



# Alignment Analysis Memo

(Addendum to Macro Analysis)

## U.S. 51 Environmental Impact Statement

Christian, Shelby, Fayette, Marion, Clinton,  
Washington, and Jefferson Counties

April 2010

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**RE:** Alignment Analysis Memo (Addendum to Macro Analysis Memo)

**I. INTRODUCTION**

The US Route 51 Macro Analysis (available under separate cover) evaluated and eliminated corridors in Centralia, Sandoval, Vernon, Patoka, Vandalia, and Ramsey based on their impacts to known environmental resources and engineering judgment. From the Macro Analysis, three (3) corridor alternatives in Centralia-Sandoval, two (2) corridor alternatives in Vernon-Patoka, five (5) corridor alternatives in Vandalia, and two (2) corridor alternatives in Ramsey were identified for further consideration.

The purpose of this memorandum is to document the analysis of preliminary alignment development within the corridors selected for further consideration, the final step in the process of Development of Alternative Alignments. The Alignment Analysis is used to screen and eliminate alignments with the greatest impacts to known environmental resources within the corridors. Figure 1 below shows the study development process and highlights the step that this memorandum documents.

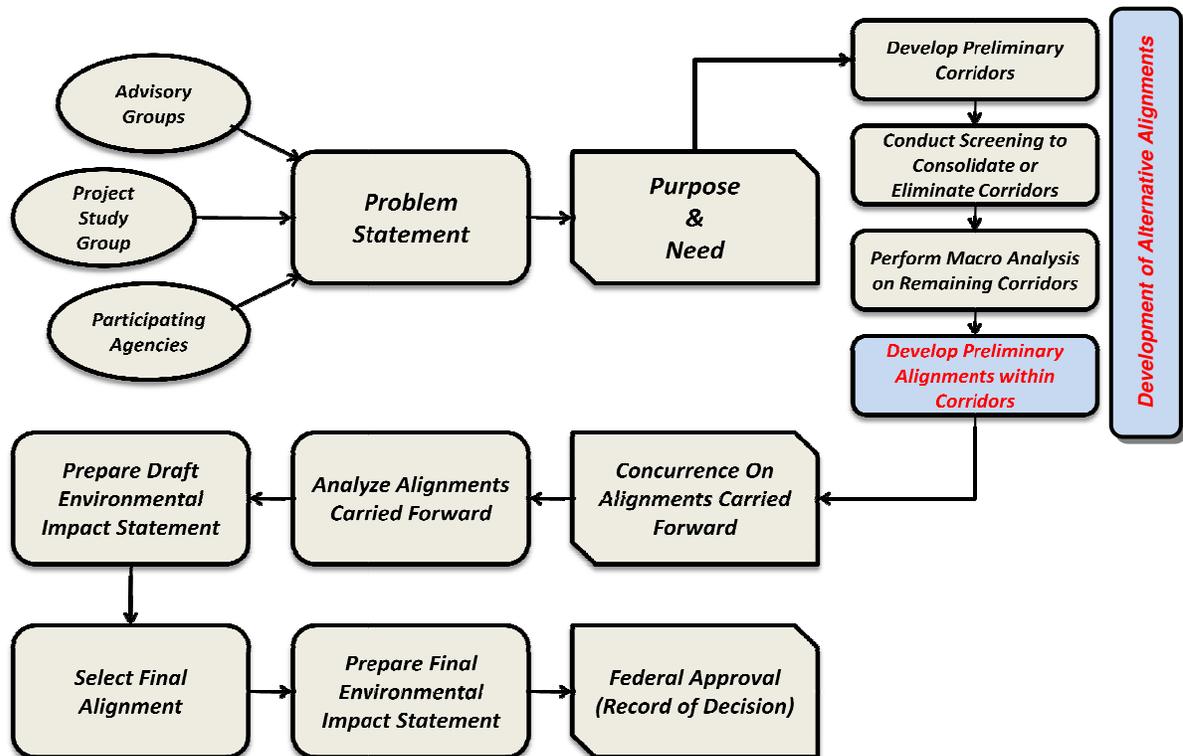


Figure 1 – Study Process Flow Chart

For the Alignment Analysis, a preliminary roadway alignment was developed within each of the remaining corridors to minimize or avoid environmental resource impacts. Documented in this memo are the following:

- **Section II – Environmental Resources Evaluated.** The Alignment Analysis evaluates the alignments based on the same environmental criteria as the Macro Analysis.
- **Section III – Alignment Development Methodology.** This section describes the methodology for alignment development which is based upon roadway design criteria and avoidance of environmental resources. The 500-foot corridor widths evaluated in the Macro Analysis were refined to a 200-foot width (rural) or 130-foot width (urban) using the design criteria.
- **Section IV – Alignment Analysis Summary.** This section provides a summary and discussion of the detailed analysis results for each community and the links of US 51 between communities.
- **Section V – Alignment Recommendations.** This section identifies the alignments to be carried forward as alternatives for further study in the Draft Environmental Impact Statement.
- **Appendix A – Environmental Resource Descriptions.** This appendix describes each resource evaluated, and includes methodology and sources of information.
- **Appendix B – Alignment Summary Sheets.** This appendix includes an analysis summary and a graphic exhibit for each corridor carried forward from the Macro Analysis.

**II. ENVIRONMENTAL RESOURCES EVALUATED**

The environmental resources evaluated are summarized in Table 1. The degree of accuracy to which the resource impacts were measured and rounded for the alignment analysis is more precise than the Unit of Measure used for the Macro Analysis. Each resource evaluated is briefly described with assumptions, methodology, and sources of information in Appendix A.

**Table 1: Environmental Resources Evaluated**

Criterion	Unit of Measure
<b>Environmental</b>	
Water Quality/Water Resources       Wetlands      Special Waste INAI Sites High Quality Woodlands T&E Species Important Habitat Areas	Floodplain (acres affected)
	Floodways (acres affected)
	Biologically Significant Streams (number of crossings)
	Class I Streams (number of crossings)
	Streams (number of crossings)
	Drinking Water Supplies - Surface Water (number affected)
	Wetland areas (acres affected)
	Wetland areas (number affected)
	High Quality Wetland areas (acres affected)
	High Quality Wetland areas (number affected)
	CERCLIS sites (number affected)
	INAI sites (acres affected)
	High Quality Woodland sites (acres affected)
Threatened and Endangered Species (number affected)	
Important Habitat Areas (number affected)	
<b>Community</b>	
Residences Business Public Facilities Land Use Section 4(f) & 6(F) Impacts  Utilities Community	Homes (number displaced)
	Commercial buildings (number displaced)
	Public facilities (number displaced)
	Compatibility with adopted Land Use Plan (Y/N)
	Parklands (number affected)
	Parklands (acres affected)
	Utilities [Including tank farms] (number of conflicts)
	Divides or isolates a community (Y/N)
<b>Agricultural</b>	
Prime and Important Farmland Farmsteads Severances Centennial/ Sesquicentennial Farms	Prime and Important Farmland (acres affected)
	Farm Out Buildings (number affected)
	Parcels (number affected)
	Farms (number affected)
<b>Cultural</b>	
Cultural	Historic Sites (number affected)
	Cemeteries (number affected)

### III. ALIGNMENT DEVELOPMENT METHODOLOGY

Alignments were developed within the preferred corridors using basic roadway geometric considerations and avoiding environmental resources to the greatest extent possible. Figure 2 illustrates the Alignment Process used to determine the general location of the preliminary alignment within the preferred corridors; the steps are summarized below.

Two potential alignment widths were utilized for the proposed four-lane expressway configuration: Rural and Urban. A preliminary rural width was set at 200 feet; a preliminary urban width was set at 130 feet. The preliminary footprint of an alignment was established first through determination of the existing right-of-way width (if applicable) and then in consideration of environmental impacts. Of the remaining corridors following the Macro Analysis, only segment C59 of Centralia-Sandoval Corridor D utilized an urban cross section.

Using these guidelines, the alignment was further analyzed through the following steps:

- 1) Refine horizontal footprint of alignment based upon environmental resource impacts and geometric considerations;
- 2) Investigate vertical profile of alignment; revisit horizontal plan if required;
- 3) Set cross section width based on plan and profile development.

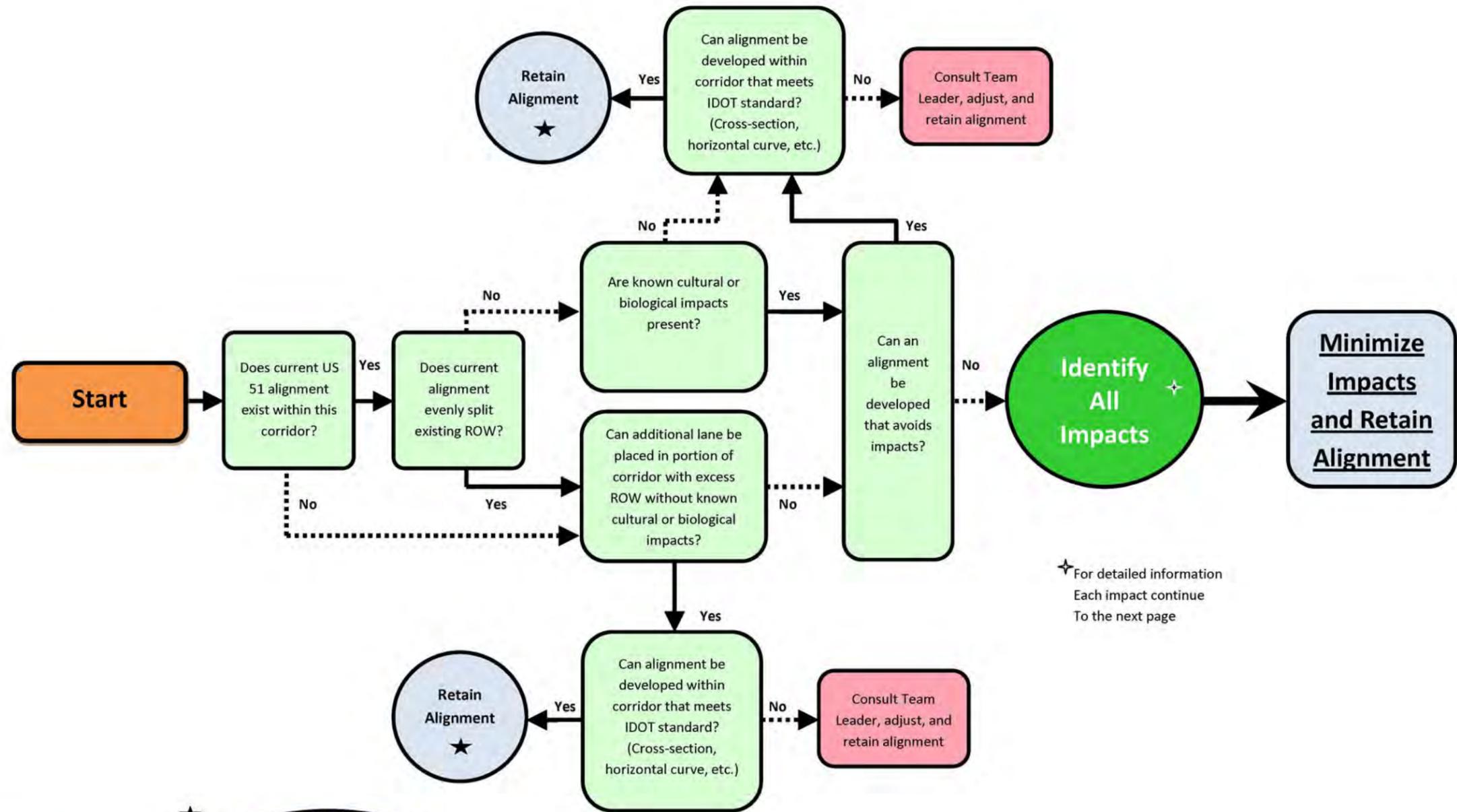
Basic geometric criteria, as established in the Illinois Department of Transportation's Bureau of Design and Environment Manual, Chapters 32, 33, and 45, were followed in the alignment refinement process. These criteria were based upon a 70 mph design speed for the rural sections and a 50 mph design speed for the urban sections. Table 2 depicts the basic criteria followed for preliminary alignment development:

Table 2: Minimum Design Criteria

Criteria	Rural Section	Urban Section
Design Speed	70 mph	50 mph
Minimum Radius	2050' (minimum) 3000' (desirable)	835'
Maximum Radius without Superelevation	14,400'	8155'
Max. Grade (Level)	4%	3%
Max Grade (Rolling – Vandalia)	5%	4%

In addition to the criteria above, critical length of grade was investigated to assure that an alignment's profile did not exceed a 10 mph truck speed reduction for inclines and a 5 mph truck speed increase for downgrades.

The alignment developed in each corridor utilizing the prescribed cross-section width is shown in the alignment summary in Appendix B.



✦ For detailed information  
Each impact continue  
To the next page

★ For all alignments, verify that location at corridor terminus matches location of adjacent section. Adjust as necessary.



**Figure 2**  
**Alignment Process Flow Chart**

#### **IV. ALIGNMENT ANALYSIS SUMMARY**

Alignments were developed within the preferred corridors with an emphasis on avoiding or minimizing environmental resource impacts. In each corridor, the reduced alignment width resulted in a reduction to the number and magnitude of impacts originally identified in the 500-foot wide corridor. On the Alignment Analysis Summary sheets (Appendix B), a written summary of each corridor, a map depicting the alignment location, a description of the environmental resource impacts, and a comparison table between macro and alignment resource impacts is provided. Additionally, each summary provides a rationale for inclusion or elimination from further consideration.

The following is a summary, comparison, and discussion of the alignment impacts within each community:

Centralia –Sandoval

Three preliminary corridors (D, DJ, and DL) around Centralia and Sandoval were carried forward from the Macro Analysis. The resource impacts for the alignment alternatives are summarized in the table below.

Preliminary alignments in Centralia-Sandoval were developed to minimize impacts to floodplains, wetlands, public facilities, residences, farmland, and parkland. Specifically, it was determined that high quality wetlands traversed by segments S47 and S48 could be avoided with new alignment. New segment (S50) was introduced specifically to avoid high quality wetland. In reviewing the resource impact table below for preliminary alignments D, DJ, and DL, it becomes apparent that alignment D exhibits greater impacts to floodplains, wetlands, high quality wetlands, and residential and commercial displacements. Alignment D, however, traverses the east side of Centralia, while alignments DJ & DL traverse the west side. While the differences in resource impacts are notable when comparing the final three remaining alignments, these alignments, in comparison to all other eliminated alignments, appear similar. Without a detailed alignment analysis, there is merit in moving forward with at least one corridor on each side of Centralia. For these reasons, it is recommended that Centralia-Sandoval D, DJ DL be carried forward in the reasonable range of alternatives for further consideration.

Please refer to Appendix B for detailed information on the Centralia-Sandoval alignments.

Resource	Centralia-Sandoval Alignment		
	D	DJ	DL
Floodplain, acres	34.5	22.4	21,8
Biologically Significant Streams, number of crossings	1	1	1
Streams, number of crossings	5	6	6
Drinking Water Supplies – surface water, crossing	1	None	None
Total Wetlands, acres/number	3.6 / 7	1.3 / 3	2.2 / 4
High Quality Wetlands, acres/number	1.9 / 2	0.3 / 1	1.2 / 2
CERCLIS Sites, number impacted	None	None	None
Residential Displacements	21	8	12
Commercial Displacements	9	None	None
Public Facility Displacements	1	None	None
Parkland, acres	<0.1	None	None
Prime/Important Farmland, acres	274	303	424
Farmland Severances, parcels	4	11	14
Engineering Constraints	No	No	No

 Corridors carried forward

Vernon-Patoka

Two preliminary corridors (J and Q) around Vernon-Patoka were carried forward from the Macro Analysis. The resource impacts for the alignment alternatives around Vernon-Patoka are summarized in the table below.

Alignments in Vernon-Patoka were developed to minimize impacts to floodplains, wetlands, residences, and farmland. Specifically, it was determined that high quality wetlands traversed by segment VP37 could be avoided with new alignment. New segment (VP42) was introduced specifically to avoid high quality wetland. Vernon-Patoka J impacts a slightly greater number of wetland sites and demonstrates more utility conflicts than Vernon-Patoka Q. Segment VP24 and VP23 in Vernon-Patoka J parallels segment VP25 of Vernon-Patoka Q and represents the only difference between these two corridors. Segment VP25 follows the existing US 51 alignment. Segment VP24 was created to provide a better skew angle at an intersection with a recent history of crash incidents on the southwest side of Patoka. Review during alignment analysis indicated that this skew could also be remedied using VP25. Vernon-Patoka J does not demonstrate an identifiable advantage over Vernon-Patoka Q. Because VP25 maximizes use of existing Right-of-Way, and because public comment received during presentation of these corridors questioned the creation of new roadway parallel to existing roadway that impacted additional farmland, Vernon-Patoka J was eliminated from further consideration. Therefore, it is recommended that Vernon-Patoka Q be carried forward in the reasonable range of alternatives for further consideration.

Please refer to Appendix B for detailed information on the Vernon-Patoka alignments.

Resource	Vernon-Patoka Alignment	
	J	Q
Floodplain, acres	4.6	4.6
Total Wetlands, acres/number	0.3 / 4	0.3 / 3
High Quality Wetlands, acres/number	<0.1 / 1	<0.1 / 1
Residential Displacements	3	3
Commercial Displacements	1	None
Utility conflicts	19	15
Prime/Important Farmland, acres	221	221
Farmland Severances, parcels	5	4
Engineering Constraints	Yes	No

 Corridors carried forward

## Vandalia

Five preliminary corridors (A, D, S, U, and Q) around Vandalia were carried forward from the macro analysis. The resource impacts for the alignment alternatives around Vandalia are summarized in the table below.

Alignments in Vandalia were developed to minimize impacts to floodplains, wetlands, residences, farmland, and commercial facilities. Engineering considerations associated with Vandalia A and Q include traversing an area of steep vertical relief south of Vandalia Lake that includes an approximate forty-foot cut into a ridge formation. In this area, vertical profile cannot be developed without exceeding critical length of grade for acceptable truck speed reduction, or without resulting in excessive momentum grades as identified in Section 33-2.04 in the IDOT BDE Manual. All western bypasses must cross the ridge, but Vandalia S and Vandalia U cross at lower elevation and avoid severing a residential area. Additionally, the Vandalia Community Advisory Group (CAG) expressed opposition to Vandalia A and Q because of impacts to the residential area. For the reasoning stated above, Vandalia A and Q are recommended to be eliminated from further study.

At its farthest western point, Vandalia D is located 3.6 miles west of existing US 51. Approximately four miles of this alignment lie outside of Vandalia's corporate limits. It exhibits the greatest acreage impacts to prime and important farmland of all the remaining corridors. Such a corridor could promote leap-frog development which would result in increased impacts to farmland. Additionally, vehicles heading southbound utilizing Vandalia D will travel approximately 2 miles directly west in their bypass of Vandalia. Based upon case studies of similar bypass routes, this is a deterrent that would persuade regional travelers to use existing US 51 through town. For all of these cumulative impacts, Vandalia D was eliminated from further study.

Several high quality wetlands (2.6 acres) impacted by Vandalia S are forested wetlands located along an abandoned railroad right-of-way north of the Vandalia corporate limits. Based upon coordination with the United States Army Corps of Engineers (USACE) – St. Louis District<sup>1</sup>, although the wetlands in the right-of-way have a high Floristic Quality Index (FQI), wetlands created on borrow are not regarded as highly as wetlands created naturally. The remaining high quality wetlands (4.5 acres) impacted by Vandalia S are associated with the Kaskaskia River and tributaries south/west of Vandalia. The location of these wetlands adjacent to the river Kaskaskia River bottoms precludes development of a western bypass corridor that does not result in impacts. However, the alignments were shifted to minimize impacts. Additionally, Vandalia S demonstrates a feasible crossing of the ridge formation through avoidance of the forty-foot cut. For these reasons and based upon discussions with USACE, Vandalia S was considered a feasible alternative for further study.

Vandalia U traverses the southeast portion of the Vandalia Geologic Area, a designated Illinois Natural Area Inventory (INAI) site. The Vandalia Geologic Area is part of a larger ridge formation that begins near Vera, Illinois, and extends south to Carlyle Lake. Based upon coordination with the Illinois Department of Natural Resources (IDNR)<sup>2</sup> and based on a preliminary report by Illinois State Geological Survey (ISGS)<sup>3</sup>, avoidance of this site is not necessary if the integrity of the site can be maintained. Corridor U impacts 4.1 acres of the Vandalia Geologic Area. By traversing this area, Vandalia U avoids impacts to high quality wetlands.

Therefore, it is recommended that Vandalia S and Vandalia U be carried forward in the reasonable range of alternatives for further consideration.

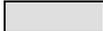
<sup>1</sup> USACE Coordination meeting minutes for February 3, 2010, available under separate cover

<sup>2</sup> IDNR coordination meeting minutes for February 16, 2010, available under separate cover

<sup>3</sup> ISGS report, dated February 11, 2010, available under separate cover

Please refer to Appendix B for detailed information on the Vandalia alignments.

Resource	Vandalia Alignment				
	A	D	Q	S	U
Floodplain, acres	61.1	85.6	60.6	85.5	63.1
Total Wetlands, acres/number	5.3 / 7	17.3 / 13	6.3 / 10	15.7 / 13	6.4 / 10
High Quality Wetlands, acres/number	4.4 / 1	7.0 / 3	4.6 / 4	7.1 / 4	4.7 / 4
INAI sites, acres	None	None	None	None	4.1
Residential Displacements	16	7	9	10	6
Commercial Displacements	1	None	None	None	None
Public Facility Displacements	None	None	None	None	None
Prime/Important Farmland, acres	295	310	274	278	271
Farmland Severances, parcels	13	19	18	18	17
Engineering Constraints	Yes	No	Yes	No	No

 Corridors carried forward

Ramsey

Two preliminary corridors (A and C) around Ramsey were carried forward from the Macro Analysis. The resource impacts for the alignment alternatives around Ramsey are summarized in the table below.

Alignments in Ramsey were developed to minimize impacts to wetlands, residences, commercial facilities, and farmland. A feasible alignment was developed in Ramsey A and C that resulted in similar impacts to resources. Therefore, the alignment analysis did not result in any alignment elimination in the community of Ramsey. It is recommended that Ramsey A and Ramsey C be carried forward in the reasonable range of alternatives for further consideration.

Please refer to Appendix B for detailed information on the Ramsey alignments.

Resource	Ramsey Alignment	
	A	C
Total Wetlands, acres/number	0.1/4	None
High Quality Wetlands, acres/number	None	None
Residential Displacements	2	10
Commercial Displacements	None	None
Public Facility Displacements	None	None
Parkland, acres	None	None
Prime/Important Farmland, acres	87	82
Farmland Severances, parcels	None	None
Engineering Constraints	No	No

 Corridors carried forward

### Coincident Segments Between Communities

The Macro Analysis addressed the corridors within and around communities and did not include sections of existing US 51 linking the communities. The Alignment Analysis includes the links and represents a continuous roadway from community to community. In general, the sections between communities would be widened to four lanes using the existing US 51 roadway wherever feasible, resulting in minimized impacts.

In some cases, due to high quality wetlands or other resources adjacent to the right-of-way, more than one alignment was created between communities as represented by Ramsey End Link A and B and Vandalia to Ramsey Link A and B. Options for these segments include widening east of the existing right-of-way (ROW), west of the existing ROW, or splitting ROW to minimize potential environmental resource impacts. The corridors between communities studied include:

Centralia End Link,  
Sandoval to Patoka Link,  
Vernon to Vandalia Link,  
Vandalia to Ramsey Link A,  
Vandalia to Ramsey Link B,  
Ramsey End Link A, and  
Ramsey End Link B.

A feasible alignment was developed within each link between communities and is included in the one page summaries in Appendix B. In comparing the impacts of Ramsey End Link A to Ramsey End Link B and Vandalia to Ramsey Link A and Vandalia to Ramsey B, the impacts were within the same magnitude. Therefore, it is recommended that all the coincident segments between communities listed above be carried forward in the reasonable range of alternatives for further consideration. See Appendix B for a written description of each link location and a description of the environmental resource impacts.

**V. ALIGNMENT RECOMMENDATIONS**

In conclusion, as result of the Alignment Analysis, it is recommended that the following alignments be carried forward in the reasonable range of alternatives for further consideration:

- Centralia End Link,
- Centralia-Sandoval D,
- Centralia-Sandoval DJ,
- Centralia-Sandoval DL,
- Sandoval to Patoka Link,
- Vernon-Patoka Q,
- Vernon to Vandalia Link,
- Vandalia S,
- Vandalia U,
- Vandalia to Ramsey Link A,
- Vandalia to Ramsey Link B,
- Ramsey A,
- Ramsey C,
- Ramsey End Link A, and
- Ramsey End Link B

# Appendix A

## ENVIRONMENTAL RESOURCE DESCRIPTIONS

Following is a discussion of the environmental resource categories considered for alignment evaluation. The Alignment Analysis corridor footprint mentioned in the descriptions below is two hundred feet (200') in width for a rural section or one hundred feet (130') in width for an urban section.

### Environmental

#### Water Quality/Water Resources

##### *Floodplains*

Floodplains within the corridors have been identified by the Federal Emergency Management Agency (FEMA). Flood Insurance Rate Maps (FIRM) from FEMA shows the limits of flooding affecting the individual communities. Flood events which are commonly referred to as the 10, 50, 100, and 500-year floods represent storm events having a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. The 100-year floodplain boundaries are shown on the FIRM as Zones A or AE and correspond to the boundary of the areas of special flood hazards. The 500-year floodplain boundaries are shown on the FIRM as Zones X which corresponds to the boundary of the areas of moderate flood hazards.

FIRM maps were used to measure potential impacts to floodplains. FIRM maps were obtained from FEMA for Washington, Marion, Fayette and Shelby Counties. Within those counties, the towns of Ramsey, Vernon, Patoka, and Sandoval are not mapped from the FEMA FIRM and therefore floodplain data is not available within the municipal boundaries.

Executive Order 11988 (Protection of Floodplains) requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct and indirect support of floodplain development when a practicable alternative exists. In identifying impacts to floodplains at the macro analysis level, any floodplain area within the corridor footprint was measured and described as either transverse or longitudinal. The floodplain impacts were measured and rounded to the nearest tenth acre. Avoidance of longitudinal encroachments was evaluated for the stream crossings proposed. Given the general flow direction of streams and the north-south orientation of US 51, only a few longitudinal encroachments were identified and these were minimized by the alternatives proposed. Further refinements in the alignment analysis will consider avoidance of these encroachments.

##### *Floodways*

Floodways within the corridors have been identified by the Federal Emergency Management Agency (FEMA). The floodway is the channel of a stream that must be kept free of encroachment to allow the 100-year flood to be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. More recent Flood Insurance Rate Maps (FIRM) from FEMA shows the limits of floodway within a particular floodplain area.

FIRM maps were obtained from FEMA for Marion, Fayette and Shelby Counties. Within those counties, Centralia is the only community with a mapped floodway.

In characterizing impacts to floodways at the macro analysis level, any floodway area within the corridor footprint was measured. The floodway impacts were measured and rounded to the nearest tenth acre.

Both transverse and longitudinal encroachments were evaluated for the stream crossings proposed. Given the general flow direction of streams and the north-south orientation of US 51, only a few longitudinal encroachments were identified and these were minimized by the alternatives proposed.

### *Biologically Significant Streams*

Biologically Significant Streams (BSS) have been identified by the Illinois Department of Natural Resources (IDNR) based upon the integrity and diversity of their aquatic communities. The IDNR issued a report in October 2008 "Integrating Multiple Taxa in a Biological Stream Rating System," which classified stream segments in Illinois and identified BSS. Data were not available for all streams so the classification process is incomplete.

For purposes of the macro analysis all biologically significant streams were separately counted to identify high quality areas. Only two streams, Ramsey Creek and Lost Creek, were classified as biologically significant streams. Both are currently crossed by existing US 51.

In characterizing impacts to streams at the macro analysis level, stream crossings provide a measure of impact. If any portion of a biologically significant stream is crossed by a potential corridor, it is counted as one crossing.

Each stream may have more than one crossing by the same corridor. For example, if the stream meanders, there may be multiple crossings of the same stream. Each crossing is counted individually.

### *Other Streams*

Other perennial and intermittent streams in the corridors were identified for purposes of providing a measure of water quality impacts. Each stream may have more than one crossing by the same corridor and each crossing is counted individually.

### *Class 1 Streams*

Class 1 streams are specific waterways identified in an interagency agreement between the Illinois Department of Natural Resources (IDNR) and the Illinois Department of Transportation (IDOT). Such streams require early coordination with IDNR and are listed by county in the IDOT Memorandum "IDNR-DOT Natural Resource Review and Coordination Agreement" dated February 2, 1996.

In characterizing impacts to this resource at the macro analysis level, corridor crossings of a stream provide a measure of the impact. If any portion of a Class 1 stream is crossed by a potential corridor, it is counted as one crossing. The same Class 1 stream may have more than one crossing by the same corridor. For example, if the stream meanders, there may be multiple crossings of the same stream. Each crossing is counted individually.

The only Class 1 stream in the US 51 project corridor is Ramsey Creek, which is also a biologically significant stream. This stream was counted under "biologically significant" stream.

### *Drinking Water Supplies – Surface Water*

Drinking water supplies represent surface waters used as a supply of potable water. Sources of data used to identify drinking water supplies included Source Water Assessment Summary Fact Sheets from the IEPA website as well as personal contact with community representatives. The information from both sources was compared to an aerial photograph with GIS shape files of the alternatives to verify the location of crossings of surface water bodies.

In characterizing impacts to drinking water supplies at the macro analysis level, crossings that occur upstream of a drinking water supply are counted individually.

## Wetlands

### *Wetlands*

The U.S. Army Corps of Engineers (COE) (Federal Register 1982) and the U.S. Environmental Protection Agency (Federal Register 1980) jointly define wetlands as: "Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions". Wetlands include forested areas, wet prairies, wet meadows, and a variety of habitats exhibiting the hydrology, soils, and vegetation required by the COE.

Wetland information was provided by the Illinois Natural History Survey (INHS). Wetlands along the sections of existing US 51 between communities were surveyed by INHS during the 2008 field season and this information was released in GIS format in May 2009. Wetlands along the bypass areas of each community were surveyed by INHS during the 2009 field season and this information was released in GIS format in December 2010.

Segment V55 in Vandalia was shifted slightly north/east to avoid impacts to a state listed threatened/endangered species identified by INHS during the 2009 field season. The updated location of segment V55 has not been surveyed by INHS to date. Therefore, wetland information based on confirmed field delineations for this segment is not available. However, based upon INHS review of the original V55 location, assumptions were made regarding the potential locations of wetlands. Specifically, INHS identified several linear wetlands, including high quality wetlands, associated with streams and indicated that these areas continue outside the limits of the INHS survey areas. Based upon the INHS information and with the aid of the county soil surveys (presence of hydric soils), assumptions were made as to the potential location of wetlands along the shifted corridor location. These potential wetland areas are included in the wetland impact analysis. All non-delineated areas will be submitted for INHS review during the 2010 field season and impacts will be updated as soon as the delineated wetland information becomes available.

Executive Order 11990 (Protection of Wetlands) requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of wetlands, and avoid direct and indirect impacts whenever there is a practicable alternative. Avoidance of wetlands was of first importance in evaluating corridor alternatives. Minimizing wetland impacts was an important criterion in evaluating corridor alternatives. In characterizing impacts to wetlands at the macro analysis level, any wetland area within the corridor footprint was measured. This wetland assessment included all wetlands identified by INHS as well as the potential wetlands within Segment V55 as described above. The wetland impacts were measured and rounded to the nearest tenth of an acre. Additionally, the number of wetlands impacted was tallied so that both metrics (areas impacted and number of wetlands impacted) could be assessed.

### *High Quality Wetlands*

The INHS provided information regarding the plant species composition of each wetland using a Floristic Quality Index (FQI). High quality wetlands are associated with an FQI equal to or greater than 20. High quality wetlands were identified for special consideration and avoidance. In identifying impacts to high quality wetlands at the macro analysis level, impacts were measured and rounded to a tenth of an acre. High quality wetland impacts were also characterized as either a bisecting (or crossing) impact or an edge impact. Avoidance of such impacts was considered, where feasible.

## Illinois Natural Area Inventory (INAI) Sites

Illinois Natural Area Inventory (INAI) sites and Illinois Nature Preserves are protected by the State of Illinois and may include threatened and endangered species within their boundaries. State laws have been established to define and protect these areas.

Known INAI sites within the project area include Ramsey Creek and the Vandalia Geologic Area. Existing US 51 already crosses Ramsey Creek south of the convergence point of bypass alternatives. This crossing, therefore, was not considered in the macro analysis.

The Vandalia Geologic Area is located north of the Vandalia corporate limits and south of Thrill Hill Road. The designated INAI area is part of a larger formation that begins near Vera, IL and extends south to Carlisle Lake. A preliminary investigation into the nature of the site is available under separate cover. Based on the investigation and coordination with the Illinois Department of Natural Resources (IDNR), complete avoidance of this site is not necessary if the integrity of the site can be maintained. Therefore, corridors that traversed the southeast corner of the INAI site were evaluated.

There is one Nature Preserve in the project area, the Ramsey Railroad Prairie located at the north side of Ramsey, which is avoided by all corridors.

### High Quality Woodlands

High quality woodlands along the Kaskaskia River bluffs near Vandalia were identified during the INHS 2008 field season. This area was identified as a potential Illinois Natural Areas Inventory (INAI) candidate by INHS, and was considered for avoidance. Several additional high quality woodland areas were identified by INHS in Vandalia near the US 51 and I-70 interchange. These areas were also avoided.

### Threatened and Endangered Species

Threatened and endangered species include all types of plants and animals which face possible extinction in the near future if steps aren't taken to protect them. These species are protected by both state and federal laws, such that avoidance of these resources is required to the maximum extent possible.

T&E species were surveyed by INHS during the 2008 and 2009 field seasons. One endangered fish species, the western sand darter (*Etheostoma clarum*), was found in the Kaskaskia River near the project area. Two endangered bird species, the northern harrier (*Circus cyaneus*) and osprey (*Pandion haliaetus*), were also recorded in the project area. The endangered heart-leaved plantain (*Plantago cordata*) was identified within a high quality wetland along the Kaskaskia River bluffs south of Vandalia within the project area. In addition, one rare plant species, twinleaf (*Jeffersonia diphylla*), was found at two locations in the study area. Twinleaf, although rare to the study area, is not listed as a threatened or endangered species. All known T&E species were avoided.

### Important Habitat Areas

The INHS identified several important habitat areas within the study area during the 2008 field season. Four important avian census areas were identified within the study area. These areas contain diverse communities of bird species, including Neotropical migrants, and contain a relatively high number of species with special conservation designations. These designations include species on the *American Bird Conservancy* watch-list, *Partners in Flight* species of concern, and the *Comprehensive Illinois Wildlife Action Plan* conservation priority species. No threatened or endangered bird species were identified in these important habitat areas.

Three reptile and amphibian important habitat areas were identified within the study area. These areas contained five or more reptile and amphibian species. No threatened or endangered amphibian or reptile species were identified in these areas. The avian and reptile and amphibian important habitat areas are not impacted by the proposed bypass corridors.

One ecologically sensitive site, an unnamed remnant savanna/open oak woodland, was also identified by INHS during the 2008 field season. This savanna is located along existing US 51 and is not impacted by the project.

## Special Waste

### *CERCLIS Sites*

CERCLIS is the abbreviation for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Information System, the United States Environmental Protection Agency's (EPA's) database and management system that inventories sites that reportedly have unlawfully accepted and stored hazardous substances or that have a record of accidental spills or dumping.

The Illinois State Geological Survey (ISGS) is currently surveying special waste sites including CERCLIS sites along the potential corridors and to date this information is not available. For the macro level analysis, the USEPA "Superfund Site Information" online database was searched to locate CERCLIS sites within the vicinity of the project. Any additional CERCLIS sites identified by ISGS will be included during the alignment analysis when the ISGS information becomes available, which is expected in 2010.

In characterizing impacts to CERCLIS sites at the macro analysis level, if any portion of a property identified as a CERCLIS site is crossed by a potential corridor, it is counted as one impact.

## **Community**

### Residences and Businesses

#### *Homes and Commercial Buildings*

Home and commercial buildings were identified within the corridor limits based on information from ESRI (Environmental System Research Institute, Inc.) data, Google Maps, and public feedback. Buildings were located by the project team using 2007 aerial photography. The buildings identified as residences and businesses were compared to other public facility buildings in order to remove duplicates.

For the purpose of macro analysis, residential and commercial impacts were counted separately. A residential or commercial property was impacted if any part of the building structure is located within the corridor limits.

Only the residential structure was counted as being impacted; freestanding garages or other structures on the respective property were not counted as impacted. Residential buildings under construction were counted. Multi-unit housing, such as apartments, townhomes, or condos, was considered as one residence. Farmsteads were included in the count of residential buildings.

Commercial impacts were computed as each commercial building impacted. Several commercial properties incorporated multiple buildings. Each of the buildings was counted as a separate commercial building. Multi-use buildings with commercial and residence in the same building were counted as both residential and commercial impacts.

Public facilities were not counted as a residential impact; they are identified under separate Environmental Resource descriptions below.

### Public Facilities

Public facilities were identified within the corridor limits based on information from ESRI data, Google Maps, municipality maps, and public feedback. Public facilities include schools, libraries, places of worship, post offices, public institutions (hospital, prison, etc.) or municipal buildings. For the macro analysis, public facility impacts were counted for each of the categories above.

Some public facility properties were situated at the edge of the corridor limits with portions of the property being contained within the corridor and portions being outside the corridor. It is only identified as an impact if the building structure is within the corridor limits.

Numerous public facility properties are multi-purpose facilities. As an example, a single building might contain a police station in addition to a fire station. Impacts were calculated separately for each of these categories.

#### Section 4(f) and 6(f)

##### *Parklands 4(f), 6(f)*

Publicly owned lands within the study area that are managed as parks and recreation areas, wildlife or waterfowl refuges, or historic sites are identified as Section 4(f) properties. Although publicly owned historic sites are Section 4(f) properties, the impacts to historic sites are identified under separate Environmental Resource description below. Section 4(f) properties were identified through a review of USGS topographic maps, ESRI data, and community maps.

Section 6(f) properties are lands that were acquired or developed with funds from the Land and Water Conservation (LAWCON) Fund (16 USC 4601-4) or the Open Space Lands and Acquisition and Development Program (OSLAD). Section 6(f) properties within the study area were identified by the Illinois Department of Natural Resources.

Some Section 4(f) properties are also identified as Section 6(f) properties; the impact assessment, however, was calculated separately for these two property types. Impacts to Section 4(f) and Section 6(f) properties were calculated by measuring the overlap of the corridor with parkland property. For the macro analysis, the number and acreage of Section 4(f) and Section 6(f) properties impacted by the corridors was identified.

#### Utilities

Utilities evaluated as part of the macro analysis include antenna structures, radio/microwave towers, electrical facilities (substation or similar), utility crossings, and oil tank farms. Utilities were identified from database searches, aerial photography and during field reconnaissance. Antenna structures and radio/microwave tower information were identified from the Federal Communications Commission (FCC) database (<http://wireless.fcc.gov/antenna/>). The electrical facilities and pipe lines information were obtained from the U.S. Census Bureau. The substation and oil tank farm locations are identified from aerial information.

In identifying impacts to utilities at the macro analysis level, utility crossings provide a measure of the impact. If any portion of a utility crosses through or is located within a potential corridor, it is counted as one impact. The same utility may have more than one crossing by the same corridor. Each crossing is counted individually.

#### Community

##### *Divides or Isolates a Community*

The study area contains numerous communities along the existing US 51 corridor: Ramsey, Vandalia, Vernon, Patoka, Sandoval, Junction City, Central City, and Centralia. The isolation or division of these communities was a criterion evaluated in the macro analysis. This metric relates to the division of a community into two or more sections with one section being isolated from facilities or services such as schools, emergency services or recreation areas in which there was previous access.

The potential to divide or isolate a community for each combined corridor alternative was measured and defined as either "Community Division/Isolation" or "No Community Division/Isolation" Category. The evaluation was based on the relative location of combined corridor alternative to community boundaries and the location of public facilities, schools, and recreational areas. If a combined corridor alternative divided a community or isolated a community from a majority of its school, public facilities, or recreational areas, "YES" was applied to that combined corridor alternative. In all other cases, the combined corridor alternative was given a "NO."

## **Agricultural**

### Prime and Important Farmland

The Code of Federal Regulations (CFR) Title 7, Volume 6, Section 657.5(a) 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 is also available for these uses. The CFR states, "Prime Farmland has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crop when treated and managed, including water management, according to acceptable farming methods." To be considered prime farmland, the land does not have to be cleared; however, it cannot be urbanized, paved, or permanently under water. Soils are designated as prime farmland by the county soil scientist, and therefore, may differ between counties.

The digital format Natural Resource Conservation (NRCS) soil maps for each county were used to measure potential prime and important farmland impacts. The digital soil maps identify each soil type designated as prime and important farmland.

In characterizing impacts to prime and important farmland at the macro analysis level, any soil type designated as prime and important farmland within the corridor footprint was measured rounded to one acre.

### Farmsteads

#### *Farm Residences and Out-Buildings*

A farmstead refers to the residence located on a farm and was included in the count of residential buildings; outbuildings refer to structures separated from the farmstead and include barns, stables, sheds, and storehouses. Farmsteads and outbuildings were located by the project team using 2007 aerial photography.

In characterizing impacts to farmsteads and outbuildings at the macro analysis level, if any portion of the corridor crosses a farmstead structure or outbuilding, it is counted as one impact per structure.

### Severances

#### *Parcels*

Severed farm operations occur when a new roadway divides a farm either laterally or diagonally, and separates one or more parcels from others within a single farm operation. If a corridor takes farm land on the edge or perimeter of a farm tract, this is not a severance. Farm parcels were visually identified using 2007 aerial photography.

In characterizing impacts to farm severances at the macro analysis level, if any portion of the corridor severs the parcel and the severance results in less than 25% of a parcel separated from the remainder of the parcel, it is counted as one impact.

### Centennial/Sesquicentennial

#### *Farms*

Centennial and Sesquicentennial Farms are those registered in the Illinois Department of Agriculture (IDOA) Centennial Farms Program. To qualify for Centennial Farm status, an agricultural property must have been owned by the same family of lineal (child or grandchild) or collateral (brother, sister, aunt, uncle, niece, nephew, or cousin) descendants for at least 100 years. Centennial Farms may also be registered as Sesquicentennial Farms, those properties that have been owned by the same family of lineal or collateral descendants for at least 150 years.

The Centennial and Sesquicentennial Farms registered in the IDOA program were queried by county on February 3, 2009. The query identifies names of property owners of registered farms and general location of the farm (township, range, and section). The owner names were checked against the most recent available county plat maps by the project team to attempt to locate the farms. A small number (approximately 2%) of registered farms could not be identified due to inadequate address information.

In characterizing impacts to Centennial and Sesquicentennial Farms, if any portion of the farm property is crossed by the project corridor, it is counted as one impact.

## **Cultural**

### Cultural

#### *Historic Sites*

Historic sites are those listed on the National Register or those eligible for listing on the National Register. The National Register is the official federal list of districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering, and culture. The National Park Service administers the National Register of Historic Places.

Historic sites were identified using the online Illinois Historic Preservation Agency (IHPA) Historic Architectural and Archaeology Resources Geographic Information System (HAARGIS) database. A survey of potential historic sites within the project corridors will be conducted and submitted to IHPA for a determination as to which sites are potentially eligible for registration. The survey will include structures more than 50 years in age. When available, those sites determined by IHPA to be potentially eligible will be incorporated in the alignment analysis.

In characterizing impacts to historic sites, if any portion of a historic site or structure is crossed by the project corridor, it is counted as one impact.

#### *Cemeteries*

A cemetery is any land used for human burial and includes undeveloped areas as well as plotted areas. Cemeteries were identified using topographic maps, aerial photography, plat books, and during field reconnaissance.

In characterizing impacts to cemeteries, if any portion of a cemetery is crossed by the project corridor, it is counted as one impact.

## **Other Considerations**

The analysis of preliminary alternatives utilizes information available at the GIS level to screen a variety of resources. Two additional environmental factors that will be considered in the refinement of alignments will be subgroup population data and travel dependent businesses. Sensitive population groups, identified by income, national origin, age, or disability can only be characterized by using U.S. Census block data. Impacts to travel dependent businesses are important where bypass alternatives will be evaluated. Travel-dependent businesses are a subset of businesses and can be identified using guidance from the BDE Community Impact Assessment Manual. The level of detail necessary to evaluate impacts for these two environmental factors is not appropriate for or consistent with the preliminary alignment analysis; such analysis, however, will be included in the future refinement of alignments.

# Appendix B