

ENGINEER'S REPORT

SR 10 Road Rehabilitation



**From the Illinois State Line to I-65
Newton & Jasper Counties**

Des. No. 0100641

May 9, 2005 (Revised August 24, 2005)

Prepared By:



Prepared For:

**Engineering Assessment Section
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D. EXISTING CONDITIONS:

See the ground level photographs, pages A-3 through A-12 of the Appendix, the PowerPoint file of ground level photos on the project CD, and the aerial photographs in Appendix A-13 to A-37 for existing conditions throughout the project area.

Basic Elements:

SR 10	
Functional Class	Rural Minor Arterial
Posted Speed	55 mph Station 10+00 to Station 600+00
	40 mph Station 600+00 to 620+00
	50 mph Station 620+00 to 680+00
	45 mph Station 680+00 to Station 727+00
Member Road Systems	3R Network Off National Highway System On National Truck Network Regional Corridor

Cross Section:

The prevailing cross section along SR 10 consists of 2-12' lanes bordered by 2' gravel shoulders (from the Illinois State Line to CR 400 E) and by 10' paved (11' usable) shoulders (from CR 400 E to the end of project limit at I-65). 3R (and 4R) criteria for rural arterials (AADT > 5,000) recommend a minimum of 10' paved (11' usable) shoulders.

Prevailing apparent right-of-way through the corridor is 50' to 80' (total width). Roadside drainage is via V-ditches throughout the corridor with sideslopes varying from 2:1 to 4:1. The sideslopes are typically 3:1 for the majority of the project limits. East of CR 400 E, where the shoulder is widened to 10' paved, the sideslopes are typically 4:1. There are a few, intermittent areas throughout the project limits where 2:1 sideslopes are present.

Road History:

SR 10		
Year	Construction	Construction Limits
Prior to 1933	Stone county road	N/A
1933	Concrete grading and paving, 20' wide	Illinois State Line to Knight Ditch
1934	Oil treated surface on stone, 18' wide	Knight Ditch to I-65
1939	Bituminous mix, 18' wide	Knight Ditch to I-65
1978	Hot asphalt concrete surface and binder, 26' wide	Illinois State Line to US 41
1979	Bituminous concrete resurface, 20' wide	US 41 to CR 400 E
1986	Bituminous concrete surface, 24' wide	CR 400 E to I-65
1994	Bituminous concrete resurface, 26' wide	Illinois State Line to CR 400 E

Existing road and bridge plans for the following are available at the INDOT central office:

SR 10 Existing Plans		
Year	Construction	Project No.
1933	SR 10 from the Illinois State Line to CR 150 W	F.A. Project No. E323
1933	Bridge plans for SR 10 over Best Ditch, Beaver Lake Ditch and Knight Ditch	Project No. 10 Sec. A
1961	US 41, including intersection with SR 10	F – Project No. 69
1964	I-65, including SR 10 interchange	I – Project No. 65 - 8
1977	Ditch channelization on SR 10 from Station 486+00 to Station 488+00	ST – Project No. 188-1
1977	Bridge rehabilitation for SR 10 over Best Ditch	Project No. ST – 323A
1985	SR 10 from CR 400 E to I-65	F – Project No. 188 - 1

Pavement Condition:

The following summarizes the INDOT's 2004 Pavement Surface Report for these sections of SR 10.

SR 10	Constr. year	PCR	Rut Depth (in)	IRI	PQI
RP 0+00 to RP 11+05	1994	89 (good)	0.16 – 0.25 (fair)	138 - 141 (fair)	64 (poor)
RP 11+05 to RP 13+78	1986	90 (good)	0.58 – 0.68 (poor)	112 - 139 (fair)	51 (poor)

Horizontal and Vertical Alignments:

The SR 10 corridor runs in a west-to-east direction. The horizontal alignment can be seen in the aerial plan sheets, pages A-13 to A-37 of the Appendix. There are three horizontal curves that have a CEDS under 55 mph. They are summarized below:

Existing horizontal curves		
PI Station	Radius	CEDS
9+33.0	954.83'	54 mph
10+19.8	179.65'	25 mph
10+76.6	954.83'	54 mph

The prevailing vertical terrain along the SR 10 corridor is considered level. There were six areas of vertical alignment noted during the field check that may be substandard with respect to stopping sight distance (plans were not available for these portions of SR 10).

- Station 362+00
- Station 482+00
- Station 493+00
- Station 515+00
- Station 540+00
- Station 555+00

Intersecting Roadways:

There are 26 public road intersections with SR 10 within the project limits. The intersections with US 41, CR 450 E and CR 600 E/County Line Road are signalized. The intersection with SR 55 is a 4-way stop. All other intersections are stop controlled for the minor approach, giving SR 10 the through movement. Minimum intersection sight distance for 3R rural arterials (speed: 55 mph) is 755' and (speed: 45 mph) 495'. Intersecting roadway characteristics are summarized in the following table:

Intersecting Roadway	RP (Sta.)	Intersecting Angle	Intersection Sight Distance (ISD)	ISD CEDES (3R)	Leg Width	Posted Speed Limit on Crossroad
CR 700 W (Lt.)	RP 0+00 (Sta. 10+00)	79 °	>755'	>55 mph	18'	Not Posted
CR 650 W (Rt.)	RP 0+56 (Sta. 40+10)	90 °	>755'	>55 mph	20'	Not Posted
CR 600 W (Rt.)	RP 1+07 (Sta. 66+80)	89 °	>755'	>55 mph	18'	Not Posted
CR 1050 N (Lt.)	RP 1+69 (Sta. 100+00)	9 °	>755'	>55 mph	16'	35 mph
CR 475 W	RP 2+49 (Sta. 141+20)	68 °	500'	45 mph	16'	Not Posted
CR 400 W (Rt.)	RP 3+24 (Sta. 180+80)	90 °	>755'	>55 mph	16'	Not Posted
Airport Drive/CR 388 W (Rt.)	RP 3+35 (Sta. 187+20)	90 °	>755'	>55 mph	20'	20 mph
US 41 (Signalized)	RP 3+99 (Sta. 219+00)	72 °	>755'	>55 mph	Multi-lane divided highway	55 mph
CR 300 W	RP 4+25 (Sta. 234+00)	90 °	>755'	>55 mph	24'	Not Posted
CR 150 W (Rt.)	RP 5+75 (Sta. 312+70)	90 °	>755'	>55 mph	24'	Not Posted
CR 108 W (Rt.)	RP 6+17 (Sta. 335+00)	90 ° (via small radius connector)	>755'	>55 mph	20'	Not Posted
CR 75 W (Lt.)	RP 6+50 (Sta. 352+50)	90 °	>755'	>55 mph	22'	Not Posted
Meridian Rd. (Rt.)	RP 7+28 (Sta. 393+10)	90 °	>755'	>55 mph	20'	Not Posted
CR 100 E	RP 8+24 (Sta. 444+00)	90 °	>755'	>55 mph	20'	Not Posted
CR 200 E	RP 9+25 (Sta. 497+40)	89 °	>755'	>55 mph	16' (north) 24' (south)	35 mph
SR 55 (4-way stop)	RP 10+25 (Sta. 550+00)	89 °	>755'	>55 mph	24'	Not Posted
CR 400 E	RP 11+25 (Sta. 603+00)	90 °	>495'	>45 mph	22'	35 mph
W. Front St. (Rt.)	RP 11+32 (Sta. 606+00)	58 °	>495'	>45 mph	20'	Not Posted
E. Front St. (Rt.)	RP 11+35 (Sta. 608+00)	58 °	>495'	>45 mph	22'	Not Posted

Intersecting Roadway	RP (Sta.)	Intersecting Angle	Intersection Sight Distance (ISD)	ISD CEDS (3R)	Leg Width	Posted Speed Limit on Crossroad
CR 450 E (Lt.) (Signalized)	RP 11+75 (Sta. 630+00)	89 °	>755'	>55 mph	22'	Not Posted
CR 490 E (Rt.)	RP 12+12 (Sta. 651+00)	76 °	>755'	>55 mph	28'	20 mph
CR 500 E (Lt.)	RP 12+23 (Sta. 656+40)	90 °	>755'	>55 mph	20'	35 mph
CR 550 E (Rt.)	RP 12+71 (Sta. 682+00)	86 °	>495'	>45 mph	20'	20 mph
CR 570 E (Rt.)	RP 12+92 (Sta. 693+00)	90 °	>495'	>45 mph	20'	20 mph
CR 575 E (Lt.)	RP 12+98 (Sta. 696+50)	88 °	>495'	>45 mph	20'	20 mph
CR 600 E/County Line Rd (Signalized)	RP 13+25 (Sta. 710+00)	88 °	>495'	>45 mph	24'	35 mph

As can be seen in the above table, ISD appears adequate for all intersections except at CR 475W.

Existing Signage:

The following summarizes notable warning signage along this portion of SR 10.

RP (Sta.)	Signage	Comments
Eastbound SR 10		
RP 3+76 (Sta. 209+00)	Signal Ahead with 45 mph intersection advisory speed	Approaching intersection with US 41
RP 7+36 (Sta. 398+00)	Truck Entrance	Approaching greenhouse
RP 8+13 (Sta. 440+00)	Emergency Truck Exit	Approaching Newton County EMS
RP 13+10 (Sta. 700+00)	Truck Entrance with 40 mph advisory speed	Approaching INDOT Unit 3 building
Westbound SR 10		
RP 12+40 (Sta. 664+00)	Intersection Ahead	Approaching CR 500 E
RP 11+85 (Sta. 635+00)	Pedestrian Crossing with 40 mph advisory speed	Approaching Roselawn area
RP 4+14 (Sta. 228+00)	Signal Ahead with 45 mph intersection advisory speed	Approaching intersection with US 41
RP 2+71 (Sta. 153+00)	Intersection Ahead	Approaching CR 475 W

There are also several "Watch for School Bus" signs along SR 10 from the State Line to I-65.

Railroad Crossings:

SR 10 crosses the Consolidated railroad at station 240+00 (RP: 4+35) and the CSX railroad at station 607+00 (RP: 11+33).

The INDOT Railroad database indicates that the Consolidated railroad has been abandoned. The track has been removed (and the pavement resurfaced) at the crossing with SR 10.

The INDOT Railroad database indicates that the CSX railroad crossing consists of a single track, averaging 11 trains per day (however, only 3 trains during the daylight hours of 6am to 6pm). Train speeds range over the crossing from 5 to 79 mph. SR 10 crosses the CSX railroad at a 31° angle. AMTRAK utilizes this crossing for passenger service, averaging 2 trains per day. The railroad crossing is protected with a warning flasher and gates. (See pages B-1 and B-2 of the Appendix for the crossing inventory.)

Small Drainage Structures:

The INDOT Preliminary Hydraulic Review (pages B-3 to B-17 of the Appendix) identifies several major cross culverts (small drainage structures). Approximate cross culvert locations are shown on the aerial plan sheets (A-13 to A-37). The following table summarizes the cross structures:

Structure Location (Station)	Existing Size (Rise x Span) & Type
Sta. 16+00	3'x3' RCB
Sta. 92+10	4.4'x10' RCB
Sta. 220+00	18" pipe
Sta. 245+40	2'x3' RCB
Sta. 264+60	4'x4' RCB
Sta. 273+00	2'x3' RCB
Sta. 312+00	24" pipe
Sta. 368+50	Unknown
Sta. 409+50	7'x16' RCB
Sta. 488+00	Unknown
Sta. 518+60	Unknown
Sta. 527+10	Unknown
Sta. 573+30	24" HDPE pipe w/ 2 inlets in R/W
Sta. 654+50	60" RCP

The following cross culverts were not identified on the INDOT Preliminary Hydraulic Review, however are included within the project limits:

Structure Location (Station)	Existing Size (Rise x Span) & Type
Sta. 67+20	2.5'x5' RCB
Sta. 122+00	24" pipe
Sta. 233+90	15" RCP
Sta. 234+30	15" RCP
Sta. 619+60	22"x13" pipe arch
Sta. 656+50 (CR 500 E)	60" RCP
Sta. 664+40	36" pipe
Sta. 680+00	36" pipe

Bridge Structures:

There are 3 bridge structures (length greater than 20') within the project limits. The following table summarizes the bridge characteristics. The complete bridge inspection reports can be found on pages C-4 through C-27 of the Appendix.

Structure #	Description	Sufficiency Rating (Year: 2004)	Deck, Superstructure, Substructure	Type & Size	Clear Roadway	Year Built /Last Rehabilitation
10-56-1453B	SR 10 over Best Ditch	96.1	7, 8, 7	Reinforced Concrete Slab	34'-0"	1934/1977
10-56-1456C	SR 10 over Beaver Lake Ditch	86.4	5, 5, 5	Precast Box Beam	34'-6"	1933/1980 (reconstructed) 1967 (widened)
10-56-1455	SR 10 over Knight Ditch	91.7	6, 7, 7	Reinforced Concrete Arch	32'-0"	1933

Structure No. 10-56-1453B, SR 10 over Best Ditch

The existing structure is a 23' single span reinforced concrete slab top. The existing structure is in pressure flow and lacks the INDOT required 1 foot of freeboard. Aluminum guardrail is on the approaches and across the bridge. Guardrail is substandard.



Structure 10-56-1456C, SR 10 over Beaver Lake Ditch

The existing structure is a 70'-4" single span precast box beam. The precast box beams are showing signs of cracking. Spalling has occurred in some of the box beams as well as at the east abutment. The bridge inspection report indicates that the channel is not well maintained, and numerous dead trees have fallen into and across the stream causing meanders, bank instability, and scour. W-beam guardrail is on the approaches and across the bridge. Guardrail is substandard.



Structure 10-56-1455, SR 10 over Knight Ditch

The existing structure is a 36' single span reinforced concrete arch. The existing parapets are showing signs of severe spalling. No guardrail is present on the approaches. Across the bridge are substandard concrete railings/parapets.



Utilities:

The following utilities were observed in the area (all were noted during the field check):

- Overhead electric and telephone, primarily on north side of SR 10
- Buried gas line along south side of SR 10
- Buried fiber optic cable

Land Use:

Land use in the area is primarily agricultural from the Illinois State line to the Town of Roselawn, and a mix of residential, agricultural and commercial from Roselawn to the end of the project at I-65. There are 2 cemeteries located within the project limits. Lake Village Cemetery is located on the south side of the roadway at Station 178+00 and Roselawn Cemetery is located on the north side of the roadway at Station 640+00. The Lake Village Airport is located on the north side of the roadway at Station 200+00. The La Salle State Fish and Wildlife Area is located approximately 1,000 to 3,000 feet north of the SR 10 alignment, from the beginning of the project (Station 10+00) to Meridian Road (Station 394+00).

E. TRAFFIC DATA AND CAPACITY ANALYSIS:

An outside consultant prepared the traffic forecast for the subject project for the INDOT Traffic Statistics Unit. The results are presented in a report titled *Traffic Forecasts, SR 10 Road Reconstruction, Newton County, Indiana, INDOT Des. No. 0100641*, dated June 2005. The report shows current and projected traffic data (AADT, DHV, and percent commercial vehicles) for each through and turning movement at the following intersections:

- SR 10 at CR 300 W
- SR 10 at CR 200 E
- SR 10 at SR 55
- SR 10 at CR 400 E
- SR 10 at CR 500 E
- SR 10 at CR 600 E (County Line Rd)

A copy of the traffic data for each intersection can be found in Appendix B-18 through B-32.

In addition, the LaPorte District provided 12-hour turning movement counts at the SR 10 intersection with US 41. The growth factors used in the above mentioned traffic forecast report were utilized to take these existing counts to the anticipated construction year (2009) and design year (2029). A copy of this traffic data can be found in Appendix B-33 through B-35.

Mainline Volumes:

Projected daily traffic is summarized in the adjacent table. Capacity analysis on the two-lane highway was performed for the anticipated construction year (2009) and the design year (2029), and is summarized in the following table.

Existing Configuration						
Roadway Segment	Daily Traffic			2009 LOS	2029 LOS	% Trucks
	2005	2009	2029			
Illinois State Line to CR 300 W	4,805	4,997	5,958	D	D	54 %
CR 300 W to CR 200 E	6,790	7,062	8,420	D	D	42 %
CR 200 E to SR 55	6,890	7,165	8,543	C	D	38 %
SR 55 to CR 400 E	9,985	10,384	12,381	D	D	27 %
CR 400 E to CR 500 E	10,115	10,520	12,543	D	E	25 %
CR 500 E to CR 600 E (County Line Rd)	10,430	10,847	12,933	D	D	25 %
CR 600 E (County Line Rd) to I-65	11,150	11,596	13,826	E	E	25 %

Under 3R standards the desirable LOS is B and the minimum is D for rural and urban conditions (B is desirable and C is minimum for 4R). As can be seen in the above table, existing SR 10 LOS falls below acceptable levels prescribed by 3R standards in 2029 for the segment from CR 400 E to CR 500 E and in both 2009 and 2029 for the last segment, CR 600 E (County Line Road) to I-65. All other segments maintain no less than LOS D through the design year.

Intersection LOS:

A capacity analysis was performed at each of the 7 intersections for which turning movements were provided, pursuant to the Highway Capacity Manual's (year 2000) methodology for intersections to determine level of service (LOS) during the anticipated construction year (2009) and the design year (2029) for the existing intersection configurations. The following table summarizes the findings.

INTERSECTION LOS SUMMARY				
SR 10 @	Existing Configuration			
	2009		2029	
	AM	PM	AM	PM
US 41 (signalized)	B	B	B	B
CR 300 W (2-way stop)	EB, WB: A, A NB, SB: A, B	EB, WB: A, A NB, SB: A, B	EB, WB: A, A NB, SB: B, B	EB, WB: A, A NB, SB: B, C
CR 200 E (2-way stop)	EB, WB: A, A NB, SB: A, B	EB, WB: A, A NB, SB: B, B	EB, WB: A, A NB, SB: B, B	EB, WB: A, A NB, SB: B, C
SR 55 (4-way stop)	EB, WB: B NB, SB: A	EB, WB: B NB, SB: A	EB, WB: B NB, SB: A	EB, WB: B, C NB, SB: A, B
CR 400 E (2-way stop)	EB, WB: A, A NB, SB: B, B	EB, WB: A, A NB, SB: B, C	EB, WB: A, A NB, SB: B, B	EB, WB: A, A NB, SB: B, C
CR 500 E (2-way stop)	SB: B EB/WB: A	SB: C EB/WB: A	SB: B EB/WB: A	SB: C EB/WB: A
County Line Rd. /CR 600 E (signalized)	A	A	A	A

Further traffic capacity analysis results are presented later, in the "Project Alternates and Recommendations" section.

F. CRASH DATA:

The INDOT database shows 243 recorded crashes (accidents) from the Illinois State line to the I-65 interchange during the 4 year period from January 1997 to December 2000. The following table describes the distribution of crash events by intersection and "mid-block" segments, with the number of crashes shown, followed by the number of crashes resulting in personal injury in parentheses and fatal crashes in brackets. Mapping of crashes by location, type and severity is shown on the aerial plan sheets on pages A-13 through A-37 of the Appendix.

Location	Totals								
	Rear end	Sideswipe	Head On	Right Angle	Off Road	Left Turn	Right Turn	Animal	Totals
@ CR 700 W					2				2
Mid-block								5	5
@ CR 650 W								1	1
Mid-Block								1	1
@ CR 600 W		1			1			1	3
Mid-Block					2(1)				2(1)
@ CR 1050 N					2(1)				2(1)
Mid-block		1			2			1	4
@ CR 475 W				1	1(1)			2	4(1)
Mid-block	1(1)	1		1			1(1)	1	5(2)
@ CR 400 W	1(1)			1	1				3(1)
Mid-block					1(1)				1(1)
@ US 41	10(4)	1		25 (8) [1]	3	10(2)		1	50(14)[1]
Mid-block	2(2)		1(1)		2(1)	1(1)			6(5)
@ CR 150 W					2				2
Mid-block	2(1)	1	1		1				5(1)
@ Meridian Rd.					2(1)				2(1)
Mid-block			1[1]		2			1	4[1]
@ CR 100 E		1		1	1	1(1)		1	5(1)
Mid-block		2			4			6(1)	12(1)
@ CR 200 E	5(2)		1	2(1)	2				10(3)
Mid-block					1(1)			1	2(1)
@ SR 55	6(5)		1	2				1	10(5)
Mid-block		1			5			7(1)	13(1)
@ CR 400 E	1			5(1)	1			1	8(1)
Mid-block	4							1	5
@ CR 500 E	3(1)[1]	2(1)			2			1	8(2)[1]
Mid-block	1				1			3	5
@ County Line (CR 600 E)	9(1)			4(2)		3(3)	1	2	19(6)
Mid-block	2(1)			1					3(1)
@ I-65 Ramp C/D	11			1(1)	1(1)	1(1)			14(3)
Mid-block									N/A
@ I-65 Ramp A/B	10(3)			5[1]	5	6(2)		1	27(5)[1]
TOTALS	68	11	5	49	47	22	2	39	243(58)[3]
% of Total Accidents	28%	5%	2%	20%	19%	9%	1%	16%	100%

of crashes (# of crashes resulting in personal injury) [# of crashes resulting in fatality]

As can be seen in the above table, 28% of the crashes were classified as rear end. Lack of auxiliary lanes throughout the corridor is likely a contributing factor for this type of crash. Twenty percent of the crashes are right angle crashes, however, 50% of these occurred at the SR 10/US 41 intersection. The high volumes at this intersection contribute to that concentration of events. Nineteen percent of the crashes are off road. Narrow shoulders and steep, non-

traversable and non-recoverable roadside ditch slopes are likely contributing factors for this type of crash.

G. PROJECT ALTERNATES AND RECOMMENDATIONS:

In assessing suitable measures to address the needs (deficiencies) of SR 10, two build alternates were considered and are briefly described below.

Alternate A Reconstruct SR 10 to a 2-lane section with paved shoulders from the Illinois State line east 13.58 miles to Station 727+00 (RP 13+58), 0.20 mile west of I-65.

Alternate B Reconstruct SR 10 to a 2-lane section with paved shoulders from the Illinois State line east 12.65 miles to Station 678+00, 1.13 miles west of I-65. Reconstruct SR 10 to a 3-lane section from Station 678+00 east 0.93 mile to 727+00, 0.20 mile west of I-65 (2-lane with continuous median/left-turn lane).

No Build Alternate

Discussion of Alternates:

Alternate A proposes a 2-lane section throughout the project length, utilizing rural design criteria. This alternate does not adequately address the traffic capacity and operation deficiencies that exist at the east end of this project and therefore is not recommended. (See "Traffic Data and Capacity Analysis".)

Alternate B proposes an undivided 2-lane section from the beginning of the project limits, east 12.65 miles (1.13 miles west of I-65) to station 678+00, utilizing rural design criteria; then a section having 2 through lanes divided by a continuous median/left turn lane (3-lane section) from station 678+00 to station 723+00, utilizing urban design criteria. In compliance with 3R criteria for urban arterials (intermediate), 6' paved (7' usable) shoulders are acceptable and should be utilized for this typical section, which would reduce right-of-way impacts in this "urbanized" area. The introduction of a continuous median/left turn lane in this eastern segment of SR 10 would reduce interference with left turning vehicles, thus providing smoother flow of traffic and better LOS, hence **Alternate B is recommended.**

Design Guidelines:

This project was originally programmed as a Road Reconstruction, with the anticipation of full depth pavement replacement. Through coordination with the INDOT Materials and Tests division, the preliminary pavement recommendation indicates that widening, milling and resurfacing the existing SR 10 pavement is adequate in addressing the pavement deficiencies for this portion of the corridor. (See section on Pavement Recommendation.) There is also a desire to optimize value in improvements made to SR 10. Investment level and consequent impacts associated with 4R reconstruction standards are not, under the circumstances, viewed as the most cost-effective course of action. Thus, 3R standards are appropriate, and the work category has been updated to "Road Rehabilitation."

The following items are to be included in the final design.

Design Criteria	
Functional Classification:	Rural Minor Arterial
Design Classification:	Rural Arterials, 2-lane, AADT > 5000 (Table 55-3A)
Sta. 5+00 to Sta. 678+00	
Sta. 678+00 to Sta. 727+00	Two-Lane Urban Arterials (Intermediate) (Table 55-3F)
Terrain:	Level
Design Speed:	55 mph
Sta. 5+00 to Sta. 600+00 Sta. 620+00 to Sta. 680+00	
Sta. 600+00 to Sta. 620+00 Sta. 680+00 to 727+00	45 mph
Design Year:	2029

Although the posted speed limit is reduced to 50 mph from station 620+00 to 680+00 and 40 mph from station 600+00 to 620+00, it is proposed to maintain the design speed at 55 mph and 45 mph respectively in these areas. This is due to driver anticipated speeds through these lower posted areas.

Pavement Recommendation:

The INDOT pavement recommendation (see page B-36 and B-37 of the Appendix) consists of milling, resurfacing and widening the existing pavement. The preliminary pavement recommendation is as follows:

Section 1: From Illinois State Line to approximately 5.73 miles east

Remove 3' of existing pavement each side (from the edge of the existing concrete pavement) and widen with 11" HMA Type B.
Mill 1" asphalt and resurface with 4" QC/QA HMA.

Section 2: From Section 1 for approximately 5.59 miles east

Widen 2' each side of existing pavement with 11" HMA Type B.
Mill 3" asphalt and resurface with 4" QC/QA HMA.

Section 3: From Section 2 for approximately 1.25 miles east

Mill 3" asphalt and resurface with 6" of QC/QA HMA.

Section 4: From Section 3 for approximately 0.85 miles east to end of project

Replace existing pavement due to new 14' median/continuous left turn lane. Preliminary pavement design for new pavement calls for a 14" thick pavement.

The final pavement type and design will be determined after completion and receipt of the geotechnical report and traffic data. Underdrains are anticipated as part of these improvements.

Horizontal Alignment:

(See Plan & Profile Sheets (A-13 to A-37))

The horizontal alignment of SR 10 shall be maintained in this project with the following exceptions:

- The three horizontal curves at the beginning of the project limits shall be replaced with a single curve with a radius of approximately 1300'
- SR 10 shall be shifted approximately 6' north of the existing centerline from Station 172+00 to Station 193+00 in order to avoid impacts to Lake Village Cemetery
- SR 10 shall be shifted approximately 6'-8' south of the existing centerline from Station 630+00 to Station 650+00 to avoid the impacts to Roselawn Cemetery

All limits and offsets of horizontal realignment are approximate and shall be used as guidance. The designer shall refine the specific limits of realignment in the design phase. The designer shall also examine shifting the centerline at various locations throughout the project limits as needed in order to minimize right-of-way impacts, environmental impacts, or to facilitate maintenance of traffic.

In addition, there were some areas where horizontal realignment was considered, but not recommended. These areas include the following:

- From Station 527+00 to Station 544+00 a ditch is located along the south side of SR 10. Realignment is not recommended at this location due to the proximity of the SR 55 intersection (Station 560+00). Realignment of SR 10 to the north would encroach onto the Auto Shop property in the northwest quadrant at the SR 55 intersection and restaurant in the northeast quadrant, impacting parking for these businesses and increasing right-of-way costs. It is recommended to provide guardrail at this location to shield vehicles from the ditch. Approximately 2,031'-3" of W-beam guardrail will be required (231'-3" advance, 100'-0" opposing, 1,700' along ditch). If a slight shift in alignment to the north is required in order to provide the guardrail (3'-5') this could likely be done with minimal impacts to the properties at SR 55.
- Otis Ditch lies along the north side of SR 10 from Station 653+00 to Station 665+00. Realignment would impact the properties on the south side of SR 10 at Station 652+00 and 655+00. It is recommended to provide guardrail at this location to shield vehicles from the ditch. Approximately 1,581'-3" of W-beam guardrail will be required (231'-3" advance, 100'-0" opposing, 1,250' along ditch).

Vertical Alignment:

(See Plan & Profile Sheets (A-13 to A-37))

The vertical alignment of SR 10 shall be maintained in this project except in areas where a grade change is required for hydraulic purposes or areas of substandard vertical curvature with respect to stopping sight distance. The following locations require a grade change due to hydraulics:

- Station 47+50, SR 10 over Best Ditch
- Station 92+10
- Station 195+50, SR 10 over Beaver Lake Ditch

There were also several areas of vertical alignment noted during the field check that may be substandard in terms of stopping sight distance. Plans were not available for these portions of SR 10, so the designer shall verify.

- Station 362+00
- Station 482+00
- Station 493+00
- Station 515+00
- Station 540+00
- Station 555+00

These locations were noted during the field check, and should be verified for sufficient stopping sight distance by the designer, and, among other sites, corrected if found to be substandard and if this correction is reasonably cost effective.

No design exceptions for horizontal or vertical alignment are anticipated.

Typical Section:

The proposed typical section from station 10+00 to station 678+00 shall consist of 2-12' travel lanes, bordered by 10' paved shoulders (11' usable). Roadside ditches shall consist of a 4' flat-bottom ditch with 4:1 foreslopes and 3:1 backslopes. These desirable values were utilized as opposed to minimums due to the relatively high AADT and significant amount of truck traffic on this corridor.

The proposed typical section from station 678+00 to station 723+00 shall consist of 2-12' travel lanes with a 14' median/left-turn lane, bordered by 6' paved shoulders (7' usable). Above minimum values were chosen for the shoulder width and median/left-turn lane due to the high truck traffic in the area (minimum paved shoulder width is 4', minimum median/left turn-lane width is 12'). The designer shall select the median/left-turn lane layout given the specific access needs at given segments. Roadside ditches are expected to consist of V-ditches with 3:1 foreslopes and backslopes. Curb and gutter was examined for this section, but dismissed due to the high percentage of trucks in the area. See pages A-13 through A-37 of the Appendix for the proposed typical sections.

In an effort to reduce impacts to residential properties (and avoid several relocations) along the SR 10 corridor, ditch enclosure or other means to reduce roadside width is proposed at several locations. At various locations along the SR 10 corridor (specifically the areas of SR 10 in Lake Village and Roselawn), the designer should make every effort to minimize right-of-way impacts due to close proximity of houses and businesses to the roadway. For purposes of right-of-way estimation for this report, 70' half width right of way was assumed, even in these areas where right-of-way impacts should be minimized. These areas are labeled on the plan and profile sheets, pages A-13 through A-37 of the Appendix.

Hydraulic Recommendations:

The INDOT Hydraulics Unit has provided preliminary structure sizes for notable cross culverts (small drainage structures) within the project limits. Fourteen crossings have been identified, 9 of which are hydraulically inadequate.

Due to several hydraulic inadequacies, as well as for uniformity along the corridor, it is proposed to replace all existing culverts. This information is included in the Appendix, sheets B-3 to B-17 and is summarized below.

Eight additional culverts were identified within the project limits, which were not included in the INDOT Hydraulic review. The location and size of these structures is summarized in the "Existing Conditions" portion of this report. The designer shall examine these structures for hydraulic adequacy. Replacement of all cross culverts is recommended.

Structure Location (Station)	Existing Size & Type Rise x Span	Proposed Size & type Rise x Span
Sta. 16+00	3'x3' RCB	Replace in kind
Sta. 92+10	4.4'x10' RCB	4'x12' concrete flat top or arch culvert
Sta. 220+00	18" pipe	4'x4' RCB
Sta. 245+40	2'x3' RCB	3'x6' RCB
Sta. 264+60	4'x4' RCB	Replace in kind
Sta. 273+00	2'x3' RCB	3'x5' RCB
Sta. 312+00	24" pipe	3'x4' RCB
Sta. 368+50	Unknown	38"x60" RCPE or 4'-11"x6'-9" CMPA
Sta. 409+50	7'x16' RCB	Replace in kind
Sta. 488+00	Unknown	32"x49" RCPE or 38"x57" CMPA
Sta. 518+60	Unknown	4'x5' RCB
Sta. 527+10	Unknown	4'x6' RCB
Sta. 573+30	24" HDPE pipe w/ 2 inlets in R/W	Replace in kind
Sta. 654+50	60" RCP	Replace in kind

Railroad Treatment:

The designer will need to coordinate with the railroad regarding pavement resurfacing work within the railroad tracks. No relocation of the warning flasher and gates are anticipated.

Bridge Treatment:

Structure No. 10-56-1453B, SR 10 over Best Ditch

The preliminary hydraulic review indicates that the existing structure is hydraulically adequate, however the structure is in pressure flow and lacks the INDOT required 1 foot of freeboard. For this reason, structure replacement is recommended. The proposed replacement structure is a 24' span concrete flat or arch top box culvert with wingwalls or projecting (approximate hydraulic height of 6.5).

Structure 10-56-1456C, SR 10 over Beaver Lake Ditch

The preliminary hydraulic review indicates that the existing structure is hydraulically adequate. Due to the poor condition of the structure (cracking, spalling), replacement is recommended. The proposed structure should be "replaced-in-kind".

Structure 10-56-1455, SR 10 over Knight Ditch

This structure is programmed for rehabilitation due to the extent of deterioration of the parapets and the fact that there is no guardrail. Although the structure is in relatively good condition (sufficiency rating: 91.7), replacement is proposed for consistency in design throughout this portion of the SR 10 corridor. This recommendation was coordinated with George Snyder, Bridge Rehabilitation Engineer Supervisor. The proposed replacement structure is a 60' to 65' span spill though bridge.

Mainline Volumes:

Capacity analysis on the two-lane highway section (with improvements) was performed for the construction year (2009) and design year (2029), and is summarized below.

Proposed Configuration			
Segment No.	Roadway Segment	2009 LOS	2029 LOS
1	Illinois State Line to CR 300 W	C	C
2	CR 300 W to CR 200 E	C	C
3	CR 200 E to SR 55	C	C
4	SR 55 to CR 400 E	C	D
5	CR 400 E to CR 500 E	D	E
6	CR 500 E to CR 600 E (County Line Rd)	C	D
7	CR 600 E (County Line Rd) to I-65	E	E

The proposed improvements, including widened shoulder, improve LOS from D to C for segments 1, 2, 4, 6 in the construction year and for segments 1, 2, 3 in the design year.

Although the LOS for a 3-lane section and 2-lane section are similar, the 3-lane section would provide better traffic operation, since with the 3-lane section there would be less mid-block interference with left-turning vehicles. Assuming that 20% of the traffic is removed from the through lane via the addition of this third lane, the v/c ratio decreased from 0.34 to 0.27 in the construction year and from 0.40 to 0.32 in the design year.

Intersection Treatment:

The following summarizes the intersection recommendations:

Proposed improvements at each intersection within the project limits will include a Type "B" public road approach. Treatment at all "T" intersections shall include a passing blister. All 4-legged intersections shall include opposing left turn lanes.

The following summarizes intersections with special consideration.

CR 1050 N (page A-16): CR 1050 E shall be realigned to form a "T" intersection with SR 10. It currently intersects from the east to form a "Y" intersection. Design speed for CR 1050 E: 35 mph (posted speed limit).

CR 475 W (page A-17): CR 475 W intersects SR 10 at a 22° skew. (Maximum intersection angle should be within 30° of perpendicular, desirable within 20°). Intersection sight distance (ISD) looking east from the north approach is substandard. Additional right-of-way will be required at this location in order to provide sufficient ISD. Realignment was considered in order to improve the intersection angle. However, due to the minimal crash history (4 crashes, 2 of which involved animals) and likely low traffic volumes on the county road (CR 475 W terminates in a dead end 0.5 mile south and 0.75 mile north of SR 10), realignment does not appear to be cost effective in terms of crash reduction, and is not recommended.

US 41 (page A-20): Improvements will include lengthening the existing westbound right turn lane to meet standards for deceleration and storage length. Radii shall be improved on all four corners to permit trucks to make turning movements without encroachment into adjacent or opposing lanes. From a traffic capacity standpoint, the signalized intersection functions at a LOS

B in the peak hour of the design year and therefore no additional auxiliary lanes or signal modernizations are anticipated as part of this project.

SR 55 (page A-31): The existing intersection functions at adequate traffic capacity in the design year. Due in part to this, and that this is a 4-way stop, no auxiliary lanes are proposed. Improvements will include radius improvements.

W. Front Street & E. Front Street (page A-33): These intersections are in the urbanized area of Roselawn. They are low volume, local dead-end roads. Although they intersect SR 10 at a 32° skew, due to minimal crash history (3 rear ends), minimal traffic and significant right-of-way impacts associated with realignment, realignment is not recommended. A Level 3 Design Exception will be required for the intersection skew.

CR 450 E (page A-33): There appears to be an existing right turn lane at this “T” intersection for the gas station on the eastbound approach. Since this turn lane is for a commercial drive, it should be put back “in-kind”. A traffic signal modernization is anticipated as part of these improvements.

CR 600 E/County Line Rd (page A-36): There are existing right turn lanes for the eastbound and westbound approaches. These should be lengthened to meet standards for deceleration and storage length. Opposing left turn lanes are proposed at this location. Due to the widened section, a traffic signal modernization is anticipated.

A capacity analysis was performed for the design year at each intersection where turning movements were provided. The following summarizes the results:

INTERSECTION LOS SUMMARY				
SR 10 @	Existing Configuration			
	2009		2029	
	AM	PM	AM	PM
US 41 (signalized)	B	B	B	B
CR 300 W (2-way stop)	EB, WB: A, A NB, SB: A, B	EB, WB: A, A NB, SB: A, B	EB, WB: A, A NB, SB: B, B	EB, WB: A, A NB, SB: B, C
CR 200 E (2-way stop)	EB, WB: A, A NB, SB: A, B	EB, WB: A, A NB, SB: B, B	EB, WB: A, A NB, SB: B, B	EB, WB: A, A NB, SB: B, C
SR 55 (4-way stop)	EB, WB: B NB, SB: A	EB, WB: B NB, SB: A	EB, WB: B NB, SB: A	EB, WB: B, C NB, SB: A, B
CR 400 E (2-way stop)	EB, WB: A, A NB, SB: B, B	EB, WB: A, A NB, SB: B, C	EB, WB: A, A NB, SB: B, B	EB, WB: A, A NB, SB: B, C
CR 500 E (2-way stop)	SB: B EB/WB: A	SB: C EB/WB: A	SB: B EB/WB: A	SB: C EB/WB: A
County Line Rd. /CR 600 E (signalized)	A	A	A	A

Signage:

It is anticipated at this time that existing signage will be removed and replaced as part of these improvements.

Survey Requirements:

The mainline survey should extend from 1000' west of CR 700 W (Station 0+00) to the I-65 bridge (Station 736+52). Length of mainline survey: 13.95 miles. The survey should extend a minimum distance of 125 feet north and south of the centerline. Design survey along the S-lines should extend 300' from the centerline of SR 10 at areas receiving a public road approach, and 150' east of centerline for the residential roads not receiving a public road approach. Additional survey will be required at CR 1050 N due to the proposed realignment, approximately 800' along new alignment. Total length of survey: 15.80 miles.

Traffic Maintenance:

SR 10 Construction

Due to the relatively high AADT, lack of a good state detour route, and importance of this route (Arterial, located on the National Truck Network) it is desirable to maintain traffic through the project. It is anticipated that traffic will be maintained by conventional phased construction. In order to allow for 2-10' travel lanes with 1' paved shoulders to be maintained during construction, full depth shoulder will be required on one side of the roadway, with an additional 3' of temporary pavement. In addition, full depth pavement will need to be extended on the other side of the roadway by 3'. See the typical section on pages A-13 through A-37 of the Appendix for the proposed typical section.

It is anticipated that traffic will be maintained by conventional phased construction at the east project limits (full depth pavement replacement with the addition of a 14' median/left turn lane).

The designer shall refine the maintenance of traffic plan during design.

Bridge Construction

Best Ditch

Due to the lack of a good detour route, and AADT being below 10,000 (3905 vpd in the construction year) it is proposed to construct this structure one half at a time and maintain traffic via a temporary signal. (AADT below 10,000 is a general volume guideline for determining adequate capacity for a temporary signal for typical bridge replacement.)

Beaver Lake Ditch

Due to the lack of a good detour route, and AADT being below 10,000 at this location (4576 vpd in the construction year) it is proposed to construct this structure one half at a time and maintain traffic via a temporary signal.

Knight Ditch

Due to the lack of a good detour route, and AADT being below 10,000 at this location (6710 vpd in the construction year) it is proposed to construct this structure one half at a time and maintain traffic via a temporary signal.

Right-of-Way Summary:

The apparent, unconfirmed existing right-of-way varies from 50' to 80' total width. The proposed improvements will require continuous (more or less) "strip" right-of-way acquisition. The typical section with open drainage will have a right-of-way width of 70' (half width). The designer should use discretion in treatment of the roadside ditch at select areas (e.g. where a conventional ditch would effect a residential relocation), and implement reasonable and practicable measures to minimize right-of-way requirements by use of such measures as short retaining walls, narrower (than typical) ditch and short runs of longitudinal underground pipes in the roadside.

Right-of-Way Summary	
Land Use	R/W
Residential	35.80 (139)
Agricultural/Wooded	78.34 (112)
Commercial	2.26 (21)
Totals	116.40 (272)
Note: Table shows total acres (# of parcels)	

No relocations are anticipated. Again, the designer should consider at locations aside homes, businesses, and other select sites (e.g., aside notable environmental resources), the use of ditch enclosure, small retaining walls and other reasonable methods in an effort to minimize the right-of-way impacts. (See previous discussion under Typical Section heading.) Plans shall be developed such that no R/W is required at a cemetery.

Proposed right-of-way requirements presented in this Engineer's Report are approximate, developed using limited information available at this stage. Later phases of project development will establish precise right-of-way requirements. The more refined right-of-way limits generated from these later phases may differ from the estimates presented at this time.

The designer should coordinate with the Illinois Department of Transportation (IDOT) at some point in design regarding the incidental construction that will occur across the state line.

Estimated Costs (Year 2005):

Road Construction*	\$ 21,000,000
Bridge Replacement (Best Ditch)	\$ 100,000
Bridge Replacement (Beaver Lake Ditch)	\$ 285,000
Bridge Replacement (Knight Ditch)	\$ 255,000
Traffic Maintenance	\$ 500,000
CONSTRUCTION TOTAL	\$ 22,140,000
Right-of-Way Services	\$ 1,360,000
Right-of-Way	\$ 2,600,000
RIGHT-OF-WAY TOTAL	\$ 3,960,000
Engineering (Includes Survey)	\$ 1,600,000
PROJECT TOTAL	\$ 27,700,000
*Full depth shoulder for traffic maintenance included in Road Construction cost. Temporary pavement included in Traffic Maintenance cost	

H. ENVIRONMENTAL CONSIDERATIONS:

The primary environmental considerations on this project involve the additional right-of-way requirement and environmental permitting. According to the U.S. Fish and Wildlife Service National Wetlands Inventory, there are areas of Freshwater Emergent Wetlands and Freshwater Forested/Shrub Wetlands in the vicinity of the SR 10 Road Rehabilitation project. (Specifically

from Station 15+00 to Station 45+00, along both sides of SR 10, and at Station 680+00 on the north side of SR 10.

The INDOT Environmental Assessment Section is preparing the project's environmental document. The designer shall continually confer with the environmental scientist in the Environmental Assessment Section (or its agent) as the project advances.

Proposed right-of-way dimensions, areas and number of parcels presented in this Engineer's Report are estimates at this stage in development of the project. Assessment of social, economic, and environmental impacts should account for the unrefined nature of these right-of-way limits by assessing potential impacts a reasonable extent beyond the proposed preliminary limits.

I. RELATED PROJECTS, CONSISTENCY:

The subject project is scheduled as ready for contracts (RFC) in April 2009. The kin number assigned is 4452. According to the *2004 Directory of Authorized INDOT Highway Projects*, there are at this time three projects that are kinned to (and will be included in) this subject project. (Other "baby" projects may enter the system as the project develops.) The projects (currently in the system program) are as follows:

Des. Number	Project Description	Comments
0201037	Bridge Replacement, SR 10 over Beaver Lake Ditch, 0.48 mile west of US 41 (RP 3+51), Newton County	RFC Date: 4/09. This project is within the limits of the subject project. This project will be included in (a "baby" to) the subject project. Kin # 4452
9610520	Bridge Replacement, SR 10 over Knight Ditch, 2.31 miles east of US 41 (RP 6+30), Newton County	RFC Date: 4/09. This project is within the limits of the subject project. This project will be included in (a "baby" to) the subject project. Kin # 4452
0100385	Bridge Replacement, SR 10 over Best Ditch, 3.28 miles west of US 41 (RP 0+71), Newton County	RFC Date: 4/09. This project is within the limits of the subject project. This project will be included in (a "baby" to) the subject project. Kin # 4452

The designer shall periodically check for any new projects posted after this date during the design process for compatibility with the proposed work.

J. COORDINATION AND MEETINGS:

This project has involved coordination with the following individuals, among others:

- Don Abraham INDOT, LaPorte District, Development
- Ross Andrews INDOT, LaPorte District, Construction
- Jim Kaur INDOT, LaPorte District, Traffic
- Katrina Rogan INDOT, LaPorte District, Operations
- Vernan Hammersley INDOT, LaPorte District, Roselawn Unit
- Phil Kuntz Janssen & Spaans, INDOT Design Division representative

These individuals attended the field check meeting held on October 16, 2003 and provided their input into this project. The Environmental Assessment Section was invited. The

major issues relative to the field investigation are detailed in the Field Check Minutes, located in Appendix C-1 through C-3.

Draft copies of this Engineer's Report were sent to Don Abraham, John Wright (Design Division consultant review section manager), Lyle Sadler (Environmental Assessment Section manager) and Phil Kuntz for their review and comments.

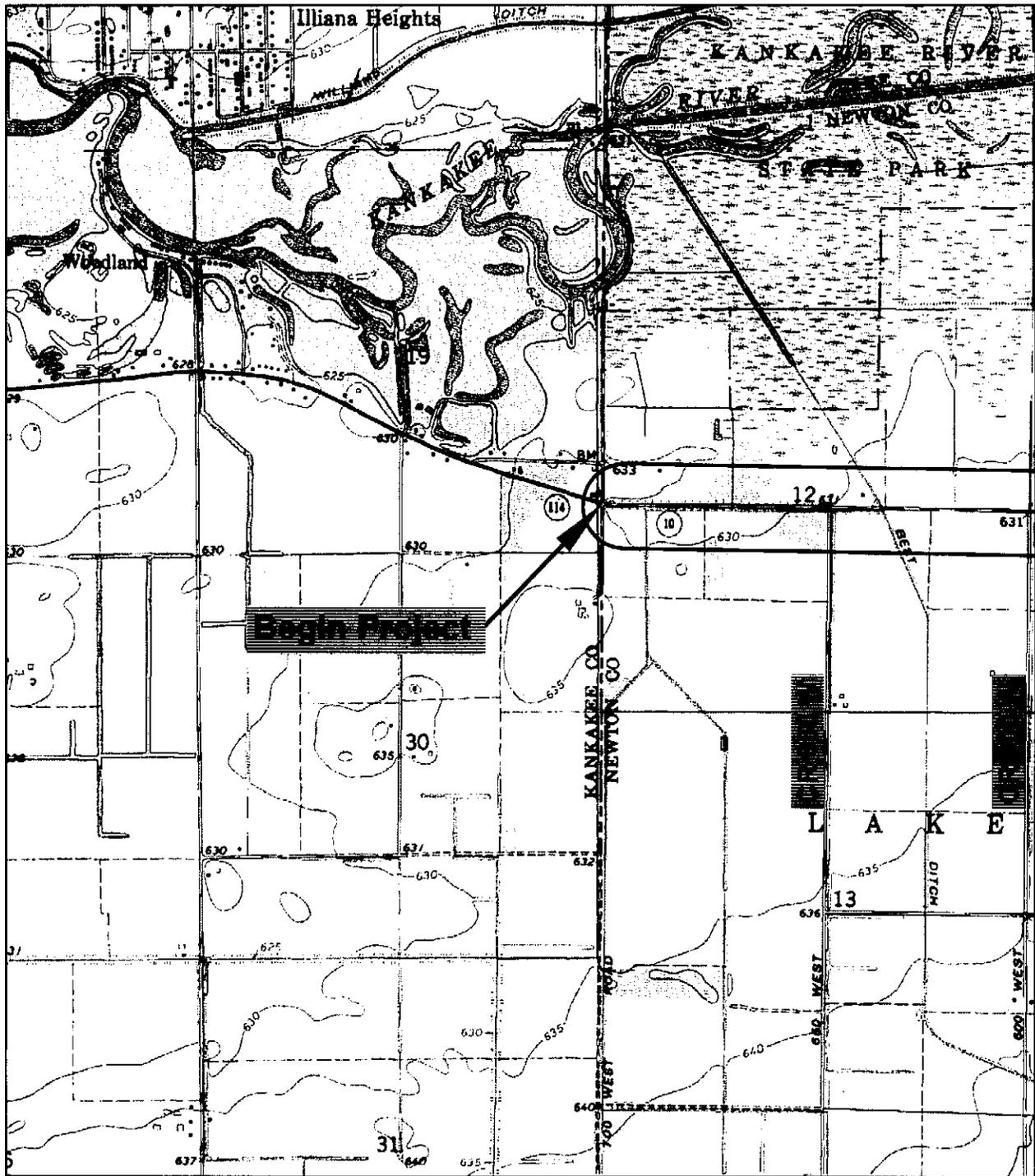
K. CHANGES TO PROPOSAL:

The Engineering Assessment Section shall be consulted if deviation from the proposal is determined to be necessary during a later phase of project development. The person initiating the change should send a memo to the Engineering Assessment Section Manager for concurrence. The designer should route the memo through the Design Division Section Manager. The memo should include justification for the change and its consequences with respect to project cost, right-of-way, timetable and environmental impact.

cc:

Tamera Stoakes (3), INDOT Project Coordinator
John Wright, INDOT, Design Division
William Schmidt, INDOT Design-Location Survey Unit
Ben Lawrence, INDOT Environmental Assessment Section (Acting)
Athar Khan, INDOT Materials & Test, Geotechnical Section
Sally Morgan, INDOT, Land Acquisition
Don Abraham, NDOT, LaPorte District, Development
Jim Kaur, INDOT, LaPorte District, Traffic
Brad Steckler, INDOT, Engineering Assessment Section File

USI File 2003-918



**Illiana Heights Quadrangle, IL
Schneider & Shelby
Quadrangles, IN
Scale = 1" = 2000'**

**Des. No. 0100641
SR 10 from Illinois state line to I-65
Road Reconstruction
Kankakee County, IL
Newton & Jasper Counties, IN**