INDIANA DEPARTMENT OF TRANSPORTATION
INDIANAPOLIS, INDIANA 46204-2228
INTER-DEPARTMENT COMMUNICATION

May 23, 2003

MEMORANDUM:

To: Brad L. Steckler, Manager
Engineering Assessment Section
Division of Environment, Planning and Engineering

Thru: Tarlochan S. Bansi, Supervisor
Engineering Assessment Section

From: L. Nick Batta, Highway Engineer
Engineering Assessment Section

Subject: **Engineer's Report**
Des. No. 0100487
Project No. STP-4622( )CN
Sight Distance Improvement
S.R. 64 at Mayden Trail in Harrison County

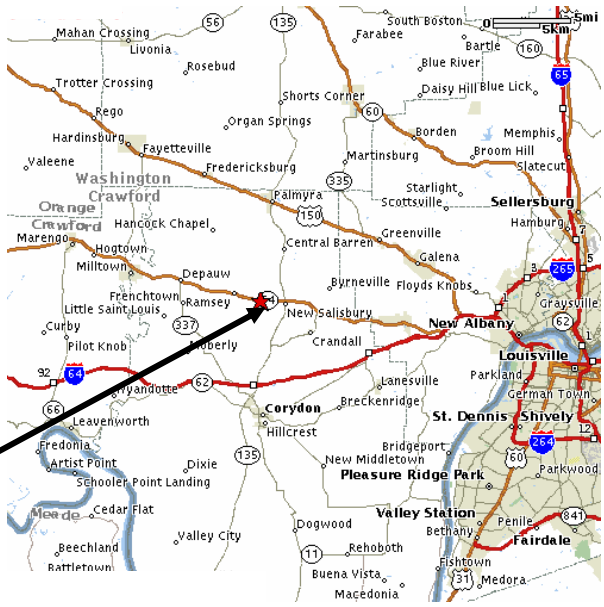
A. PURPOSE OF THE REPORT

This Engineer's Report documents the engineering assessment phase, including an outline of the proposal (scope of work) to improve this portion of S.R. 64. It describes the project at a preliminary level and all relevant background data is included. The Engineer's Report conclusions and recommendations will guide the ongoing environmental and succeeding design phases.

B. PROJECT LOCATION

The project is located on S.R. 64 at the intersection of Mayden Trail, 1.5 miles west of S.R. 135. The intersection is in Harrison County in INDOT's Seymour District and begins at RP 95+31 and ends at RP 95+41.

See map aside for project location. For other location and topography maps, see appendices A-1 & A-2.



C. PROJECT NEED AND PURPOSE

The need (road deficiency) for this project is substandard intersection sight distance (ISD) for southbound Mayden Trail traffic in both the east and west directions on S.R. 64. The purpose is to improve sight distance to current INDOT standards.

D. EXISTING CONDITIONS

Intersection:

The existing three-leg intersection is one-way stop controlled on Mayden Trail and has an intersection angle of approximately 90°. All intersection legs have one travel lane in each direction. The turning radii are approximately 30 ft and allow for a single unit truck to make the turn without encroachment.

S.R. 64 Approaches (East & West Legs):

Table 1: Roadway Geometrics for East & West Legs

Typical Cross Section	Lane Width	Usable Shoulder	Paved shoulder
	12 ft.	2 ft.	2 ft.
Approx. Right-of-Way	35 ft. each side		
Horizontal Alignment	Located on curve with L=1200 ft, Δ=12° and R=5700 ft. The existing computed estimated design speed (CEDS) at the curve is 55 mph.		
Drainage	Open V-ditch on north side; ground descends away from road on south side.		
Vertical Alignment	Ascends 2.20% west to east at intersection. There is a 300 ft crest curve (K=94) 250 ft east of intersection. To the west there is a 300 ft crest curve (K=93) 150 ft from the intersection and a 400 ft sag curve (K=93) 700 ft from the intersection. The CEDS at these curves is 50 mph. As shown in Figure 1 below, the crest curve to the east is the major cause of the substandard ISD. The crest and sag curves to the west provide adequate ISD's.		
Pavement Type	Asphalt surface		

S.R. 64 Basic Elements:

Functional Class:	Rural Minor Arterial	
Posted Speed:	55 mph	
Member Road Systems:	Indiana 3R or 4R Network	3R
	National Truck Network?	No
	National Highway System?	No

S.R. 64 Road History:

Pre-1931	S.R. 64 existing approximately 0.5 mile to the south on county roads.
1931	Road relocated; mix bituminous on stone 16 ft wide and 2"-6" thick.
1936	Bituminous concrete on non-rigid base graded and drained 20 ft wide and 2"-7" thick
1964	Hot asphaltic concrete resurface and binder 24 ft wide and 1"-7" thick. Widened 2'-3" each side by H.A.C.
1978	Hot asphaltic emulsion surface and binder 24 ft wide and 0.5"-11" thick.
1993	Resurface. No other data provided

Figure 1: East leg

Figure 2: West leg

Mayden Trail Approaches (North Leg):

Table 2: Roadway Geometrics for North Leg

Typical Cross Section	Lane Width	Usable Shoulder	Paved Shoulder
	10 ft.	None	None
Approx. Right-of-Way	15 ft. both sides		
Horizontal Alignment	Tangent		
Drainage	None		
Vertical Alignment	Descends toward S.R. 64		
Pavement Type	Asphalt surface		
Intersection Sight Distance	Approximately 600 ft east and over 1000 ft west		

Mayden Trail Basic Elements:
Functional Class: Rural local road
Posted Speed: 35 mph

Mayden Trail Road History:
No history provided. Pavement is chip and seal type and in good condition.

Figure 3: North leg looking north

Figure 4: NW quadrant, Smith Animal Clinic

Public Utilities:
Overhead electric lines run along the north side of S.R. 64 and the west side of Mayden Trail. Buried utilities run along the north side of S.R. 64. Waterlines run along the north side of S.R. 64 and down the centerline of Mayden Trail. A fire hydrant is located 54 ft. north of S.R. 64 in the northeast quadrant.

Land Use:
Quadrants: NW – commercial (Smith Animal Clinic); NE – residential; S – residential. Both Mayden Trail and S.R. 64 contain rural residential properties in all directions. North Harrison Elementary School is located about two miles north of the intersection. In the NE quadrant there are four trees and a bush that block the sight distance from Mayden Trail to the east.

For more details, refer to the aerial photograph in appendix A-3 and the field minutes in appendices C-1 & C-2.

E. CRASH DATA:

Traffic crash (accident) analysis is preformed to identify locations operating undesirably and probable causes. During the past four year period (1997 – 2000), there have been a total of 2 recorded crashes at the intersection, consisting of one property-damage only and one personal-injury.

Table 3: Crash Data

S.R. 64 at Mayden Trail															
Year	*Number of Crashes*				*Total # of*		*Crash Types*								
	Total	Property Damage Only	Personnel Injury	Fatal	Injuries	Fatalities	Rear End	Head On	Same Sideswipe	Opposite Sideswipe	Off Road	Right Angle	Left-turn	Right-turn	Unknown
1997	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0
1998	1	0	1	0	2	0	1	0	0	0	0	0	0	0	0
1999	0														
2000	0														
II	**2**	**1**	**1**	**0**	**2**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
%		50	50	0	N/A	N/A	50	50	0	0	0	0	0	0	0

F. TRAFFIC DATA:

INDOT Traffic Statistics Unit has provided current and projected traffic data for the intersection. Refer to appendix B-1.

The following table shows the AADT in vehicles per day (vpd) for all three legs in both the base year (2002) and the design year (2026):

Table 4: AADT

	North leg (Mayden Trail.)	East leg (S.R. 64)	West leg (S.R. 64)
Base year AADT (vpd)	420	8420	8120
Design year AADT (vpd)	640	12470	12030

The following table shows the percentage of AADT that makes up the AM and PM peak for the design year:

Table 5: DHV as Percent of AADT

	North leg (Main St.)	East leg (S.R. 64)	West leg (S.R. 64)
AM peak %AADT	10	9	9
PM peak %AADT	14	12	12

Percent commercial vehicles represent the percentage of DHV whose vehicles are commercial or recreational. It was determined that this percentage will hold constant throughout the forecasted years. The following table shows percent commercial vehicles in the design year:

Table 6: %Commercial vehicles

	North leg (Mayden Trail.)	East leg (S.R. 64)	West leg (S.R. 64)
%DHV	3	5	5

The following figures show the Design Hourly Volumes for the intersection during the AM & PM peaks:

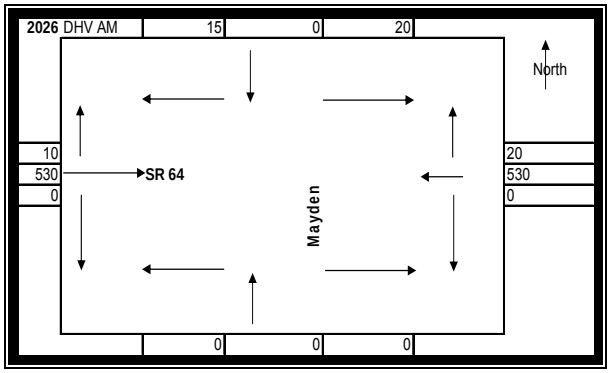


Figure 5: AM Design Hourly Volume (2026)

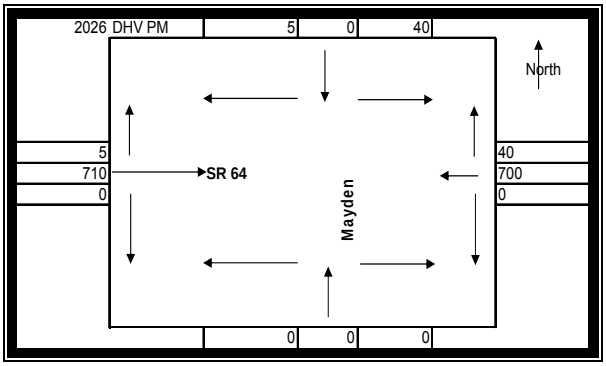


Figure 6: PM Design Hourly Volume (2026)

Capacity Analysis:

The methodology outlined in the 2000 Highway Capacity Manual was used to perform the unsignalized intersection analysis. INDOT 3R standards prescribe level-of-lervice (LOS) B as the desirable condition and LOS D as the minimum. The following table shows the LOS's for all approaches during the base year (2002) and the design year (2026).

Table 7: LOS

	North leg (Mayden Trail)		East leg (S.R. 64)		West leg (S.R. 64)	
	AM	PM	AM	PM	AM	PM
Base year LOS	B	C	A	A	A	A
Design year	C	E	A	A	A	A

Due to the LOS of E for the Mayden Trail approach, this movement from the crossroad onto the mainline will operate at an unacceptable level of service into the design year as stop controlled. As of the base year, no signalization warrants are met and the author does not anticipate a need for signal control as a part of this project.

G. PROJECT RECOMMENDATIONS

Due to the substandard intersection sight distance, it is recommended the vertical alignment on S.R. 64 be constructed to INDOT 3R standards to assist intersecting traffic from Mayden Trail. Since S.R. 64 is classified as an arterial and will carry over 12,000 vpd in the design year, a westbound right turn lane and an eastbound passing blister will give turning vehicles on S.R. 64 a refuge from the through traffic.

Design Guidelines:

This project shall be developed as a "3R" project in compliance with Indiana Design Manual Chapter 55, "Geometric Design of Existing Non-Freeways (3R)", Chapter 46, "At-Grade intersections" and all other applicable standards.

Main Project Features:

Table 8: Preferred Alternate Recommendations:

S.R. 64	
Functional Classification	Rural Minor Arterial
Design Classification	State Rural Arterial; 2-lane; AADT>5000
Design Speed	55 mph
Horizontal Alignment	See appendix A-3
Vertical Alignment	See appendix A-3
Cross Section	See appendix A-3
Obstruction Free Zone	20 ft from edge of travel lane
Terrain	Rolling

Access Control	None, by permit only
Drainage	Open V-ditches; remove 18" corrugated steel culvert (L=30 ft) in NW quadrant
Intersection Sight Distance	750 ft for passenger cars, 920 ft for single unit trucks and 1080 ft for combination trucks
Project Limits	Approximately 1300 ft east and 850 ft west of intersection; additional 100 ft of incidental construction beyond the project limit.
Approx. Right-of-Way	See Right-of-Way Summary

Figure 7: Facing west down S.R. 64, 500 ft. west of Mayden Trail. Backslope will be 2:1 or flatter which will increase horizontal sight distance.

Figure 8: Facing east down S.R. 64, 300 ft. west of Mayden Trail. Red barn on the left to be relocated.

Seymour District Traffic office is asked to perform a field examination of the potential that the four trees and bush in the NE quadrant are hindering ISD, and to take appropriate measures to remove those within existing INDOT right-of-way which obstruct visibility. This is an interim improvement pending the completion of the project. See appendices C-3 through C-4 for additional pictures and a letter sent to the Seymour District concerning the removal of trees to improve the horizontal sight distance. It is recommended that the request in the letter be followed through as soon as possible.

Recommendation for Right Turn Lane:
With a design hourly volume of 700 vph on S.R. 64 and a turning volume of 40 vph, a right turn lane *may* be considered for the intersection, according to the Design Manual warrants. Since there are no apparent right-of-way constraints and S.R. 64 is classified as an arterial, a right turn lane for Mayden Trail is recommended. This addition will also improve the horizontal sight distance from Mayden Trail looking east. The right turn lane will have a 100 ft. taper, 740 ft. deceleration length and a storage length of 50 ft. (total length=890 ft.), per Design Manual Chapter 46.

Recommendation for Passing Blister (right hand passing lane):
Due to the low left turning volume in the design year, a left turn lane is not warranted. With an AADT count on S.R. 64 over 5000 vpd, a passing blister *may* be considered, according to the Design Manual Warrants. Since S.R. 64 is an arterial, a passing blister will greatly assist the eastbound traffic and so is recommended. The passing blister will have two tapers at 295 ft. each and a passing length of 246 ft. (total length=836 ft.), per Design Manual Chapter 46.

Traffic Maintenance:
Traffic will need a detour for S.R. 64 due to the vertical alignment changes. The proposed state detour would use S.R. 135, U.S. 150 and S.R. 66 and the proposed local detour would use S.R. 135 and Old S.R. 64. Assuming a 180 day closure and user costs at $0.25/mile, the estimated user costs for a detour will be $800,000. The estimated cost to the department for a runaround will be $500,000. Due to the rolling terrain, the grading for a runaround will have relatively high impacts and is deemed not cost-effective; therefore a

detour is recommended. The designer shall consult with INDOT's Seymour District to refine the traffic maintenance plan.

Pavement Treatment:
The Engineering Assessment Section does not submit requests to the Materials Engineering Section for preliminary pavement design on sight distance improvement projects. The final pavement design shall be provided after the geotechnical investigation is completed and traffic data is submitted during the design phase. The designer shall consult with INDOT's Pavement Design Engineer for the final pavement design. However, the expected pavement treatment was assumed to be replacement.

Survey Requirements:
The survey limits along S.R. 64 shall extend 1500 ft. east and 1100 ft. west of the intersection. The survey limits along Mayden Trail shall extend 400 ft. north of the intersection. The total length of survey along the mainline and minor road shall be 3000 ft.

Right-of-Way Summary:
The existing typical right-of-way along this section of S.R. 64 is 35 ft. each side of the centerline. The proposed right-of-way south of the centerline will be 50 ft, except in the area of the two sink holes. There the right-of-way must increase to 80 and 155 ft. to allow for proper drainage. The proposed right-of-way north of S.R. 64 will be 70 ft. west of Mayden Trail and 50 ft. east. The 70 ft. in the NW quadrant will allow flatter backslope, increasing the horizontal sight distance from Mayden Trail looking west. Temporary right-of-way is proposed at all private drives inside the project limits. The total right-of-way requires an acquisition of approximately 2.72 acres from 10 residential parcels, one agricultural and one commercial. A barn on the south side of S.R. 64 will need to be relocated.

Other Alternatives:
The "No-Action" Alternative does not involve the disruption of the existing facility by maintaining the continued use of the existing facilities. Therefore, the construction costs are almost none. With the lack of horizontal sight distance to the west and lack of vertical sight distance to the east the operation of the intersection will continue to be deficient. Based on this data, the "No-Action" alternative is not preferred.

Table 9: 2003 Cost Estimate:

Roadway and Drainage	$520,000
Traffic Maintenance	$20,000
Construction Subtotal	**$540,000**
Right-of-Way	$160,000
Engineering	$30,000
PROJECT TOTAL	**$730,000**

H. OTHER PROJECTS IN AREA

In addition to this project, scheduled ready-for-contracts (RFC) in December 2006, there are seven other projects in Crawford, Harrison, Orange and Washington counties currently in the highway project listings within close proximity to the project. The designer should check these and any future projects for consistency and traffic maintenance.

Table 10: Other Projects in Area

RFC	Des. No.	Type of Work	Location
11/15/05	9902630	Intersection improvement	S.R. 64 at S.R. 135
7/15/03	9003199	Pavement replacement	S.R. 135 from U.S. 150 to Shorts Corner Road
4/15/07	0100752	Intersection improvement	S.R. 135 at S.R. 335
11/15/04	9302700	Intersection improvement	U.S. 150 at West Washington School Road, 4.64 miles West of S.R. 135
9/15/06	0014770	Sight distance improvement	U.S. 150 at McCracken Road, West of Palmyra
1/25/07	0012560	Road reconstruction	U.S. 150 from S.R. 66 to S.R. 135

I. ENVIRONMENTAL CONSIDERATIONS

It was observed at the field check that sink holes exist on the north and south sides of S.R. 64, west of the Mayden Trail intersection. Since karst features are present in Harrison County, this should be studied by the Environmental Scientist. The designer is instructed to avoid or minimize impacts to karst features. The Environmental Assessment Section will continue its review of environmental, economic and social impacts of the proposal and will prepare the appropriate document.

J. MEETINGS AND COORDINATION

A field investigation was held on May 2, 2002 concerning the project to gather data (measurements, pictures and field notes) necessary for the preparation of this Engineer's Report. Those in attendance were Nick Batta and Kevin Knoke of INDOT Engineering Assessment Section and Jim Ude of INDOT Seymour District Development. The Environmental Assessment Section and Design Division were invited.

K. CHANGES TO PROPOSAL

The Engineering Assessment Section shall be consulted if the proposal (scope of work) is to be changed. The person initiating the change should send a letter to the Engineering Assessment Section Manager for concurrence. If the designer initiates the revision, he/she should route the correspondence through the Design Development Section Manager. The request should include justification for the change and the estimated cost difference.

Concur: _____
Brad L. Steckler, Manager
Engineering Assessment Section

TSB/LNB/lnb

cc:	Jim Juricic	Environmental Assessment
	Peggy Spears (3)	Design Coordinator
	Roberta Johnson	Land Acquisition
	Gary Mroczka	Design
	Athar Khan	Geotechnical Engineer
	William Schmidt	Location Survey
	Jim Ude	Seymour District
	Mike Hoffman	District Traffic Engineer
	File	Engineering Assessment

APPENDIX

A-1	Location map	C-1 to C-2	Minutes of field check
A-2	USGS topographic map	C-3 to C-4	Seymour District letter from May 31, 2002
A-3	Uncontrolled aerial photograph		