville and is approximately 210 ft east of Alternatives Cs and G-C.

- Jackson Road County Landfill (IND980904312)-This inactive landfill accepted industrial and municipal waste from the late 1960s until 1979. This site is located south of Jackson Road between Locust and Linden Streets and is about 111 acres in size of which 60 acres in the middle of the property was filled. This filled area is approximately 800 ft west of Alternatives G-C and Cs. The realignment of Linden Road and Alternatives G-C and Cs will cross within the boundaries of this property, but will not cross over the filled area. The realignment of Linden Road is approximately 200 feet from the filled area. If alternate G-C or Cs is selected it is recommended that soil sampling be completed to screen for possible contaminants at this site. It is also recommended that design alterations be considered to avoid any contaminated areas.

- Ireland Road site (IND980904288)-This is an inactive industrial and municipal waste landfill. It is located the northwest corner of the US 20 and US 31 interchange and proceeds north to Ireland Road. This site is adjacent to the right-of-way for all the alternatives. It is currently being proposed to be developed as a commercial area as a Brownsfield development. If the interchange at US 20 and US 31 does not extend the present right-of-way, this site will impact none of the alternatives. If any of the alternates require an alteration to the interchange at US 20 and US 31, it is recommended that soil sampling be completed and alternate interchange designs be reviewed to avoid possible contaminants.

- Bradberry Brothers Landfill (IND982073108)-This site was a 31-acre county approved landfill that was designated to receive demolition material and is located between Dice Street and Johnson Road and is approximately 400 ft west of Alternative Es.

- St. Joseph County Landfill #2 (IND982073157)-This site is located ¾ of a mile west of US 31 on Kern Road and is approximately 1,400 ft east of Alternative G-C.

- St. Joseph County Landfill (IND980613715)-This site is located at the corner of Jackson and Locust Road and is part of the Jackson Road County Landfill according to the currently available information provided from IDEM. This site is approximately 700 ft west of Alternatives Cs and G-C. The realignment of Linden Road and Alternatives G-C and Cs will cross within the boundaries of this property, but will not cross over the filled area. If alternate G-C or Cs are selected, it is recommended that soil sampling be completed to screen for possible contaminants. It is also recommended that design considerations be studied to avoid any contaminated areas.

- ARCO (IND982072969)-This site located at 20630 West Ireland Road and was a storage facility for petroleum products. This site would be within the right-of-way of Alternatives Cs and G-C because of the new interchange at US 20. In 1984 all tanks were cleaned and emptied. All line products were blown out and filled with nitrogen. This site was archived in 1987. According to information found on the IDEM website, dissolved and free phase products and methyl-teritary-buytl-ether (MTBE) were detected in the soil and groundwater at off the site. If either Alternative G-C or Cs is selected, it is recommended that soil sampling be completed to screen for possible contaminants for this site. It is also recommended that design alterations be studied for this area to help avoid any contaminated areas if they are found. This site is now Transmontaigne Terminaling Inc., which reconstructed the terminal and restarted operations.

RCRA

Resource Conservation and Recovery Act imposes management requirements on generators and transporters of hazardous waste and upon owners and operators of treatment, storage, and disposal facilities. RCRA sites found within or near the proposed alternates include the following.

- Wiegand's Amoco (984897405IND) is located at 111 East Ireland Road and is over 500ft north of the US 31 and US 20 interchange.

- Galloway Body Shop Inc. (IND981538440) is located at 60251 US 31 South. This site is a small quantity generator and is located within the right-of-way for Alternative Es.

- Reds Towing (IND984915546) is located at 60990 US 31 South and is a conditionally exempt small quantity generator. This site in not within the right-of-way of any alternative, but is about 500 ft from Alternative Es.

- Instant Lube Inc. (IND984896324) is located at 4425 South Michigan Street and is listed as a conditionally exempt small quantity generator. This site is located north approximately 530 ft of the existing US 31 and US 20 interchange.

- INDOT Plymouth Subdistrict (IND984904193) is located at 12636 4-A Road in Plymouth off of US 31and is a small quantity generator. This site is about 800 feet from the point where all three alternatives break off from US 31 and is adjacent to the widening of Maple road on to US 31. This widening of Maple Road is not anticipated to encroach upon this property.

- Transmontaigne Terminaling Inc. (IND000717926) is a categorically exempt generator. This site is located at 20630 W. Ireland Road and is on the same land as the ARCO site. This property will be crossed by Alternatives G-C and Cs.

UST's

Sites for which UST's registered, or gas stations within and near to the right-of-way noted during fieldwork are described below.

- McClure Oil, located west of US 31 and north of Kern road is located within the right-of-way for Alternative Es.
- Country Convenience gas station located at 60990 US 31 South.. This site is approximately 150 feet east of Alternative Es.
- Phillips 66 is located at the southwest corner of US 31 and Kern Road. This site is located only about 60 ft from the right-of-way for Alternative Es.
- Bradberrry Brothers Inc. is located off Dice Street approximately 400 feet west of Alternative Es.
- Transmontaigne Terminal Inc. is located at 20630 W. Ireland Road. This site is located within the right-of-way of Alternatives G-C and Cs.
- Robin Hood Golf Course is located at 20099 New Road and is approximately 1,000 ft from Alternative Cs.
- Berliner & Marx Inc. is located at 21149 W. Roosevelt Road. This site is approximately 140 feet west of Alternative Cs and 850 ft from Alternative G-C. It is currently abandoned.
- Kocelene Service Station is a LUST site and is located at 60600 US 31 South. This site is believed to be a vacant lot and is approximately 120 feet from Alternative Es.
- Wiegand's Amoco is located at 111 East Ireland Road and is approximately 500 feet from the eastern edge of all the alternatives.
- Sparkle Wash is located at 60423 US 31 South. This is based on information listed in the IDEM UST database. There was no such carwash located at this area during field surveys. This location would be within the right-of-way for Alternative Es.

LUST

- Berliner & Marx Inc., is located off of Roosevelt Road approximately 140 feet west of Alternative Cs and 850 ft from Alternative G-C. This site is currently abandoned.
- Wiegand's Amoco Station is a LUST site located at 111 East Ireland Road and is over 500 feet north from the existing right-of-way of the US 31 and US 20 interchange.
- Country Convenience is a LUST site located at 60990 US 31 South and is approximately 150- feet from Alternative Es.
- Singer General Tire is a LUST site located at 60885 US 31 South and is approximately 30 feet from the eastern edge of Alternative Es.

- McClure Oil Corporation is a LUST site and is located within the right-of-way of Alternative Es.
- Kocelene Service Station is a LUST site and is located at 60600 US 31 South. This site is believed to be a vacant lot and is approximately 120 feet from Alternative Es.
- Transmontaigne Terminaling Inc. South Bend is a LUST site located at 20630 West Ireland Road and is within the right-of-way for Alternatives G-C and Cs.

A summary of the hazardous material sites found within the alternatives can be seen in Table 5.14.30 below.

Table 5.14.30: Hazardous Material Sites

Alternatives	CERCLIS (Archive)	RCRA	UST	LUST	Total
Cs	2	1	1	1	5
Es	0	1	2	1	4
G-C	2	1	1	1	5

5.15 Energy Impacts

Transportation accounts for a major portion of energy consumption in the nation. Energy is directly consumed by vehicles traveling on roadways, and is indirectly consumed during the construction and maintenance of new roadways. Energy consumption for vehicle operation and roadway facility maintenance represent long-term energy impacts; whereas, energy consumption in new road construction is a large, short-term energy impact.

Studies suggest that over half of the energy consumed for most transportation projects involves vehicle operation, and another 42% of the energy is consumed in the manufacture and maintenance of transportation vehicles (Hatano et al., July 1983). Thus, transportation facility construction and maintenance involve less than 8% of the energy consumed for national transportation. Therefore, the energy impacts analysis focuses on direct energy consumption associate with vehicle travel.

5.15.1 Methodology

In the evaluation of the US 31 Improvement Project alternatives, a "post-processor" program was modified to analyze the travel characteristics produced by the US 31 Improvement Project Travel Demand Model. The Travel Demand Model replicates travel patterns for the No-Build Alternative and the three Build Alternatives, and reports daily auto and truck volumes, daily vehicles-miles of travel, and typical vehicle speeds for each link in the highway system. The "post-processor" program converts these travel characteristics into gallons of gasoline and diesel fuel consumed in the year 2030 for each Build Alternative over the No-Build Alternative. Factors were then used to convert gallons of fuel to BTUs to assess energy impacts. (One million BTUs is approximately equal to 8.007 gallons of gasoline or 7.201 gallons of diesel fuel.) For the purposes of this analysis, it was assumed that passenger cars and light-duty trucks consume gasoline and that heavy-duty trucks consume diesel fuel.

5.15.2 Results

Table 5.15.31 reports the results of the energy analysis. Because the Build Alternatives result in additional miles of roadway, the Build Alternatives all result in an increase in annual vehicle-miles of travel (VMT) over the No-Build Alternative. The resulting VMT depends on the effectiveness of diverting traffic to the new facility and the length of additional new road mileage for each Build Alternative. Alternative G-C results in the least increase in VMT because it is least effective in diverting traffic from existing US 31 although it is the longest route of new construction. While Alternative Es is the most effective in diverting traffic from existing US 31, it has the second least increase in VMT because it is the shortest route of new construction, using the existing alignment of US 31 from Kern Road to the US 20 Bypass as well as the segment of existing US 31 from the US 30 interchange to West 4A Road common to all alternatives.

Because Alternative Es attracts the most traffic and results in more vehicles at higher speeds, it results in the greatest energy consumption. Alternative G-C results in the second greatest energy consumption due to its greater length than the other alternatives. Alternative Cs has the least addition energy consumption over the No-Build Alternative; however, there is little difference in energy consumption overall between the Build Alternatives.

Short-term energy consumption by vehicles traveling in the US 31 corridors may also increase during construction due to possible delays. As maintenance of traffic is greater for Alternative Es during the construction of the freeway segment between Kern Road and the US 20 Bypass along the existing alignment of US 31, this alternative has greatest short-term vehicle operation energy impacts.

The large, short-term indirect energy impacts associated with the construction and maintenance of the new freeway are directly related to the total project capital cost and maintenance cost. The total project capital cost for materials and construction (excluding right-of-way, engineering and traffic maintenance costs) is greatest for Alternative G-C, followed by Alternative Es and Alternative Cs. Annual roadway maintenance and operational (State Police) costs are driven by the additional lane-miles of facility. The incremental annual operation and maintenance is $393,518 for Alternative G-C, followed by $386,139 for Alternative Es and $368,923 for Alternative Cs.

Table 5.15.31: Energy Consumption in the Year 2030 by Alternative

Alternative		Annual Vehicle Miles of Travel (in millions)	Daily Fuel Consumption (in gallons)	Annual BTUs (in millions)	BTU's/Vehicle-Mile
No-Build		125,744	27,309,468	1,99.70	9,541
Cs		125,804	27,335,364	1,200.83	9,545
	% change over No-Build	0.048%	0. 095%	0.083%	0.042%
Es		125,799	27,337,251	1,200.91	9,546
	% change over No-Build	0.044%	0.102%	0.083%	0.052%
G-C		125,793	27,335,638	1,200.85	9,546
	% change over No-Build	0.039%	0.096%	0.083%	0.052%

Source: US 31 Improvement Project Travel Demand Model for 2030 and Net_BC post-processor

5.16 Construction Impacts

Construction of any of the build alternatives will impact the existing environment in several ways. The construction impacts for this project may include noise generated by construction equipment, air pollution as a result of construction activities, water pollution due to soil erosion and construction activities, and traffic impacts from detours and motorist inconveniences. The No-Build Alternative would incur no construction impacts.

5.16.1 Drainage

Erosion on the construction site is accelerated due to vegetation clearing and the prominence of bare disturbed soils on the site during construction. Procedures to reduce the impact of erosion and runoff into streams will be implemented. These procedures include silt fencing, silt check dams, sedimentation basins, immediate revegetation, and limitation of disturbed areas among others. These are known as best management practices (BMPs). BMPs shall be used in the construction of this freeway to minimize impacts of erosion.

5.16.2 Water Quality and Biotic Communities

There are several stream crossings under any proposed alternative that could be adversely affected by construction activity. Disposition of chemicals and increased turbidity may result from construction within or near streams. Appropriate sediment and erosion control BMPs should be implemented to reduce the impacts to water resources.

Construction activities also have potential to impact threatened and endangered species primarily during right-of-way clearing and construction in and around streams. Right-of-way clearing concerns are directed at the Indiana bat whose summer roost habitat is primarily in large diameter trees with loose bark. The clearing of these trees during the summer roosting season could constitute a taking of this species. All construction activities with the potential to affect the Indiana bat or its habitat will take place in accordance with the specified terms and conditions identified by the US Fish and Wildlife Service.

5.16.3 Solid Waste Disposal

Solid waste generation resulting from construction activities should be short-term and confined to the vicinity of the project area. Solid waste generated by clearing and grubbing, demolition or other construction practices would be removed from the location and properly disposed.

Burning of construction related debris would be conducted in accordance with all local, state and federal regulations. All burning would be conducted within a reasonable distance from all homes and care will be taken to alleviate any potential atmospheric conditions that may be a hazard to the public. All burning will be monitored.

5.16.4 Air Quality

The main component of air pollution derived from construction activities is fugitive dust. Fugitive dust is the generation of airborne particulate matter which escapes beyond the right-of-way or construction boundary. Fugitive dust emissions can be created by many construction-related activities. Reasonable precautions are typically sufficient to control fugitive dust emissions. Emissions from construction equipment and open burning would be regulated in accordance with appropriate state and federal regulations. During construction the contractor must comply with all regulations governing the control of air pollution.

All bituminous and Portland cement concrete proportioning plants and crushers would meet the requirements of IDEM. For any portable bituminous or concrete plant or crusher, the contractor must apply for and obtain a permit-to-install from the Permit Section, Air Quality Division of IDEM. Dust collectors must also be provided on all bituminous plants. Dry, fine aggregate material removed from the dryer exhaust by the dust collector must be returned to the dryer discharge unless otherwise directed by the project engineer.

5.16.5 Noise

Noise generated by construction equipment may be an impact of construction. The presence of a sensitive noise receptor within close proximity of the construction limits could raise the concern of potential construction noise impacts. Generally speaking, the potential for construction-related noise impacts will be much higher where an alternative passes through a developed area, and where an alternative follows an existing alignment. The potential in these areas is increased due to the higher number of noise receptors in close proximity to the construction activity.

Noise impacts could be controlled through the regulation of construction time and hours worked, using noise-controlled construction equipment, limitations of construction vehicles during evening and weekend hours and by locating equipment storage areas away from noise sensitive areas.

5.16.6 Traffic Maintenance

Existing travel patterns will be impacted during construction of a new freeway along existing roadways. Motorist inconveniences and safety concerns will be greatest where construction occurs along existing US 31. There will be more detours and lane restrictions along these routes compared to construction that occurs on new terrain routes.

In order to minimize traffic impacts, adequate travel lanes will be maintained for northbound and southbound traffic during construction on existing US 31. In addition, through traffic on crossroads would be maintained during interchange construction and all turning movements would be maintained.

5.16.7 Mitigation

Construction impacts will be minimized and mitigated in accordance with standard INDOT specifications for construction contracts. These specifications address issues such as erosion control, servicing of equipment, spill prevention and containment, minimization of construction noise, and minimization of construction-related air quality impacts. In addition, traffic impacts will be minimized and mitigated through the development and implementation of a traffic management plan. In areas where residences may be subject to high levels of construction noise, consideration will be given to the early construction of reasonable and feasible noise barriers, so that barriers are in place during construction of the highway. Each of the alternatives will have similar construction impacts to the existing environment and require similar mitigation measures. The No-Build Alternative will have no construction impacts.

5.17 Permits

The following Federal permits relating to terrestrial and aquatic resources relative to waters of the US will be required for any build alternative.

Agency	Permit
United States Army Corps of Engineers (USACE)	Section 404 Permit for the Discharge of dredged or fill material into waters of the US (e.g. streams and wetlands)

The following permits from the State of Indiana relating to terrestrial and aquatic resources will be required for any build alternative.

Agency	Permit
Indiana Department of Environmental Management (IDEM)	Section 401 Water Quality Certification
Indiana Department of Natural Resources (IDNR)	Construction in a Floodway

The following agencies regulate a "permit by rule." Though no actual permit is issued, proper correspondence and the incorporation of specific measures in design and construction are required prior to commencing construction activities.

Agency	Permit
IDEM (facilitated by SWCD)	National Pollutant Discharge Elimination System (NPDES) Rule 5 Erosion Control
IDEM	NPDES Rule 13 Stormwater
St. Joseph County Drainage Board	Legal Drain Crossing
Marshall County Drainage Board	Legal Drain Crossing

Each of the alternatives would require permits. The Section 404 permit and Section 401 WQC are authorized under the federal Clean Water Act (CWA), and the decisions are subject to the State of Indiana's water quality standards under IAC Title 327 of the Water Pollution Control Board (WPCB). Also, IDNR will require permit approvals for floodway impacts under the State of Indiana's Flood Control Act (IC 14-28-1) and Navigable Waterways Act (IC 14-29-1). Rule 5 of the NPDES regulates sediment discharges from construction site erosion. Rule 13 of the NPDES regulates contaminant discharge via storm water runoff.

All necessary permits will be applied for and obtained prior to construction, and the terms and conditions of these permits will be adhered to during the construction and maintenance of this facility.

5.18 Short Term Uses of Environment Versus Long Term Productivity

There will be a considerable amount of resources allocated to the completion of the proposed US 31 Plymouth to South Bend project. These resources would include rock, cement, steel, sand, earth, fossil fuels, and labor. As with any construction come temporary disturbances. Such disturbances would consist of construction noise and visual impacts; wildlife, wetland and forest disturbances; and home and business relocations.

The negative short-term effects stated above are necessary in order to receive the positive effects of the proposed project. The long-term effects will result in a quicker and safer route from Plymouth to South Bend. The long-term benefits of the proposed project are consistent with the use of resources.

5.19 Irreversible and Irretrievable Commitment of Resources

The US 31 Plymouth to South Bend project will involve a commitment of many resources. Some of these resources include land, construction materials, and manpower. Land used in the construction of the proposed project is considered an irretrievable resource.

The main resources in the study area that are irretrievable include farmland, sand, and gravel. Not only does the roadway make these resources irretrievable; the indirect impacts that may follow from the construction of the roadway do as well. Indirect impacts may result from development of businesses and residential areas along the roadside of the new facility. These indirect impacts would result in the taking of more land that contains mineral resources and prime farmland.

The use of these resources is warranted in this project because the construction of this roadway will produce an overall improved transportation system.

5.20 Indirect and Cumulative Impacts

Natural resource impacts, beyond those directly induced by the US 31 Plymouth to South Bend Project, have been reviewed in this study. These impacts fall into one of two major categories, i.e., indirect and "others" impacts on different natural resources. The major natural resources in the US 31 Plymouth to South Bend project are farmland, forest, and wetlands. Avoidance and minimization of impacts to forests and wetlands will similarly benefit a threatened or endangered species.

Cumulative impacts are the summation of direct and indirect impacts to a natural resource because of the proposed action, and "others" consists of actions on these resources that are not a result of the proposed action. Indirect impacts are defined as the effects of the proposed project that occur at a different time or location from the direct impacts of the project. These are areas that are currently undeveloped and have not been identified for proposed future or potential future development from committed projects. However, development on these lands as a result of the proposed action is reasonably foreseeable in response to the project.

Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions." (40 CFR 1508.7) Areas planned for future development, regardless of the present road project, have been reviewed and are considered to be "others" action on the natural resource. Such "others" actions have site plans that have been approved and the area has been identified for future development by a local planning commission, or the land is zoned or will be rezoned for development.

The indirect and "others" impact analysis was completed as per methods detailed in "Considering Cumulative Effects Under the National Environmental Policy Act" (Council on Environmental Quality, January 1997), "Desk Reference for Estimating the Indirect Affects of Proposed Transportation Projects" (National Cooperative Highway Research Program Report 466, 2002), "Indirect and Cumulative Impact Assessment in the Highway Project Development Process" (FHWA Position Paper, HEP-32, April 1992), and "Consideration of Cumulative Impacts in EPA Review of NEPA Documents" (EPA 315-R-99-002, May 1999).

The boundary of the study area for the impacts analysis is a two-mile corridor, one-mile on both sides of the proposed centerline, along the existing alignment up to West 4A Road, and the proposed corridor of Alternatives Cs, Es and G-C through Marshall and St. Joseph Counties.

The US 31 corridor is about 20 miles long, crossing from the southern terminus at US 30 near Plymouth to the northern terminus at US 20 near South Bend in Marshall and St. Joseph counties, Indiana. The land use impacts associated with the US 31 project are contained within these boundaries. Current land uses were mapped within the study area, and cross-referenced with recent and current development and transportation improvement projects.

Specific consideration was given to the areas surrounding proposed interchanges as being high potential development areas. A one-mile corridor was identified along the cross street, defining, for purposes of the analysis, the interchange area. The indirect impact analysis was limited to the interchange areas since improvements to US 31 would include a limited access facility and thus, development induced by the project would occur at such interchanges. Detailed development activity was analyzed for a 30-year time span, i.e., to the year 2030. Aerial photography of the project area was evaluated for development trends along the corridor alternatives to 1939. Analysis of impacts to specific natural resources (wetlands, forest, farmland) was accomplished via trend analysis based on documented resource impacts within the study area and/or Marshall and St. Joseph counties.

Coordination with the Planning Commissions for Marshall and St. Joseph counties identified recent and current development, and proposed future and potential future development along the US 31 corridor. These developments

are shown in Figure 5.20.56. When presenting the cumulative impacts, these developments are included as other actions that are occurring presently and that are reasonably foreseeable.

Undeveloped Parcels (Direct and Indirect): Many parcels and tracts of land within the study area are currently undeveloped and zoned agricultural. Impacts in these areas are considered direct and indirect. Direct impacts are influenced by direct conversion of the land. Indirect impacts are exemplified by the presence of the US 31 project in an area that is unlikely to be developed in the reasonably foreseeable future, but is likely eventually. Indirect impacts are especially focused in the southern, less developed portion of the project area.

Recent and Current Development (Cumulative): Since the beginning of the project, many new developments have been or are being constructed. These include:

- Office Building at corner of US 31 and Whitmer Street
- Locust Knolls Estates Subdivision
- Lakeville Commerce Park Subdivision

Proposed Future Development (Cumulative): The rezoning of occupied and vacant parcels of land is already planned and approved for several scattered sites along the existing alignment and in proximity to Alternatives Cs, Es and G-C. Plans for these proposed developments have been incorporated into Alternative Route Maps (Appendix A). These areas include:

- Fieldstone Centre Subdivision
- Self Store Mini Warehouse
- Mixed Use Commercial and Housing at Old Lakeville School

Potential Future Development (Cumulative): Large tracts of undeveloped land in the southern parts of the City of South Bend (agriculture, pasture, wooded, etc.) have been zoned for future residential development. Although no plans have been accepted, it is highly likely that the areas are being prepared for development. It also is anticipated that managed growth will occur in some of the smaller rural towns and communities throughout St Joseph and Marshall counties over the years.

Transportation Improvement Projects (Cumulative): INDOT and/or local transportation improvements planned in or near the project area. Other INDOT projects are listed in the US 31 Preliminary Screening Report.

- Shave down the slope of a hill at Roosevelt and US 31 for site distance improvement
- Install traffic light at intersection of New Road and US 31

5.20.1 Analysis

The study corridor was reviewed from the southern terminus at US 30 near Plymouth in Marshall County to the northern terminus at US 20 near South Bend in St. Joseph County. The analysis included a review of existing road maps, aerial photography, zoning maps, planning documents and development plans as well as on-site reconnaissance. The timeframe for the analysis of development trends is from 2000 (the beginning of the project) to 2030.

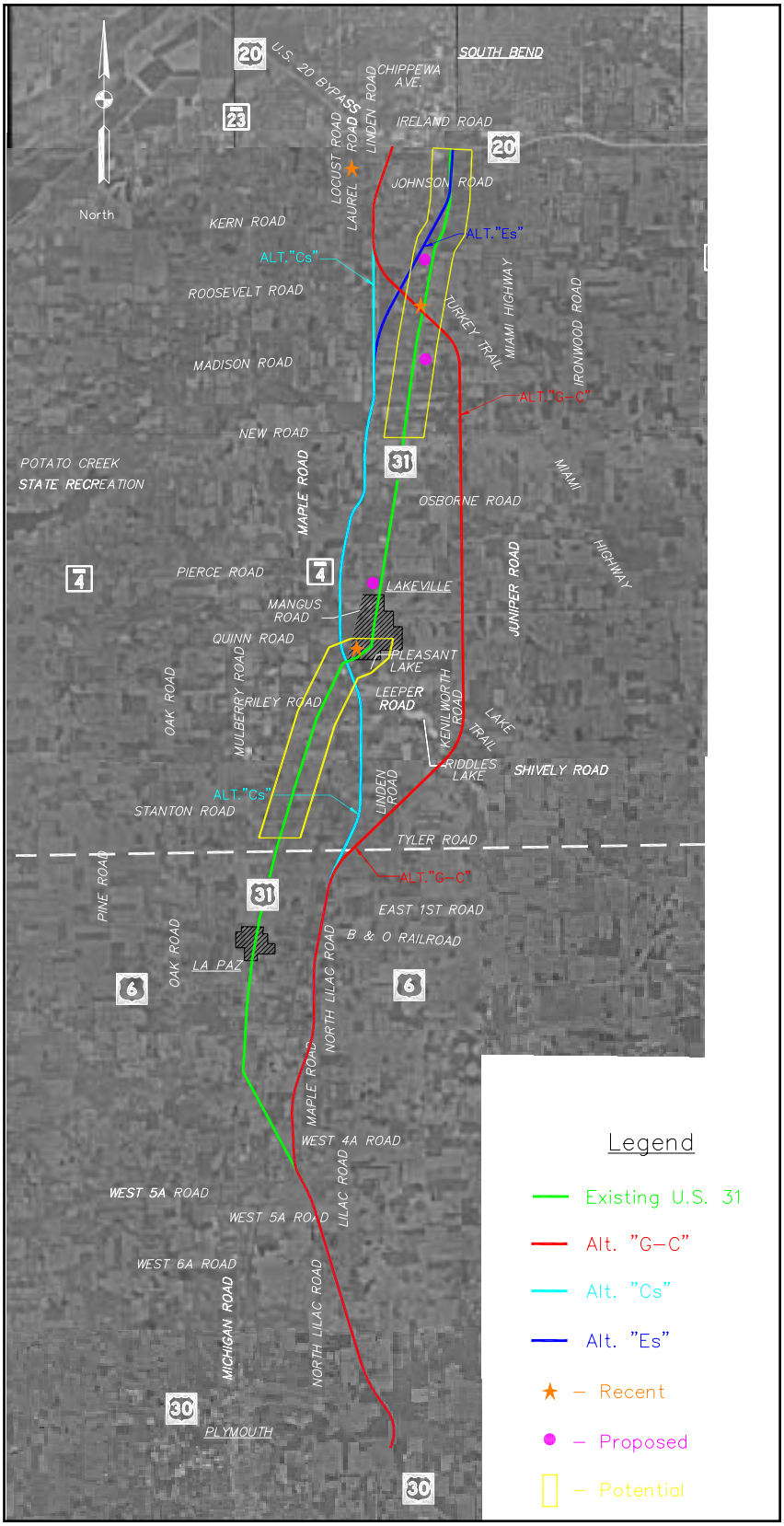


Figure 5.20.56: Recent, Proposed, and Potential Future Development along US 31

The future year of 2030 is the future analysis year for the transportation modeling and the population and employment forecasts. Forecasting impacts beyond the year 2030 is speculative. The following documents were reviewed for purposes of the Indirect and Cumulative Impact Analysis:

- USDA Forest Service Resource Bulletin N-C 7, "Indiana's Timber" (1969); Bulletin N-C 108, "Indiana Forest Statistics, 1986" (1986); Bulletin N-C 196, "Indiana's Forest in 1998" (1998); Forest Inventory and Analysis NA-TP-03-00, "Forests of Indiana: A 1998 Overview" all are publications of the USDA Forest Service.
- Comprehensive Plan for South Bend/St. Joseph County, Indiana. (April 2002) City of South Bend, Indiana.
- Comprehensive Plan for Marshall County, Indiana. (2003, Adopted Draft) City of Plymouth, Indiana.
- City of Plymouth, Indiana Comprehensive Plan. (April 2003, Adopted Draft) City of Plymouth, Indiana.
- Zoning Ordinance of Marshall County, Indiana. (April 1, 1974) City of Plymouth, Indiana.
- St. Joseph County Zoning Ordinance, Title 26. (June, 2002) City of South Bend, Indiana
- Aerial photography (2002). St. Joseph/Marshall County, Indiana.

Plymouth/Marshall County

Little to no development exists along Alternatives Cs, Es and G-C, particularly from US 30 to US 6. All of the land within this section of Marshall County is zoned agricultural. The Marshall County Zoning Ordinance defines the Agricultural District (A-1) as agriculture including confined feeding operations, migrant housing, nurseries and greenhouses, produce market stands, public and parochial schools, riding stables and academies, government owned parks and recreational areas, single family dwellings, manufactured and modular homes, home occupations and accessory uses normally permitted. Given the wide range of uses allowed under this designation, Marshall County's Comprehensive Planned Growth policy statement calls for the establishment of a multiple agricultural zoning district to adequately differentiate agricultural uses and residential uses.

Marshall County Comprehensive Plan Vision Statement 1 states, "Marshall County will plan growth in order to protect the County's rural nature, which is comprised of a healthy agricultural base, open spaces forestlands, and wetlands." The associated goal to this statement indicates, "Marshall County should prevent nonfarm development (such as residential subdivisions or shopping centers) from spreading across agriculture/open space land at random." All US 31 alternatives will be designed as a limited access rural freeway in Marshall County. Access to US 31 will be limited to interchanges which will control the development activity on agricultural land along the roadway. This follows the development goals stated in the Marshall County Comprehensive Plan.

US 30 to US 6 (Alternatives Cs, Es and G-C)

All three alternatives follow the existing US 31 alignment from its southern most terminus at US 30 to just south of 4A Road and then deviate to follow a northeast alignment between Maple and Lilac Road. This section of the study area is zoned agricultural (A-1). Primarily row crops such as corn and soybeans characterize approximately 80% of the landmass. The balance of this section contains fragmented forest along with some fallow fields. Fourteen single-family dwellings are interspersed throughout this section of the study area and along Lilac Road.

LaPaz/Marshall County

Little to no development exists along Alternatives Cs, Es and G-C from US 6 to the County Line. The land within this section of Marshall County is also zoned agricultural (A-1). Although it is out of the boundaries of the study area, the City of LaPaz may experience some controlled development in the future. The results of a land use survey published inside the Marshall County Comprehensive Plan states, "workshop participants felt that commercial development should focus on existing communities and cities within the county." Consistent with that outcome, the Land Use element of the Comprehensive Plan purports to, "support the continued vitality of LaPaz as a mixed use activity center," (particularly at the intersection of US 31 and US 6 near the City of LaPaz). Given that, the LaPaz area may experience some managed growth in the future.

US 6 to the County Line (Alternatives Cs and Es)

The Alternatives Cs and Es are on the same alignment here and thus continue northeast between Maple and Lilac Roads up to the county line. The property in this section of the study area is also zoned agricultural (A-1). Primarily row crops characterize the majority of the land. A few fragmented forest areas exist along with approximately three residential dwellings.

US 6 to the County Line (Alternative G-C)

Alternative G-C continues northeast between Maple and North Lilac Roads just south of the county line where it begins to deviate east of Alternatives Cs and Es. The property in this section is primarily row crops coupled with a few patches of woodlands in between. This area contains approximately three to four residential dwellings.

Lakeville/St. Joseph County

The Comprehensive Plan states, "The St. Joseph County's agricultural protection zone has effectively provided constraint to unlimited growth in some areas. Still some challenges exist. Incomes in unincorporated areas of the county are high relative to the two central cities. Transportation in new growth areas is automobile-oriented. Some leapfrog development has occurred to the north and east of existing incorporated areas as well as south along US 31."

The Land Use Element of the Comprehensive Plan for South Bend and St. Joseph County designates the City of Lakeville and most of the land fronting US 31 to the east and west as "Special Study Areas." Section 4.3 of the Comprehensive Plan describes the Lakeville Individual Town Plan as follows: "This community constitutes a major entry way into the county from the south side. As such, particular attention should be paid to urban design. A corridor plan for US 31 is already proposed; this concept should be expanded upon with gateway markers at the north and south sides of town, and a corridor overlay zone that controls setbacks, architectural design, signage and lighting along the commercial portion of the corridor." The undertaking of a "special study" for the City of Lakeville, as designated in the Comprehensive Plan, would allow for more consideration of appropriate mixed land uses to ensure that growth occurs in an orderly fashion and assists in addressing growth projections more accurately.

County Line to SR 4/Pierce Road (Alternatives Cs and Es)

Alternatives Cs and Es (on the same alignment) continue northward between Lilac and Maple Roads beyond the City of Lakeville. The county zoning designations along Alternatives Cs and Es are primarily agriculture (A) and include residential (R), commercial (C) and manufacturing (M) in the area contiguous to the southeast boundaries of the City of Lakeville. Approximately half of the property in this section contains row crops and the other half contains

fragmented woodlands with just a few single-family residences. The 10.5 acre Lakeville Commerce Park Subdivision, which already contains a Subway Sandwich Store, is currently being developed at the northwest corner of US 31 and Mangus Drive in the City of Lakeville. The 13-acre mixed-use commercial and residential development of the Old Lakeville High School area is a proposed activity located at the intersection of Jefferson and US 31.

County Line to SR 4/Pierce Road (Alternative G-C)

Alternative G-C deviates east of Alternatives Cs and Es beyond Kenilworth Road and heads north to SR 4. This section is zoned agriculture (A) and is characterized primarily by row crops. About a half dozen single family dwellings are within this area.

South Bend/St. Joseph County

Development increases along Alternatives Cs, Es and G-C as you approach the city of South Bend. Particularly, the area between Kern Road and the US 20 Bypass, which is characterized by mixed use residential, commercial, light industrial and manufacturing. As residential subdivisions expand outside the city limits, so does the associated neighborhood serving commercial and retail businesses. The Land Use element of the Comprehensive Plan for South Bend and St. Joseph County has several areas of focus for residential growth. "The residential growth has three facets, the first being new growth focused on the northwestern and southern parts of the City of South Bend, infill growth in the northeastern part of the county, and rural growth in some of the smaller towns and communities throughout the county."

In addressing the roadway network, the Transportation Conditions element of the Comprehensive Plan for South Bend and St. Joseph County states, "providing connections between subdivisions continues to be an issue, and its practice should be promoted. Interconnections provide multiple options for access to collector and secondary roadways, thereby easing congestion and lowering accident rates."

SR 4/Pierce Road to New Road (Alternatives Cs and Es)

Alternatives Cs and Es (on same alignment) continue to meander northward between Locust and Linden Roads. The zoning designation along this section of the corridor is agriculture (A). Row crops along with small patches of fallow field characterize the majority of this area. It also contains some scattered woodlands. Several single-family dwellings and a residential subdivision exist east of the corridor on Osborne Road.

SR 4/Pierce Road to New Road (Alternative G-C)

The alternative continues north along Kenilworth Road to new New Road. The area is zoned agriculture (A). Approximately half of the property contains row crops and the other half consists of fragmented forest. Several residential dwellings are situated along Kenilworth Road west of the corridor.

New Road to Kern Road (Alternative Cs)

Alternative Cs continues northward between Linden and Laurel Roads. The property along this section is zoned agricultural (A), residential (R) and manufacturing (M). The majority of this area is characterized by fragmented forest/woodlands. It also contains a small portion of fallow fields and row crops. Residential subdivisions exist east and west of the corridor along this section. This area is one mile west of the proposed 30-acre Fieldstone hotel development site along US 31 and Kern Road.

New Road to Kern Road (Alternative Es)

Alternative Es continues north just south of Roosevelt Road where it deviates northeastward towards the existing US 31 alignment near Kern Road. This section of land is zoned agriculture (A) and residential (R) in the county portion. Residential (A-a) and commercial (C-c) zoning designations exist east of the corridor along US 31, as annexed by the City of South Bend. Fragmented woodlands, pastures and row crops characterize this area. Residential subdivisions exist east of the corridor between Roosevelt and Kern Roads and along US 31.

New Road to Kern Road (Alternative G-C)

Alternative G-C continues north along Kenilworth just beyond Madison Road where it deviates westward and connects to Alternative Cs south of Kern Road. The property contains row crops along with patches of woodlands and fallow fields. This section is zoned agriculture (A) and residential (R). Small parcels of land zoned business district (B) and manufacturing district (M) are located near Laurel and Roosevelt Roads. The corridor travels through several residential areas and is contiguous to the Kern Road Residential Subdivision located to the west near Kern and Linden Roads.

Kern Road to US 20 (Alternatives G-C and Cs)

Alternative G-C continues north along Linden Road and deviates northeast just beyond Johnson Road to the northern terminus at the US 20 Bypass. The portion of land along Laurel Road to US 20 exists within St. Joseph County and is zoned residential (R). The area south of US 20 is zoned light industrial (D-a), and the parcel at the corner of Locust and Jackson Street is zoned manufacturing (M), as they exist within the City of South Bend's zoning designations. This area traverses scattered woodlands along with some row crops. The Alternative G-C corridor is contiguous to several residential subdivisions including the 50-acre Locust Knolls subdivision, which is currently being developed.

Kern Road to US 20 (Alternative Es)

This section of Alternative Es merges with the existing US 31 alignment and continues up to the northern terminus at US 20 Bypass. The property along US 31 is zoned by the City of South Bend and is designated commercial (C-c) from Kern Road to the US 20 Bypass. This area is characterized by mixed commercial and residential uses.

The South Bend/St. Joseph County Comprehensive Plan designates land contiguous east and west to the US 31 Corridor as a "special study area" from US 20 to Tyler Road. The Future Land Use Plan element of the South Bend/St. Joseph County Comprehensive Plan shows two residential growth areas along US 31. One area is in Lakeville and the other is between US 20 and Kern Road. Land from Kern Road to south of Roosevelt Road is highlighted as a commercial growth area reserve. The South Bend/ St. Joseph County Comprehensive Plan states that "The plan has several areas of focus for residential growth. The residential growth has three facets, the first being new growth focused on the northwestern and southern parts of the City of South Bend, infill growth in the northeastern part of the county, and rural growth in some of the smaller towns and communities throughout the county."

Development of vacant properties is being actively encouraged in the southern section of South Bend. Most vacant properties have either been zoned or planned for future development. Based on land use trends and planning initiatives, it is likely that development would occur between Kern and the US 20 Bypass regardless of which US 31 Alternative is selected. However, the interchanges proposed for Kern and New Roads have resulted in some Indirect Impacts for this area.

The South Bend and St. Joseph County Planning Commission's "smart growth" policy encourages the compact urban form with integrated land uses (employment, shopping, and residential). The South Bend/St. Joseph County Comprehensive Plan also designates US 31 as part of "Special Study Areas" from South Bend (including the City of Lakeville) to Tyler Road.

The undertaking of a "special study" for the City of Lakeville, as designated in the Comprehensive Plan, would allow for more consideration of appropriate mixed land uses to ensure that growth occurs in an orderly fashion and to assist in addressing growth projections more accurately. The area along US 31, which is proposed for the Lakeville Commerce Centre and the mixed-use residential/commercial subdivision as part of the Old Lakeville High School project, coupled with the interchanges proposed for SR 4, has resulted in some Indirect Impacts for this area.

Marshall County's Comprehensive Plan Vision Statement 1 states, "Marshall County will plan growth in order to protect the County's rural nature, which is comprised of a healthy agricultural base, open spaces forestlands, and wetlands." An associated goal states that "Marshall County should prevent non-farm development (such as residential subdivisions or shopping centers) from spreading across agriculture/open space land at random." A survey outcome in the plan also states, "commercial development should focus on existing communities and cities within the county." Given that the City of Plymouth is outside of the study area, we should expect nominal growth particularly for this area in the future.

The Land Use element of the Marshall County Comprehensive Plan supports the continued vitality of LaPaz as a mixed use activity center. Policy statement 1 of the plan focuses on the businesses and restaurants located in the town center and the significant commercial development, which has occurred at the intersection of US 31 and US 6. As a result of the various planning initiatives and land use trends, we can expect the City of LaPaz to experience some Indirect Impacts as a result of the proposed interchange.

Analysis of Natural Resource Impacts

The major natural resources that may be impacted by the US 31 project are forests, wetlands, and farmland. Each resource has been analyzed based on available documentation of past and present data from which projections have been derived for this cumulative impacts analysis. The following includes a description of each of these major natural resources.

Forests

Information regarding forest is limited to countywide data. Based on the USDA Forest Service's Forest Inventory and Analysis, forested acreage has increased in St Joseph County from 21,800 acres in 1967 to 47,764 acres in 2002. Forested acreage has decreased in Marshall County from 25,400 acres in 1967 to 17,634 acres in 2002 (Table 5.20.32 and Figure 5.20.57). Restrictive land management practices and zoning designations may have contributed to the trend of decreased forests in Marshall County. In St. Joseph County, changing land management practices and zoning designations such as the 20 acres per residence requirement, have contributed to the trend of increased forests as some cropland and pasture are allowed to revert to forest and existing narrow wooded strips were allowed to expand by new home owners. The increase in forests due to these changing practices has been greater than the losses associated with conversion of forests to agriculture, urban/suburban expansion, and other uses.

The future trend for forests in Marshall County seems to indicate that forest is decreasing. This decrease is likely a result of various comprehensive plan policies and land use trends. A linear regression analysis of forest in Marshall County indicates that the small trees have reached a plateau and the medium sized trees are slowly decreasing (see Table 5.20.33 and Figure 5.20.58). The future trend for forests in St. Joseph County indicates that forests are increas-

Table 5.20.32: Area of Land by County and Major Land-Use by Class (acres)

	Forest				Non-Forest		
County	1967	1986	1998	2002	1986	1998	2002
Marshall	25,400	22,900	32,262	17,634	264,300	252,159	257,911
St. Joseph	21,800	21,400	27,355	47,764	284,900	265,328	236,816
Total	47,200	44,300	59,617	65,398	549,200	517,488	494,728

Source: USDA, Forest Service

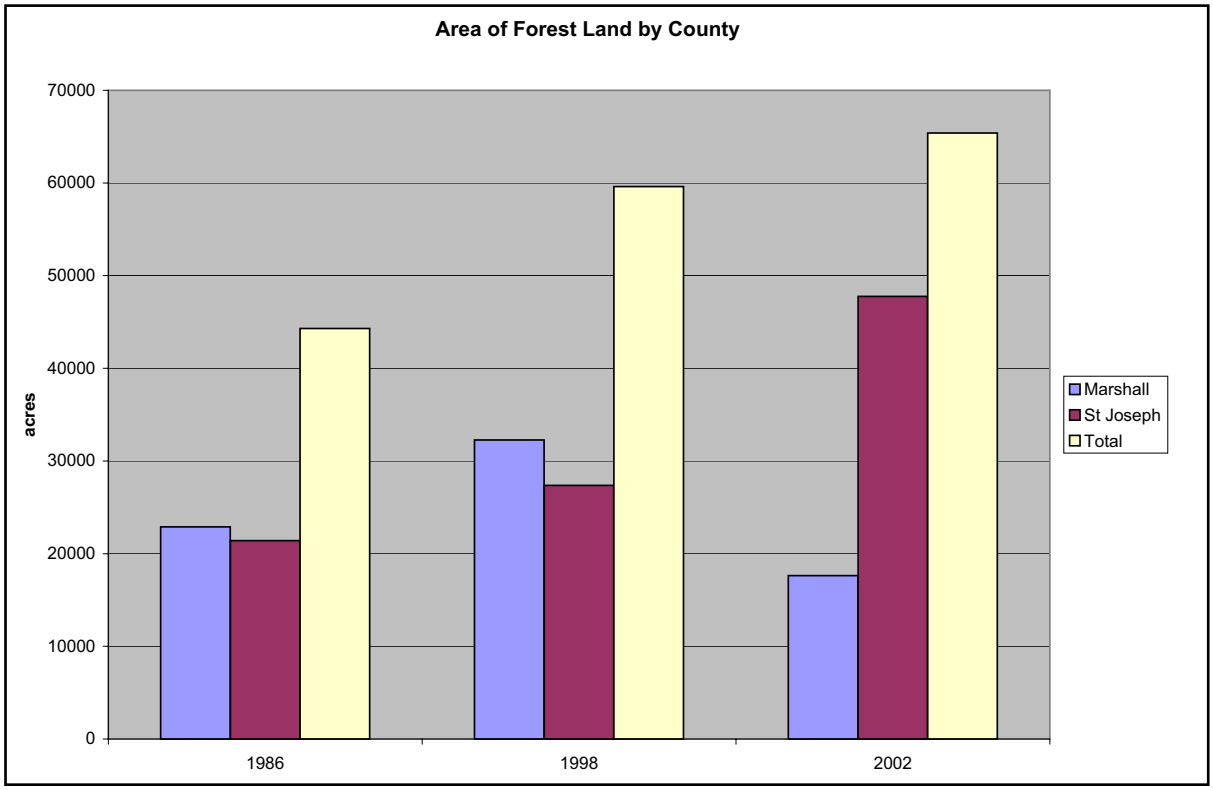


Figure 5.20.57: Area of Forest Land by County

ing due to programs such as the Classified Wildlife Habitat, the Classified Forest, and the Conservation Reserve Program. A linear regression analysis of forest in St. Joseph County indicates the small and particularly medium sized trees are experiencing a strong and steady increase.

Wetlands

The U.S. Fish and Wildlife Service estimated that Indiana had about 5,600,000 acres of wetland prior to European settlement 200 years ago, which covered approximately 24.1% of the State. (Indiana Department of Natural Resources, 1996) Today wetlands cover about 813,000 acres or approximately 3.5% of total area in Indiana. Indiana and other states have lost many acres of wetlands, especially during the late 1800s and early 1900s, in developing farmland. However, he trend today is an increase in wetlands because of the “no net loss” policy signed by President

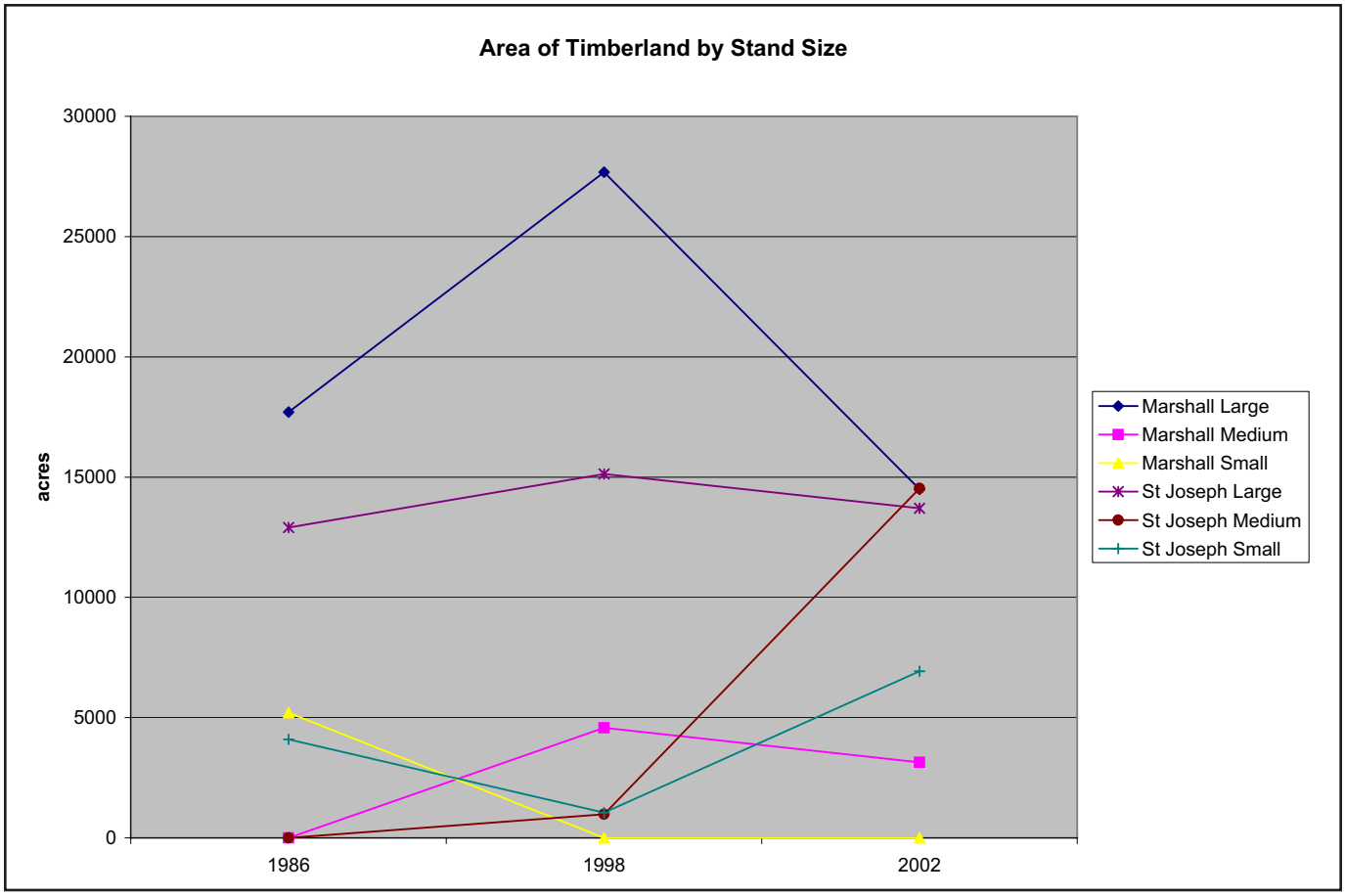


Figure 5.20.58: Area of Timberland by Stand Size

Table 5.20.33: Area of Timberland by County and Stand Size Class (acres)

	1986			1998			2002		
County	Large	Medium	Small	Large	Medium	Small	Large	Medium	Small
Marshall	17,700	0	5,200	27,682	4,581	0	14,492	3,142	0
St. Joseph	12,900	0	4,100	15,131	981	1,047	13,708	14,533	6,924
Total	30,600	0	9,300	42,813	5,562	1,047	28,200	17,675	6,924

Source: USDA, Forest Service

Clinton. According to the latest wetland inventory conducted during the mid 1980s by the Indiana Department of Natural Resources, Marshall County had 21,231 acres and St. Joseph County had 12,716 acres.

Legislation in the 1970s and 1980s, coupled with permit requirements for construction in wetland areas, has reversed the downward trend in wetlands in Indiana. At both the federal and state level, the policy is a "no net loss of wetlands." Officials at the state level indicate that this statement currently provides the best information as to the future direction of wetlands. Efforts will be made to avoid impacting wetlands during the development of the alternative chosen for more detailed study and the exact amount of jurisdictional wetland impacts will be include in the FEIS.

Farmland

Since early settlement in Indiana, agricultural land has been, and continues to be, one of the most valuable natural resources within the state. However, there is a continued loss of farmland, specifically prime farmland, as cities expand and rural development for industry and housing becomes more attractive. This trend holds true for Marshall and St. Joseph counties as well. Figures 4.5-1 and 4.5-2 [these figure references need to be remunerated per changes made] in Chapter 4 illustrate the historic decline of farmland use in Marshall and St. Joseph counties, respectively, from 1900 to 1997. Projections indicate a similar downward trend in farmland acres in the future. The rate of farmland conversion appears to be greater for St. Joseph County than Marshall County.

Conclusion

The City of South Bend has experienced significant growth, particularly in the city's southern portion as a result of newly annexed areas along US 31 South. The City of Lakeville has experienced nominal growth. Planning documents from both St. Joseph County and Marshall counties indicate continued growth through at least the year 2020. All recent, proposed, and potential development occurs within St. Joseph County. Marshall County reflects no development within the US 31 Improvement Project study area.

Table 5.20.34 shows the cumulative impacts for each alternative by direct, indirect, and other impacts. The indirect impacts reflect development at the proposed interchanges, such as at SR 6, SR 4/Pierce Road and Kern Road, and scattered residential subdivisions. For farmland, Alternative G-C has the highest direct and indirect impacts of the three alternatives with 485 acres and 85 acres, respectively. The farmland impacts for Alternatives Cs and Es are very similar. For forests, Alternative Cs has the highest direct and indirect impacts of the three alternatives with 196 acres and 25 acres, respectively. Alternative G-C has the fewest acres of indirect impacts with five acres. For wetlands, Alternative Cs has the highest direct and indirect impacts of the three alternatives with 58 and 2 acres, respectively.

Other impacts include recent development, proposed development, and potential development. These other impacts for the alternatives are shown in Table 5.20.34.

Table 5.20.34: Cumulative Impacts by Resource

Resource	Alternative	Direct[1] Impact	Indirect[2] Impact	Other Impacts			Cumulative Impacts Total
				Recent[3]	Proposed[4]	Potential[5]	
Farmland*	Cs	403	45	50	40	400	938
	Es	406	35	50	40	400	931
	G-C	485	85		30	375	975
Forest*	Cs	196	25	5	1	250	477
	Es	139	20	5	1	250	415
	G-C	139	5	5	1	250	400
Wetland*	Cs	58	2	5	3	20	88
	Es	41	2	5	3	20	71
	G-C	45	0	5	3	20	73

* Measured in acres
[1] Acreage immediately impacted by construction of US 31 improvements
[2] Undeveloped land zoned agriculture where future development, inspired by the project, is likely
[3] Development that has been recently completed or currently under construction
[4] Areas of proposed development with existing site plans
[5] Undeveloped land (agricultural or natural) that is zoned for development

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