Analysis of Hybrid Alternatives

Introduction

In its written comments on the DEIS, the USEPA requested that "hybrid" alternatives, which combined the best-performing segments of existing routes be considered in order to determine if critical environmental resources could be avoided while maintaining high levels of performance. In addition, USEPA staff (at a meeting at USEPA Region 5 on October 17, 2002) recognized the value of a connection to Bloomington for I-69, and specifically suggested a hybrid alternative that involved a connection to both Vincennes and Bloomington.

The number of alternatives (with variations) which were considered in the DEIS provided a wide range of reasonable routes for connecting Evansville and Indianapolis. These alternatives were selected through an in-depth scoping and screening process. This process included extensive public involvement and agency coordination, including input from USEPA. At the end of the screening process, the routes proposed for detailed study were publicly announced, and no objections were received. Nonetheless, in a good-faith effort to respond to the USEPA's comments on the DEIS, FHWA and INDOT developed and considered two potential hybrid routes after completing the DEIS.

Given the broad range of alternatives considered in the Screening of Alternatives, there were a limited number of combinations of existing routes that had not previously been considered. A connection between Vincennes and Bloomington is provided by the hybrid suggested by USEPA. The other hybrid examined was a SR 39 version of Alternative 4 - such a route concept had been examined in the Level 2, Screening of Alternatives for what later became Alternatives 2, 3, and 5.

A description of these two routes are:

2/3C Hybrid. One of the hybrid alternatives was designated as the 2/3C hybrid. This alternative was the one specifically suggested by USEPA staff in the meeting on October 17, 2002. This alternative would follow Alternative 2 to Northern Knox County, near the Knox/Greene County border. From there, it would proceed east, crossing the White River near Sandborn, and join with Preferred Alternative 3C near Elnora. From there, it would proceed via the 3C route to Indianapolis.

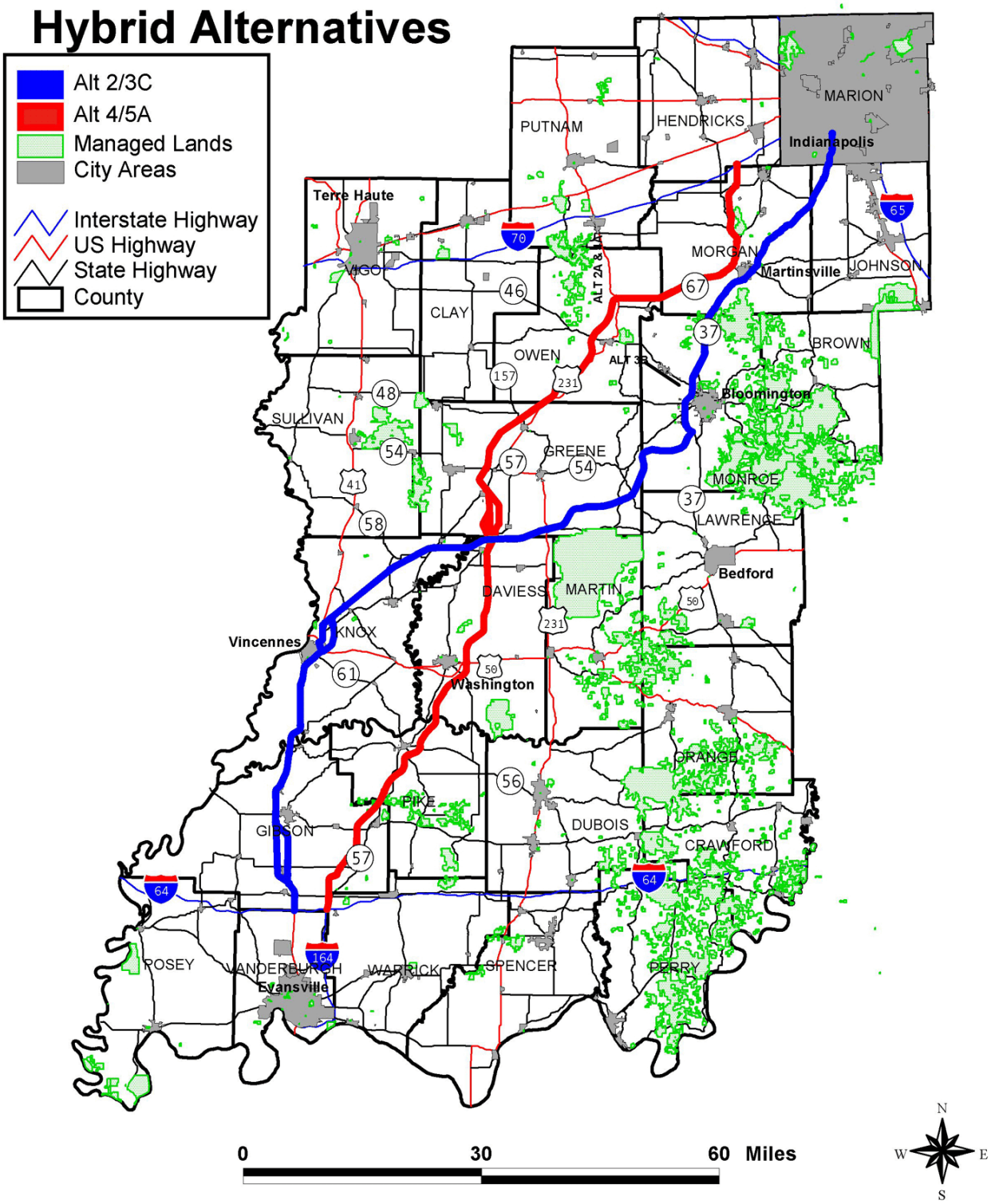
4/5A Hybrid. The other hybrid alternative was designated as the 4/5A hybrid. This alternative would follow Alternative 4C to near Paragon in Morgan County. From there, it would proceed north to the 5A routing through central Morgan County. It followed the 5A routing to I-70, and used I-70 to reach Indianapolis. This alternative was developed independently by FHWA and INDOT in response to USEPA's request to consider potential combinations of existing alternatives.

Figure CC-1 shows both of these hybrid alternatives.

Evansville to Indiananpolis Study

Tier 1 Environmental Impact Statement

Hybrid Alternatives



An initial screening analysis was performed to determine the key impacts, performance measures, and cost for each hybrid alternative. This initial screening was used to compare each of these hybrid alternatives with the five Preferred Alternatives from the DEIS. These analyses were conducted to determine if it was likely that either of these would have been considered a preferred alternative, had it been analyzed in the DEIS. This screening considered the following factors:

- **Key environmental impacts.** Many of the key impacts found in Tables S-6 and 6-1 were calculated for each hybrid alternative. The key impacts for the hybrid alternatives were compared with those for the DEIS Preferred Alternatives. These impacts are presented in Table CC-1. Note that these impacts and the comparisons made from them were calculated before certain route modifications were made. These include the elimination of the Mann Road Variation, the selection of a single variation around Washington, and minor shifting of certain alignments in response to comments provided on the DEIS. This has the effect of making the impact range for the alternatives somewhat larger than before these variation decisions were made.

- **Cost and performance comparison.** The hybrid alternatives' performance on core goals was compared with that of the DEIS Preferred Alternatives. In addition, the capital cost and annual increase in operating and maintenance costs for the hybrid alternatives were compared with the DEIS Preferred Alternatives. These performance and cost comparisons are given in Table CC-2.

Initial Screening Analysis

In this analysis, the initial examination was made regarding the environmental impacts of each alternative. This was done to determine whether, as requested by USEPA, hybrid alternatives could be determined that minimized environmental impacts. After the impacts were evaluated, the performance of each hybrid was compared with the Preferred Alternatives in the DEIS.

Key Environmental Impacts

- **New Acres of Right-of-Way.** The 2/3C hybrid requires, on average, 5,480 acres of new right-of-way. The 4/5A hybrid requires, on average, 6,520 acres of new right-of-way. By comparison, the DEIS Preferred Alternatives required on average between 5,800 (3C) and 6,460 (4C) acres of new right-of way. The 2/3C hybrid requires less new right-of-way (320 to 980 acres less) than any Preferred Alternative. By comparison, the 4/5A hybrid requires more new right-of-way (60 to 720 acres more) than any DEIS Preferred Alternative. The longer length of the 2/3C hybrid (151 driving miles) leads to increased right-of-way requirements, somewhat offsetting its greater use of existing rights-of-way.

- **Acres of Farmland.** The 2/3C hybrid requires, on average, 3,850 acres of farmland. The 4/5A hybrid requires, on average, 5,350 acres of farmland. By comparison, the DEIS Preferred Alternatives require, on average, between 4,350 acres (3C) and 5,450 acres (4C). The 2/3C hybrid requires 500 acres less farmland than the lowest DEIS Preferred Alternative. The 4/5A hybrid requires nearly as much farmland as the highest DEIS Preferred Alternative.

- **Acres of Forest.** The 2/3C hybrid requires, on average, 1,225 forested acres. The 4/5A hybrid requires, on average, 1,090 forested acres. By comparison, the DEIS Preferred Alternatives require, on average, between 890 forested acres (2C) and 1,380 forested acres (3B). Neither hybrid alternative offers an advantage in terms of reducing forest impacts, compared with the Preferred Alternatives. Hybrid 2/3C, in particular, would require more forested acres than any DEIS Preferred Alternative other than 3B.

Table CC-1 Impact Comparison of Hybrid Alternatives and DEIS Preferred Alternatives							
Criteria	**Alt 2C**	**Alt 3B**	**Alt 3C**	**Alt 4B**	**Alt 4C**	**Hybrid 2/3C**	**Hybrid 4/5A**
% Existing Alignment	46	19	35	13	18	58	9
New ROW (Acres)	5,500-6,260	5,850-6,440	5,500-6,090	5,980-6,050	6,160-6,760	5,260-5,690	6,480-6,550
% Glaciated (in till)	97	63	63	84	84	67	84
Karst in Unglaciated Areas (Acres)	0	30	50	0	0	50	0
Relocation of Homes	280-408	346-484	370-458	158-179	247-336	388-562	246-267
Relocation of Businesses	56-113	42-66	51-75	11-12	35-59	62-119	22-23
Farmland (acres)	4,300-5,070	4,290-4,850	4,070-4,630	4,970-5020	5,170-5,730	3,460-4,230	5,320-5,370
Prime Farmland (acres)	3,140-4,100	2,300-3,750	2,280-3,730	3,290-4,130	3,480-4,880	2,070-3,010	3,660-4,500
Forest (acres)	840-935	1,315-1,450	1,140-1,275	935-1,005	805-935	1,190-1,260	1,050-1,120
Core Forest Habitat (acres)	85	440	398	142	97	386	241
Wetland (acres)	80-105	80	75	90	105	79-82	102
Federal TES occurrences	2	2	2	2	2	7	2
Potentially Eligible Historic Properties	4-6	3	2-4	0	1-2	6	3
Potentially Eligible Historic Districts	0	1-2	1-2	0-1	0-1	1	1
Known Archaeological Sites	38	54	57	59	66	47	55

Table CC-2 Cost and Performance Measure Comparison of Hybrid Alternatives and DEIS Preferred Alternatives								
Criteria		**Alt 2C**	**Alt 3B**	**Alt 3C**	**Alt 4B**	**Alt 4C**	**Hybrid 2/3C**	**Hybrid 4/5A**
Capital Costs (Millions)		$1,665	$1,780	$1,780	$1,080	$1,480	$2,035	$1,210
Annual Oper. & Maint. Costs (Millions)		$2.03	$2.72	$2.91	$2.80	$2.90	$2.55	$3.15
Typical Indy-Evv. Time Savings (Minutes)		21	30	27	27	27	15	25
Accessibility (Added People with Given Access)	1 Hr. to Indy	37,000	29,000	60,000	8,000	37,000	60,000	8,000
	2 Hr. to Indy	43,000	46,000	42,000	32,000	42,000	56,000	39,000
	3 Hr. to Indy	84,000	166,000	166,000	112,000	112,000	122,000	112,000
	30 Min. Urb. Area	13,000	12,000	37,000	0	9,000	41,000	0
Daily Truck Hours Saved		4,100	4,900	4,500	3,000	4,600	2,100	1,200

- **Acres of Wetlands.** As noted above, calculations for other resources were performed before several route modifications were made to eliminate certain route variations and avoid wetland impacts affecting all DEIS Preferred Alternatives. As documented in the FEIS (see Table 6-22), particular efforts were made to modify alternatives to avoid wetland impacts. These modifications are reflected in the calculations of wetlands impacts in Table CC-1. The 2/3C hybrid requires, on average, 81 acres of wetlands. The 4/5A hybrid requires 102 acres of wetlands. By comparison, the DEIS Preferred Alternatives require between 75 acres (3C) and 105 acres (4C). The 2/3C hybrid requires more wetlands than two of the DEIS Preferred Alternatives (3B and 3C), and less wetlands than three of the DEIS Preferred Alternatives (2C, 4B, and 4C). The 4/5A hybrid requires more acres of wetlands than any of the DEIS Preferred Alternatives other than 4C.

- **Residential Relocations.** The 2/3C hybrid requires, on average, 475 residential relocations. The 4/5A hybrid requires, on average, 257 residential relocations. By comparison, the DEIS Preferred Alternatives require, on average, between 169 residential relocations (4B) and 415 residential relocations (3B). Hybrid alternative 2/3C would require more residential relocations than any DEIS Preferred Alternative, while the 4/5A hybrid is mid-range compared with the DEIS Preferred Alternatives. The high number of relocations for hybrid 2/3C is associated with its extensive use of existing rights-of-way. See Table CC-1.

- **Business Relocations.** The 2/3C hybrid requires, on average, 91 business relocations. The 4/5A hybrid requires, on average, 23 business relocations. By comparison, the DEIS Preferred Alternatives require, on average, between 12 business relocations (4B) and 85 business relocations (2C). Hybrid alternative 2/3C would require more business relocations than any DEIS Preferred Alternative, while the 4/5A hybrid is in the lower part of the range compared with the DEIS Preferred Alternatives. The high number of relocations for hybrid 2/3C is associated with its extensive use of existing rights-of-way. See Table CC-1.

In summary, ***Hybrid 2/3C*** offers the opportunity to decrease impacts to farmland, as well as total acres of new right-of-way, compared to the DEIS Preferred Alternatives. It is somewhat higher on forested acres taken, and is lower on acres of wetlands impacted. It is higher in both residential and business relocations than any DEIS Preferred Alternative.

Hybrid 4/5A is higher than any DEIS Preferred Alternative in new acres of right-of-way, and wetlands acres. It is near the high end of the range for DEIS Preferred Alternatives for farmland acres. It is lower in the number of business and residential relocations.

Key Cost and Performance Measures[1]

- **Capital Cost.** The capital cost of hybrid 2/3C is $2.035 billion. This is over $250 million more (about 15% greater) than the cost of any DEIS Preferred Alternative. The DEIS Preferred Alternatives ranged in average cost from $1.08 billion to $1.78 billion.

- **Annual Operating and Maintenance Cost.** The annual increase in operating and maintenance costs for hybrid 2/3C is $2.55 million. By comparison, the increases for the DEIS Preferred Alternatives ranged from $2.03 million to $2.91 million. This increase for hybrid 2/3C is midrange, compared with the DEIS Preferred Alternatives.

- **Core Goal Performance Measure - Evansville to Indianapolis Typical Travel Time.** The Evansville to Indianapolis typical travel time savings for the 2/3C hybrid is 15 minutes. By comparison, the travel time savings for the DEIS Preferred Alternatives ranged from 21 to 30 minutes. For many of the DEIS Preferred Alternatives, the typical travel time savings ranged between 27 and 30 minutes. The performance of hybrid 2/3C not only is lower than the DEIS Preferred Alternatives, it also is lower than that of any alternative evaluated in the DEIS other than Alternative 1 (12 minutes). This is largely attributable to its longer length (151 driving miles). By comparison, the DEIS Preferred Alternatives which had savings between 27 and 30 minutes were 141 to 142 driving miles in length.

- **Core Goal Performance Measures - Access to Indianapolis.** Hybrid 2/3C produces increases of 60,000 persons (within one hour), 56,000 persons (within two hours) and 122,000 persons (within three hours). On the first measures, it is higher than all but one of the DEIS Preferred Alternatives (Alternative 3C also has 60,000 persons). Hybrid 2/3C performs better (56,000 persons) than any DEIS Preferred Alternative (which range from 32,000 to 46,000 persons). On the third measure, it is at the middle of the range for DEIS Preferred Alternatives, which range from 84,000 to 166,000 persons.

- **Core Goal Performance Measure - Access to Urban Areas.** Hybrid 2/3C produces an increase of 41,000 people within 30 minutes of a major urban area. By comparison, the DEIS Preferred Alternatives produce increases of between 0 and 37,000 people. The 2/3C Hybrid performs better than any of the DEIS Preferred Alternatives.

- **Core Goal Performance Measure - Daily Truck Hours Saved.** Hybrid 2/3C produces a daily savings of 2,100 truck hours. By comparison, the DEIS Preferred Alternatives produce increases of between 3,000 and 4,900 daily truck hours. The 2/3C hybrid provides about two-thirds the performance of the poorest-performing DEIS Preferred Alternative on this measure.

Summary

[1]One of the performance indicators for personal accessibility, Accessibility to Higher Education, was modified and recalculated in the Final EIS. This recalculation had not occurred when the hybrid alternatives were evaluated. This measure is not included in Table CC-2.

Hybrid 2/3C

1. ***Cost*** was a significant factor for the 2/3C hybrid. Its average capital cost was $2.035 billion, or over $250 million more than the most expensive DEIS Preferred Alternative (3B and 3C - each $1.78 billion).

2. The performance on ***project goals*** for the 2/3C hybrid was comparable to Preferred Alternative 3C in some areas, but poor in other areas. It performed well on accessibility goals. However, it performed poorly on two of the core project goals. Its Evansville to Indianapolis travel time savings was only 15 minutes, lower than that of any alternative other than Alternative 1. Its daily truck hours saved was only 2,100, which was about one-third less than the performance of any DEIS Preferred Alternative.

3. Its impacts on some aspects of the natural environment were in the low range among the build alternatives. Its wetland impacts were estimated at 79-82 acres, using the updated data presented in this document for all alternatives. However, forest impacts were high (about 1,190 - 1,260 acres).

4. Its impacts on the socio-economic environment were high. It would result in more home relocations (388-562), and more business relocations (62-119) than any DEIS Preferred Alternative.

In summary, this alternative performed well in some ways, but had significantly higher costs, performed poorly on two core goals, and had high impacts to the socio-economic environment. Given these factors, it was not studied further.

Hybrid 4/5A

1. The performance of hybrid 4/5A was similar to that of Alternative 4B. It saved 25 minutes of travel time between Evansville and Indianapolis (as compared to 27 for Alternative 4B). It had medium performance in accessibility. However, it performed low in truck hours saved, with only 1,200 daily truck hours saved. This is lower than any alternative evaluated in the DEIS.

2. It was somewhat higher in capital cost than Alternative 4B, averaging $1.21 billion (versus $1.08 billion for 4B).

3. It had high impacts to several natural resources. It would require between 5,320 and 5,370 acres of farmland, and would require 102 acres of wetlands. In addition, this hybrid would require an additional crossing of the White River, impact the Highland Creek floodplain, fragment forest adjacent to Bradford Woods, and impact historic bridges listed on the National Register.

In summary, this alternative offered similar to somewhat poorer performance than Alternative 4B, but at a somewhat higher cost. Given these factors, it was not studied further.