

is based were Sandra L. Brecher, Goldie W. Rivkin, and Malcolm D. Rivkin. A panel of legal and transportation advisors provided guidance and proposed substantive recommendations. These were Morris Rothenberg, of JHK and Associates, Harry W. Lerch of Lerch, Pillote, and Lerch, and Herbert M. Franklin and Richard N. Tager of Lane and Edson. James March of FHWA and Richard Kraft of its Office of Program and Policy Planning provided reviews, comments, and assistance throughout the study.

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#### *Abridgment*

## Impact of Railroad Abandonment on Rural Highways

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Declining railroad patronage over the past 30 years has caused more and more people to question the need for much of the aging, little-used trackage that exists in this country today. One solution to the financial dilemma confronting many of the rail carriers is the elimination of railroad access to those rural areas that are served by lightly used branch lines. This paper addresses the problem of how a shift in transportation demand, which could result from the abandonment of a branch rail line, might affect the roads of a rural area.

The paper introduces an evaluative methodology that can be used to estimate the impact of rail-service discontinuance on rural highways and bridges. The methodology was developed from a research effort conducted at Purdue University and will itself be discussed only briefly in this paper. The major portion of the paper will describe the results of using the methodology for two areas in Indiana that have been confronted with the possible loss of direct rail service.

#### EVALUATIVE METHODOLOGY

The methodology that can be used for assessing the costs of upgrading the rural highway system to accommodate increased numbers of heavily loaded commercial vehicles is composed of several different procedures. The most important of these is the one developed for measuring the impact of railroad abandonment on highway pavements. This procedure is based on equations developed by the American Association of State Highway Officials and the U.S. Army Corps of Engineers. By using these design procedures as a foundation, formulas were developed that express the impact of railroad abandonment on a rural highway pavement in terms of the additional thicknesses of asphaltic concrete overlay that would be required to accommodate the increased traffic.

The procedure concerned with possible effects of railroad abandonment on rural highway bridges uses in-

formation that has been gathered by various agencies within a state. By analyzing data obtained from these secondary information sources, as well as personal inspection of bridges likely to be affected, it is possible to identify those structures whose physical deficiencies are a serious impediment to over-the-road transportation of the goods formerly moved by the railroad.

The methodology introduced in this paper also contains recommended techniques to be used to meet the data requirements of the evaluative system and a method for estimating the financial impact of a branch-line abandonment on affected rural highways. Detailed explanations of all of the procedures of the methodology are contained in a report that summarizes the results of this research effort for the Joint Highway Research Project at Purdue University (1).

#### TWO CASE STUDIES

Two areas in Indiana that were confronted with possible loss of direct rail service were investigated in regard to the impact that abandonment would have on local highways and bridges. The rail segments chosen for analysis were (a) the 44.2-km (27.5-mile) section of United States Railway Association (USRA) line 429 from Decatur to Portland and (b) the 41.5-km (25.8-mile) segment composed of USRA lines 589 and 590 between North Vernon and Madison. Both of these rail lines had been recommended by the Governor's Rail Task Force of Indiana for inclusion in the final system to be operated by the Consolidated Rail Corporation, but this was not done.

For the two case studies, a time span of 10 years was chosen as the length of the analysis period over which the impact was to be measured. Because both highway and railroad data were available for 1973, the 10-year analysis period was begun on January 1 of that year. Furthermore, because a normal increase in traffic volumes will probably occur on those highways, regardless of the final

disposition of USRA lines 429 and 589-590, it was assumed that there would be a 4 percent annual increase in vehicle volumes throughout the analysis period. This supposition was based on traffic information obtained from the Indiana State Highway Commission.

Line-specific rail-traffic information for 1973 was obtained from the Penn Central Transportation Company traffic tapes at the Indiana University Center of Urban and Regional Analysis. The highways that would be most likely affected by rail-service discontinuance were identified by a survey of 33 rail patrons located in the case-study areas. In the first case-study area, which is composed of Adams and Jay counties and located in eastern Indiana, US-27, a facility that parallels line 429 for its entire 44.2-km (27.5-mile) length from Decatur to Portland, was identified as the highway that would acquire added truck traffic after abandonment of the rail line. For the second study area, which is in Jennings and Jefferson counties, Ind-7 and Ind-56 were identified as the highways that would receive the added truck traffic.

Because the sizes and configurations of the motor carriers to be used for transporting the diverted rail commodities were not precisely known, the procedure for converting rail carloads to an equivalent number of trucks was performed twice, assuming two separate truck configurations: (a) a five-axle tractor semitrailer carrier with a legal gross-weight limit of 27 333 kg (73 280 lb) and (b) a four-axle tractor semitrailer carrier with a legal gross-weight limit of 23 126 kg (62 000 lb). The directional distribution of the truck volumes was based primarily on information gathered from the shippers themselves during the railroad-user interviews.

The case studies led to the following conclusions:

1. The structural strength of the pavement of US-27 in the first case-study area is sufficient to accommodate the added truck traffic that will result from the rail-freight diversion. On the other hand, the impact on the pavements of Ind-7 and Ind-56 in the second study area ranged from almost zero for several sections to a high of 1.5 cm (0.6 in) of additional asphaltic concrete overlay for a 14.5-km (9.08-mile) segment of Ind-56 between Madison and Scottsburg. For all three highways, yearly maintenance costs will probably increase as a result of increased road wear.

2. None of the six bridges located on US-27 are currently classified as deficient, according to data compiled by the Indiana State Highway Commission. In the second study area, numerous bridges located on Ind-7 and Ind-56 are old, narrow, and possibly structurally deficient: Ten of the 19 structures should be either replaced or repaired. Thus, the abandonment of lines 589 and 590 could have a serious impact on these two highways.

3. The use of trucks for transporting commodities to firms located in the larger towns of the two case-study areas could cause added traffic congestion on major city streets. However, for the most part, increases in the

numbers of trucks for both study areas were limited, on the average, to three or four more on a highway section each day. Increases of this magnitude are not likely to create congestion problems unless there are seasonal fluctuations that cause the number of additional trucks to greatly exceed the average.

4. Because the impact of abandonment was relatively significant in the second case study, the public costs that would be incurred from resurfacing the pavement sections that would be affected to the greatest extent were computed. These costs do not reflect annual highway and bridge maintenance expenditures; thus, they represent only a first approximation to the financial impact of abandoning lines 589 and 590. The costs were based on the 1973 average bid price of asphaltic concrete resurfacing for the state of Indiana and are \$82 600 for a 14.5-km (9.08-mile) segment of Ind-56 and \$62 600 for a 24.2-km (15.14-mile) segment of Ind-7.

## SUMMARY

Some possible effects of railroad abandonment on rural highways and bridges have been discussed. Because the overall goal for either national, state, or local transportation policies should involve minimizing the total resource consumption of goods movement, the public costs associated with a highway providing equivalent service to a marginal railroad facility were investigated.

The results obtained from two case studies should not be construed as representing the impacts of railroad abandonment on highways in other rural areas. However, the results of these studies indicate that the abandonment of lightly used branch lines does not have as great an impact on rural highways as some highway and railroad interests would like to believe. Many of the rail facilities that have been proposed for abandonment in the Northeast and Midwest do not carry sufficient traffic volumes to cause significant impacts on nearby highways if service along these lines were to be discontinued. However, whether the impact of railroad abandonment on local roads and bridges is expected to be significant or is considered to be quite small, an area-specific investigation of its impact should be performed. This can be easily accomplished through the methodology introduced here.

## ACKNOWLEDGMENTS

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## REFERENCE

1. L. O. Purnell. A Methodology for Evaluating the Impact of Railroad Abandonment on Rural Highways. Joint Highway Research Project, Purdue Univ., West Lafayette, Ind., Jan. 1976.