



Chapter 5: Environmental Consequences

This chapter discusses the social, economic and environmental impacts of the Alternatives Cs, Es, G-Cs and Preferred Alternative G-Es 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.

Table 5.1.1: Comparison of Impacts for Preliminary Alternatives Cs, Es, G-Cs, G-Es, and Final Preferred Alternative G-Es

Socio-Economic/Environmental Measure	ALTERNATIVE				
	Cs	Es	G-Cs	G-Es	Final Pref. Alt. G-Es ¹
COSTS (Total) (Mil. Of \$) (year 2005 dollars)	324.7 to 327.9	362.3 to 365.9	332.2 to 339.7	366.9 to 374.4	371.0 to 378.3
Length (Miles)	19.5	19.9	20.3	20.5	20.5
No. of New Interchanges (Total Interchanges)	5 (7)	5 (6)	5 (7)	5 (6)	5 (6)
No. of Grade Separations (Overpass/Underpass)	16	16	16	16	16
No. of Grade Separations (Railroad Crossings)	2	1	2	1	1
CONSTRUCTION COSTS (Mil. of \$)	208.6 to 211.8	218.2 to 221.3	213.4 to 220.9	221.7 to 228.7	223.2 to 230.2
RECONSTRUCTION of US 20 Right-of-Way & Construction (Mil. of \$)	29.6	21.1	29.6	21.1	21.1
LOCAL & STATE ROAD IMPROVEMENT PROJECTS Right-of-Way & Construction (Mil. Of \$)	3.6	11.5	5.8	13.7	13.6
US 31 MAINLINE RIGHT-OF-WAY COSTS (Mil. of \$)	44.7	70.7	47.1	70.9	72.5
ENGINEERING COSTS (Mil. of \$)	13.7	18.1	13.9	18.3	18.3
UTILITY RELOCATION COSTS (Mil. of \$)	17.2	17.2	17.2	17.2	17.2
MITIGATION COSTS (Mil. of \$)	7.3	5.5 to 6.0	5.2	4.0 to 4.5	5.1 to 5.4
TRAFFIC PERFORMANCE					
Meet Purpose and Need	Yes	Yes	Yes	Yes	Yes
Performance (Compared to Other Alternatives, 1 is Best Performer)	3	1	4	2	2
LAND USE	961 Ac.	968 Ac.	1,012 Ac.	1,011 Ac.	1,061 Ac.
Agricultural (row crop)	390 Ac.	395 Ac.	504 Ac.	503 Ac.	537 Ac.
Commercial	15 Ac.	23 Ac.	16 Ac.	23 Ac.	23 Ac.
Church/Religious	2 Ac.				
Herbaceous Cover	51 Ac.	48 Ac.	68 Ac.	52 Ac.	53 Ac.
Open Water	<1 Ac.				
Pasture	14 Ac.	12 Ac.	3 Ac.	4 Ac.	4 Ac.
Transportation	213 Ac.	220 Ac.	217 Ac.	222 Ac.	226 Ac.



Table 5.1.1: Comparison of Impacts for Preliminary Alternatives Cs, Es, G-Cs, G-Es, and Final Preferred Alternative G-Es (Continued)

Socio-Economic/Environmental Measure	ALTERNATIVE				
	Cs	Es	G-Cs	G-Es	Final Pref. Alt. G-Es ¹
Residential	51 Ac.	86 Ac.	55 Ac.	77 Ac.	82 Ac.
Scrub/Shrub	38 Ac.	46 Ac.	31 Ac.	36 Ac.	37 Ac.
Woodland (Wetland & Non-Wetland) (Forests)	186 Ac.	135 Ac.	115 Ac.	91 Ac.	96 Ac.
RELOCATIONS					
Residences Acquired	50	128	59	124	131
Businesses Acquired ²	7	40	5	39	39
Businesses Damaged	5	13	5	13	13
Churches Acquired	1	1	1	1	1
HISTORIC PROPERTIES (Listed or Eligible)					
SECTION 4(f) PROPERTIES	0	0	0	0	0
PROPERTIES WITHIN A.P.E.	5	4	9	8	8
PROPERTIES ADVERSELY AFFECTED BUT NO SUBSTANTIAL LOSS OF INTEGRITY	0	0	1	1	1
ARCHAEOLOGICAL SITES					
Within Alignment	2	3	2	3	3
TOTAL WETLANDS (NWI + FARMED)	51.6 Ac.	35.6 Ac.	30.7 Ac.	23.9 Ac.	29.93 Ac.³
WETLANDS (From NWI Maps)	49.6 Ac.	33.7 Ac.	27.8 Ac.	21.1 Ac.	
Forested	21.8 Ac.	17.8 Ac.	17.7 Ac.	14.8 Ac.	13.21 Ac.
Scrub/Shrub	3.0 Ac.	1.6 Ac.	1.4 Ac.	0.0 Ac.	1.45 Ac.
Emergent	24.0 Ac.	13.6 Ac.	8.7 Ac.	6.3 Ac.	15.27 Ac.
Aquatic Bed	0.8 Ac.	0.7 Ac.	0.0 Ac.	0.0 Ac.	0.0 Ac.
ESTIMATED FARMED WETLANDS	2.0 Ac.	1.9 Ac.	2.9 Ac.	2.8 Ac.	0.44 Ac.⁴
STREAM IMPACTS (No. of Impact Locations) (USGS)	18	19	18	17	17
WILDLIFE HABITAT AREAS					
Potato Creek State Park & Swamp Rose Nature Preserve	0	0	0	0	0
Notable Wildlife Habitat (IDNR)	2	1	0	0	0
Classified Wildlife Habitat (IDNR)	4	3	0	0	0
Classified Forest (IDNR)	2-3	2-3	1-2	1-2	1-2
Conservation Reserve Program (CRP) (NRCS)	1	2	2	1	1
Wetland Reserve Program (WRP) (NRCS)	1	1	0	0	0
Partners for Fish and Wildlife Program (USFWS)	2	1	0	0	0



Table 5.1.1: Comparison of Impacts for Preliminary Alternatives Cs, Es, G-Cs, G-Es, and Final Preferred Alternative G-Es (Continued)

Socio-Economic/Environmental Measure	ALTERNATIVE					
	Cs	Es	G-Cs	G-Es	Final Pref. Alt. G-Es ¹	
INDIRECT IMPACTS						
Farmland	115 Ac.	50 Ac.	105 Ac.	45 Ac.	45 Ac.	
Wetland	3 Ac.	3 Ac.	3 Ac.	3 Ac.	3 Ac.	
Forests	30 Ac.	25 Ac.	10 Ac.	10 Ac.	10 Ac.	

NOTES: The final impacts associated with Preferred Alternative G-Es are Shaded

1. Following the identification of Alternative G-Es as the Preferred Alternative, additional, in-depth studies were performed on the alternative. These additional studies included, but were not limited to, refinement of local access plan and proposed right-of-way requirements, wetland delineations, Phase 1a Archaeological Review, etc.
2. Businesses acquired include large farming operations
3. Delineations of wetlands resulted in 29.93 acres of wetlands impacted, of which, 25.51 acres were jurisdictional and 4.42 acres were isolated wetlands.
4. One farmed wetland area was identified. This area met the three U.S. Army Corps of Engineers wetland criteria and was considered an emergent wetland. This farmed wetland was included in the emergent wetland total.

5.1 Traffic and Transportation

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

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.



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 of 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 along US 31, 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 and improve traffic flow, and increased 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 LOS today, and the fourth signalized intersection will operate at an unacceptable LOS 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 more than 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. The daily traffic volumes in the year 2000 are actual traffic counts adjusted to the year 2000. The LOS is based on the daily capacities found in Table 2.1.1. The daily traffic volumes in the year 2030 are assigned traffic volumes from the US 31 Improvement Project Travel Demand Model with a refined roadway network for the alternatives. The LOS is consistent with the daily capacities used in the evaluation of alternatives in Table 3.1.3.

Referring to Table 5.1.2, Alternatives Cs, Es, G-Cs and Preferred Alternative G-Es 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.

Segments (location of daily volume reported)	Rural or Urban	Alternatives / Year					
		No Build 2000	No Build 2030	Cs 2030	Es 2030	G-Cs 2030	G-Es (Preferred) 2030
US 30 to Michigan Road (north of W6A Road)	Rural	16,989(B)	21,215(C)	512(A)	514(A)	612(A)	426(A)
Michigan Road to US 6 (south of US 6)	Rural	24,232(C)	26,542(D)	4,485(A)	4,324(A)	4,593(A)	4,450(A)
US 6 to Tyler Road (south of Tyler Road)	Rural	19,845(E)	23,270(F)	2,695(A)	2,530(A)	3,885(A)	3,193(A)
Tyler Road to Lake Trail (south of South Quinn Trail)	Rural	21,400(C)	23,362(D)	2,998(A)	2,837(A)	4,147(A)	3,339(A)



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) (Continued)

Segments (location of daily volume reported)	Rural or Urban	Alternatives / Year					
		No Build 2000	No Build 2030	Cs 2030	Es 2030	G-Cs 2030	G-Es (Preferred) 2030
Lake Trail to SR 4 (north of Patterson Street)	Rural	27,217(F)	29,691(F)	5,327(A)	5,227(A)	5,441(A)	3,355(A)
SR 4 to New Road (south of New Road)	Rural	24,240(E)	26,789(F)	5,435(A)	4,072(A)	7,001(A)	5,187(A)
New Road to Roosevelt Road (south of Roosevelt Road)	Rural	26,419(E)	29,445(F)	7,681(A)	6,684(A)	9,407(B)	7,990(A)
Roosevelt Road to US 20 Bypass (north of Kern Road)	Urban	31,526(F)	43,512 39,323(F)	18,369(D)	7,987(B)**	19,587(D)	9,133(B)**

* An LOS C is the minimum acceptable for rural segments. An LOS D is the minimum acceptable for urban segments.
 ** Volume south of Kern Road is shown because it is higher than north of Kern Road.
 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, G-Cs and Preferred Alternative G-Es have no significant impact on existing and future daily traffic volumes on Michigan Street (Business US 31) north of the US 20 Bypass. South of Ireland Road, these traffic volumes are the same as the No-Build Alternative daily traffic volume for Alternative Cs and G-Cs and are within 14% of the No-Build Alternative for Alternatives Es and Preferred Alternative G-Es North of Ireland Road, the year 2030 daily traffic volumes on Michigan Street (Business US 31) are comparable to the No-Build Alternative.

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)

Segment	Alternatives				
	No-Build	Cs	Es	G-Cs	G-Es (Preferred)
US 30 to CR 7th	24,227 (C)	31,780 (B)	31,740 (B)	29,890 (B)	30,820 (B)
CR 7th to Michigan Road	21,215 (C)	34,360 (C)	33,980 (C)	31,160 (B)	32,590 (B)
Michigan Road to US 6	26,542 (D)	34,360 (C)	33,980 (C)	31,160 (B)	32,590 (B)
US 6 to SR 4	29,691 (F)	33,260 (B)	35,270 (C)	27,520 (B)	32,480 (B)
SR 4 to New Road	26,789 (F)	35,850 (C)	38,610 (C)	29,670 (B)	34,590 (C)
New Road to Kern Road	29,445 (F)	35,850 (C)	38,610 (C)	29,670 (B)	34,590 (C)
Kern Road to US 20 Bypass	47,929 (F)	39,290 (B)	51,380 (C)	33,800 (B)	46,780 (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 on and off-ramps to and from the north must be two lanes on the departure from and approach to the Kern Road for adequate storage capacity and functioning of the ramp-crossroad intersections in the case of Alternatives Es and Preferred Alternative G-Es. Also, in the case of Alternatives Es and G-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-Cs at the possible Kern Road interchange and the balance of the possible interchanges on all alternatives except for the possible interchange at US 6, the widening of the crossroad to three lanes through the interchange area to accommodate left-turn lanes appears sufficient. Because a portion of US 6 is already four lanes east of existing US 31, consideration is being given to extending this four-lane section through the possible US 6 interchange.

In addition to the widening of Kern Road from the interchange to existing US 31 in the case of Alternatives Es and Preferred Alternative G-Es and the widening of US 6 from east of existing US 31 through the possible US 6 interchange in the case of all alternatives, County Road 7 must be extended from Linden Road through the possible East 7th Road interchange to Michigan Road. A high type two-lane roadway (12-foot lanes and 10-foot paved shoulders) will be needed for East 7th Road from the US 31 interchange to Michigan Road in order for all build alternatives to handle the high access traffic volumes (including truck traffic), which range from 6,370 vpd for Alternative G-Cs to 7,580 vpd for Alternative Cs (6,820 vpd for preferred Alternative G-Es). In the case of Alternatives G-Cs and Preferred Alternative G-Es, Pierce Road (which becomes SR 4 at existing US 31) should also be reconstructed from existing US 31 to the new freeway interchanges due to significantly higher traffic volumes on this section of Pierce Road (4,510 vpd for Preferred Alternative G-Es)

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 average an eight-mile spacing with a minimum spacing of two miles in rural areas and a 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 (East 7th Road, US 6, SR 4/Pierce Road and Kern Road). While the interchanges 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 8,000 vpd in the year 2030 from the possible East 7th Road interchange to Michigan Road. Because the alternatives depart the existing alignment of 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 East 7th Road (about 2.0 miles north of US 30) to accommodate the heavy traffic movement from Michigan Road to the freeway. Excluding the system-interchanges, the interchange at East 7th Road carries the highest daily traffic volumes in the case of Alternatives Cs and G-Cs, the second highest daily traffic volumes in the case of Alternative Es and third highest daily traffic volumes in the case of Preferred



Table 5.1.4: Possible Access for the Alternatives (Preferred Alternative G-Es Shaded)

Crossroad	Alternatives			
	Cs	Es	G-Cs	G-Es (Preferred)
US 30	Existing Interchange	Existing Interchange	Existing Interchange	Existing Interchange
Plymouth-Goshen Trail	grade separation	grade separation	grade separation	grade separation
West 7B Road	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced
East 7th Road	Diamond Interchange	Diamond Interchange	Diamond Interchange	Diamond Interchange
Lilac Road/West 6th Road	grade separation	grade separation	grade separation	grade separation
West 5A Road	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced
Existing US 31	closed southeast of Maple Rd./West 4A Rd. intersection	closed southeast of Maple Rd./West 4A Rd. intersection	closed southeast of Maple Rd./West 4A Rd. intersection	closed southeast of Maple Rd./West 4A Rd. intersection
West 4A Road	grade separation	grade separation	grade separation	grade separation
West 3A Road	grade separation	grade separation	grade separation	grade separation
Maple Road	relocated	relocated	relocated	relocated
West 2C Road	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced
US 6	Diamond Interchange	Diamond Interchange	Diamond Interchange	Diamond Interchange
West 1B Road	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced
CSX Railroad	grade separation	grade separation	grade separation	grade separation
East 1st Road	grade separation	grade separation	grade separation	grade separation
North Lilac Road			relocated	relocated
Tyler Road	grade separation	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	closed and cul-de-saced
Rockstroh Road			closed and cul-de-saced	closed and cul-de-saced
Kenilworth Road			grade separation	grade separation
Leeper Road	grade separation	grade separation		
US 31	grade separation	grade separation		
Quinn Trail	relocated	relocated		
Lake Trail			grade separation	grade separation
Quinn Road	grade separation	grade separation	closed and cul-de-saced	closed and cul-de-saced
SR 4 (Pierce Road)	Diamond Interchange	Diamond Interchange	Diamond Interchange	Diamond Interchange
Osborne Road	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced	closed and cul-de-saced
New Road	grade separation	grade separation	grade separation	grade separation
Miller Road			grade separation	grade separation
Madison Road	grade separation	grade separation		
Louise Dr.		closed		
Roycroft Road		closed		
Existing US 31			grade separation	grade separation
Roosevelt Road	grade separation	grade separation	grade separation	grade separation
Kern Road	Diamond Interchange	Diamond Interchange	Diamond Interchange	Diamond Interchange
Main Street		closed and cul-de-saced		grade separation
Dice Street		grade separation		closed and cul-de-saced
Linden Road	relocated		Relocated	
Johnson Road	grade separation	grade separation	grade separation	grade separation
Jewell Avenue		grade separation		closed and cul-de-saced
Jackson Road				grade separation
US 20 Bypass	Trumpet Interchange	Modified Existing Interchange	Trumpet Interchange	Modified Existing Interchange
Interchanges	6	6	6	6
Road Grade Separations	13	15	13	15
Railroad Grade Separations	1	1	1	1
Road Relocations	3	2	3	2
Road Closures	7	10	9	10



Interchanges	Ramps	Alternatives (Daily Volumes)			
		Cs	Es	G-Cs	G-Es (Preferred)
East 7th Road	NB off	2,041	2,116	2,151	2,077
	NB on	3,807	3,661	3,174	3,468
	SB off	3,636	3,495	3,013	3,215
	SB on	2,008	2,052	2,115	2,046
	Total	11,492	11,324	10,453	10,806
US 6	NB off	3,032	2,309	3,288	2,846
	NB on	2,422	3,318	1,431	3,502
	SB off	2,388	2,615	1,405	2,004
	SB on	2,876	2,325	3,193	2,774
	Total	10,718	10,577	9,317	11,126
SR 4	NB off	1,162	936	360	295
	NB on	2,284	2,489	1,333	1,800
	SB off	2,598	3,400	1,543	2,255
	SB on	1,134	933	361	303
	Total	7,178	7,758	3,597	4,653
Kern Road	NB off	851	1,208	585	1,038
	NB on	2,679	5,292	2,769	4,895
	SB off	2,572	8,861	2,531	8,922
	SB on	952	1,242	587	1,048
	Total	7,054	16,603	6,472	15,903

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

Alternative G-Es. The interchange at East 7th Road is recommended in the Plymouth Comprehensive Plan (2003) when US 31 is upgraded to a freeway.

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

In the case of all Alternatives, 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. The proposed SR 4 interchange carries the least daily traffic volumes of the four service interchanges for all Alternatives, except for Alternative Cs where it handles slightly more traffic than the Kern Road interchange.

In the case of Alternative G-Cs, 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 daily traffic volumes in the case of Alternatives Es and Preferred Alternative G-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 Alternatives Es and Preferred Alternative G-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. The proposed Kern Road interchange has the third highest daily traffic volumes in the case of Alternative G-Cs and the least service interchange volumes in the case of Alternative Cs.

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 East 7B Road and East 6th Road (Lilac Road). All Alternatives would provide an interchange at East 7th Road, a grade separation at Plymouth-Goshen Trail (a rural major collector), close and cul-de-sac West 7B Road and provide a grade separation at West 6th Road (Lilac Road).

Between the East 7th Road interchange and the US 6 interchange, grade separations are proposed at West 6th Road, West 4A Road and West 3A Road. Due to the proximity of Maple Road to the freeway near West 2C Road, Maple Road will 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 five roadway grade separations (East 1st Road, Tyler Road, Leeper Road, US 31 and Quinn Road). The south end of 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-Cs and Preferred Alternative G-Es depart the common alignment of the other two alternatives. Alternative G-Cs and Preferred Alternative G-Es have four roadway grade separations (East 1st Road, 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 Alternatives G-Cs and Preferred Alternative G-Es, grade separations are proposed at New Road, Miller Road, Existing US 31 and Roosevelt Road.

From Kern Road to the US 20 Bypass, Alternatives Cs and G-Cs 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. Alternatives Es and Preferred Alternative G-Es provide grade separations at Dice Street (Alternative Es) or Main Street (Preferred Alternative G-Es), at Johnson Road, and at Jewell Avenue (Alternative Es) or Jackson Street (Preferred Alternative G-Es).

In the case of Alternative Es, the alignment north of Kern Road joins the existing alignment of US 31 near Dice Street. At Dice Street, traffic may pass from existing US 31 to Main Street which intersects with the Johnson Road



grade separation; traffic may return to the east side of the freeway at the Jewell Avenue grade separation. For Preferred Alternative G-Es, traffic may pass from existing US 31 to Main Street which intersects with the Johnson Road grade separation. A grade separation is proposed at Jackson Street over the freeway in Preferred Alternative G-Es to link the east and west side of the freeway. Grade separations are also proposed in Preferred Alternative G-Es at Fellows Street and Scott Street between Jackson Road and Ireland Road to connect the areas north and south of the US 20 Bypass.

Summary of Preferred Alternative G-Es

Table 3.6.41 gives an overview of the socio/economic and environmental impacts associated with Preferred Alternative G-Es. These impacts are discussed in greater detail throughout Chapter 5.

Preferred Alternative G-Es would result in a future (year 2030) LOS of A (the best) for all rural segments of existing US 31. This would be from US 30 to Roosevelt Road. It would result in a future (year 2030) LOS of B from Roosevelt Road to the US 20 Bypass. Thus, the Preferred Alternative G-Es will relieve traffic congestion on existing US 31 achieving an acceptable LOS in the year 2030. The Preferred Alternative G-Es will have no significant impact on existing and future daily traffic volumes on Michigan Street (Business US 31) north of the US 20 Bypass.

Preferred Alternative G-Es is expected to have acceptable LOS and forecasted traffic volumes for the year 2030 for the freeway itself. The LOS will range from B to C in rural segments and B in the urban segment.

Preferred Alternative G-Es will involve six interchanges that will be refined in later phases of the project development. These include two system-interchanges at US 30 and US 20 Bypass, and possibly four service-interchanges (East 7th Road, US 6, SR 4/Pierce Road and Kern Road).

Preferred Alternative G-Es will involve 16 grade separations (overpass/underpass). Grade separations will be located at Plymouth-Goshen Trail, Lilac Road/West 6th Road, West 4A Road, West 3A Road, CSX Railroad, East 1st Road, Tyler Road, Kenilworth Road, Lake Trail, New Road, Miller Road, existing US 31, Roosevelt Road, Main Street, Johnson Road and Jackson Road.

Preferred Alternative G-Es will involve the relocation of two roads. Due to the proximity of Maple Road to the freeway near West 2C Road, Maple Road will be relocated along the east side of the freeway to maintain its intersection with West 2C. North Lilac Road will likely be relocated to maintain its connection with Tyler Road.



5.2 Pedestrian and Bicyclist Access

There are no bicycle or pedestrian trails impacted by any of the proposed alternatives. The proposed highway is designated as a freeway. The roadside shoulders for roadways crossing US 31 will be wide enough to accommodate pedestrian and bicycle traffic access at interchanges and grade separations (overpass/underpass). This will allow non-motorized traffic to maintain connectivity across the highway.

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 classified 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. The evaluation concluded that there would be no impact to bicycle and pedestrian trails.



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. It should be noted that the right-of-way and relocation costs and displacements contained in this chapter include those associated with the alternatives as-well-as the Local Roadway Improvement Projects (see Chapter 3.5) for the alternatives.

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. More detailed right-of-way determinations will be made during the design phase.

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.

Alternatives	Costs
Alternative Cs	\$45,700,000
Alternative Es	\$73,800,000
Alternative G-Cs	\$48,900,000
Alternative G-Es (Preferred)	\$74,800,000

As a fully access controlled grade separated 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 includes right-of-way and relocation costs associated with Local Road Improvement Projects (see Chapter 3.5) and the reconstruction of U.S. 20 for the alternatives but do not include damages to landlocked or severed properties that have not yet been identified. There will be no relocations for the No-Build Alternative.

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 conducted a windshield survey of 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.

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 and G-Es have the greatest number of residential displacements because they 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. Following review of the DEIS, a decision was made to add access improvements in the vicinity of Johnson Road, and from Jackson Street to the north over US20, near the northern terminus for Alternatives Es and G-Es. These access improvements increased the number of residential relocations above what was originally predicted in the DEIS. 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 further revised during the design phase when more detailed engineering decisions are made.

Price Range	Alternative Cs	Alternative Es	Alternative G-Cs	Alternative G-Es (Preferred) ¹
\$0 - \$50,000	2	3	2	3
\$50,000 - \$100,000	5	28	6	25
\$100,000 - \$150,000	17	38	16	40
\$150,000 - \$200,000	9	28	12	26
\$200,000 - \$250,000	8	14	11	14
\$250,000+	9	17	12	16
Total Residences	50	128	59	124

¹ See Table 3.6.41 for Summary of Impacts Associated with Preferred Alternative G-Es following additional, in-depth studies.

Discussion of Preferred Alternative G-Es:

Following the identification of Alternative G-Es as the Preferred Alternative, additional, in-depth studies were performed on the alternative. Included in these additional studies were minor refinements of the local access plan and associated proposed right-of-way requirements and number of relocations. The results of the additional analysis (See table 3.6.41) showed that Preferred Alternative G-Es has a total of approximately 127 residential relocations. The decision to utilize the existing US 20 and US 31 interchange at the north terminus requires a higher number of residential relocations due to the higher density housing that currently exists along US 31, especially in the area north of Kern Road. This alternative also would impact a proposed subdivision platted for approximately 250 homes and a proposed 350-unit apartment complex located south of Kern Road and west of existing US 31. As of February 2005, there were no completed homes or apartments in this area and the developers were aware of the proposed US 31 improvement project.

A review of 2000 US Census Bureau Block Statistics for the areas impacted by Alternative G-Es revealed that 92.6% of the occupied homes in the corridor area were owner-occupied, while only 7.4% were renter-occupied. The following table summarizes the housing characteristics for the census blocks within the identified census tracts along the G-Es corridor.



Geographical Area	Owner-Occupied	Renter-Occupied	White Head of Household	Non-White Head of Household	Over 65 Head of Household
North of Kern Road (census tract 118)	92.7%	7.3%	96.6%	3.4%	25.6%
Kern Road to New Road (census tract 119)	95.3%	4.7%	97.5%	2.5%	24.4%
New Road to County line (census tract 123)	92.4%	7.6%	97.5%	2.5%	15.3%
County line to 7 th Road (census tract 202.1)	80.3%	19.7%	100%	0%	19.7%
7 th Road to south project limits (census tract 207.01)	94%	6%	100%	0%	12.5%
Totals for Alternative G-Es Corridor Area	92.6%	7.4%	97.5%	2.5%	23.1%
Saint Joseph County	71.7%	28.3%	84.4%	17.6%	13.6%
Marshall County	76.8%	23.2%	96.9%	3.1%	22.9%
State of Indiana	71.4%	28.6%	87.5%	12.5%	12.4%

Source: 2000 US Census Bureau

Generally, the housing characteristics within the G-Es corridor show a high percentage of owner-occupied homes when compared to the statistics for the State of Indiana or when compared to Marshall and St. Joseph County statistics. The corridor area has only 2.5% of minority residents which compares to a rate of 12.5% for the State of Indiana as a whole. The G-Es corridor area does show a slightly higher than normal percentage of householders over the age of 65. The corridor as a whole has approximately 23.1% over the age of 65 compared to the State of Indiana rate of 12.4% over the age of 65. This higher percentage is likely attributed to the fact that there is a high percentage of owner-occupied homes and the area as a whole has long established neighborhoods where residents tend to stay in place. Long term or elderly residents often have more difficulty adjusting to a required relocation. It is often difficult for these people to adjust to new surroundings and possibly to establish new social ties.

Census statistics for the G-Es project area show that there are very few residents in this area living below the poverty level. The percentage below poverty level for the project area is between 3.4% and 5.3%. This compares with a poverty rate of 9.5% in the State of Indiana as a whole. It is not expected that this project will have a disproportionate impact on any low-income populations.

The high number of residential relocations associated with Alternative G-Es is a negative impact that can only be mitigated by providing good relocation advisory services and adequate compensation. Potential social and psychological impacts to displaced residents pertain to the changes in the living environment and the emotional attachment to a particular home or neighborhood. There can be negative financial impacts if the displaced resident incurs increased living expenses, increased property taxes, moving costs or increased travel costs to and from work. There can also be some potential positive relocation impacts, including the sale of a home which may have been difficult to sell on the open market or the relocation to a better home and better neighborhood. Negative financial impacts are handled in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 as amended. The availability of replacement housing and a discussion of relocation assistance can be found in the Mitigation Section 6.1.



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 5.3.9 depicts the alternatives and shows that Alternatives Es and G-Es have the greatest impacts to commercial establishments.

Table 5.3.9: Business Displacements by Alternative

Type of Business	Alternative Cs	Alternative Es	Alternative G-Cs	Alternative G-Es (Preferred) ¹
Office or Professional Service	1 displaced	19 displaced 3 damaged	1 displaced	19 displaced 3 damaged
Industrial or Warehouse	1 displaced 3 damaged	4 displaced	1 displaced 3 damaged	4 displaced
Hospitality and Lodging		2 damaged		2 damaged
Retail	1 damaged	5 displaced 5 damaged	1 damaged	5 displaced 4 damaged
Restaurant		1 displaced 1 damaged		1 displaced 1 damaged
Agricultural-Related	4 displaced 1 damaged	4 displaced	2 displaced 1 damaged	3 displaced 1 damaged
Gas or Auto Related		5 displaced 2 damaged		5 displaced 2 damaged
Specialty Business	1 displaced	2 displaced	1 displaced	2 displaced
Total	7 displaced 5 damaged	40 displaced 13 damaged	5 displaced 5 damaged	39 displaced 13 damaged

¹ See Table 3.6.41 for Summary of Impacts Associated with Preferred Alternative G-Es following additional, in-depth studies.

Alternative Es follows the same new terrain alignment as Alternative Cs in the southern portion of the project area while Alternative G-Es follows the Alternative G-Cs route. Both of these Alternatives 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 is 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 is considered damaged if the proposed right-of-way takes a portion of the property and impacts the value or utility of the improvement but does not take the entire parcel. The displacement of business 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.

The project area supports a very active farming community, although the number of active farms is higher in the southern reaches of the project area and begins to dwindle as one approaches the South Bend Metropolitan Area. The area also supports various agricultural-related businesses such as horse boarding operations. If an alternative appeared to displace or acquire the operational components of a large farm or horse boarding operation (including large barns, silos, etc.), it was included as a displaced or damaged agricultural-related business. It is expected that additional small farming operations will be impacted. All displaced farm structures would be fully evaluated during the right-of-way acquisition stage. A more detailed discussion of farmland impacts can be found in Section 5.5.



All four of the Alternatives will likely displace a small church located on the south side of US 6. The New Philadelphia Church utilizes a former office building. A survey sent to the church office was not returned. Other attempts to contact someone at the church were not successful. The church appears to own several acres at its current location. It may be possible to construct a new church building on the remaining acreage depending on the final right-of-way requirements for the US 6 Interchange.

Summary of Preferred Alternative G-Es

Following the identification of Alternative G-Es as the Preferred Alternative, additional, in-depth studies were performed on the alternative. Included in these additional studies were minor refinements of the local access plan and associated proposed right-of-way requirements and number of relocations. The results of the additional analysis (See table 3.6.41) showed that Preferred Alternative G-Es has a total of approximately 127 residential relocations. This alternative also would impact a proposed subdivision platted for approximately 250 homes and a proposed 350-unit apartment complex located south of Kern Road and west of existing US 31. As of February 2005, there were no completed homes or apartments in this area and the developers were aware of the proposed US 31 improvement project. Generally, the housing characteristics within the G-Es corridor show a high percentage of owner-occupied homes when compared to the statistics for the State of Indiana or when compared to Marshall and St. Joseph County statistics.

Because Preferred Alternative G-Es utilizes the existing US 31 corridor, it will have comparatively high business relocations. Preferred Alternative G-Es is estimated to displace 39 businesses and damage 13 businesses.

Preferred Alternative G-Es will also likely displace the New Philadelphia Church located on the south side of US 6.

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. All Marshall County and St. Joseph County property owners pay State, County, township school, library, and in some cases fire and airport property taxes. Those who live within municipal boundaries also pay municipal tax rates. Total tax rates vary depending on the township, school district, library district and fire district. Projected property tax impacts were estimated using current assessed values of land and improvements for each county as a whole and compared to estimated losses in assessed value from right-of-way acquisition for each alternative. The resulting property tax impacts are shown in Tables 5.3.10 and 5.3.11. The estimated loss in the Gross Levy (total income raised from property taxes) is a small percentage of the total tax base for Marshall and St. Joseph Counties. The No-Build Alternative would not impact property tax revenue.

	Alternative Cs	Alternative Es	Alternative G-Cs	Alternative G-Es (Preferred)
Estimated Loss in Assessed Value Centre and North Townships	\$4,130,850	\$3,930,850	\$4,250,650	\$3,950,650
Total Assessed Value of Land and Improvements in Marshall County*	\$2,229,507,365	\$2,229,507,365	\$2,229,507,365	\$2,229,507,365
Estimated Percent Loss in Assessed Value from Right-of-Way Acquisition	0.18%	0.19%	0.18%	0.19%
Gross Levy (Total Income Raised from Property Taxes in Marshall County)*	\$48,072,441	\$48,072,441	\$48,072,441	\$48,072,441
Estimated Loss in Gross Levy from Right-of-Way Acquisition	\$86,530	\$91,338	\$86,530	\$91,338

* Source: Indiana Handbook of Taxes, Revenues, and Appropriations – Fiscal Year 2004 (2003 taxes payable in 2004)



	Alternative Cs	Alternative Es	Alternative G-Cs	Alternative G-Es (Preferred)
Estimated Loss in Assessed Value Centre and Union Townships	\$8,846,150	\$23,420,550	\$9,370,750	\$23,394,800
Total Assessed Value of Land and Improvements in St. Joseph County*	\$8,869,647,768	\$8,869,647,768	\$8,869,647,768	\$8,869,647,768
Estimated percent loss in Assessed Value from Right-of-Way Acquisition	0.1%	0.26%	0.1%	0.26%
Gross Levy (Total Income Raised from Property Taxes in St. Joseph County)*	\$322,686,491	\$322,686,491	\$322,686,491	\$322,686,491
Estimated Loss in Gross Levy from Right-of-Way Acquisition	\$322,686	\$838,985	\$322,686	\$838,985

* Source: Indiana Handbook of Taxes Revenues, and Appropriations – Fiscal Year 2004 (2003 taxes payable in 2004)

5.3.2.2 Local Business Economic Impacts

The No-Build Alternative would not have local business economic impacts, however, the freeway alternatives for the US 31 project will 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 State-wide 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) 25-4¹, 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 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 1/4 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 G-Cs or the result of access restrictions in the case of Alternatives Es and G-Es which follow 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 5.3.12. For the segment of US 31 from the US 30 interchange to Michigan Road (about 6 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 US 6) and minor growth (3%) over 30 years result in a significant sales benefit for highway-oriented uses.

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



Table 5.3.12: Nearby Business Sales Impacts by Alternative
(Total Estimated Sales Shown, a Comparison to the No-Build Reveals the Impact)

Segment	Option/Use	No-Build	Alternative Cs	Alternative Es	Alternative G-Cs	Alternative G-Es (Preferred)
US 30 to Michigan Road (6 miles)	Restaurant/Bar	\$250,000	\$389,000	\$389,000	\$389,000	\$389,000
	Services	\$1,250,000	\$1,718,000	\$1,718,000	\$1,718,000	\$1,718,000
	Subtotal	\$1,500,000	\$2,107,000	\$2,107,000	\$2,107,000	\$2,107,000
	Change over No-Build		+ \$607,000	+ \$607,000	+ \$607,000	+ \$607,000
Michigan Road to Roosevelt Road (12 miles)	Grocery-Convenience	\$2,000,000	\$162,000	\$148,000	\$193,000	\$162,000
	Non-Durables Retail	\$23,000,000	\$12,091,000	\$11,751,000	\$12,836,000	\$12,097,000
	Durables Retail	\$1,000,000	\$942,000	\$935,000	\$959,000	\$943,000
	Gas Station	\$8,250,000	\$668,000	\$610,000	\$797,000	\$669,000
	Restaurant/Bar	\$7,250,000	\$5,110,000	\$5,022,000	\$5,301,000	\$5,111,000
	Services	\$16,000,000	\$15,239,000	\$15,117,000	\$15,506,000	\$15,241,000
	Specialty Retail	\$7,250,000	\$7,661,000	\$7,624,000	\$7,742,000	\$7,662,000
	Subtotal	\$64,750,000	\$41,873,000	\$41,207,000	\$43,333,000	\$41,885,000
	Change over No-Build		- \$22,877,000	- \$23,543,000	- \$21,417,000	- \$22,865,000
Roosevelt Road to US 20 Bypass (2 miles)	Grocery-Convenience	\$0	\$0	\$0	\$0	\$0
	Grocery-Supermarket	\$0	\$0	\$0	\$0	\$0
	Non-Durables Retail	\$13,750,000	\$10,356,000	\$13,750,000	\$10,675,000	\$13,750,000
	Durables Retail	\$11,000,000	\$11,776,000	\$11,000,000	\$11,906,000	\$11,000,000
	Gas Station	\$3,750,000	\$703,000	\$3,750,000	\$745,000	\$3,750,000
	Restaurant/Bar	\$1,500,000	\$1,342,000	\$1,500,000	\$1,371,000	\$1,500,000
	Hotel	\$2,000,000	\$1,173,000	\$2,000,000	\$1,214,000	\$2,000,000
	Services	\$17,500,000	\$18,933,000	\$17,500,000	\$19,143,000	\$17,500,000
	Specialty Retail	\$4,250,000	\$4,890,000	\$4,250,000	\$4,924,000	\$4,250,000
	Subtotal	\$53,750,000	\$49,172,000	\$53,750,000	\$49,977,000	\$53,750,000
	Change over No-Build		- \$4,578,000	+ \$0	- \$3,773,000	+ \$0
All	Total	\$120,000,000	\$93,152,000	\$97,064,000	\$95,417,000	\$97,742,000
	Change over No-Build		- \$26,848,000	- \$22,936,000	- \$24,583,000	- \$22,258,000



From Michigan Road to Roosevelt Road (about 12 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 Es results in the greatest diversion of traffic through LaPaz and Lakeville, and has the greatest adverse impact on pass-by traffic dependent businesses, a 36% decline. On the other hand, Alternative G-Cs is the least effective in diverting traffic through LaPaz and Lakeville, and has the least impact on highway-oriented businesses, a 33% decline. Alternatives Es and G-Es result in a 35% 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 Cs diverts the most traffic from existing US 31, and has the greatest adverse impact on highway-oriented businesses, a 9% decline. Alternative G-Cs results in about a 7% decline in sales for highway-oriented businesses.

In the case of Alternatives Es and G-Es, several highway-oriented businesses along existing US 31 will be displaced, but 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, Alternatives Es and G-Es are 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.

In conclusion, for the entire corridor, Alternative Cs is projected to have the greatest long-term adverse impact on highway-oriented business sales; and Alternative G-Es is projected to have the least adverse impact. The No-Build Alternative would not have local business economic impacts.

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. The No-Build Alternative would not have local business economic impacts.

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 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 2016. As shown in Table 5.3.13, Alternative Es generated the most user benefits in the opening year, followed by Alternatives Cs, G-Es and Alternative G-Cs.

Table 5.3.13: Highway User Benefits Over No-Build Alternative				
Alternative	Cs	Es	G-Cs	G-Es (Preferred)
Mobility (Travel Time Savings)	\$9,311,504	\$14,295,853	\$5,842,316	\$7,390,865
Vehicle Operating Benefit	-\$11,127,480	-\$9,067,746	-\$11,638,570	-\$13,109,003
Safety Benefit	\$14,513,333	\$16,455,683	\$11,098,942	\$14,105,272

Note: Positive numbers represent a cost benefit and negative numbers represent a cost expenditure for the assumed opening year of the facility of 2016.

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



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.

5.3.3 Land Use and Zoning

Table 5.3.14 shows the direct land use impacts of Alternatives Cs, Es, G-Cs and G-Es. Alternative G-Cs would require the most land for right-of-way with an estimated 1,012 acres while Alternative Cs would require the least land with an estimated 961 acres. The Preferred Alternative G-Es will nearly require as much land for right-of-way as Alternative G-Cs with 1,011 acres. Alternative G-Cs would require the most acres of agricultural land with an estimated 504 acres while alternatives Cs and Es would require an estimated 390 and 395 acres of agricultural land, respectively. Preferred Alternative, G-Es will nearly require as much agricultural land as Alternative G-Cs with an estimated 503 acres. 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.

Land Uses	Alternative Cs (Acres)	Alternative Es (Acres)	Alternative G-Cs (Acres)	Alternative G-Es (Preferred) ¹ (Acres)
Agricultural (row crop)	390	395	504	503
Commercial	15	23	16	23
Church/Religious	2	2	2	2
Herbaceous Cover	51	48	68	52
Open Water	<1	<1	<1	<1
Pasture	14	12	3	4
Transportation	213	220	217	222
Residential	51	86	55	77
Scrub/Shrub	38	46	31	36
Woodland	186	135	115	91
Total	961	968	1012	1011

¹ See Table 3.6.41 for Summary of Impacts Associated with Preferred Alternative G-Es following additional, in-depth studies.

Following the identification of Alternative G-Es as Preferred Alternative G-Es, additional, in-depth studies were performed on the alternative. Included in these additional studies were minor refinements of the local access plan and associated proposed right-of-way requirements and number of relocations. The results of the additional analysis (see Table 3.6.41) showed that Preferred Alternative G-Es has direct land use impacts totaling 1,051 acres including 503 acres of Agricultural (row crops), 503 acres of Commercial, 2 acres of Church/Religious, 52 acres of Herbaceous Cover, <1 acre of Open Water, 4 acres of Pasture, 220 acres of Transportation, 77 acres of Residential, 36 acres of Scrub/Shrub and 91 acres of Woodland (Wetland & Non-Wetland) (Forested).



5.3.4 Neighborhoods and Community Cohesion

5.3.4.1 Neighborhoods

Impacts to the various neighborhoods and subdivisions by the freeway alternatives are discussed below. Varying levels of noise impacts will occur in neighborhoods along the length of any new facility, with those neighborhoods closest to the highway seeing the highest noise levels. The No-Build Alternative would result in no significant impacts to neighborhoods. 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) is located on the south side of US 6 approximately 1500 feet west of Alternatives Cs, Es, G-Es and G-Cs. There will be no displaced homes or lost access from this neighborhood. The proposed interchange at US 6 will likely increase traffic along the portion of US 6 in the vicinity of 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 Alternatives G-Cs and G-Es pass 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. Alternatives G-Cs and G-Es 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. The original Alternative G-C would have required the acquisition of four out of seven homes from this subdivision. The revised Alternatives G-Cs and G-Es (preferred) were both shifted approximately 900 feet east of the original alignment in the vicinity of this subdivision. Preferred Alternative G-Es does not involve the acquisition of any homes from this subdivision, although the new roadway will be located approximately 700 feet east of the subdivision.
- *Colburn Subdivision* – This subdivision is located north of Lakeville and south of Osborne Road just west of US 31. Alternatives Cs and Es crossed Osborne Road approximately 500 feet west of this neighborhood. Preferred Alternative G-Es is approximately 3.4 miles east of this subdivision. There will be no displacements or lost access from the Colburn Subdivision as a result of Preferred Alternative G-Es.
- *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 would 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 Ts onto Madison Road. Madison Avenue will cross over the new facility at this location. Preferred Alternative G-Es passes approximately 1.3 miles east and north of this subdivision. There will be no displacements or lost access resulting from Preferred Alternative G-Es.



- *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. Preferred Alternative G-Es passes approximately 2.6 miles east of this mobile home park. No significant impacts are expected as a result of Preferred Alternative G-Es.
- *Barber Mobile Home Park (Sunset Trailer Village)*– 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. Preferred Alternative G-Es is located approximately 2.6 miles east of the park. There will be no relocations or lost access resulting from Preferred Alternative G-Es.
- *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, while Preferred Alternative G-Es is located approximately 1.9 miles east of this subdivision. There will be no relocations or lost access from the Kern Road Subdivision. The proposed Kern Road Interchange should provide improved access and mobility for residents in this area.
- *Sycamore Hills Subdivision* – This subdivision is located along the east side of Lilac Road between Kern and Johnson Roads. Alternative Cs cuts just east of this subdivision and would require one residential relocation due to interchange construction at Kern Road. The access point at Lilac and Kern Road would remain unchanged. Preferred Alternative G-Es will pass approximately 3 miles east of the Sycamore Hills Subdivision. Area residents will have access to the new facility at the proposed Kern Road Interchange.
- *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-Cs would cut across the western edge of this subdivision with impacts on Quiet Ridge Court, Soft Wind Court and Hush Breeze Court. Alternative Cs would displace a total of five homes and Alternative G-Cs would displace approximately nine homes out of this neighborhood of approximately 125 homes. The access point at Whispering Hills Drive and Kern Road would remain unchanged. Preferred Alternative G-Es will pass approximately 1.7 miles east of this subdivision. There will be no direct displacements or lost access as a result of Preferred Alternative G-Es. Residents of Whispering Hills will have access to the new facility at Kern Road, while Johnson Road is proposed to cross over the improved US 31.
- *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-Cs would tie into US 20 approximately 1000 feet east of this subdivision of approximately 80 homes. Preferred Alternative G-Es is located approximately 3.2 miles east of this subdivision. There will be no displacements or lost access from this neighborhood from Preferred Alternative G-Es.
- *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-Cs 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. Preferred Alternative G-Es circles around the neighborhood on the south and west side of the subdivision. Alternative G-Es will require the acquisition of several homes along Roosevelt Road, but is not expected to displace any homes within the Weller's Heights Subdivision. The access point on existing US 31 is expected to remain unchanged. US 31 south of the subdivision and Roosevelt Road are both proposed to remain open and cross under the new facility with a grade separation.



- *Gilmer-South Michigan Subdivision* – This neighborhood is located just west of US 31 between Kern and Johnson Road. Alternative Es and Preferred Alternative G-Es cross the southeast corner of this subdivision as they begin to converge onto the existing US 31 corridor. It is expected that approximately 7 homes from this subdivision will be acquired. Gilmer Street and Pulling Street will likely have new access to a relocated Main Street that will pass under the new facility and connect to existing US 31.
- *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 and Preferred Alternative G-Es utilize 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. The Jackson Street access improvements that are now proposed for Alternatives Es or G-Es (following review of the DEIS) would require the acquisition of additional homes in the Gilmer Park neighborhood. Approximately 14 homes would be acquired along the east side of existing US 31 and along the northbound to eastbound US 20 entrance ramp in this area. Additionally, it appears likely that three homes would be displaced along Carroll Street in the vicinity of the Southeast Little League Park. The access improvements would include the extension of Carroll Street/Fellows Street across US 20 to improve north - south connectivity 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 and Preferred Alternative G-Es utilize 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. The access improvements now proposed for this area with Alternatives Es and G-Es will require the acquisition of additional homes in this area, above the number originally predicted in the DEIS. Approximately 21 homes will be acquired west of existing US 31 in this neighborhood.
- *Fellows Street and Main Street Neighborhoods North of US 20* – There is a small cluster of homes located north of US 20 along Main Street in the area west of US 31. The proposed reconstruction of the southbound to westbound US 20 entrance ramp from US 31 will likely require the displacement of approximately 8 homes in this area. The extension of Carroll Street/ Fellows Street across US 20, east of US 31 will likely displace 4 to 5 homes in the area north of US 20

5.3.4.2 Community Cohesion

The relocation of households, businesses and community facilities can negatively impact the normal functions of a community. Relocating households from a neighborhood can reduce the amount of social support and neighbor-to-neighbor interaction. This in turn reduces the cohesiveness of the community or neighborhood. The removal of businesses and institutions can result in the loss of local facilities on which neighborhood residents rely for essential services and can reduce the sense of community in the subject area.

The No-Build Alternative would result in no significant impacts to community cohesion within the project area. The main impacts from the various alternatives 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 lower-than-average numbers of 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 G-Cs 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-Cs 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.

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.

Alternatives Es and G-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, but will be changed substantially by the number of homes displaced (see discussion of neighborhoods). The proposed access changes that are described under the Discussion of Preferred Alternative G-Es will substantially change the traffic patterns and functionality of the neighborhoods north of Kern Road. These neighborhoods are already subject to the high traffic volumes and congestion associated with existing US 31, but the cohesiveness of the immediate neighborhoods will likely be reduced by either Alternative Es or G-Es.

Discussion of Preferred Alternative G-Es

Following publication of the DEIS, City of South Bend officials expressed concerns with Preliminary Alternative Es and subsequently, Preferred Alternative G-Es, related to the proposed facility being an elevated roadway, constructed on retaining walls, from Kern Road northward to the US 31/US 20 interchange. Along with this, they were also concerned with local access to the subdivisions on the east and west sides of the new facility between Kern Road and the US 31/US 20 interchange. Local officials in South Bend met with the Project Management Team on two occasions to discuss these concerns and potential modifications to the alternative to address these concerns. Through the course of discussions at these meetings, modifications were made to the alternative as well as the local access plan that was in the best interests of both the City of South Bend and INDOT. These modifications included revising the alternative between Kern Road and the US 31/US 20 interchange to be an "at grade" facility and not an elevated roadway, constructed on retaining walls. A revised local access plan was developed to improve north-south connectivity between Kern Road and Ireland Road, just north of US 20, that included two separate grade separated crossings of US 20, one on the west side of US 31 at Scott Street and the other on the east side of US 31 at Fellows Street. East-west connectivity across US 31 was improved with the addition of grade-separated crossings at Johnson Road and Jackson Road and the extension of Main Street southward, under the proposed US 31, to existing US 31 near Kern Road.

The revised local access plan has both negative and positive impacts to the immediate neighborhoods along US 31, north of Kern Road. Negative impacts are primarily related to the higher number of displaced households. This will result in a loss of community cohesion and may reduce the sense of community in this area. Positive impacts will include improved accessibility to existing US 31 and across US 20 to Ireland Road for residents in the immediate neighborhoods and for the community as a whole. The trade-off of higher residential relocations for an improved local access plan is expected to result in long-term benefits for the community as a whole.

As discussed in Chapter 8 – Comments and Coordination, there has been a high degree of public involvement in the decision making process. There have been four Community Advisory Committee (CAC) meetings and eight individual Stakeholder meetings over the course of the project. The Stakeholder meetings included the Residents and Businesses Opposed to Alternative Es and the Whispering Hills Subdivision Task Force. The CAC consisted of



approximately 25 members, representing a diverse cross section of the public, elected officials and appointed officials, and was a valuable source of information and direction to the US 31 Project Management Team. As the project progressed and the areas of impact became more localized, new members representing various groups (i.e.: neighborhood or business associations) were added to the CAC upon their request. There have also been three public information meetings and one official public hearing where residents, business owners and interested groups could express their opinions and provide input regarding the selection of a preferred alternative.

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 alternative 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, G-Cs, and G-Es 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%. According to census data, there are no disproportionate impacts to low-income households within the project area. Using the Census data for 2000, Table 5.3.15 shows the total poverty status of individuals for Indiana, for all of Marshall and St. Joseph Counties, and for just the census tracts of Marshall and St. Joseph Counties within the project study area through which Alternative G-Es passes.

Geographic Area	Percent Below Poverty Level
Indiana	9.5%
Marshall County	6.8%
Marshall County and Census Tract 202.01 Within Study Area and G-Es	3.6%
Marshall County and Census Tract 207.01 Within Study Area and G-Es	4.8%
St. Joseph County	10.4%
St. Joseph County and Census Tract 118 Within Study Area and G-Es	3.4%
St. Joseph County and Census Tract 119 Within Study Area and G-Es	5.3%
St. Joseph County and Census Tract 123 Within Study Area and G-Es	3.4%



US 31 - Poverty by Blockgroups

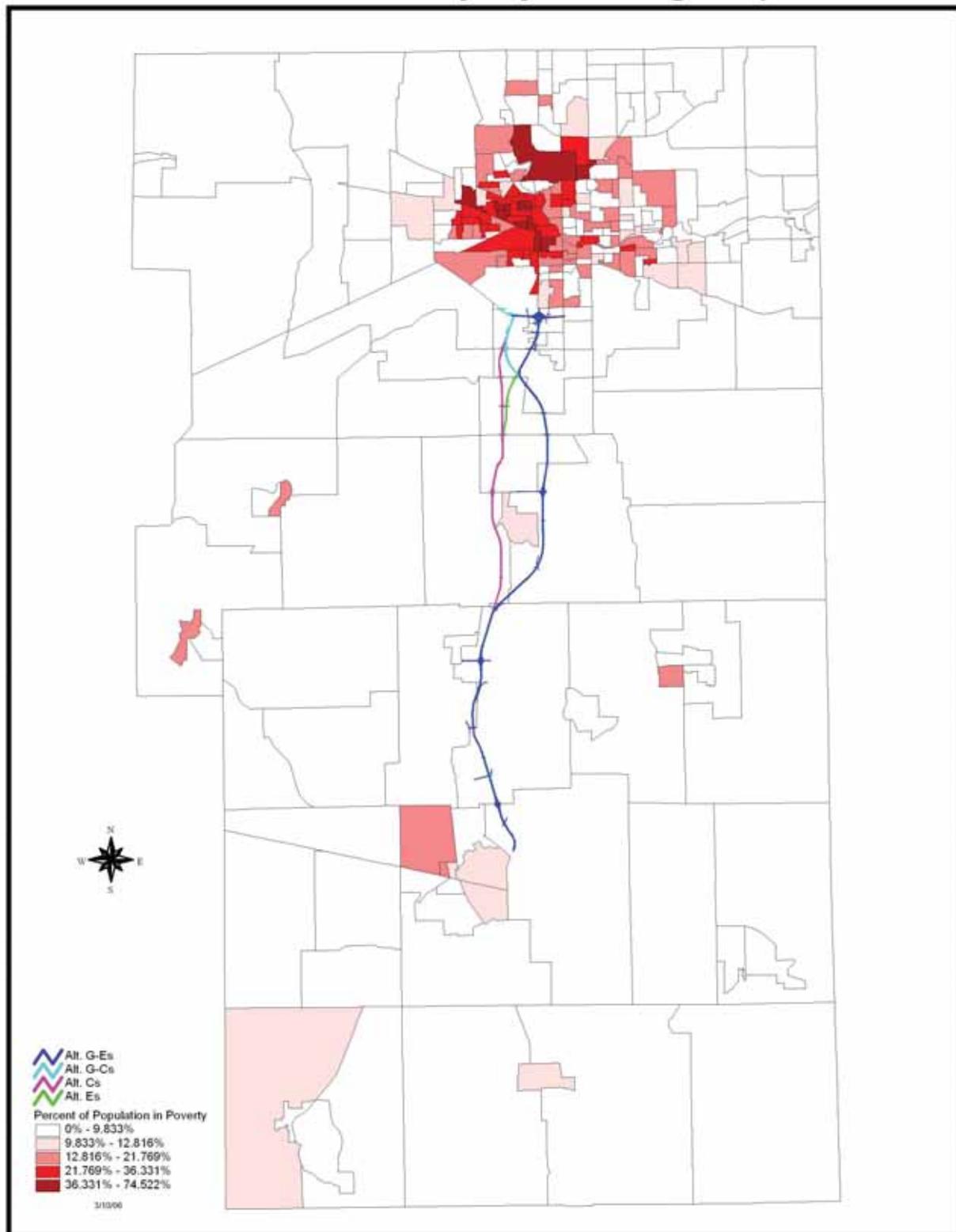


Figure 5.3.1 – Low-income Households in Relation to the Proposed Alternatives by Census Tract



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 households within the project area. Using the Census data for 2000, Table 5.3.16 shows the total white and non-white housing units for Indiana, for all of Marshall and St. Joseph Counties, and for just the portion of Marshall and St. Joseph Counties within the project study area through which Alternative G-Es passes.

Table 5.3.16: White and Non-White Housing Units		
Geographic Area	% of Housing Units Occupied by White Households	% of Housing Units Occupied by Non-White Households
Indiana	87.5%	12.5%
Marshall County	96.9%	3.1%
Marshall County Within the Project Study Area and G-Es	100.0%	0.0%
St. Joseph County	82.4%	17.6%
St, Joseph County Within the Project Study Area and G-Es	97.2%	2.8%

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, G-Cs and G-Es have been recognized as containing a high percentage of low-income or minority populations. The No-Build Alternative would result in no significant impacts to any minority or low-income populations.

Summary of Preferred Alternative G-Es

Preferred Alternative G-Es will have an impact on local businesses and on highway users. Impacts depend on the type of business, such as businesses dependent on pass-by traffic, and the location of businesses in the vicinity of a particular section of the proposed US 31. For the segment of US 31 from the US 30 interchange to Michigan Road (about 6 miles), Preferred Alternative G-Es is unlikely to negatively impact businesses because there are few businesses present and the significant increase in traffic on US 31 and minor growth over 30 years will result in a sales benefit for highway-oriented uses. From Michigan Road to Roosevelt Road, Preferred Alternative G-Es will result in a 35% decline in sales for highway-oriented businesses.

From Roosevelt to the US 20 Bypass (about two miles), for Preferred Alternative G-Es, several highway-oriented businesses along existing US 31 will be displaced, but these businesses are assumed to relocate in the immediate area with little or no loss of 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, Preferred Alternative G-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.

In conclusion, for the entire corridor, Preferred Alternative G-Es is projected to have the least adverse impact on businesses.



US 31 - Minorities by Blocks

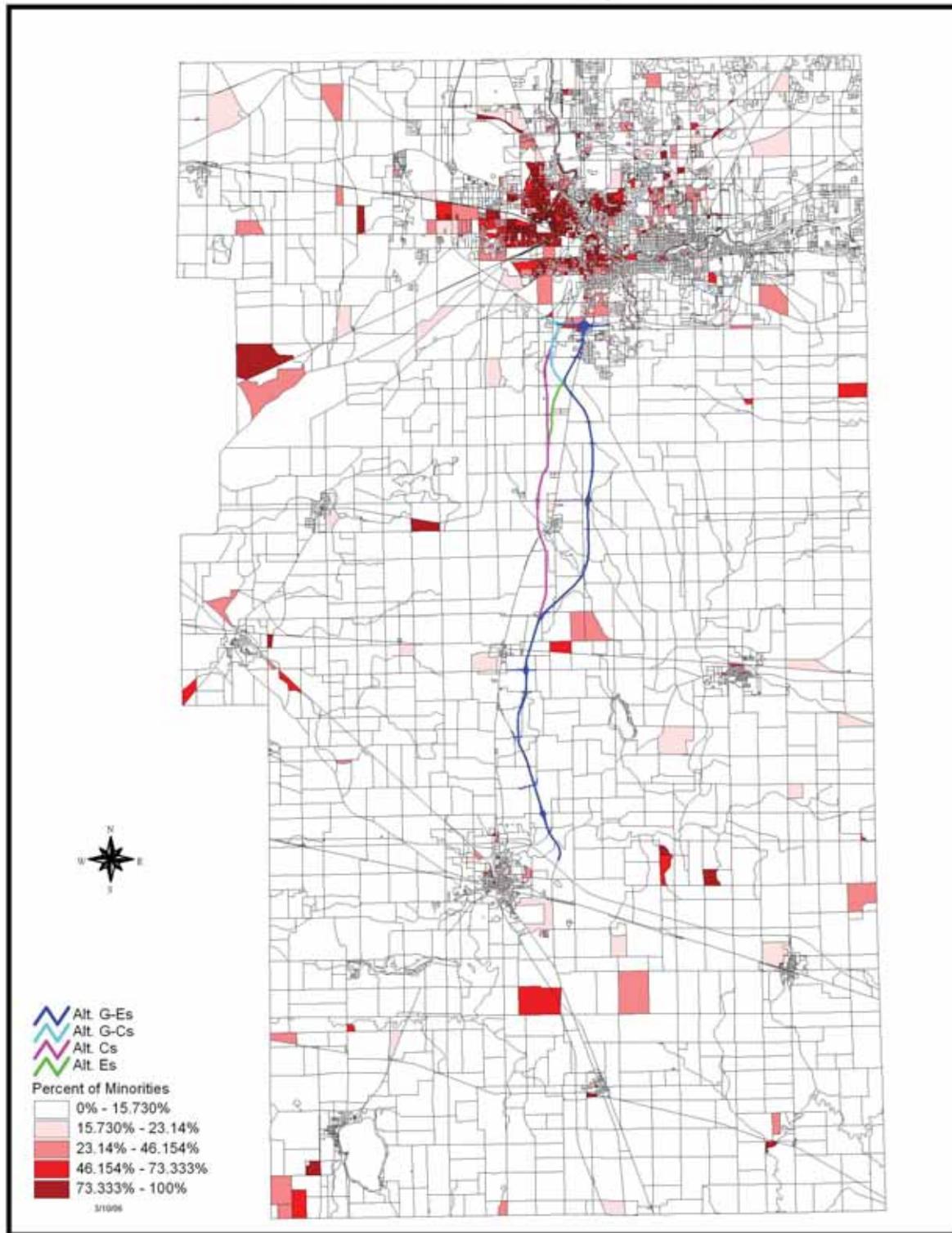


Figure 5.3.2 – Minority Concentrations in Relation to the Proposed Alternatives by Census Block



Preferred Alternative G-Es will also result in highway user benefits. Benefits include reduced travel time, vehicle-operating costs and accident cost reductions. Preferred Alternative G-Es is expected to result in a travel time savings of \$7,390,865 in travel time savings, -\$13,109,003 in vehicle operating benefit, and \$14,105,272 in safety benefit over a 30 year period.

Preferred Alternative G-Es will directly impact the following neighborhoods: Gilmer-South Michigan Subdivision, Gilmer Park Neighborhoods, Jewell's Dixie Garden Subdivision and the Fellows Street and Main Street Neighborhoods north of US 20. Preferred Alternative G-Es will come into close proximity and potentially indirectly impact the following neighborhoods: Meadow Lane Subdivision, Riddles Lake Subdivisions, Robin Hood Subdivision and Weller's Heights Subdivision.

Preferred Alternative is not expected to result in any Environmental Justice issues. The residential displacements resulting from Preferred Alternative G-Es 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 Preferred Alternative G-Es have been recognized as containing a high percentage of low-income or minority populations.



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-Cs and G-Es: 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 North Linden Road.

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-Cs and G-Es: 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, although buses will be able to cross US 31 on realigned Tyler Road. Interchange 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. Underpasses 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-Cs are both located approximately one mile west of Forest G. Hay Elementary and Andrew Jackson Middle School. Indirect impacts would include the alteration of bus routes and changes in access to the new facility. Interchange access to the new facility for school buses would be at Kern Road.

Alternative Es and Preferred Alternative G-Es will utilize existing US 31 right-of-way between Kern Road and US 20. A revised local access plan was developed to improve north-south connectivity between Kern Road and Ireland Road, just north of US 20, that included two separate grade separated crossings of US 20, one on the west side of US



31 at Scott Street and the other on the east side of US 31 at Fellows Street. East-west connectivity across US 31 was improved with the addition of grade-separated crossings at Johnson Road and Jackson Road and the extension of Main Street southward, under the proposed US 31, to existing US 31 near Kern Road.

This local access plan should improve access 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, 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. The New Philadelphia Church utilizes a former office building. A survey sent to the church office was not returned. Other attempts to contact someone at the church were not successful. The church appears to own several acres at its current location. It may be possible to construct a new church building on the remaining acreage depending on the final right-of-way requirements for the US 6 Interchange.

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 or by Preferred Alternative G-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. The church responded to a church survey for the US 31 project and expressed their concern that an elevated US 31 would restrict the visibility of the church by the public. In addition to Sunday services, the church provides a preschool facility and many weekly activities. They also voiced concern regarding construction impacts, parking and the possibility of construction-related drainage problems. The issue of drainage will be addressed more completely during the design phase of this project, when detailed engineering plans are developed. At this time, it is not expected that the church parking lot will be altered as a result of this project.

As previously discussed, modifications were made to Alternative G-Es as well as the local access plan that were in the best interests of both the City of South Bend and INDOT. These modifications included revising the alternative between Kern Road and the US 31/US 20 interchange to be an “at grade” facility and not an elevated roadway constructed on retaining walls. A revised local access plan was developed to improve north-south connectivity between Kern Road and Ireland Road, just north of US 20, that included two separate grade-separated crossings of US 20. It is expected that these modifications should address some of the concerns raised by Southlawn United Methodist Church.



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 and Preferred Alternative G-Es would cross Kern Road approximately 1,000 feet west of the fire station. An interchange is proposed to 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. The proposed local access plan for the area north of Kern Road is expected to reduce the impacts to emergency response times for the Centre Township Fire Station.

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

None of the alternatives, including the No-Build Alternative, will impact any public parks or recreation areas. 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 and Preferred Alternative G-Es also cross sewer and water mains in the area north of Kern Road. Alternative G-Cs and Preferred Alternative G-Es cross six electrical transmission lines and three gas or petroleum pipelines.

Summary of Preferred Alternative G-Es

Preferred Alternative G-Es could potentially impact the existing bus routes of some schools. Preferred Alternative G-Es could result in the rerouting of some Plymouth Community School Corporation school bus routes due to lost access to US 31 at West 7B Road and Plymouth-Goshen Trail. Buses will continue to have access across US 31 at North Linden Road. Preferred Alternative G-Es will also 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. Preferred Alternative G-Es will utilize existing US 31 right-of-way between Kern Road and US 20. A revised local access plan was developed to improve north-south connectivity between Kern Road and Ireland Road, just north of US 20, that included two separate grade separated crossings of US 20, one on the west side of US 31 at Scott Street and the other on the east side of US 31 at Fellows Street. East-west connectivity across US 31 was improved with the addition of grade-separated crossings at Johnson Road and Jackson Road and the extension of Main Street southward, under the proposed US 31, to existing US 31 near Kern Road.

This local access plan should improve access 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.

Preferred Alternative G-Es will directly impact the New Philadelphia Church located on the south side of US 6 approximately one mile east of US 31.

The one fire station that would be indirectly impacted by Preferred Alternative G-Es is the Centre Township Fire Station located at Kern Road and US 31. It would cross Kern Road approximately 1,000 feet west of the fire station. An interchange is proposed to be constructed at this location, which should improve emergency response times for highway-related accidents.

Preferred Alternative G-Es will not directly impact any cemeteries, libraries, police stations, hospitals or public parks and recreation areas.



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; however land utilized or designated for commercial, industrial or residential purposes is therefore, categorically excluded from consideration. 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 NRCS-CPA-106) 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 5.5.17). 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 5.5.18).



Table 5.5.17: Agricultural Harvest and Production Statistics for US 31 Counties

County	Crop	Harvested Area (acres) x1000				Production ¹ X1000				Average Yield ²
		2000	2001	2002	Average	2000	2001	20002	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
St. Joseph	hay	10.6	10.0	9.9	10.17	45.8	37.6	29.0	37.47	3.69
	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

- 1 corn, soybeans and wheat reported in bushels; popcorn reported in pounds; hay reported in tons
- 2 corn, soybeans and wheat reported in bushels/acre; popcorn reported in pounds/acre; hay reported in tons/acre

Table 5.5.18: 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 prorated factor for a specific commodity

CYR_{com} is the county yield rate for a specific commodity (bushels/acre or 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 5.5.19). 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 were determined using three years of recent data (Table 5.5.20). 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 5.5.21).

County	Crop	Yield	Sales Price	Prorate Factor	Alternative Cs		Alternative Es		Alternative G-Cs		Alternative G-Es (Preferred)	
					Acres	Crop Loss (in dollars)	Acres	Crop Loss (in dollars)	Acres	Crop Loss (in dollars)	Acres	Crop Loss (in dollars)
Marshall	Corn	137.54	\$2.11	0.4945	222	\$32,000	222	\$32,000	231	\$33,000	231	\$33,000
	Soybeans	43.98	\$4.81	0.4145		\$19,000		\$19,000		\$20,000		
	Wheat	57.17	\$2.57	0.0196		\$640		\$640		\$670		
	Popcorn	2738.59	\$0.09	0.0134		\$760		\$760		\$790		
	Hay	3.69	\$99.67	0.0581		\$4,700		\$4,700		\$4,900		
St. Joseph	Corn	131.52	\$2.11	0.5239	168	\$24,000	173	\$25,000	273	\$49,000	272	\$40,000
	Soybeans	42.36	\$4.81	0.4256		\$15,000		\$15,000		\$24,000		
	Wheat	65.94	\$2.57	0.0089		\$250		\$260		\$400		
	Popcorn	2627.97	\$0.09	0.0018		\$70		\$80		\$120		
	Hay	3.64	\$99.67	0.0399		\$2,400		\$2,500		\$3,900		
County Subtotals	Marshall				222	\$57,000	222	\$57,000	231	\$59,000	231	\$59,000
	St. Joseph				168	\$42,000	173	\$43,000	273	\$77,000	272	\$68,000
Alternative Totals					390	\$99,000	395	\$100,000	504	\$127,000	503	\$127,000



Table 5.5.20: 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 5.5.21: 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 G-Cs	Alternative G-Es (Preferred)
Marshall	\$35,774,333	0.16	0.16	0.16	0.16
St. Joseph	\$41,296,000	0.10	0.10	0.18	0.16

0 – 0.5%	0.5 – 1.0%	1.0 – 2.0%	2.0 – 3.0%	3.0%
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Table 5.5.22: Summary of Farmland Impacts for US 31 Alternatives

Counties	Farmland Conversions (acres)			
	Alternative Cs	Alternative Es	Alternative G-Cs	Alternative G-Es ¹
Marshall	222	222	231	231
St. Joseph	168	173	273	272
Total Farmland Acreage (acres)	390	395	504	503
Total Prime and State Important Farmland Acreage (acres)	557	517	575	594
Annual Crop Cash Receipt Loss (dollars)	\$99,000	\$100,000	\$127,000	\$127,000

¹ See Table 3.6.41 for Summary of Impacts Associated with Preferred Alternative G-Es following additional, in-depth studies.

Table 5.5.22 includes 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 5.5.1 illustrates farmland acreage loss for each of the alternatives. Figure 5.5.2 illustrates the assessment of prime and statewide important farmland impacts. Figure 5.5.3 illustrates estimated crop cash receipt loss in dollars per year.

Coordination with the USDA-NRCS regarding assessment of farmland conversion impacts in accordance with the Farmland Protection Policy Act was initiated with a request to the USDA-NRCS Indianapolis state headquarters office on December 10, 2003. This initial assessment involved scor-

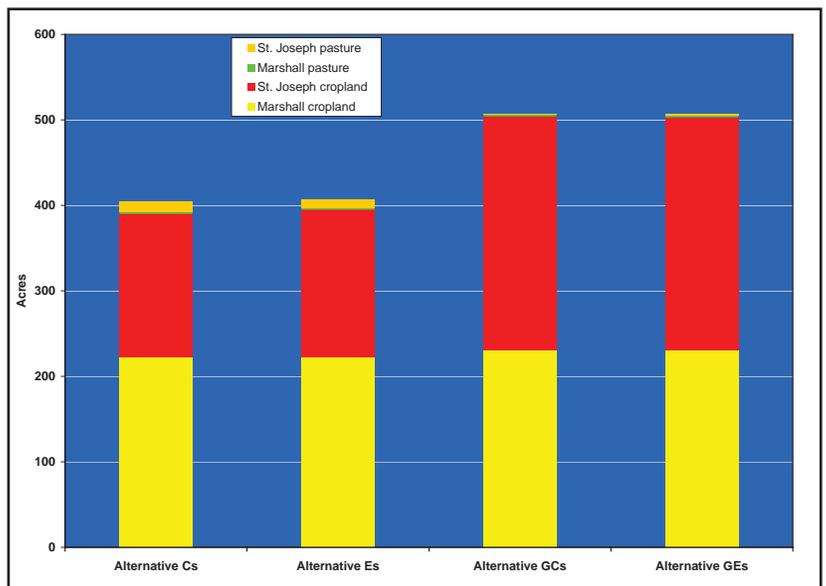


Figure 5.5.1 Total Farmland for US 31 Alternatives



ing for Alternatives C, E and G-C using the Farmland Conversion Impact Rating Form AD-1006 and was returned in a response letter dated January 7, 2004 (Appendix K). Subsequent shifts in alignments resulting in Alternatives Cs, Es and G-Cs, as well as the development of a new hybrid Alternative G-Es, prompted additional coordination with the USDA-NRCS on January 31, 2004, to determine if the changes were of sufficient magnitude and scope to warrant a re-evaluation of impacts to prime and state important farmland for the project. Based on the USDA-NRCS response letter dated March 1, 2005 (Appendix K) and subsequent phone correspondence, the decision was made to re-evaluate farmland impacts for the current alignments by submitting a second Farmland Conversion Impact Rating assessment to USDA-NRCS. The request for re-evaluation was submitted to USDA-NRCS on March 21, 2005 using Form NRCS-CPA-106 (Farmland Conversion Impact Rating for Corridor Type Projects). The USDA-NRCS completed Parts II, IV and V of the re-evaluation and returned the assessment on April 18, 2005 (Appendix K). The following summarizes the assessment of anticipated impacts to farmland based on the USDA-NRCS re-evaluation of Alternatives Cs, Es, G-Cs and G-Es.

The No-Build alternative will have no impacts on agricultural resources. The April 18, 2005 NRCS evaluation (Appendix K - Farmland Protection Policy Act, Form NRCS-CPA-106) revealed that Preferred Alternative G-Es would have the greatest

impact to prime and statewide important farmland acreage (594 acres combined as shown in Table 5.5.19), approximately 20 acres more than Alternative G-Cs (575 acres combined). Prime and state important farmland impacts for Alternative Es (517 acres combined) are slightly less than that for Alternative Cs (557 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 NRCS-CPA-106 yielded total point scores of 139 for Alternative Cs, 138 for Alternative Es, 146 for Alternative G-Cs, and 145 for Alternative G-Es (Preferred Alternative). 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 than 160 points, none will receive any further consideration for farmland protection. No other alternatives other than

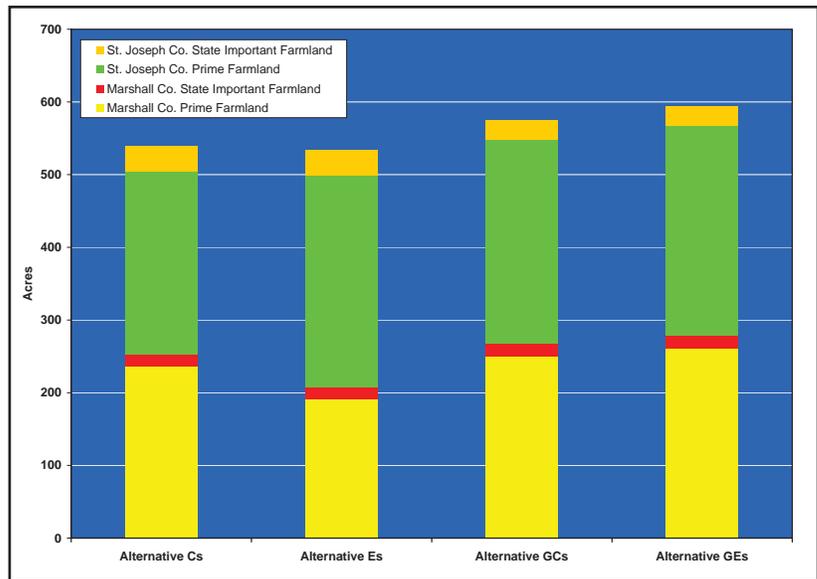


Figure 5.5.2 Total Prime Farmland Area for US 31 Alternatives

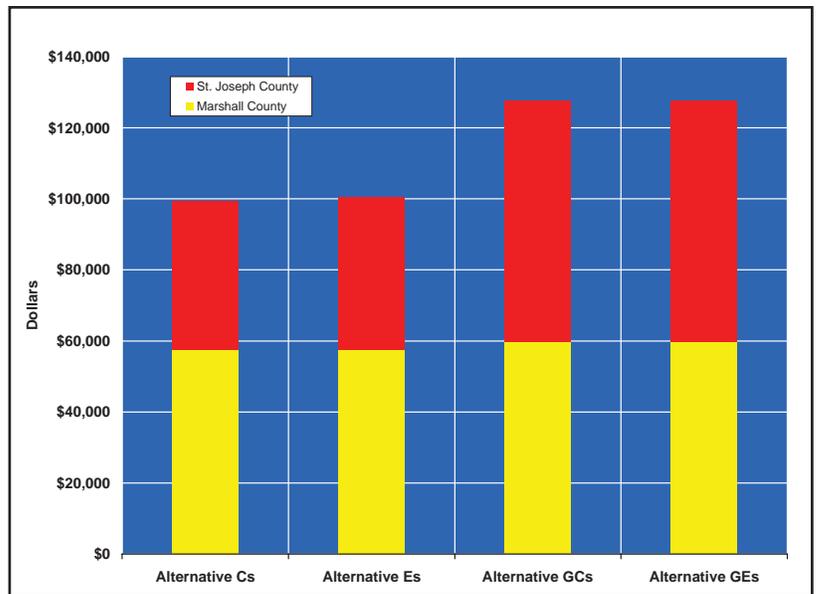


Figure 5.5.3 Annual Crop Cash Receipts Loss for Marshall and St. Joseph Counties for US 31 Alternatives



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-Es (Preferred Alternative) would directly impact an estimated 503 acres of cropland and approximately four acres of pasture. This constitutes approximately 50% of the proposed estimated right-of-way (1,011 acres) for this alternative. Alternative G-Cs involves nearly identical impacts to cropland and pastureland. Alternatives Cs and Es would require approximately 404 and 407 acres of cropland, respectively, and roughly 10 to 12 acres of pasture. Although the impacted cropland and pastureland acreage for Alternatives Cs and Es is 20% less than that expected for Alternative G-Cs and G-Es (Preferred Alternative), it still represents approximately 42% of the total required 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 for all alternatives 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 four alternatives continue to share a common alignment on new terrain through Marshall County crossing portions of an estimated 18 farm fields, 15 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 27 farm fields, 15 of which would be fragmented or bisected to some degree. Likewise, Alternative Es would involve an additional 33 farm field encroachments in St. Joseph County up to the proposed Kern Road interchange. Seventeen of these fields would be split by the alignment. Alternative G-Cs would cross an additional 34 farm fields along its alignment up to the proposed US 20 interchange, 26 of which involve fragmenting. Preferred Alternative G-Es is similar to Alternative G-Cs in the number of farm fields impacted (approximately 35 fields) and number of sites potentially bisected (26 fields).

The total estimated annual loss in crop cash receipts for Marshall and St. Joseph counties would be greatest for Alternative G-Es (Preferred Alternative) and Alternative G-Cs at approximately \$127,000 a year. The reductions anticipated resulting from Alternatives Cs and Es are estimated at around \$100,000 annually. Since all four alternatives share nearly all of their alignment through Marshall County, the annual crop cash receipt loss would essentially be the same in this county regardless of alternative.

Summary of Preferred Alternative G-Es

The April 18, 2005 NRCS evaluation (Appendix K - Farmland Protection Policy Act, Form NRCS-CPA-106) revealed that the Preferred Alternative G-Es would have the greatest impact to prime and statewide important farmland acreage (594 acres combined). Combining the Land Evaluation Criterion and Site Assessment Criteria scores on Form NRCS-CPA-106 yielded total point score of 145 for Preferred Alternative G-Es. 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 the Preferred Alternative received a total point value less than 160 points, it will receive any further consideration for farmland protection.

Following the identification of Alternative G-Es as the Preferred Alternative, additional, in-depth studies were performed on the Alternative. Included in these additional studies were minor refinements of the local access plan and associated proposed right-of-way requirements. Based on a field assessment of land use and photo interpretation, it was determined that the Preferred Alternative G-Es would directly impact an estimated 530 acres of cropland and approximately four acres of pasture. This constitutes approximately 50% of the proposed estimated right-of-way (1,050 acres) for this alternative.

The Preferred Alternative G-Es will impact approximately 35 farm fields and bisect approximately 26 fields. The total estimated annual loss in crop cash receipts for Marshall and St. Joseph counties would be greatest for Preferred Alternative G-Es at approximately \$127,000 a year.



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 listed in the National Register of Historic Places (NR): Evergreen Hill and Lakeville High School. A discussion of the effects of each of the alternatives studied further is included below. Preferred Alternative G-Es will have no effect on Evergreen Hill, and it will have no adverse effect on 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 a modern and an older 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 much of its 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, 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.

No-Build Alternative

Direct Effect: No permanent or temporary use of the property will be required.

Visual Effect: Evergreen Hill presently experiences light intrusion at night, 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 currently visible through the trees. The lights from the Clean Seal, Inc., facility, which is located south of the intersection of Keria and Ireland, present the most prominent lighting intrusion at night. One would expect these conditions to continue with the No-Build Alternative.

Auditory Effect: Evergreen Hill presently sits with Ireland Road to the south of the property; Ireland Road may experience some increase in traffic with suburbanization to the west.

Alternative Cs

Direct Effect: Evergreen Hill is located approximately 1,530 feet from the proposed right-of-way for 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 50 feet above grade of the present highway; at least one building (Clean Seal, Inc.) would be taken as part of the undertaking. The interchange would likely be seen from the property

Evergreen Hill encompasses approximately thirty-eight acres. From much of Evergreen Hill, the undertaking may not be visible. Trees mask Ireland Road from much of the property. However, the undertaking (the ramps and the elevated interchange at US 20) will likely be visible from the southern property boundary. Presently, the southern

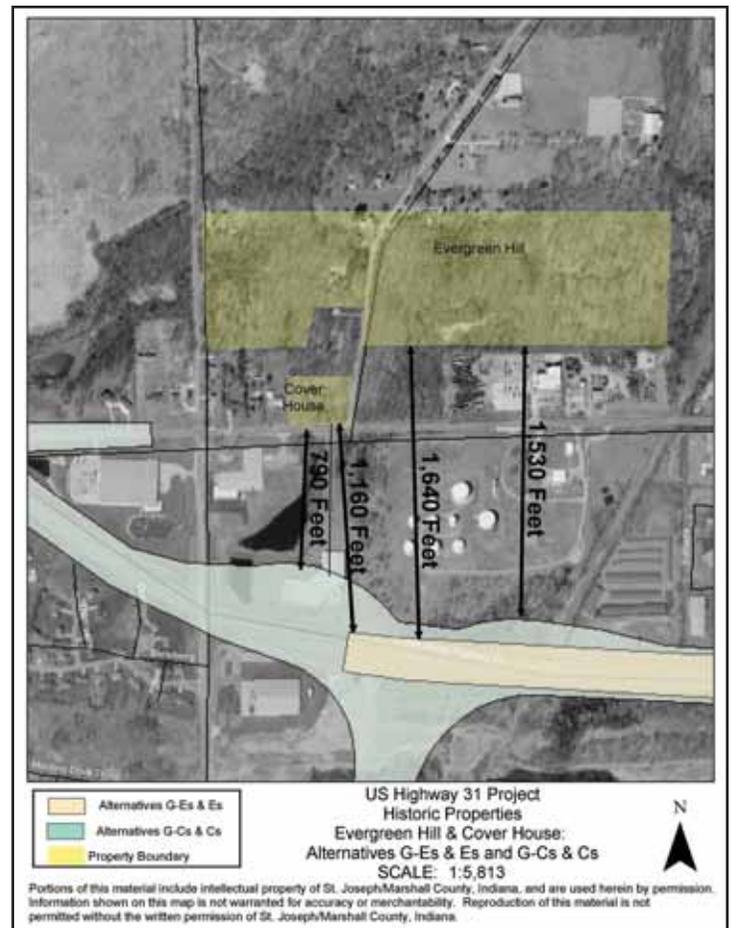


Figure 5.6.6 Evergreen Hill National Register Property



property boundary overlooks industrial buildings, storage tanks, and existing US 20; several buildings, including Clean Seal, Inc., would be taken as part of the undertaking. The interchange would likely be visible from the property. The Ireland Road Bridge over US 20 and the Linden Road Bridge over US 20 would be upgraded as part of this project, but there is no anticipated widening of either Ireland Road or Linden Road as a result.

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 currently visible through the trees. The lights from the Clean Seal, Inc., facility, which is located south of the intersection of Keria Road and Ireland Road, 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: Noise was modeled from the nearest point on the property to the centerline of the project; the predicted noise level (L_{eq}) would be 50.2 dBA.

Alternative Es

Direct Effect: The property is located approximately 3,310 feet from the proposed right-of-way for Alternative Es and 1,640 feet from the improved section of US 20. Improvements to existing US 20 for this alternative includes the addition of a ramp lane adjacent to the existing roadway. 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. The improvements to US 20 will not affect those qualities that make this property eligible for listing in the NR.

Auditory Effect: From the nearest point on the property to the centerline of the improvements at US 20, the predicted noise levels would be 48.6 dBA. With the undertaking so far distant, no auditory effect is anticipated.

Alternative G-Cs

Direct Effect: The property is located approximately 1,530 feet from the proposed right-of-way for Alternative G-Cs; 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 50 feet above grade of the present highway; at least one building (Clean Seal, Inc.) would be taken as part of the undertaking. The interchange would be seen from the property.

Evergreen Hill encompasses approximately thirty-four acres. From much of Evergreen Hill, the undertaking may not be visible. Trees mask Ireland Road from the much of the property. However, the undertaking (the ramps or elevated interchange at US 20) will likely be visible from the southern property boundary. Presently, the southern property boundary overlooks industrial buildings, storage tanks, and existing US 20. Several buildings (Clean Seal, Inc.) will be taken as part of the undertaking. The interchange will likely be seen from the property. The Ireland Road Bridge over US 20 and the Linden Road Bridge over US 20 would be upgraded as part of this project but there is no anticipated widening of either Ireland Road or Linden Road as a result.

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; currently these lights are visible through the trees. The lights from the Clean Seal, Inc., facility, which is located south of the intersection of Keria Road and Ireland Road, 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: Noise modeling showed that from the nearest point on the property to the centerline of the project, the predicted noise level would be 55.4 dBA. The property is too far distant from the undertaking for noise to be an effect.

Preferred Alternative G-Es

Direct Effect: The property is located approximately 3,260 feet from the proposed right-of-way for Preferred Alternative G-Es, approximately 1,640 feet from the improved section of existing US 20. The improvements to US 20 for this alternative includes the addition of a ramp lane adjacent to the existing roadway. 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 or other natural resources to obscure it. The improvements to US 20 will not affect those qualities that make this property eligible for listing in the NR.

Auditory Effect: Noise modeling showed that from the nearest point on the property to the centerline of the project the predicted noise level would be 50.4 dBA. The property is too far distant from the undertaking for noise to be an effect.

Evergreen Hill will not be affected by Preferred Alternative G-Es.

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.

No-Build Alternative

Direct Effect: No permanent or temporary use of the property will be required.

Visual Effect: Lakeville High School is located along US 31, which will likely experience increase in traffic.



Auditory Effect: Lakeville High School experiences noise intrusion presently as a result of its location along US 31.

Alternative Cs

Direct Effect: The property is approximately 2,560 feet from the proposed right-of-way for Alternative Cs; according to present alternative 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 likely 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: Noise modeling found the predicted noise level from the nearest point to the centerline of the project to be 44.9 dBA. Reduction in residual traffic volumes on existing US 31 due to this alternative would result in anticipated noise levels below the 68.2 dBA predicted for 2030 No Build conditions.

Alternative Es

Direct Effect: The property is 2,560 feet from the proposed right-of-way for Alternative Es; 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 likely 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: Reduction in residual traffic volumes on existing US 31 due to this alternative would in effect result in anticipated noise levels below the 68.2 dBA predicted for 2030 No Build conditions. Noise modeling found levels from the nearest point on the property to the centerline of the project to be 45.0 dBA.

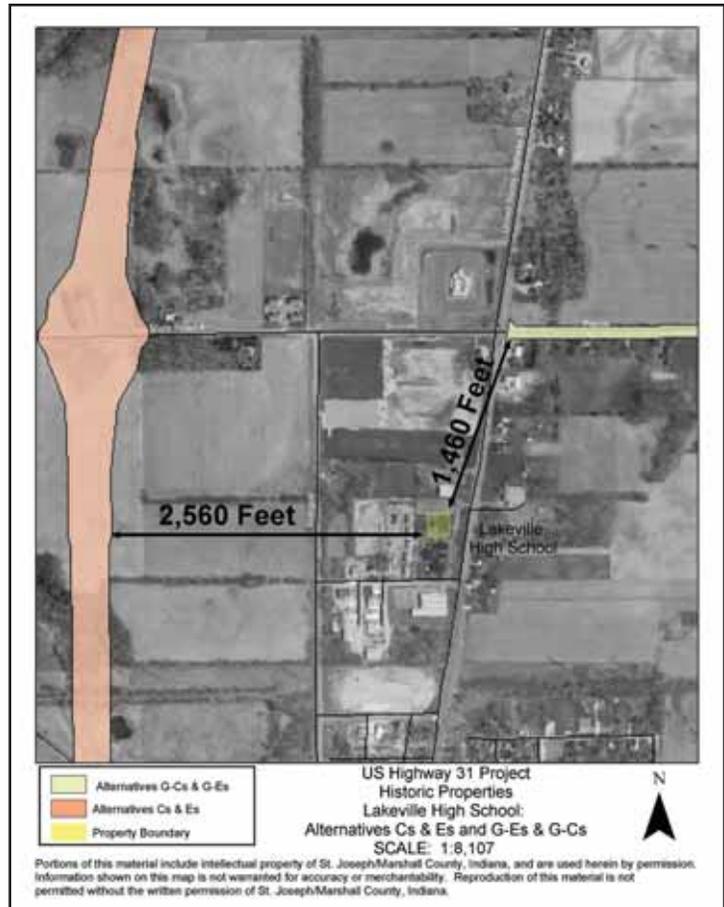


Figure 5.6.7 Lakeville High School National Register Property



Alternative G-Cs

Direct Effect: The property is located approximately 6,230 feet from the proposed right-of-way for Alternative G-Cs and approximately 1,460 feet from the proposed right-of-way for the local improvement project on Pierce Road (SR 4 extension); there will be no direct effect.

Visual Effect: Setting is not integral to the eligibility of the property; however, the setting will not appreciably change as a result of this undertaking; a modern four-lane highway (US 31) presently runs along the eastern property boundary.

Auditory Effect: Because the property is more than 6,000 feet west of the proposed right-of-way for Alternative G-Cs, noise levels were not calculated for this alternative. The travel demand model indicates a slightly reduced volume of traffic along existing US 31 in 2030 that should lead to a reduction in noise levels.

Preferred Alternative G-Es

Direct Effect: The property is located approximately 6,230 feet from the proposed right-of-way for Preferred Alternative G-Es and approximately 1,460 feet from the proposed right-of-way for the local improvement project on Pierce Road (SR 4 extension); there will be no direct effect.

Visual Effect: Setting is not integral to the eligibility of the property; however, the setting will not appreciably change as a result of this undertaking; a modern four-lane highway (US 31) presently runs along the eastern property boundary.

Auditory Effect: Because the property is more than 6,000 feet west of the proposed right-of-way for Preferred Alternative G-Es, noise levels were not calculated for this alternative. The travel demand model indicates a slightly reduced volume of traffic along existing US 31 in 2030 that should lead to a reduction in noise levels.

Lakeville High School will not be affected by Preferred Alternative G-Es.

Eligible Properties:

Throughout the identification and evaluation efforts, project historians and consulting parties worked closely. Consultations included telephone calls and/or meetings with local historian 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. Three consulting party meetings were held, the first on June 6, 2003, to discuss the Area of Potential Effects (APE) and to solicit input regarding historic properties; the second on September 4, 2003, to discuss eligibility; and the third on November 5, 2004, to discuss effects on historic properties.

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 Officer (SHPO) on August 19, 2003. (See the Appendix P for letter of concurrence.) These NR-eligible properties are: Cover House (St. Joseph 70003), Emil Johnson House (St. Joseph 70005), Ullery/ Farneman House (St. Joseph 70018), Peter Schafer House (St. Joseph 70026), Francis Donaghue Farmstead (St. Joseph 70038), Conrad Schafer Farmstead (St. Joseph 85002), Court Farmstead (St. Joseph 85037), and W.O. Bunch Farm (St. Joseph 85050). Through subsequent changes to the route of the alternatives, one of these properties, the Peter Schafer Farmstead, is not within the APE of any of the alternatives studied further.



For each of the NR-eligible properties, the effects on each of the alternatives studied further are discussed below. Preferred Alternative G-Es will have an adverse effect only on the W.O. Bunch Farm.

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 the more common American Foursquare. The Cover House demonstrates signature elements of the Prairie style developed by Frank Lloyd Wright, including an emphasis on horizontality. 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 Avenue 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.

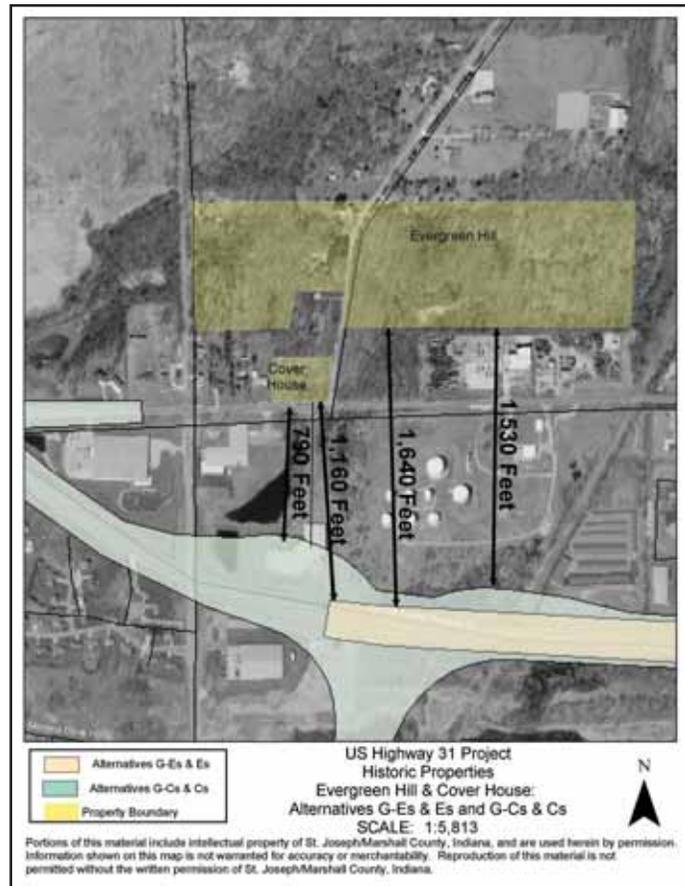


Figure 5.6.8 Cover House Property

No-Build Alternative

Direct Effect: No permanent or temporary use of the property will be required.

Visual Effect: The Cover House presently experiences light intrusion at night, especially to the south in the winter when trees in the trees surrounding the Cover House are barren of leaves. Many of the businesses along Ireland Road have security lighting; these lights are currently visible through the trees. The lights from the Clean Seal, Inc., facility, which is located south of the intersection of Keria and Ireland, present the most prominent lighting intrusion at night. One would expect these conditions to continue to with the No-Build Alternative.

Auditory Effect: The Cover House presently sits on Ireland Road; Ireland Road may experience some increase in traffic with suburbanization to the west.



Alternative Cs

Direct Effect: The property is located approximately 790 feet from the proposed right-of-way for Alternative Cs; 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 Clean Seal, Inc., facility, presently provide light intrusion to the setting. The proposed interchange, which is approximately 50 feet in height, would likely be seen from the property. At least one of these buildings that presently screen US 20 from the Cover House would be taken if Alternative Cs was the Preferred Alternative.

The Ireland Road Bridge over US 20 and the Linden Road Bridge over US 20 would be upgraded as part of this project but there is no anticipated widening of either Ireland Road or Linden Road as a result of this undertaking.

Auditory Effect: Modeling found noise levels from the closest point on this property to the centerline of the Alternative Cs ramp to be 53 dBA. Traffic on US 20 and Ireland Road presently contributes to the ambient noise at this property.

Alternative Es

Direct Effect: The property is located approximately 5,000 feet from the proposed right-of-way for Alternative Es and approximately 1,160 feet from the US 20 improvement. The improvements to US 20 for this alternative includes the addition of a ramp lane adjacent to the existing roadway. No permanent or temporary use of the property will be required.

Visual Effect: Setting is not integral to the eligibility of this property for the NR. The house was moved from its original location (setting) at the intersection of Chippewa Avenue and US 31 in the 1970s. Buildings and terrain will mask much of the undertaking; light intrusion already exists from the industrial buildings along Ireland Road.

Auditory Effect: Noise modeling found noise levels from the nearest point on the property to the centerline of the US 20 improvements are predicted at 51.2 dBA. US 20 and Ireland Road presently contribute to the ambient noise of this property.

Alternative G-Cs

Direct Effect: The property is located approximately 790 feet from the proposed right-of-way for Alternative G-Cs; 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 Clean Seal, Inc., facility, presently provide light intrusion to the setting. The proposed interchange, which is approximately 50 feet in height, would likely be seen from the property. One building (Clean Seal, Inc.) that presently screens US 20 from the Cover House would be taken if Alternative G-Cs was the Preferred Alternative.

The Ireland Road Bridge over US 20 and the Linden Road Bridge over US 20 would be upgraded as part of this undertaking but there is no anticipated widening of either Ireland Road or Linden Road as a result.

Auditory Effect: Noise modeling found noise levels from the nearest point on the property to the centerline of the ramp for this alternative to be 58.3 dBA. Traffic on US 20 and Ireland Road presently contributes to the ambient noise at this property.



Preferred Alternative G-Es

Direct Effect: The property is located 4,980 feet from the proposed right-of-way for Preferred Alternative G-Es and 1,160 feet from the improvements to US 20. The improvements to US 20 for this alternative includes the addition of a ramp lane adjacent to the existing roadway. No permanent or temporary use of the property will be required.

Visual Effect: Setting is not integral to the eligibility of this property for the NR. The house was moved from its original location (setting) at the intersection of Chippewa Avenue and US 31 in the 1970s. Buildings and terrain will mask much of the undertaking; light intrusion already exists from the industrial buildings along Ireland Road.

Auditory Effect: Noise modeling found levels from the nearest point on the property to the centerline of the improvements on US 20 to be 52.9 dBA. US 20 and Ireland Road presently contribute to the ambient noise of this property.

The Cover House will not be affected by Preferred Alternative G-Es.

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 design 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 the elaborate, but mass-produced, millwork of earlier periods. Interiors from

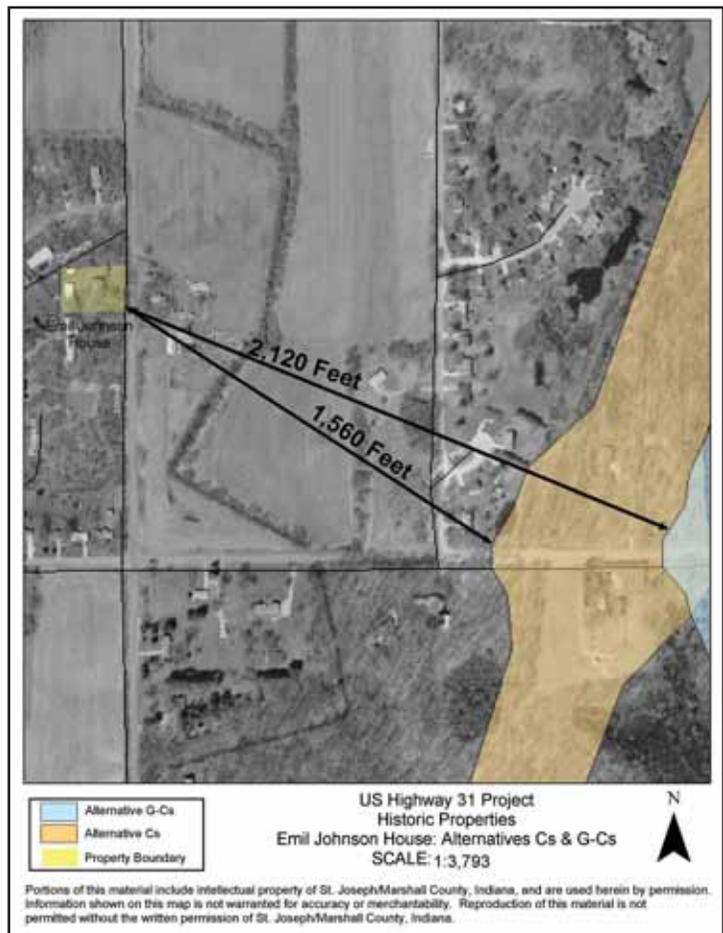


Figure 5.6.9 Emil Johnson House Property



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.

No-Build Alternative

Direct Effect: No permanent or temporary use of the property will be required.

Visual Effect: If suburbanization increases along Kern Road, the visual impact of increased traffic and more houses will change the setting of this property. The No-Build Alternative is more than 8,000 feet distant with natural and man-made features screening it.

Auditory Effect: On roads with little traffic, such as Locust Road; the ambient noise will likely be close to what it is now. Kern Road may experience increase in traffic if suburbanization increases.

Alternative Cs

Direct Effect: The property is located approximately 1,560 feet from the right-of-way for the proposed 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: Modeling predicted noise levels from the point on the property nearest to the centerline of the undertaking to be 46.2 dBA.

Alternative Es

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

Alternative G-Cs

Direct Effect: The property is located approximately 2,120 feet from the right-of-way for the proposed 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: Modeling predicted noise levels from the point on the property nearest to the centerline of the project to be 52.7 dBA.

Preferred Alternative G-Es

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

The Emil Johnson House will not be affected by Preferred Alternative G-Es.



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 Joseph Ullery and Joseph 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 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 this area, then called Palmer’s Prairie, in 1838. South Bend was only 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 with a number of 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.



No-Build Alternative

Direct Effect: No permanent or temporary use of the property will be required.

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

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

Auditory Effect: Traffic on US 31 presently produces high noise levels. For the base year of 2002, the noise levels were modeled at 67.7 dBA (with existing US 31 at a distance of 126 feet from the front of the house); for the design year 2030 with the No-Build Alternative, the noise level at the front of the house is predicted to be 69.6 dBA, which is above INDOT's noise threshold.

Alternative Cs

Direct Effect: The property is located approximately 5,030 feet from the proposed right-of-way for Alternative Cs; no permanent or temporary use of the property will be required.

Visual Effect: Rolling terrain, trees, and buildings will block the view of the undertaking from the property.

Auditory Effect: Noise levels will decrease with the change in movement of traffic farther from the property.

Alternative Es

Direct Effect: There will be no direct effect; the property is approximately 330 feet from the proposed right-of-way for Alternative Es; no permanent or temporary use of the property will be required.

Visual Effect: The front of the property of the Ullery/ Farneman House currently abuts existing US 31. Automobile and truck traffic along existing US 31 are a feature of the present landscape. Currently in the evening rush hour, vehicular traffic (with lights on) backs up on the two northbound lanes of US 31 just to the 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 approximately 330 feet from the proposed right-of-way. According to current plans, a barrier of trees will not be removed as part of this project. Even with these trees and modern housing, the interchange at Kern Road and the undertaking will likely be visible from some portions of the property. This will not adversely affect the elements that make this property eligible for listing in the NR.

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

Auditory Effect: Traffic on US 31 presently produces high noise levels. For the base year of 2002, the noise levels were modeled at 67.7 dBA (with existing US 31 at a distance of 126 feet from the front of the house); for the design year 2030 with the No-Build Alternative, the noise level at the front of the house is predicted to be 69.6 dBA. For



Alternative Es, modeling predicts the 2030 noise levels on the property to range from 57.4 dBA from the rear of the house to the centerline, to 60.0 dBA from the point on the property nearest to the centerline of the undertaking.

Alternative G-Cs

Direct Effect: The property is located approximately 4,560 feet from the undertaking; no permanent or temporary use of the property will be required.

Visual Effect: Rolling terrain, trees, and buildings will block the view of the undertaking from the property.

Auditory Effect: Noise levels will decrease with the change in movement of traffic farther from the property.

Preferred Alternative G-Es

Direct Effect: The property is located approximately 330 feet from the proposed right-of-way for Preferred Alternative G-Es.; no permanent or temporary use of the property will be required.

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

With the proposed Preferred Alternative G-Es, trees and modern housing will obscure much of the undertaking as it passes to the rear of the property at a distance of approximately 330 feet from the proposed right-of-way. According to current plans, a barrier of trees will not be removed as part of this project. Even with these trees and modern housing, the interchange at Kern Road and the undertaking will likely be visible from some portions of the property. This will not adversely affect the elements that make this property eligible for listing in the NR.

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

Traffic on US 31 presently produces high noise levels. For the base year of 2002, the noise levels were modeled at 67.7 dBA (with existing US 31 at a distance of 126 feet from the front of the house); for the design year 2030 with the No-Build Alternative, the noise level at the front of the house is predicted to be 69.6 dBA. For Preferred Alternative G-Es, modeling predicts the 2030 noise levels on the property to range from 63.6 dBA from the rear of the house to the centerline, to 65.3 dBA from the point on the property nearest to the centerline of the undertaking.

The Preferred Alternative G-Es will not have an adverse effect on the Ullery Farneman House.

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. The barn and poultry house are situated along Turkey Trail, reportedly a Native American trace.



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.

No-Build Alternative

Direct Effect: 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.

However, suburban development is presently creeping closer to this property. There may be a change in setting with more development.

Auditory Effect: Traffic may not substantially increase along that road so ambient noise levels will not likely be affected by the No-Build Alternative, which is more than a mile distant.

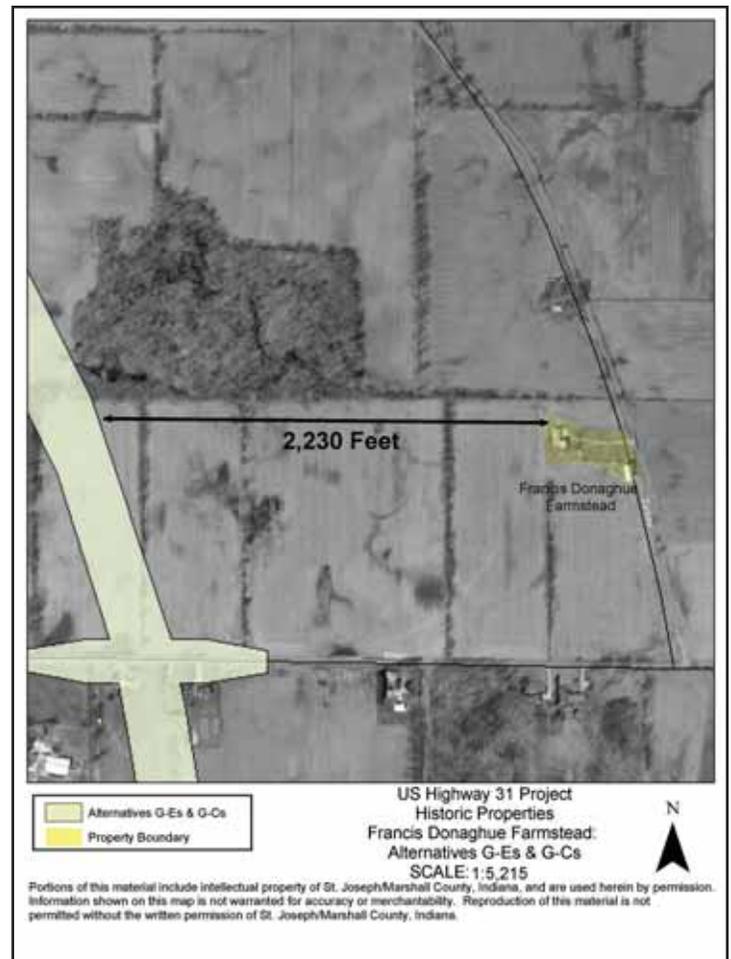


Figure 5.6.11 Francis Donaghue House Property



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-Cs

Direct Effect: The undertaking will be located approximately 2,230 feet from the proposed right-of-way for Alternative G-Cs to 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 story of the residence and from the barn, which is sited on a modest rise along Turkey Trail. This change in vista will not adversely affect the property.

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 an overpass that will go over US 31; traffic may not substantially increase along that road. (See Figure 5.6.11) Predicted noise levels from the nearest point on the property to the centerline of the undertaking will be 50.5 dBA. Although setting is key to this property's eligibility for listing in the NR, predicted noise levels do not rise to the level established by INDOT's noise policy.

Preferred Alternative G-Es

Direct Effect: The undertaking will be located approximately 2,230 feet from the proposed right-of-way for Preferred Alternative G-Es to 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 story of the residence and from the barn, which is sited on a modest rise along Turkey Trail. This change in vista will not adversely affect the property.



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 an overpass that will go over US 31; traffic may not substantially increase along that road. (See Figure 5.6.11) Predicted noise levels from the point on the property nearest to the centerline of the undertaking will be 50.9 dBA. Although setting is key to this property's eligibility for listing in the NR, predicted noise levels do not rise to the level established by INDOT's noise policy.

The Preferred Alternative G-Es will not have an adverse effect on the Francis Donaghue Farmstead.

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 farm in Union Township with a large 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 centerpiece 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 seventy-acre farm at this location.

As early as 1875, Americus and Sarah Bunch lived on this farm. Here, 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). 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.

The style and substance of the farm demonstrate the Bunch family's 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 sphere (home, honey house, and chicken house) and man's sphere (barns, granary, etc.) than in other farmsteads viewed in

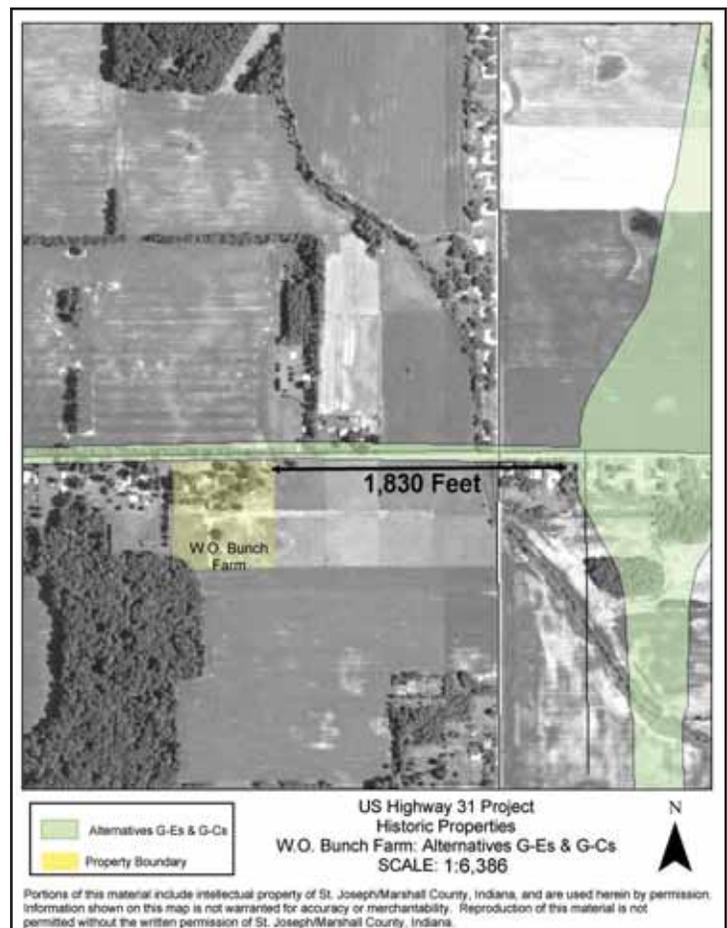


Figure 5.6.12 W.O. Bunch Farm Property



the Study Area. The two worlds seem more commingled, which is atypical of late-nineteenth century life and may indicate a trumping of practicality over cultural thought.

The farm buildings and outbuildings demonstrate the patterns of use of a late-nineteenth-century farm. Limitations imposed by horse-drawn equipment are still evident in the farm's smaller field patterns. St. Joseph County farmers, such as the Bunches, 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. Union Township was the second highest producer of fruit and cider in the county and the highest producer of vinegar. For Bunch and his neighbors on other general farms, and unlike the dairy farmers in the county, a multiplicity of needs 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. For Alternative G-Cs and Preferred Alternative G-Es, with the introduction of the proposed interchange at Pierce Road and the proposed extension of SR 4 from existing US 31 to the proposed interchange, the rural setting will change. Figure 5.6.12 shows the location of this property.

No-Build Alternative

Direct Effect: No permanent or temporary use of the property will be required.

Visual Effect: The No Build 2030 traffic predictions show a slight increase from current of 790 vehicles per day to 875 vehicles per day.

Auditory Effect: With such a slight increase in the number of vehicles per day, the No-Build Alternative will increase only slightly the ambient noise levels

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-Cs

Direct Effect: The interchange is approximately 1,830 feet from the proposed right-of-way for Alternative G-Cs to the east of the property boundary. With the planned local road improvement project, the widening of Pierce Road (SR 4 extension), additional right of way will be necessary but it will be taken from the north side of Pierce Road to avoid any taking of the property of this historic resource.

As noted earlier, the Pierce Road local improvement project will be a Federally-funded project under state review occurring either in conjunction with this project or at a later date. The improvement of Pierce Road, which is an extension of SR 4, maintains the continuity of SR 4 and the integrity of the State Roadway Network by linking SR 4 with the new US 31.



In keeping this local road improvement project to the north side of Pierce Road (SR 4 extension), there will be no direct taking of land from the Bunch Farm.

Visual Effect: Traffic will increase on Pierce Road from 790 vehicles per day to 2,385 vehicles per day in the year 2030. (The No Build 2030 traffic predictions show a slight increase from current to 875 vehicles per day.)

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. 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 Road, a row of modern houses (perhaps four or five). North of the intersection of Pierce Road and Kenilworth Road on the west side of Kenilworth Road 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. The visual changes at the interchange and at the local road improvement project along Pierce Road (SR 4 Extension) will constitute an adverse effect.

There will be a visual adverse effect because setting is key to maintaining the integrity of feeling and association for the property, but the change in setting will not so substantially impair the integrity of the property to render it ineligible for listing in the NR.

Auditory Effect: Predicted noise levels from the point on the property nearest to the centerline of the Pierce Road undertaking are 66.1 dBA; 67 dBA is the criteria established by INDOT's noise level policy. There will be no additional travel lanes added to Pierce Road; traffic will increase from 790 vehicles per day to 2,385 vehicles per day in the year 2030. This additional traffic will diminish the property's integrity but not substantially impair its eligibility for listing in the NR.

Preferred Alternative G-Es

Direct Effect: The interchange is approximately 1,830 feet east of the property boundary but the property is located along the planned local road improvement project, the widening of Pierce Road. With the widening of Pierce Road, additional right of way will be necessary, but it will be taken from the north side of Pierce Road to avoid the taking of a historic resource.

As noted earlier, the Pierce Road local improvement project will be a Federally-funded project under state review occurring either in conjunction with this project or at a later date. The improvement of Pierce Road, which is an extension of SR 4, maintains the continuity of SR 4 and the integrity of the State Roadway Network by linking SR 4 with the new US 31.

In keeping this local road improvement project to the north side of Pierce Road (SR 4 extension), there will be no direct taking of land from the Bunch Farm.

Visual Effect: Traffic will increase on Pierce Road, which runs directly in front of the property, from 790 vehicles per day to 4,070 vehicles per day in the year 2030. (The No Build 2030 traffic predictions show a slight increase from current to 875 vehicles per day.) 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.

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. 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 Road, a row of modern houses (perhaps four or five). North of the intersection of Pierce Road and Kenilworth Road on the west side of Kenilworth Road 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. The visual changes at the interchange and at the local road improvement project along Pierce Road (SR 4 extension) will constitute an adverse effect.

There will be a visual adverse effect because setting is key to maintaining the integrity of feeling and association for the property, but the change in setting will not so substantially impair the integrity of the property to render it ineligible for listing in the NR.

Auditory Effect: Predicted noise levels from the point on the property nearest the centerline of the undertaking at Pierce Road will reach 67.4 dBA; 67 dBA is the criteria established by INDOT’s noise level policy. There will be no additional travel lanes added to Pierce Road; traffic will increase from 790 vehicles per day to 4,070 vehicles per day in the year 2030. This additional traffic will diminish the property’s integrity but not substantially impair its eligibility for listing in the NR.

Preferred Alternative G-Es will adversely affect the characteristics that make the W.O Bunch Farm eligible for listing in the NR by introducing a visual and auditory adverse effect.

Conrad Schafer Farmstead (circa 1860) 65154 Miami Highway

Architectural Style: Greek Revival Criterion: C

The Conrad Schafer Farmstead includes a residence, a Sweitzer barn, a Pennsylvania German barn, a milk house, a non-period garage, a non-period pole barn, a Harvestore silo, and modern grain bins. The residence, constructed circa 1860 is a two-story, Greek Revival with Italianate influences and a massed plan. (According to a family member, the house looks very much as it did in a photo from the late nineteenth century, lacking only an iron railing across the porch roof.) The symmetrical five-bay house rises from a stone foundation to clapboard-sided walls painted light brown and trimmed in white. The windows in the façade are original six-over-six and they flank the center entry door. The door retains its original surround. The original porch spans the width of the house. Pilasters at the corners of the façade extend upward to the roofline where they meet a double dentil molding forming a wide trim band. A shed-roof addition is attached to the rear of the house, as is a large enclosed back porch. These are not visible from the façade.

The Sweitzer barn has a stone foundation, vertical, wood-plank siding, beneath corrugated metal sheathing, and a wood shingle roof. It is one of only two Sweitzer barns extant in the study area. A large Pennsylvania German bank barn with stone foundation, vertical wood siding, and composition shingle

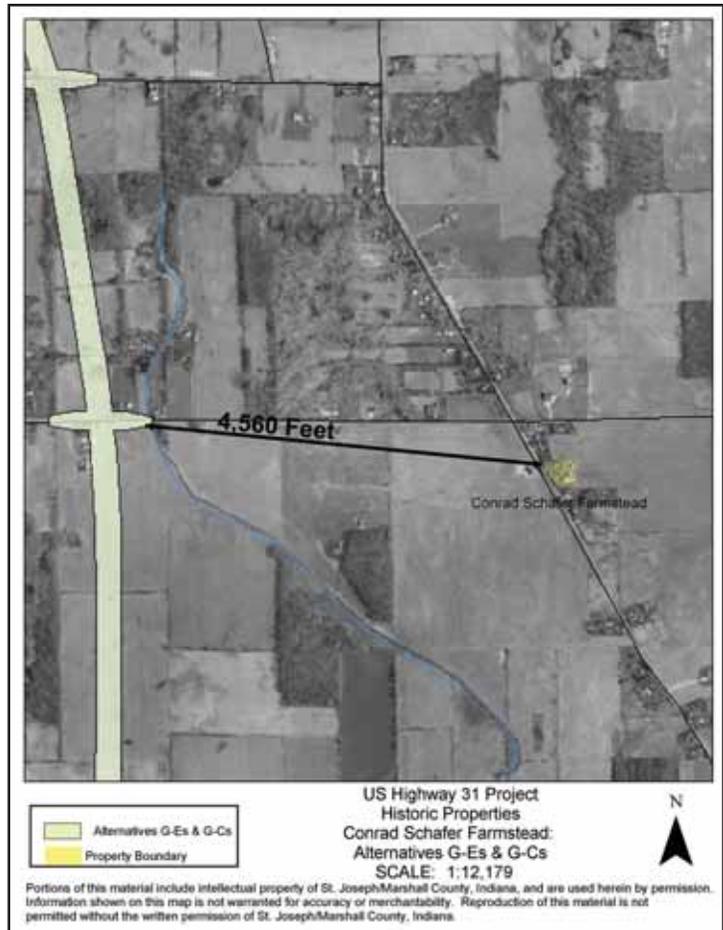


Figure 5.6.13 Conrad Schafer Farmstead



roof is south of the Sweitzer barn. This barn retains faded white paint and the black lettering: “Schafer Homestead 1853.” A gabled, tiled milk house, three modern grain bins, and a Harvester silo are located nearby.

The Conrad Schafer family symbolizes German settlement patterns in an agricultural setting in St. Joseph County. Starting in the 1840s, St. Joseph County saw a large influx of German immigrants. Typically affluent, these immigrants were seeking asylum from political and religious unrest and looking for the freedom preached in the German Romantic Movement. They brought money and farming skills to America and soon began to acquire and.

Conrad and Sophia Schafer immigrated to the United States from Prussia in 1847, bringing with them sons Conrad and George and daughter Mary. They purchased this property from Chester and Clarissa Kidder for \$1,000 in 1855, when the road in front of the house was called Turkey Creek Trail (now Miami Trail). The Schafers already owned four acres of the property by then (which may explain the 1853 date on the barn.) The house was located in a small settlement of homes and commercial enterprises known at that time as Carson Settlement. Conrad and Sophia sold some of their land to their son Conrad in 1857 and, over the course of time, their other children located on farms nearby. Conrad Schafer died in 1871 and his wife Sophia died in 1892 at this home.

Greek Revival residences, such as the one Conrad built, are uncommon in this township. The façade and side elevations retain a high degree of architectural integrity with original trim, clapboard siding, and windows. The Sweitzer barn and bank barn on the property are also architecturally intact.

No-Build Alternative

Direct Effect: No permanent or temporary use of the property will be required.

Visual Effect: US 31 is approximately 10,500 feet from the property; it is too far distant to pose a visual effect.

Auditory Effect: US 31 is too far distant to pose an auditory effect.

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-Cs

Direct Effect: The property is located approximately 4,560 feet from the proposed right-of-way for Alternative G-Cs; no permanent or temporary use of the property will be required.

Visual Effect: Buildings and terrain will mask the undertaking.

Auditory Effect: The undertaking will not have an auditory effect on this property. The predicted noise levels from the nearest point on the property to the centerline of the project would be 41.6 dBA, with normal rural noise levels ranging from mid 40 to mid-50 L_{eq}



Preferred Alternative G-Es

Direct Effect: The property is located approximately 4,560 feet from the proposed right-of-way for Alternative G-Es; no permanent or temporary use of the property will be required.

Visual Effect: Buildings and terrain will mask the undertaking.

Auditory Effect: The undertaking will not have an auditory effect on this property. The predicted noise levels from the nearest point on the property to the centerline of the project would be 41.6 dBA, with normal rural noise levels ranging from mid 40 to mid-50 L_{eq}

The Conrad Schafer Farmstead will not be affected by Preferred Alternative G-Es.

Court Farmstead (circa 1895), 18681 Osborne Road

Architectural Style: Queen Anne

Criteria: A and C

The Court Farmstead was rated Notable in the *Indiana Historic Sites and Structures Inventory*. The farmstead consists of a residence, a small well house, a granary, a livestock holding facility, a garage, a drive-through corncrib, silos, a poultry house, and a large barn. The residence is a one-and-one-half story, Queen Anne cottage, circa 1895, in a rural setting that adds context to the farmstead. The house foundation is brick, the exterior walls are metal siding, and the roof has composition shingles. The windows and doors are original. North of the garage and resting on stone piers is the granary constructed of vertical wooden siding with an entry door in the east elevation.

Dairy farms and the attendant buildings and field patterns necessary for large-scale operations were once a common sight throughout St. Joseph County. Fields needed to grow corn for silage, fenced pastures, large barns, silos, and associated outbuildings dotted the countryside. As the profession evolved in the early twentieth century, fewer dairies produced more and more milk by changing their operations to feed more cows, grow crops more efficiently, and make their product safer for the consumer. Regulations in the early century required separate milk processing facilities away from the domain of the animals, and milk houses became common. All of these changes were a response to a stricter adherence to efficient operations and the emergence of a commercial dairy in its fullest capacity. The Court Farmstead retains many of the features of this evolutionary period. The efficiently organized central barn, with a greatly increased hay storage capability in the

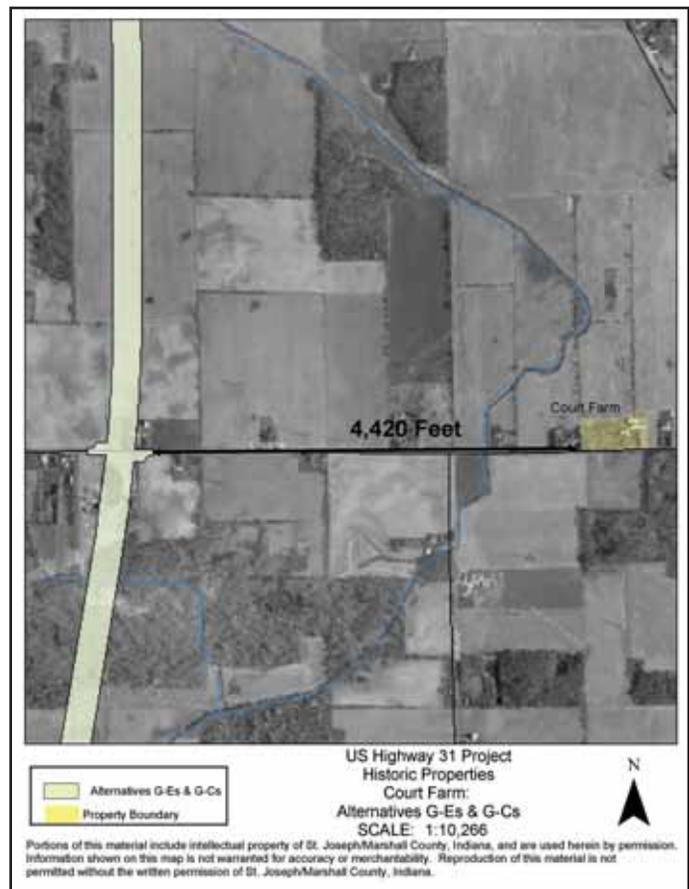


Figure 5.6.14 Court Farmstead



high-ceilinged loft, housed the major activities required to produce the milk; large silos to hold silage and the broad expanses of fields for crops are still visible.

No-Build Alternative

Direct Effect: No permanent or temporary use of the property will be required.

Visual Effect: Trees and other buildings will mask the no-build alternative from the Court Farmstead.

Auditory Effect: US 31 is approximately 10,800 feet from the property; it too far distant to pose an auditory effect.

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-Cs

Direct Effect: The property is located approximately 4,420 feet from the proposed right-of-way for Alternative G-Cs; no permanent or temporary use of the property will be required.

Visual Effect: Buildings and terrain will mask the undertaking.

Auditory Effect: The undertaking will not have an auditory effect on this property. The predicted noise levels from the point on the property nearest to the centerline of the undertaking would be 42.9 dBA.

Preferred Alternative G-Es

Direct Effect: The property is located approximately 4,420 feet from the proposed right-of-way for Preferred Alternative G-Es; no permanent or temporary use of the property will be required.

Visual Effect: Buildings and terrain will mask the undertaking.

Auditory Effect: The undertaking will not have an auditory effect on this property. Noise level predictions from the point on the property nearest to the centerline of the undertaking would be 42.2 dBA, a normal level for rural areas.

Preferred Alternative G-Es will not have an adverse effect on the Court Farmstead.

5.6.2 Archaeological Resources

Thirty-one previously recorded archaeological sites were identified within an area extending one mile on either side of the alignments. Alternative Cs would impact two previously recorded sites; Alternative Es would impact three previously recorded sites; Alternative G-Cs would impact two previously recorded sites, and Preferred Alternative G-Es will impact three previously recorded sites. These sites include two prehistoric loci of unidentified cultural



affiliation (12-Mr-308 and 318) and one reported historic farmstead (12-Sj-26), none of which is considered eligible for listing in the National Register of Historic Places (NRHP). 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 fieldwork was conducted as part of the DEIS. However, due to the large amount of new right-of-way required and the fact that most of the area had not been previously examined by a professional archaeologist a Phase 1a archaeological field reconnaissance was conducted on Preferred Alternative G-Es prior to publication of the FEIS.

A total of twenty-three archaeological sites, consisting of twenty (20) new archaeological sites (12-Mr-413 through 12-Mr-419 and 12-Sj-420 through 12-Sj-432), and three (3) previously recorded archaeological sites (12-Mr-308, 12-Mr-318, and 12-Sj-26), were found to be within the footprint of the selected G-Es alignment during a Phase Ia archaeological field study. This study was conducted as weather and field conditions allowed between November 2004 and June 2005. Fifteen (15) Prehistoric archaeological sites of Native American origin ranging from Early Archaic (ca. 8000 B.C.) to Mississippian (ca. 1650 A.D.), and eight (8) Historic archaeological sites of Euro-American origin (ca. 1850's to present) were found. No evidence of Historic Native Americans was found within the proposed right-of-way, though historic records and accounts note their presence in the immediate vicinity of the study corridor. The archaeological sites found do not appear to be of State (IRHSS) or National Registers (NRHP) significance, and no further work concerning these sites is recommended. It is recommended that the project be allowed to be completed as planned, with the understanding that if human remains, features, or midden deposits are revealed during any subsequent phase of this project, disturbance will cease until a professional archaeologist is contacted, and mitigation is completed.

The study was conducted in accordance with guidelines in *“The Management of Archaeological Resources, The Arlie House Report”* (McGimsey and Davis, 1977), and the *“Indiana Archaeological Report Guidelines 1989”* issued by the IDNR, DHPA. The study is in compliance with recent amendments to the Indiana Historic Preservation Act (IC 14-21-1). The archaeological records check, Phase 1a field reconnaissance, and the report and recommendations have been accomplished or directly supervised by a Professional Archaeologist meeting the standards set forth by the U.S. Department of the Interior detailed in 36 CFR Part 61 and 66 and the Secretary of Interior’s *“Guidelines for Historic Preservation and Archaeology”* (48 FR 44716).

As a result of the finding of Historic Properties Affected, Adverse Effect, FHWA, SHPO and other consulting parties entered into consultation regarding a Memorandum of Agreement (MOA). On November 5, 2005, a consulting party meeting was held at Lakeville High School to discuss effects and possible ways to resolve those adverse effects. Only SHPO submitted written comments following the meeting; these comments concurred with the effects finding. In December 2004, FHWA and SHPO entered in to discussion regarding a drafting of a MOA. Both agreed that appropriate mitigation would be to fund educational materials that will complement the 4th grade Indiana History curriculum, whereby the role of settlement and agriculture in northern Indiana are discussed, especially as it relates to roads and agricultural properties. On March 29, 2005, a draft MOA was sent to consulting parties for comments; no comments were received. After the archaeological report was received by SHPO and no significant sites were encountered, slight modifications were made to the MOA but the provision for educational materials remained in place. The MOA was sent to consulting parties for signature on March 7, 2006. The MOA was signed by SHPO on March 16, 2006; signed by INDOT on March 23, 2006; and signed by FHWA on March 29, 2006.



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 Clean Air Act, the air quality analysis will be used to demonstrate that the selected alternative is in conformity with applicable air quality plans. The No-Build Alternative would result in no significant impacts to air quality.

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. Having chosen Alternative G-Es as the preferred alternative, conformity with the applicable State Implementation Plan (SIP) ozone emission budgets and national carbon monoxide standards is 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 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 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)¹ and from MOBILE 6 for each county to the VMT for the adopted LRP network with each of the final alternatives to get total daily emissions; and
- (5) Comparing the daily emissions for each alternative to the emission budgets established by the SIP for the two-county (St. Joseph and Elkhart) air quality area .

5.7.1.2 Analysis

The results of the comparative air quality analysis appear in Table 5.7.23 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 or MOBILE 6.



Table 5.7.23: Air Quality Emissions Year 2025

Alternative								
	LRP* 03/18/02	LRP No Date	LRP 10/26/04	Cs	Es	G-Cs	Preferred Alternative G-Es	SIP *Budget
VOC (Tons/Day)								
Mobile 5	20.663	-	-	-	-	-	-	20.680
Mobile 5 + Tier II	-	19.570	-	19.570	19.582	19.556	19.571	-
Mobile 6	-	-	5.973	5.974	5.975	5.972	5.973	-
CO** (Tons/Day)								
Mobile 5	147.360	-	-	-	-	-	-	142.240
Mobile 5 + Tier II	-	147.360	-	147.854	148.064	147.730	147.968	-
Mobile 6	-	-	84.300	84.785	84.789	84.665	84.704	-
NOX (Tons/Day)								
Mobile 5	25.153	-	-	-	-	-	-	27.240
Mobile 5 + Tier II	-	17.172	-	17.390	17.406	17.355	17.381	-
Mobile 6	-	-	5.385	5.413	5.414	5.406	5.409	-

Notes: * MACOG 2025 Transportation Plan Update Air Quality Conformity Analysis (analysis date)
 ** 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 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 alternatives from least to most total VMT are Alternative Cs, Alternative G-Cs, Alternative Es and Preferred Alternative G-Es.
- (3) Relative to rural Interstate (i.e., the rural portion of US 31 Improvement Project), the alternatives from least to most total VMT are Alternative G-Cs, Alternative Cs, Preferred Alternative G-Es and Alternative Es. . This reflects the effectiveness of diverting travel from existing US 31 to the Build Alternative.
- (4) Relative to urban freeway (i.e., the urban portion of US 31 Improvement Project), the alternatives from least to most total VMT are Preferred Alternative G-Es, Alternative Es, Alternative G-Cs, and Alternative Cs.
- (5) Because Mobile 6 emission rates per VMT for VOCs 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 G-Cs had the lowest VOC emissions followed by Preferred Alternative G-Es, and Alternative Es had the highest VOC emissions.

- (6) Because the Mobile 6 CO and 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-Cs had the lowest CO and NOX emissions, and Alternative Es had the highest CO and NOX emissions. Preferred Alternative G-Es has the second lowest CO and 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 an Build Alternative would not jeopardize conformity with the SIP. Thus, the selection of Alternative G-Es as the preferred final alternative conforms 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 5.7.23), and FHWA/FTA jointly determined the LRP meet 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.

On October 26, 2004, MACOG performed an air quality conformity analysis of the adopted LRP with the alignment and proposed interchanges of the preferred final Alternative G-Es, and demonstrated compliance with applicable SIP emission budgets (see Table 5.7.23). Because the SIP emission budgets are based on tons of emissions per day, the demonstration of air quality conformity applies to both designation of St. Joseph and Elkhart Counties as a “maintenance” area for the one-hour standard for VOCs and NOX and as a “nonattainment” area for the eight-hour standard for VOCs and NOX.

On March 30, 2005, MACOG performed another Air Quality Transportation Conformity analysis for the new *2030 Long Range Transportation Plan* and the *FY 2005-2007 Transportation Improvement Program* that were adopted by MACOG on April 13, 2005. The 2030 Long Range Transportation Plan continues to include the preferred final Alternative G-Es for US 31 Improvement Project, and the air quality conformity analysis using MOBLE 6.2 resulted in slightly lower emissions (5.52 tons per day of VOC and 5.35 tons per day of NOX) than the analysis of October 26, 2004. On May 24, 2005, the FTA and FHWA concluded that the criteria of the conformity rule have been met by the MACOG conformity analysis.

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 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-Cs, 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-Cs 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 and Preferred Alternative G-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 or Preferred Alternative G-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 five segments between the proposed interchanges: 1) US 30 to East 7th Road, 2) East 7th 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 for the year 2005 (from the MACOG Transportation Air Quality Analysis for the 2025 Transportation Plan Update (March 18, 2002)), and from 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.

5.7.3.4 Results

As shown in Table 5.7.24, 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 emission calculated along the No-Build Alternative was 2.4 ppm between Kern 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 East 7th Road where the CO emissions were 2.5 ppm. The maximum CO emission calculated for Alternatives Es and G-Es were 2.9 ppm between Kern Road and the US 20 Bypass. The maximum CO emission calculated for Alternative G-Cs 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.

In addition to the criteria air pollutants for which there are National Ambient Air Quality Standards (NAAQS), EPA also regulates air toxics. Most air toxics originate from human-made sources, including on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners) and stationary sources (e.g., factories or



refineries).

Segments	Alternative in the Year 2025				
	No-Build	Cs	Es	G-Cs	Preferred Alternative G-Es**
US 30 to East 7th Road*	2.1	2.5	2.5	2.5	2.5
East 7th Road to US 6*	2.3	2.7	2.7	2.6	2.6
US 6 to SR 4	2.3	2.7	2.7	2.5	2.5
SR 4 to Kern Road	2.4	2.7	2.4	2.7	2.7
Kern Road to US 20 Bypass	2.4	2.7	2.9	2.6	2.9

Notes:

- * Because the receptor conditions and forecasted daily traffic volumes are similar for the mainline for the DEIS for the interchange at West 5A Road and FEIS for the interchange at East 7th Road, the DEIS analysis of the segments of the alternatives north and south of the West 5A Road interchange is considered applicable to the final alternatives north and south of the East 7th Road interchange. Further, because no CO emissions exceeded the one-hour and eight-hour CO NAAQS for the DEIS segments of all alternatives between US 30 and US 6, no additional hot-spot analysis was performed for the final alternatives with the shift of the proposed interchange from West 5A Road to East 7th Road.
- ** Based on the results of the DEIS analysis of Alternatives Es and G-Cs, it has been concluded that no CO emissions will exceed the one-hour and eight-hour NAAQS. Thus, no additional hot-spot analysis was performed for the preferred Alternative G-Es whose alignment coincides with portions of Alternatives G-Cs and Es.

Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics defined by the Clean Air Act. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

The EPA is the lead Federal Agency for administering the Clean Air Act and has certain responsibilities regarding the health effects of MSATs. The EPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources. 66 FR 17229 (March 29, 2001). This rule was issued under the authority in Section 202 of the Clean Air Act. In its rule, EPA examined the impacts of existing and newly promulgated mobile source control programs, including its reformulated gasoline (RFG) program, its national low emission vehicle (NLEV) standards, its Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements, and its proposed heavy duty engine and vehicle standards and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in VMT, these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 percent to 65 percent, and will reduce on-highway diesel PM emissions by 87 percent. As a result, EPA concluded that no further motor vehicle emissions standards or fuel standards were necessary to further control MSATs. The agency is preparing another rule under authority of CAA Section 202(l) that will address these issues and could make adjustments to the full 21 and the primary six

¹ MOBILE 5 Information sheet #8: Tier 2 Benefits Using MOBILE 5; U.S. Environmental Protection Agency; April 2000. "Tier 2" in this context, refers to "Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements" that have been enacted subsequent to the release of the MOBILE 5 emissions factors.



MSATs.

This FEIS includes a basic analysis of the likely MSAT emission impacts of this project. However, available technical tools do not enable us to predict the project-specific health impacts of the emission changes associated with the alternatives in this FEIS. Due to these limitations, the following discussion is included in accordance with CEQ regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information:

Evaluating the environmental and health impacts from MSATs on a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project.

1. Emissions: The EPA tools to estimate MSAT emissions from motor vehicles are not sensitive to key variables determining emissions of MSATs in the context of highway projects. While MOBILE 6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE 6.2 is a trip-based model--emission factors are projected based on a typical trip of 7.5 miles, and on average speeds for this typical trip. This means that MOBILE 6.2 does not have the ability to predict emission factors for a specific vehicle operating condition at a specific location at a specific time. Because of this limitation, MOBILE 6.2 can only approximate the operating speeds and levels of congestion likely to be present on the largest-scale projects, and cannot adequately capture emissions effects of smaller projects. For particulate matter, the model results are not sensitive to average trip speed, although the other MSAT emission rates do change with changes in trip speed. Also, the emissions rates used in MOBILE 6.2 for both particulate matter and MSATs are based on a limited number of tests of mostly older-technology vehicles. Lastly, in its discussions of PM under the conformity rule, EPA has identified problems with MOBILE6.2 as an obstacle to quantitative analysis.

These deficiencies compromise the capability of MOBILE 6.2 to estimate MSAT emissions. MOBILE6.2 is an adequate tool for projecting emissions trends, and performing relative analyses between alternatives for very large projects, but it is not sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

2. Dispersion. The tools to predict how MSATs disperse are also limited. The EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess potential health risk. The NCHRP is conducting research on best practices in applying models and other technical methods in the analysis of MSATs. This work also will focus on identifying appropriate methods of documenting and communicating MSAT impacts in the NEPA process and to the general public. Along with these general limitations of dispersion models, FHWA is also faced with a lack of monitoring data in most areas for use in establishing project-specific MSAT background concentrations.
3. Exposure Levels and Health Effects. Finally, even if emission levels and concentrations of MSATs could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude us from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of MSATs near roadways, and to



determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because unsupported assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity of the various MSATs, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

Research into the health impacts of MSATs is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or State level.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at <http://www.epa.gov/iris>. The following toxicity information for the six prioritized MSATs was taken from the IRIS database Weight of Evidence Characterization summaries. This information is taken verbatim from EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **Benzene** is characterized as a known human carcinogen.
- The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.
- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- **Diesel exhaust (DE)** is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases.
- **Diesel exhaust** also represents chronic respiratory effects, possibly the primary noncancer hazard from MSATs. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.



There have been other studies that address MSAT health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway MSAT hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the series is not expected for several years.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes -- particularly respiratory problems². Much of this research is not specific to MSATs, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

Because of the uncertainties outlined above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level. While available tools do allow us to reasonably predict relative emissions changes between alternatives for larger projects, the amount of MSAT emissions from each of the project alternatives and MSAT concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. (As noted above, the current emissions model is not capable of serving as a meaningful emissions analysis tool for smaller projects.) Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination of whether any of the alternatives would have “significant adverse impacts on the human environment.”

As discussed above, technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of MSAT emissions and effects of this project. However, even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future MSAT emissions under the project. Although a qualitative analysis cannot identify and measure health impacts from MSATs, it can give a basis for identifying and comparing the potential differences among MSAT emissions—if any—from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*, found at:

www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm

For each alternative in this FEIS, the amount of MSATs emitted would be proportional to the vehicle miles traveled, or VMT, assuming that other variables such as fleet mix are the same for each alternative. Because the VMT estimated for the No Build Alternative is higher than for any of the Build Alternatives, higher levels of regional MSATs are not expected from any of the Build Alternatives compared to the No-Build. (See Table 3.4.32) In addition, because the estimated VMT under each of the Build Alternatives are nearly the same, varying by less than 2 percent, it is expected there would be no appreciable difference in overall MSAT emissions among the various alternatives. Also, regardless of the alternative chosen, emissions will likely be lower than present levels in the design year as a result of EPA’s national control programs that are projected to reduce MSAT emissions by 57 to 87 percent from 2000 to 2020. Local conditions may differ from these national projections in terms of fleet mix and turnover, VMT growth rates, and local control measures. However, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in virtually all locations.

² South Coast Air Quality Management District, *Multiple Air Toxic Exposure Study-II* (2000); Highway Health Hazards, The Sierra Club (2004) summarizing 24 Studies on the relationship between health and air quality); NEPA’s *Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles*, Environmental Law Institute, 35 ELR 10273 (2005) with health studies cited therein.



Because of the specific characteristics of the project alternatives [i.e. new connector roadways], under each alternative there may be localized areas where VMT would increase, and other areas where VMT would decrease. Therefore it is possible that localized increases and decreases in MSAT emissions may occur. The localized increases in MSAT emissions would likely be most pronounced along the new roadway sections that would be built at all interchange locations, including 7th Road, US 6, SR 4/Pierce Road, Kern Road, and US 20, under all build alternatives. However, even if these increases do occur, they too will be substantially reduced in the future due to implementation of EPA's vehicle and fuel regulations. The localized decreases in MSAT emissions would likely be most pronounced along the existing roadway sections in the populated areas of LaPaz and Lakeville.

In summary, under all Build Alternatives in the design year, it is expected there would be reduced MSAT emissions in the immediate area of the project, relative to the No Build Alternative, due to the reduced VMT associated with more direct routing, and due to EPA's MSAT reduction programs. In comparing various project alternatives, MSAT levels could be higher in some locations than others, but current tools and science are not adequate to quantify them. However on a regional basis, EPA's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial reductions that, in almost all cases, will cause region-wide MSAT levels to be significantly lower than today.

Summary of Preferred Alternative G-Es

Air quality impacts are both regional (i.e., meso-scale concerns) and local (i.e., micro-scale concerns) in scope. Conformity with the applicable State Implementation Plan (SIP) ozone emission budgets and national carbon monoxide standards was demonstrated for Preferred Alternative G-Es. To assess the regional air quality impacts and demonstrate conformity, vehicle-miles of travel (VMT) 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. Excluding the carbon monoxide (CO) SIP budget that is informational only, Preferred Alternative G-Es conforms to the MACOG "maintenance area" SIP budgets using MOBILE 5 with Tier 2 estimates or MOBILE 6.

Hot spot air quality analysis was completed along the proposed Preferred Alternative G-Es using the CAL3QHC mobile source air dispersion model for the one-hour standard of 35 ppm. The results of this analysis show that Preferred Alternative will not 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 emission calculated for Preferred Alternative G-Es was 2.9 ppm between Kern Road and the US 20 Bypass.



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 2.5 software.

Predicted Noise Impacts

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. No-Build traffic volumes and speed data for the year 2030 are included in Appendix J-1. The TNM 2.5 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-2). 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 several crossroad intersections. Figure 5.8.15 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.

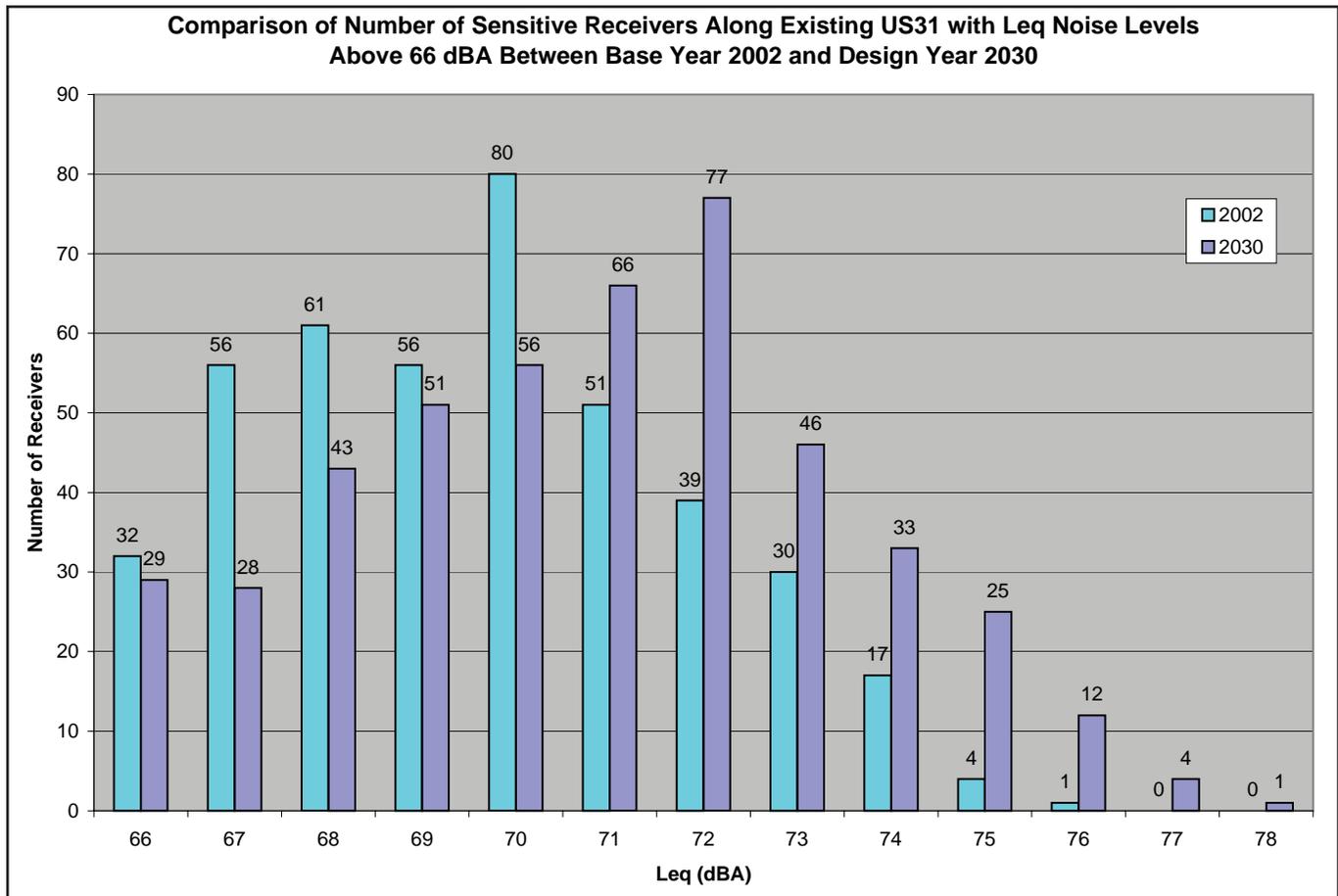


Figure 5.8.15 Comparison of Number of Sensitive Receivers Along Existing US31 with Leq Noise Levels Above 66 dBA Between Base Year 2002 and Design Year 2030



Build Alternatives

This section highlights those areas along each proposed build alternative where highway noise impacts are anticipated. In accordance with INDOT Traffic Noise Policy, a noise impact occurs when one or both of the following criteria are met.

- 1) The predicted design year hourly L_{eq} approaches or exceeds the appropriate noise abatement criteria (NAC) indicated in Table 5.8.25. Approach means that the future levels are higher than 1 dBA $L_{eq}(h)$ below the appropriate NAC.
- 2) The predicted design year hourly L_{eq} substantially exceeds existing noise levels. Substantially exceeds means that predicted levels are 15 dBA or more above existing levels.

Appendix J-1 includes traffic volumes and speed data used in the TNM 2.5 modeling for each alternative. Figure 5.8.16 illustrates the number of residential 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) criteria. Table 5.8.25 summarizes the number and location where highway traffic noise impacts are predicted for each of the alternatives for the year 2030.

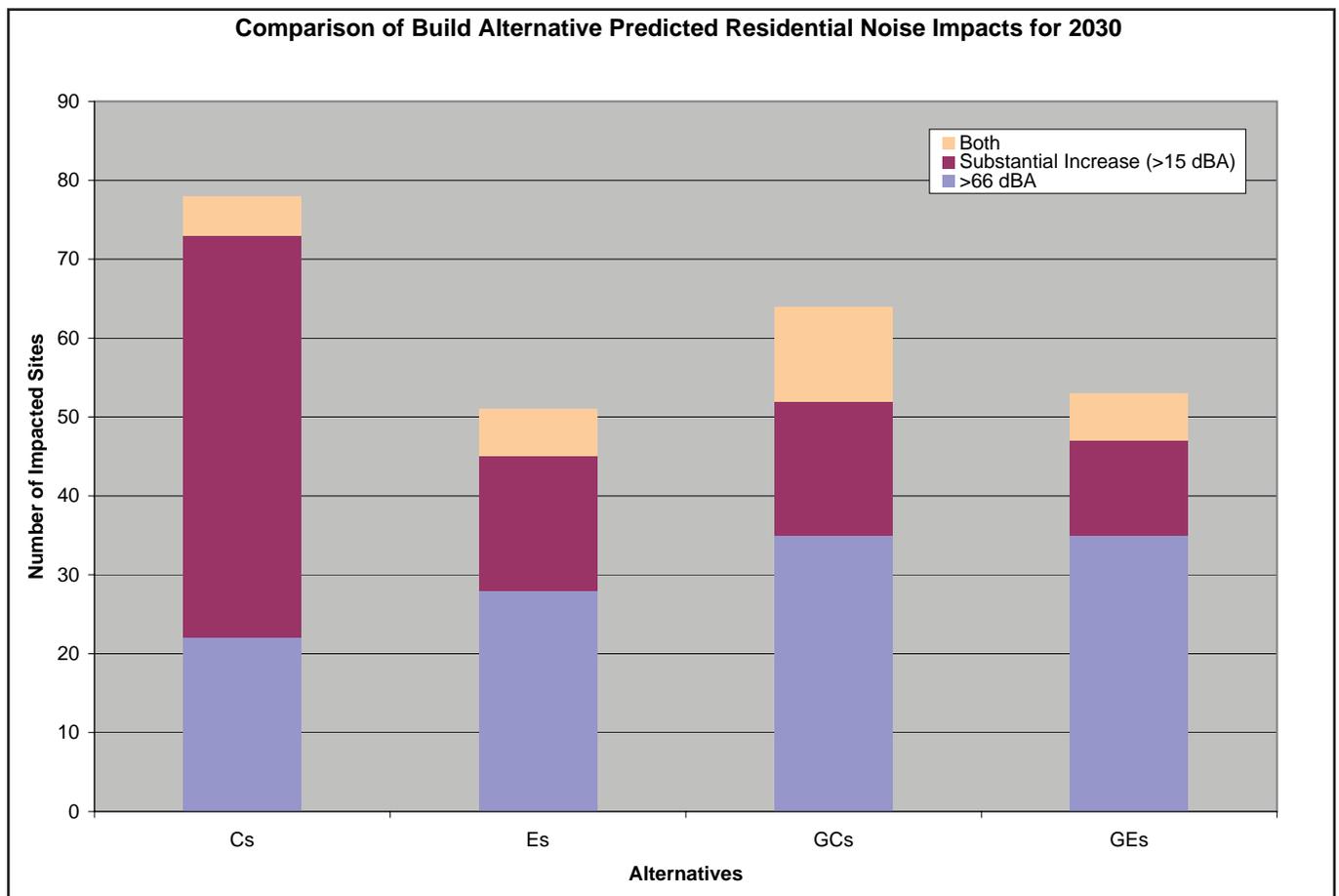


Figure 5.8.16 Comparison of Build Alternative Predicted Noise Impacts for 2030



Table 5.8.25. Summary of Predicted Highway Noise Impacts for US 31 Build Alternatives

Location	Alt. Cs	Alt. Es	Alt. G-Cs	Preferred Alt. G-Es
Maple Road, 2A Road, 2C Road	6 residences	6 residences	6 residences	6 residences
1B Road	1 residence	1 residence		1 residence
Tyler Road			1 residence	1 residence
Lilac Road	1 residence	1 residence		
Old US31 at Lakeville	1 residence	1 residence		
Osborne Road	1 residence	1 residence	1 residence	1 residence
US31		1 residence	12 residences	9 residences
Southern Acres subdivision		3 residences		
Sun Communities MHP	30 residences			
Roosevelt Road and vicinity	1 business	7 residences	13 residences	7 residences
Johnson Road to Kern Road (includes Sycamore Hills and Whispering Hills subdivisions)	17 residences		9 residences	
Kern Road		2 residences		2 residences
Gilmer Street		1 residence		1 residence
West of Alternative Es and GEs from Gilmer Street to Jackson Road		8 residences		8 residences
West of US31 from Jewell Avenue to Jackson Road	6 residences		6 residences	
East of Alternatives Es and GEs from Dice Street to Southeast Little League and Jackson Fields		15 residences 2 businesses		13 residences 1 business
East of US31 from Jewell Avenue to Jackson Road	3 residences		3 residences	
Baneberry subdivision	5 residences		6 residences	
Southeast Little League and Jackson Fields	2 baseball fields 2 soccer fields	2 baseball fields 2 soccer fields	2 baseball fields 2 soccer fields	2 baseball fields 2 soccer fields
Reasor Road	7 residences	4 residences	7 residences	4 residences
Business US31 south of Ireland Road		1 business		1 business
Residential Total	78 residences	51 residences	64 residences	53 residences
Business Total	1 business	3 businesses	none	2 businesses
Recreation Total	2 baseball fields 2 soccer fields			



Alternative Cs

Predicted L_{eq} noise levels for 373 sites modeled along Alternative Cs range from 55.5 to 69.8 dBA (Appendix J-3). The Alternative Cs analysis included sites along the US 31/US 20 bypass between Ireland Road to the west and Miami Road to the east. 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 78 single-family residences throughout the project area for this alternative. Seven of the residential impacts occur in rural Marshall County, six of which occur along Maple Road, 3A Road and 2C Road where predicted values were >15 dBA over existing L_{eq} noise levels. The majority of the remaining 71 impacted receivers are located in St. Joseph County, primarily in five 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 this analysis, 61 dBA levels would be experienced up to 390 feet from the centerline and encompass 30 residential units within the mobile home park. Further north, a second grouping of 17 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. Within the Baneberry Hills subdivision south of US 20/US 31 and west of Linden Road, predicted noise levels at five residences at the ends of cul-de-sacs would be between 66 and 70 dBA. Base year modeling indicates that three of these currently meet the Category B NAC. Because Alternative Cs proposes alignment and configuration changes for the existing interchange between US 31 and US20, noise sensitive receivers between Ireland Road and Jewel Road, and east along US 20 as far as Miami Road were also assessed for impact. With predicted L_{eq} levels of 67 to 68 dBA, the seven residences on Reasor Road north of US 20 will continue to experience noise levels at or above the Category B 67 dBA NAC. In addition, six first row receivers along the west side of US 31 and three along the east side of US 31 between Jackson and Jewel are expected to experience decreases of 3 to 4 dBA, yet would still experience predicted levels of 67 to 70 dBA, equal to or above the Category B NAC. One rural business site on Roosevelt Road would experience L_{eq} levels of 62.0 dBA, representing a substantial increase.

In addition to residences and the one business identified, portions of the Southeast Little League and Jackson Fields nearest to US 20 east of Fellows Street are predicted to continue experiencing highway noise levels in excess of the 67 dBA NAC. Design year results predict levels up to 69 dBA for the baseball fields and as much as 74 dBA at the soccer fields.

By substantially removing the through traffic currently on US 31 between 4A Road in Marshall County and Jewel Road in southern South Bend, the residual local traffic expected to use existing US 31 would be reduced to the point where highway noise impacts are only anticipated at very few locations. Of the 702 noise receivers modeled along US 31 between 4A Road and Jewel Road, only four are still predicted to meet the NAC of 67 dBA for residences or 72 dBA for businesses. Noise reductions along this portion of US 31 are predicted to range from just 2 dBA to as much as 16 dBA with a mean and median of 10.2 and 10.1 dBA respectively.

Alternative Es

Predicted L_{eq} noise levels for 280 sites modeled along Alternative Es range from 53.7 to 74.9 dBA (Appendix J-3). At the northern terminus, the Alternative Es analysis included sites along the US 20 bypass from the US 31 interchange east to Miami Road. The 2030 design year analysis for this alignment predicted L_{eq} noise level impacts (>67 dBA or substantial) at 51 single-family residences. For Marshall County, the residential noise impacts are the same as those described for Alternative Cs, including the six 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, the Whispering Hills and Sycamore Hills subdivisions between Johnson Road and Kern Road, and the



Baneberry Hills subdivision south of US 20 and west of Linden Road described for Alternatives Cs and G-Cs. The Alternative Es alignment does however pass through the western end of the Southern Acres subdivision north of Madison Road resulting in several displacements. Three of the remaining westernmost residences of this neighborhood are predicted to experience L_{eq} levels between 63 and 67 dBA representing a substantial increase and/or levels approaching or equaling the Category B NAC. Further north at Roosevelt Road, seven residences (four to the west and three to the east of the proposed alignment) are expected to experience a substantial increase in highway noise 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. On the east side of Alternative Es north of Dice Street, including the area southeast of the US 31/US 20 interchange up to the Southeast Little League fields, there are 15 residential receivers predicted to meet the 67 dBA NAC. To the west of Alternative Es between Gilmer Street and Jewel Street, eight residences are also predicted to meet the 67 dBA NAC. The extension of Fellows Street over US 20 to provide local access is currently expected to require the displacement of three residences along Reasor Street north of US20. The four remaining residences to the east of the proposed overpass are predicted to experience L_{eq} levels between 68 and 69 dBA, above the Category B NAC. Additional single or paired residential impacts (67 dBA criteria and/or substantial increase) are predicted on Lilac Road, Old US 31 at Lakeville, Osborne Road, US 31, Kern Road and Gilmer Street. Three businesses along US 31, two to the south of US20 and one to the north would also be impacted based on the Category C NAC of 72 dBA.

As indicated for Alternative Cs, portions of the Southeast Little League and Jackson Fields nearest to US 20 east of Fellows Street are predicted to continue experiencing highway noise levels in excess of the 67 dBA NAC. Design year results predict levels up to 69 dBA for the baseball fields and as much as 74 dBA at the soccer fields.

The diversion of traffic off of existing US 31 onto Alternative Es between 4A Road in Marshall County and Kern Road in St. Joseph County will result in greatly reduced highway noise levels along the existing facility. The residual local traffic expected to use existing US31 is expected to result in L_{eq} levels between 43 and 68 dBA for the 600 receiver sites modeled within 800 feet of the centerline. Of these, only four residences along US 31 south of Roosevelt Road are predicted to experience L_{eq} levels of 66 dBA or greater. Noise reductions along this portion of US31 are predicted to range from 0 dBA to as much as 15 dBA with a mean and median of 9.8 and 10.0 dBA respectively.

Alternative G-Cs

Predicted L_{eq} noise levels for 371 sites modeled along Alternative G-Cs range from 55.1 to 67.6 dBA (Appendix J-3). The Alternative G-Cs analysis included sites along the US 31/US 20 bypass between Ireland Road to the west and Miami Road to the east. 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 64 single-family residences along this alternative. Six of the residential impacts occur in rural Marshall County, all of which along Maple Road, 3A Road and 2C Road where predicted values were >15 dBA over existing L_{eq} noise levels. The majority of the remaining 59 residential sites predicted to experience highway noise impacts occur at six localized areas in St. Joseph County. Alternative G-Cs crosses existing US 31 just south of Roosevelt Road resulting in predicted impacts to six residences along the east side of US 31 and six along the west side of US 31. The 66 to 71 dBA L_{eq} noise levels predicted at these sites include noise emanating from residual traffic on existing US31 as well as from the new alignment. Progressing north, an estimated 13 residences along or in the vicinity of the Roosevelt Road crossing would experience levels that equal or exceed the 67 dBA criteria or represent a substantial increase over existing levels. Within the Whispering Hills subdivision, an estimated eight residential sites are predicted to experience L_{eq} levels between 61 and 72 dBA resulting in substantial increases over existing and/or exceeding the 67 dBA NAC. A ninth residential site west of the



alignment between Johnson Road and Kern Road is also predicted to experience a substantial increase. Within the Baneberry Hills subdivision south of US 20/US 31 and west of Linden Road, predicted noise levels for six residences at the ends of cul-de-sacs are between 66 and 70 dBA. Base year modeling indicates that three of these currently meet the Category B NAC. As with Alternative Cs, Alternative G-Cs proposes alignment and configuration changes for the existing interchange between US 31 and US 20, therefore noise sensitive receivers between Ireland Road and Jewel Road, and east along US 20 as far as Miami Road were also assessed for impact. Anticipated highway noise impacts for this alignment are the same as those described for Alternative Cs: the seven residences on Reasor Road north of US 20 will continue to experience noise levels at or above the Category B 67 dBA NAC with predicted L_{eq} levels of 67 to 68 dBA, six first row receivers along the west side of US 31 and three along the east side of US 31 between Jackson and Jewel are expected to experience decreases of 3 to 4 dBA, yet would still experience predicted levels of 68 to 71 dBA, in excess of the Category B NAC. No business site impacts are predicted for this alternative.

The Southeast Little League and Jackson Fields nearest to US20 east of Fellows Street are predicted to continue experiencing highway noise levels in excess of the 67 dBA NAC. Design year results for Alternative G-Cs scenario predict levels up to 69 dBA for the baseball fields and as much as 73 dBA at the soccer fields.

The diversion of traffic off of existing US31 onto Alternative G-Cs between 4A Road in Marshall County and Jewel Road in southern South Bend, will result in greatly reduced highway noise levels along the existing facility. Of the 678 noise receivers modeled along US31 between 4A Road and Jewel Road, 33 residences were still predicted to meet the NAC of 67 dBA NAC. Noise reductions along this portion of US 31 are predicted to range from 0 dBA to as much as 15 dBA with a mean and median of 8.2 and 8.5 dBA respectively.

Preferred Alternative G-Es

Predicted L_{eq} noise levels for 310 sites modeled along Alternative G-Es range from 51.0 to 74.8 dBA (Appendix J-3). Maps in Appendix J show the location of all modeled sites (impacted and non-impacted) for the Alternative G-Es analysis. At the northern terminus, the Alternative G-Es analysis included sites along the US 20 bypass from the US 31 interchange east to Miami Road. 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 53 single-family residences along this alternative. Seven of the residential impacts occur in rural Marshall County, six of which are along Maple Road, 3A Road and 2C Road where predicted values were >15 dBA over existing L_{eq} noise levels. In St. Joseph County, this alignment avoids impacts to the Sun Communities mobile home park off of Locust Road, the Whispering Hills and Sycamore Hills subdivisions between Johnson Road and Kern Road, and the Baneberry Hills subdivision south of US20 and west of Linden Road described for Alternatives Cs and G-Cs, as well as the western end of the Southern Acres subdivision described for Alternative Es. The majority of the 47 residential sites predicted to experience highway noise impacts in St. Joseph County occur at five localized areas. Alternative G-Es crosses existing US 31 just south of Roosevelt Road resulting in predicted impacts to five residences along the east side of US 31 and four along the west side of US 31. The 67 to 71 dBA L_{eq} noise levels predicted at these sites include noise emanating from residual traffic on existing US 31 as well as from the new alignment. Progressing north, an estimated seven residences (four to the east and three to the west of the proposed alignment) along or in the vicinity of the Roosevelt Road crossing would experience levels that equal or exceed the 67 dBA criteria or represent a substantial increase over existing levels. North of the proposed Kern Road interchange Alternative G-Es converges back onto the existing US 31 alignment and results in the same highway noise impacts as Alternative G-Es. 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. On the east side of Alternative G-Es north of Dice Street, including the area southeast of the US 31/US 20 interchange up to the Southeast Little League fields, there are 13 residential receivers predicted to meet the 67 dBA NAC. To the west of Alternative G-Es between Gilmer Street and Jewel Street, eight residences are also predicted to meet the 67 dBA NAC. The extension of Fellows Street over US 20 to provide local access is currently expected to require the displacement of three residences along Reasor Street



north of US 20. The four remaining residences to the east of the proposed overpass are predicted to experience L_{eq} levels between 68 and 69 dBA, above the Category B NAC. Additional single or paired residential impacts (67 dBA criteria and/or substantial increase) are predicted on 1B Road, Tyler Road, off US31, Kern Road, and Gilmer Street. Two businesses along US 31, one to the south of US 20 and one to the north, would also be impacted based on the Category C NAC of 72 dBA.

The Southeast Little League and Jackson Fields nearest to US 20 east of Fellows Street are predicted to continue experiencing highway noise levels in excess of the 67 dBA NAC. Design year results for Alternative G-Es scenario predict levels up to 69 dBA for the baseball fields and as much as 73 dBA at the soccer fields.

The diversion of traffic off of existing US 31 onto Alternative G-Es between 4A Road in Marshall County and Kern Road in St. Joseph County will result in greatly reduced highway noise levels along the existing facility. The residual local traffic expected to use existing US 31 is expected to result in L_{eq} levels between 43 and 67 dBA for the 580 receiver sites modeled within 800 feet of the centerline. Of these, only seven residences along US 31 south of Kern Road are predicted to experience L_{eq} levels of 66 dBA or greater. Noise reductions along this portion of US 31 are predicted to range from 0 dBA to as much as 16 dBA with a mean and median of 10.2 and 10.7 dBA respectively.

Preferred Alternative Abatement Consideration

INDOT Policy considers the following measures for the abatement of highway noise where an impact has been identified:

- Traffic control measures (TCM) – Includes reduced speed limits, prohibiting heavy truck traffic, etc.
- Alteration of vertical and horizontal alignment – Includes raising or lowering a roadway profile to alter the acoustic setting between roadway and receiver, and/or shifting the alignment away from receiver(s) to increase the distance over which highway noise must travel.
- Acquisition of buffering land – Involves the purchase of land along a highway facility, thus precluding future development into an area where noise impacts would occur.
- Noise insulation of impacted receivers – Generally reserved as an option for public offices or facilities (e.g. libraries)
- Construction of traffic noise barriers – The use of earthen berms or structural walls to alter the pathway of sound between roadway and receiver, thus reducing its energy at the receiver. This is the most common means of noise abatement employed in Indiana.

Given the purpose and need of the project and the functional classification of the proposed facility, the use of traffic control measures is not considered prudent for Preferred Alternative G-Es. Although a horizontal shift of the alignment may locally reduce noise levels at specific receivers below the NAC, such shifts generally only result in additional noise impacts elsewhere by moving the alignment closer to other receivers. At this time the vertical alignment of the roadway relative to impacted receivers is not known. However, due to the relatively flat terrain of the project area, changing the vertical alignment is only expected to result in minor reductions. This would need to be explored in greater detail during the design phase of the project. The acquisition of buffering land is not justified for this project, nor is the need for noise insulation. The remainder of this section addresses the “feasibility” and “reasonableness” of abatement using traffic noise barrier walls at various locations along Preferred Alternative G-Es where predicted 2030 impacts have been identified.



An analysis of noise barrier performance was performed at 18 sites using TNM 2.5. Barriers were comprised of 200 feet long segments with a maximum height of 20 feet. Total cost was based on \$20.00 per square foot. The feasibility of the barrier was based on whether it is structurally and acoustically possible to attenuate traffic noise occurring at a receiver by at least 5 dBA $L_{eq}(h)$. Since at this stage of the design process sufficient detail is lacking to completely address the structural feasibility of any proposed barrier, it is assumed that it would be possible to construct all barriers evaluated. According to INDOT policy, “reasonable” means that abatement of traffic noise impacts is prudent based on consideration of all the following factors:

1. The number of benefited receivers, those for whom the mitigation will benefit by at least 5 dBA $L_{eq}(h)$ at the noisiest hour conditions. This number is not necessarily the number of receivers impacts.
2. The cost of abatement on a benefited receiver basis and on a project level basis. The INDOT has set the acceptable cost per benefited receiver range as \$20,000 - \$30,000. This cost should be arrived at by applying a square footage cost basis on the square footage of the noise barrier.
3. The severity of existing and future traffic noise level. The absolute level and the increase of the future noise are two aspects with which to assess the severity of the noise impacts.
4. The timing of development near the project. The state considers it appropriate to give more consideration for development that occurs before initial highway construction.
5. The views of noise impacted residents. Potential negative impacts of noise barriers include unsightliness, shortened daylight, poor air circulation, degradation by weather, reduced safety, vandalism, and restriction of access for emergency vehicles.

Table 5.8.26 summarizes the results of the analysis for the 18 barrier sites along Preferred Alternative G-Es. The length, height, cost, number of benefited receivers and cost per benefited receiver are based on an optimal barrier solution that provides a minimum of 5 dBA abatement to the greatest number of residences possible, but at the lowest cost per benefited receiver possible. The severity of impact at each barrier site was determined based on the difference between the predicted noise level and the existing noise level compared to the difference between the predicted noise level and the appropriate noise abatement criteria (Appendix J).

Each of the 18 barrier analysis sites are evaluated in terms of the “reasonableness” criteria as follows:

Site 1 (Maple Road south of 3A Road) – Two of the five residences along Maple Road are predicted to experience L_{eq} levels greater than 15 dBA over existing levels, resulting in a severity of impact rating of “severe”. The remaining three residences fall into the “moderate” class. All five of the residences were constructed before the US 31 EIS was initiated. An optimal barrier 1200 feet long ranging from 11 to 15 feet in height is predicted to provide ≥ 5 dBA noise reduction at only one residence, thus resulting in a cost per benefited receiver of \$344,043. It is assumed that impacted and benefited receivers at this location would be favorable to highway noise mitigation in the form of a barrier wall. Although a barrier is likely feasible, such a barrier is capable of only achieving the goal of 5 dBA reduction at one receiver, and is therefore not considered to be likely reasonable.

Site 2 (3A Road) - One of the two residences along 3A Road are predicted to experience L_{eq} levels greater than 15 dBA over existing levels, resulting in a severity of impact rating of “severe”. The remaining residence is classified as “moderate”. Both residences were constructed before the US 31 EIS was initiated. A short barrier 400 feet long and 17 feet tall is predicted to provide ≥ 5 dBA noise reduction for only one residence with a cost per benefited receiver of \$136,022. It is assumed that impacted and benefited receivers at this location would be favorable to highway noise mitigation in the form of a barrier wall. Although a barrier is likely feasible, such a barrier is capable of only achieving the goal of 5 dBA reduction at one receiver and at a cost of 4.5 times the INDOT criteria. Therefore, such a barrier is not considered to be likely reasonable.



Table 5.8.26. Summary of Barrier Performance Assessment for Preferred Alternative G-Es

ID	Location	NAC	No. Impacted	No. Analyzed	No. Benefited	Benefit Range (dBA)	Length	Height	Cost	Cost Per Benefited Receiver	Severity of Impact	Feasible	Reasonable
1	East side of Alt G-Es along Maple Road	67	2	5	1	5	1200	11-15	\$344,043	\$344,043	Severe = 2 Moderate = 3	Yes	No
2	West side of Alt G-Es along 2A Road	67	1	2	1	5	400	17	\$136,022	\$136,022	Severe = 1 Moderate = 1	Yes	No
3	West side of Alt G-Es along Maple Road and 2C Road	67	3	3	3	5	2000	10-15	\$560,046	\$186,682	Severe = 3	Yes	No
4	East side of Alt G-Es along 1B Road	67	1	3	3	5 - 8	800	17	\$271,951	\$90,650	Severe = 1 Moderate = 2	Yes	No
5	West side of Alt G-Es along Tyler Road	67	1	1	1	5	200	8	\$32,008	\$32,008	Severe = 1	Yes	No
6	West side of Alt G-Es along Osborne Road	67	1	3	1	5	400	8	\$64,005	\$64,005	Moderate = 1 No Impact = 2	Yes	No
7	West side of Alt G-Es along existing US 31	67	5	13	0	No Barrier Solution					Minor = 2 No Impact = 11	No	No
8	East side of Alt G-Es along existing US 31	67	5	8	2	5	800	8-10	\$144,031	\$72,015	Minor = 1 No Impact = 7	Yes	No
9	West side of Alt G-Es along Roosevelt Road	67	3	4	3	5 - 9	1200	8-19	\$344,008	\$144,669	Severe = 3 Moderate = 1	Yes	No
10	East side of Alt G-Es along Roosevelt Road and west end of Weller Heights subdivision	67	4	44	11	5 - 12	2400	18-20	\$888,031	\$80,730	Severe = 4 Moderate = 16 Minor = 4 No Impact = 20	Yes	No
11	West side of Alt G-Es off of Gilmer Street	67	1	1	1	5	800	10-11	\$172,010	\$172,010	Severe = 1	Yes	No
12	West side of Alt G-Es from Gilmer Street to Johnson Road	67	3	18	12	5 - 10	2212	8-12	\$769,654	\$64,137	Minor = 4 No Impact = 14	Yes	No
13	East side of Alt G-Es from Gilmer Street to Johnson Road	67	7	26	22	5 - 12	1856	12-15	\$493,433	\$22,428	Minor = 3 No Impact = 23	Yes	Yes
14	West side of Alt G-Es from Johnson Road to Jackson Road	67	5	19	10	5 - 10	800	14-19	\$267,792	\$26,779	Minor = 1 No Impact = 18	Yes	Yes
15	East side of Alt G-Es from Johnson Road to Jackson Road	67	5	15	11	5 - 11	1400	8-16	\$364,005	\$33,180	Minor = 4 No Impact = 11	Yes	Yes
16	East side of Alt G-Es/US 20 interchange from Jackson Road to Southeast Little League baseball fields	67	2	13	7	5 - 10	1280	16-17	\$427,063	\$61,009	Minor = 2 No Impact = 11	Yes	No
17	Southeast Little League and Jackson Fields	67	See Discussion Below								Moderate = 4 Minor = 2 No Impact = 7	Yes	No
18	Northeast side of Alt G-Es/US 20 interchange along Reasor Street	67	4	4	4	5 - 6	800	9-10	\$151,998	\$36,999	No Impact = 4	Yes	No

Red shaded cells indicate locations where optimized barrier does not meet \$30,000 reasonableness criteria.

Yellow shaded cells indicate locations where optimized barrier is slightly above the \$30,000 reasonableness criteria.

Green shaded cells indicate locations where optimized barrier is within the \$30,000 reasonableness criteria.

Site 3 (Maple Road and 2C Road) – All three of the residences at this location are predicted to experience L_{eq} levels greater than 15 dBA over existing levels, resulting in a severity of impact rating of “severe”. Each were constructed before the US 31 EIS was initiated. An optimal barrier 2000 feet long ranging from 10 to 15 feet tall is predicted to provide ≥ 5 dBA noise reduction for all three residences at a cost per benefited receiver of \$186,682. It is assumed that impacted and benefited receivers at this location would be favorable to highway noise mitigation in the form of a barrier wall. Although a barrier is likely feasible, and would potentially benefit all three receivers, the cost per benefited receiver is six times the \$30,000 INDOT criteria, and is therefore not considered to be likely reasonable.



Site 4 (1B Road) – One of the three residences at this location are predicted to experience L_{eq} levels greater than 15 dBA over existing levels, resulting in a severity of impact rating of “severe”. The remaining two are classified as “moderate”. All three residences were constructed before the US 31 EIS was initiated. An optimal barrier 800 feet long and 17 feet tall is predicted to provide ≥ 5 dBA noise reduction for all three residences at a cost per benefited receiver of \$90,650. It is assumed that impacted and benefited receivers at this location would be favorable to highway noise mitigation in the form of a barrier wall. Although a barrier is likely feasible, and would potentially benefit all three receivers, the cost per benefited receiver is three times the \$30,000 INDOT criteria, and is therefore not considered to be likely reasonable.

Site 5 (Tyler Road) – The single impacted residences at this location is predicted to experience L_{eq} levels greater than 15 dBA over existing levels, resulting in a severity of impact rating of “severe”. This residence was constructed before the US 31 EIS was initiated. A short 200 foot long and 8 feet tall barrier is predicted to provide ≥ 5 dBA noise reduction for this residence at a cost per benefited receiver of \$32,008. It is assumed that this resident(s) would be favorable to highway noise mitigation in the form of a barrier wall. Such a barrier is likely feasible, and has a cost per benefited receiver only slightly above the \$30,000 INDOT criteria; however, it is not currently considered to be likely reasonable as abatement for a single receiver.

Site 6 (Osborne Road) - One of the three residences west of Alternative G-Es along Osborne Road are predicted to experience L_{eq} levels greater than 66 dBA, resulting in a severity of impact rating of “moderate”. The remaining two residences are classified as “no impact”. All three residences were constructed before the U S31 EIS was initiated. A short barrier 400 feet long and 8 feet tall is predicted to provide ≥ 5 dBA noise reduction only for the single impacted residence at a cost per benefited receiver of \$64,005. It is assumed that the resident(s) at this location would be favorable to highway noise mitigation in the form of a barrier wall. Although a barrier is likely feasible, such a barrier is capable of only achieving the goal of 5 dBA reduction at only one receiver and at a cost per benefited receiver twice that of the INDOT criteria. Therefore, barrier wall abatement is not considered to be likely reasonable.

Site 7 (West side of Alternative G-Es along US31 and Whitmer Road) – Five of the 13 residences west of Alternative G-Es along US 31 are predicted to experience L_{eq} levels greater than 66 dBA. Two have a severity of impact rating of “minor” with the remainder classed as “no impact”. All thirteen residences were constructed before the US 31 EIS was initiated. An assessment of barrier performance along the west side of Alternative G-Es did not yield a barrier solution with a height less than or equal to 20 feet in which a ≥ 5 dBA noise reduction was predicted for any of the residences included in the analysis. This inability to abate traffic noise by 5 dBA at this site is attributed in part to the effect of the residual traffic anticipated along existing US31. Based on this TNM 2.5 analysis, abatement is not currently considered to be likely feasible since a 5 dBA reduction would not be achievable; therefore, reasonableness criteria for cost per benefited receiver was not applied.

Site 8 (East side of Alternative G-Es along US31) – Five of the eight residences at this location are predicted to experience L_{eq} levels greater than 66 dBA, resulting in a severity of impact rating of “minor” for one residence and “no impact” for the remaining seven. All eight residences were constructed before the US 31 EIS was initiated. An optimal barrier 800 feet long ranging in height between 8 and 10 feet is predicted to provide ≥ 5 dBA noise reduction for only two residences at a cost per benefited receiver of \$72,015. It is assumed that impacted and benefited receivers at this location would be favorable to highway noise mitigation in the form of a barrier wall. Although a barrier is likely feasible, such a barrier is predicted to only benefit two residences and at a cost of 2.4 times the \$30,000 INDOT criteria. Therefore, barrier wall abatement is not considered to be likely reasonable.

Site 9 (West side of Alternative G-Es along Roosevelt Road) – Three of the four residences at this location are predicted to experience L_{eq} levels greater than 66 dBA and/or L_{eq} levels greater than 15 dBA over existing levels, resulting in a severity of impact rating of “severe”. The fourth residence is classified as “moderate”. All eight residences were constructed before the US 31 EIS was initiated. An optimal barrier 1200 feet long ranging in height



between 8 and 19 feet is predicted to provide ≥ 5 dBA noise reduction for all three residences at a cost per benefited receiver of \$144,669. It is assumed that impacted and benefited receivers at this location would be favorable to highway noise mitigation in the form of a barrier wall. Although a barrier is likely feasible, and would potentially benefit all three impacted receivers, the cost per benefited receiver is 4.8 times the \$30,000 INDOT criteria, and is therefore not considered to be likely reasonable.

Site 10 (East side of Alternative G-Es along Roosevelt Road and west end of Weller Heights subdivision) – Four of the 44 residences at this location (i.e. within 800 feet of the proposed centerline) are predicted to experience L_{eq} levels greater than 66 dBA and/or L_{eq} levels greater than 15 dBA over existing levels, resulting in a severity of impact rating of “severe”. The remaining 40 residences have severity of impact ratings of “moderate” (16 homes), “minor” (4 homes) or “no impact” (20 homes). All 44 residences were constructed before the US 31 EIS was initiated. An optimal barrier 2400 feet long ranging in height between 8 and 20 feet is predicted to provide ≥ 5 dBA noise reduction for eleven residences at a cost per benefited receiver of \$80,730. It is assumed that impacted and benefited receivers at this location would be favorable to highway noise mitigation in the form of a barrier wall. Although a barrier is likely feasible, and would potentially benefit eleven first row receivers, the cost per benefited receiver is 2.7 times the \$30,000 INDOT criteria, and is therefore not considered to be likely reasonable.

Site 11 (West side of Alternative G-Es off of Gilmer Street) – A single residence accessed off of Gilmer Street is predicted to experience L_{eq} levels greater than 15 dBA over existing levels, resulting in a severity of impact rating of “severe”. This residence was constructed before the US 31 EIS was initiated. An optimal barrier 800 feet long ranging in height between 10 and 11 feet is predicted to provide ≥ 5 dBA noise reduction for eleven residences at a cost per benefited receiver of \$172,010. It is assumed that impacted and benefited receiver at this location would be favorable to highway noise mitigation in the form of a barrier wall. Although a barrier is likely feasible, such a barrier is capable of only achieving the goal of 5 dBA reduction at only one receiver and at a cost per benefited receiver 5.7 times that of the INDOT criteria. Therefore, the use of a barrier for abatement is not considered to be likely reasonable.

Site 12 (West side of Alternative G-Es from Gilmer Street to Johnson Road) – Three out of 18 residences at this location are predicted to experience L_{eq} levels equal to or greater than 66 dBA. Four residences have a severity impact rating of “minor” with the remaining 14 classed as “no impact”. All residences were constructed before the US 31 EIS was initiated. An optimal barrier 2212 feet long ranging in height between 8 and 12 feet is predicted to provide ≥ 5 dBA noise reduction for 12 residences at a cost per benefited receiver of \$64,137. It is assumed that impacted and benefited receiver at this location would be favorable to highway noise mitigation in the form of a barrier wall. Although such a barrier is likely feasible, and is capable of achieving the goal of 5 dBA reduction at 12 receivers, the cost per benefited receiver is still twice that of the INDOT criteria. Therefore, the use of a barrier for abatement is not considered to be likely reasonable.

Site 13 (East side of Alternative G-Es from Gilmer Street to Johnson Road) – Six out of 20 residences and Southlawn Church are predicted to experience L_{eq} levels equal to or greater than 66 dBA, and one out of 5 businesses in this area are expected to experience L_{eq} levels equal to or greater than 71 dBA. Three residences have a severity impact rating of “minor” with the remaining 23 classed as “no impact”. All residences, businesses and Southlawn Church were constructed before the US 31 EIS was initiated. An optimal barrier 1856 feet long ranging in height between 12 and 15 feet is predicted to provide ≥ 5 dBA noise reduction for 16 residences and six businesses between Gilmer Street and Johnson Road at a cost per benefited receiver of \$22,428. It is assumed that the 16 impacted and/or benefited residential receivers and Southlawn Church at this location would be favorable to highway noise mitigation in the form of a barrier wall; however, the businesses may view the structure as an impairment to visibility from the highway. Such a barrier is likely feasible, and although the severity of impact is generally low for the area, a barrier is capable of achieving the goal of 5 dBA reduction at several residential receivers and at a cost per benefited receiver below the INDOT criteria. Based on the preliminary results of this analysis, the use of a barrier for abatement is also considered to be likely reasonable.



Site 14 (West side of Alternative G-Es from Johnson Street to Jackson Road) – Five out of 19 residences are predicted to experience L_{eq} levels equal to or greater than 66 dBA, resulting in a severity of impact rating of “minor” for one residence and “no impact” for the remaining 18. All residences were constructed before the US 31 EIS was initiated. An optimal barrier 800 feet long ranging in height between 14 and 19 feet is predicted to provide ≥ 5 dBA noise reduction for 10 residences between Jewel Avenue and Johnson Road at a cost per benefited receiver of \$26,779. It is assumed that the 10 impacted and/or benefited residential receivers at this location would be favorable to highway noise mitigation in the form of a barrier wall. Such a barrier is likely feasible, and although the severity of impact is generally low for the area, a barrier is capable of achieving the goal of 5 dBA reduction at several residential receivers and at a cost per benefited receiver below the INDOT criteria. Based on the preliminary results of this analysis, the use of a barrier for abatement is also considered to be likely reasonable.

Site 15 (East side of Alternative G-Es from Johnson Street to Jackson Road) – Five out of 15 residences are predicted to experience L_{eq} levels equal to or greater than 66 dBA, resulting in a severity of impact rating of “minor” for four residences and “no impact” for the remaining eleven. All residences were constructed before the US 31 EIS was initiated. An optimal barrier 1400 feet long ranging in height between 8 and 16 feet is predicted to provide ≥ 5 dBA noise reduction for 11 residences between Jewel Avenue and Johnson Road at a cost per benefited receiver of \$33,090. It is assumed that the 11 impacted and/or benefited residential receivers at this location would be favorable to highway noise mitigation in the form of a barrier wall. Such a barrier is likely feasible, and although the severity of impact is generally low for the area and the cost per benefited receiver is slightly above the INDOT criteria, such a barrier is capable of achieving the goal of 5 dBA reduction at several residential receivers in this area. Based on the preliminary results of this analysis, the use of a barrier for abatement is therefore considered to be likely reasonable.

Site 16 (East side of Alternative G-Es/US20 Interchange from Jackson Road to Southeast Little League baseball fields) – Two out of 13 residences are predicted to experience L_{eq} levels equal to or greater than 66 dBA, resulting in a severity of impact rating of “minor”. The remaining eleven residences are classed as “no impact”. All residences were constructed before the US 31 EIS was initiated. An optimal barrier 1280 feet long ranging in height between 16 and 17 feet is predicted to provide ≥ 5 dBA noise reduction for seven residences at a cost per benefited receiver of \$61,009. It is assumed that the seven impacted and/or benefited residential receivers at this location would be favorable to highway noise mitigation in the form of a barrier wall. Although a barrier is likely feasible, and would potentially benefit seven residences, the overall severity of impact is low and the cost per benefited receiver is twice the INDOT criteria; therefore it is not considered to be likely reasonable.

Site 17 (Southeast Little League and Jackson Fields) - In addition to consideration of abatement at residences and businesses along Preferred Alternative G-Es alignment, a noise barrier analysis was also conducted for the Southeast Little League and Jackson Fields south of US 20 between the proposed Fellows Street extension and Miami Road. Noise receivers were modeled at the bleachers, dugouts and home plate for the two baseball fields closest to US 20, as well as along the northern sidelines of the two soccer fields to the east. Receiver points at a third baseball field between the aforementioned baseball fields and soccer fields were not modeled since only the outfield is closest to US 20. The analysis demonstrated that reductions of 5 to 12 dBA would be possible at these points through the use of two barrier walls of 8 to 10 feet high totaling 1,534 feet in length. This discontinuous wall configuration (one section for the baseball fields to the west and one for the soccer fields to the east) has an estimated cost of \$261,000. A continuous barrier wall with no gap between the two baseball fields and two soccer fields would be 2,124 feet in length and cost approximately \$360,000. Owing to the fact that these fields are only used for limited periods of time on a seasonal basis and the fact that a relatively quiet environment is not critical to the continued functional use of the facility, the construction of barrier walls to provide abatement for these recreational land uses does not appear to be reasonable, and is therefore not currently recommended.



Site 18 (Northeast side of Alternative G-Es/US20 interchange along Reasor Street) – All four residences east of the proposed Fellows Street overpass are predicted to experience L_{eq} levels equal to or greater than 66 dBA, but have a severity of impact rating of “no impact”. All residences were constructed before the US 31 EIS was initiated. A short optimal barrier 800 feet long ranging in height between 9 and 10 feet is predicted to provide ≥ 5 dBA noise reduction for all four residences along Reasor Street at a cost per benefited receiver of \$36,999. It is assumed that all four impacted and/or benefited residential receivers at this location would be favorable to highway noise mitigation in the form of a barrier wall. Although a barrier is likely feasible, such abatement would potentially benefit a small number of residences, the overall severity of impact is low and the cost per benefited receiver is approximately \$7,000 above the INDOT criteria. Based on the preliminary results of this analysis, the use of a barrier for abatement is therefore currently not considered to be likely reasonable, but should be given further consideration during the design phase.

The specific characteristics of the proposed barriers (i.e., placement, length, height) at Sites 13, 14, and 15 will be refined during the final design. If during final design conditions substantially change, the abatement measures might be proved to no longer be feasible and/or reasonable, in which case barrier wall(s) may not be provided. A final decision on the installation of abatement measure(s) will be made upon completion of the project design and the public involvement process.



5.9 Natural Resources

5.9.1 Physiographic Regions

All four 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 sections of Chapter 5.

5.9.2 Natural Regions

All 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. 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 sections of Chapter 5.

Wetlands were delineated and streams were seined for the Preferred Alternative G-Es. Wetland impacts are discussed in more detail in Chapter 5.12, Wetlands. Detailed results of the wetland delineations can be found in the report, "Waters of the U.S." Verification Report U.S. 31 Improvement Project (Plymouth to South Bend) Revised on May 2, 2005. Stream impacts are discussed in more detail in Chapter 5.10, Water Resources. Appendix M contains Aquatic Field Forms for each of the streams seined.

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 Alternatives G-Cs and G-Es avoid the majority of the area, but both do cross it in the very northern portion as it connects with US 20. Of the alternatives studied in detail, the Preferred Alternative G-Es avoids the most of this sensitive area. The No-Build Alternative will have no impact on this area.

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-Cs. 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 and 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

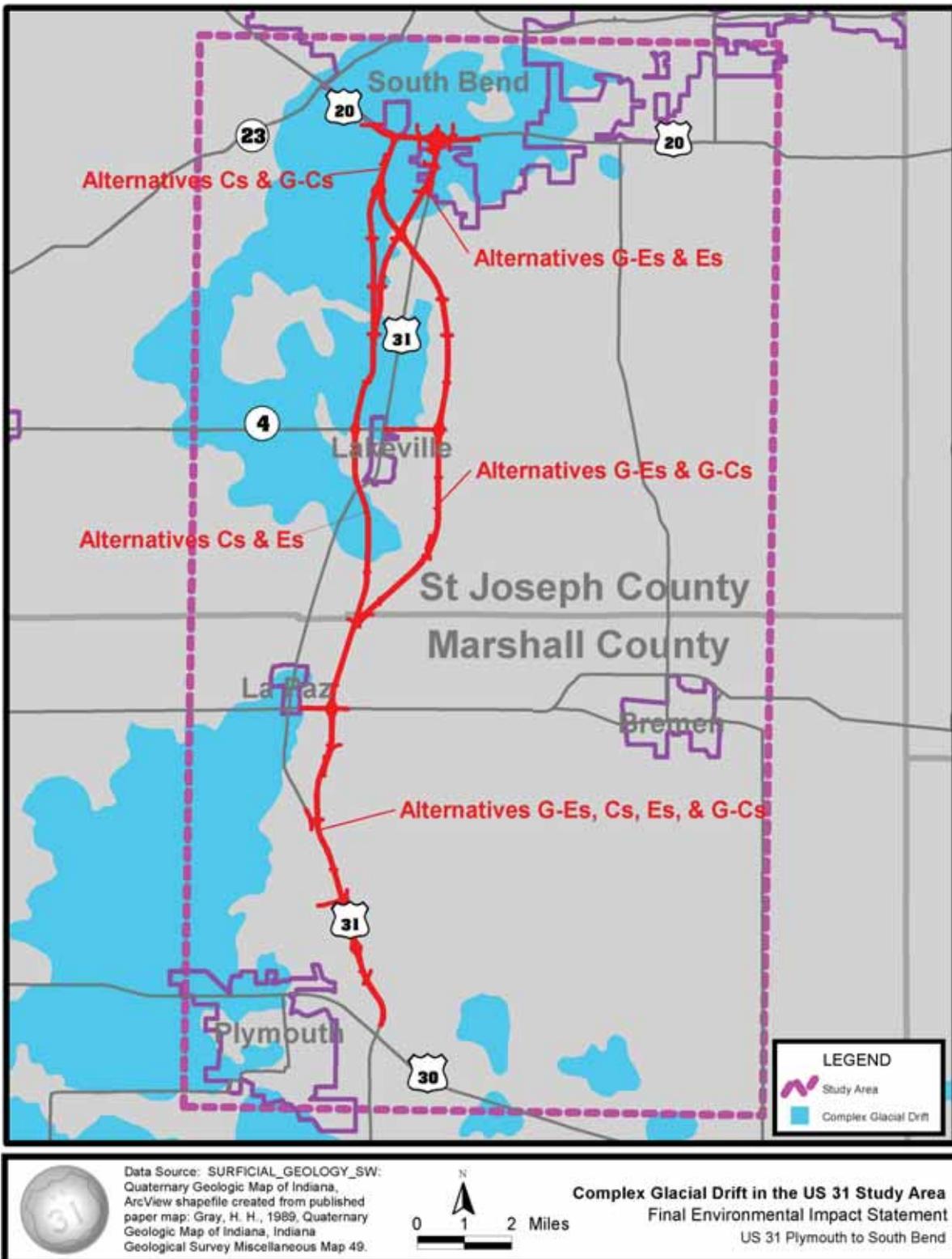


Figure 5.9.17: Complex Glacial Drift in the US 31 Study Area

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.



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.

General Habitat Impacts

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

Forestland

Table 5.9.27 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 forested upland and forested wetland directly within the working alignment right-of-way. Alternative Cs had the greatest acreage of forest directly taken with approximately 186 acres, followed by Alternative Es with 135 acres and Alternative G-Cs with 115 acres. The Preferred Alternative G-Es had the lowest relative forest impacts with approximately 91 acres. 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. Alternative Cs and Alternative Es will split 13 tracts, Alternative G-Cs 11 tracts, and the Preferred Alternative G-Es 10 tracts. The No-Build Alternative will have no impact on this resource.

Forest Impacts	Alternative			
	Cs	Es	G-Cs	G-Es (Preferred) ¹
Forest				
Direct Take (acres)	186	135	115	91
# of Tracts Split	13	13	11	10
Core Forest				
Direct Take (acres)	7	6	5	2
# Tracts Directly Impacted	4	4	3	2
Converted to Edge (acres)	15	10	10	6
# Tracts Indirectly Impacted	8	6	4	3
TOTAL Core Forest Impacts (acres)	22	16	15	8

¹ See Table 3.6.41 for Summary of Impacts Associated with Preferred Alternative G-Es following additional, in-depth studies.

According to the United States Department of Agriculture (USDA) Forest Service publication, Indiana's Forests in 1998, the total forest area in Marshall and Fulton counties (USDA grouping) was 45,700 acres, or 8.8% of the total land area. The total forest area in St. Joseph, Pulaski, and Starke counties (USDA grouping) was 79,600 acres, or 10.4% of the total land area. Of the total forest area in Marshall and Fulton counties, 86.0% of this was in private individual ownership, with the remaining 14.0% in corporate ownership. Of the total forest area in St. Joseph, Pulaski, and Starke counties, 65.5% is in private individual ownership, 16.2% is in corporate ownership, 12.6%



is owned by the state, and 10.6% is owned by the county. The vast majority of the forests in the study area are privately owned. Most are scattered woodlots, although more contiguous forested areas can be found west of US 31 in the unique geological area formerly known as the Maxinkukee Moraine.

Forest Impacts for Preferred Alternative G-Es

Following the identification of Alternative G-Es as the Preferred Alternative, additional, in-depth studies were performed on the alternative. Included in these additional studies were minor refinements of the local access plan and associated proposed right-of-way requirements and number of relocations. Forest impacts for Preferred Alternative G-Es are detailed in Table 5.9.28. Only those impacts 0.5 acres or greater are listed in the table. Impacts are listed by a Total Forest Area category range and assigned a Forest ID number. Forest ID numbers for each impact are shown on aerial photographs in Appendix A, Alternative Route Maps. The Area of Impact column lists the area of forest to be directly impacted by the proposed G-Es footprint. This footprint is generally 300 feet wide and also includes interchange, overpass, cul-de-sac, and local road improvement locations. The % of Total Area column lists the approximate percent of the total forest tract that will be taken, and the Type of Impact lists where in the tract the impact will occur. A “Fragment” listing means that significant portions of the forest tract will remain on either side of the proposed highway. An “Edge” listing means that the impact will occur on the edge of the tract, and a “Total” listing means greater than 80% of the entire tract will be taken. The Number of Encroachments column refers to the number of times a tract will be impacted by the Preferred Alternative.

Total Area Forest	Forest ID	Area of Impact	% of Total Area	Type of Impact	Number of Encroachments
0 – 5 acres	F7	1.0 ac	40 - 50	Fragment	1
	F16	0.7 ac	30 - 40	Edge	1
	F18	2.8 ac	40 -50	Fragment	1
	F19	1.5 ac	50 - 60	Edge	1
	F21	1.3 ac	50 - 60	Edge	1
	F22	1.1 ac	60 - 70	Edge	1
	F27	1.2 ac	60 - 70	Edge	1
5 – 15 acres	F5	1.6 ac	10 – 20	Edge	1
	F6	0.6 ac	5 - 10	Edge	2
	F10	1.2 ac	10 – 20	Edge	1
	F11	0.9 ac	5 - 10	Edge	1
	F12	2.6 ac	10 – 20	Edge	1
	F14	1.0 ac	10 - 20	Edge	1
	F17	2.6 ac	40 - 50	Fragment	1
	F28	4.5 ac	60 - 70	Fragment	1
	F29	3.9 ac	30 - 40	Fragment	1



Table 5.9.28: Forest Impacts for Preferred Alternative G-Es (Continued)

Total Area Forest	Forest ID	Area of Impact	% of Total Area	Type of Impact	Number of Encroachments
5 – 15 acres (Continued)	F30	4.5 ac	80 -90	Total	1
	F31	0.8 ac	5 - 10	Edge	1
	F32	1.3 ac	20 - 30	Edge	1
	F33	2.3 ac	30 - 40	Edge	1
15 - 30 acres	F3	1.2 ac	5 - 10	Edge	1
	F9	2.3 ac	5 – 10	Edge	1
	F26	2.1 ac	10 - 20	Fragment	1
30 – 50 acres	F4	2.7 ac	5 - 10	Edge	2
	F13	3.5 ac	5 - 10	Edge	2
	F15	5.9 ac	10 - 20	Edge	1
50 – 100 acres	F1	3.7 ac	0 - 5	Edge	1
	F8	4.5 ac	5 - 10	Edge	2
	F24	6.9 ac	10 - 20	Fragment	1
	F25	1.0 ac	0 - 5	Fragment	1
100+ acres	F2	3.6 ac	0 - 5	Edge	1
	F20	4.1 ac	0 - 5	Fragment	1
	F23	10.7 ac	5 - 10	Fragment	1

Note: Only impacts 0.5 acres or greater are included in the table.

Based on additional studies and minor refinements to the Preferred Alternative G-Es, it will directly impact a total of 96 acres of forest. Of this, approximately 13 acres are wetland forest and 83 acres are upland forest. No recent evidence of livestock grazing was observed at the majority of the forest impact locations.

The majority of the forest impacts are the Maple-Beech and Elm-Ash-Cottonwood forest types. The Oak-Hickory forest type was also present in some areas. These types are defined by the United States Department of Agriculture Forest Service in *Indiana’s Forests in 1998*. The Maple-Beech type includes forests in which hard maple, beech, American elm, and red maple, singly or in combination, comprise a plurality of the stocking. Species commonly associated with maple-beech forest type in Indiana include white oaks, red oaks, hickories, yellow-poplar, and ash. The Elm-Ash-Cottonwood forest type includes forests in which lowland elm, ash, red maple, silver maple, and cottonwood, singly or in combination, comprise a plurality of the stocking. Species commonly associated with the elm-ash-cottonwood forest type in Indiana include sycamore, yellow-poplar, red oak, and black walnut. The Oak-Hickory forest type includes forests in which upland oaks and hickories, singly or in combination, comprise a plurality of the stocking. Species commonly associated with the oak-hickory type in Indiana include yellow-poplar, ash, black cherry, cottonwood, and black walnut.



Although all forestland, regardless of location on the landscape, can function to protect water quality to some degree, no forests adjacent to lakes and very little riparian forest will be impacted by the project. Most of the streams that will be crossed are channelized ditches in agricultural fields with little to no riparian cover.

Core Forest

Core forest can be directly affected by directly impacting the core area, or by impacting the edge of the forest, which in turn redefines the core area. Impacts to core forest and the number of core forest tracts were estimated for each alternative in order to determine relative impacts to this resource (see Figure 5.9.18).

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,

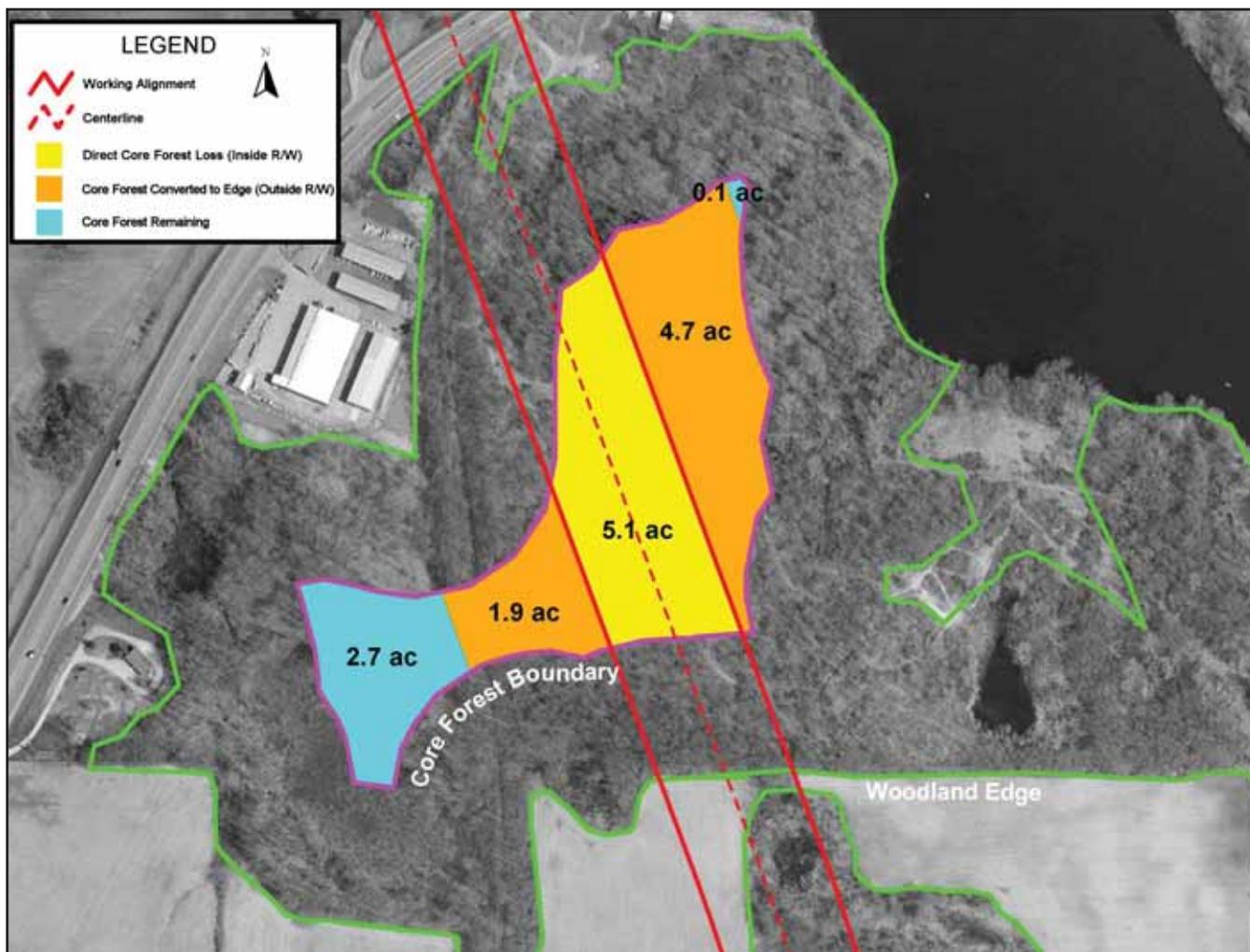


Figure 5.9.18: Diagram Showing: Working Alignment Right-of-Way and Core Forest Directly Impacted.

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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 impacts.

Much of the forest within the study area exists as fragmented woodlots, and core forest is not extremely abundant. Both direct impacts to core forest and the conversion of core forest to edge were calculated. Conversion to edge impacts were greater than direct impacts for all four alternatives. Alternative Cs is estimated to directly impact seven acres (four tracts) and convert 15 acres (eight tracts) to edge, for a total of 22 acres of core forest impacts. Alternative Es is estimated to directly impact six acres (four tracts) and convert ten acres (six tracts) to edge, for a total of 16 acres of core forest impacts. Alternative G-Cs is estimated to directly impact five acres (three tracts) and convert 10 acres (four tracts) to edge, for a total of 15 acres of core forest impacts. Preferred Alternative G-Es had the lowest relative core forest impacts with two acres (two tracts) of direct impacts and six acres (three tracts) converted to edge, for a total of eight 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. The No-Build Alternative will have no impact on this resource.

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 vireescens*), least flycatcher (*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 (*Poliophtila 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 warbler (*Mniotilta varia*), and American redstart (*Setophaga ruticilla*).

Research in this area of study has shown neotropical migrant populations of interior woodland birds are adversely affected by fragmentation of large tracts of forests. These interior birds could 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 5.9.19 shows the acres of shrub/scrub land directly within the working alignment right-of-way. There was little variation between the alternatives in acreages of this habitat type directly impacted. Alternative Cs will impact approximately 38 acres, Alternative Es 46 acres, and Alternative G-Cs 31 acres. Preferred Alternative G-Es will impact approximately 36 acres of shrub/scrub land.

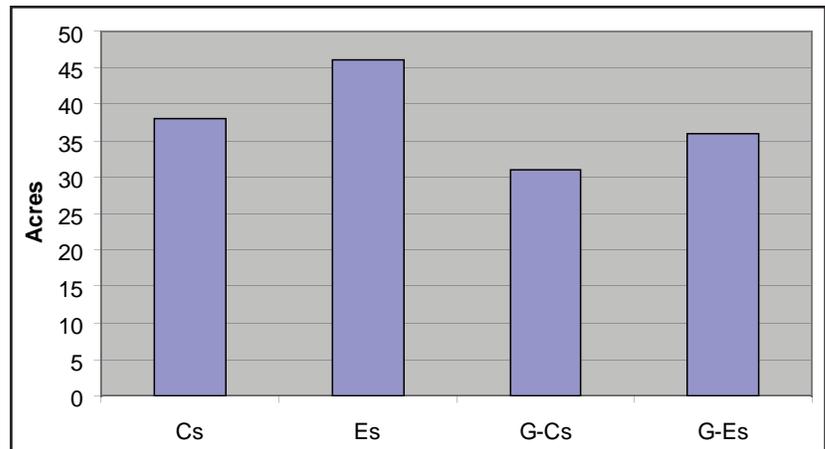


Figure 5.9.19: Shrub/Scrub Land Directly Impacted (acres)

Following the identification of Alternative G-Es as the Preferred Alternative, additional, in-depth studies were performed on the alternative. Included in these additional studies were minor refinements of the local access plan and associated proposed right-of-way requirements and number of relocations. The results of the additional analysis (see Table 3.6.41) showed that Preferred Alternative G-Es has direct land use impacts totaling 37 acres of Scrub/Shrub Land. The No-Build Alternative will have no impact on this resource.

Pasture/Crop/Fallow Land.

Figure 5.9.20 shows the acres of pasture, crop and fallow land directly within the working alignment right-of-way. Alternative G-Cs will impact the most of this habitat type with 575 acres, followed by Preferred Alternative G-Es with 559 acres. Alternative Cs and Es will each impact approximately 455 acres. Additional analysis (see Table 3.6.41) showed that Preferred Alternative G-Es has direct land use impacts totaling 594 acres of Pasture/Crop/Fallow Land. The No-Build Alternative will have no impact on this resource.

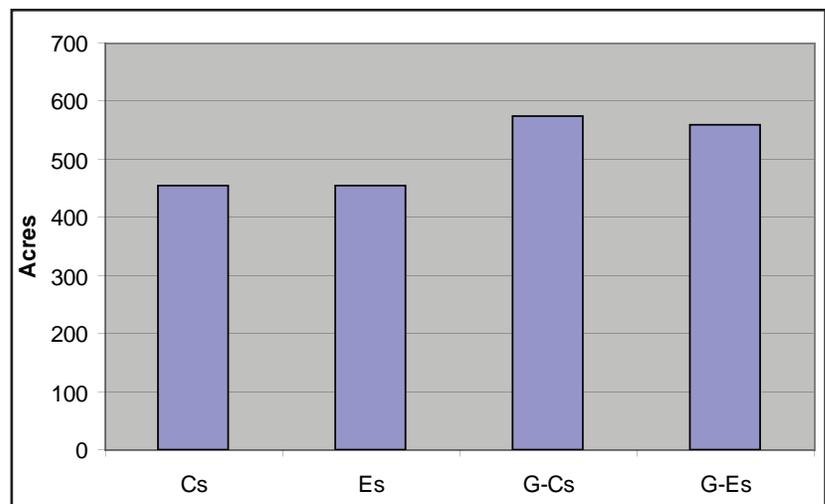


Figure 5.9.20: Pasture/Crop/Fallow Land Directly Impacted (acres)

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. There are federal and state interests in many of these lands in the form of cost-sharing agreements, purchased easements, or property tax reductions. Federal and state funds have been or are being expended on many of these properties. 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 5.9.21 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

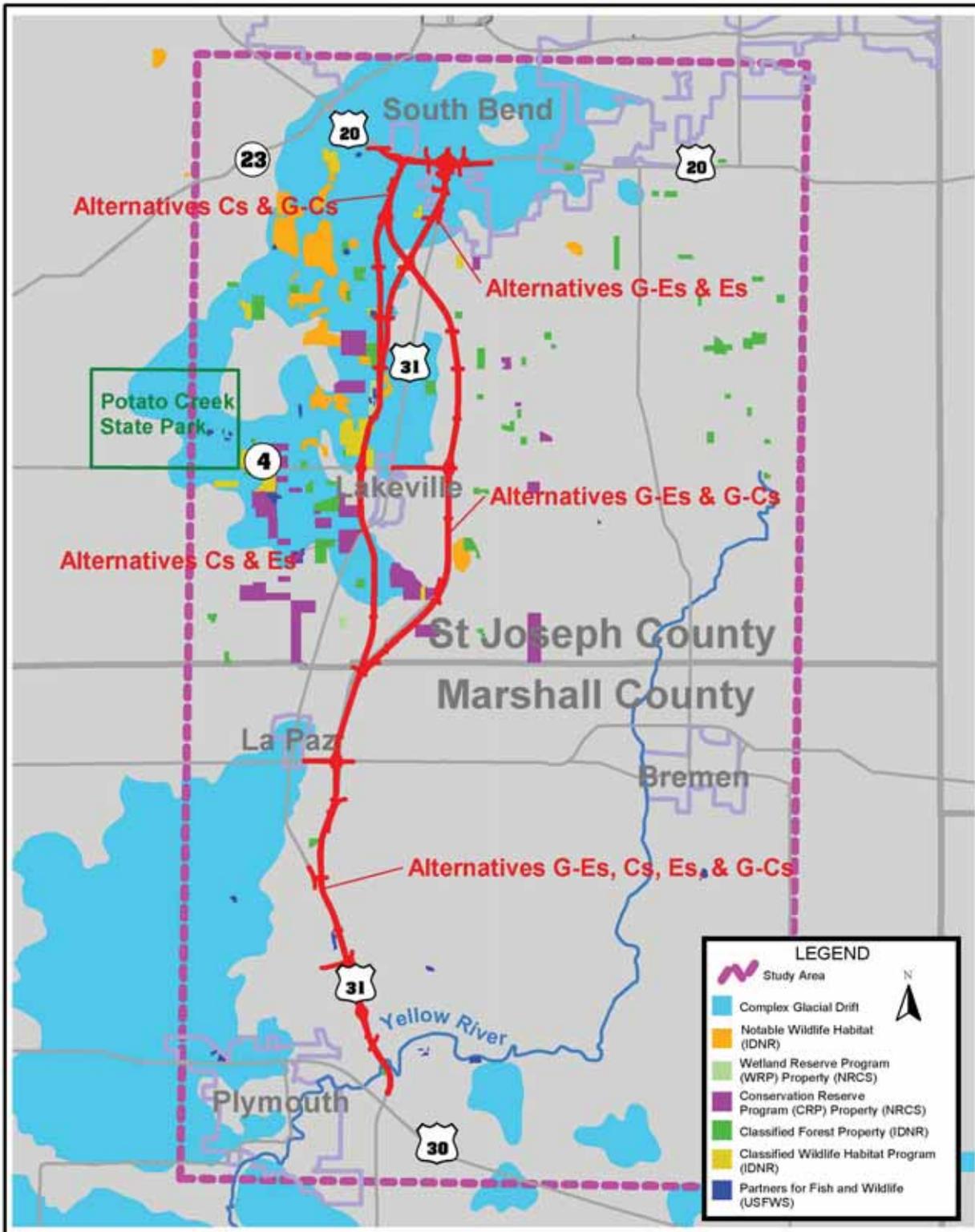


Figure 5.9.21: Designated/Managed Habitat Areas within the Study Area

Data Source: Coordination with IDNR, NRCS, & USFWS



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 5.9.29 shows the number of each of the Designated/Managed areas directly impacted by each alternative. Definitions of these areas are found in Chapter 4.9.4. All properties are privately owned except for Potato Creek State Park and the Swamp Rose Nature Preserve. The No-Build Alternative would have no impact on any of these properties.

Table 5.9.29: Designated/Managed Wildlife Habitat Areas Directly Impacted				
Wildlife Habitat Area*	Alternative			
	Cs	Es	G-Cs	G-Es (Preferred)
Potato Creek State Park & Swamp Rose Nature Preserve	0	0	0	0
Notable Wildlife Habitat (IDNR)	2	1	0	0
Classified Wildlife Habitats (IDNR)	4	3	0	0
Classified Forests (IDNR)	2 - 3	2 - 3	1 - 2	1 - 2
Conservation Reserve Program (CRP) (NRCS)	1	2	2	1
Wetland Reserve Program (WRP) (NRCS)	1	1	0	0
Partners for Fish and Wildlife Program (USFWS)	2	1	0	0

*Refers to entire property and not necessarily the portion enrolled in the program. Source of information shown in parentheses.

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-Cs and Preferred Alternative G-Es would not directly impact any of these high quality areas.

Classified Wildlife Habitats. Alternative Cs will directly impact four Classified Wildlife Habitats, and Alternative 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 (*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-Cs and Preferred Alternative G-Es would not directly impact any Classified Wildlife Habitats.

Classified Forests. Alternatives Cs and Es would directly impact two properties with land enrolled in the Classified Forest Program. Alternative G-Cs and Preferred Alternative G-Es would impact one to two properties with land in this program. These numbers are reported as ranges because one property, located along the Yellow River, just west of the US 31 crossing, could be potentially impacted by all proposed alternatives.

Figure 5.9.22 shows the proposed footprint for Preferred Alternative G-Es (and all other alternatives at this location) and the potential impact to the Classified Forest located along the Yellow River floodplain. The portion of the forest within the proposed footprint did not meet wetland criteria; however, the entire Classified Forest may contain wetland areas. Typical species in this area include: staghorn sumac, crown vetch, common ragweed, false nettle, silver maple, sycamore, honey locust, red maple, poison ivy, American elm, giant ragweed, jewelweed, and box elder.

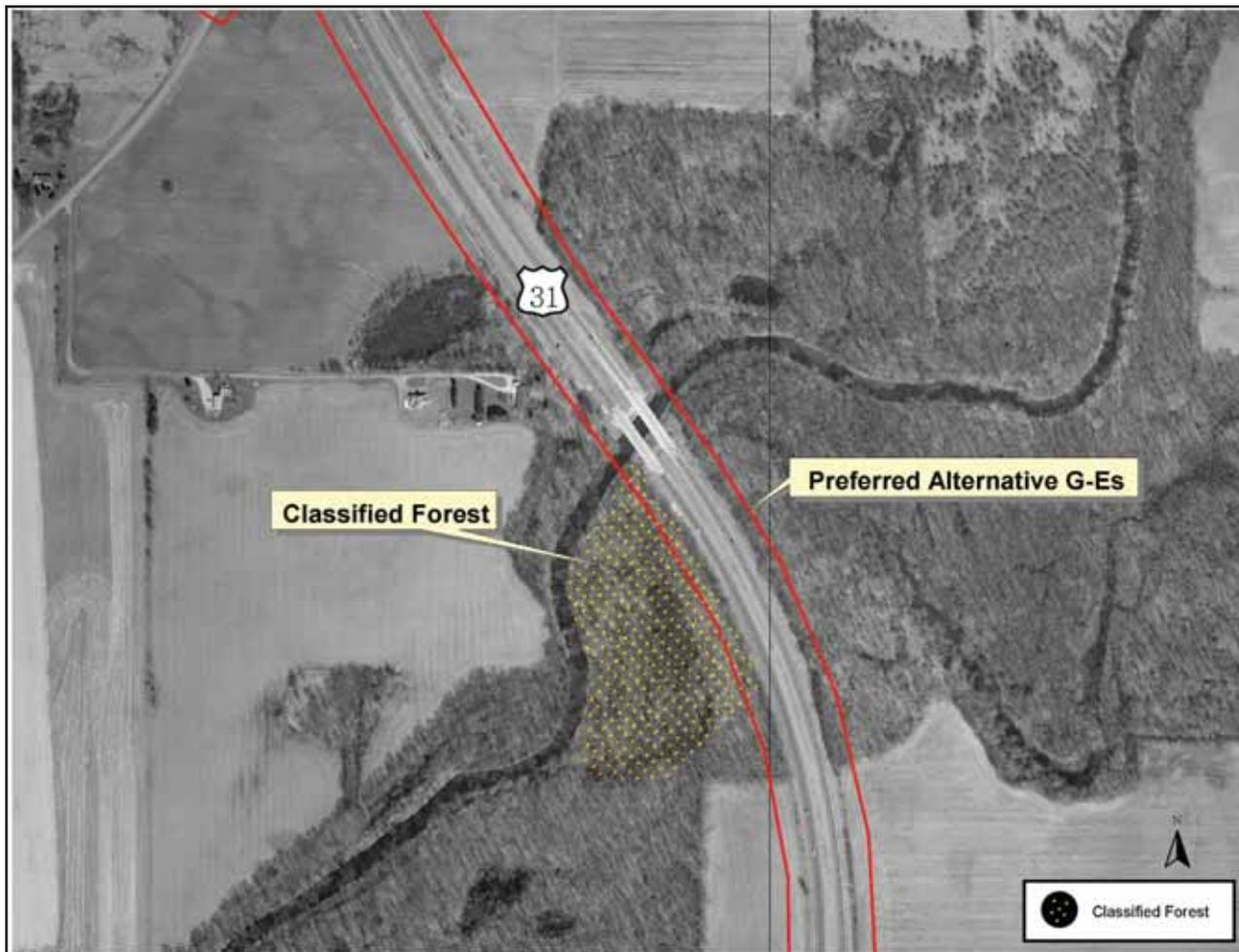


Figure 5.9.22: Classified Forest and Preferred Alternative G-Es Footprint

Note: Classified Forest Boundary is Approximate



The second Classified Forest to be impacted by Preferred Alternative G-Es is located in Marshall County, west of Maple Road. This forest is shown in Figure 5.9.23. This forest, the vicinity of Preferred Alternative G-Es, did not meet wetland criteria. Typical species in this area include: pokeweed, bitternut hickory, garlic mustard, American elm, red maple, shagbark hickory, blackberry, raspberry, sweet woodreed, goldenrod, multiflora rose, greenbrier, black cherry, pin oak, hackberry, sassafras, red oak, and sensitive fern. The area included trees up to 20" diameter breast high (dbh), shrubs, and herbaceous cover. Herbaceous cover ranged from 30-40%.



Figure 5.9.23: Classified Forest and Preferred Alternative G-Es Footprint

Caption: Note: Classified Forest Boundary is Approximate

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-Cs would each impact two properties. Preferred Alternative G-Es will impact one CRP property and no WRP property. A CRP and WRP property impacted by Alternatives Cs and Es also includes 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. Alternatives Es and G-Cs would impact a CRP property located just north of Roosevelt Road. The location for the second CRP land impacted by Alternative G-Cs and Preferred Alternative G-Es is north of Rockstroh Road and is south of Riddles Lake.

Figure 5.9.24 shows the proposed footprint for Preferred Alternative G-Es and the potential impact to the CRP located just north of Rockstroh Road. This area did not meet wetland criteria. The main line of Preferred Alternative G-Es and the proposed cul-de-sac of Rockstroh Road would directly impact the southeast corner of the CRP tree planting. The trees were planted in 1988, and were reoffered at the end of their contract and reaccepted into the program. Walnuts, oaks, tulips, pines, and possibly maples were originally planted.

USFWS Partners for Fish and Wildlife Program. 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. Alternative G-Cs and Preferred Alternative G-Es will not impact any USFWS Partners for Fish and Wildlife Program properties.

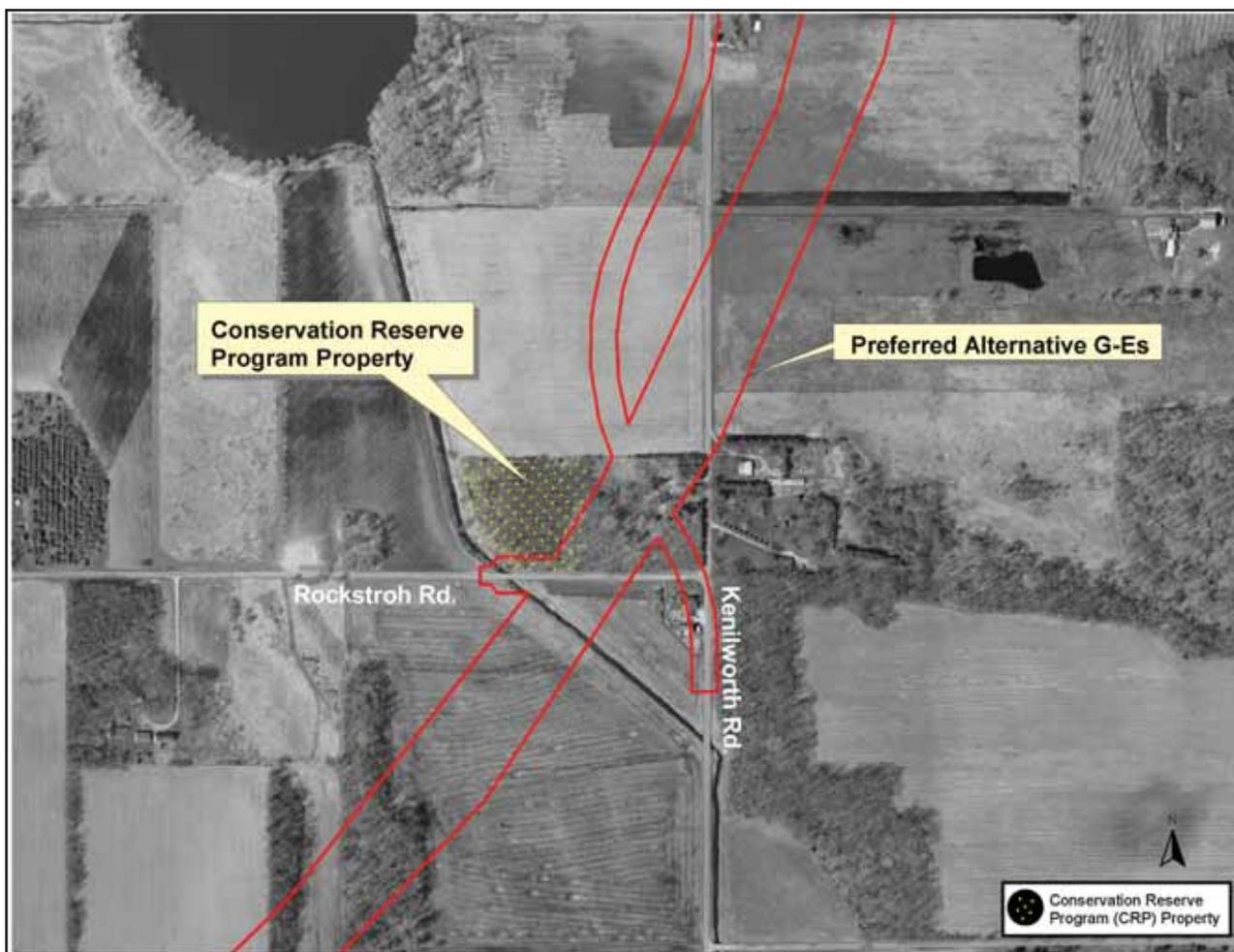


Figure 5.9.24: Conservation Reserve Program (CRP) Property and Preferred Alternative G-Es Footprint

Caption: Note: CRP Boundary is Approximate

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 four 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.



Small Animal Trapping

Mammals occurring within the study area were determined through both direct and indirect passive observation during pedestrian reconnaissance and through an active trapping investigation. Passive observations of medium (e.g., rabbit, squirrel, fox, etc.) and large mammals (i.e., deer) were documented throughout all field exercises. Trapping for small mammals (e.g., mice, voles, shrews, etc.) was conducted over the course of two nights (October 26-27, 2004) at nine locations within the study area. Trapping locations were focused near Preferred Alternative G-Es. All collections were conducted under the authority of an IDNR Scientific Collectors License issued to Rusty Yeager effective till December 31, 2004.

Collectively, 61 Sherman live capture box traps and 31 pitfall traps were distributed at nine locations sites within the study area. The eight box traps and five pitfall traps at Site #7 were part of a drift fence array within a wetland woods north of Pierce Road. The drift fences consisted of a black garden-bedding fabric stretched between ¾" PVC pipes used for stakes. The array was comprised of four wings arranged in an "X" pattern with a pitfall trap at the end of each wing and a fifth located where the wings meet in the middle. Pitfall traps for the drift fence site were large 5-gallon buckets buried level with the ground. One box trap was set along both side of each wing, midway along the wing. Traps at the remaining eight sites were randomly distributed based on available habitat features. Forty-six box traps and 24 pitfall traps were set on October 26, 2004 and checked for two consecutive days at Sites #1 through #7. The remaining 15 box traps and 7 pitfall traps were set on October 27, 2004 for a single night of collection at Sites #8 and #9. Collectively, the survey included 162 trap-nights (107 box trap, 55 pitfall).

The box traps (3"x3.5"x9", 3"x3"x10", 3"x3"x13") were baited with peanut butter and whole oats, and typically placed along downed branches and logs, drainage channels, or within potential herbaceous run corridors. Pitfall traps, except those at the drift fence array, were fabricated from 4" diameter PVC pipe cut to a length of 12 inches. Each pitfall was buried in the ground at the end or along a fallen tree or branch thus creating a natural drift fence for voles and shrews. Pitfalls were also baited with peanut butter and whole oats.

Traps were checked each morning and data was collected for each trap documenting if it was not triggered, triggered but empty, disturbed, or occupied. Data for each capture included: species, gender and disposition (dead, collected and vouchered, released).

The general habitat for each of the trap sites is as follows:

1. Wetland woods and adjacent reed canary grass wetland west of Maple Road and north of 4A Road. Eight box traps and four pitfall traps distributed in four groupings at the site.
2. Eastern edge of a level drained woods located west of Maple Road south of 3B Road. Four box traps and two pitfall traps distributed in tow groupings at the site.
3. Near eastern edge of open woods surrounded by row crops. North and east of Mangun Arm of Lehman Ditch and north of 1st Road. Eight box traps and four pitfall traps distributed in four groupings at the site.
4. Site included trapping within an open upland woods, an adjacent young wetland woods and a wet scrub habitat east of Linden Road. Four box traps and two pitfall traps were set in the upland woods. One group of two box traps and one pitfall were set in each of the wetland woods and scrub habitat.
5. Upland woods north of Rockstroh Road and west of Kenilworth Road. Four box traps and two pitfalls were set in two groupings.
6. Open upland woods with slight relief between Christmas tree farm and row crop field north of Lake Trail Road. Six box traps and three pitfalls were set in three groupings.



7. The drift fence array was located in a wetland woods east of Kenilworth and north of Pierce Road. The array included eight box traps and five pitfalls.
8. This is the same general location as Site #7, but with traps distributed elsewhere in the wetland woods as well as a reed canary grass wetland and wooded area south of a Bunch Ditch tributary. Four box traps and two pitfall traps were set in two groupings within the woods (one near the south edge, one near the north edge). Two box traps and one pitfall were set in the reed canary grass with the remaining two box traps and pitfall set in a wooded habitat south of the tributary creek.
9. This site included sampling within two habitats. Four box traps and two pitfalls were set in two groups within an open upland woods located west of US31 and roughly midway between Roosevelt Road and Kern Road. Four box traps and one pitfall were randomly set within or near small clusters of trees and/or shrubs in an abandoned pasture south of the aforementioned woods.

Table 5.9.30 lists the number of individuals and species collected at each trapping location. A total of 41 individuals representing four species were captured. White-footed mice (*Peromyscus leucopus*) were the most common species captured with 32 individuals. Other species included the short-tailed shrew (*Blarina brevicauda*) with six individuals, southeastern shrew (*Sorex longirostris*) with one individual, and eastern chipmunk (*Tamias striatus*) with 2 individuals. None of these species are listed as federally or state endangered, threatened, special concern, or rare.

No.	Trap Distribution			Subtotals	Trap Success Rate	
		Oct. 26	Oct. 27		capture:effort	
1	8 box	<i>P. leucopus</i> 1 <i>B. brevicauda</i> 2 <i>T. striatus</i> 1	<i>P. leucopus</i> 1 <i>B. brevicauda</i> 2	<i>P. leucopus</i> 2 <i>B. brevicauda</i> 4 <i>T. striatus</i> 1	box:	7:16 44%
	4 pitfall				pit:	0:8 0%
2	4 box	<i>P. leucopus</i> 2 <i>T. striatus</i> 1	<i>P. leucopus</i> 3	<i>P. leucopus</i> 5 <i>T. striatus</i> 1	box:	6:8 75%
	2 pitfall				pit:	0:4 0%
3	8 box	<i>P. leucopus</i> 5	<i>P. leucopus</i> 4 <i>B. brevicauda</i> 1	<i>P. leucopus</i> 9 <i>B. brevicauda</i> 1	box:	10:16 63%
	4 pitfall				pit:	0:8 0%
4	8 box	<i>P. leucopus</i> 4	<i>P. leucopus</i> 4	<i>P. leucopus</i> 8	box:	8:16 50%
	4 pitfall		<i>B. brevicauda</i> 1	<i>B. brevicauda</i> 1	pit:	1:8 13%
5	4 box		<i>P. leucopus</i> 2	<i>P. leucopus</i> 2	box:	2:8 25%
	2 pitfall				pit:	0:2 0%
6	6 box	<i>P. leucopus</i> 1	<i>P. leucopus</i> 1	<i>P. leucopus</i> 2	box:	2:12 17%
	3 pitfall				pit:	0:4 0%



No.	Trap Distribution	Oct. 26	Oct. 27	Subtotals	Trap Success Rate	
					capture	effort
7	8 box				box: 0:12	0%
	5 pitfall				pit: 0:5	0%
8	8 box	no traps set	<i>P. leucopus</i> 1	<i>P. leucopus</i> 1	box: 1:8	13%
	4 pitfall	no traps set	<i>S. longirostris</i> 1	<i>S. longirostris</i> 1	pit: 1:4	25%
9	7 box	no traps set	<i>P. leucopus</i> 3	<i>P. leucopus</i> 3	box: 3:7	43%
	3 pitfall	no traps set			pit: 0:3	0%
				Totals	<i>P. leucopus</i> 32 <i>B. brevicauda</i> 6 <i>S. longirostris</i> 1 <i>T. striatus</i> 2	box: 39:107 36% pit: 2:55 4%
Overall Trap Success Rate					41:162	25%

P. leucopus = *Peromyscus leucopus* (white-footed mouse)
B. brevicauda = *Blarina brevicauda* (short-tailed shrew)
S. longirostris = *Sorex longirostris* (southeastern shrew)
T. striatus = *Tamias striatus* (eastern chipmunk)

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 four build 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 four build alternatives. No federal or state threatened or endangered species, or evidence of any threatened or endangered species, were observed during field investigations. No critical habitat is present in the study area, thus critical habitat will not be impacted by the proposed project.

Figure 5.9.25 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-Cs and Preferred Alternative G-Es avoid it except for the northern portion of the Alternatives.

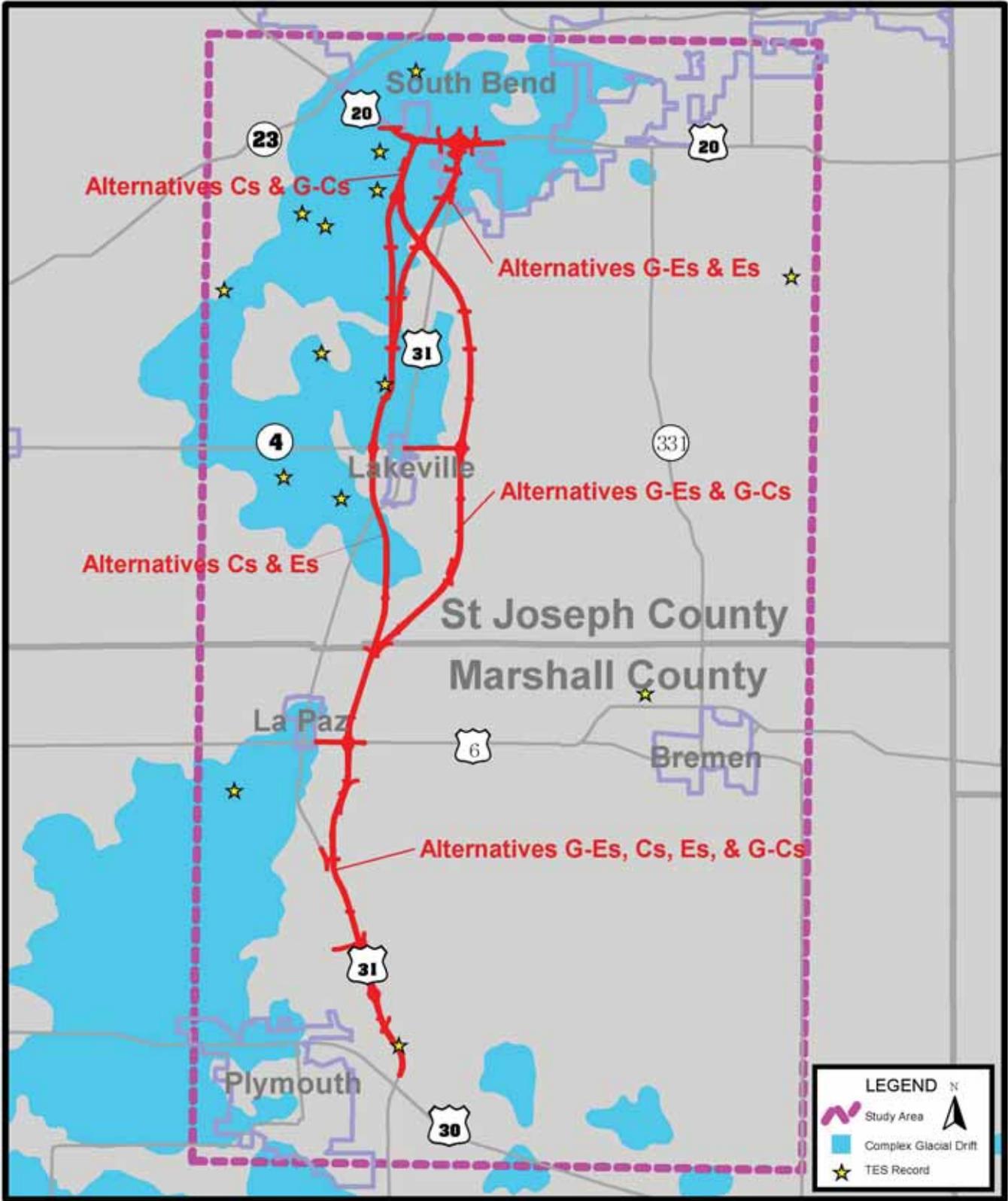


Figure 5.9.25: Recent (1980+) TES Records in the US 31 Study Area



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-Cs and Preferred Alternative G-Es avoid it.

Detailed field investigations were conducted for Preferred Alternative G-Es. Such investigations included 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), visual surveys for birds, and ground surveys for habitat for the star-nosed mole, bobcat, and American badger. No federal or state threatened or endangered species, or evidence of any threatened or endangered species, were observed during field investigations. Bat mist netting is discussed in the following discussion on the Indiana bat. Seining for aquatic organisms is discussed in Chapter 5.10, Water Resources. Small animal trapping is discussed in the preceding section, 5.9.4, Terrestrial Wildlife and Habitat.

The No-Build Alternative will have no impact on the habitat of Threatened and Endangered Species.

Federally Listed 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.

The northern population, possibly a relict of the more expansive southern population, consists of just eight local clusters from southern Michigan, northwestern Ohio, and northeastern Indiana. The southern population is comprised of 36 local clusters; five in southeastern Illinois, thirteen in southwestern Indiana, and eighteen in western Kentucky. These clusters consist of snakes within connected or nearly connected habitat units which are able to interbreed because of this proximity. Because the northern and southern populations meet the criteria of discreteness, significance, and conservation status outlined in the USFWS Policy Regarding the Recognition of Distinct Vertebrate Population Segments under the Endangered Species Act (ESA), the USFWS recognizes two distinct population segments for the species. In so doing, this enabled the USFWS to treat each population segment



Figure 5.9.26: Northern Copperbelly Water Snake

Photo Credit: B. Kingsbury



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.

In its comment letter on the DEIS, the USFWS agrees that the proposed project is not likely to adversely affect the northern copperbelly.

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.

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



Figure 5.9.27: Bald Eagle

Photo Credit: Roberts W. French Jr.



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.

In their comment letter on the DEIS, the USFWS agrees that the proposed project is not likely to adversely affect the bald eagle.

Mammals

Indiana Bat (*Myotis sodalis*)

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 hibernacula 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).



Figure 5.9.28: Indiana bat

Photo Credit: Rich Fields



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. The Indiana bat is a facultative wetland species, stenotypic specialist, and carnivore specialist.

Bat mist netting surveys were conducted in July 2004 for the US 31 study area. Mist netting involved stretching large nets across a stream or other flyway between aluminum telescoping poles. Bats are captured in the nets, the species, sex and reproductive status identified, then released. Four sites were netted for two nights each. Three of the four sites were east of existing US 31 in the vicinity of Preferred Alternative G-Es. The fourth site was west of existing US 31. Nets were generally monitored from dusk to 12:00 a.m. Bat detectors were used constantly to monitor bat activity in the vicinity of the nets. This allowed for a determination of usage of the areas by bats, and also gave an assessment of how well the nets were working at a particular site. Few calls on the detector (<30 – 40) indicated little use of the site by bats. Numerous calls on the detector, but no bats in the net indicated that the net should be repositioned.

No Indiana bats were captured at any of the mist netting sites. A total of 22 big brown bats (*Eptesicus fuscus*) and three red bats (*Lasiurus borealis*) were captured at Sites 2 and 4. No bats were captured at Sites 1 and 3. The results of the mist netting survey can be found in Appendix O.

FHWA acknowledges the absence of Indiana bats during mist netting surveys does not rule out their presence. Therefore, to avoid any direct take of Indiana bats, no trees with a diameter of three (3) or more inches will be removed between 15 April and 15 September. Tree clearing and snag removal will be kept to a minimum and limited to within the construction limits. If INDOT proposes to cut trees during the prohibited time, INDOT and FHWA must consult with the USFWS before any tree cutting may proceed. FHWA has determined that this project is not likely to adversely affect the Indiana bat, given the absence of the species during the mist net surveys and tree clearing restrictions committed to in the FEIS and ROD that will be implemented during construction. In a letter dated June 16, 2005, the USFWS agreed with the FHWA determination that the US 31 Plymouth to South Bend project is not likely to adversely affect the Indiana bat given the absence of bats and tree cutting restrictions. In their letter, the USFWS states,

“This precludes the need for further consultation on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. However, should new information arise pertaining to the project plans or a revised species list be published, it will be necessary for the Federal agency to reinstate consultation.”

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 5.9.29: 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 Lymnaea (*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 individuals 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 5.9.30: 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 approximately 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-Cs 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.

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 have and 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.

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.



Figure 5.9.31: Blanchard's Cricket Frog

Photo Credit: B. Kingsbury



Figure 5.9.32: Blue-spotted Salamander

Photo Credit: B. Kingsbury



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. All efforts have and will be made to avoid and minimize potential impacts to this species by locating the Final Preferred Alternative outside their preferred habitat. The blue-spotted salamander is a facultative wetland species, landscape dependent, and a carnivore generalist.

Reptiles

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. This snake is also a **State Endangered** species

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).



Figure 5.9.33: Eastern Massasauga Rattlesnake

Photo Credit: G.J. Lipps, Jr.

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 led 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. These snakes are typically not aggressive, and bites are extremely rare resulting often only when the snake is picked up or stepped on.

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. However, during field investigations for this project, many property owners were contacted in order to get permission to work on their property. Many conversations lead to additional information about the project area. In one such conversation, a property owner described a species matching the description of the eastern massasauga observed in a small woodlot south of Pierce Road. The species was described as a rattlesnake that is reoccurring in the area during the spring. The proposed interchange at Pierce Road would directly take this area. 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.

In their comment letter on the DEIS, the USFWS agrees that the proposed project is not likely to adversely affect the eastern massasauga.

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).

Spotted 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.

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. It 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 led to the decline of this snake's numbers. Most populations are now isolated in small areas of suitable habitat (IPFW, 2003).



Figure 5.9.34: Spotted Turtle

Photo Credit: B. Kingsbury

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.

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.

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 are major reasons 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 have been 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



Figure 5.9.35: Kirtland's Snake

Photo Credit: Ohio Public Library Information Network



Figure 5.9.36: Blanding's Turtle

Photo Credit: C. Barlow

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 fourth scale rows, unlike other garter snakes (IPFW, 2003).

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 led 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 **state 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.

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



Figure 5.9.37: Butler's Garter Snake

Photo Credit: G.J. Lipps Jr., The Center for Reptile and Amphibian Conservation and Management



Figure 5.9.38: Great Egret

Photo Credit: Jim & Mildred Clark, Refuge Reporter



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).

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 low since little suitable habitat was observed in the Preferred Alternative. The American bittern is an obligate wetland species, landscape dependent, carnivore generalist, and breeding season resident/neotropical migrant.



Figure 5.9.39: American Bittern

Photo Credit: www.SaltGrassFlats.com

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.

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.



Figure 5.9.40: Brown Creeper

Photo Credit: Lewis Agassiz Fuertes

Black Tern (*Chidonias niger*)

The **black tern (*Chidonias 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.

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).



Figure 5.9.41: Black Tern

Photo Credit: Barbara Simpson

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.

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

According to 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.

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



Figure 5.9.42: Adult Male Northern Harrier

Photo Credit: George Jameson, USGS



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 low since little suitable preferred habitat was found in the Preferred Alternative. 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 special concern** species reported within the study area. Sandhill cranes are tall birds with a relatively heavy body. Adults average 3.5 feet tall, and can weigh between 7 – 12 pounds. These birds have a wingspan of 6 to 7 feet.

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 nests have 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.

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.

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



Figure 5.9.43: Sandhill Crane

Photo Credit: Dorothy Hilary

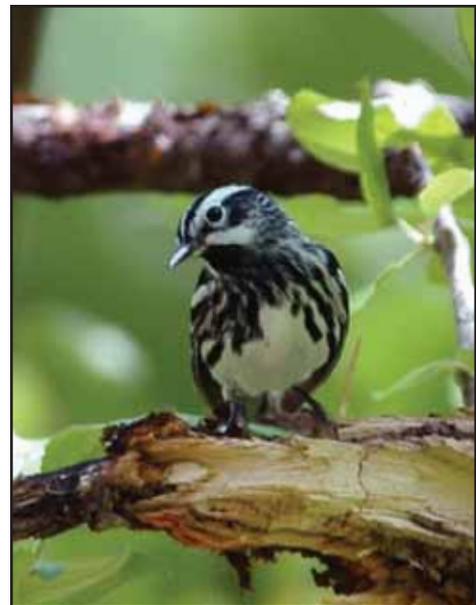


Figure 5.9.44: Black-and-White Warbler

Photo Credit: Greg Prelich



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).

Butler (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.

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 black-and-white warbler is sensitive to forest fragmentation. A study by Robbins, Dawson, and Dowell titled “Habitat Area Requirements of Breeding Forest Birds of the Middle Atlantic States” investigated the relationship between forest area and the probability of occurrence for individual bird species. The study found that certain species, including the black-and-white warbler, were only found in larger forest tracts. The study found that the probability of occurrence for this species was only 50% in forests 544 acres (220 hectares) in size. The study found that the species seems to be dependent on large tracts of forest interior during the breeding season, and no number of small isolated tracts can take the place of this requirement. Preferred Alternative G-Es will only impact three forest tracts larger than 100 acres in size. The impacts to these three tracts range from four acres to 11 acres. Impacts to the black-and-white warbler are not expected to be significant because of the size of the forest tracts present in the area.

The black-and-white warbler 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.

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. 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 low since little suitable habitat was found in Preferred Alternative G-Es. 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



Figure 5.9.45: Virginia Rail

Photo Credit: Marcus Martin, USGS

inches in length with a pointed black bill.

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.

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.



Figure 5.9.46: Yellow-headed Blackbird

Photo Credit: George Jameson, USGS

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).

Star-nosed 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. All efforts have and will be made to avoid and minimize potential impacts to this species by locating the Final Preferred Alternative outside their preferred habitat. The star-nosed mole is an obligate wetland species, a stenotypic specialist, and a carnivore generalist.



Figure 5.9.47: Star-nosed Mole

Photo Credit: Kenneth Catania



Bobcat (*Lynx rufus*)

The **bobcat (*Lynx rufus*)** is a **state special concern 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.

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.



Figure 5.9.48: Bobcat
Photo Credit: Big Cats Online

American Badger (*Taxidea taxus*)

The **American badger (*Taxidea taxus*)** is a **state special concern 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.

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.



Figure 5.9.49: American Badger
Photo Credit: NatureWorks



Plants

Herb-Robert (*Geranium robertianum*)

Herb-robot (*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 5.9.50: Herb Robert

Photo Credit: Washington State Noxious Weed Control Board

Summary of Preferred Alternative G-Es

The Preferred Alternative is within the Northern Moraine and Lake physiographic region and the Northern Lakes natural region. There are no apparent caves, sinkholes, coal mines, or oil or gas wells, impacted by the Preferred Alternative. 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 preferred alternative.

Preferred Alternative G-Es had the lowest relative forest impacts compared to the other alternatives with approximately 91 acres. Of this, approximately 13 acres are wetland forest and 79 acres are upland forest. 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. Preferred Alternative G-Es is expected to split 10 tracts of forest. 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. Preferred Alternative G-Es had the lowest relative core forest impacts with two acres (two tracts) of direct impacts and six acres (three tracts) of indirect impacts, for a total of eight 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.

Preferred Alternative G-Es will also impact approximately 36 acres of shrub/scrub land and 559 acres of pasture, crop and fallow land.

In addition to general types of wildlife habitat, some areas have been identified by state agencies or managed such that they provide wildlife habitat. There are federal and state interests in many of these lands in the form of cost-sharing agreements, purchased easements, or property tax reductions. Preferred Alternative G-Es will impact one to two Indiana Department of Natural Resources Classified Forests and one Natural Resource Conservation Service Conservation Reserve Program tree planting property. One of the Classified Forests is located at the edge of the existing US 31 highway, and may not be impacted if additional right-of-way is not necessary.

Mammals occurring within the study area were determined through both direct and indirect passive observation during pedestrian reconnaissance and through an active trapping investigation. Passive observations of medium (e.g. rabbit, squirrel, fox, etc.) and large mammals (i.e. deer) were documented throughout all field exercises. Trapping for small mammals for Preferred Alternative G-Es resulted in a total of 41 individuals representing four species



were captured. These species included white-footed mice (*Peromyscus leucopus*), short-tailed shrew (*Blarina brevicauda*), southeastern shrew (*Sorex longirostris*), and eastern chipmunk (*Tamias striatus*). None of these species is listed as federally or state endangered, threatened, special concern, or rare.

No federal or state threatened or endangered species, or evidence of any threatened or endangered species, were observed during field investigations. Four federally threatened, endangered, or candidate species were originally considered. These species were the federally endangered Indiana bat (*Myotis sodalis*), federally threatened copperbelly water snake (*Nerodia erythrogaster neglecta*), federally threatened bald eagle (*Haliaeetus leucocephalus*), and the federal candidate Eastern massasauga rattlesnake (*Sistrurus catenatus catenatus*). In their comment letter on the DEIS, the USFWS stated “the FWS agrees that the proposed project is not likely to adversely affect the bald eagle, northern copperbelly, or eastern massasauga. However, the presence or absence of the Indiana bat within the project area is not currently known. The DEIS indicates that surveys for the Indiana bat will be conducted in 2004 after the preferred alternative is selected.”

Bat mist netting surveys were conducted in July 2004 for the US 31 study area. Mist netting sites were in the vicinity of Preferred Alternative G-Es. No Indiana bats were captured at any of the mist netting sites. A total of 22 big brown bats (*Eptesicus fuscus*) and three red bats (*Lasiurus borealis*) were captured at Sites 2 and 4. No bats were captured at Sites 1 and 3.

FHWA has determined that this project is not likely to adversely affect the Indiana bat or its critical habitat, given the absence of the species during the mist net surveys and tree clearing restrictions committed to in the FEIS and ROD that will be implemented during construction. In a letter dated June 16, 2005, the USFWS agreed with the FHWA determination that the US 31 Plymouth to South Bend project is not likely to adversely affect the Indiana bat given the absence of bats and tree cutting restrictions. In their letter, the USFWS states, “This precludes the need for further consultation on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. However, should new information arise pertaining to the project plans or a revised species list be published, it will be necessary for the Federal agency to reinitiate consultation.”

No state listed threatened, endangered, rare, or special concern species were observed in the vicinity of Preferred Alternative G-Es.



5.10 Water Resources

Water resource impacts were evaluated by reviewing information from a number of sources and by conducting field surveys. 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 the St. Joseph River watershed. The Yellow River is crossed by all of the alternatives along the existing alignment of US 31. It is possible that US 31 may need to be widened in this area and the existing bridge replaced. If this occurs, impacts to the Yellow River are expected to be minimal. All of the streams crossed by each of the alternatives are reported in Tables 5.10.31 through 5.10.34.

Stream Name	Watershed	OHWL Width (ft)	Length (ft)	Area (ft ²)	Area (acres)
Elmer Seltenright Ditch	Kankakee	22.0	318	6996	0.16
Unnamed Ditch*	Kankakee	4.0	360	1440	0.03
Elmer Seltenright Ditch	Kankakee	20.0	587	11,740	0.27
Unnamed Trib of Lehman Ditch*	Kankakee	6.0	459	2754	0.06
Lehman Ditch	Kankakee	14.0	362	5068	0.12
Mangun Arm of Lehman Ditch	Kankakee	9.0	309	2781	0.06
Unnamed Trib of Lehman Ditch	Kankakee	8.0	333	2664	0.06
Unnamed Trib of Riddles Lake*	Kankakee	10.0	1202	12,020	0.28
Unnamed Trib of Heston Ditch	Kankakee	10.0	907	9070	0.21
Heston Ditch	Kankakee	7.0	380	2660	0.06
Ditch (Dennis Schaeffer)	Kankakee	9.0	149	1341	0.03
Unnamed Trib of Shidler-Hoffman Ditch	Kankakee	2.0	338	676	0.02
Auten Ditch*	St. Joseph	3.0	501	1503	0.03
Unnamed Trib of Auten Ditch	St. Joseph	7.0	325	2275	0.05
Auten Ditch	St. Joseph	8.0	323	2584	0.06



Table 5.10.31: Alternative Cs (Estimated Stream Impacts) (Continued)

Stream Name	Watershed	OHWM Width (ft)	Length (ft)	Area (ft ²)	Area (acres)
Unnamed Trib of Philips Ditch*	St. Joseph	5.0	1822	9110	0.21
Philips Ditch*	St. Joseph	8.0	1280	10240	0.24
Auten Ditch	St. Joseph	8.0	156	1248	0.03
Totals:			10,111	86,170	1.98

Source: Bernardin-Lochmueller & Associates, Inc. (2004)

Note: * Denotes a possible ditch rechannelization.

Table 5.10.32: Alternative Es (Estimated Stream Impacts)

Stream Name	Watershed	OHWM Width (ft)	Length (ft)	Area (ft ²)	Area (acres)
Elmer Seltenright Ditch	Kankakee	22.0	318	6996	0.16
Unnamed Ditch*	Kankakee	4.0	360	1440	0.03
Elmer Seltenright Ditch	Kankakee	20.0	587	11,740	0.27
Unnamed Trib of Lehman Ditch*	Kankakee	6.0	459	2754	0.06
Lehman Ditch	Kankakee	14.0	362	5068	0.12
Mangun Arm of Lehman Ditch	Kankakee	9.0	309	2781	0.06
Unnamed Trib of Lehman Ditch	Kankakee	8.0	333	2664	0.06
Unnamed Trib of Riddles Lake*	Kankakee	10.0	1202	12,020	0.28
Unnamed Trib of Heston Ditch	Kankakee	10.0	907	9070	0.21
Heston Ditch	Kankakee	7.0	380	2660	0.06
Ditch (Dennis Schaeffer)	Kankakee	9.0	149	1341	0.03
Unnamed Trib of Shidler-Hoffman Ditch	Kankakee	2.0	338	676	0.02
Auten Ditch	Kankakee	3.0	116	348	0.01
Unnamed Trib of Auten Ditch	St. Joseph	2.5	302	755	0.02
Unnamed Trib of Auten Ditch	St. Joseph	6.0	303	1818	0.04
Unnamed Trib of Auten Ditch	St. Joseph	3.0	331	993	0.02
Unnamed Trib of Auten Ditch	St. Joseph	5.0	335	1675	0.04
Philips Ditch	St. Joseph	10.0	355	3550	0.08
Philips Ditch*	St. Joseph	12.0	1520	18240	0.42
Totals:			8,966	86,589	1.99

Source: Bernardin-Lochmueller & Associates, Inc. (2004)

Note: * Denotes a possible ditch rechannelization.



Stream Name	Watershed	OHWL Width (ft)	Length (ft)	Area (ft ²)	Area (acres)
Elmer Seltenright Ditch	Kankakee	22.0	318	6996	0.16
Unnamed Ditch*	Kankakee	4.0	360	1440	0.03
Elmer Seltenright Ditch	Kankakee	20.0	587	11,740	0.27
Unnamed Trib of Lehman Ditch*	Kankakee	6.0	459	2754	0.06
Lehman Ditch	Kankakee	14.0	362	5068	0.12
Mangun Arm of Lehman Ditch	Kankakee	9.0	309	2781	0.06
Unnamed Trib of Lehman Ditch	Kankakee	8.0	319	2552	0.06
Unnamed Ditch	Kankakee	3.0	425	1275	0.03
Unnamed Trib of Lehman Ditch	Kankakee	4.0	405	1620	0.04
Heston Ditch	Kankakee	16.0	366	5856	0.13
Shidler-Hoffman Ditch	Kankakee	13.0	531	6903	0.16
Unnamed Trib of Bunch Ditch (East Branch)	Kankakee	15.0	308	4620	0.11
Bunch Ditch	Kankakee	15.0	118	1770	0.04
Unnamed Ditch*	St. Joseph	6.0	393	2358	0.05
Unnamed Ditch*	St. Joseph	4.0	533	2132	0.05
Unnamed Trib of Philips Ditch*	St. Joseph	5.0	92	460	0.01
Philips Ditch*	St. Joseph	8.0	1280	10240	0.24
Auten Ditch	St. Joseph	8.0	156	1248	0.03
Totals:			7,321	71,813	1.65

Source: Bernardin-Lochmueller & Associates, Inc. (2004)
 Note: * Denotes a possible ditch rechannelization.

Stream Name	Watershed	OHWL Width (ft)	Length (ft)	Area (ft ²)	Area (acres)
Elmer Seltenright Ditch	Kankakee	22.0	318	6996	0.16
Unnamed Ditch*	Kankakee	4.0	360	1440	0.03
Elmer Seltenright Ditch	Kankakee	20.0	587	11,740	0.27
Unnamed Trib of Lehman Ditch*	Kankakee	6.0	459	2754	0.06



Table 5.10.34: Preferred Alternative G-Es (Estimated Stream Impacts) (Continued)

Stream Name	Watershed	OHWL Width (ft)	Length (ft)	Area (ft ²)	Area (acres)
Lehman Ditch	Kankakee	14.0	362	5068	0.12
Mangun Arm of Lehman Ditch	Kankakee	9.0	309	2781	0.06
Unnamed Trib of Lehman Ditch	Kankakee	8.0	319	2552	0.06
Unnamed Ditch	Kankakee	3.0	425	1275	0.03
Unnamed Trib of Lehman Ditch	Kankakee	4.0	405	1620	0.04
Heston Ditch	Kankakee	16.0	366	5856	0.13
Shidler-Hoffman Ditch	Kankakee	13.0	531	6903	0.16
Unnamed Trib of Bunch Ditch (East Branch)	Kankakee	15.0	308	4620	0.11
Bunch Ditch	Kankakee	15.0	118	1770	0.04
Unnamed Ditch*	St. Joseph	6.0	393	2358	0.05
Unnamed Ditch*	St. Joseph	4.0	533	2132	0.05
Philips Ditch	St. Joseph	10.0	355	3550	0.08
Philips Ditch*	St. Joseph	12.0	1520	18240	0.42
Totals:			7,668	81,655	1.87

Source: Bernardin-Lochmueller & Associates, Inc. (2004)

Note: * Denotes a possible ditch rechannelization.

Tables 5.10.31 to 5.10.34 identify estimated stream impact lengths from 7,321 to 10,111 feet including 1.65 to 1.99 acres of impacts below ordinary high water marks (OHWM) for the alternatives. Streams exhibiting an OHWM and downstream connectivity to other waters of the US (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 OHWM 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. Additional ditches have been added and some OHWM widths have been revised since publication of the DEIS. Impact lengths were estimated based on aerial photography review. The area of impact was estimated by multiplying the length of the impact by the average width at the OHWM. The No-Build Alternative will have no significant stream impacts.

Stream rechannelizations may be applicable. Alternative Cs would require six rechannelizations (unnamed ditch, unnamed tributary of Lehman Ditch, unnamed tributary of Riddles Lake, Auten Ditch headwaters, unnamed tributary of Philips Ditch, and Philips Ditch). Alternative Es would require four rechannelizations (unnamed ditch, unnamed tributary of Lehman Ditch, unnamed tributary of Riddles Lake, and Philips Ditch). Alternative G-Cs would require six rechannelizations (unnamed ditch, unnamed tributary of Lehman Ditch, unnamed ditch, unnamed ditch, unnamed tributary of Philips Ditch, and Philips Ditch). Preferred Alternative G-Es will require five rechannelizations (unnamed ditch, unnamed tributary of Lehman Ditch, unnamed ditch, unnamed ditch, and Philips



Ditch). All of the streams requiring rechannelization are excavated drainage ditches or previously channelized and straightened streams. The majority, with the exception of Philips Ditch, are small ephemeral ditches. It may be possible to avoid some of these rechannelizations during the design phase.

More detailed descriptions of potential stream and ditch impacts for Preferred Alternative G-Es, including pictures and figures, can be found in the report titled, "Waters of the US" Verification Report US 31 Improvement Project, Plymouth to South Bend, Revised on May 2, 2005. Representatives from the USACE Detroit District and IDEM reviewed proposed wetland impacts during a field review on November 4 – 6, 2004. At this time, agency representatives were able to assess impacts based on their professional opinion.

Approximately of 7,668 feet of streams and ditches at 17 separate impact (18 including the Yellow River) locations are within the proposed Preferred Alternative G-Es footprint and are expected to be impacted at this time. The majority of these streams have been previously altered from farming practices, pass through agricultural fields, and have little to no tree cover. Most had a trapezoidal channel shape with steep banks, and a silt (soft) substrate. Riffle/pool complexes were infrequent to nonexistent. Several of these ditches were seined for fishes and showed a number of species tolerant to distressed habitats and low oxygen concentrations. Twelve (12) of the 17 crossings are considered regulated drains in Marshall and St. Joseph Counties, while the remaining are small ephemeral (1 small perennial) streams. The County Surveyor and County Drainage Boards are the technical authority on the construction, reconstruction, and maintenance of all regulated drains or proposed regulated drains in the county. Impacts to streams as part of this project typically include bridge or culvert construction.

Stream impacts will be mitigated such that the functions of the stream impacted are replaced. Possible mitigation measures include, but are not limited to, riparian plantings, bank stabilization, and in-stream habitat improvements. Stream mitigation will be completed following the requirements of all appropriate review agencies.

Open water impacts are limited for the alternatives. No large natural lakes within the project area will be directly impacted. The open water areas were generally small, excavated ponds with a wetland fringe. Open water impacts total less than an acre for each alternative. See Section 5.12, Wetlands, for a detailed description of wetland impacts.

5.10.2 Water Quality

Fish were sampled and basic water quality parameters were tested at 12 stream locations within the study area. Sample locations were included for each of the four alternatives. All measurements were conducted on-site and according to manufacturers instructions. Table 5.10.35 lists the parameters that were measured and equipment used. Prior to each daily use, the pH probe was calibrated and checked against Oakton buffered standards of 7.00, 4.01 and 10.00, in that order. Grab samples from each stream were obtained in clean plastic bottles. Tests for chloride, iron, hardness, alkalinity, phosphate and nitrate were either conducted on site, or were performed later the same day using stored samples.



Table 5.10.35. Water Quality Survey Parameters and Instrumentation

Parameter	Instrument/Method	Units	Accuracy
pH	Oakton™ pHTestr 2™	standard units	±0.1 pH
Air temp.	YSI Model 85 Handheld Oxygen, Conductivity, Salinity, and Temperature System	8C	±0.1 8C (±1 lsd)
Water temp.		8C	±0.1 8C (±1 lsd)
Conductivity		mS	±0.5% FS
Specific Conductance		mS	±0.5% FS
DO		mg/l	±0.3 mg/l
DO % saturation		% air sat.	±2% air sat.
Salinity		ppt	±0.1 ppt or ±2%
Total Alkalinity		LaMotte Model WAT-MP-DR	ppm CaCO ₃
Total Hardness	LaMotte Model PHT-CM-DR-LT	ppm CaCO ₃	N/A
Chloride	LaMotte Model PSC-DR	ppm Cl	N/A
Iron	LaMotte Model P-61	ppm Fe	N/A
Phosphate	LaMotte Model VM-12	ppm PO ₄	N/A
Nitrate-Nitrogen	LaMotte Model NCR	ppm NO ₃ -N	N/A

A 10' seine (0.25" mesh) was used for the fish collections. Table 5.10.36 lists the 12 sample locations, the Index of Biotic Integrity scores (discussed below) for each stream, and the alternatives that would cross that stream. Aquatic data sheets showing water chemistry and fish collection results for each sample location can be found in Appendix M.

Table 5.10.36: Stream Water Quality & Fish Sampling Locations

Site	Stream	IBI Score	Alt. Cs	Alt Es	Alt. G-Cs	Alt. G-Es (Preferred)
1	Elmer-Seltenright Ditch #1	38 (Poor-Fair)	X	X	X	X
2	Elmer-Seltenright Ditch #2*	16 (Very Poor)	X	X	X	X
3	Lehman Ditch	24 (Very Poor-Poor)	X	X	X	X
4	Unnamed Trib. of Lehman Ditch	46 (Fair-Good)	X	X	X	X
5	Heston Ditch #1	44 (Fair)			X	X
6	Unnamed Trib. of Bunch Ditch	19 (Very Poor)			X	X
7	Unnamed Trib. of Riddles Lake	18 (Very Poor)	X	X		
8	Heston Ditch #2	34 (Poor)	X	X		



Table 5.10.36: Stream Water Quality & Fish Sampling Locations (Continued)

Site	Stream	IBI Score	Alt. Cs	Alt Es	Alt. G-Cs	Alt. G-Es (Preferred)
9	Ditch (Dennis Schaeffer)	No Fish	X	X		
10	Auten Ditch	No Fish	X			
11	Unnamed Trib. of Auten Ditch	No Fish		X		
12	Unnamed Trib. of Heston Ditch	16 (Very Poor)	X	X		

The ambient condition of each sample location was evaluated using the Index of Biotic Integrity (IBI). This index relies on multiple parameters (termed “metrics”) based on community concepts, to evaluate a complex system. It incorporates professional judgment, but sets quantitative criteria that enables determination of what is poor and excellent based on species richness and composition, trophic and reproductive constituents, and fish abundance and condition. Table 5.10.37 lists the total IBI scores, corresponding integrity class, and attributes of each.

Table 5.10.37: Attributes of Index of Biotic Integrity (IBI) Classification, Total IBI Scores, & Integrity Classes

Total IBI Score	Integrity Class	Attributes
58 - 60	Excellent	Comparable to the best situation without human disturbance; all regionally expected species for the habitat and stream size, including the most intolerant forms, are present with a full array of age (size) classes; balance trophic structure
48 - 52	Good	Species richness somewhat below expectation, especially due to the loss of the most intolerant forms; some species are present with less than optimal abundances or size distributions; trophic structure shows some signs of stress
40 - 44	Fair	Signs of additional deterioration include loss of intolerant forms, fewer species, highly skewed trophic structure (e.g. increasing frequency of omnivores and other tolerant species; older age classes of top predators may be rare
28 - 34	Poor	Dominated by omnivores, tolerant forms, and habitat generalists; few top carnivores; growth rates and condition factors commonly depressed; hybrids and diseased fish often present
12 - 22	Very Poor	Few fish present, mostly introduced or tolerant forms; hybrids common; disease, parasites, fin damage, and other anomalies regular
	No Fish	Repeated sampling finds no fish

Total IBI scores for the streams sampled ranged from 16 to 46. No fish were collected at Sites 9, 10, and 11. Four sites ranked Very Poor (Sites 2, 6, 7, and 12), one site ranked Very Poor-Poor (Site 3), one site ranked Poor (Site 8), one site ranked Poor-Fair (Site 1), one site ranked Fair (Site 5), and one site ranked Fair-Good (Site 4). The majority



of the fish species collected were tolerant of stressed conditions or showed an intermediate tolerance. The fish species collected at each site are listed in Appendix M. The vast majority of streams sampled showed evidence of human disturbance for agricultural and/or drainage purposes. Most had little or no riparian cover. The IBI scores suggest that previous human alteration has adversely affected water quality within the study area.

Each seining location was also tested for basic water quality parameters. The pH values ranged from 7.4 to 8.7. This pH range meets the Indiana minimum water quality standards for aquatic life of 6.0 to 9.0. Daytime dissolved oxygen levels ranged from 2.14 to 9.55 mg/L; however, it is believed there was a problem with the probe at the majority of the locations. Dissolved oxygen levels were retested at four locations and levels ranged from 6.79 to 9.55 mg/L. These levels are believed to be more accurate. Indiana minimum water quality standards for aquatic life state that dissolved oxygen levels must average 5.0 mg/L per day and shall not be less than 4.0 mg/L at any time. Dissolved oxygen in good fishing waters generally average 9.0 mg/L, and levels lower than 3.0 mg/L kill all fish. Other parameters measured included temperature, conductivity, specific conductance, dissolved oxygen percent saturation, salinity, alkalinity, total hardness, chloride, iron, phosphate, and nitrate. Results are listed in Appendix M.

Water resource impacts are not expected to be significant in crossing the potentially impacted 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.

Roadway runoff can have impacts to the water quality of streams crossed by highways as well as water quality downstream. Highway runoff can contain particulates, nitrogen, phosphorus, metals, cyanide, deicing salts (sodium, calcium, chloride), sulfates, petroleum, pesticides, PCBs, rubber, pathogenic bacteria, and asbestos. Effects of these contaminants depend on the project location, environmental setting, and the characteristics of receiving waters. Different contaminants will also have different biological effects based on the physical and chemical properties of the constituent, concentrations found in the environment, the sensitivities of organisms to adverse physical and chemical characteristics of the runoff, and the ability of the system and the individual organism to assimilate a particular constituent or a given mixture of constituents (Buckler and Granato, 1999). Primary sources of these constituents include deicing chemicals, tire wear, engine and moving part wear, exhaust, motor lubricant leaks and blow-by, roadside fertilizing and spraying, and atmospheric deposition.

The use of deicing chemicals is the most economical method available to provide bare pavement conditions for safer winter driving on highways. However, a variety of environmental consequences have been associated with the use of these materials and their associated additives. Deicing salts and chemicals draining from roads into nearby streams can cause changes in water quality, especially under low flow conditions. Weak biodegradable acids like calcium magnesium acetate and potassium acetate are more environmentally sensitive deicing compounds compared



to sodium chloride, calcium chloride and magnesium chloride. Increased salt concentrations can cause osmoregulatory problems and toxicity in freshwater aquatic animal life that lack effective means of eliminating salt from their bodies and have difficulty adapting to sudden increases in salinity. The effects of salt concentrations on aquatic life vary considerably. Concentrations as high as 2,000 to 3,000 ppm have been tolerated by freshwater species such as largemouth bass and brown trout (McKee and Wolf, 1963). On the other hand, concentrations as low as 400 ppm cannot be tolerated by some species of fish (FHWA Environmental Technology Brief). Salt concentrations of 1,500 ppm are generally considered suitable for use as drinking water for livestock and wildlife (McKee and Wolf, 1963). Concentrations greater than 1 percent will endanger the health, reproduction and longevity in all species adapted to freshwater environments (Terry, 1974). Elevated salt concentrations also increase the suspended solid load, thus increasing water temperature and reducing dissolved oxygen.

In addition to aquatic animals, trees, shrubs and other vegetation along or near a roadway treated with deicing salts can also be adversely affected by runoff and airborne deposits. Damage generally occurs through two mechanisms: increased salt concentration in soil and soil water, which can result in salt absorption through roots, and salt accumulation on foliage and branches due to splash and spray (Transportation Research Board, 1991). Salt inhibits plant growth by changing soil structure, changing naturally occurring osmotic gradients and through chloride ion toxicity (NCHRP, 1976). Excess salinity causes moisture stress in plants, suppresses proper nutrient uptake, and leads to deficiencies in plant nutrition (NCHRP, 1978). As with aquatic animals, some species of trees such as red oak, white oak, red cedar, black locust, quaking aspen, and birches are more salt tolerant than are other species like red pine, speckled alder, sugar maple, hemlock (Transportation Research Board, 1991).

Deicing chemical additives in roadway runoff can also result in adverse effects to organisms or undesirable side effects in adjacent lands. Cyanide ion byproducts from sodium ferrocyanide used to prevent caking of deicing chemicals may be toxic to humans, animals and fish when occurring in sufficient concentrations. Phosphorus used as a rust inhibitor in road salts can promote the growth of unwanted aquatic plants or algae in lakes (FHWA Environmental Technology Brief).

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.

5.10.3 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 5.10.51) 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.

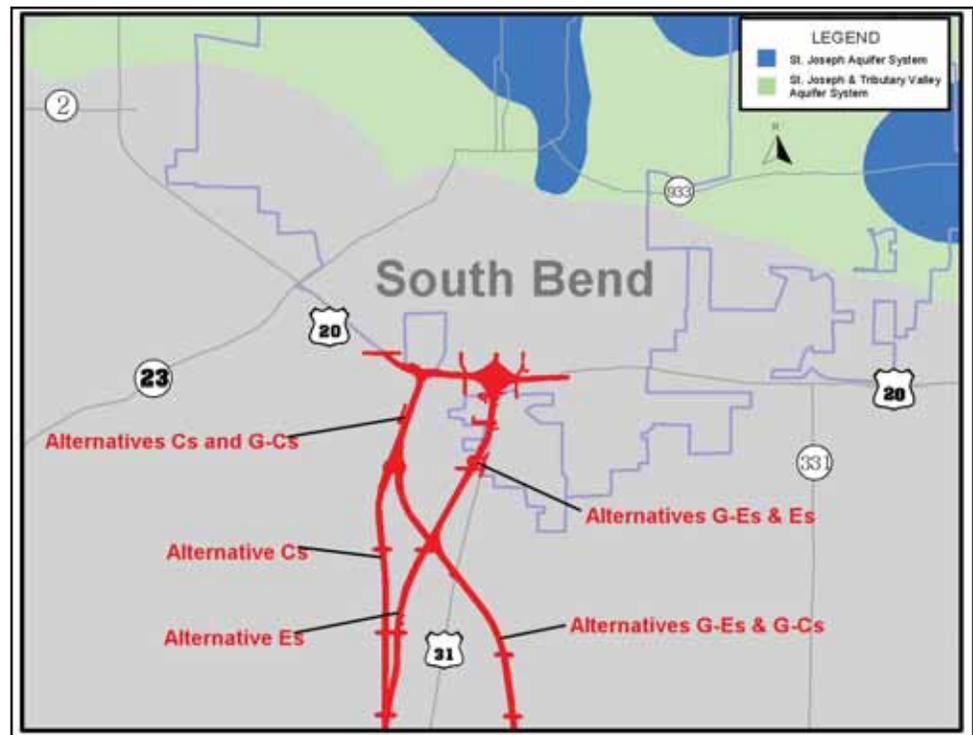


Figure 5.10.51: St. Joseph Aquifer System



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 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 No-Build Alternative will have no significant impacts to groundwater. The development of any of the freeway 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 four alternatives. Alternative Cs crosses both of these areas while Alternatives Es and G-Cs each cross one of the areas. Preferred Alternative G-Es only crosses the two wellhead protection areas currently crossed by the existing US 31 and US 20. By improving the geometrics of the interchange area, safety will be improved and the likelihood of a spill will probably decrease. 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.

5.10.4 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.



5.10.5 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 NWI maps, 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; also includes farmed wetland estimations
- 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

Table 5.10.38: 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	0.4	18	10,111	51.6	0	0	5 (171)
Es	0.3	19	8,966	35.6	0	0	4 (160)
G-Cs	0.7	18	7,321	30.7	0	0	3 (101)
G-Es (Preferred)	0.5	17	7,668	23.9	0	0	2 (123)

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

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 5.10.38 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.



The majority of water resource 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 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 impacts on water resources from the project will be minimized.

Summary of Preferred Alternative G-Es

Approximately 7,668 feet of streams and ditches at 17 separate impact (18 including the Yellow River) locations are within the proposed Preferred Alternative G-Es footprint and are expected to be impacted at this time. The majority of these streams have been previously altered from farming practices, pass through agricultural fields, and have little to no tree cover. Most had a trapezoidal channel shape with steep banks, and a silt (soft) substrate. Riffle/pool complexes were infrequent to nonexistent.

Fish were sampled and basic water quality parameters were tested at 12 stream locations within the study area. The ambient condition of each sample location was evaluated using the Index of Biotic Integrity (IBI). IBI scores for Preferred Alternative G-Es ranged from 16 (Very Poor) to 46 (Fair-Good).

Three streams to be crossed by Preferred Alternative G-Es 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).

Preferred Alternative G-Es will not cross any sole source aquifers.

Preferred Alternative G-Es only crosses the two wellhead protection areas currently crossed by the existing US 31 and US 20. By improving the geometrics of the interchange area, safety will be improved and the likelihood of a spill will probably decrease.

No Wild and Scenic Rivers, Outstanding State Resource Waters, Exceptional Use Streams, or streams on the Listing of Outstanding Rivers and Streams will be impacted by Preferred Alternative G-Es.



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, an interim version of the Indiana Department of Natural Resources Division of Water Digital Flood Insurance Rate Maps (DFIRM) was used to determine potential floodplain impacts. The purpose of this interim digital data is to provide much of the same information that is provided on the paper copies of the Federal Emergency Management Agency (FEMA) FIRM. Hard copies of the FEMA FIRM's were also checked for floodplain impacts. The four alternatives were compared using the IDNR digital floodplain data for 1) floodplain encroachments measured in linear feet and, 2) potential floodplain acres to be impacted. Table 5.11.39 shows the results of the analysis. Figure 5.11.52 shows a map of the alternatives and floodplain impacts.

The results of this analysis show that floodplains associated with Yellow River, Shidler-Hoffman/Bunch Ditch and Philips Ditch will be crossed by the proposed alternatives. All alternatives will cross the floodplain of the Yellow River along existing US 31. It is possible that US 31 may need to be widened in this area and the existing bridge replaced. Thus, impacts to the Yellow River Floodplain (1,100 feet and 8.0 acres) are included for each alternative. Alternatives Cs and Es have the least amount of potential floodplain impacts with 1,400 and 1,450 feet in length of impacts, respectively, and 10.3 and 9.9 acres in area. Alternative G-Cs will have the potential to have the highest amount of floodplain impacts in regards to floodplain area with 11.4 acres, and is second highest in length with 1,995 feet. Preferred Alternative G-Es will result in the largest impacts in regards to length of floodplain impact with 2,045 feet, and second highest in regards to area with 11.0 acres. The No-Build Alternative would have no impacts on floodplains. The length and area results in this document are different than those presented in the DEIS because of refinements of the alternatives during the development of the project.

Floodplain Name	Alternative Cs	Alternative Es	Alternative G-Cs	Alternative G-Es (Preferred)
Yellow River	1,100 feet	1,100 feet	1,100 feet	1,100 feet
Shidler-Hoffman / Bunch Ditch	0	0	595 feet	595 feet
Philips Ditch	300 feet	350 feet	300 feet	350 feet
Total Feet	1,400 feet	1,450 feet	1,995 feet	2,045 feet
Total Acres	10.3 acres	9.9 acres	11.4 acres	11.0 acres

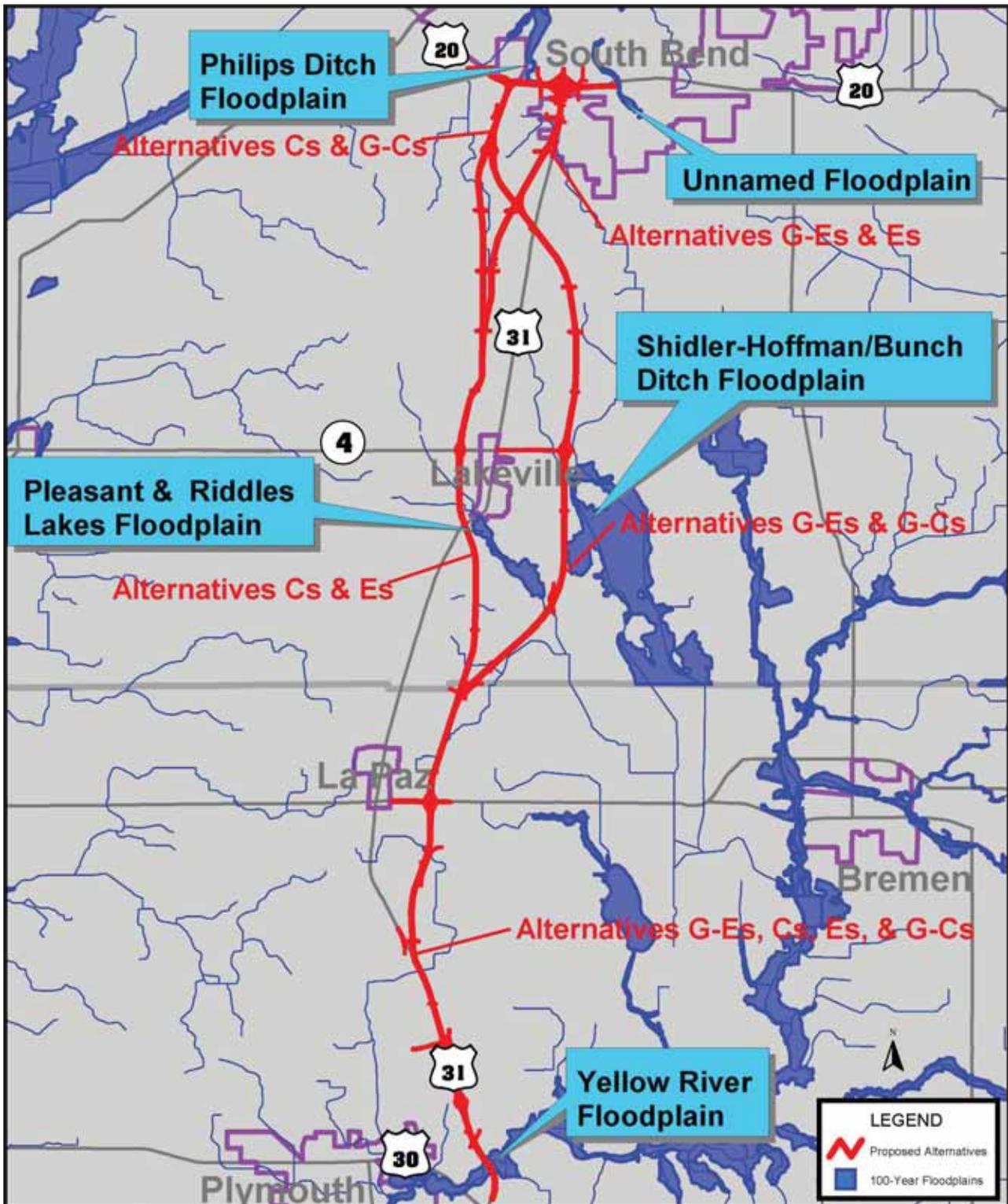


Figure 5.11.52: Floodplain Map



Floodplain Risk Assessment forms for Preferred Alternative G-Es can be found in Appendix U. There will be no significant impacts on natural and beneficial floodplain values; no significant change in flood risks; and no significant increase in potential for interruption or termination of emergency service or emergency evacuation routes. Therefore, it has been determined that this encroachment is not significant. A hydraulic design study that addresses various structure size alternates will be completed during the preliminary design phase. A summary of this will be included with the Field Check Plans and also in the Design Summary.

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.



5.12 Wetlands

Wetlands as defined by the US Army Corps of Engineers (USACE) (33 CFR 328.3) and the Environmental Protection Agency (EPA) 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.”

In order to equally compare alternatives, wetland calculations for the FEIS 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 aerials for classifying wetlands and such a methodology may not meet all of the criteria used by the USACE 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 FEIS 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 FEIS, some small wetlands and lakes/ponds may not be included in this analysis.

A wetland delineation was completed for Preferred Alternative G-Es. Detailed results of this delineation can be found in the report titled, “Waters of the U.S.” Verification Report US 31 Improvement Project, Plymouth to South Bend, Revised on May 2, 2005. Representatives from the USACE Detroit District and Indiana Department of Environmental Management (IDEM) reviewed proposed wetland impacts during a field review on November 4 – 6, 2004. At this time agency representatives were able to assess impacts based on their professional opinion. Wetland impacts for Preferred Alternative G-Es will be discussed separately in this chapter because the level of detail is far greater for this alternative.

For equal comparison purposes, NWI maps were studied in order to determine the type and acreage of wetlands affected by each alternative. A 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 estimated farmed wetlands and unconsolidated bottom open water habitats. Farmed wetlands were estimated for each alternative by calculating 2% of the hydric soils on agricultural land. This percentage was an estimate given by a Natural Resources Conservation Service (NRCS) representative. Unconsolidated bottom wetlands were mapped as part of the National Wetland Inventory, but rarely do they meet the Corps’ technical definition of a wetland due to the absence of the vegetation parameter. 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 5.12.40 shows the results of the analysis.



Table 5.12.40: US 31 NWI Wetland Acres Impacted by Alternatives

Wetland Type	Alternative Cs	Alternative Es	Alternative G-Cs	Alternative G-Es* (Preferred)
Aquatic Bed	0.8 acres	0.7 acres	0 acres	0 acres
Emergent	24.0 acres	13.6 acres	8.7 acres	6.3 acres
Scrub/Shrub	3.0 acres	1.6 acres	1.4 acres	0 acres
Forested	21.8 acres	17.8 acres	17.7 acres	14.8 acres
Totals	49.6 acres	33.7 acres	27.8 acres	21.1 acres
Farmed (Estimate)	2.0 acres	1.9 acres	2.9 acres	2.8 acres
Total Wetlands	51.6 acres	35.6 acres	30.7 acres	23.9 acres
Unconsolidated Bottom (Lakes and Ponds)	0.4 acres	0.3 acres	0.7 acres	0.5 acres

* Wetland delineations and farmed wetland investigations were performed for the Preferred Alternative G-Es. The results of these more detailed studies for the Preferred Alternative G-Es differ from the NWI results. Wetland delineation results are discussed in the proceeding section.

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. Additional modifications occurred to all the alternatives after publication of the DEIS in order to further reduce wetland impacts. 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 2% to 5% of the total acres of land impacted by each alternative. Coordination with the Detroit USACE indicates that none of the wetland impacts are existing compensatory mitigation sites.

The results of this analysis indicate that Preferred Alternative G-Es had the lowest total estimated wetland impacts with 23.9 acres. Alternative Cs had the greatest amount of wetland impacts with 51.6 acres. Alternatives Es and G-Cs fell somewhere in between with 35.6 acres and 30.7 acres, respectively. The No-Build Alternative will have no impacts on wetlands. For a discussion of cumulative wetland impacts refer to Section 5.20, Cumulative Impacts.

Wetland Delineations for Preferred Alternative G-Es

Efforts have been made to avoid and minimize wetland impacts during the development of Preferred Alternative G-Es. A detailed wetland delineation was conducted for Preferred Alternative G-Es footprint during July – October 2004. Wetland determinations and delineations were performed in accordance with the *Corps of Engineers Wetland Delineation Manual (1987)* and all subsequent Corps of Engineers guidance releases. Non-wetland “waters of the United States,” were determined and described in accordance with the definitions in 33 CFR 328.3 and the wetland delineation manual. Detailed results of this delineation can be found in the report titled, “Waters of the U.S.” Verification Report US 31 Improvement Project, Plymouth to South Bend, Revised on May 2, 2005. This report also includes figures and pictures of each potential wetland and stream/ditch impact. Representatives from the USACE Detroit District and IDEM reviewed the proposed wetland impacts during a field review on November 4 – 6, 2004.



The wetland delineation found that a total of 29.93 acres of wetlands at 39 separate impact locations are within Preferred Alternative G-Es' footprint and are expected to be impacted at this time. Of this, 15.27 acres are emergent, 13.21 acres are forested, and 1.45 acres are scrub/shrub. Preferred Alternative G-Es crosses two 8-digit watersheds, the Kankakee (07120001) and the St. Joseph (04050001). Of the total wetland impacts, 24.75 acres are within the Kankakee watershed and 5.18 acres are within the St. Joseph.

In a jurisdictional determination letter dated February 24, 2005 (See Appendix C) the USACE identifies which impact sites are considered "waters of the United States," thus falling under federal jurisdiction. Twenty wetland impact sites, totaling 25.51 acres, fall under federal jurisdiction. Approximately 77.10 acres of mitigation are estimated to be necessary to compensate for federal jurisdictional wetland impacts. Nineteen of the wetland impact sites, totaling 4.42 acres, do not fall under federal jurisdiction. These sites will likely fall under state jurisdiction under the IDEM Isolated Wetlands Regulatory Program.

As part of this program, isolated wetlands are grouped into one of three Classes based upon wetland quality. Class III isolated wetlands are generally of higher quality and Class I wetlands of lower quality, while Class II wetlands fall somewhere in the middle. Different wetland classes require different mitigation requirements. Prior to permitting each isolated wetland will be appropriately classified, and based upon this classification, wetland mitigation ratios will be assigned.

A total of 0.69 acres of open water at 6 separate impact locations are within the proposed US 31 footprint and are expected to be impacted at this time. The open water areas were generally small, excavated ponds with a wetland fringe. Most impacts were within the Kankakee watershed, with only one impact (0.12 acres) in the St. Joseph. The USACE identified three open water impact sites, totaling 0.38 acres, as falling under federal jurisdiction. Three sites, totaling 0.31 acres, were considered isolated and not under federal jurisdiction.

The discussion on mitigation of wetland impacts can be found in Chapter 6.6.

Farmed Wetland Investigation for Preferred Alternative G-Es

Farmed wetlands are defined by the United States Department of Agriculture (USDA) National Food Security Act Manual, 3rd Edition, September 2000 (NFSAM) as "Wetlands that were drained, dredged, filled, leveled, or otherwise manipulated before December 23, 1985, for the purpose of, or to have the effect of, making the production of an agricultural commodity possible, and continue to meet specific wetland hydrology criteria." Farmed wetlands may be farmed as they were before the 1985 date, and the drainage that was in place before that date can be maintained, but no additional drainage is allowed.

Farmed wetlands must meet all of the following four criteria:

1. The area must have been manipulated prior to December 23, 1985.
2. An agricultural commodity was produced once before December 23, 1985.
3. The area meets the required hydrology criteria for farmed wetlands.
4. The site has not been abandoned.

The proposed US 31 footprint was investigated for farmed wetlands using USDA Natural Resources Conservation Service (NRCS) methodology. Preferred Alternative G-Es footprint is approximately 300 feet wide and 20.5 miles



long. It includes approximate interchange and overpass locations as well as local road improvements near South Bend.

The investigation began with Criteria #3 (the area must meet the required hydrology criteria for farmed wetlands). Because farmed wetlands must meet ALL four criteria, if an area did not meet this criterion, it would not be considered a farmed wetland. Areas must show specific signatures (wetland indicators) to meet the hydrology criterion for farmed wetlands. The signatures include evidence of either 1) surface water or 2) flooded or drowned out crops. Color aerial slides are used to determine if these signatures are present. Surface water, or inundation, typically appears as dark blue or gray color on the color slides. Flooded or drowned out crops can appear as white or beige color, or as a distinctly different color from the surrounding vegetation. To meet the flooded or drowned out crop signature, the area must show concentric rings of color differentiation. These concentric rings can be likened to rings in a bathtub and show where water has pooled then receded. These signatures must be present for at least three out of five years that had normal precipitation. Normal precipitation years near 1985 are preferred if available. If a wetter year is used, and drier year should also be used to balance out the sample and vice versa. Areas that appear to meet the farmed wetland hydrology criterion based off of the slide review should be field checked in order to confirm potential wetland hydrology and soils.

USDA NRCS offices in St. Joseph and Marshall Counties were visited on September 2 and September 9, 2004 respectively in order to review color aerial slides for the length of the proposed US 31 footprint.

The following slides were reviewed for St. Joseph County:

- 1981 – 12-21, 13-15, 13-16, 13-17, 13-18, 13-22, 13-23, 13-24, 13-25, 13-26, 13-27, 14-16, 14-17, 14-18
- 1984 – N-15, N-16, N-17, N-23, N-24, N-25, O-15, O-16, O-17, O-18, O-19, O-20
- 1986 – N-14, N-20, N-21, N-22, N-23, N-24, O-14, O-15, O-16, O-17
- 1987 – O-11, O-12, O-16, O-17, O-19, O-20, P-14, P-15, P-16, P-17, P-20
- 1990 – P-10, P-11, P-16, Q-10, Q-11, Q-12, Q-13, Q-14, Q-15, Q-19

The following slides were reviewed for Marshall County:

- 1983 – ML-15 047-23, ML-15 047-24, ML-15 047-25, ML-15 047-26, ML-15 047-27, ML-15 047-28, ML-15 047-29, ML-15 047-30, ML-15 047-31, ML-15 047-32
- 1984 – 10-6, 10-7, 10-8, 10-9, 10-10, 10-11, 11-2, 11-7, 11-8, 11-9, 11-10, 11-11, 11-12, 11-13
- 1987 – 10-2, 10-3, 10-4, 10-5, 10-6, 10-7, 10-8, 10-9, 10-10, 10-11
- 1989 – 11-9, 11-10, 11-11, 11-12, 11-13, 11-14, 12-2, 12-6, 12-7, 12-8
- 1990 – 1F, 2F, 3F, 4F, 5F, 6F, 7F, 8F

Two areas appeared to show wetland hydrology signatures for farmed wetlands for at least three of the five years during the slide review. One area was in St. Joseph County (Figure 5.12.53) and one was in Marshall County (Figure 5.12.54). Both areas were visited in the field.

The area field checked in St. Joseph County showed no indications of wetland hydrology or soils. The area was a small, forested hill, and likely not farmed because of the slope. Soils for the area are mapped by the USDA NRCS as

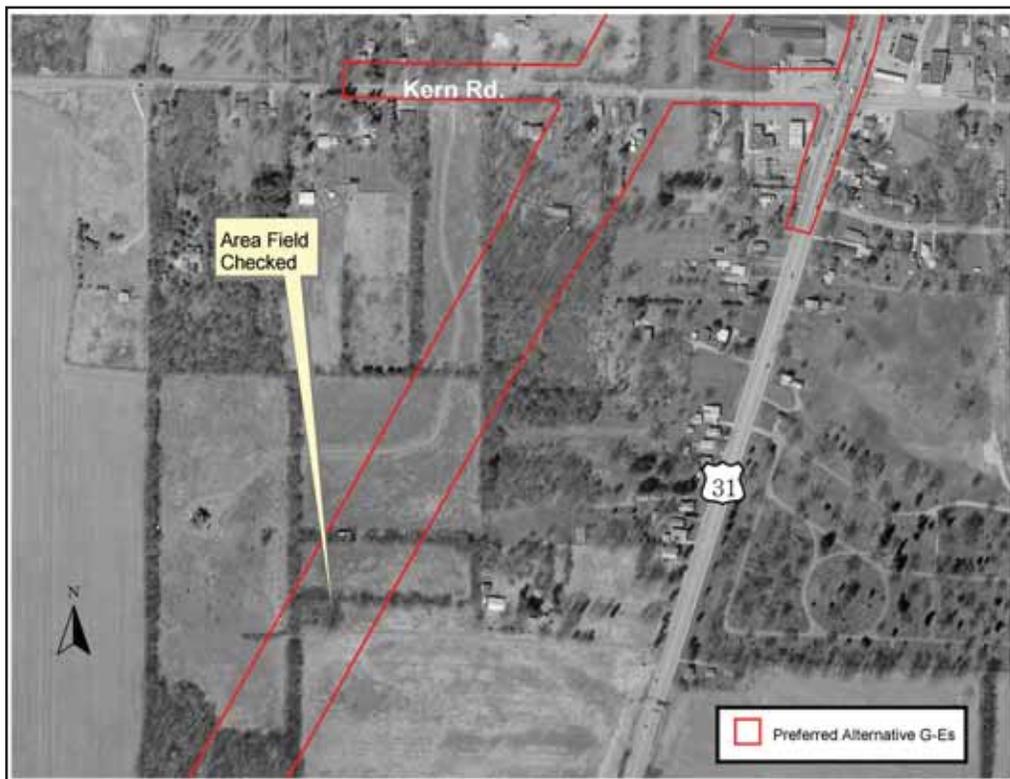


Figure 5.12.53: Potential Farmed Wetland Area Field Checked in St. Joseph County

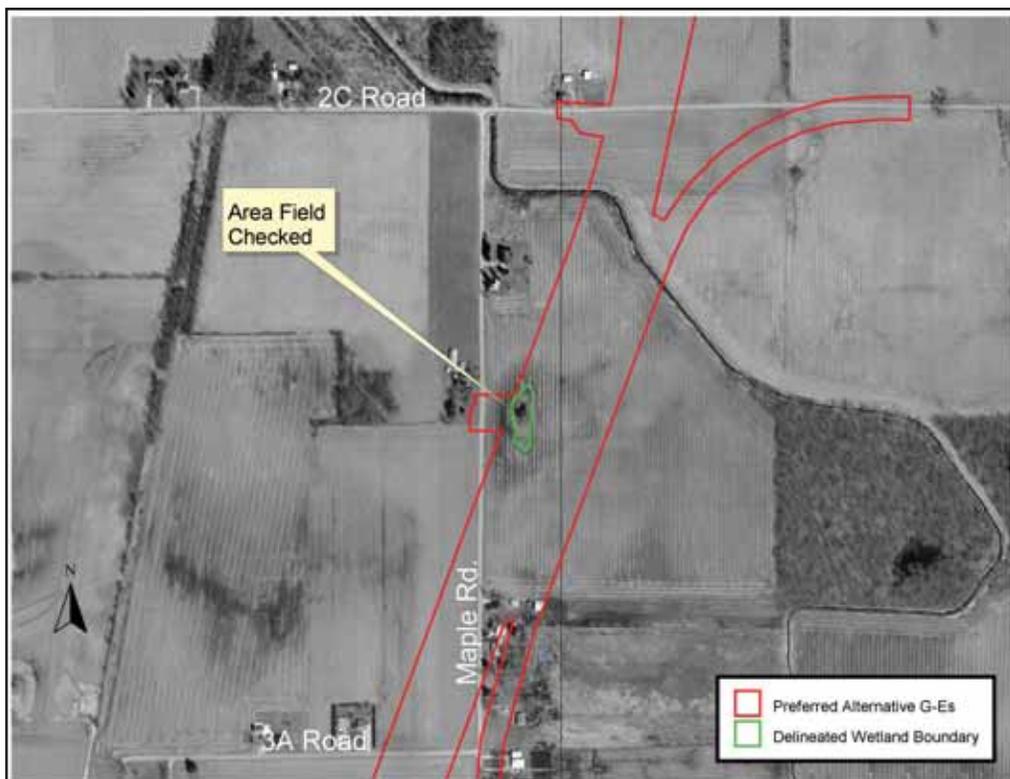


Figure 5.12.54: Potential Farmed Wetland Area Field Checked in Marshall County



Hillsdale-Tracy sandy loam, 5 to 10 % slopes and Abscota loamy sand, 0 to 2 % slopes. Neither are listed on the St. Joseph County Hydric Soils List.

The area field checked in Marshall County showed positive indications of wetland hydrology, soils, and vegetation. Soils are mapped as Houghton muck, drained and Brady sandy loam. Houghton muck, drained is listed as hydric in the Marshall County Hydric Soils List. The site was approximately 0.44 acres in area. Because this area met the three criteria listed in the 1987 Corps of Engineers Wetlands Delineation Manual it was considered an emergent wetland. In their jurisdictional verification letter, the USACE determined this area to be isolated, and not falling under federal jurisdiction. This area will fall under the jurisdiction of the IDEM Isolated Wetlands Regulatory Program and mitigated appropriately. In all tables and calculations this area is listed as an emergent wetland rather than a farmed wetland in order to avoid double counting. This area is listed as Site 12 in the “Waters of the U.S.” Verification Report.

Close coordination with review agencies and other local agencies will continue to avoid and minimize wetland impacts during further design of Preferred Alternative G-Es.

Summary of Preferred Alternative G-Es

In order to equally compare alternatives, wetland calculations for the FEIS were completed using digital NWI maps and verifying wetland locations during field reviews of each alternative. Farmed wetlands were also estimated for each alternative. NWI impacts and estimated farmed wetland impacts for Preferred Alternative G-Es totaled 23.9 acres. This total included 6.3 acres of emergent wetlands, 14.8 acres of forested wetlands, and 2.8 acres of farmed wetlands. This was the lowest wetland total for all four alternatives.

In Section 404 permitting, the selection of the “least environmentally damaging alternative” or “LEDPA” is required. In particular, the Section 404(b)(1) Guidelines require the selection of the practicable alternative that causes the least harm to the “aquatic environment,” which consists of wetlands and other jurisdictional waters of the United States, so long as the alternative does not have other significant adverse environmental consequences. A detailed Section 404(b)(1) (LEDPA) Consistency Analysis is found in Appendix T of this document. The analysis in Appendix T shows that the detailed evaluation completed for the four (practicable) alternatives (Cs, Es, G-Cs and G-Es). Of the four remaining (practicable) alternatives, Alternative G-Es is the least environmentally damaging. Additionally, the development of Alternative G-Es will cause no violation of other laws and will not cause or contribute to significant degradation of waters of the United States. Finally, preliminary plans have been developed to minimize and mitigate unavoidable impacts caused by Alternative G-Es (Appendix N). These factors show that the selected Alternative G-Es is the LEDPA and meets all Section 404(b)(1) guidelines for the selection of an alternative.

Preferred Alternative G-Es had the lowest NWI wetland impacts (23.9 acres) of the four alternatives carried forward for detailed analysis. Preferred Alternative G-Es is a hybrid alternative developed, in part, to avoid wetland impacts. Alignment shifts were made throughout this study in order to avoid and minimize wetland impacts. A detailed wetland delineation was conducted for Preferred Alternative G-Es footprint during July – October 2004. Wetland determinations and delineations were performed in accordance with the Corps of Engineers Wetland Delineation Manual (1987) and all subsequent Corps of Engineers guidance releases. The wetland delineation found that a total of 29.93 acres of wetlands at 39 separate impact locations are within the proposed US 31 footprint and are expected to be impacted at this time. Of this, 15.27 acres are emergent, 13.21 acres are forested, and 1.45 acres are scrub/shrub. The proposed alternative crosses two 8-digit watersheds, the Kankakee (07120001) and the St. Joseph (04050001). Of the total wetland impacts, 24.75 acres are within the Kankakee watershed and 5.18 acres are within the St. Joseph.



Representatives from the USACE Detroit District and IDEM reviewed proposed wetland impacts during a field review on November 4 – 6, 2004. In a jurisdictional determination letter dated February 24, 2005 (Appendix C), the USACE identifies which impact sites are considered “waters of the United States,” thus falling under federal jurisdiction. Of the total wetland acreage impacted, 25.51 acres fall under federal jurisdiction. The remaining 4.42 acres are considered isolated, and will likely fall under state jurisdiction under the IDEM Isolated Wetlands Regulatory Program.

Based on the detailed wetland delineations, a total of 0.69 acres of open water at 6 separate impact locations are within the proposed Preferred Alternative G-Es footprint and are expected to be impacted at this time. The open water areas were generally small, excavated ponds with a wetland fringe.

The proposed Preferred Alternative G-Es footprint was investigated for farmed wetlands using USDA Natural Resources Conservation Service (NRCS) methodology. Only one area met the necessary criteria to be considered a farmed wetland. The site was approximately 0.44 acres in area. Because this area met the three criteria listed in the 1987 Corps of Engineers Wetlands Delineation Manual, it was considered an emergent wetland and counted as such in all calculations.



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 their variations, and use of GIS layers. Commentaries on each alternative begin in the south, near Plymouth, and end near US 20 in South Bend. Aerial 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.” The No-Build Alternative would have no significant visual impacts.

5.13.1 View from the Road

Alternative Cs

Alternative Cs begins at the existing US 31 and US 30 interchange, utilizing the existing cloverleaf configuration, and proceeds northward along the existing US 31 alignment to just south of West 4A Road in Marshall County, just south of LaPaz. It then continues northward on new alignment east of LaPaz and parallels existing US 31. Just south of Lakeville, in St. Joseph County, it crosses existing US 31 and continues northward, west of Lakeville, paralleling existing US 31. It terminates at US 20, approximately one mile west of the existing US 31 and US 20 interchange. It crosses flat agriculture/grazing lands of the Northern Lakes Natural Region and also passes through the Northern Moraine and Lake Physiographic Region.

From US 31/US 30 Interchange to LaPaz: there is the Yellow River, agricultural/grazing lands, farms, homes, forested areas, wetlands, a tributary of the Yellow River, a commercial grain operation, small businesses, an INDOT sub-district, the LaPaz wastewater treatment plant, overhead utility lines, the New Philadelphia Church and an injection plastics business. New interchanges are proposed at the US 31 intersections with 7th Road and with U.S. 6.

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

From Lakeville to South Bend: on the south edge of Lakeville, the roadway will cross from the east side to the west side of existing US 31. It will continue northward and will pass on the west side of Lakeville and remain on the west side of existing US 31 until it terminates at US 20. There is an outdoor recreation sports complex, a tributary to Moon Lake, wetlands, wooded areas, homes, farms, small businesses, gas stations, Colburn Subdivision, Southern Acres Subdivision, 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. New interchanges are proposed at the US 31 intersections with SR 4 (Pierce Road), Kern Road (Figures 5.13.55 and 5.13.56) and at US 20, approximately 1-mile west of the existing US 31 and US 20 interchange location (Figures 5.13.57 and 5.13.58).



Figure 5.13.55: (Before) Proposed Interchange Location for Alternatives Cs and G-Cs at Kern Road



Figure 5.13.56: (After) Proposed Interchange Location for Alternatives Cs and G-Cs at Kern Road



Figure 5.13.57: (Before) Proposed Interchange Location for Alternatives Cs and G-Cs at US 20

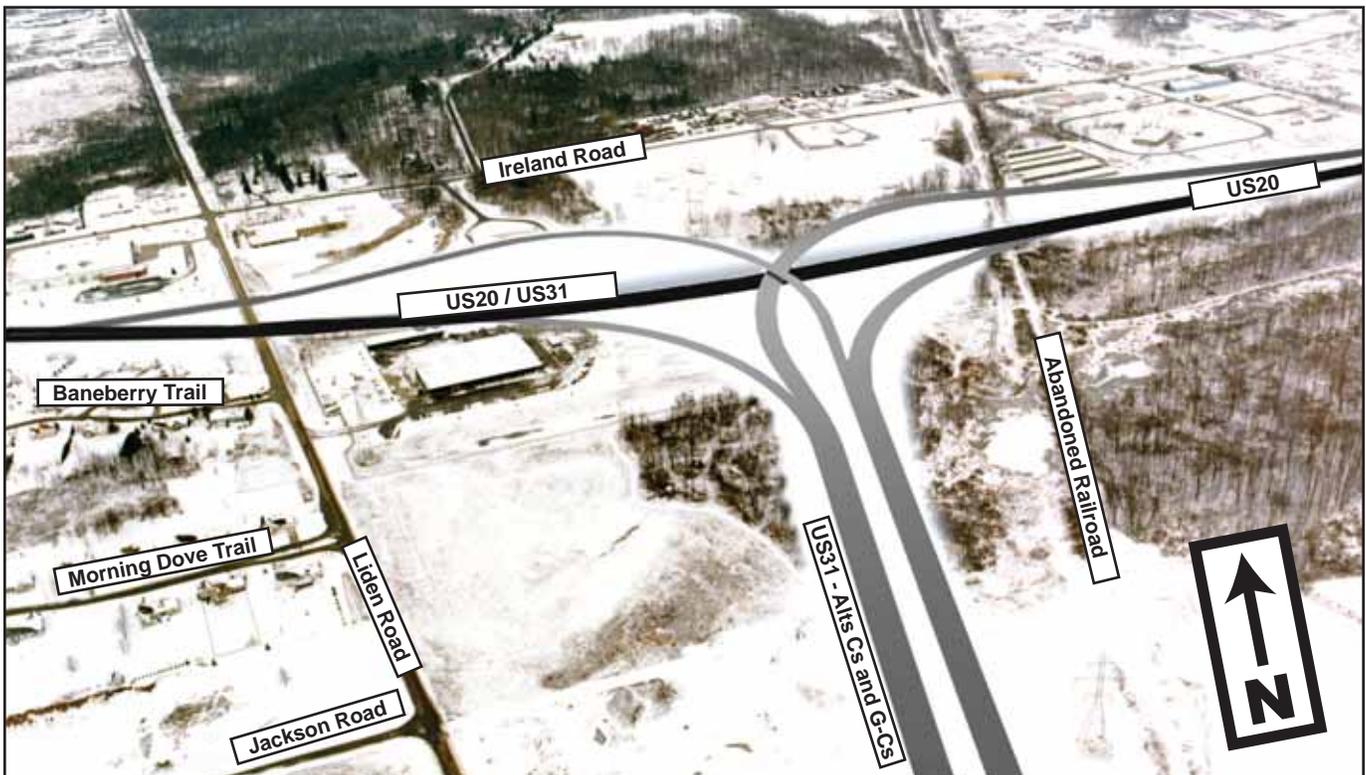


Figure 5.13.58: (After) Proposed Interchange Location for Alternatives Cs and G-Cs at US 20



Alternative G-Cs

Alternative G-Cs begins at the existing US 31 and US 30 interchange, utilizing the existing cloverleaf configuration, and proceeds northward along the existing US 31 alignment to just south of West 4A Road in Marshall County, just south of LaPaz. It then continues northward on new alignment east of LaPaz and parallels existing US 31. Just south of the Marshall-St. Joseph County line, the alternative assumes a northeasterly direction around the east side of Riddles Lake, where it then continues in a northerly direction bypassing Lakeville on the east and paralleling existing US 31. Near Miller Road, the alternative turns in a northwesterly direction and crosses to the west side of existing US 31 just south of Roosevelt Road. The alternative then turns in a northerly direction, paralleling existing US 31, and terminates at US 20, approximately one mile west of the existing US 31 and US 20 interchange. It crosses flat agriculture/grazing lands of the Northern Lakes Natural Region and also crosses the Northern Moraine and Lake Physiographic Region.

From US 31/US 30 Intersection to LaPaz: there is the Yellow River, agricultural/grazing lands, farms, homes, forested areas, wetlands, a tributary of the Yellow River, a commercial grain operation, small businesses, an INDOT sub-district, the LaPaz wastewater treatment plant, overhead utility lines, the New Philadelphia Church and an injection plastics business. New interchanges are proposed at the US 31 intersections with 7th Road and with U.S. 6.

From LaPaz to Lakeville: the roadway will pass on the east side of LaPaz, near LaPaz Junction. There are agricultural/grazing lands, farms, homes, wooded areas, wetlands, a tributary of the Yellow River, Riddles Lake, Pleasant Lake, a pipeline, 84 Lumber 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 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 existing US 31 just south of Roosevelt Road, turns in a northwesterly direction, paralleling existing US 31, and terminates at US 20, approximately one mile west of the existing US 31 and US 20 interchange. There is the Weller's Heights Subdivision, businesses, a historical home, gas stations, Southern Acres Subdivision, 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. New interchanges are proposed at the US 31 intersections with SR 4 (Pierce Road) (Figures 5.13.57 and 5.13.58), Kern Road (Figures 5.13.55 and 5.13.56) and at US 20, approximately 1-mile west of the existing US 31 and US 20 interchange location (Figures 5.13.57 and 5.13.58).

Alternative Es

Alternative Es begins at the existing US 31 and US 30 interchange, utilizing the existing cloverleaf configuration, and proceeds northward along the existing US 31 alignment to just south of West 4A Road in Marshall County, just south of LaPaz. It then continues northward on new alignment east of LaPaz and parallels existing US 31. Just south of Lakeville, in St. Joseph County, it crosses existing US 31 and continues northward, west of Lakeville, paralleling existing US 31. Just north of Madison Road the alternative assumes a northeasterly direction and ties into existing US 31 just north of Kern Road. It then terminates at the existing US 31 and US 20 interchange. It crosses flat agriculture/grazing lands of the Northern Lakes Natural Region and also passes through the Northern Moraine and Lake Physiographic Region.



From US 31/US 30 Interchange to LaPaz: there is the Yellow River, agricultural/grazing lands, farms, homes, forested areas, wetlands, a tributary of the Yellow River, a commercial grain operation, small businesses, an INDOT sub-district, the LaPaz wastewater treatment plant, overhead utility lines, the New Philadelphia Church and an injection plastics business. New interchanges are proposed at the US 31 intersections with 7th Road and with U.S. 6.

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

From Lakeville to South Bend: on the south edge of Lakeville, the roadway will cross from the east side to the west side of existing US 31. It will continue northward and will pass on the west side of Lakeville and remain on the west side of existing US 31 until it terminates at the existing US 31 and US 20 interchange location. There is an outdoor recreation sports complex, a tributary to Moon Lake, wetlands, wooded areas, homes, farms, small businesses, gas stations, Colburn Subdivision, Southern Acres Subdivision, Weller's Heights Subdivision, Sun Communities Mobile Home Park, Berliner Marx Vacant Industrial facility, Kern Road Subdivision, Gilmer South Michigan Subdivision, Gilmer Park Subdivision, agricultural/grazing lands, the Southside Church of God, an unnamed stream and a small ditch, homes, an historic home, Southlawn Cemetery and the commercial business district that includes businesses, gas stations, small shops, and a restaurant.. New interchanges are proposed at the US 31 intersections with SR 4 (Pierce Road), Kern Road (Figures 5.13.59 and 5.13.60) and at US 20 at the existing US 31 and US 20 interchange location.

Preferred Alternative G-Es

Alternative G-Es begins at the existing US 31 and US 30 interchange, utilizing the existing cloverleaf configuration, and proceeds northward along the existing US 31 alignment to just south of West 4A Road in Marshall County, just south of LaPaz. It then continues northward on new alignment east of LaPaz, paralleling existing US 31. Just south of the Marshall-St. Joseph County line, the alternative assumes a northeasterly direction east of Riddles Lake, and then continues north, east of Lakeville, paralleling existing US 31. Near Miller Road, the alternative turns in a northwesterly direction and crosses existing US 31 just south of Roosevelt Road. As the alternative approaches Kern Road, it assumes a northeasterly direction and ties into existing US 31, just north of Kern Road. It then follows existing US 31 northward and terminates at the existing US 31 and US 20 interchange location. It crosses flat agriculture/grazing lands of the Northern Lakes Natural Region. It passes through the Northern Moraine and Lake Physiographic Region.

From US 31/US 30 Intersection to LaPaz: there is the Yellow River, agricultural/grazing lands, farms, homes, forested areas, wetlands, a tributary of the Yellow River, a commercial grain operation, small businesses, an INDOT sub-district, the LaPaz wastewater treatment plant, overhead utility lines, the New Philadelphia Church and an injection plastics business. New interchanges are proposed at the US 31 intersections with 7th Road and with U.S. 6.

From LaPaz to Lakeville: the roadway will pass on the east side of LaPaz, near LaPaz Junction. There are agricultural/grazing lands, farms, homes, wooded areas, wetlands, a tributary of the Yellow River, Riddles Lake, Pleasant Lake, a pipeline, 84 Lumber 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 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, just south of Roosevelt Road and turn north-easterly and tying into existing US 31 just north of Kern Road. It continues along the existing US 31 corridor and



terminates at the existing interchange location. There are small businesses, gas stations, Southern Acres Subdivision, Weller's Heights Subdivision, Sun Communities Mobile Home Park, Berliner Marx Vacant Industrial facility, Kern Road Subdivision, Gilmer South Michigan Subdivision, Gilmer Park Subdivision, agricultural/grazing lands, the Southside Church of God, an unnamed stream and a small ditch, homes, an historic home, Southlawn Cemetery and the commercial business district that includes businesses, gas stations, small shops, and a restaurant.. New interchanges are proposed at the US 31 intersections with SR 4 (Pierce Road) (Figures 5.13.59 and 5.13.60), Kern Road (Figures 5.13.61 and 5.13.62) and at US 20 at the existing US 31 and US 20 interchange location.

5.13.2 View of the Road

Alternative Cs, Es, G-Cs, & Preferred Alternative G-Es

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 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 may 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 5.13.59 and 5.13.60), 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 5.13.59: (Before) Proposed Interchange Location for Alternative G-Cs and Preferred Alternative G-Es at SR 4 (Pierce Road)



Figure 5.13.60: (After) Proposed Interchange Location for Alternative G-Cs and Preferred Alternative G-Es at SR 4 (Pierce Road)



Figure 5.13.61: (Before) Proposed Interchange Location for Alternative Es and Preferred Alternative G-Es at Kern Road

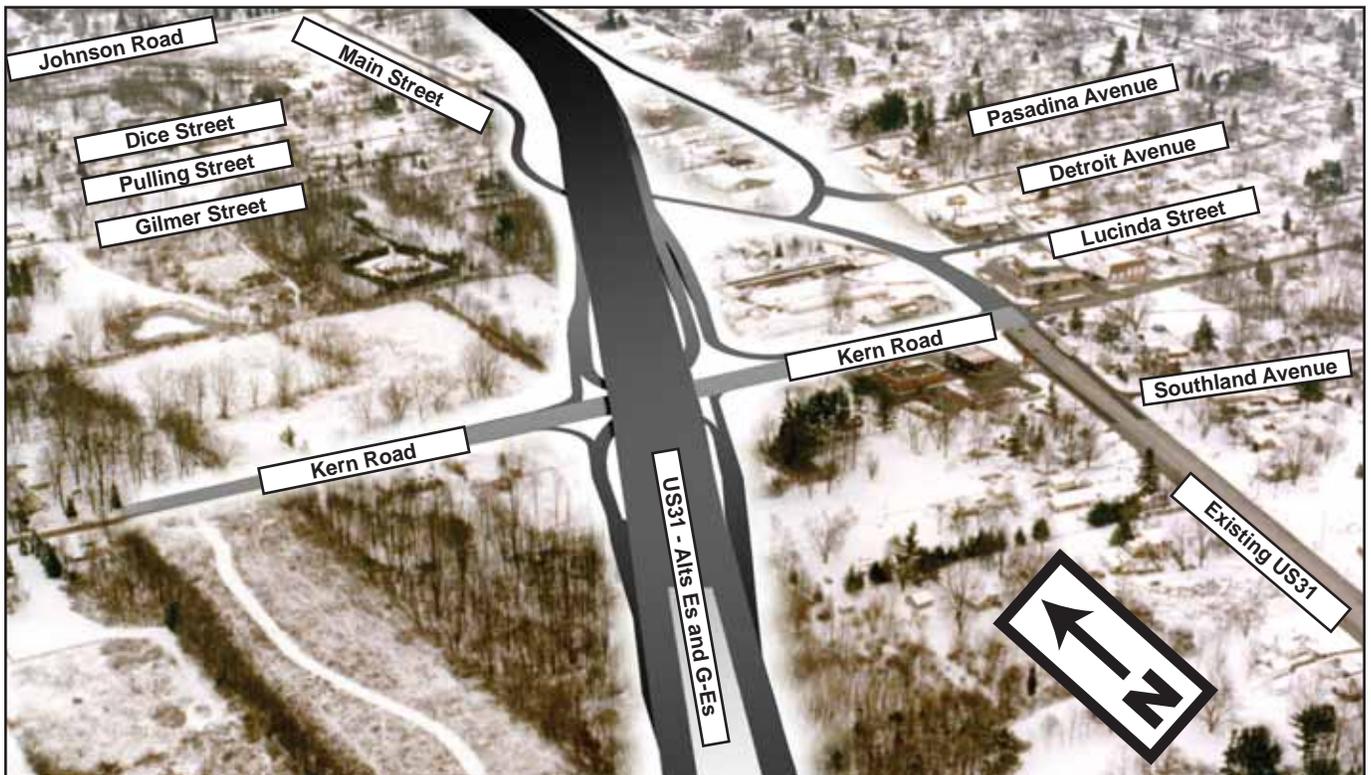


Figure 5.13.62: (After) Proposed Interchange Location for Alternative Es and Preferred Alternative G-Es at Kern Road



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; Underground Storage Tank (UST), and Leaking Underground Storage Tank (LUST) lists from the IDEM website; EPA EnviroMapper and archived Comprehensive Environmental Response, Compensation, and Liability Information System (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. In addition, the Department of Public Works and Department of Community and Economic Development were contacted for information.

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. Four of these sites are within the right-of-way of the alternatives. These sites include the ARCO site, the Jackson Road County Landfill, the Ireland Road site and the Bradberry Brothers Landfill. The ARCO site is within the right-of-way of the new interchange at US 20 associated with Alternatives G-Cs and Cs. This site is also slightly within the right-of-way of Alternatives Es and G-Es due to road improvements occurring along US 20. The interchange at US 20 near the ARCO Site has been scaled back so it no longer encroaches upon the storage tank area on this property. The Jackson Road County Landfill will be within the right-of-way for the realignment of Linden Road along Alternatives G-Cs and Cs. The realignment of Linden Road should not cross the fill area of the Jackson Road Landfill. The Ireland Road site is currently located within the boundaries of the interchanges at US 31 and US 20 for Alternates G-Es (the preferred) and Es due to their larger nature. This site is currently being developed into a commercial area that will include a Wal-Mart, and Lowes. The area nearest to the alignments has undergone remediation and the fill has been removed from this area where the proposed alignments may cross the property. The Bradberry Brothers site is located within the right-of-way of Alternatives G-Cs and Cs. This was a county approved landfill that received demolition material such as concrete and masonry. The No-Build Alternative would have no impact to these sites.

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 900 ft east of Alternative Cs.
- 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-Cs and Cs. The realignment of Linden Road and Alternatives G-Cs 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.
- Ireland Road site (IND980904288) - This is an inactive industrial and municipal waste landfill. It is located in the northwestern 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 Alternatives Cs and G-Cs and within Alternatives Es and G-Es. This site is currently being remediated and used as commercial area under the Brownfields development



program. The Ireland Road site will not be impacted by any of the alternatives since remediation activities have already been completed in the southern portion of the site. According to IDEM (per communication with the Abandoned Landfill Branch and their project manager), the area of fill located along the southern boundary of the site was excavated and placed into the northern portion of the site to be ultimately located under a parking lot. Information gathered from IDEM, identified that the groundwater in this area flows to the northwest away from the proposed alternatives. Preferred Alternative G-Es will not impact this site since remediation in the areas nearest to it have already been completed.

- Bradberry Brothers Landfill (IND982073108) - This site was a 31-acre county approved landfill that was designated to receive demolition material. This site was listed as being located at 21750 Johnson Road, but this address does not exist. This landfill is located approximately 1 mile west of US 31 on Kern Road according to IDEM (per conversation with the abandoned landfill branch). This site is within the right-of-way for Alternatives Cs and G-Cs. It was listed as receiving masonry and concrete materials.
- St. Joseph County Landfill #2 (IND982073157) - This site is located $\frac{3}{4}$ of a mile west of US 31 on Kern Road according to information provided by the EPA database. After receiving further information from EPA, their investigations and interviews with local government found that no such landfill ever existed at this location.
- St. Joseph County Landfill (IND980613715) - This site is located at the corner of Jackson and Locust Road and is believed to be 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-Cs. The realignment of Linden Road and Alternatives G-Cs and Cs will cross within the boundaries of this property, but will not cross over the filled area.
- ARCO (IND982072969) - This site is located at 20630 West Ireland Road and was a storage facility for petroleum products. This site should no longer be an issue for Alternatives Cs and G-Cs now that a new interchange at US 20 has been reduced in size and no longer would be within the tank storage area. Alternatives Es and G-Es will encroach upon this property due to improvements to US 20, but should not be within the vicinity of any potential contamination. According to a conversation with IDEM none of the alternatives will be located near any of the areas of potential contamination for this site. 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-tertiary-butyl-ether (MTBE) were detected in the soil and groundwater at a home off the site. This home is located to the northwest of the site north of Ireland Road. This low level plume is located in a northwest direction away from the proposed alternatives. This site has been known as ARCO, COZ Terminaling and Transmontaigne Terminaling Inc., which reconstructed the terminal and restarted operations at the site. Currently this site is operating under the name Buckeye Terminal. This site is currently on the Commissioners Bulletin. Remedial investigations for this property are ongoing. These further investigations include the installation of a deeper well near the home where the MTBE was discovered at low levels. The contaminated area of this property is not located near the preferred Alternative G-Es or any of the other alternatives.

RCRA

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



- Wiegand's Amoco (IND984897405) is located at 111 East Ireland Road and is approximately 200 ft north of the US 31 and US 20 interchange, which would be in the vicinity of all the alternatives. This site is listed as no longer a generator (NG).
- 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 and G-Es.
- Rob's Towing (IND984915546), which is now known as Country Convenience is located at 60990 US 31 South and is a conditionally exempt small quantity generator. This site is about 590 ft from the main line of Alternatives Es and G-Es, but it is adjacent to the local road improvements along US 31.
- 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 approximately 220 ft north of the existing US 31 and US 20 interchange associated with all of the alternatives.
- INDOT Plymouth Subdistrict (IND984904193) is located at 12636 4-A Road in Plymouth off of US 31 and 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.
- COZ Terminaling Inc. (IND000717926) is a conditionally exempt small quantity 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 Cs and G-Cs. Alternatives Es and G-Es will also encroach upon the southern edge of this property due to improvements to US 20. The interchange at this location associated with Cs and G-Cs was scaled down so as to not encroach upon the storage tank area. All of the alternatives should avoid any potential contaminants.
- Master Metal Engineering Inc. (IND984880187) is a conditionally exempt small quantity generator. This site is located at 4520 Burnette Drive is within the right-of-way for the Scott Street local road improvement that is part of Alternatives Es and G-Es.
- Rankin Automotive Inc. (INR000004697) is a conditionally exempt small quantity generator located at 538 W. Ireland Road. This facility is located approximately 640 ft. east of the Scott Street local road improvement.
- Gurley Leep Ford Inc. (IND069765337) is a conditionally exempt small quantity generator located at 320 E. Ireland Road. This site is approximately 680 ft from Alternatives G-Es and Es. This site is approximately 200 ft from the Fellows Street local road improvement on the east side of US 31 that is associated with both Alternatives G-Es and Es.

The No-Build Alternative would have no impact to these sites.

UST's

Sites for which Underground Storage Tanks (USTs) are registered, or gas stations within and near the right-of-way noted during fieldwork are described below.

- McClure Oil, located at 60749 US 31 north of Kern road is located within the right-of-way for Alternative Es and G-Es. There are 5 tanks that are currently in use at this site.
- Country Convenience gas station is located at 60990 US 31 South. This site is approximately 590 ft east of Alternatives G-Es and Es. This station is also immediately adjacent to the local road improvements that will be constructed along the existing US 31 as part of Alternatives G-Es and Es. A total of 6 tanks have been



removed from this site. Currently there are 3 tanks in use.

- One Stop Phillips 66 is located at the southwest corner of US 31 and Kern Road. This property is slightly within the right-of-way for Alternative Es and G-Es. This site is also adjacent to the local road improvements to existing US 31. There are 3 tanks currently in use at this station.
- Bradberry Brothers Inc. is located off Dice Street approximately 400 feet west of Alternatives G-Es and Es. This site has 2 open temporary out of service tanks on the premises.
- Transmontaigne Terminal Inc., currently Buckeye Terminal, is located at 20630 W. Ireland Road. The storage tank area at this site is no longer located within the right-of-way of any of the alternatives. All of the alternatives should avoid the potential contaminants at this site. This site has had 2 tanks removed from the premises.
- Robin Hood Golf Course is located at 20099 New Road and is approximately 1,800 ft from Alternative G-Cs and G-Es. There is one tank at this site that is permanently out of service.
- Berliner & Marx Inc. is located at 21149 W. Roosevelt Road. This site is approximately 140 feet west of Alternative Cs and 1,500 ft from Alternative G-Cs. It is currently abandoned. This site has 7 open tanks that are permanently out of service and 1 that has been removed.
- Kocolene Service Station is located at 60600 US 31 South. This site is now a vacant lot and is partially within the right-of-way of Alternatives G-Es and Es. There will also be local road improvements occurring immediately adjacent to the north and south of the property associated with Alternatives G-Es and Es. This site has had 5 tanks removed, and none remaining on site.
- Wiegand's Amoco is located at 111 East Ireland Road and is approximately 200 feet from the eastern edge of all the alternatives. This site has 5 open tanks currently in use and has one tank that is inert and permanently out of service.
- 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 instead this property is now called Key Oil Co. This location is within the right-of-way for Alternative Es and G-Es. This site has 4 tanks that are permanently out of service.
- K&B Transport now Diversified Transport Inc. is located at 731 W. Ireland Road and has 2 tanks that are now permanently out of service according to IDEM records. This site is north of Ireland Road approximately 100 ft. from the Scott Street improvement. This road improvement is associated with Alternatives G-Es and Es.
- Basney Ford of South Bend Inc. now Gurley Leep Ford has 4 tanks that are listed as being permanently out of service. This property is located approximately 200 ft west of the Fellows Street local road improvement that is part of Alternatives G-Es and Es.
- Singer General Tire now called Professional Detailing and Carwash is located at 60885 US 31 South and is approximately 100 ft from the eastern edge of Alternatives Es and G-Es. This site is within the right-of-way of the local road improvements occurring along existing US 31. This site has one permanently out of service tank on the premises.
- Select Beverages is located at 4610 S. Burnette Dr. adjacent to US 20 and the local road improvement at Scott Street west of US 31. This site was listed as having 3 tanks removed from the premises.

The No-Build Alternative would have no impact to these sites.



LUST

These are sites that contain Leaking Underground Storage Tanks (LUSTs) according to the IDEM data system. The sites that are on this list are categorized into different types. One site category includes the sites that have been closed using the UST Branch Guidance Manual, October 1994 (NFA 94 Guidance). The other categories are active and discontinued. “Active” designates that a LUST is currently undergoing site characterization or corrective action. Discontinued sites may be active sites. A site maybe listed as discontinued for different reasons including:

1. The site was referred to another program because the release is not from a regulated UST.
 2. The FID and LUST number assigned were based on a complaint and not to a known facility.
 3. A LUST that is a dead end because the owner cannot be located and is a lower priority based on information and potential threats to human health and the environment.
- Berliner & Marx Inc. is located off of Roosevelt Road approximately 140 feet west of Alternative Cs and well over a 1,500 ft from Alternatives G-Cs. This site is currently abandoned. The tank at this site was closed using NFA 94 Guidance.
 - Wiegand’s Amoco Station is a LUST site located at 111 East Ireland Road and is about 200 feet north from the existing right-of-way of the US 31 and US 20 interchange. This site has been listed in the IDEM database as having 3 tanks closed using the NFA 94 Guidance.
 - Country Convenience is a LUST site located at 60990 US 31 South. This site is approximately 590 ft east of Alternatives G-Es and Es. This station is also immediately adjacent to the local road improvements that will be constructed along the existing US 31. This site is listed as having one active tank.
 - Singer General Tire now called Professional Detail and Carwash is a LUST site located at 60885 US 31 South and is approximately 100 ft from the edge of Alternative Es and G-Es. This site is within the right-of-way of the local road improvements occurring along existing US 31. The tank located at this site has been closed using the NFA 94 Guidance.
 - McClure Oil Corporation located at 60749 US 31 South is a LUST site that is within the right-of-way of Alternative Es and G-Es. This site has 2 active tanks on the premises.
 - Kocelene Service Station is a LUST site and is located at 60600 US 31 South. This site is now a vacant lot and is partially within the right-of-way of Alternatives G-Es and Es. There will also be local road improvements occurring immediately adjacent to the property. The 2 LUST at this site have been closed using the NFA 94 Guidance.
 - Transmontaigne Terminaling Inc. now Buckeye Terminal is a LUST site located at 20630 West Ireland Road. This property is within the right-of-way for Alternatives G-Cs, Cs, Es and G-Es but the storage tank area at this site is not located within the right-of-way. The alternatives should not be crossing any potential contaminants associated with this property. There are two listed tanks on this site one is listed as an active tank and the other one is listed as a discontinued tank.
 - Select Beverages is located at 4610 S. Burnette Dr. and is adjacent to US 20 and the local road improvement at Scott Street west of US 31 associated with Alternatives G-Es and Es. This site is listed as having a tank that was closed using the NFA 94 Guidance.



In addition to the listed sites within the study area there are also many homes that are located within the boundaries of alternatives. Some of the older homes may have asbestos containing building material (ACBM) within them. There is also a wrecker service located at 644 W. Ireland Road that has several old cars behind it that is located within the right of way of the local road improvement to Scott Street, which is part of Alternatives Es and G-Es. This wrecker service is also included in the development and remediation plan for the Ireland Road Site.

The No-Build Alternative would have no impact to these sites.

Summary

The alternatives generally cross over a mostly rural area until they reach the south side of South Bend. Most of the commercial businesses and potential LUST and UST's are located along US 31 south of US 20. In addition to these sites there are also several inactive landfill areas that are dispersed within the area surrounding the alternatives. Table 5.14.41 shows a summary of the hazardous material sites found within the right-of-way of the alternatives. The Preferred Alternative G-Es has five different potentially hazardous sites not including the conditionally exempt small quantity generators and gas stations with removed tanks or NFA 94 Guidance tank closures. It does not appear that the locations of removed or closed tanks are within the right of way for Preferred Alternative G-Es, however, portions of the gas station property may be within the right of way. In addition, this does not include the ARCO (Transmontaigne, COZ, Buckeye) property, of which the potentially contaminated areas are not being encroached upon by the Preferred Alternative or the property currently undergoing remediation Ireland Road Site, which includes the wrecker service on the western edge of the property. The abandoned landfill (Ireland Road Site) is currently in the process of remediation as part of the development of a commercial shopping area. The fill area that is nearest to the alignments has been remediation and is no longer be an issue for this project. Preferred Alternative G-Es has five hazardous waste sites that are located along US 31, south of US 20. They are one body shop, three gas stations, and one carwash which are all located along US 31 south of US 20.

Type of Facility	Alternatives				Comments
	Cs	G-Cs	Es	G-Es Preferred Alt.	
CERCLIS					
Lakeville Dump Site	Not in R/W				Approximately 900ft east of Alternative Cs
Jackson Road Landfill	X	X			These alternatives cross the property, but are not within the landfill area.
Ireland Road Site	X	X	X	X	This site is currently undergoing remediation. The Southern portion of this site closest to the alignment has already had remediation completed.
Bradberry Brothers Landfill	X	X			This landfill was listed as receiving demolition waste such as masonry and concrete.
St. Joseph Co. Landfill #2	Not in R/W				This landfill was never confirmed as existing.
St. Joseph Co. Landfill	X	X			These alternatives cross the property, but are not within the landfill area. This landfill is believed to be part of the Jackson Road Landfill.
ARCO Storage Facility (Now Buckeye Terminaling)	X	X	X	X	None of these alternatives cross within the storage tank area. The contaminants from this site are located in a northwest direction away from the alternatives.



Table 5.14.41 Summary of Hazardous Material Sites Within the Right-of-Way (Continued)					
Type of Facility	Alternatives				Comments
	Cs	G-Cs	Es	G-Es Preferred Alt.	
RCRA					
Wiegand's Amoco	Not in R/W				Is approximately 200 ft to the north of the right-of-way needed for the US 20 and US 31 intersection
Galloway Body Shop Inc.			X	X	This site is a small quantity generator.
Country Convenience (also known as Rob's Towing)			X	X	This site is a conditionally exempt small quantity generator.
Instant Lube Inc.	Not in R/W				This property is approximately 220 ft. north of the US 20 and US 31 proposed interchange.
INDOT Plymouth Subdistrict	Not in R/W				This site is approximately 800 ft. from all of the alternatives point of exit from existing US 31.
COZ Terminaling (Now Buckeye Terminaling)	X	X	X	X	This site is a conditionally exempt small quantity generator. The storage tank portion of this site will not be encroached upon by any of the alternatives.
Master Metal Engineering Inc.			X	X	This business is within the R/W for the Scott Street improvement and is a conditionally exempt small quantity generator.
Rankin Automotive Inc.	Not in R/W				It is a conditionally exempt small quantity generator located about 640 ft. from Alternatives Es and G-Es.
Gurley Leep Ford Inc.	Not in R/W				It is approximately 200 ft. from the Fellows Street local road improvement, which is part of Alternatives Es and G-Es.
UST's					
McClure Oil			X	X	There are five tanks currently in use at this site.
Country Convenience					This site is immediately adjacent to the local road improvements to existing US 31 as part of Alternatives Es and G-Es. This site has 3 tanks currently in use.
One Stop Phillips 66			X	X	This property is within the right-of-way for these two alternatives, but the station will more than likely not need to be disturbed.
Bradberry Brothers Inc.	Not in R/W				Is approximately 400 ft. from Alternatives Es and G-Es. This site is not located in the same area as the Bradberry Brothers Landfill.
Transmontaigne Terminal Inc. (Now Buckeye Terminaling)	X	X	X	X	The storage tank area for this facility is not located within the right-of-way for any of these alternatives.
Robin Hood Golf Course	Not in R/W				It is located approximately 1,800 ft. from Alternatives G-Cs and G-Es.
Berliner & Marx Inc.	Not in R/W				This site is 140 ft. from Alternative Cs and 1,500 ft. from Alternative G-Cs.
Kocolene Service Station (Now a vacant lot)			X	X	This property within the eastern edge of these alternatives. It has had its five tanks removed. This site is now a vacant lot.
Wiegand's Amaco	Not in R/W				This property is 200 ft. north of the right-of-way for the reconstruction of the US 20 and US 31 interchange.
Sparkle Wash (Now Key Oil)			X	X	Has four tanks that are permanently out of service



Table 5.14.41 Summary of Hazardous Material Sites Within the Right-of-Way (Continued)					
Type of Facility	Alternatives				Comments
	Cs	G-Cs	Es	G-Es Preferred Alt.	
K&B Transport (Now Diversified Transport)	Not in R/W				Approximately 110 ft. from the Scott Street local road improvement. There are two tanks at this site that are permanently out of service.
Basney Ford of South Bend Inc.	Not in R/W				This property has four tanks that are listed as permanently out of service and is about 200 ft. from the Fellows Street local road improvement.
Singer General Tire (Now Professional Detailing and Carwash)			X	X	It is within the R/W of the local road improvements along existing US 31 associated with Alternatives Es and G-Es. There is one permanently out of service tank at this site.
Select Beverages	Not in R/W				This property is located approximately 100 ft. west of the right-of-way for the Scott Street local road improvement. This site was listed as having three tanks removed from the premises.
LUST					
Berliner & Marx Inc.	Not in R/W				This site is 140 ft. from Alternative Cs and 1,500 ft. from Alternative G-Cs.
Wiegans's Amoco	Not in R/W				This property is 200 ft. north of the right-of-way for the reconstruction of the US 20 and US31 interchange.
Country Convenience also known as Robs Towing	Not in R/W				This site is immediately adjacent to the local road improvements to existing US 31 as part of Alternatives Es and G-Es. There is one tank at this site that is listed as active.
Singer General Tire (Now called Professional Detail and Carwash)			X	X	It is within the R/W of the local road improvements along existing US 31 associated with Alternatives Es and G-Es. The tank at this site has been closed using NFA 94 Guidance.
McClure Oil Corporation			X	X	This site is listed as having two active tanks on the premises.
Kocolene			X	X	This property within the eastern edge of these alternatives. The two LUSTs at this site have been closed using NFA 94 Guidance. This site is now a vacant lot.
Transmontaigne Terminaling (Now Buckeye Terminaling)	X	X	X	X	None of these alternatives encroach upon the storage tank area and should not be impacted by this site.
Select Beverages	Not in R/W				This property is located approximately 100 ft. west of the right-of-way for the Scott Street local road improvement. There has been one tank here that was closed using NFA 94 Guidance.
Non Listed Site					
Buds Wrecker Service			X	X	This site is located within the right-of-way of the Scott Street local road improvement. This site is being developed as part of the redevelopment associated with the Ireland Road Site.

Note: An "X" denotes properties that are within the right of way



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 associated 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 four final 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 over the No-Build Alternative. Factors were then used to convert gallons of fuel to BTUs to assess energy impacts. (One million BTUs are 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 5.15.42 reports the results of the energy analysis. Because the final alternatives result in additional miles of roadway, the 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 alternative. Alternative G-Cs 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. Because Alternative Es is the most effective in diverting traffic from existing US 31, it has the greatest increase in VMT. While greater in length than Alternative Es, Alternative G-Es results in less VMT because it is less effective than Alternative Es in diverting traffic from existing US 31.

Alternative G-Es results in the greatest energy consumption because its length is greater than Alternatives Cs and Es and it is more effective than G-Cs in attracting traffic. Being shorter than Alternative G-Es, Alternative Es results in the second greatest energy consumption because it diverts the most traffic from existing US 31. Alternative G-Cs has the least additional energy consumption over the No-Build Alternative because it is the second longest final build alternative with the least traffic; however, there is little difference in energy consumption overall between the 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 Alternatives Es and G-Es during the construction of the freeway segment between Kern Road and the US 20 Bypass along the existing alignment of US 31, these alternatives have greater short-term vehicle operation energy impacts than final Alternatives Cs and G-Cs which use less existing US 31 alignment.



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-Es, followed by Alternative G-Cs, 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 \$319,3221 for Alternative G-Es, followed by \$317,852 for Alternative G-Cs, \$310,507 for Alternative Es and \$304,632 for Alternative Cs.

Table 5.15.42: Energy Consumption in the Year 2030 by Alternative

Alternatives		Annual Vehicle-Miles of Travel (in millions)	Daily Fuel Consumption (in gallons)	Annual BTUs (in millions)	BTUs/Vehicle-Mile
No-Build		121,279	28,781,508	1,265.21	10,432
Cs		121,330	28,803,306	1,266.16	10,436
	% change over No-Build	0.042%	0.076%	0.075%	0.033%
Es		121,344	28,803,763	1,266.18	10,435
	% change over No-Build	0.054%	0.077%	0.077%	0.023%
G-Cs		121,329	28,802,601	1,266.13	10,436
	% change over No-Build	0.042%	0.073%	0.073%	0.031%
G-E (Preferred)		121,338	28,803,993	1,266.19	10,435
	% change over No-Build	0.049%	0.078%	0.077%	0.029%

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

Summary of Preferred Alternative G-Es

Preferred Alternative G-Es was analyzed for energy consumption by converting expected travel characteristics into gallons of gasoline and diesel fuel consumed in the year 2030. Alternative G-Es results in the greatest energy consumption because its length is greater than Alternatives Cs and Es and it is more effective than G-Cs in attracting traffic.

The large, short-term indirect energy impacts associated with the construction and maintenance of the new freeway are comparatively greatest for Preferred Alternative G-Es.



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.

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. Storm water detention areas may be required and locations will be determined during the design phase of the project. It is likely that they may be outside of the project footprint. Land use for these detention areas would likely be agricultural and impacts will be assessed when the final locations are determined.

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)

In its comment letter on the DEIS, the EPA pointed out that the Section 404(b)(1) Guidelines require, in the context of Section 404 permitting, the selection of the “least environmentally damaging practicable alternative” or “LEDPA.” In particular, the Section 404(b)(1) Guidelines require the selection of the practicable alternative that causes the least harm to the “aquatic environment,” which consists of wetlands and other jurisdictional waters of the United States, so long as the alternative does not have other significant adverse environmental consequences.

In response to this comment, the Federal Highway Administration (FHWA) and the Indiana Department of Transportation (INDOT) have outlined consideration of the Section 404(b)(1) Guidelines in selecting a preferred alternative. In particular, consideration was given to issues of practicability, aquatic environment impacts and other environmental impacts, in addition to meeting the other requirements of Section 404(b)(1). The Section 404 LEDPA Consistency Analysis for Preferred Alternative G-Es can be found in Appendix T of this document.

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 IDEM Isolated Wetlands Regulatory Program
Indiana Department of Natural Resources (IDNR)	Permit 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	National Pollutant Discharge Elimination System (NPDES) Rule 5 Erosion Control
St. Joseph County Drainage Board	Notice Only
Marshall County Drainage Board	Notice Only

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 (327 IAC 15-5), established under the NPDES, regulates sediment discharges from construction site erosion.

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

5.20.1 Introduction

Cumulative effects analysis seeks to identify the impact on the human and natural environment which results from the direct and indirect impacts of a particular action or project when added to past, present, and reasonably foreseeable future actions of others. Impacts to the human and natural environment fall into one of three major categories, i.e., direct, indirect and “others” impacts. Direct impacts are defined by the Council on Environmental Quality (CEQ) Regulations as *“effects which are caused by the action and occur at the same time and place.”* For this project, the direct impacts are the result of the right-of-way needs of the project.

Indirect impacts are defined by the CEQ Regulations as *“effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.”* For this project, an example of an indirect impact would be the development of farmland as a result of new access provided by the project. There are also impacts of reasonably foreseeable future actions of others not associated with the US 31 project. 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.

Cumulative impacts are the summation of direct and indirect impacts to the human or natural environment because of the proposed action, and “others” impacts which consist of actions on these resources that are not a result of the proposed action. These 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) The assessment of cumulative impacts is required by the CEQ Regulations. These regulations ensure that the US 31 project and other federal, state, and private actions will be evaluated with regard to cumulative impacts.

5.20.2 Methodology

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).

For the proposed US 31 project, three human and natural resources were identified that are being analyzed for cumulative impacts. These three resources are wetlands, forest and farmland. During meetings on 5/15/03, 12/03/04, and 7/14/04 with various federal and state resource agencies, it was identified that potential disturbances of wetlands, forest and farmland are the significant cumulative effects issues associated with this project. These meeting minutes are located in Appendix C.

The analysis of the past and present trends of these three resources show that Indiana has lost approximately 85% of its wetland areas. Wetlands serve as habitat for many plant and animal species as well as help to stabilize shorelines in lake and river areas. Nationally, approximately 35% of all rare and endangered animal species depend on wetlands for their livelihood. In Indiana alone there are more than 60 animal species that are listed as endangered, threatened, or of special concern that are dependent on wetlands. There are also over 120 plant species associated with wetland areas that are endangered, threatened or rare in Indiana. Together wetlands and forest make up the majority of



the environmentally sensitive habitat for threatened and endangered species in Indiana. These statistics show the relevance of analyzing these two resources that are extremely important to Indiana flora and fauna. In addition to providing habitat, Indiana forests are a major source of revenue for this state. In 2001 Indiana ranked 3rd nationally in hardwood lumber production, which added over \$4 billion to the state's economy. Farmland in Indiana is also a valuable economic resource. Indiana ranked in the top 10 nationally in 11 different crop production categories in 2003.

5.20.2.1 Study Area

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.

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, G-Cs and G-Es through Marshall and St. Joseph Counties.

5.20.2.2 Time Frame

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. 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.

5.20.2.3 Determination of Land Use Impacts

The analysis identifies the anticipated land use changes of the project alternatives in the project study area. These land use changes will form the basis for the indirect and cumulative effects analysis for this project. This included the US 31 indirect impacts associated with accessibility changes as a result of interchanges. Growth in residential, commercial and industrial development in the two county study area occurring independently of the US 31 project was labeled as other impacts. Specific consideration was given to the areas surrounding proposed interchanges as being high potential development areas. A one-mile corridor was identified along cross streets, defining, for purposes of the analysis, the interchange area.

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. The future year of 2030 is the future analysis year for the transportation modeling and the population and employment forecasts. It is not reasonably foreseeable to forecast impacts beyond the year 2030. 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.

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. When presenting the cumulative impacts, these developments are included as other actions that are occurring presently and that are reasonably foreseeable. Current development that is occurring in the US 31 corridor includes the following commercial, industrial, and residential land uses. These developments are shown in Figure 5.20.63.

- Office Building at corner of US 31 and Whitmer Street - 1 Acre
- Locust Knolls Estates Subdivision – 50 Acres
- Lakeville Commerce Park Subdivision – 11 Acres
- Hidden Creek on Jackson Road – 31 Acres
- Lafayette Falls Subdivision – 115 Acres
- Fieldstone Centre Subdivision – 30 Acres
- Mixed Use Commercial and Housing at Old Lakeville School - 13 Acres

In addition to current development in the project study area, the cumulative analysis includes other INDOT and/or local transportation improvements planned in or near the project area. These INDOT projects are listed in the US 31 Preliminary Screening Report and include:

- 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

Forecasted population and employment growth within the project study area was obtained from the US 31 Improvement Project Travel Demand Model. The allocation of these forecasts to the Traffic Analysis Zones (TAZs) was based upon the existing and future land use plans for South Bend, Plymouth, LaPaz, St. Joseph County, and Marshall County. From the 39 TAZs included within the project study area, the population and employment forecasts were converted into acres of development. Population was first converted into households and then into acres using a value of 3 households or housing units per acre. This value is for single-family detached housing and comes from the “Trip Generation- 6th Edition” Institute of Transportation Engineers, 1997. The forecasts for employment were converted into acres of land using values from the “Trip Generation- 6th Edition” Institute of Transportation Engineers, 1997.

The result was a total of 975 acres of land is forecasted to be converted to commercial, industrial, and residential land use development within the project study area by the year 2030. The acreage related to indirect impacts from

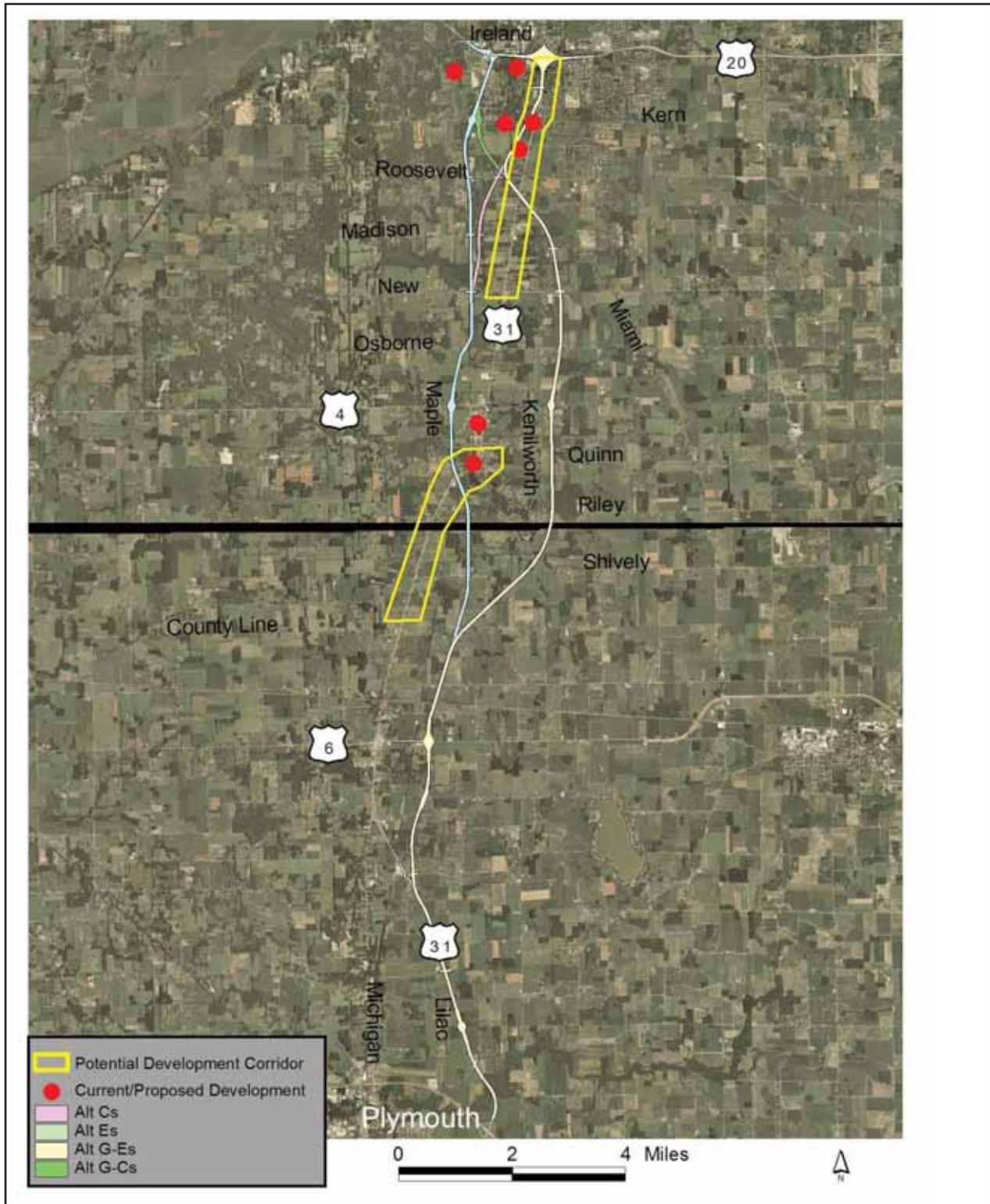


Figure 5.20.63: Recent, Proposed, and Potential Future Development along US 31



the proposed project was subtracted from the total of 975 acres of total development. The remaining acreage was the result of “other actions” and was determined to be wetland, forests and farmland acreage based on current land zoning, land uses, aerials and NWI maps.

5.20.2.4 Current Zoning and Land Use Trends

Plymouth/Marshall County

Little to no development exists along Alternatives Cs, Es, G-Es and G-Cs particularly from US 30 to US 6. Primarily row crops such as corn and soybeans characterize approximately 80% of the land use in this portion of Marshall County. The balance of this section contains fragmented forest along with some fallow fields. 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 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.” A survey outcome in the plan also states, “commercial development should focus on existing communities and cities within the county.” 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. Given that the City of Plymouth is outside of the study area, we should expect nominal growth particularly for this area in the future.

LaPaz/Marshall County

Little to no development exists along Alternatives Cs, Es, G-Es and G-Cs 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.

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.



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.

This portion of the county is zoned primarily agriculture (A) and includes residential (R), commercial (C) and manufacturing (M) in the area contiguous to the southeast boundaries of the City of Lakeville. 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.

South Bend/ St. Joseph County

Development increases along Alternatives Cs, Es, G-Es and G-Cs 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.”

The properties along US 31 where Alternatives Es and G-Es merge into existing US 31 and continue to the northern terminus at US 20 Bypass 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. Residential subdivisions exist east and west of existing US 31 corridor along this section. The new developments in this area are the proposed 30-acre Fieldstone hotel development site along US 31 and Kern Road south of Es and G-Es. The 50-acre Locust Knolls subdivision, which is currently being developed is located along Jackson Road west of Locust Road. This subdivision is west of Alternatives Cs and G-Cs. Another proposed development in this area is Hidden Creek Subdivision, which is located along Johnson Road west of Alternatives Cs and G-Cs. The last known proposed development



in the area is Lafayette Falls Subdivision. This 115 acre subdivision is located along Kern Road between Alternative Cs and existing US 31.

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, “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 Road 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.

There are four access controlled interchanges associated with each of the four alternatives. These interchanges are at 7th road, US 6, Pierce Road (SR 4) and Kern Road. The acreages of indirect impacts at these interchanges were determined using a model developed for a national study entitled Commercial Development at Rural and Small-Town Interstate Exits (Hartgen and Kim, 1998). This model takes factors such as traffic data, surrounding land use, nearest towns, populations of nearest towns and how far the area is from other interchanges and estimates the amount of development that will take place at that area. Once a number of establishments is given it is converted into acreages.

The interchange at 7th Road was proposed by Marshall County as a result of comments to the DEIS. Initially, the interchange was planned for 5A Road since no intersecting roadway currently exists at 7th Road and US 31. The interchange was shifted to 7th Road with the understanding that Marshall County would construct a new road at this interchange before construction of US 31. The estimated amount of growth at this interchange was estimated at 10 acres.

There was little new development predicted to occur at the proposed interchange with US 6. The main reason for this is the existing businesses along US 6 will be close enough to the new interchange that they will be visible to motorist and likely will not need to move. With regard to new residential development, the future land use plans show no residential areas on the east side of La Paz in the US 6 area.

The proposed Pierce Road (SR 4) interchange is expected to have 14 acres of commercial development according to the model by Hartgen and Kim. There was also an estimated 16 additional acres of residential development to occur



at this interchange for Alternatives Cs and Es. The 16 acres would result from the nearby commercial development in the area and the attractiveness of Newton Park to families. Alternatives G-Cs and G-Es would have little development associated with this interchange, because they are located east of US 31 in an area that is forecasted in the future land use plan to remain an agricultural area.

Alternatives Cs and G-Cs will have the most indirect impacts related to the proposed Kern Road interchange. At each of these interchanges there is anticipated to be 10 acres of commercial development and 75 acres of residential development. The commercial development is expected to happen just west of existing US 31 near Main Street. This commercial development would fill in the small amount of open land in that area. The residential development is projected to occur in an open field at the northeast corner of Kern and Locust Road. There are subdivisions and a park proposed for the area just north this area that could attract more residences to locate here.

Alternatives Es and G-Es will only have 10 acres of commercial indirect impacts associated with the proposed interchange to be located at Kern Road. The commercial development is expected to happen just west of existing US 31 near Main Street. This commercial development would fill in the small amount of open land in that area.

5.20.2.5 Past and Future Trends of the Effected Environment

The significant 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 5.20.43 and Figure 5.20.64). 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 5.20.44 and Figure 5.20.65). The future trend for forests in St. Joseph County indicates that forests are increasing 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.

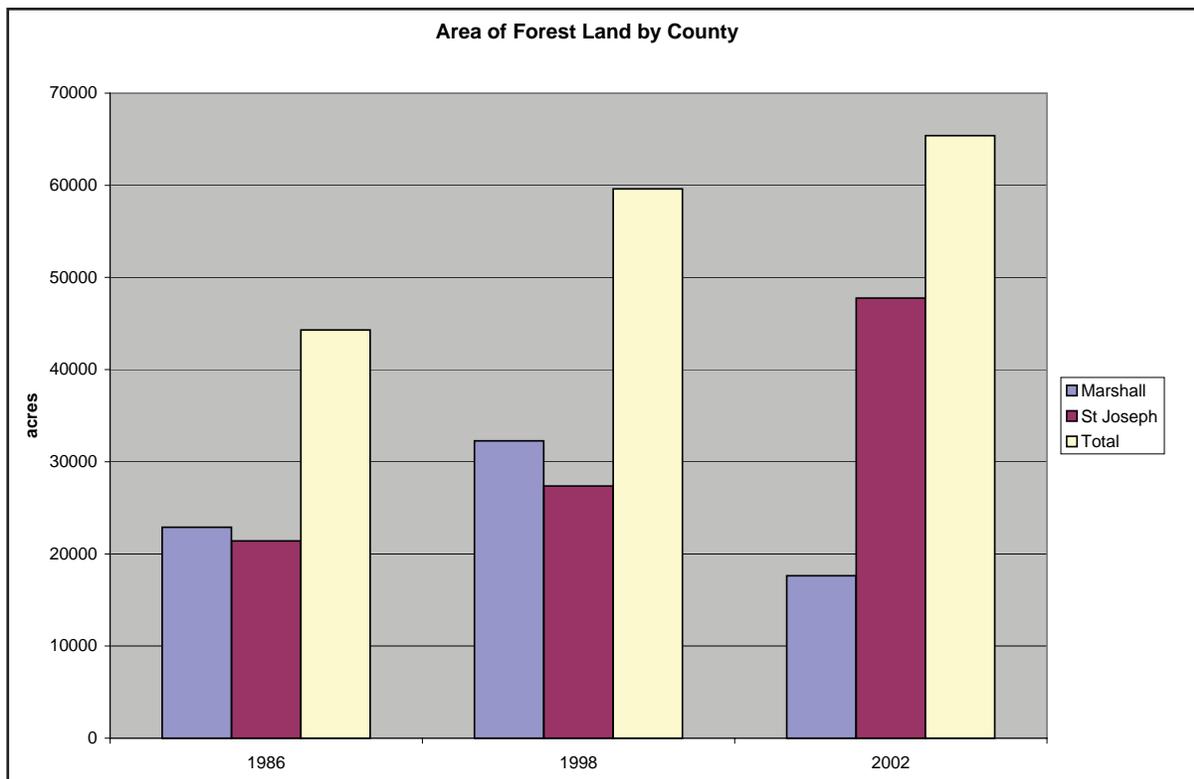


Figure 5.20.64: Area of Forest Land by County

County	Forest				Non-Forest		
	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

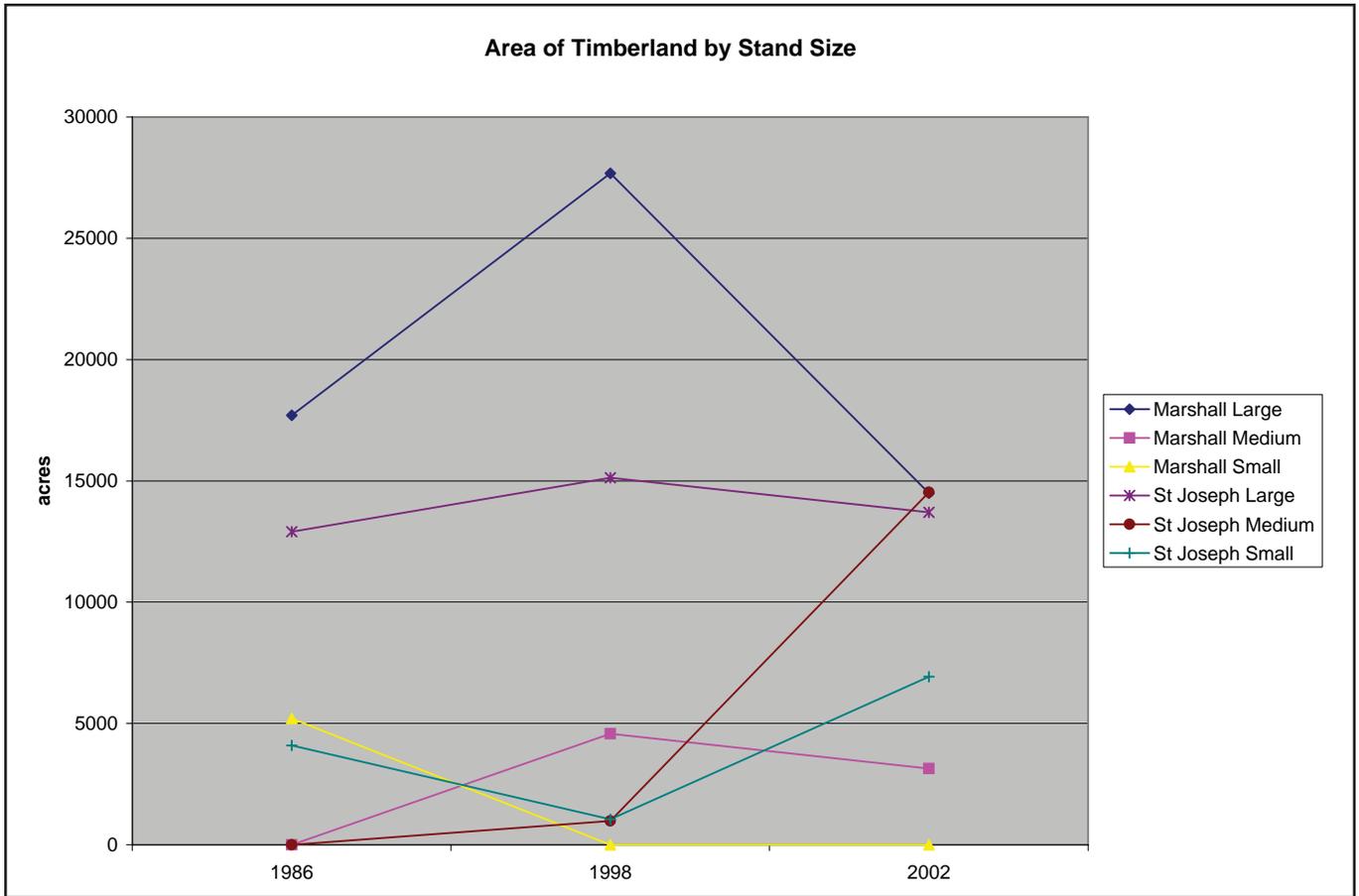


Figure 5.20.65: Area of Timberland by Stand Size

Table 5.20.44: Area of Timberland by County and Stand Size Class (acres)

County	1986			1998			2002		
	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



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. 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 have been and will be made to avoid impacting wetlands during the development of the preferred alternative. Delineated jurisdictional wetland impacts for the Preferred Alternative G-Es are described in Chapter 5.12 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 4.5.20 and 4.5.21 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.

5.20.3 Analysis

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 5.20.45 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 7th Road, SR 6, SR 4/Pierce Road, Kern Road, and scattered residential subdivisions. Also included in these indirect impacts is an approximation of the impacts associated with the 7th Road Extension Local Road Improvement Project (see Chapter 3.5.5). The 7th Road Extension Project developed as a result of coordination between the study team and local officials from Marshall County and the City of Plymouth regarding the location of an interchange within the county. Local officials requested that an interchange be located at 7th Road instead of at 5th Road as proposed in the DEIS. Since 7th Road does not currently intersect with US 31, county officials committed to providing funding associated with preliminary engineering, environmental studies, right-of-way acquisition and construction of the extension of 7th Road westward from US 31 to Michigan Road and eastward from US 31 to North Linden Road. It is anticipated that the county will utilize Federal funding for the construction of the 7th Road Extension Project so the associated environmental evaluation will be required to follow the NEPA process and the direct impacts of the project will be determined at that time. No direct socio-economic and environmental impacts for the 7th Road Extension Project have been determined or included in the US 31 Project; however, in response to requests made at the July 14, 2004, resource agency meeting,



an estimation of the impacts associated with the project have been included as indirect impacts in the cumulative impacts of the US 31 Project.

In order to estimate the potential indirect impacts associated with the 7th Road Extension Project, a conceptual alignment for the proposed roadway was developed based on the Marshall County and City of Plymouth long-range plans. For the purpose of determining indirect impacts, a right-of-way width of 100 feet was utilized to determine a potential footprint for the project. It should be noted that the graphical representation of the 7th Road extension used for this analysis is a conceptual representation developed for this EIS only (see Figure 3.5.34). The final alignment of the 7th Road extension will be determined by Marshall County officials during the design of the local roadway project. Environmental information used for the impact analysis was collected from the best-known existing secondary sources of information including GIS data and aerial photography. An estimate of potential indirect impacts associated with the 7th Road Extension Project include wetland impacts, determined from digital NWI maps, of 3 acres; forest impacts of 5 acres; and farmland impacts of 15 acres.

A comparison of the cumulative impacts for each freeway alternative as shown in Table 5.20.45, shows that for farmland, Alternative G-Cs has the highest direct with 504 acres and second highest indirect impacts with 105 acres. Alternative G-Es had the second highest amount impacts to farmland. The farmland impacts for Alternatives Cs and Es are very similar. For forests, Alternative Cs has the highest direct and indirect impacts of the four build alternatives with 186 acres and 30 acres, respectively. Alternatives G-Cs and G-Es have the fewest acres of indirect impacts with ten acres. For wetlands, Alternative Cs has the highest direct impacts of the four build alternatives with 51 acres.

Other impacts include recent development, proposed development, and potential development. These other impacts for the alternatives are shown in Table 5.20.45.

Resource	Alternative	Direct ¹ Impact	Indirect ² Impact	Other Impacts	Cumulative Impacts Total
Farmland*	Cs	390	115	530	1035
	Es	395	50	580	1025
	G-Cs	504	105	520	1129
	G-Es (Preferred) ³	503 ³	45	560	1108
Forest*	Cs	186	30	290	506
	Es	135	25	305	465
	G-Cs	115	10	325	450
	G-Es (Preferred) ³	91 ³	10	345	446
Wetland* (NWI)	Cs	51	3	30	84
	Es	36	3	35	74
	G-Cs	31	3	35	69
	G-Es (Preferred) ³	24 ³	3	35	62

NOTES: * Measured in acres

Categories encompassed in other impacts include:

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. See Table 3.6.41 for Summary of Impacts Associated with Preferred Alternative G-Es following additional, in-depth studies.



Summary of Preferred Alternative G-Es

Following the identification of Alternative G-Es as the Preferred Alternative, additional, in-depth studies were performed on the alternative. Included in these additional studies were minor refinements of the local access plan and associated proposed right-of-way requirements and number of relocations. The results of the additional analysis (see Table 3.6.41) showed that Preferred Alternative G-Es has the least amount of total indirect impacts at only 58 acres. This alternative would directly impact 537 acres of farmland. The indirect impacts to farmland are estimated at only 45 acres, which is the lowest of the proposed alternatives. This alternative also has the fewest amount of direct and cumulative impacts to wetlands and forests. This is mainly due to the fact that most of this alternative travels across farmland.