

THE COSTS AND BENEFITS OF STRATEGIC ACQUISITION OF LIMITED ACCESS RIGHT-OF-WAY AT FREEWAY INTERCHANGE AREAS

PROBLEM STATEMENT

The Florida Department of Transportation (FDOT) is interested in maintaining the capacity and safety of critical freeway interchange areas. It has become apparent that access connections and signalized intersections within the functional area of an interchange can adversely impact safety and operations at the interchange crossroad and on the freeway, and can cause the interchange to fail prematurely.

Standard FDOT practice is to acquire a minimum of 300 ft of limited access right-of-way beyond the end of the acceleration/deceleration lanes for rural interchanges and 100 ft. in urban areas. Additional limited access right-of-way is purchased in freeway interchange influence areas only on a case-by-case basis. Although the safety and operational benefits of managing access in interchange areas are clear, the cost-effectiveness of purchasing more limited access right-of-way at the time of construction—as opposed to retrofitting interchange areas following functional failure—has not been established through research at the national or state levels.

OBJECTIVES

The primary objective of the study is to assess the relative costs and benefits of purchasing additional limited access right-of-way at the time of construction in lieu of retrofitting interchange areas after functional failure. Specific research objectives include the following:

- Document current practices in Florida and other states as they relate to acquisition of limited access right-of-way at interchanges.
- Assess agency rules and requirements that relate to or impact the acquisition of limited access right-of-way.
- Establish a methodology for evaluating the costs and benefits of interchange area access control in coordination with FDOT.
- Conduct a cost/benefit analysis of a representative interchange in relation to acquisition of varying amounts of limited access right-of-way.

FINDINGS AND CONCLUSIONS

The study methodology included the following basic steps: (1) traffic operations analysis of the study interchange with varying configurations of signalized access spacing using CORSIM, (2) safety analysis of a sample of Florida interchanges with varied access spacing, and (3) cost/benefit analysis of acquiring varying amounts of limited access right-of-way. Operational analysis assumptions included a 3% growth in traffic volume per year over a 20 year design life, with no changes to the geometry of the simulation network. Other variables that could affect interchange operations (e.g., distribution of turning or through traffic volumes, signal operations, etc.) were considered to be constants to focus the analysis on the impacts of access control. Interchange failure was defined as the point at which traffic was observed backing up onto the mainline.

A safety analysis was conducted using crash data for eleven interchange study sites identified as having periodic traffic-back-ups onto the freeway mainline due to the proximity of signalized access on the crossroad. Crash data were obtained from FDOT for a one mile freeway section before the off ramp over a five year period (1999 to 2003). The objective of the safety analysis was to relate crash frequency to the length of access controlled frontage, and to provide an approximate measure of potential crash reduction for the benefit and cost analysis.

The final step was to conduct a cost/benefit analysis for purchasing different lengths of limited access right of way (LA ROW), with 200 ft. representing standard practice. The benefit-and-cost ratio was calculated for urban and rural conditions for two comparisons: 200' vs. 600' and 200' vs. 1320' using the following equation, $B/C = (B1+B2+B3)/C1$. B1 represented the \$ savings of not purchasing LA ROW on developed land, assuming 400 feet as the minimum length of LA ROW that would later be needed to reconstruct the freeway off-ramp area. B2 represented anticipated decreases in delay and travel time, and B3 indicated the potential crash reductions. C1 represented the initial cost of acquiring the additional LA ROW on undeveloped land. Future benefits were converted into present values using the federally recommended discount factor of 7%. The value of benefits was determined as follows:

- an average cost of time of \$13.25 per person hour for two PM peak hours (TTI Urban Mobility Study),
- average cost of crashes based on crash type from the National Safety Council (Death: \$1,120,000, Nonfatal Disability Injury: \$45,500 , PDO: \$8,200), and
- average cost of LA ROW from FDOT District 7 ranging from \$500 per front foot for rural unimproved conditions to \$15,000 per front foot for urban improved conditions.

The results of the benefit-and-cost analysis are provided in Tables 1 and 2, below.

	Urban		Rural	
	Benefit	Cost	Benefit	Cost
ROW (B1)	\$1,550,514	\$650,000	\$103,368	\$200,000
Delay (B2)	\$28,280,906	\	\$28,280,906	\
Crashes (B3)	\$1,809,178	\	\$1,809,178	\
Total	\$31,640,598	\$650,000	\$30,193,452	\$200,000
B/C Ratio	49		151	

Table 1 Benefit-and-Cost Ratio of 200' vs. 600' of LA ROW

	Urban		Rural	
	Benefit	Cost	Benefit	Cost
ROW (B1)	\$1,550,514	\$1,820,000	\$103,368	\$560,000
Delay (B2)	\$31,256,063	\	\$31,256,063	\
Crashes (B3)	\$5,065,698	\	\$5,065,698	\
Total	\$37,872,276	\$1,820,000	\$36,425,129	\$560,000
B/C Ratio	21		65	

Table 2 Benefit-and-Cost Ratio of 200' vs. 1320' of LA ROW

BENEFITS

Although FDOT regulates access spacing in interchange areas, managing interchange area access through police power alone has certain limitations. Pressure tends to be high for interchange area access, development is rapid but incremental making coordinated planning difficult, and land ownership patterns and subdivision practices can limit the effectiveness of state policies. Access permits are not usually denied to individual properties when the result would be to deny all access, unless the property is acquired by the government agency or alternative access is provided.

Given these limitations, it is advisable for state transportation agencies to acquire additional limited access right-of-way (beyond the standard 100 or 300 feet) when an interchange is being planned and before the adjacent land is subdivided and developed. This would help redirect access to more appropriate locations for safety and traffic operations, and promote internal street and circulation networks for interchange area development. Those who own businesses or homes in the interchange area would benefit from improved access design and a lower likelihood that their property would be damaged or needed for interchange expansion. Policy measures would help accomplish the desired outcomes.

This study indicates that the long term safety, operational, and fiscal benefits of purchasing additional LA ROW at interchange areas greatly exceed the up front costs. The increase of access spacing could extend the operational life of the interchange as much as 8 to 10 years, fewer backups would enhance driver safety, and right-of-way could be acquired in advance of development when it is much less costly. The findings are preliminary, given the limited data set and limitations of CORSIM. Nonetheless, the research suggests that state transportation agencies and the traveling public may benefit greatly by an increase in the amount of limited access right-of-way at interchange areas to a minimum 600 feet and a desirable ¼ mile.

This research project was conducted by Kristine Williams, Huaguo Zhou, and Larry Hagen of the Center for Urban Transportation Research at the University of South Florida. For more information, contact Gary Sokolow at (850) 414-4912, gary.sokolow@dot.state.fl.us.