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Assess the Need for Implementing Access Management Program

J. L. Gattis

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16. Abstract

This report presents issues and considerations associated with implementing an access management program to preserve safety and mobility on the state's urban and rural highways. Information for the report was gathered by reviewing documents and research reports, and by interviewing a number of transportation professionals having experience with access management programs. The report:

- presents findings from a number of sources about a variety of effects of access management;
- reviews access management principles and practices;
- documents current practices in Arkansas related to access management programs, and compares them with the state of the practice; and
- lists a series of steps a state would need to take to embark upon an access management program.

Before implementing access management, a transportation agency will need to inform public officials about the benefits of access management, and educate design professionals and staff about access management methods and procedures. Instead of implementing a full-blown program, an agency can start with a few select demonstration projects or another incremental approach. This should ease the transition for staff as they learn new procedures, and give the agency a chance to identify problematic aspects of the procedures and revise them.

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ASSESS THE NEED FOR IMPLEMENTING AN ACCESS MANAGEMENT PROGRAM

by J. L. Gattis, Civil Engineering Department, University of Arkansas

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DISCLAIMER

LIST OF SELECTED ABBREVIATIONS AND TERMS

AASHTO	American Association of State Highway and Transportation Officials
ADT	average daily traffic
CBD	central business district
ft	feet
gsf	gross square feet
ISD	intersection sight distance
ITE	Institute of Transportation Engineers
MPO	metropolitan planning organization
mi	mile
mph	miles per hour
NCHRP	National Cooperative Highway Research Program
NTSB	National Transportation Safety Board
sec	second
TRB	Transportation Research Board
TWLTL	two-way left-turn lane
vpd	vehicles per day

ASSESS THE NEED FOR IMPLEMENTING AN ACCESS MANAGEMENT PROGRAM

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CHAPTER 1
INTRODUCTION

Access management is much more than a driveway permit program. Access management is the systematic control of the location, spacing, design, and operation of interchanges, medians and median openings, and driveway and street connections to a roadway (CAM 2003). Access management is implemented and applied to roadways by means of policy, planning, and design procedures.

The freeways of the Interstate Highway System were constructed in the mid-1900s with full control of access -- there were no driveways or at-grade intersections. The only way to get onto or off of a freeway is via ramps. While freeways obviously have highly controlled access, the term "access management" is usually not used in reference to freeways, but rather to managing the partial control of access along expressways, arterials, and other roads below the "freeway" classification. Exhibit 1-1 shows a conceptual schematic of freeways and other levels of access control.

Interest in access management is growing. A number of states have either implemented or are considering implementing an access management program. *A Policy on the Geometric Design of Highways and Streets* (i.e., *Green Book*) by the American Association of State Highway and Transportation Officials (AASHTO) now stresses the importance of access management (AASHTO 2004). The Transportation Research Board (TRB) published the first edition of the *Access Management Manual* in 2003 (CAM 2003).

WHY IS ACCESS MANAGEMENT NEEDED?

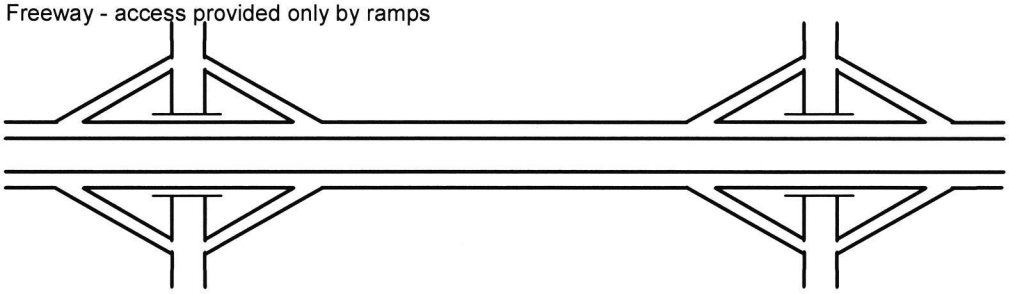
Roadways serve two main travel functions: providing access to abutting properties, and conveying or moving people and goods. Experience has shown that a roadway cannot provide both much access and much mobility (or movement) at the same time. If a roadway needed for mobility also has frequent access demands placed on it, then the ability to provide the needed mobility is significantly diminished.

Striking a Balance

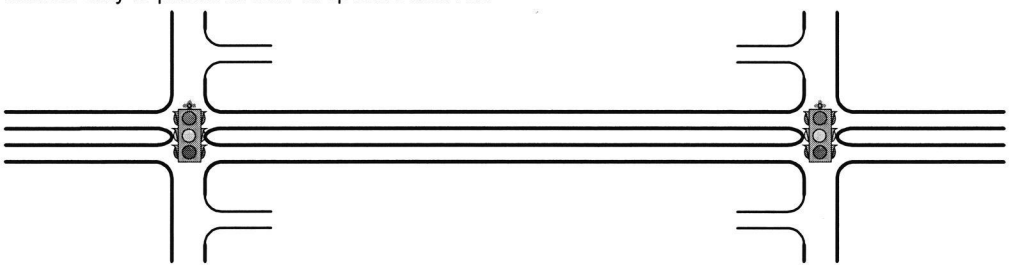
Most roadways provide a fairly high degree of access. In order to get the overall roadway system into balance, a certain proportion of the roadways needs to be set aside mainly for mobility. The parts of the roadway network intended to accommodate the public's need for mobility (exemplified by relatively higher volumes and speeds) have been called "arterials." Arterials comprise a small fraction of the overall miles in the road network, but serve the majority of the vehicle-miles of travel.

Recognition of the need to ensure that mobility is not shortchanged has led to managing the access of some roadways. On access-managed roadways, the transportation agency seeks to strike a balance

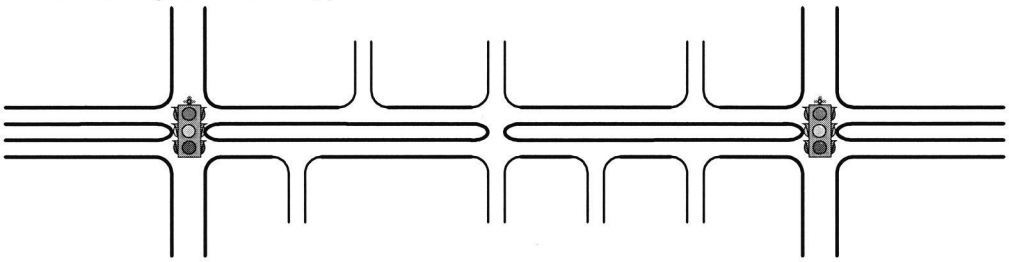
FULL ACCESS CONTROL
Freeway - access provided only by ramps



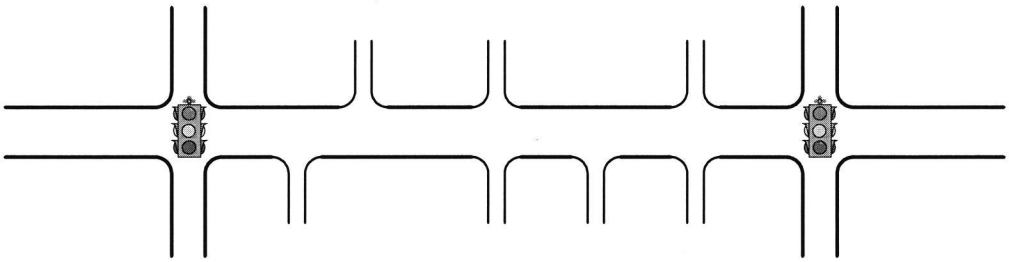
PARTIAL ACCESS CONTROL
access only to public streets at specific intervals



PARTIAL ACCESS CONTROL
full access at specific intervals, partial access elsewhere



NO ACCESS CONTROL
full access at all streets and driveways



NOTE: Drawings are conceptual schematics, to convey the broad concept of varying access levels. Other access management components, such as spacing, are not depicted.

EXHIBIT 1-1 Conceptual schematic of levels of access management

between the needs of private property owners and of the general public using the roadway, by maintaining reasonable access for abutting properties while maintaining safe and efficient traffic flow.

Comparing the Two

To appreciate access management, compare and contrast two roadways, one without and one with access management. Exhibit 1-2 shows one of each. Roadways built according to practices that sometimes date back a century or more have little or no access control, exemplified by frequent driveway and street connections. This does not create widespread problems as long as traffic volumes and speeds are low. But when today's road-user demands are placed on arterial roadways, uncontrolled access causes the roadway's service to deteriorate -- that is, the ability to move decreases while the number of crashes increases. Often, the response to this deterioration has been to spend sizeable sums either to

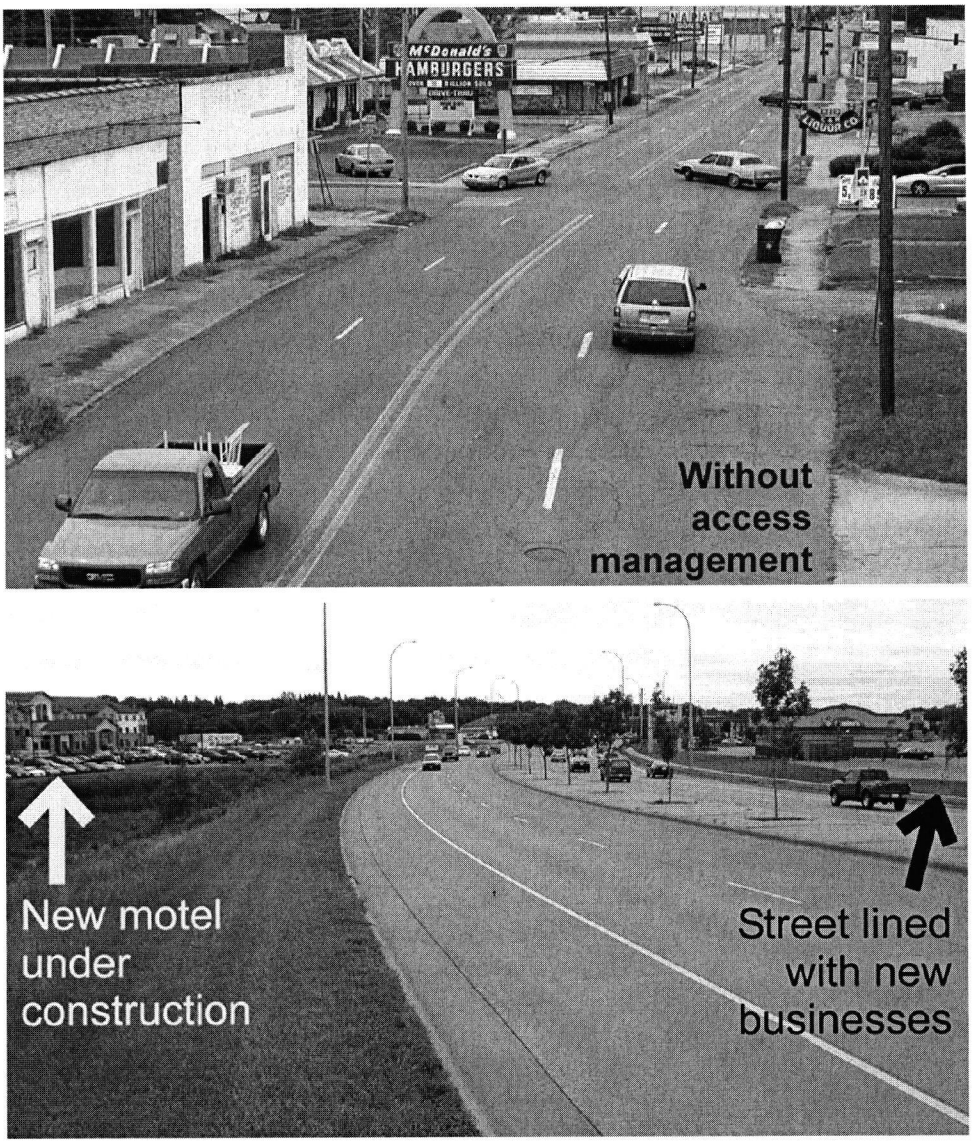


EXHIBIT 1-2 Roadways without (above) and with (below) access management applied

expand the existing roadway or to build a new roadway on a new alignment. In some cases this cycle of roadway deterioration just repeats itself, so the replacement road itself eventually has to be replaced. Applying access management can help preserve the corridor for the movement of people and goods, and address this costly cycle of roadway deterioration.

An access-managed arterial roadway will have less frequent street and driveway intersections, and a median is desirable. These and other access management design features can be expected to result in the following benefits.

- Improved roadway safety, by controlling some of the elements that contribute to roadway crashes
- Enhanced mobility, by removing impediments to smooth traffic flow
- Protecting the public's investment in the roadway system, by greatly extending the functional life of arterials to move people and goods

FROM DRIVEWAY PERMITS TO ACCESS MANAGEMENT

"Most state transportation agencies have had some form of driveway regulation for several decades. These programs were developed to regulate construction within the right of way of a state highway and addressed issues such as drainage, installation of culverts, and construction of driveways....often called a right-of-way encroachment permit....

As metropolitan areas expanded and arterials became more congested, the need to manage all elements influencing arterial efficiency became apparent. Growing demands for highway access were making it increasingly clear that driveways, and the developments they served, were resulting in cumulative adverse impacts on the safety and efficiency of major roadways. It was also becoming clear that these cumulative impacts were not adequately addressed through traditional encroachment permitting.

Colorado was the first state to adopt a comprehensive access management code. In 1979, the Colorado legislature declared that all state highways were controlled access highways. In 1981, a new regulatory code of standards and procedures was adopted requiring permission from the state to access a state highway through the issuance of a permit. What made this a process different from earlier permit systems in Colorado and other states was the application of contemporary access management principles to all state routes....

Since then, an increasing number of state and local agencies have expanded their driveway regulation efforts for the purpose of access management....."

Williams, NCHRP Synthesis 304

PURPOSE OF THIS REPORT

The purpose of this report is to present the issues and considerations associated with implementing an access management program to preserve safety and mobility, as an alternative to the costly process of continually replacing roadways whose performance has deteriorated over time. Information for the report was gathered by reviewing documents and research reports, and by interviewing a number of transportation professionals who have experience with access management programs.

ORGANIZATION OF THIS REPORT

The following list describes the content of each chapter in this report.

- Chapter 2 presents findings from a number of sources about a variety of effects of access management.
- Chapter 3 reviews access management principles and practices.
- Chapter 4 documents current practices in Arkansas related to access management programs, and compares them with the state of the practice.
- Chapter 5 discusses the steps a state would take to implement an access management program.
- Chapter 6 summarizes and concludes the report.

Finally, reference sources and supplemental materials are presented.

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CHAPTER 2
ROADWAYS WITH AND WITHOUT ACCESS MANAGEMENT

Research studies have been conducted to compare and contrast roadways that have access management with roadways that do not. These studies have focused on attributes such as safety, delay, and economic impacts on abutting properties.

IMPACTS OF ACCESS MANAGEMENT ON ROADWAY SAFETY

The lack or presence of access management features can affect the safety of a roadway. Roadways with access management tend to have lower crash rates than roadways with unmanaged access. This is not unexpected, as access management programs will reduce or eliminate many of the conflicting traffic movements that are a factor in crashes.

When considering crash statistics, remember that the databases are probably incomplete. One recent paper (Elvik and Mysen) reported on an examination of different sources of crash data (police reports, hospital records, insurance records) from 13 countries. They concluded that for the United States, the road accident statistics contained 95% of the fatal crashes and about half of the hospital-treated injury crashes.

Traffic professionals have observed the effects of access on roadway safety and attempted to remedy observed problems for over half a century. These studies have examined the effects of features such as separate left-turn lanes, two-way left-turn lanes, median opening closures, and access density.

Separate Left-Turn Lanes and Safety

A state highway safety program analysis noted that intersection improvements such as installing separate left-turn lanes and closing median openings reduced accidents (Wilson). The most noticeable benefit from installing separate left-turn lanes was a dramatic reduction in rear-end collisions. Before-and-after studies were conducted at 53 intersections where channelization had been added (Hammer). Left-turn channelization produced a 48% reduction in accidents at unsignalized (urban and rural) intersections, and a 17% reduction at signalized (urban) intersections. Most of the reduction was due to the drop in multiple-vehicle accidents. The rural intersections had a greater reduction in crashes than did the urban.

One of the many studies conducted in the 1960s on Indiana roadways concluded that left-turn lanes in the median substantially reduced the number of accidents and the amount of delay. This study considered rural and suburban intersections, and found a favorable benefit-cost ratio for constructing a turn lane for a period of time as short as five years in some cases (Shaw and Michael).

Five years of crash data from Lexington, Kentucky were analyzed (Agent). Crash rates were computed for intersections with and without left-turn lanes. At the unsignalized intersections, the crash rate related to left turns was 77% lower when left-turn lanes were present; at signalized intersections, the rate was 54% lower with left-turn lanes.

In Indianapolis, nine locations where the pavement markings were revised to add turn lanes experienced an over 50% reduction in total accidents. At five other locations where signals were modernized along with the addition of left-turn lanes, total accidents declined by 2/3 (Greiwe).

A 1988 article reported that Vancouver annually spent approximately two and a half million dollars for six to ten projects adding left-turn bays at major intersections. The Engineering Department measured the effects, and found a 25% to 50% decrease in accident rates (Rudberg).

More recently, a national pooled funds study (Harwood et al. 2002) found similar accident-reduction benefits from adding left- or right-turn lanes at intersections with either stop or signal control (see Exhibit 2-1).

EXHIBIT 2-1 Percent reductions in total accidents from installing turn lanes

Intersection type and control	Urban add left-turn lane	Rural add left-turn lane	Urban and Rural add right-turn lane
STOP control	-	-	26
Three-leg intersection	33	44	-
Four-leg intersection	47	48	-
Signal control	-	-	8
Three-leg intersection	7	15	-
Four-leg intersection	19	33	-

NOTE: Percent reductions are for lanes added on both major road approaches, except for three-leg intersections are for lane added on one major road Approach.

from Harwood et al., *Safety Effectiveness of Intersection Left- and Right-Turn Lanes*

The recent multi-volume NCHRP Report 500, addressing highway safety, devoted Volume 12 to crashes at signalized intersections. To improve safety, it called for restricting cross-median access near intersections (Antonucci et al.).

Two-way Left-Turn Lanes and Safety

There is debate about the origin of flush medians used as continuous two-way left-turn lanes (TWLTL). Applied to two- and four-lane roadways, especially in commercial strip areas with frequent driveways, this treatment removes left-turning vehicles from the inside through lane. There are reports of one in Michigan in 1950 (ITE 1981). One of the first TWLTLs was installed in Seattle in 1952 (Nemeth). Some have erroneously called them "suicide lanes", confusing TWLTLs with the rural highway two-way passing lanes of a previous generation.

Before-and-after studies showed significant reductions in crash rates, such as the 33% reduction reported by Horne and Walton (Stover et al. 1982). Thakkar (1984) reported on 15 roadway sections of at least 0.25 mile length converted from four-lane to five-lane operation (i.e., TWLTL), at which traffic or other factors had not changed appreciably. The total accident rate decreased 28%, and the fatal-plus-

personal injury accident rate decreased 26%. With an 8% interest rate over a 15 year period, the benefit-cost ratio for these projects was 2.65.

Researchers (McCoy et al. 1988) studied urban four-lane roadways in Nebraska with volumes ranging from 5,000 to 25,000 vehicles per day (vpd). The accident rate on the TWLTL sections was 34% lower than on the undivided sections; this difference in rates was somewhat offset by a greater accident severity on the TWLTL sections. They employed computer simulation to estimate the extra costs of stops and delay on undivided roadways, and then estimated the benefit/cost ratio of constructing TWLTL, for various percentages of left turns and a number of driveways ranging from 30 to 90 per mile. When considering only stop and delay costs, TWLTL were justified at volumes ranging from about 11,000 to 16,000 vpd; when considering only accidents, the justification threshold was 7,100 vpd. For all costs (both crashes and delay), TWLTL were justified at volumes of around 6,200 to 6,600 vpd.

In a survey of over 100 state and local agencies and consultants around 1980, 87% reported they did not have accident problems with TWLTLs, but half reported problems with improper use of them. These improper uses included entering the lane at an angle and therefore leaving part of the vehicle sticking out in the through traffic lane, entering the lane too far in advance of the turn and therefore conflicting with other vehicles in the TWLTL, using the lane for acceleration or passing, and truckers parking in and using the space as a loading zone. Other issues included questions about the suitability of the TWLTL on high speed roadways, and whether TWLTLs encourage strip development (ITE 1981). Exhibits 2-2 and 2-3 show some of the problems with TWLTL use.

EXHIBIT 2-2 Trucks using TWLTL for parking area

Nontraversable Medians and Safety

Nontraversable (e.g., raised, depressed) medians are often installed on access-managed arterial roadways. These have sometimes been called "barrier medians", in contrast to flush medians marked as TWLTLs. The terminology seems to have morphed over the years: one older reference (Billion and Parsons) contrasts "deterring medians" (e.g., flush grass, curbed) with "non-traversable medians" (e.g., guard rail, concrete posts).

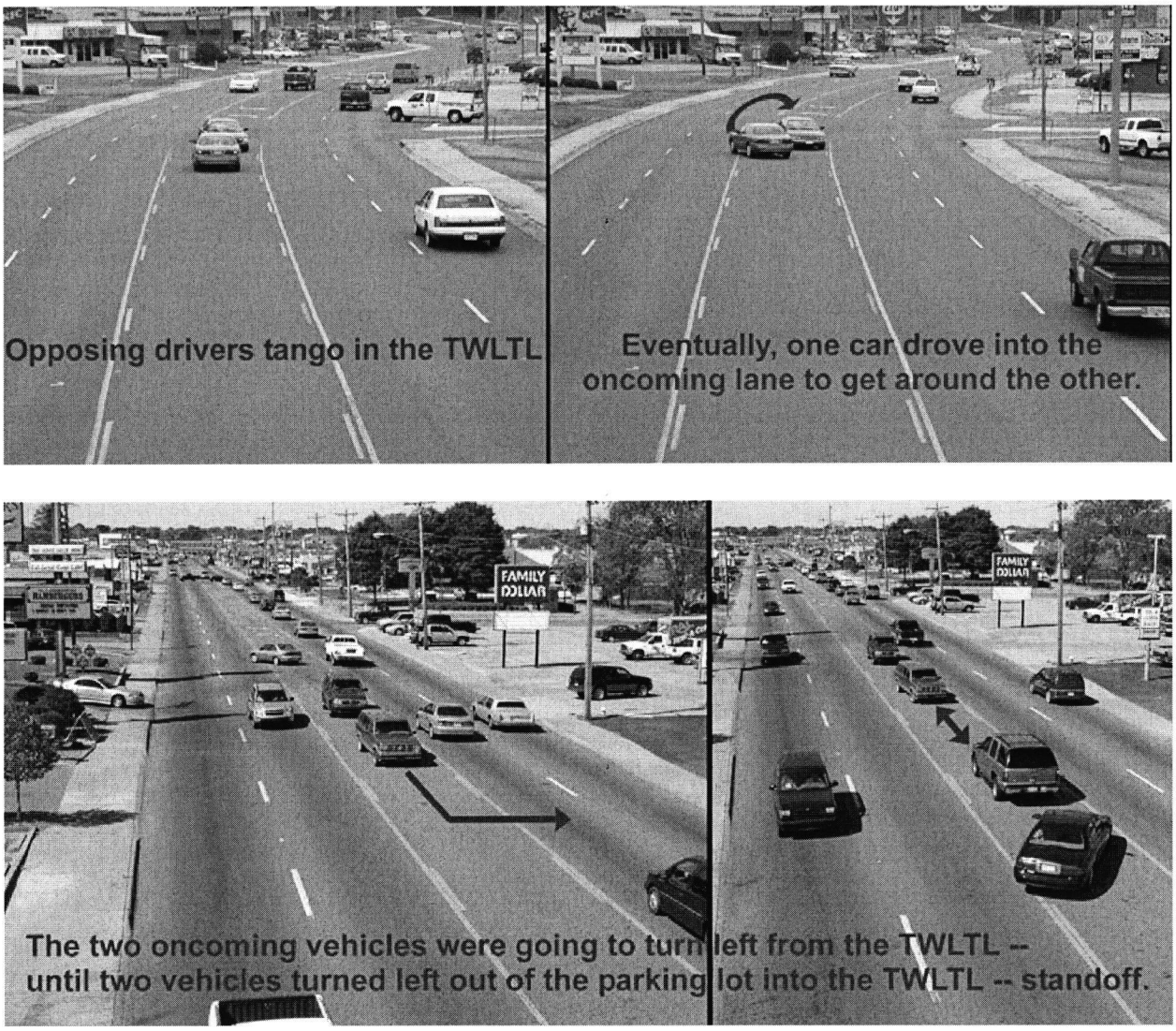


EXHIBIT 2-3 Opposing left-turning vehicles occupy TWLTL

A study of Minnesota roadways in the late 1940s found that four-lane divided roadways had the lowest accident rate of all types of highways studied. About 4/5 of the mileage consisted of two-lane highways. A reader can infer that urban-core roadways were not included in the study (Kipp).

Another study examined of over 80 miles of divided, multilane urban highways with no control of access on Long Island, using crash data from the late 1950s. For crashes between intersections, crash rates peaked with median widths around 15 ft. The study authors also opined that median widths of from 40 to 56 ft confused drivers at night in fog or rain, and contributed to drivers thinking they had turned into a two-way road when in fact they were driving on the wrong side, against the flow of traffic. The authors recommended extra signing as a countermeasure (Billion and Parsons).

Kihlberg and Tharp (1968) studied rural roadway data from three states. They found that four-lane highways had higher accident rates than two-lane highways when there was no median or access control. The partial control of access was partially effective in reducing accidents, and medians to some degree tended to decrease the number of accidents.

A two-year study compared driveway accidents on 5.8 miles of major traffic routes having barrier medians with 33.9 miles without barrier medians (Box 1969). Exhibit 2-4 shows much higher driveway crash rates along the routes lacking the barrier median.

EXHIBIT 2-4 Driveway accident rates related to median control

	Service station	Other commercial, industrial	Residential	Alley	Total drives and alleys
Routes w/barrier median					
Number of driveways	25	30	244	13	312
Annual rate per drive	0.0	0.08	0.01	0.0	0.017
Routes w/o barrier median					
Number of driveways	150	422	325	29	926
Annual rate per drive	0.17	0.28	0.03	0.10	0.165
Ratio of barrier rate: non-barrier rate	--	1:3	1:2	--	1:9

NOTE: In FHWA *Safety Design and Operational Practices for Streets and Highways* TS80-228 (May 1980) Sec. 3.5.5, the term "barrier median" was used in contrast to "painted median."

A study of median width design concluded that at rural unsignalized intersections, a wider median was associated with fewer crashes and fewer undesirable driving behaviors. On the other hand, at both signalized and unsignalized suburban intersections, a wide median was associated with more accidents and more undesirable driving behaviors. The report concluded that suburban medians should not be

wider than necessary. It was also noted that at four observed signalized intersections, the median acceleration lanes seemed to work well (Harwood et al. 1995).

Nontraversable Median Modifications and Safety

One state experienced accident problems at median openings on divided arterials. To address problems caused by openings that were too close, poor taper designs, and inadequate storage lengths, "median revision U-turn concept projects" were initiated. These projects, which were especially applicable to six-lane roadways with medians 15.5 ft. wide or less (i.e., too narrow to shadow a crossing vehicle), reduced the number of conflict points per opening from 16 to 4 by channelizing the median openings. Main road U-turns and left turns into the driveways remained, but left turns from the driveways were eliminated.

Before-and-after safety records were compared on two roadways on which the median openings were modified, along with a control roadway which was not modified. Daily volumes ranged from about 36,000 to 55,000. There was approximately a 1/4 decrease (statistically significant) in the overall accident rates on the modified roadways, with similar reductions in injury crashes. Meanwhile, the crash rate on the unchanged control section had increased slightly (Vargas and Gautam).

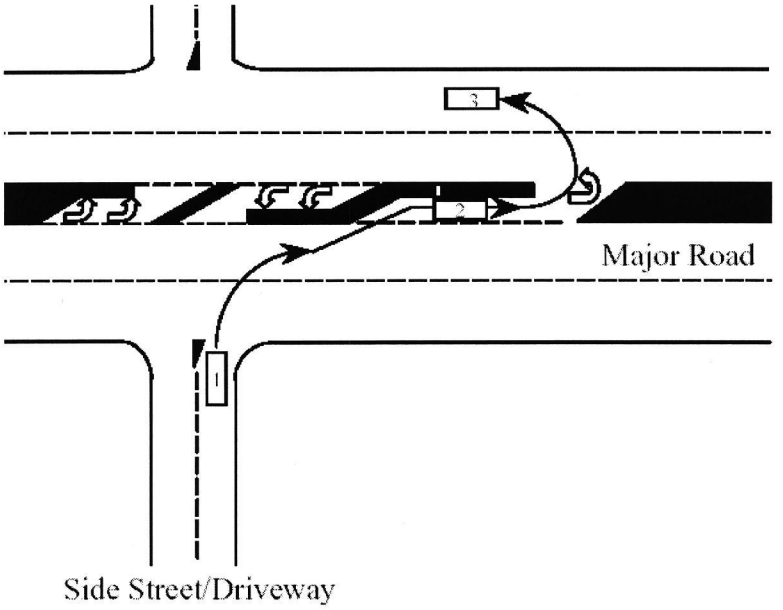
U-turns and Safety

Some have raised questions about the safety of the U-turns necessitated by the presence of non-traversable medians. One study (Lu et al.) compared traffic conflicts, crash data, and delays under two contrasting conditions. One group was comprised of locations where drivers exiting driveways and side streets were able to make the normal direct left-turn maneuver out. The other group consisted of locations where drivers first turned right out of the driveway or side street, and then made a U-turn at a downstream median opening (see Exhibit 2-5).

The researchers reviewed over 258 sites in seven Florida counties, and had more than 100 study sites in each of the two categories. Comparing two regression models from the crash data, they found that when traffic volumes exceeded 36,000 vehicles per day, right turn followed by U-turn locations had fewer crashes than direct left-turn locations (see Exhibit 2-6). It should be noted that the crash data from the right turn followed by U-turn locations was very scattered in the lower volume range, and from a comparison of the plots of the two data sets one could hypothesize that the direct left turns could in fact be less safe than U-turns at even lower volumes. Comparing locations with the two different types of maneuvers, the right turn followed by U-turn locations had lower overall crash rates and by-category crash rates, except for sideswipes. At $\alpha = 0.05$, the differences were statistically significant for the total, injury/fatality, and angle categories.

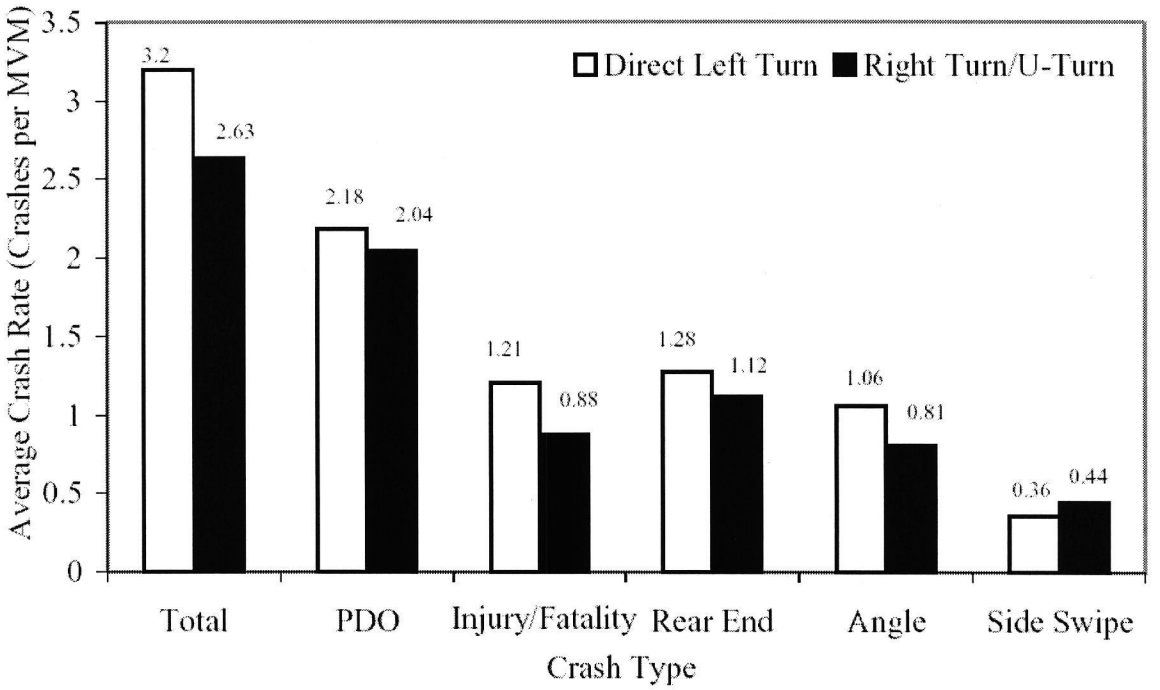
NCHRP Report 524, *Safety of U-Turns at Unsignalized Median Openings*, examined U-turns and crash data from both rural and urban arterial corridors. The study computed crash rates for mid-block median openings where only U-turns were allowed, and crash rates for both directional (some movements prohibited) and conventional (all movements allowed) three- and four-leg intersections.

Only 1.1% of the almost 8,000 median-opening crashes were identified as U-turn crashes. From a review of the data, the researchers inferred that U-turn crashes were being incorrectly coded as left-turn crashes.



from Lu et al., *Safety Evaluation of Right Turns Followed by U-turns as an Alternative to Direct Left Turns - Crash Data Analysis*

EXHIBIT 2-5 Schematic showing right turn followed by U-turn



from Lu et al., *Safety Evaluation of Right Turns Followed by U-turns as an Alternative to Direct Left Turns - Crash Data Analysis*

EXHIBIT 2-6 Average crash rate comparisons between direct left turns and right turns followed by U-turns

At the 103 urban unsignalized median openings studied, an average of 0.41 U-turn plus left-turn crashes per year occurred at a median opening. At the 12 rural locations, this figure was 0.20. At all of these openings combined, 58% of the movements were U-turns. Major road average daily traffic volumes (ADTs) ranged from 13,161 to 42,361.

In the urban corridors, mid-block median openings had substantially lower median opening accident rates than did three- and four-leg intersection median openings. The rural sample size was too small to make firm conclusions. Exhibit 2-7 displays some of the crash rates in the report.

At three- and four-legged urban intersections, two or more directional median openings are needed to serve the same movements as one conventional median opening. For three-leg intersections, the combined directional crash rate was markedly less than the conventional opening rate; for four-leg intersections, the combined directional crash rate was about the same as that for the conventional openings (Potts et al.).

EXHIBIT 2-7 Example median opening crash rates

Median opening type	Crash rate per 10^6 turning vehicles
Midblock	
Directional opening w/ left-turn lanes (2b)	0.23
Directional opening w/ left-turn lanes and loons (2c)	0.37
Three-leg intersection	
Directional opening w/ one left-turn lane (4a)	1.44
Four-leg intersection	
Directional opening w/ left turn-lanes (6a)	2.57

from Potts et al., NCHRP Report 524

Access, Signals, and Safety

A study of Minnesota highway data from the late 1940s, of which about 4/5 was from two-lane highways, found a pattern (see Exhibit 2-8) of lower speeds being accompanied by greater access densities and higher accident rates (Kipp). However, there was no significant difference in accident rates by speed for road sections with no access points and sections having noncommercial access.

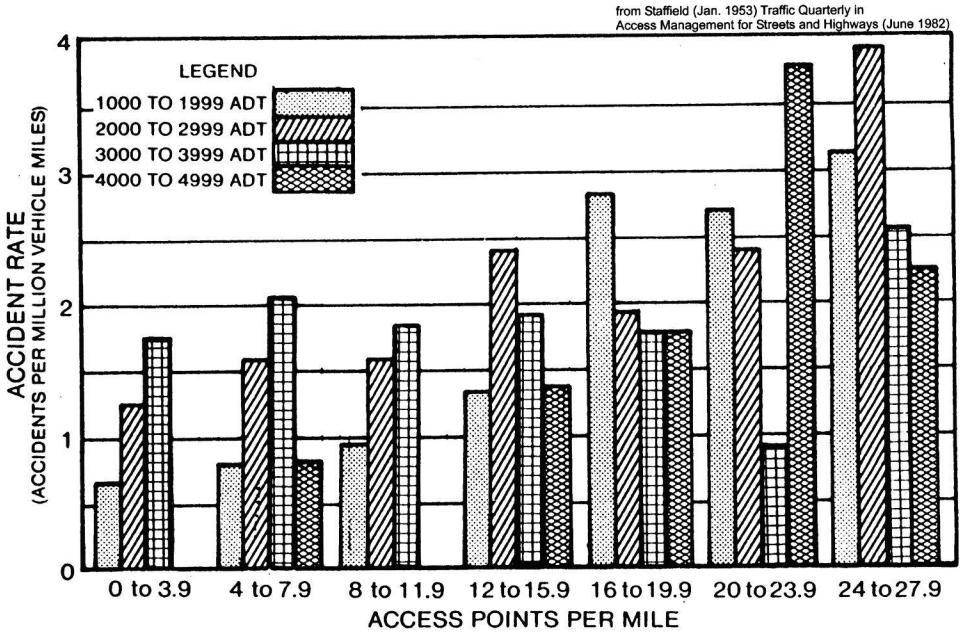
> "This apparent relationship between access points per mile and accident rates casts another element of doubt on the assumption that speed in itself is a major cause of accidents."
>
> Kipp, Highway Research Bulletin 56

EXHIBIT 2-8 Accident rates and access frequency

Speed group (mph)	Access points per mile	Accident rate
30 to 39	27.4	2.5
40 to 49	13.8	1.8
50 to 59	8.8	1.4

A few years later, an Oregon study of urban state highways found that residential driveway density had a low correlation with accident rates. The Oregon urban study included 426 sections, all of which had parallel parking. The study subdivided the data set by "roadside culture" (abutting land use), volume group, and number of lanes (two or four). In all groups except low volume two-lane roadways, increasing commercial driveways per mile was correlated with increasing accident rates, and increasing signal density was correlated with increasing accident rates. The researchers preferred the number of commercial units per mile over the number of commercial driveways per mile as a predictor. Although pavement width was positively related to accident rates, the relationship varied considerably and was normally low (Head).

Flora and Keitt reported a 1953 study by Staffield showing a relationship of generally increasing crash rates as access points per mile and traffic volumes increased (see Exhibit 2-9). Wilson (1967) noted that closing median openings at selected intersections in a corridor resulted in lower numbers of total crashes in the corridor.



from Flora and Keitt, *Access Management for Streets and Highways* (*Traffic Quarterly*, Jan. 1953)

EXHIBIT 2-9 Early study of crash rates by access frequency and a volume range

A North Carolina study included data from 92 homogeneous urban and rural multilane divided highway sections with posted speed limits ranging from 35 to 60 miles per hour (mph). Accident rates increased as access points increased, as volume increased, and as speed limit decreased. The study found that with low volumes, wide medians, and sparse roadside development, median openings were "not necessarily accident prone," but as volumes and development increased, accidents increased as the number of median openings (with or without left-turn storage) increased (Cribbins, Horn, et al.). A related study found that for most accident types, the accident rate tended to increase as the number of median openings (excluding intersections) increased (Cribbins, Arey, and Donaldson 1967).

Mulinazzi and Michael (1967) examined 100 sections of urban arterial in Indiana, and also compared 15 pairs of similar sections; the majority were two-lane sections. They concluded that the crash rate would likely decrease when the number of access points or the number of traffic signals per mile was reduced. Cribbins, Arey, and Donaldson (1967) also found that with the exception of accidents occurring at night on unilluminated sections, an increase in the accident rate was associated with an increase in the frequency of signalized intersections.

A mid-1970s review of other research studies found reports of from about 5% to 15% of all rural and urban crashes were driveway-related (Azzeh et al.).

McGuirk and Satterly (1976) concluded that the driveway crash rate decreased as spacing between driveways or between driveways and street intersections increased. Studying the accidents on 100 urban arterial sections in Indiana cities with populations over 30,000, they found that among driveway crashes, 65% of the accidents and 76% of the injury accidents involved left-in or left-out movements. In a related study focusing exclusively on somewhat congested commercial roadways outside of the central business district (CBD) in cities with population between 35,000 and 100,000, Uckotter (1974) reported that on 14 study sections having 1,638 crashes, 1/3 were driveway accidents, and 32% of these occurred between 3:00 and 6:00 pm. Nine percent of the driveway accidents involved personal injury. Left turns were involved in 63% of all driveway crashes, and 71% of injury crashes. Obscured vision (i.e., parked cars, signs, weather) was a factor in 15% of the crashes. Driveway volumes were estimated from sample counts, and it was noted that the greatest crash problem was not at the high volume driveways (> 800 vpd), which tended to have good geometric design, but rather in the medium category (250 to 800 vpd); the number of crashes increased considerably as driveway volume rose within this range.

One study noted that Box had found that 70% of driveway accidents in Skokie, Illinois, involved left-turning vehicles (Azzeh et al.). The authors speculated that probable underreporting of the following types of crashes make it difficult to fully identify and precisely tabulate all crashes related to access.

1. rear-end collisions upstream of a connection, as a vehicle decelerates to enter the driveway
2. sideswipe collisions upstream of a connection, as a vehicle changes lanes to avoid a vehicle decelerating to enter the driveway
3. rear-end collisions downstream of a connection, involving a driveway vehicle that did not accelerate quickly enough
4. collisions involving two vehicles using closely-spaced connections (driveway and/or street intersections)

A Colorado demonstration project (Colo) found a "marked decrease" in accidents as access management increased. McGee and Hughes (1993) referenced a Wisconsin regional planning

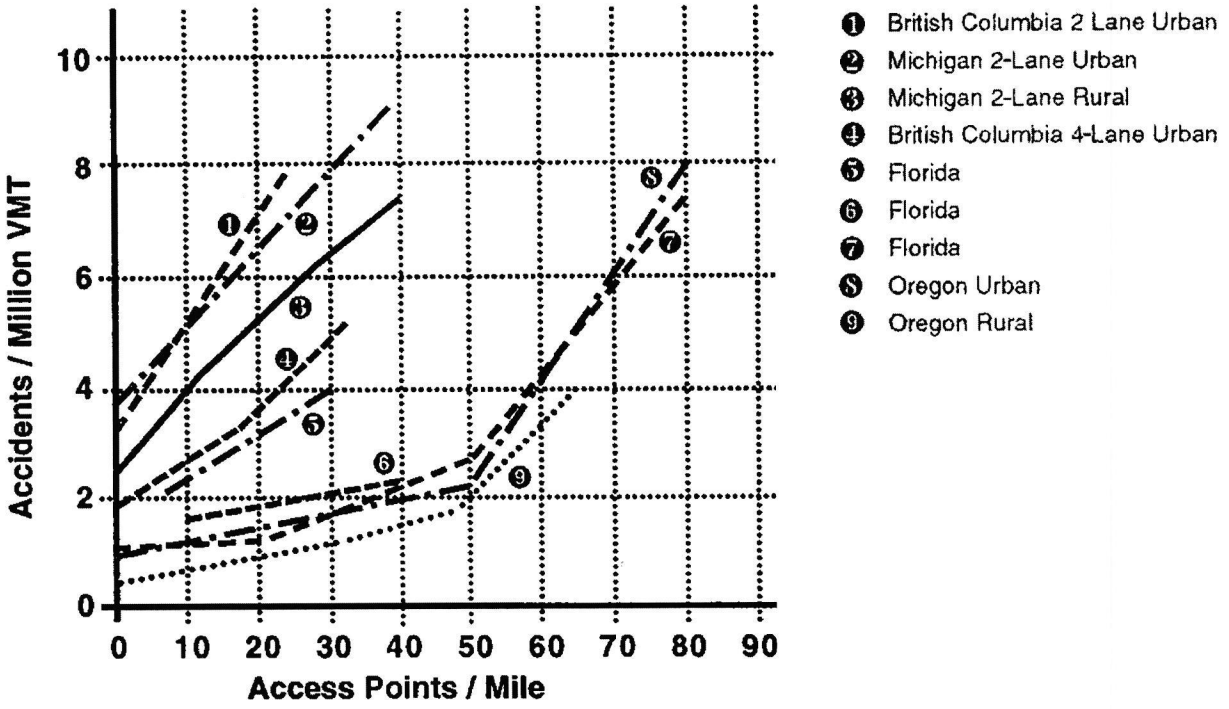
commission study which found that for both county and state trunk highways, crashes per mile dramatically increase when the average spacing between access connections is less than 300 ft.

A 5.1 mile long section of a four-lane divided arterial was studied to compare performance before and after the median was modified in 1997. Before, there were 12 signalized and 65 unsignalized full median openings. The project closed 16 openings and converted 42 full openings to directional openings. After the project was completed, collision rates decreased by 15% and injury rates decreased by 24%. In addition, the number of observed traffic conflicts dropped and travel speeds increased. Subsequent improvements to the traffic signal system, made possible by the median modifications, were expected to produce additional benefits (Wu).

A 1998 Minnesota study sampled 432 rural and urban segments from the state network, and divided them into eleven categories. The study included two-lane, four-lane and six-lane roadways, but excluded freeways. For both urban two-lane and urban four-lane roadways, crash rates increased as either public street or commercial access density increased. However, no effect was found with changes in residential access density. In rural areas, the crash rate increased as access density increased, but a differentiation among access types was not apparent. In addition, benefits-costs analyses were performed to compare the accident reduction benefits against the costs of access management. Even with just a 10% reduction in crashes, over a 20 year period with a 5% discount rate, the benefits justified costs ranging from $100,000 to $500,000 per mile, depending on the category of road (Preston et al.).

Other studies have concluded the following.

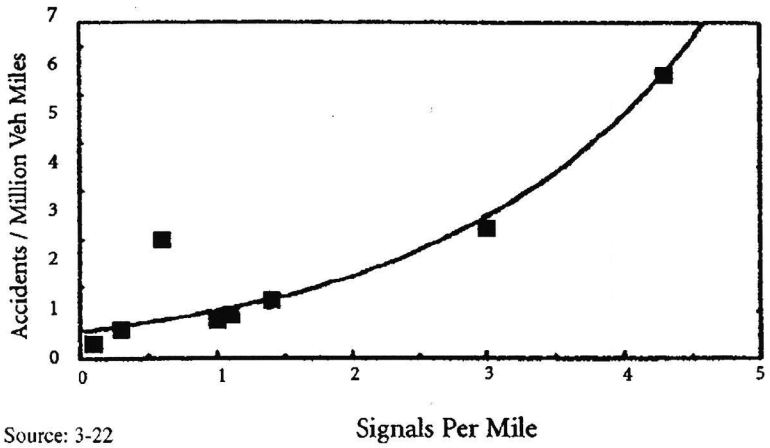
- As the number of access points per mile increases, the crash rate increases (see Exhibit 2-10).



from Gluck et al., NCHRP Report 420

EXHIBIT 2-10 Accidents increase as access density increases

- As the number of traffic signals per mile increases, the crash rate increases (see Exhibit 2-11).



Source: 3-22

from Gluck et al., NCHRP Report 420 (US 41, Lee County, Florida)

EXHIBIT 2-11 Accidents increase as signal density increases

An examination of urban and suburban area crash rates as a function of traffic signal density and access density produced the following tables shown in Exhibits 2-12 and 2-13 (Gluck et al. 1999).

EXHIBIT 2-12 Relationship between traffic signal frequency and crash rate

Signals per Mile	Accidents per Million Vehicle-Miles
≤ 2	2.6 - 3.8
2.01 - 4.00	3.9 - 8.2
4.01 - 6.00	4.8 - 8.7
> 6	6.0 - 9.5

from Gluck et al., NCHRP Report 420

EXHIBIT 2-13 Representative accident rates per million VMT by access density

Unsignalized Access Points Per Mile	Signalized Access Points Per Mile (urban and suburban areas) ≤2	2.01-4	4.01-6.00	>6
≤ 20	2.6	3.9	4.8	6.0
20.01-40	3.0	5.6	6.9	8.1
40.01-60	3.4	6.9	8.2	9.1
> 60	3.8	8.2	8.7	9.5
All	3.1	6.5	7.5	8.9

from Gluck et al., NCHRP Report 420

A recent NCHRP report recommended restricting access to commercial properties near intersections in order to reduce conflicts that lead to crashes. Methods suggested included closing driveways on major streets, moving driveways to cross streets, and restricting turns into and out of driveways (Antonucci et al., Neuman et al.).

Some researchers have presented the relationship between the amount of access and crashes by plotting access frequency and crash rates on the same graph. The following Exhibit 2-14 contains two graphs, each showing a general trend of crash occurrence in a roadway corridor fluctuating to a considerable degree with the access frequency. The data in the lower graph is from a 29 mile segment of US 101 in Oregon, comprised of two-lane, TWLTL, and non-traversable median cross sections. Note that the part with the non-traversable median (labeled "parkway") is an exception to the general trend, in that in this part the crash rate does not increase as access density increases. This study also found that the crash rate increased as the number of access points per mile increased, and the rate of increase for both rural and urban parts increased when access densities exceeded 50 per mile.

Pedestrians and Safety

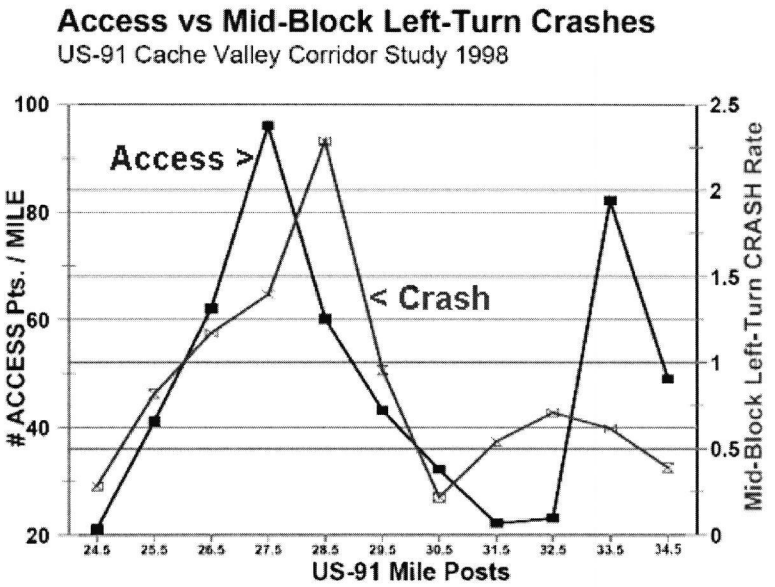
For pedestrians crossing wider streets, medians can provide a welcome place of refuge when the available gaps in the traffic flow allow pedestrians to cross only 1/2 of the street at a time. Exhibit 2-15 shows an elderly pedestrian with a cane crossing a four-lane roadway with a flush median, in a section with extensive commercial strip development along both sides. Although safety advocates have long encouraged pedestrians to cross at intersections (and not in the middle of the block), the very long spacings between intersections found in some suburban areas make this impractical. Compare the exposure of the pedestrian on the TWLTL roadway with what it would have been if the roadway had a grass raised or depressed median.

A recent National Transportation Safety Board (NTSB) report concerning a vehicle accident with multiple pedestrian fatalities stated:

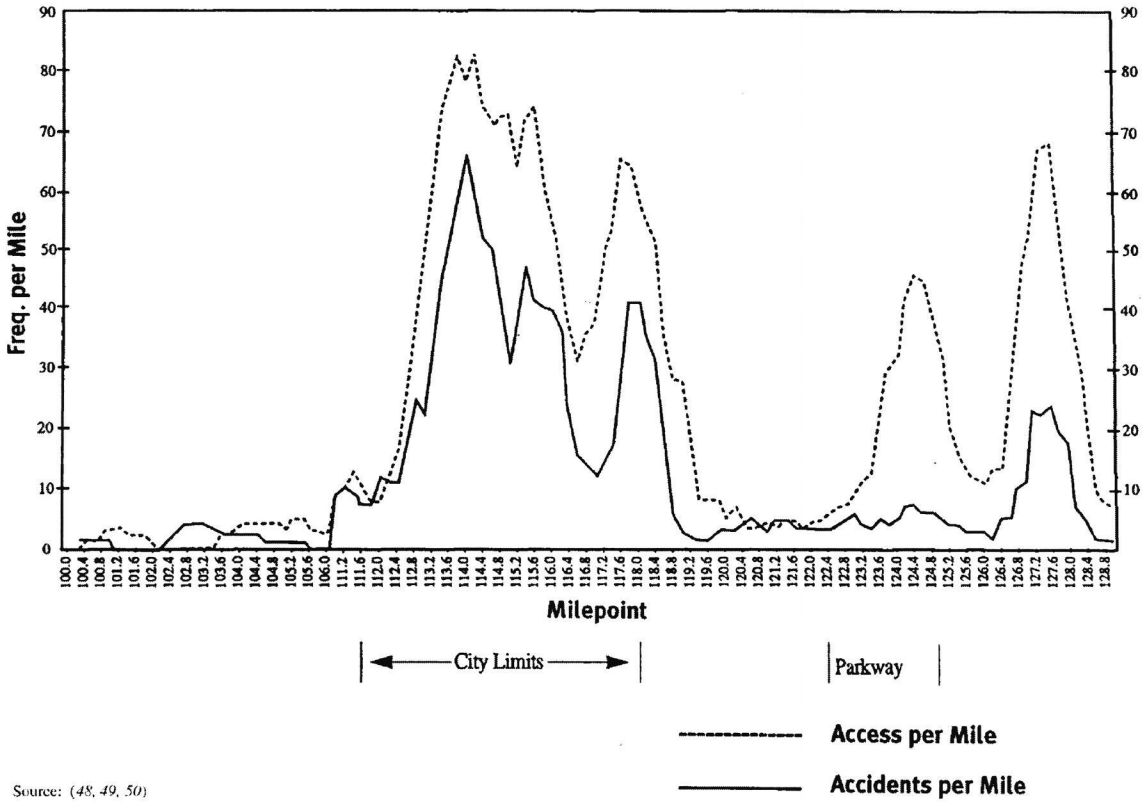
"Segregating pedestrian from vehicular traffic is a key element in pedestrian safety..."

Raised medians on arterial roadways have been promoted as one way to enhance pedestrian safety, by providing pedestrians with a mid-crossing refuge area. Some have asserted that a painted flush median can provide essentially the same benefits (Smith).

A study compared crash rates among undivided, TWLTL, and raised curb median roadways using data from 15 arterial sites in four cities across the country. For all three treatments, the pedestrian accident rate was significantly higher in the central business district (CBD) than in suburban areas. In the CBD areas, undivided arterials had significantly higher crash rates for pedestrians. The pedestrian crash rate for raised curb medians was less than that for TWLTLs (Bowman and Vecellio). Another study concluded that for both marked and unmarked crosswalks on multilane roadways, the presence of a raised median or a raised crossing island was associated with a lower pedestrian crash rate. Only other hand, flush medians and TWLTLs did not provide significant safety benefits (Zegeer et al.).



from Boschert, "Utah Department of Transportation Access Management Study", *Conference Proceedings*, 5th National Access Management Conference. accessmanagement.gov



from Gluck et al., NCHRP Report 420; from Lall, et al. "Access Management and Traffic Safety"

EXHIBIT 2-14 Crashes fluctuating with access frequency

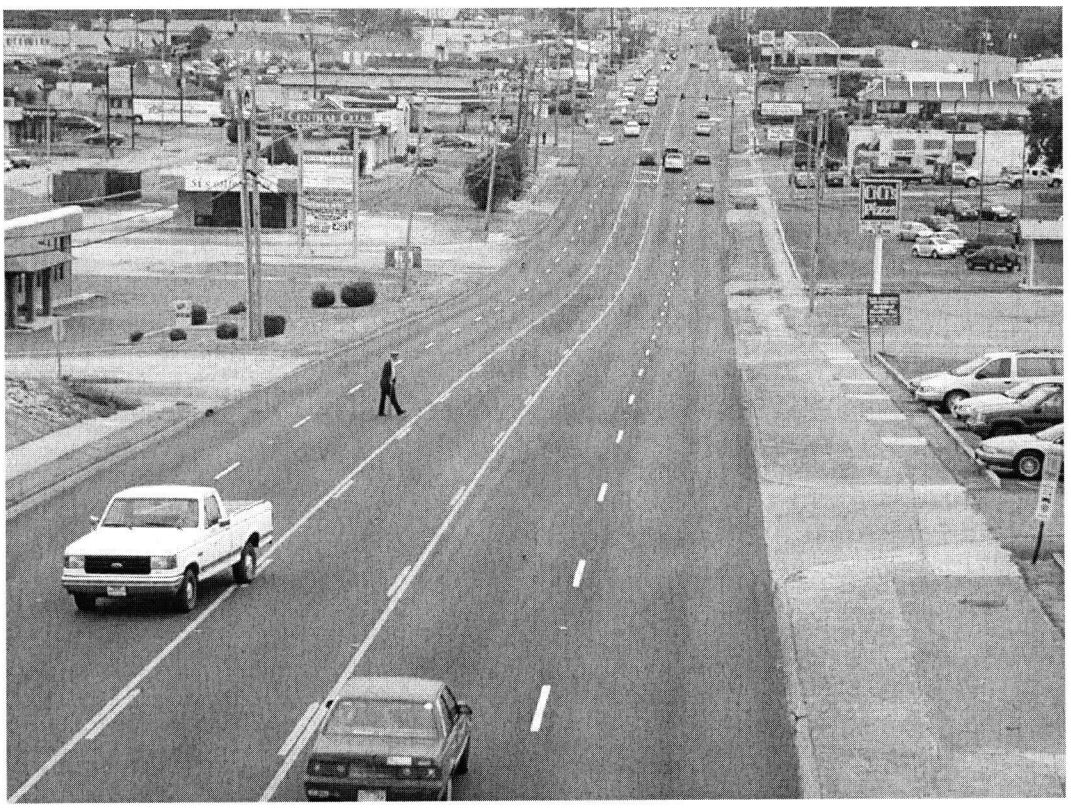


EXHIBIT 2-15 Brake lights go on as elderly pedestrian with a cane crosses a suburban arterial

In response to speculation that providing a median may actually encourage unsafe pedestrian behaviors, a pedestrian advocate wrote the following.

> "One argument often raised in objection to medians is that their presence encourages street crossings at locations other than signalized intersections. It is argued that, by making the mid-block crossings more difficult, pedestrians are more likely to cross the road at a signal, wherein it is supposedly easier and safer. The major flaw in this argument is that it ignores typical pedestrian behavior patterns. It has long been recognized that pedestrians seek the most direct route between points. Although the perception of risk may alter the paths of some pedestrians, observation of pedestrian behavior suggests that most pedestrians will increase their risk to make their route shorter. The solution is not to attempt to discourage this behavior by increasing the risk, but to accommodate observed pedestrian tendencies and to make street crossing more convenient and less dangerous" (Smith).

IMPACTS OF ACCESS MANAGEMENT ON TRAFFIC FLOW

The degree or amount of access management can affect the quality of traffic flow and the level-of-service that a given roadway provides to the traveling public. Compared to roadways lacking access management, access managed roadways have smoother traffic flow and less delay (CAM 2003).

> "For the general benefit of through-traffic movements, the number of crossroads, intersecting roads, or intersecting streets should be minimized."
>
> AASHTO Green Book (2004)

As Exhibit 2-16 shows, access management proponents have stated that a four-lane road with good access management can carry as much traffic as a six-lane road with poor access management (CAM 2003). Depending upon the traffic volume when an area is fully built out, access management can postpone if not eliminate the need to widen some roads, thus saving the taxpayers money.

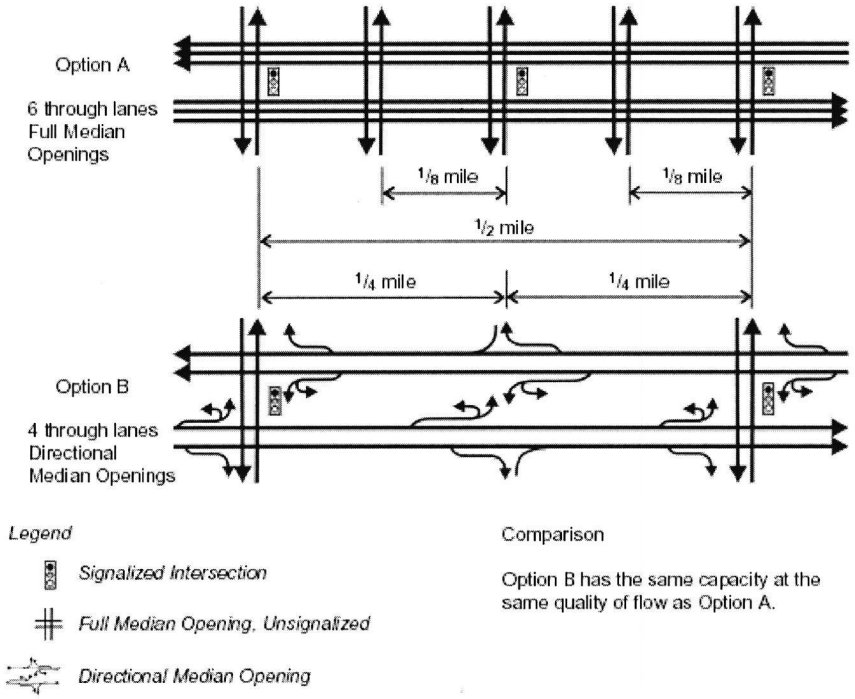


FIGURE 9-2 Four-lane roadway with ½-mi signalized intersection spacing can carry the same volume as six lanes with ¼-mi signal spacing (3, 4).

from CAM, *Access Management Manual*

EXHIBIT 2-16 Access management increases roadway capacity

In a review of literature, Reish and Lalani (1987) noted objections to raised medians from the deputy chief of the Los Angeles Fire Department. "In a normal response to a fire, the apparatus must

thread its way through traffic, shifting from one side of the street to the other. The construction of a built-up center divider forces fire equipment to stop behind traffic at red lights since an apparatus is unable to detour to the other side of the street." [Note that it is possible to design medians so that emergency vehicles can cross them.]

Median Treatments and Traffic Flow

Researchers simulated the effects on traffic flow from installing a two-way-left-turn-lane in a four-lane street. A reduction in both the number of stops and in the amount of delay occurred over a wide range of traffic volumes, left-turn volumes, and driveway densities. The two-way left-turn lane was particularly effective at traffic volumes greater than 700 vehicles per hour in both directions and more than 70 mid-block left turns from each direction per 1000 ft (Ballard).

In another project which simulated traffic flow on a roadway with a two-way left-turn lane, researchers found that the benefits that accrued from having a TWLTL, which removes stopped vehicles in the inside through lane, varied according to both roadway and driveway volumes. Increasing the driveway density produced more negative effects on traffic flow, so when driveways were more frequent, TWLTLs were desirable even at lower volume conditions (Heikal and Nemeth).

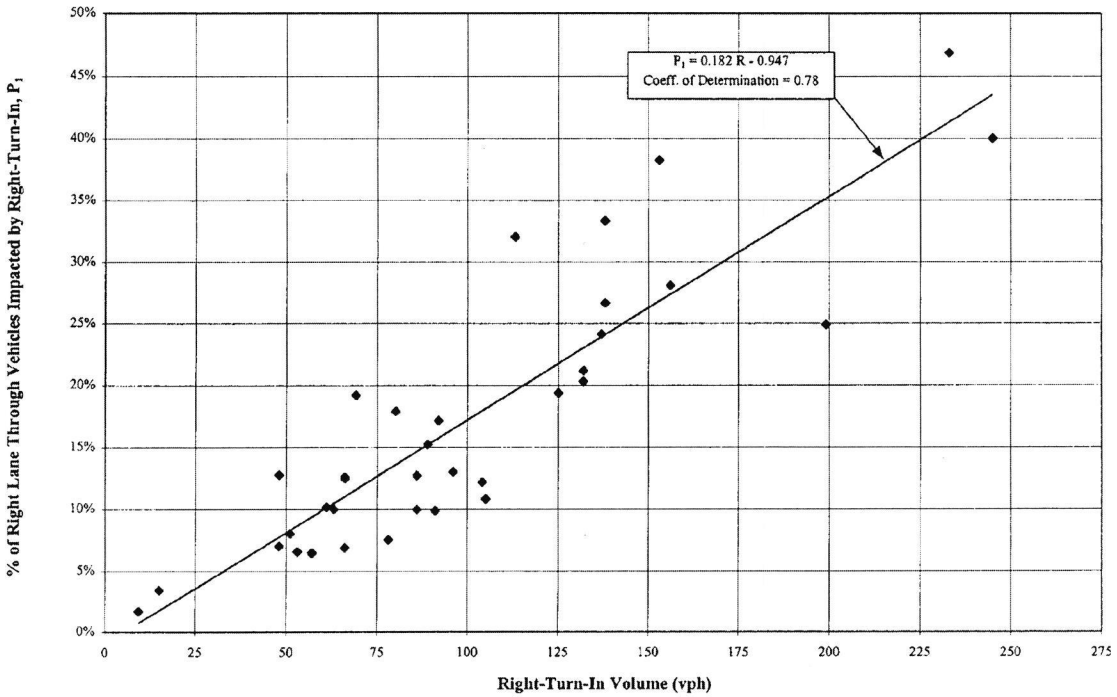
When the regional arterial system was developed in Vancouver, traffic volumes did not warrant the additional width for left-turn lanes. As traffic volumes increased, the intersections became major bottlenecks due in part to the effects of left-turning vehicles. Prohibiting left turns at the major intersections simply encouraged drivers to turn left at nearby streets and cut through residential neighborhoods. A left-turn bay construction program was initiated to address these problems, and the measured benefits included 20% increases in through roadway capacity (Rudberg).

Access and Traffic Flow

Researchers studied traffic at driveways located on the approaches to signalized intersections. They found that vehicles turning right into or out of the driveway caused the departure headways in the right lane of the road at the intersection to increase. This adversely affected the flow rate and the capacity of the signalized intersection (McCoy and Heimann).

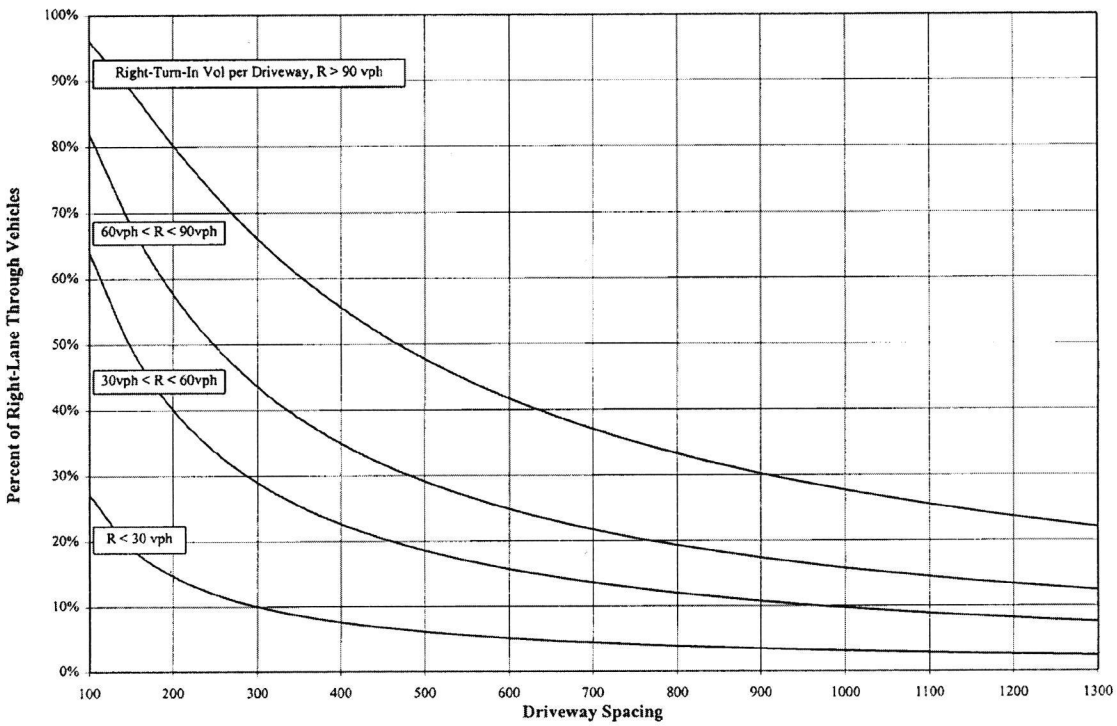
To assess how right turns into a driveway affect other drivers following in the same lane, data collectors at 22 major traffic generators along suburban arterial roadways counted the incidence of brake lights being activated or vehicles taking evasive maneuvers due to right-turning vehicles ahead. Exhibit 2-17 shows the percentage of through vehicles in the right lane affected by right-turn vehicles. These findings were then used to estimate the effects of multiple driveways within a 1/4-mile long section of road. Exhibit 2-18 shows that as the driveway spacing increases, the percentage of vehicles in the right lane adversely affected by right-turning vehicles decreased.

The observers also noted the impact lengths, or the distances in advance of the driveway at which the impact occurred. The analysts estimated influence distances for single and for multiple driveways. The influence distance is the sum of the perception-reaction distance, vehicle length, and impact length. The condition of "spillback" is said to occur when a right lane through vehicle is influenced at or beyond an upstream driveway -- thus a driver in the right lane is having to monitor more than one driveway at a time. Exhibit 2-19 from NCHRP Report 420 shows, for 35 mph and for given driveway spacings and



from Gluck et al., NCHRP Report 420

EXHIBIT 2-17 Percentage of through vehicles in right lane affected by right-turn vehicles



from Gluck et al., NCHRP Report 420

EXHIBIT 2-18 Percentage of right-lane through vehicles impacted at least once per 1/4 mile

right-turn-in volumes, the percentage of right lane through vehicles influenced at or beyond driveways of a given spacing. The percentages increase as speeds increase. This table suggests that even for 35 mph, driveway spacings of at least 250 to 400 ft (depending on right-turn-in volume) are needed to minimize (i.e., less than 10% of the time) spillback (Gluck et al. 1999).

EXHIBIT 2-19 Percentage of right-lane through vehicles influenced at or beyond another driveway (35 mph)

Driveway Spacing (ft)	No. of Driveways per 1/4 Mi., n	Right-Turn-In Volume per Driveway, R (vph)							
		R < 30		30 < R < 60		60 < R < 90		R > 90	
		Single Driveway, P_2	Multiple Driveways, At Least Once per 1/4 Mi., $1-(1-P_2)^n$	Single Driveway, P_2	Multiple Driveways, At Least Once per 1/4 Mi., $1-(1-P_2)^n$	Single Driveway, P_2	Multiple Driveways, At Least Once per 1/4 Mi., $1-(1-P_2)^n$	Single Driveway, P_2	Multiple Driveways, At Least Once per 1/4 Mi., $1-(1-P_2)^n$
100	13.2	2.4%	27.3%	7.5%	64.2%	12.2%	82.1%	21.8%	96.1%
125	10.6	2.4%	22.5%	7.5%	56.0%	12.2%	74.7%	21.8%	92.5%
150	8.8	2.4%	19.1%	7.5%	49.5%	12.2%	68.2%	21.8%	88.5%
175	7.5	2.4%	16.4%	7.4%	44.0%	12.1%	62.1%	21.6%	84.0%
200	6.6	2.2%	13.9%	7.1%	38.3%	11.5%	55.4%	20.6%	78.1%
225	5.9	2.0%	11.2%	6.3%	31.8%	10.3%	47.2%	18.4%	69.7%
250	5.3	1.5%	7.7%	4.8%	22.7%	7.8%	34.7%	13.8%	54.5%
275	4.8	1.1%	5.3%	3.5%	15.9%	5.8%	24.8%	10.3%	40.7%
300	4.4	0.8%	3.6%	2.6%	11.1%	4.3%	17.6%	7.7%	29.6%
325	4.1	0.6%	2.6%	2.0%	8.0%	3.3%	12.8%	5.9%	22.0%
350	3.8	0.5%	1.8%	1.5%	5.6%	2.5%	9.0%	4.4%	15.6%
375	3.5	0.3%	1.2%	1.1%	3.7%	1.7%	6.0%	3.1%	10.5%
400	3.3	0.2%	0.7%	0.7%	2.3%	1.1%	3.7%	2.0%	6.6%
425	3.1	0.1%	0.5%	0.5%	1.4%	0.8%	2.4%	1.4%	4.2%
450	2.9	0.1%	0.3%	0.3%	0.9%	0.5%	1.5%	0.9%	2.6%
475	2.8	0.1%	0.2%	0.2%	0.5%	0.3%	0.8%	0.5%	1.4%
500	2.6	0.0%	0.1%	0.1%	0.2%	0.1%	0.4%	0.3%	0.7%
525	2.5	0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.1%	0.3%

from Gluck et al., NCHRP Report 420

In a study conducted in four urban areas across the United States, drivers (as they were driving) made comments to researchers seated in the vehicle about the factors along the street that affected their perception of the quality of the trip they were making. Although the research subjects did not use the term "access management," the concerns (i.e., things that adversely affected traffic flow or safety) drivers expressed included too many traffic signals, and too many driveways, especially near intersections (Pecheux et al.).

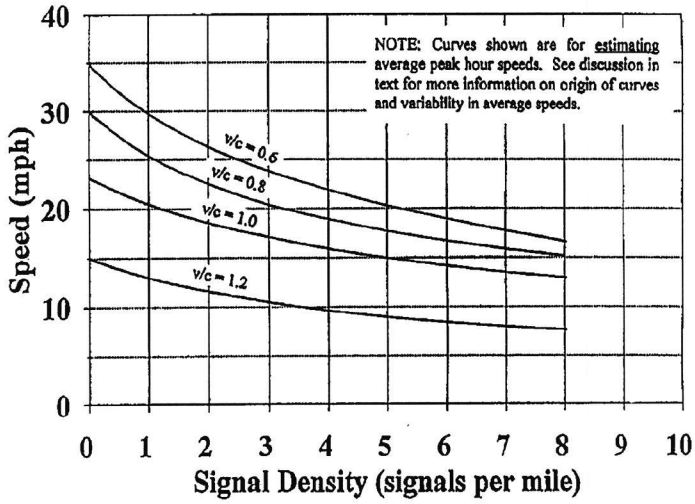
Signals, Signal Spacing, and Traffic Flow

An early Colorado study found that delay along a signalized roadway with access management was about half of that of an unrestricted segment (Colo). A roadway with signals spaced at 0.25 mi had about twice a much delay as one with 0.5 mile spacing of traffic signals. Travel time on a road with 4 signals per mile was about 1/6 greater than on a road with 2 signals per mile (CAM 2003). A longer signal

spacing allows for greater flexibility in setting a range of signal cycle lengths to match range of traffic flow conditions (i.e., both peak and off-peak volumes and speeds), thus reducing delay, fuel consumption, and pollution (CAM 2003).

Exhibit 2-20 illustrates that for Class I (40 to 45 mph) arterials, a lower signal density helps move vehicles along. Conversely, as signal density goes up, speed goes down (Gluck et al. 1999).

While collecting information for this report, I was driving on an access-managed city street in another state. Because of the smooth traffic flow, I had to change speed only once and did not have any stops until I turned onto an intersecting cross street. On the map, the length of this uninterrupted trip scaled as over 3 miles.



from Gluck et al., NCHRP Report 420

EXHIBIT 2-20 Effect of signal density on speed

COMPARING THREE MEDIAN TYPES

When faced with the need to expand to a multilane roadway, designers most often choose from among three median types: none (undivided), flush median (TWLTL), or nontraversable median (raised or depressed). Designers must then estimate which alternative will be the safest with the least delay to traffic. As the previous discussion demonstrated, designers of higher-volume, higher-speed roadways have for decades recognized the importance of providing a space for left-turning vehicles outside of the through lanes. The newspaper article presented in Exhibit 2-21 shows can happen when left turns are made from the through lane. A number of comparisons among undivided, TWLTL, and nontraversable median cross sections have been made over the years.

Frick preferred a raised median over a TWLTL (1968). He compared two two-lane state routes that were widened to four lanes in Springfield, Illinois. Both roadways were lined with commercial properties, had a mix of 30 mph and 40 mph posted speed limits, daily volumes of 14,500 and 16,500,

Farmington woman dies in three-car accident

BY KATE WARD
Northwest Arkansas Times

A Farmington woman died Tuesday after she was involved in a three-car accident on U.S. 62 near Little Springs Road at approximately 1:45 p.m.

According to the Arkansas State Police report, Josephine M[redacted], 76, was traveling eastbound in a red 1991 Chevrolet on U.S. 62 on a section of the road that runs north and south. She slowed down to turn left onto Little Elm Road.

Betty Rose Bolin, 74, of Stilwell, Okla. was following M[redacted] in a white 2000 Dodge, but failed to stop and rear ended her. The collision pushed M[redacted]'s vehicle into the southbound lane in front of oncoming traffic. A third vehicle, a brown 2001 Chevrolet, was traveling southbound on U.S. 62 when M[redacted]'s vehicle crossed its path. This collision resulted in a passenger-side impact. M[redacted]'s vehicle and the third vehicle came to rest in a west ditch. M[redacted] died as a result of the accident. Bolin was transported to the Northwest Medical Center. Both M[redacted] and Bolin were wearing their seat belts at the time of the accident.

Northwest Arkansas Times, p. A3, June 2, 2005.
Used by permission.

EXHIBIT 2-21 Crash illustrates the need for left-turn lanes

and lengths of 1.5 and 1.9 miles. The roadway improved to a five-lane (TWLTL) cross-section had a crash rate over two and a half times greater than that of the roadway on which the raised median had been constructed. The TWLTL roadway had 214 driveways, compared to 85 on the roadway with the median. However, based on experience in Peoria, a former proponent of urban roadway raised medians listed a number of objections to them (VanWinkle), and noted that the crash rate decreased on a roadway converted from a raised median to a TWLTL. He stated that raised medians are a fixed obstacle, which when struck will cause vehicles to go out of control. The relatively narrow raised medians often used in city street environments do not prevent head-on accidents, and to circumvent the indirection caused by a raised median, drivers may make wrong-way movements or jump the curb. He felt that the real key to improving safety was managing access (i.e., driveway location).

Two separate studies compared and contrasted the crash experiences and travel times on three predominantly commercial arterial segments that were in the same city but had different cross-section types. The study in Muskogee, Oklahoma, a city of about 40,000, compared two segments that joined at the ends and a third nearby segment on the same highway route. All three segments were straight and had a raised median, but had dissimilar median opening and driveway frequencies (see Exhibit 2-22). The crash rate on Segment C, with the highest level of access management, was 40% less than the crash

rate of Segment A, which had the least access management. There were similar differences in both the estimated property damage amounts and the injury accident rates. Segment B, had a crash rate that was somewhat less than that of Segment A. When adjusted to compensate for different lengths, Segment C required slightly more travel time then did Segment B., but Segment A was considerably slower then either B or C. It should be noted that traffic on Segment C was held up at a signalized intersection which should have had a dual left-turn lanes to improve the signal timing (Gattis 1996).

EXHIBIT 2-22 Description of the three Muskogee segments

Segment	Description	Length	Daily Volume	Volume on Signalized Cross Streets
A	Frequent intersections and left-turn lanes, very frequent driveways on right; access density = 61.4/km	1.45 km (0.90 mi)	22,000	3,900 13,700 6,000
B	Few median crossings; almost continuous frontage roads on both sides, small separation between frontage roads and the main lanes; access density = 7.8/km	1.53 km (0.95 mi)	23,500	1,600 16,000
C	Very few median or margin access points; a small amount of frontage road access density = 3.6/km	1.93 km (1.20 mi)	26,600	20,600

Note: volumes in vehicles per day (vpd); frontage road volumes not included

The other study examined three roadway segments from Springfield, Missouri (see Exhibit 2-23). Glenstone-north, with a TWLTL cross section and lenient driveway spacing, has little access management. It is lined with what by today's standards are relatively small- to medium-sized commercial tracts, with a scattering of highway-oriented business harkening to its past. Glenstone-south has a depressed median and a high degree of access management. Battlefield, which has raised medians within 60 m (200 ft) of signalized intersections, is otherwise a TWLTL design abutted by tracts occupied by newer-style developments which produced a driveway frequency of roughly half that of Glenstone-north. The greater depth of lots along Battlefield means that there is a greater total land area funneling traffic to Battlefield, which potentially translates into a greater number of trips generated per length of street frontage, which in turn means more turning movements into and out of parcels abutting Battlefield than parcels along Glenstone-north. The street with the highest level of access management (a non-traversable median and a much greater access spacing) was found to have a crash rate that was 20% and 40% less than that of the other two roadway sections with a center turn lane. The lower mid-block crash rate for the roadway with more access management accounted for much of the difference. A comparison

EXHIBIT 2-23 Description of the three Springfield segments

Segment	Description	Length	Daily Volume (rounded)	Volume on Signalized Cross Streets
Glenstone-north	Little access management; continuous center left-turn lane; frequent street and driveway intersections; abutted by many smaller commercial tracts; access density = 46.3/km	2.44 km (1.51 mi)	38,300	70,200
Glenstone - south	High level of access management; depressed center median, few median crossings; very few intersections; some continuous frontage roads; abutted by large commercial tracts; access density = 2.7/km	2.58 km (1.61 mi)	31,500	66,100
Battlefield	Some but not much access management; continuous center left-turn lane with raised median at intersections; fewer intersections and driveways; abutted by a mixture of large and smaller commercial tracts; access density = 27.1/km	2.51 km (1.57 mi)	28,900	97,900

Note: volumes in vehicles per day (vpd)

of the two center turn lane roadways found that the difference in driveway spacing did not produce a lower crash rate. The safer access-managed roadway also had an average travel speed of 33 mph, over 50% higher than that of the other two roadways, which translates into less delay (Gattis and Hutchison).

Harwood (1986) compared the safety, operational, and cost characteristics of selected multilane design alternatives for suburban highways. He combined the findings from the literature with data analyses to describe the advantages and disadvantages various design alternatives. He reviewed the following elements: median width and type, shoulder presence, access to roadside development, right-of-way requirements, capacity, operational characteristics, and accident experience. For the purposes of the study, the following criteria defined a suburban arterial highway.

- Traffic volume over 7,000 vpd.
- Speeds between 56.3 and 80 km/h (35 and 50 mph).
- Spacing of at least 0.4 km (0.25 mi) between signalized intersections.
- Direct driveway access from abutting properties.

- No curb parking.
- Location in or near a populated area.

Harwood concluded that the four-lane undivided (4U) design alternative is the most effective for residential and light commercial areas on suburban highways classified as collectors and minor arterials. The four-lane divided (4D) and five lane with center two-way left-turn lane (5T) design alternatives, if physically feasible, would be more desirable than the 4U design alternative on highways that have dense commercial development, have heavy left-turn volumes, or are classified as, or could become, major arterials. The 4U design alternative may also be appropriate as the first stage toward construction of a wider roadway with a median treatment.

The 4D design alternative is best suited for use on major arterials with high volumes of through traffic and less than 45 driveways per mile. The 4D design alternative is operationally preferable to the 4U design alternative only for sites with peak hour flow rates over approximately 1,000 vph in one direction, although this alternative could be used at lower flow rates where offsetting benefits, such as improved safety, land use control, or preservation of through traffic capacity, are expected. The 4D design alternative is not well suited to highways with strip commercial development and may be used to discourage such development from occurring. However, the 4D design alternative is better suited than the 5T design alternative to serve suburban highways with isolated major traffic generators having widely spaced, high volume driveways.

The 5T design alternative is most appropriate for suburban highways with commercial development, driveway densities greater than 45 driveways per mile, low-to-moderate volumes of through traffic, high left-turn volumes, and/or high rates of rear-end and angle accidents associated with left-turn maneuvers. The installation of 5T design alternative on an undivided facility is expected to reduce the accident rate by 19 to 35%, on the average, with even greater reductions possible for highly congested facilities.

Before-and-after crash rates on two TWLTL roadways posted for 45 mph converted from five-lane (with 11 and 12 ft. wide lanes) to seven-lane cross sections (with 9 and 10 ft. wide lanes) were compared. On the roadway with 30,400 vpd, where the density of development was lower and speeds were higher, the total accident rate increased by 57%. On the roadway with 48,500 vpd, where the density of development was higher and speeds were lower; the total accident rate increased by 6% (Harwood 1990).

The Highway Safety Research Center compared crash rates on four-lane undivided and divided (non-freeway) roadways in California. For ADTs ranging from 5,000 to 20,000, the crash rates on the undivided roadways averaged about twice that of the divided roadways. For over 20,000 ADT, there were no undivided roadway data presented (Council and Stewart).

The authors of NCHRP Report 420 stratified access densities and then compared urban and suburban crash rates for the three cross section types. Over a range of access densities, Exhibit 2-24 shows that non-traversable medians are associated with the lowest crash rates, followed by TWLTLs and undivided (Gluck et al. 1999).

A study of 111 rural and suburban multilane roadway segments with a speed limit of 40 mph or more and volumes ranging from 1,888 to 25,667 vpd observed a correlation between cross-section types and land use and surroundings. Findings from safety studies may be skewed if these correlations are not taken into account. The comparison in Exhibit 2-25 was structured to present crash rates in a visually scaled manner.

EXHIBIT 2-24 Representative crash rates (accidents per million VMT) by type of median

Total access points per mile (1)	Median Type (urban and suburban areas) Undivided	Two-way left turn lane	Non-traversable median
≤20	3.8	3.4	2.9
20.01-40	7.3	5.9	5.1
40.01-60	9.4	7.9	6.8
>60	10.6	9.2	8.2
All	9.0	6.9	5.6

(1) Includes both signalized and unsignalized access points.

from Gluck et al., NCHRP Report 420

	RURAL AND SUBURBAN CRASH RATE (per MVM) 0	1.0	2.0	3.0	4.0
ACCESS DENSITY (access/mile)					
< 20	Dep	None	Nar		
Sample size	17	6	7		
Crash rates	0.71	1.33	1.35		
20-40	Nar	TWLTL	None		
Sample size	10	17	9		
Crash rates	0.75	1.23	2.13		
> 40			TWLTL	None	
Sample size			22	10	
Crash rates			2.33	3.58	

NOTE: Median type Dep = Depressed Nar = Narrow None = No Median
Rais = Raised or Curbed TWLTL = Two-Way Left-turn Lane

EXHIBIT 2-25 Ordered effects of median type and access

For the "20-40" access density group, the comparison was skewed because in this group, 9 of the 10 "narrow" (i.e., flush median less than 8 ft wide) roadways had an ADT between 3,000 and 10,000, while all but 3 of the 17 TWLTL roadways had ADTs above this range. When confined to this same volume range, the crash rates were as follows.

TWLTL = 0.57 crashes/MVM Narrow = 0.64 crashes/MVM

When confined to the same range of volumes, the three TWLTL roadways had a lower crash rate than did the narrow median roadways (Gattis et al. 2005).

Volume Thresholds

Some reports either imply or recommend threshold traffic volumes for determining when a non-traversable median is preferable to a TWLTL.

- A Des Moines study stated that two-way left-turn lanes should not be used on facilities with over 25,000 vehicles per day (Reish and Lalani).
- Exhibit 2-26 presents the findings from Bonneson and McCoy (1997), who took a number of crash prediction models developed by different researchers and compared the different outcomes. A composite finding suggests that as daily traffic volumes exceed about 15,000, a raised median is safer than a two-way left-turn lane median. Both are safer than no median (i.e., an undivided roadway) for volumes at least as low as 10,000 ADT.

EXHIBIT 2-26 Expected annual crashes per mile by median treatment

ADT:	20,000			30,000			40,000		
Median type:	None	TWLTL	Raised	None	TWLTL	Raised	None	TWLTL	Raised
Source									
Bowman	126	85	50	190	128	75	253	170	101
Chatterjee	na	90	81	na	125	116	na	oor	oor
Harwood	72	54	72	109	81	108	145	108	144
McCoy	oor	52	na	oor	oor	na	oor	oor	na
Parker	na	43	32	na	58	45	na	73	59
Squires	na	31	56	na	69	75	na	108	94
Walton	na	58	na	na	78	na	na	98	na
Average number	99	59	58	149	90	84	199	112	100
Std. Deviation	27	8	9	41	13	12	54	16	18

NOTES: na = model not available or developed for this treatment type
oor = traffic volume exceeds the data range used to calibrate the model

from Bonneson and McCoy, NCHRP Report 395

- In Transportation Research Record 1581, Bonneson and McCoy presented a graph which showed raised-curb sections having fewer crashes in business and office areas than either undivided or TWLTL sections for volumes as low as 10,000 vpd.
- Gluck et al. found that over a range of access densities, and even for volumes as low as 10,000 vpd, the nontraversable median was preferable (1999). The undivided roadway had the worst performance of the three alternatives compared (see Exhibit 2-27).

EXHIBIT 2-27 Estimated total accidents per mile per year on the basis of an average of seven accident prediction models

	Accidents Per Mile Per Year		
ADT	Undivided Highway	Two-Way Left-Turn Lane	Non-traversable Median
10,000	48	39	32
20,000	126	60	55
30,000	190	92	78
40,000	253	112	85

from Gluck et al., NCHRP Report 420

- A Texas study recommended a raised median when daily volume was 24,000 or more (O'Shea et al.)
- Missouri's 2003 access management guidelines recommend a raised median instead of a TWLTL in urban areas when the current and projected volume exceeds 28,000 vpd (MoDOT).
- An Ohio manual mentions the use of TWLTL for volumes up to 20,000 (ODOT).
- The Texas design manual states "Where ADT exceeds 20,000 vehicles per day or where development is occurring, and volumes are increasing and are anticipated to reach this level, and the demand for mid-block turns is high, a raised median design should be considered" (TxDOT).
- A Washington policy for class II (arterial) roadways allows a non-restrictive median or a two way left-turn lane when special conditions exist and mainline volumes are below 20,000 (WSDOT).

Synthesis of Studies

Exhibit 2-28 displays the findings from over four decades of research that considered urban and/or rural multilane non-freeway roadways. These studies explored the safety of various median types as well other variables.

The arrows in the table show the relationship between the variable in the column and the crash rate. For instance, in the column "Volume and Crash rate", an arrow pointing straight up indicates the study found that as the volume went up, the crash rate also went up. Downward arrows show that an inverse relationship was reported; for instance, a downward arrow indicates that as the volume went up, the crash rate in the study went down. The numbers in the columns on the right side indicate the relative safety reported for different median treatments, with a "1" indicating most safe and a "5" indicating least safe.

The findings from these papers is summarized as follows.

1. as the volume increased, the crash rate usually increased
2. as the speed increased, the crash rate usually decreased
3. the relationships between an increase in lane width and changes in crash rates were mixed
4. as the outside shoulder width increased, in all of the comparisons the crash rate decreased
5. as the traffic signal density increased, in all of the comparisons the crash rate increased
6. as the access density increased, in most of the comparisons the crash rate increased

Comparing multilane roadway cross section types, the categories labeled divided, depressed, non-traversable, and raised were the safest. The undivided cross-section came out worst, with the TWLTL cross-section slightly better than the undivided.

When analyzing data, finding a relationship between a dependent variable and an independent variable does not automatically mean that a causal relationship exists.

For instance, the findings in many studies that the crash rates were higher on roadways with lower speed limits does not necessarily imply that lower speed limits *cause* more crashes. Additional information about the data that were analyzed and additional study would be required to identify other potential causal factors that were present, and to assess the relative impact of the various factors.

EXHIBIT 2-28 Summary of studies

NOTE:
↑ = positive relationship, OR generally positive but with exceptions; example, as x increases, then crash rate increases
↓ = inverse relationship, OR generally inverse but with exceptions; example, as x increases, then crash rate decreases

for All Crashes
1 = lowest crash rate
5 = highest crash rate
if ranked in middle, then = 3
2 or 4 indicates a "tie".

Author	Source	Year	Volume and Crash rate	Speed and Crash rate	Lane width and Crash rate	Shoulder width (outside) and Crash rate	Signals present and Crash rate	Signal Density and Crash rate	Access Density and Crash rate	Undivided - none	TWLTL	Non-traversable	Raised	Depressed	Divided
Telford and Israel	HRB Proc., Vol. 32	1953													
563 mi. of four-lane and four-lane divided highways in California (1947,1948)															
Excluding all sections with speed zones or roadside development and intersections.															
ADT															
5,000 - 9,999										5		1			
10,000 - 14,999										1		5			
15,000 - 25,000										5		1			
Semiurban areas: heavy or medium roadside development and restricted speed zones															
ADT															
5,000 - 9,999										1		5			
20,000 - 29,999										5		1			
Head	HRB Bull. 208	1959													
426 sections w/ parallel parking in Oregon															
for 4-lane highways:															
	ADT under 9000		↑	↓	↓			↑	↑						
	ADT 9000-17999		↑	↓	↑			↑	↑						
	ADT 18000 or over		↑	↓	↑			↑	↑						
NOTE: used "Effective Lane Width"															
Billion and Parsons	HRB Bull. 308	1962													
82 mi. of urban hwy. w/ median on Long Island			↑												
Cribbins, Horn, et al.	HRR 188	1967													
92 sites in NC; developed crash prediction equations															
multilane divided w/o access control			↑	↓				↑	↑						
Kihlberg and Tharp	NCHRP 47	1968													
Rural, many types; for 4 lane, NOT fully-control access			↑												
for volumes above ~ 10,000 ADT															
Frick	*Traffic Engineering*	1968													
Compare 2 suburban roadways in IL									↑	5			1		
Uckotter	JHRP-74-9	1974													
14 urban sections outside of CBD, pop. > 35,000			↑						↑						
only commercial roadways; Indiana															
Walton et al.	TRR 737	1979													
2 Texas cities															
TWLTL			↑					↑	↑						

NOTE:
↑ = positive relationship, OR generally positive but with exceptions; example, as x increases, then crash rate increases
↓ = inverse relationship, OR generally inverse but with exceptions; example, as x increases, then crash rate decreases

for All Crashes
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Author	Source	Year	Volume and Crash rate	Speed and Crash rate	Lane width and Crash rate	Shoulder width (outside) and Crash rate	Signals present and Crash rate	Signal Density and Crash rate	Access Density and Crash rate	Undivided - none	TWLTL	Non-traversable	Raised	Depressed	Divided
Heimbach et al.	TRR 923	1983													
57 undivided 4-ln urban sections in NC, 6 yrs.			↑		↓				↑						
Parker	VDOT	1983													
50 urban and suburban 4-lane roadways in VA															
Speed limit < 45 mph															
Raised median			↑					↑	↓						
Traversable median			↑					↑	↑						
Undivided			↑					↑							
NOTE: for Undivided, had mixed findings for "street" and "drive" density															
McCoy and Ballard	NE-DOR-R87-1	1986													
Urban 4 lane in Nebraska										5	1				
Urban 4 lane roadway with TWLTL median			↑												
Urban 4 lane undivided roadway			↑						↓						
Van Winkle	*ITE Journal*	1988													
1 street (Knoxville) in Peoria; no statistical or any other data											1		5		
Squires et al.	TRR 1239	1989													
82 urban 4- or 6-ln sections in Georgia								↑			5		1		
Harwood	NCHRP 330	1990													
Urban 4 lane Arterial, ≤ 45 mph, curbed										5	1				
Long et al.	U Fla	1993													
Sample from Fla. state hwy. system.															
400 miles of urban roadway sample									↑						
Mid-Block															
Urban Arterial	4 lane									5	3		1		
	6 lane										5		1		
Rural Arterial	4 lane									1	3		5		
All crashes															
Urban Arterial	4 lane									5	3		1		
	6 lane										5		1		
Rural Arterial	4 lane									1	5		3		
Bowman and Vecellio	TRR 1445	1994													
Atlanta, Phoenix, Los Angeles, Pasadena															
15 Arterial sites; total of 145.9 miles															
Central Business District															
Vehicular accidents										5	1		3		
Pedestrain accidents										5	3		1		
Suburban															
Vehicular accidents										3	5		1		

NOTE:
↑ = positive relationship, OR generally positive but with exceptions; example, as x increases, then crash rate increases
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Author	Source	Year	Volume and Crash rate	Speed and Crash rate	Lane width and Crash rate	Shoulder width (outside) and Crash rate	Signals present and Crash rate	Signal Density and Crash rate	Access Density and Crash rate	Undivided - none	TWLTL	Non-traversable	Raised	Depressed	Divided
Bretherton	*ITE Journal*	1994													
Compare 2 Atlanta segments, before TWLTL w/ after raised median											5		1		
Castronovo et al.	Mich. St. U.	1995													
all 5-lane, 7-lane, and boulevard hwys. in Mich., both rural and urban															
Boulevard section			↓	↓				↑							
Center left turn lane section			↓					↑							
Blvd. section, medians width ≤ 30 ft..								↑							
Blvd. section, medians width 30 to 60 ft			↓	↓	↑			↑	↑						
Blvd. section, medians width > 60 ft			↓		↑			↑							
Hadi	TRR 1500	1995													
Total Crash											5		1		
4-Lane Rural Divided						↓			↓						
4-Lane Urban Undivided				↓	↓	↓			↑						
4-Lane Urban Divided			↑			↓			↑						
6-Lane Urban Divided			↑						↑						
Injury Crash															
4-Lane Rural Divided			↑	↓					↑						
4-Lane Urban Undivided			↑	↓	↓				↑						
4-Lane Urban Divided			↑			↓			↑						
6-Lane Urban Divided			↑	↓					↑						
Fatal Crash															
4-Lane Rural Divided			↑												
4-Lane Urban Undivided			↑												
4-Lane Urban Divided			↑												
6-Lane Urban Divided			↑						↑						
Marigiotta and Chatterjee	*Jour of Tran Eng*	1995													
11 median cf. 11 TWLTL; 4 lane															
Suburban commercial, ADT up to 32,500															
Total			↑	↓				↑	↑		5	1			
Midblock (Non-intersection)			↑	↓					↑		5	1			
Non-signalized Intersections			↑						↑						
Midblock Non-signalized Intersection			↑					↑	↑		5	1			
Garber	2nd AM Conf	1996													
On Urban principal arterials in Va.			↑	↑					↑						
Gattis	2nd AM Conf	1996													
compare 3 multilane commercial segments in Muskogee, OK									↑						

NOTE:
↑ = positive relationship, OR generally positive but with exceptions; example, as x increases, then crash rate increases
↓ = inverse relationship, OR generally inverse but with exceptions; example, as x increases, then crash rate decreases

for All Crashes
1 = lowest crash rate
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if ranked in middle, then = 3
2 or 4 indicates a "tie".

Author			Source	Year	Volume and Crash rate	Speed and Crash rate	Lane width and Crash rate	Shoulder width (outside) and Crash rate	Signals present and Crash rate	Signal Density and Crash rate	Access Density and Crash rate	Undivided - none	TWLTL	Non-traversable	Raised	Depressed	Divided
Bonneson and McCoy			TRR 1581	1997													
	Phoenix and Omaha				↑						↑						
	189 segments in urban and suburban arterial																
	Considered land use type;omit intersection, snow, DUI																
	Without parallel parking																
		ADT < 20000										3	3				
		ADT > 20000										4	4		1		
	Landuse																
		Business or Office	ADT > 10,000									4	4		1		
			Raised		↑						↑						
			TWLTL		↑						↑						
			Undivided		↑						↑						
		Residential										3	5		1		
		Industrial											5		1		
		Residential or Industrial															
			ADT > 25,000									5	3		1		
			ADT 15,000 - 25,000									3	5		1		
			Raised		↑												
			TWLTL		↑												
			Undivided		↑												
	Thru Lanes																
		4										5	3		1		
		6	(note: similar rates)										3		3		
Wang et al.			FHWA-RD-98-071	1998													
	Rural multilane non-freeway in Minn.							↓			↑				5	1	
Brown and Tarko			TRR 1665	1999													
	Urban Arterial streets in Indiana				↑			↓	↑		↑						
Council and Stewart			TRR 1665	1999													
	Homogeneous sections, min length = 0.1 mi											5					1
	California																
		4 lane undivided			↑												
		4 lane divided			↑												
	Minnesota																
		4 lane divided			↑			↓									
	North Carolina																
		4 lane divided			↑			↓									
	Washington																
		4 lane divided			↑												

NOTE:	for All Crashes
↑ = positive relationship, OR generally positive but with exceptions; example, as x increases, then crash rate increases	1 = lowest crash rate
	5 = highest crash rate
↓ = inverse relationship, OR generally inverse but with exceptions; example, as x increases, then crash rate decreases	if ranked in middle, then = 3
	2 or 4 indicates a "tie".

Author	Source	Year	Volume and Crash rate	Speed and Crash rate	Lane width and Crash rate	Shoulder width (outside) and Crash rate	Signals present and Crash rate	Signal Density and Crash rate	Access Density and Crash rate	Undivided - none	TWLTL	Non-traversable	Raised	Depressed	Divided
Mouskos et al.	TRR 1665	1999													
Midblock; 4 routes, divided into 200 sections															
4 lane with shoulder			↓						↑						
4 lane without shoulder			↓	↑					↑						
4 lane with median			↓						↑						
4 lane without median			↓	↑					↑						
Papayannoulis et al.	TRB E-C019	1999													
5 states; 264 Urban segments, 122 Rural															
Urban and Suburban								↑	↑						
Rural									↑						
Signalized and unsignalized															
Urban, Suburban, Rural															
with Access density < 20; 20-40; 40-60; >60										5	3	1			
Note: lack data for Urb+Sub TWLTL, <20 per mile															
Signalized only															
Urban and Suburban										5	3	1			
with Signal density 2.01-4;4.01-6;>6															
Exception: Urb.+ Sub. w/ Sig. density <2										3	5	1			
Gattis and Hutchison	4th AM Conf	2000													
Compare 3 multilane commercial segments in Springfield, MO											5			1	
Parsonson et al.	4th AM Conf	2000													
All divided highways in Georgia											5	1			
Preston	4th AM Conf	2000													
432 segments and 766 miles of roadway in Minnesota															
2, 4, 6 lane; omit freeways				↓					↑						
4-Lane Rural Conventional									↑						
4-Lane Rural Expressway									↑						
4-Lane Urban Conventional/No Left Turn Lane				↓					↑						
4-Lane Urban Conventional/With Left Turn Lane				↓					↑						
4-Lane Urban Expressway				↓					↑						
Total points =										107	125	20	42	2	1
Count N =										27	33	12	24	2	1
Average =										4.0	3.8	1.7	1.8	1.0	1.0

NOTE: Please contact the authors if you find errors, so corrections can be made.

IMPACTS OF ACCESS MANAGEMENT ON ABUTTING PROPERTY

One of the main concerns expressed about access management is the projected economic impact upon businesses along the roadway. It is not uncommon for business owners to react negatively when they hear about an upcoming access management project on their street, fearing that access restrictions will cause a decline in business. These owners may be failing to recognize that the access management project will also increase the capacity of the street, reducing congestion. As the street handles more traffic, more motorists are exposed to their business. Access management advocates also point out that what really matters is not the number of driveways but the design of access and circulation systems that can safely accommodate the volume and not create congestion at the entrance.

How Much Access Is Needed?

At a community and at a regional shopping center where planned roadway modifications would inhibit access, over 4000 shoppers were interviewed to ascertain what percentage entered the center on impulse while passing by. Impulse traffic accounted for 6% of those surveyed at the community shopping center and 3% at the regional center. The author noted that unless extreme circuity of travel resulted from changes, loss of impulse traffic would be more than offset by the increased pass-by traffic resulting from decreased congestion and increased roadway capacity (Box 1994).

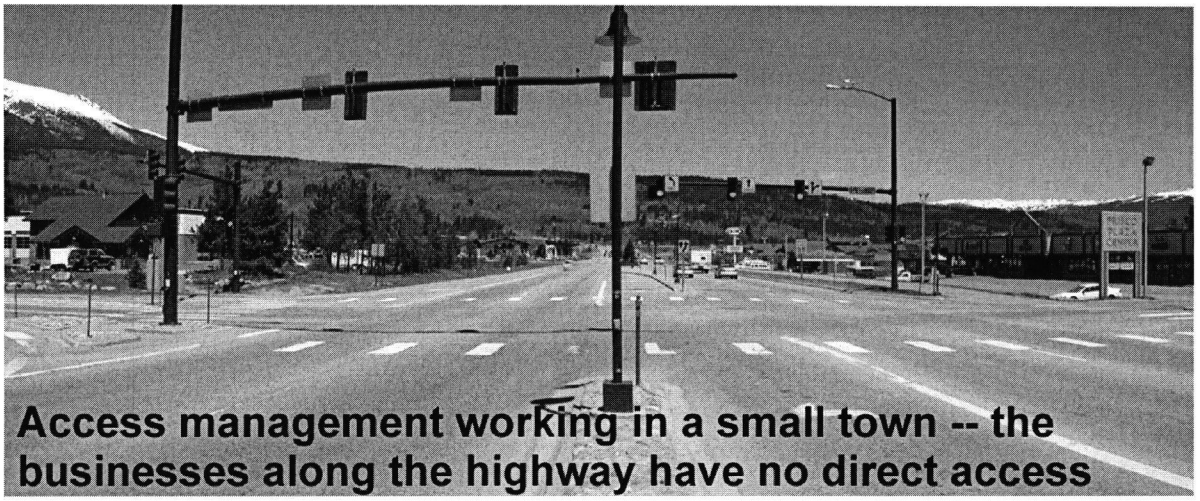
The fear that implementing access management (especially reducing the amount of access) will adversely impact abutting businesses gives rise to one of the chief sources of opposition to access management. This raises two questions:

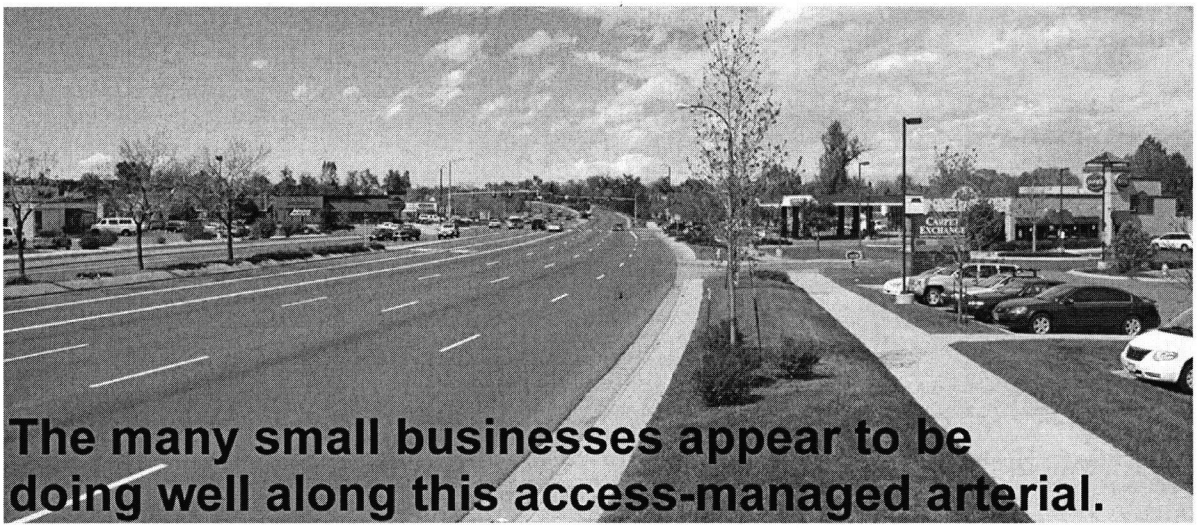
1. how much access does a site need; and
2. how much access is a transportation agency obligated to provide?

There are many extant and observable examples of properties that remain economically active, and no party is liable for damages, even though some policy or design on the part of either the government or a private party has increased the separation between a business building and the source of traffic. Examples range from creating a bypass around a traditional downtown to an office park, which by design locates buildings so that they cannot be reached directly from the abutting major roadway.

This can be also be seen with the Cracker Barrel® restaurants, which became common in many parts of the country in the 1990s as a result of corporate expansion. Many of these stores are not located on the main arterial, but instead on side streets visible from the main arterial. These stores appear to be thriving without direct access to arterial streets. What these businesses do need is a combination of signs and a road layout that allow drivers to figure out how to get from the arterial street to the business site.

Exhibit 2-29 shows a number of different scenarios where businesses along the access-managed roadway appear to be doing well. The bottom photo shows an access-managed through road in the background. The businesses in the area do not have driveways to the through road, but rather get access via the short side street in the foreground.





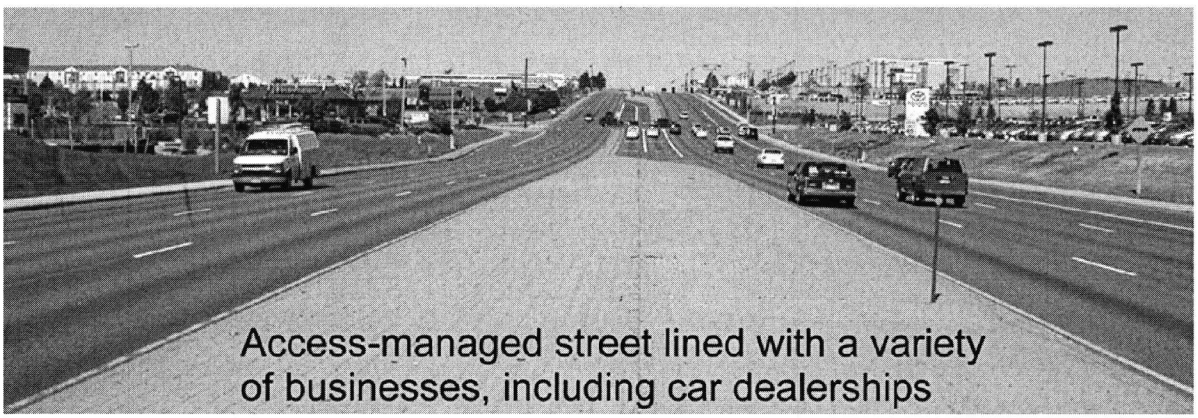


EXHIBIT 2-29 Businesses thriving without direct access to the arterial roadway

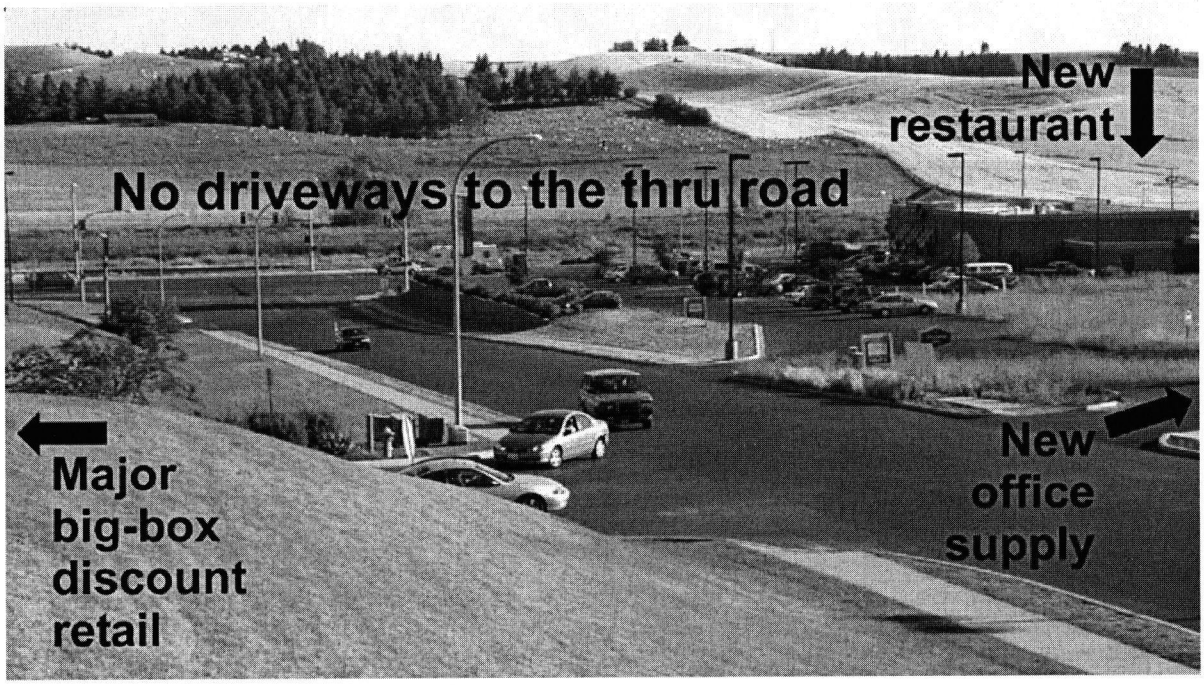


EXHIBIT 2-29 continued Businesses can succeed in an access-managed environment

Case Studies About Impacts On Abutting Property

It is difficult to adequately assess the economic impacts of access management because reliable business income data can be difficult or impossible to acquire. In NCHRP Report 420, a national research effort, the authors concluded that "destination-type businesses such as certain restaurants and specialty stores appear to be less sensitive to access changes then businesses that rely primarily on pass-by traffic, such as gasoline stations or convenience stores." A Colorado study concluded that "older-style small businesses on small lots suffer the most" from increased access control. The study went on to observe that some of the businesses in the study were losing their competitive edge to new stores in the area. In general, access management was well-received by local residents, because through traffic on neighborhood streets decreased (Colo).

There are a few published case studies of the economic effects of access management upon abutting properties. These studies, presenting objective numerical data, offer some insight into the economic effects of access management.

Arkansas

In one of Metroplan's pioneer access-managed corridors in the central Arkansas area, the owner of a large tract found that access management led to more development and profits. Instead of developing only the strip abutting the highway, the developer created commercial sites in the interior of the tract that were a better fit with the access and street patterns. Exhibit 2-30 shows a view of part of the interior that was commercially developed.

EXHIBIT 2-30 Access management allowed more land area to be developed

Colorado

In an access management study corridor, no decrease in property value was reported over a six-year period. In one area, land value quadrupled. It should be noted that traffic volume in the corridor jumped, and was continuing to grow (Colo).

Florida

After closing several median openings on a Florida roadway, the majority of merchants along the boulevard reported no adverse effect on truck deliveries, no change in business activity, and that they favored the median changes. Among those traveling along the corridor, 80% favored the project (CAM 2003).

Along Oakland Park Boulevard in Fort Lauderdale, the old full median openings spaced at 330 ft. intervals were closed or redesigned to become directional openings spaced at 660 ft. A survey after the project was completed found that 62% of the businesses reported no change, and 27% reported a loss (Stover 1998).

A consultant for the state examined five roadway corridors where the existing median had been made more restrictive over a five year period. Corridor lengths ranged from 1.25 to 2.08 mi. The gross square footage (gsf) of buildings with frontage on the street ranged from 877,800 to 4,385,215. The gsf in the corridors ranged from 29% to 84% commercial. Exhibit 2-31 lists an analysis of changes in the assessed property values in the five corridors.

EXHIBIT 2-31 Changes in assessed values from 1991 to 1994

Corridor	% change in corridor	% change in county
SR 600	+ 33%	not available
SR 436	+ 3%	+ 10%
SR 423W	- 16%	+ 4%
SR 520	- 3%	- 30%
SR 423E	0%	+ 4%

In two of the five corridors (SR 436 and SR 423W), assessed property values along the access-managed corridors suffered in comparison to those of the county as a whole, in one (SR 423E) there was little difference, and in one (SR 520) and perhaps in two (also SR 600) situations the values along access-managed corridors fared better than those of the overall county. The businesses tended to be offices, banks, sit-down restaurants, and miscellaneous retail establishments, with 86% at the same location for two years or more. About 2/3 of business owners said that the changes had not adversely affected truck delivery. At 57% of the establishments, business was reported as having stayed the same or increased within the past two years. These percentages varied among corridors; in the SR 520 corridor, where the greatest decrease in business was reported, tolls on a parallel route had been eliminated and traffic volumes on SR 520 had decreased by 15%. Asked how the median changes had affected their

businesses, 69% reported either minor or no impacts. Drivers in the corridors were also surveyed to assess their views of the changed medians. In the surveys, the plurality of respondents gave "business" as their trip purpose, and 73% of the respondents had either an origin or destination adjacent to the roadway. Over 3/4 of those drivers surveyed thought that the roadway was safer and the traffic flow had improved after the median was changed, and 82% were in favor of the median restrictions (Ivey et al.; Dickens).

Iowa

Along corridors where access management had been implemented, about 80% of businesses reported no decline in sales and no customer complaints after project completion. Surveyed motorists had favorable opinions 90 to 100% of the time (CAM 2003).

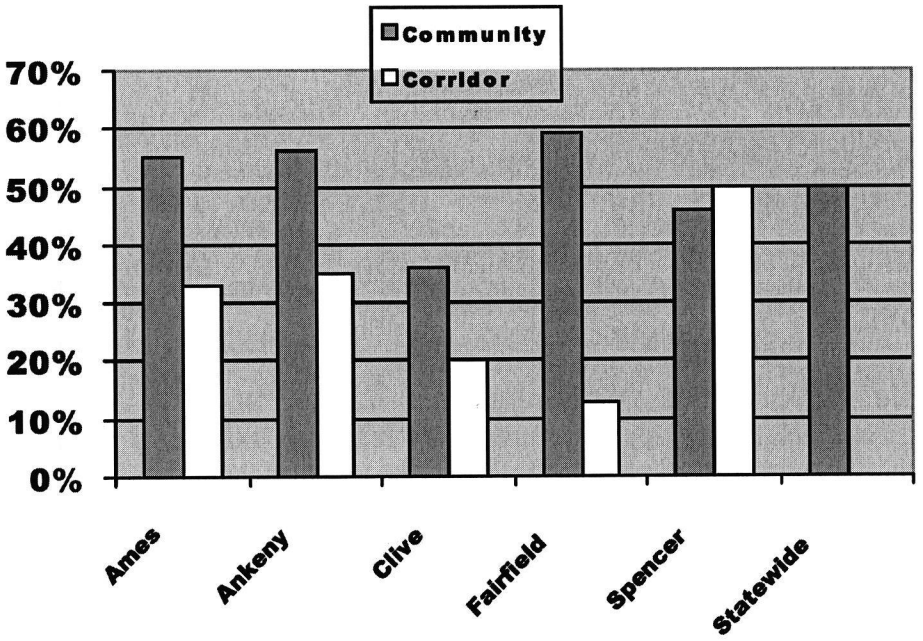
Another Iowa study examined a number of measures in communities where access management had been implemented on community corridors (Plazak et al.). Data sources included:

1 community-level business market share "pull factors" and business survival rates, developed from original source data made available by the Iowa Department of Revenue and Finance (IDRF);
2. detailed "before and after" business profiles along access management project corridors;
3. detailed retail sales trends for selected businesses along access management project corridors; and
4. extensive personal interviews of business owners, managers, and customers in each of the case study corridors.

In all but one case studied, the five-year business loss rate for the access-managed corridors was substantially lower than that for their overall communities (see Exhibit 2-32). Retail sales grew at an average annual rate of 7.3% in the access-managed corridors, compared to only 3.3% in the overall community. Once projects were completed, sales growth in the study corridors exceeded that of the overall community by 10 to 20%. Over 85% of the business owners and managers reported their after-project sales were either the same (53%) or greater than (33%) their before-project sales; only 5% of businesses reported a sales decline after completion of the project (see Exhibit 2-33). Customers (who are usually also motorists) overwhelmingly (between 90 to 100%) supported the corridor improvements and the access management. The business persons' perception about access management projects was often worse than the reality. The findings indicated that business customers were almost always more supportive of the projects than the owners and managers of the businesses they patronized.

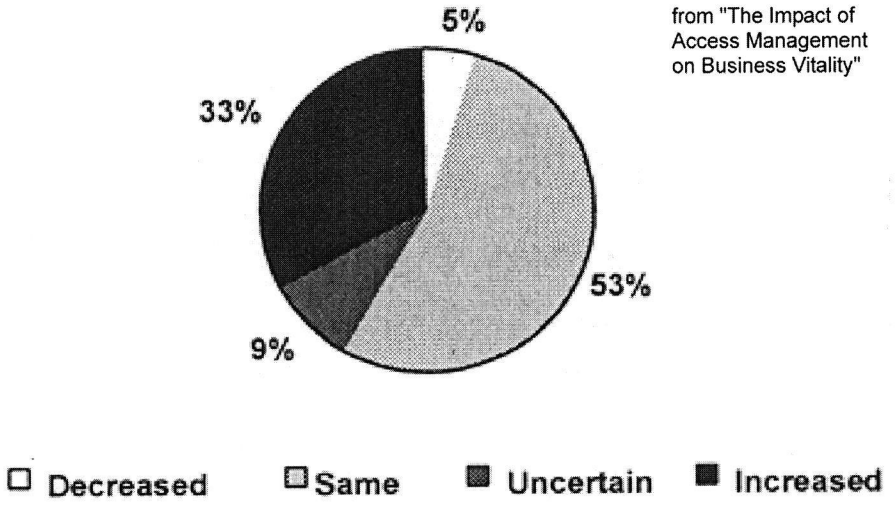
Kansas

Recounting the history of the K-150 corridor in Overland Park offers interesting insight. A development moratorium was lifted after the corridor study was released. Those proposing developments reluctantly accepted access restrictions: in retrospect, it has been speculated that the early developers were more interested in obtaining rezoning approvals and then reselling the land than in actually developing the property. After a period of land development proposals that never came to fruition, serious development finally began. This group of developers wanted exceptions to the access restrictions spelled out in the K-150 study. A major challenge was mounted by a developer proposing rezoning for a shopping center anchored by a supermarket. The developer employed different approaches to obtain additional access, such as claiming that the proposed shopping center was a unique case. The developer



from Plazak et al., "The Impact of Access Management on Business Vitality"

EXHIBIT 2-32 Iowa study five-year business loss rates in community and in access-managed corridor



from "The Impact of Access Management on Business Vitality"

from Plazak et al., "The Impact of Access Management on Business Vitality"

EXHIBIT 2-33 Iowa study effects on business sales after implementing access management

also convinced nearby residents that they would endure additional traffic if his access request was not met, thus enlisting the residents to voice support at hearings. When a developer proposing another shopping center within two miles of the first learned of the request for additional access, he submitted a letter to the City Council making it clear that he expected equal consideration.

City staff thought that the Council might approve the developer's request, and argued against the proposed deviation from the K-150 access guidelines. The staff responded with an extensive written report containing a review of the history, an analysis of the anticipated traffic patterns, and a response to the applicant's assertions about traffic impacts on nearby residents of not approving the driveway. The most effective tool was an audio-visual presentation at the public hearing. The Council eventually voted to support the staff's position, and sent a strong message to developers that the City would support the access management policy. In spite of threatening to develop elsewhere if the extra access was denied, and a second request for extra access, the developer eventually constructed the project. However, a subsequent development in the corridor requested and received an unplanned median break, asserting that high volumes would result at other points if the median opening were not granted (Stuechelli).

In 1999, the Kansas Department of Transportation (KDOT) studied 15 businesses that in the past had filed access-related inverse condemnation lawsuits against KDOT. An examination of the actual impacts after some passage of time found that two gasoline stations, now located where drivers had to go about two miles out of their way, had gone out of business. In all but one of the other cases, either the claimant was still in possession of the property and operating the business, the property was being used for the same use by a different operator, or the property use had been upgraded (Williams Jan. 2000).

Texas

A research project evaluated the effects on business from reconstruction that added a median to the road. Examining data from three Texas cities, the study found that there was a negative economic impact during the construction period, but after construction ended the total business volume began to recover, and within a year exceeded the preconstruction levels in two of the three corridors. In the two smaller cities, there was an increase in right-turn customer traffic after the median was built; however, in San Antonio there was a reduction in right-turn traffic. Comparing the sales at locations with and without median openings, there was a distinct advantage for "traffic-serving" businesses (service stations, motels, restaurants) located at median openings, but not for businesses in general. It should be noted that in each of the three areas there was a rapid influx of new businesses after the median project was finished. Some of the older businesses may have lost customers to the new businesses (Flora).

In a study conducted after left-turn restrictions were imposed on a roadway, most business types reported increases in the number of customers per day and in gross sales; the exceptions were gasoline stations and automobile repair shops. In several of the corridors, the number of employees increased. With a few exceptions, property values remained the same or increased. Negative impacts seemed more severe during construction than after the project was completed (CAM 2003; Eisele and Frawley).

Washington

A Washington study surveyed perceptions from businesses along six corridors in King County. A slight majority (52%) felt that access management negatively affected both patronage and business

revenue. Two-way left-turn lanes (TWLTL) were more accepted by businesses than were other access treatments.

Nearly 2/3 of respondents thought that pedestrian and bus issues were "not a concern" to them. The authors surmised this might be because pedestrian and transit users were not viewed as potential sources of customers (Vu).

Comments About Effects on Property

Proponents assert that access management does not stop growth, but rather reshapes growth. For instance, strip development can cut off access from back lots and make them less viable. Access management tends to cause more property depth to be developed than would be with the typical strip development approach. This results in actually more acres being developed.

> "A common sticking point in the implementation of access management projects, particularly those that involve dramatic changes such as installing raised medians, is strong skepticism and fear on the part of adjacent business owners and managers. This fear can easily turn into political opposition that can lead to counterproductive changes in projects or abandonment of attempts to manage access. This sort of problem has been encountered often in Iowa as access management has become a more common strategy for safety and congestion management..."
>
> Plazak et al., "The Impact of Access Management on Business Vitality"

Access management may positively or negatively affect businesses along the roadway and their customers, and it may affect the value of land in the immediate area. Although applying access management to a particular route may not adversely affect the overall or general economic viability of businesses or abutting land, it may affect some types of businesses or some tracts along that route.

Access management may enhance the economic viability of some land uses, such as shopping centers that thrive by attracting customers from a large area, because improved traffic flow will allow customers from farther away to reach the destination in an acceptable amount of travel time. In general, destination businesses are not adversely affected when access management is implemented.

There may be some negative impact on some convenience or pass-by businesses, where many competitors offer a similar product at a similar price. Businesses that are more "convenience based" and less "destination based", such as gasoline stations or fast food restaurants, may be adversely affected if implementing access management makes them more difficult to get to than other nearby competing sites (Gluck et al. 1999).

Retail trade is an extremely volatile endeavor. An access management study in Iowa found that half of all businesses that required a sales tax permit turned over during a five-year period (Plazak et al.). Local business persons can be alarmed by access management projects, particularly those that involve major changes such as installing raised medians or closing large numbers of driveways and median openings. They often view them as one more thing that could adversely affect their sales or put them out of business.

OTHER EFFECTS OF ACCESS MANAGEMENT

Although effects on safety, traffic flow, and business first come to mind, access management also can produce other benefits and help achieve other community objectives. The following sections present some of the other effects associated with access management.

Aesthetics

With the combination of nontraversable (raised or depressed) medians and fewer driveway openings, access management can create more space for landscaping and a more favorable appearance. An NHI (National Highway Institute) manual states that aesthetics were a major consideration in the following conversions.

- converting continuous left-turn lanes on Wadsworth Boulevard into a raised landscaped median in Lakewood, Colorado
- converting a two-way left-turn lane to a raised landscaped median in Seatac, Washington
- replacing a two-way left-turn lane on Texas Avenue with a raised landscaped median during widening in College Station, Texas

Community Goals

If the through roadways (arterials) are able to accommodate traffic well, then the incentive for drivers to cut through neighborhoods is reduced. By reducing the number of driveways, the number of places at which vehicles can conflict with sidewalks, bike lanes, and bike paths is reduced. This should improve the quality of travel for pedestrians and bicyclists.

Fuel Consumption and Pollution

Reducing the elements that cause traffic to repeatedly slow down and accelerate reduces fuel consumption and the amount of pollutants emitted into the atmosphere. Some traffic noise from acceleration and braking should also disappear.

Public Budget

Managing the access along the roadway helps preserve and extend the useful life of the roadway. Since the capacity of an access managed roadway is greater than that of an otherwise similar roadway lacking access management, access management reduces or at least postpones the need to widen roadways.

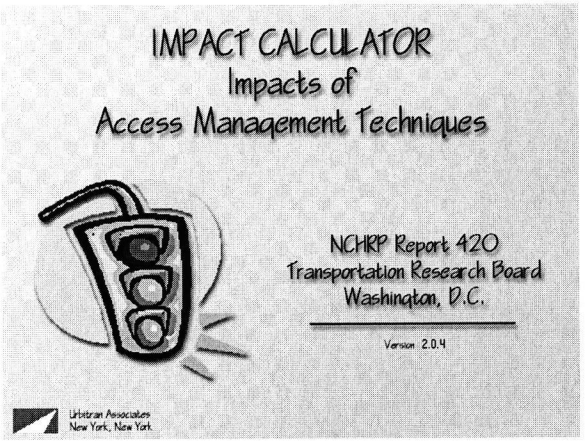
Managing the access of through roads reduces the need to spend large sums of money to purchase new corridors for new "replacement" roadway, and to construct new roadways to replace congested roadways. In particular, it forestalls or eliminates the need to replace a bypass with a new bypass.

IMPACT CALCULATOR

Software to estimate the impacts of access management was developed as a part of the NCHRP Report 420, *Impacts of Access Management Techniques* project. The software modules apply the research findings to estimate the effects of changing the access conditions along a project or a highway section. The software allows two conditions to be compared, such as “before-and-after”, or “existing and

proposed." Inputs vary by module and could include segment length, speed limit, area type (i.e. urban and rural), traffic signal information, traffic volume data, existing crash rate, and access frequency (see Exhibit 2-34).

Outputs can include projections of future traffic conditions or suggested design values. For example, in the Unsignalized Safety Analysis module, the change in crash rates is projected based on an increase or decrease in access in access density for a highway. The software also includes an economic impact analysis module that applies a simplified approach to estimate the maximum effects on commercial sites of installing a raised median.



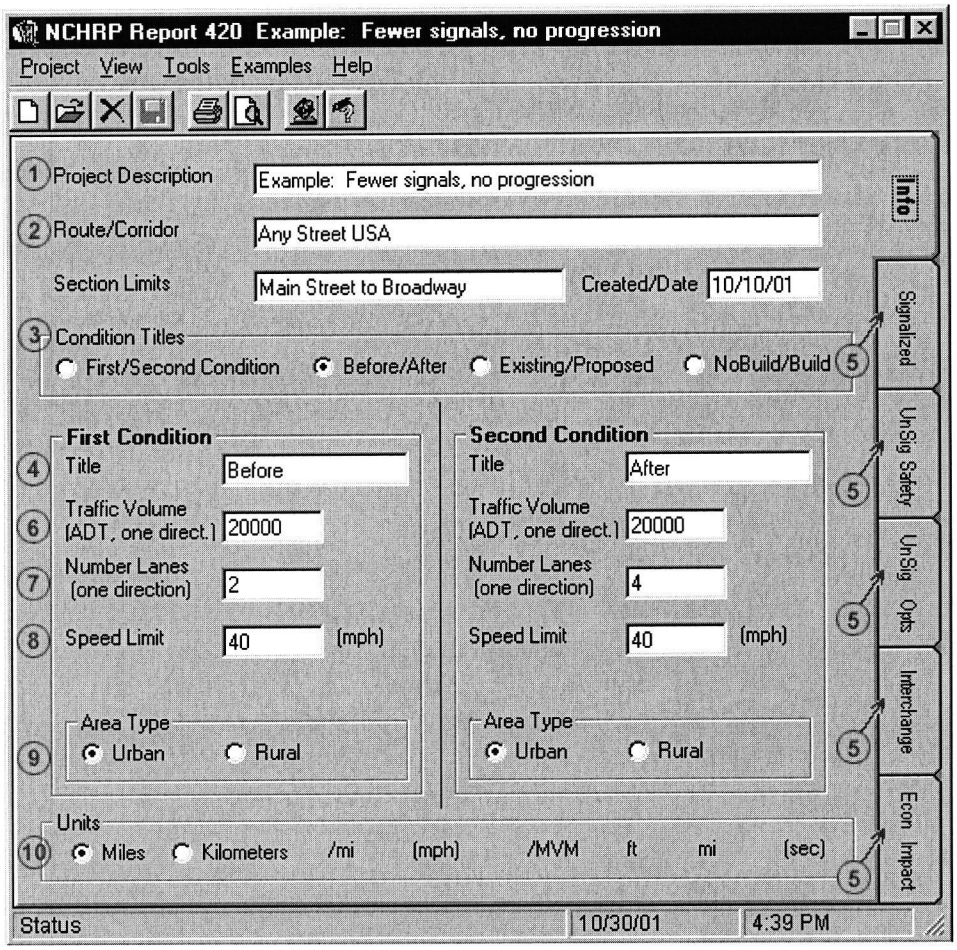


EXHIBIT 2-34 Access management impact calculator

WHAT HAPPENS WITHOUT ACCESS MANAGEMENT?

The history of engineering includes the history of learning from failure. Many of the current practices in traffic planning, design, and operations (including access management and corridor preservation) have been learned from observing that "something isn't working." The consequences of not taking steps to preserve corridors can be seen in the many examples of roadways where over time, the mobility or safety markedly declined because the corridor was not preserved.

The absence of corridor management or access management programs can lead to the following undesirable outcomes. (CAM 2003)

- buildings are constructed in locations that will be needed for future transportation facilities
- buildings are constructed in locations that limit the ability to widen the roadway in the future
- tracts of land abutting a major roadway are subdivided into small parcels, leading to an undesirably high number of driveways

Often a number of years transpire from the time that opportunities to preserve the roadway are missed until the resulting traffic and safety problems begin to appear. Therefore, the consequences of failing to act are too often not clearly seen. A couple of the more common scenarios are described in the following sections.

Urban Scenario

Perhaps the most common scenario involves the roadways radiating from a downtown; new developments tend to cluster along the highway and create an endless strip of driveways. Over time, this is accompanied by more traffic congestion and crashes. Exhibit 2-35 shows examples.

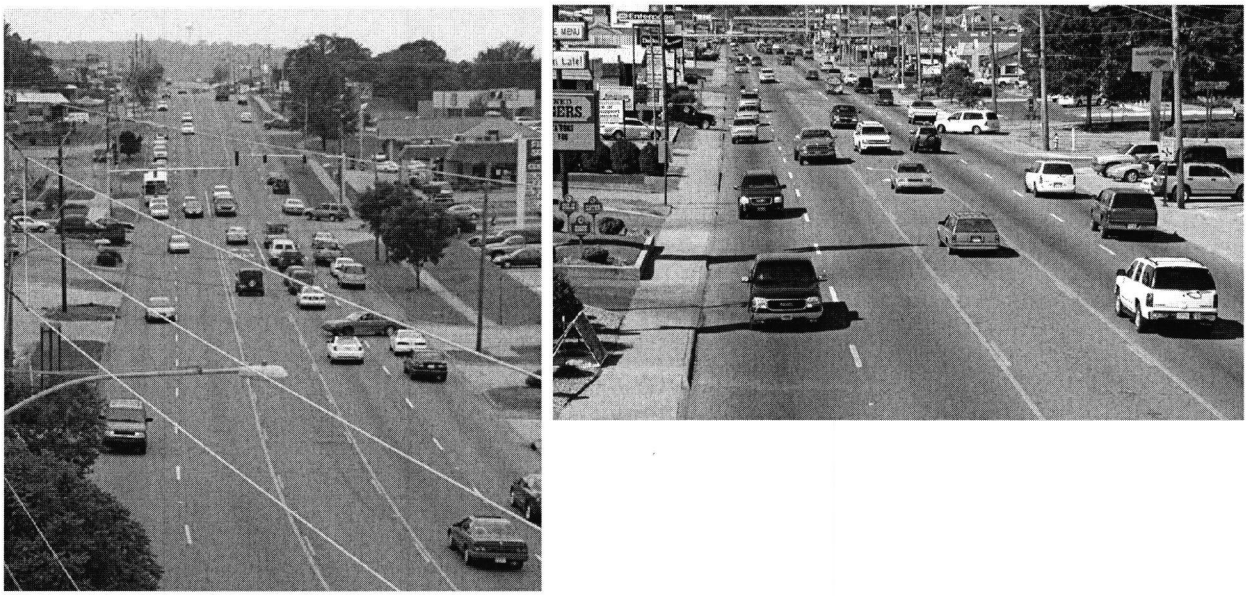


EXHIBIT 2-35 Examples of urban strip development with degraded operation

Sometimes the developed strip along the highway is so continuous that there are too few streets connecting the highway with the land back from the road (i.e., behind the strip), eventually making it difficult for this property to be developed and be adequately served with connections to the highway. An often-heard corollary to access management is the emphasis on developing an adequate network of supporting streets.

Rural Scenario

This phenomenon of "losing the highway to development" is not confined to urban and suburban areas. A case of rural corridor degradation can be seen along US 62-412 in Baxter County, east of Mountain Home. Development occurred along the most prominent high-quality paved road in this rural area, probably influenced by the proximity of Lake Norfolk. Now, due to the strip that has developed along the highway, many miles of what should be unencumbered travel -- given the overall rural nature of the land -- are restricted to speed limits of 40 and 45 mph. This location is shown in Exhibit 2-36.

EXHIBIT 2-36 Example of rural strip development degrading the service of the highway to the public

OBSERVATIONS ABOUT REACTIONS OF BUSINESSES

When trying to implement new or maintain existing access management techniques at a particular location, it is not uncommon for a prospective developer to tell the governing transportation agency that unless access restrictions are relaxed, the developer will go elsewhere. Although certainly each case is unique, it is interesting to observe the site developments shown in the following photos. These photos compare similar types of developments and contrast the amount of access to each. In each case, it would certainly appear that the imposition of more restrictive access did not deter a national company from constructing and operating a store.

Case 1 - National Drugstore Chain

The top photo (Exhibit 2-37) shows a newly constructed national drugstore chain on a site with a moderate degree of access management. Even though two of the three site driveways are on the major streets, at least they are set back from the signalized intersection. The bottom photo shows a store of the same chain with much less access. The driveway on the right serving both left and right turns is to a minor street. The second access (on the left) is via a shared site drive that functions like a minor street; this second drive has only right-in and right-out access from the main roadway.

Even though the practice in the first photo is certainly an improvement over what is often seen, from both a safety and an operational perspective, it would have been even better if driveways had been only located on the two side streets, not on either of the two major streets.

EXHIBIT 2-37 Showing different level of access to same drugstore chain

Case 2 - National Restaurant Chain

According to newspaper reports, the restaurant in the top photo (Exhibit 2-38) insisted on having three driveways, one from the side street and two from the major roadway. One of those is quite close to the intersection. In contrast, the following photo shows a store of the same chain in another state, with no direct access from the main roadway in the foreground of the photo; access is from the side street.

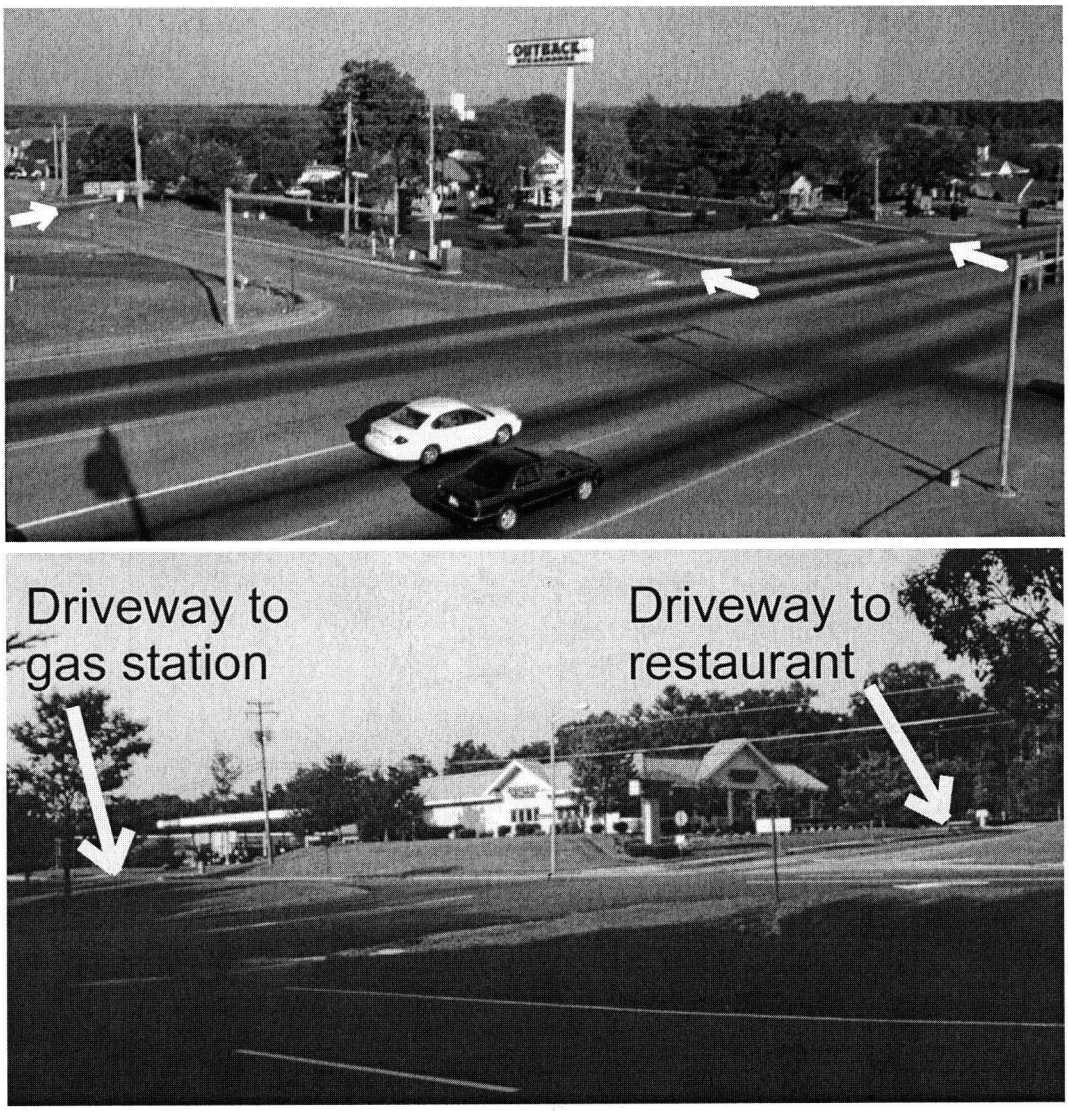


EXHIBIT 2-38 Showing different level of access to same restaurant chain

Case 3 - National Fast Food Chain

Photos (Exhibit 2-39) of the same national fast food chain in different places show significantly different levels of access. The first photo shows a site that has three driveways, one from the main roadway, and another in a highly undesirable location, immediately downstream of the intersection and

turning lane. Yet in the other photo showing a store belonging to this same chain, there is only one drive, and that drive is not off of the main thoroughfare but rather off of a side street.

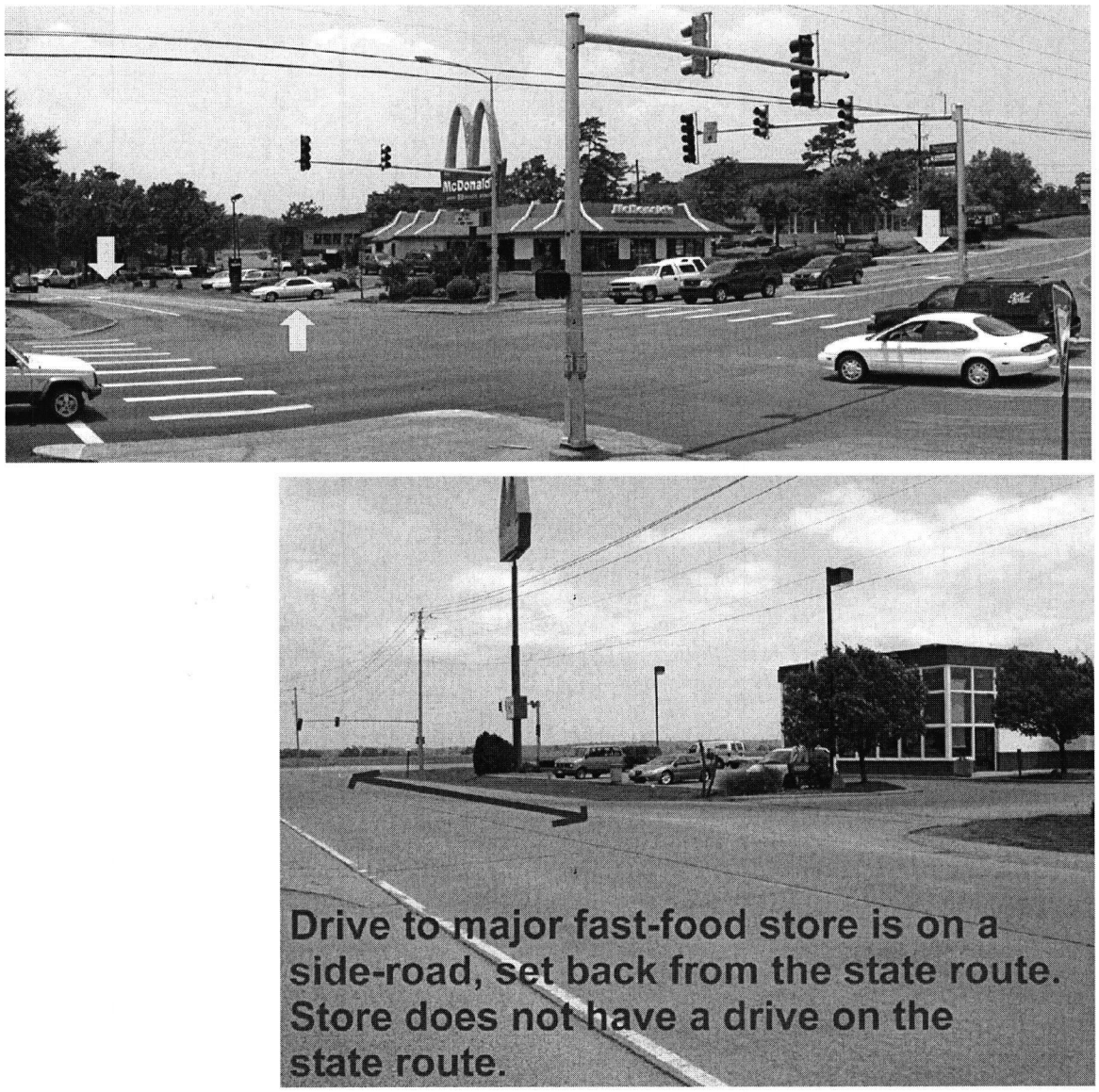
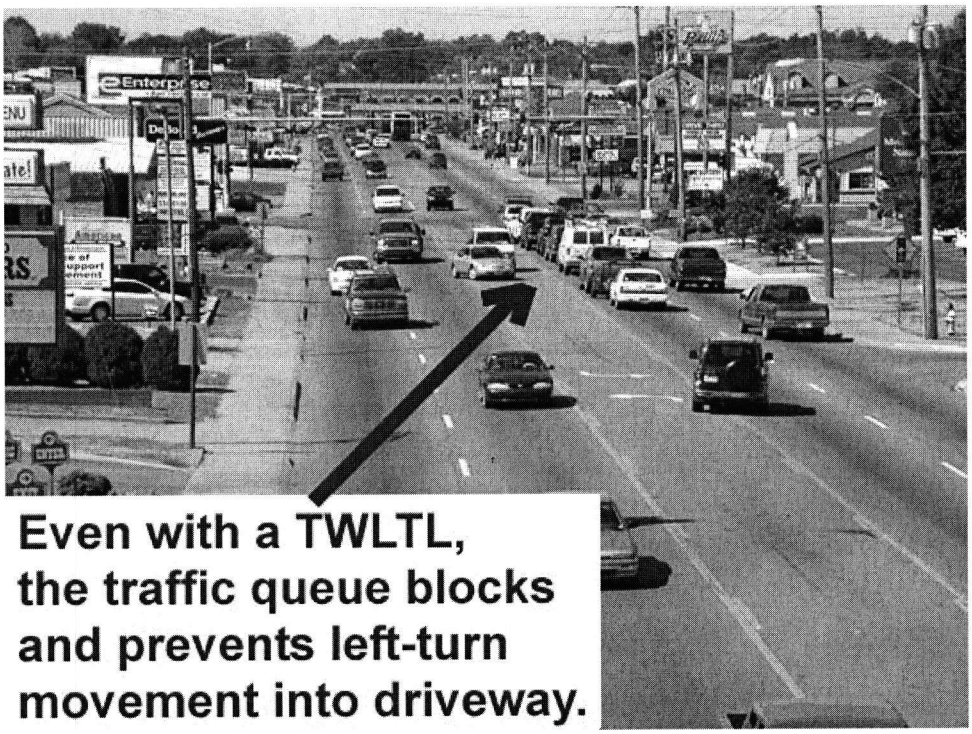


EXHIBIT 2-39 Showing different level of access to same fast-food chain

From these contrasting photos, one could infer that developers may sometimes overstate how much access is needed for a business to survive. And as Exhibit 2-40 shows, when traffic is heavy, even a continuous TWLTL does not guarantee quick entry into a business. In the top photo, the two vehicles in the turn lane waited quite a while before they found usable gaps in the oncoming traffic. In the lower photo, the driver after a long wait gave up trying to turn left to enter the business, and instead drove on ahead.



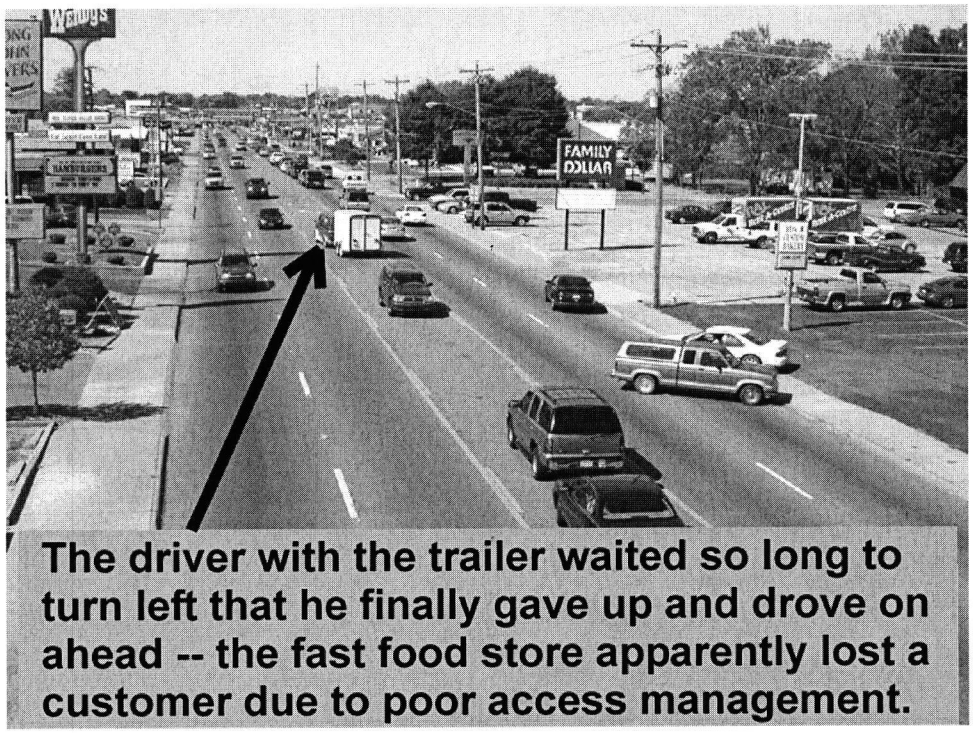


EXHIBIT 2-40 A TWLTL does not always guarantee quick access

WHY HAS ACCESS MANAGEMENT NOT BEEN ADOPTED EVERYWHERE?

Access management has an interesting history (Demosthenes 1999). In 1902, New Jersey enacted a statute allowing county boards to establish "speedways" for horses and light vehicles. No public street was allowed to intersect the speedway without the consent of the county. In 1914, Westchester County, New York began establishing "parkways" in urban areas.

Within a couple of decades, both the number of vehicles on the roads and the number of crashes were becoming sources of concern. In 1937, New York and Rhode Island enacted laws authorizing the state to acquire full or partial access rights from properties abutting the roadway. The Pennsylvania Turnpike opened in 1940, offering the American public its first modern freeway with full access control. A Federal proposal in 1944 for what eventually became the Interstate System recommended limiting access to the practicable minimum. By the end of the 1940s, most states had statutes allowing some degree of access control and court decisions had backed the government's ability to control access rights to preserve public safety.

The importance of access management has been recognized in AASHO/AASHTO policies since at least the mid-1950s. *A Policy on Arterial Highways in Urban Areas* by AASHO (1957) stated:

> "Control of the access increases efficiency operation, reduces accidents, and avoids the experience of needing to provide new parallel highways as capacity drops on existing ones due to roadside interference....Some degree of access control should be included in the development of any arterial highway."

As time passed, transportation agencies increasingly recognized that considering cost alone did not serve the public well, so when making decisions and setting policies they gave increasing emphasis to safety and efficiency. Modern comprehensive access management programs began with the Colorado legislature enacting a controlled access law in 1979. A 1989 survey found that eight states reported having an access management program, with a ninth about to begin and a tenth program under consideration. The most comprehensive programs were in Colorado, Florida, and New Jersey (Koepke and Levinson). More recently, a number of states and local jurisdictions have adopted or begun to consider access management programs.

Informal observations and formal research have led to the conclusion that in appropriate settings, access management can provide a number of benefits to the traveling public. That raises the question: "why haven't all transportation agencies implemented access management?"

If a transportation agency adopts access management, it will face new roles and challenges. An access management program will impose additional demands for staff time and resources. It will entail a greater level of interaction and coordination among certain branches within the agency, and more detailed coordination with other levels of government. The program will probably create at least some resentment and opposition from those who feel they are adversely affected by access management, such as some owners of abutting properties and businesses. This can in turn cause political pressures to be exerted on the agency, if leaders focus more on the complaints of those who perceive or actually have experienced negative impacts, rather than considering the safety and operational disadvantages to the overall traveling public which result from not having an effective access management program.

In short, while access management can produce real benefits, it also introduces new administrative challenges. It some cases it is certainly easier not to incorporate access management into the planning and design of roadways. However, a convenient design may not always be the best design, in terms of safety and service to the traveling public, and in terms of long-term financial sustainability. The political feasibility of implementing a challenging policy is something only the leaders and top officials within an agency can evaluate.

No system or program is perfect. Dwelling on the few negatives which will arise can cause one to miss a great opportunity and overlook the many benefits which would accrue.

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CHAPTER 3
REVIEW OF PRINCIPLES AND PRACTICES

Simplified, access management is focused on two questions.

- Where can access safely be allowed?
- How much and what type of access is needed to adequately serve a given tract?

In order to manage access to public roadways in a way that increases safety, decreases congestion, and preserves the public's investment in roadways, a transportation agency will find it is necessary to establish a number of administrative policies and procedures. Public agencies can and do use a number of different means to manage access to public roadways (Levinson).

- Driveway regulation: control the number, location, and the design of driveway connections allowed
- Geometric design: incorporating design features such as medians, islands, frontage roads, etc.
- Police power: the fundamental authority to protect public safety and welfare
- Deed: purchasing property rights
- Land development regulations: subdivision, zoning, and building permit authority usually exercised at the local level

This chapter includes discussions of both the principles of access management and how the principles are applied.

Reports that discuss establishing or operating an access management program were reviewed and then summarized in this chapter. Also, state department of transportation engineers, consulting engineers, and researchers having experience with access management were interviewed to document their experiences and observations about starting and operating an access management program.

ESTABLISHING AND STRUCTURING THE PROGRAM

Establishing an access management program is no minor task. It requires a commitment within the agency and enthusiastic support at the top levels.

Perhaps somewhat oversimplified, the personnel and job functions needed to carry out an access management program might be grouped into three categories:

1. establishing policies and standards,
2. establishing where and how these policies and standards will be applied (i.e., scope), and
3. access permit administration.

The structure and even the place in the organization to which access management staff are assigned varies among the states. These differences are somewhat affected by whether the state transportation agency operates in a centralized manner, or in a decentralized manner at the district level. The location of the access management coordinator position in the organizational chart of a few states is as follows. (note that the group to which access management is assigned can change due to agency reorganizations).

Colorado	traffic engineering	Florida	planning
Iowa	right-of-way	Kansas	traffic engineering
Missouri	traffic engineering	New Jersey	planning
New Mexico	traffic engineering	Oregon	engineering
South Dakota	planning		

The access management (or in some states, corridor preservation) staff serve as the access management consultants to others in the agency. No matter what division access management is housed in, there will need to be close interaction with other divisions. For example, roadway design teams will need to verify that all aspects of a proposed design will conform to the applicable access requirements.

Designating a specific person or group of people to administer an access management program can help focus adequate resources toward the program, create a group of knowledgeable specialists, and lead to more consistency in the application of the program. This, in turn, can strengthen the legal standing of access management policies and regulations.

In some states, a single person or a small group of people have access management as their full-time or near full-time responsibilities. In other states, a section will have access management as one of many responsibilities. There are pros and cons to either method. One advantage of having access management as one of many tasks within a section is that the staff may be more aware of other aspects of a project besides the access management, and can interrelate and integrate them better. Conversely, advantages of the single focus are the potential to develop a higher level of access management expertise, and not dividing time among so many responsibilities.

Some states establish advisory committees to help create a program or to provide guidance to an ongoing program. Such committees should include representatives from both the central office and the district offices. Other members may include representatives of metropolitan planning organizations (MPOs), city governments, county governments, or consultants.

Access Program Scope

The scope of existing access management programs varies among state transportation agencies. Agencies have applied the access management programs to either the entire roadway system, certain categories within the roadway system, or to specified corridors.

Access Classification Systems

In order to apply access management regulations and practices in a systematic and uniform manner, transportation agencies have established access classifications systems that differentiate among roadway types and establish varying levels of control according to the needs of a given roadway class. Many state classification systems differentiate among roadways to reflect differences in characteristics, such as proportion of through traffic, volume, speed, and the density of development in the environment or surroundings (urban, rural). NCHRP Report 348 discusses a process to establish access categories, and presents a "generalized approach" of seven classes: freeway, expressway, strategic arterial, principal arterial, other arterial, collector, and local/frontage road (Koepke and Levinson). Example systems from three states follow (Exhibit 3-1).

These classification systems not only identify various roadway categories, but also establish the frequency at which access to a roadway in a category will be allowed. Access classification systems are usually not the same as the functional classification systems.

KANSAS ACCESS CLASSES --ROUTE CLASSES

A Routes: All routes on the Interstate Highway System.
B Routes: ... all non-Interstate routes designated on the National Highway System ... Further, this category applies to all segments identified as "growth corridors" in the District Plan.
These routes are to be protected by allowing for direct access only when alternative access is infeasible. When direct access is necessary, shared access will be required wherever possible... Such routes should be protected by purchase of access rights whenever feasible.
C Routes: ... routes not on the National Highway System and not designated as a "growth corridor."
Alternative access will be utilized wherever feasible, however, direct access is not an option of last resort, and should be utilized wherever it proves more effective. Shared access will be utilized wherever possible.
D Routes: ... routes not on the National Highway System and not designated as a "growth corridor."
These routes are to be protected by a modest level of management...
E Routes: ... routes are to be protected by a minimum level of management.
* Each class is further divided by "Developed" or "Undeveloped" and by type of driveway

NEW MEXICO ACCESS CLASSES

Controlled-Access, non-Interstate Highways
Urban Principal Arterial
Urban Minor Arterial
Urban Collector
Rural Principal Arterial
Rural Minor Arterial
Rural Collector
* Each class is subdivided one of four Speed groups:
30 mph, 35 to 40, 45 to 50, 55 mph

SOUTH DAKOTA ACCESS CLASSES

Interstate
Expressway
Free-Flow Urban
Intermediate Urban
Urban Developed
Urban Fringe
Rural

EXHIBIT 3-1 Example state access classification systems

Training Programs

Staff training should accompany the startup of an access management program. Different groups, such as roadway designers and permit officers, will have different training needs. A program may reap benefits by offering training to local government staff and to consultants. At certain intervals, training will need to be repeated, both to inform new employees and as a refresher for veteran employees.

Permit Administration

In a recent survey of states, only one responded that the majority of its driveway permitting functions were handled in the central office. One-half responded that the entire permit process is decentralized (Williams 2002). In the states where interviews associated with this project were conducted, the permit application and review functions tended to be performed at a county, multi-county, or district level.

More than half of the agencies responding to the recent survey had minimum education or training requirements for the staff who review driveway applications and issue permits. The majority of these indicated that permit reviews are mainly performed by a technician, with some oversight or approval authority by higher level engineers (Williams 2002).

One mechanism that states employ to consider situations where an applicant is appealing a decision or wanting an exception to the general practice is establishing an access review committee. Access review processes are handled at different levels in different states. In states with decentralized transportation departments such as Florida, these committees are at the District level, and are comprised of higher-level managers from the affected divisions, such as design, operations, maintenance, and right-of-way.

ACCESS PERMIT PROCESS

If access to a roadway is managed, any party wanting access (referred to herein as the "owner" or the "applicant") must first apply for a permit, and the transportation agency then reviews the request to determine whether the proposed access is acceptable. The requested access may be for a median opening or a street, but the majority are usually for driveways serving a proposed or existing development on private property.

The *Access Management Manual* (CAM 2003) lists the following five general steps to the permitting process.

1. applicant makes initial inquiry
2. the agency determines what information will be required from the applicant
3. applicant prepares and submits formal application for an access permit
4. the agency reviews the permit application
5. the agency either approves/issues or denies the permit

The permit application process is where the public comes in contact with access management, so from a public-relations standpoint, it is important for the state to devise and operate a permit application process that does not generate unnecessary frustration on the part of the applicant.

Varying Thresholds of Complexity

The simplicity or complexity of a proposed or existing development to some degree affects the needed complexity of the access permit application and review process. A number of agencies do not use a one-size-fits-all-approach, but rather have different procedures and fees according to the complexity of the development. For instance, access permit applications might be classified into one of three groups: single family residential, public street, and all others. It is more likely that a simple development (such as farms or residences) are reviewed by a trained technician, whereas a commercial development review might also involve a staff engineer.

In addition, some schemes would have two or more tiers of complexity for "other", such as generating less than 100 trips in the peak hour, or more than 100 trips in the peak hour. When the expected site traffic volumes will exceed minimum threshold values, the developer must conduct a traffic impact analysis. States with this type of requirement include Florida, Kansas, and New Jersey.

Pre-application Meetings

Before the design of a proposed development begins, the owner should meet with the state to conduct an informal "concept review" or "pre-application" meeting (Williams 2002), where the parties can discuss how the general rules apply to a particular development in the given context, and what specific data and analyses will be required. When a given site is subject to access management standards of both a state agency and a local government, a common practice is to allow the more restrictive of the two (either state or local) to govern.

During a pre-application review, the agency will inform the owner of constraints on the proposed design, so the owner can avoid spending time and money on a design that will need substantial modification to comply with the access management rules. For a complex development such as a shopping center, it may be beneficial to have a series of meetings as the development design progresses, so that through a series of iterations the owner can arrive at a final design that will comply with the access management rules. The transportation agency should clearly inform the applicant of all of the requirements and expectations at the beginning, because an applicant can with good reason become more frustrated and less cooperative when new requirements keep arising incrementally.

For a basic, straightforward situation such as a single-family residential drive on a remote rural highway, it may sometimes be possible to combine the pre-application discussion with the actual permit application process.

Access Permit Application and Review

Typically, the owner (or owner's agent, such as an engineer or architect) submits an application for access to a tract of land. The application form requests the owners name and contact information, information that locates the property and the requested access, and a description of the use of the property (e.g., residential, commercial, etc.).

Appendix A presents example state access permit application forms. Appendix B contains internal documents used by states to help process access applications. Exhibit 3-2 shows a decision making flow chart from the Colorado Department of Transportation, used to evaluate an access management permit application.

In order to determine whether the proposed location is suitable for a new access connection, the state will examine the proposed driveway width, gradient, curb return radius, and distance from the edge or side property lines. The state will conduct a field inspection at the site of the requested access connection(s), checking for, among other things, spacing to adjacent access connections and available sight distance. At some time during the process, a field inspection needs to employ global positioning systems to record the location of each driveway and enter it into a database. For more complex developments, a traffic engineering review of projected impacts will be performed.

The review process is not the same in each state. In one state, for all but the simplest of applications, the lower level review will result in a denial if the application appears unacceptable. But if the application appears to be acceptable, it is forwarded to a higher level before the final approval is granted to the applicant.

When a permit is approved at any level, personnel at other levels need to be notified of it.

Access Permit Fees

A user fee can help cover the cost of administering a program. Twelve of the 28 states responding to a survey charged a fee for a driveway application (Williams 2002). The fees for residential developments ranged from $10 to $50 per driveway. The reported range for commercial developments was from $50 per entrance to as much as $12,000. The schedule in one state was reported as follows (Levinson).

single family homes or field entrances = $50
small use driveways = $100
larger use driveways = $300

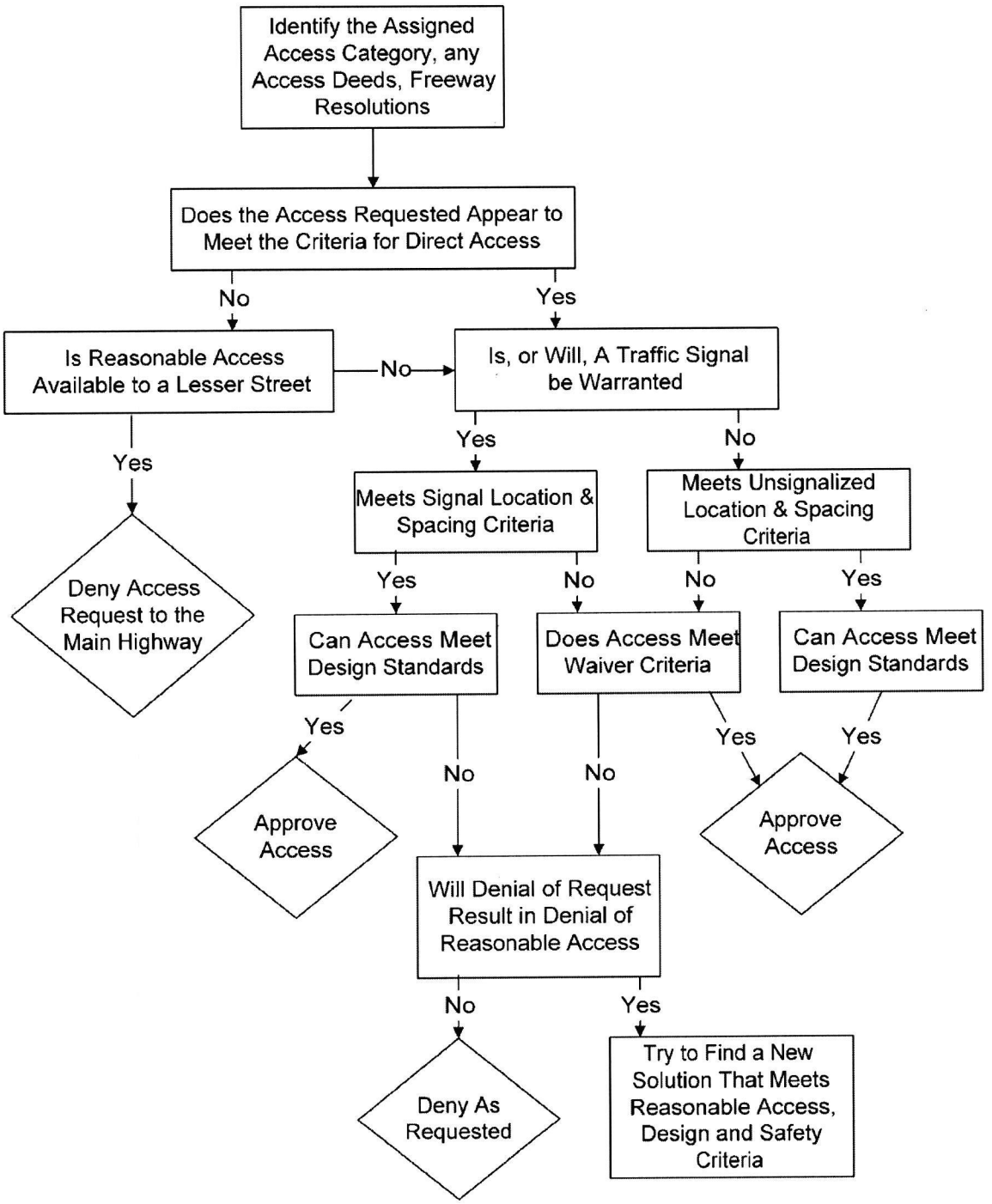
One question that arises is whether to base access connection permit fees and traffic impact analysis fees on actual counted or on projected traffic volumes. While at first glance basing requirements on actual counted volumes sounds appealing, remember that volumes from a development projected for the future cannot be counted in the present. Transportation agencies often employ a source such as ITE's *Trip Generation* (2003) to estimate the number of future trips from a proposed development. All applicants are treated equally if trip projections are based on one reference source.

Inspection

Inspection and enforcement are required to ensure that driveways are not installed in violation of a permit. Exhibit 3-3 shows states' responses to a national survey as to how they enforce rules when driveway permit requirements are violated.

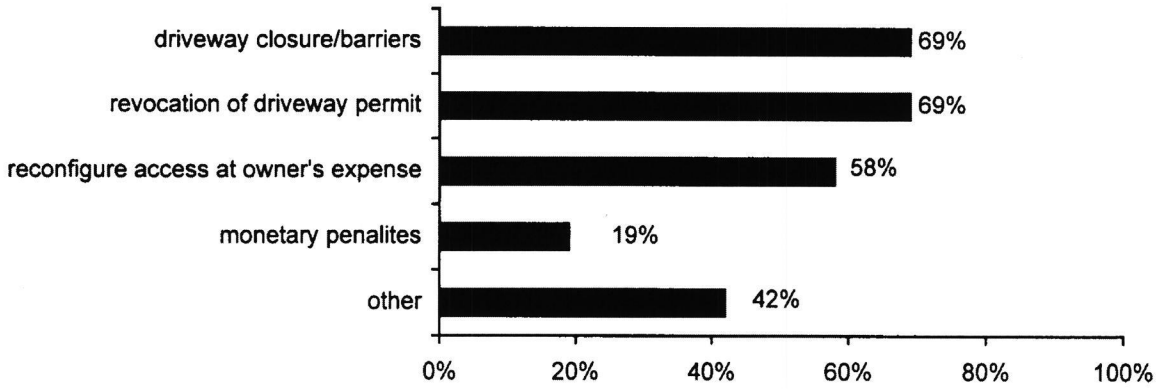
Keeping Records

Keeping records is a challenging yet necessary aspect of access management. Obviously, an application is more likely to be mishandled and not processed in a timely manner if the records are misplaced. But there are also other reasons for keeping a good record of the application and documenting how the application was processed.



from Williams, NCHRP Synthesis 304

EXHIBIT 3-2 Colorado access permit flow chart



from Williams, NCHRP Synthesis 304

EXHIBIT 3-3 Driveway permit enforcement methods (by state)

1. If an application is denied, a good set of records can help the agency document that the proper processes were followed and that the agency treated the applicant fairly.
2. If in the future an application it is made at the same or a nearby location, good records help the agency maintain a consistent evaluation and response. This can be especially important when new personnel, who are not familiar with the history of an area, assume permit responsibilities.
3. An agency needs accurate and easily retrievable records to determine where it already owns access rights, in order to avoid mistakenly allowing access.

The records and documentation for each application need to be in such a condition that another person who is not familiar with the case can determine why access was approved or denied, or if an application was made but then withdrawn.

The Kansas Department of Transportation (KDOT) has developed an access application record process that is entirely computerized. The software allows KDOT to view all aspects of the application and review. One of the program administrators stated that personnel who had never before used a computer were easily trained and were comfortable with it.

"The Kansas Department of Transportation (KDOT) developed a totally-computerized access application, review, and documentation process. The software (an Adobe® suite of products) allows us to develop electronic forms, automate workflows, and transfer permit packages to a document management system so the records can be preserved. This process also automatically updates and maintains KDOT's statewide geo-located inventory of intersections and access points."

Chris Huffman, Kansas Dept. of Transportation

A state agency should identify all property owned by the state and attempt to add access restrictions to the deeds, so if the property is sold as surplus in the future, the access restrictions will perpetuate.

Permit Conditions and Future Changes

The transportation agency grants an access permit to an owner with certain understandings. The permit should state these conditions so the owner can know what is expected and what is allowed. It is unrealistic to expect property owners to either know or fully appreciate all of the concerns that a transportation agency has when trying to protect the public's interest.

To the extent that the agency expects the owner to pay for maintenance, the permit should be granted upon the conditions that the holder preserves and maintains the integrity of the driveway surface and curbs, culverts, ditches, and other physical components. Once granted, a permit should expire if the access is not constructed within a stated amount of time, such as one year; there may be a provision for granting one extension. To remain valid, the permit should not only require the owner to remove growth and other obstructions in order to maintain adequate sight distance (NM), but also inform the owner as to just what area is to be kept clear of anything that can obstruct a driver's visibility.

The permit should stipulate what happens if some change occurs, such as the property changes ownership or there is a change in how the land is used (e.g., change from agricultural to commercial use). Typically, a permit allowing access is linked to or conditional upon a given use of the property, and if the use changes, the permit is no longer valid. One state's provision is the permit will be reevaluated if traffic volume increases by 25%, or the percent trucks of the total volume increases by more than 10%. Another example is if the volume rises by more than 25% and by more than 100 daily trips, then repermitting is required. Where applicable, the permit should inform the property owner of the requirement to remove a driveway from the through route and relocate it should alternative access (e.g., side street) become available in the future, and which party will bear the cost for such a relocation. The permit should also state that the granting of access conveys no rights, title, or to interest in the state highway rights-of-way to either the permit holder or to the property (NM).

ACCESS MANAGEMENT CONNECTION AND DESIGN CRITERIA OVERVIEW

Two significant components of an access management program are establishing standards for connection (i.e., driveways, streets, etc.) spacing and for geometric design elements related to access management. The standards are established in order to effect the principles of access management. Some of these design criteria will not be the same for all access classes or all types of roadways.

Philosophy for Connection Spacing Criteria

Experience suggests that it is better to establish standards and make exceptions as needed, rather than establish only guidelines for access management design. Establishing only guidelines is more conducive to inconsistency and a series of unwarranted exceptions.

One impetus for establishing low standards for spacing between connections is the observation that it will be impractical to enforce high standards on the many pre-existing nonconforming driveways. This concern can lead to standards that are so low as to be ineffective (CAM 2003). An alternative perspective is to establish high standards and accept that many existing properties will be nonconforming. Pre-existing nonconforming properties can be allowed to have conditional access which will be revoked upon redevelopment of the tract. When the tract is redeveloped, the access can be modified so that is comes into conformity to the access policy, to the extent that it is practical.

Access Management Design and Spacing Principles

The *Access Management Manual* lists the following ten principles needed to accomplish access management goals (CAM 2003). Some of these principles are related to the design of the overall roadway network or to connection spacing, while others are related to more discreet design elements. Some of these principles have the effect of reducing the need for vehicles to decelerate. By reducing or eliminating the need for vehicles to slow down and then accelerate back up to normal speed, crashes can be eliminated, traffic flow can be improved, pollution can be reduced, and the driving experience can be enhanced.

Principles # 1, 2, 3: Differentiate among different types of roadways, Limit to direct access to major roadways, Recognize a hierarchy of intersections

In a well-planned roadway network, freeway interchanges will connect with higher volume, higher speed arterial roadways. Arterial roadways will intersect with collector roadways. The collector roadways will in turn intersect with lower volume, lower speed local roads and streets. Establishing this pattern allows access to occur mainly on the local and collector streets, thus preserving the arterial roadways so that they can provide an adequate level of mobility for the traveling public. When there is too much access along the arterial, traffic becomes bogged down and vehicular conflicts are more likely to occur.

A roadway intended primarily to move traffic should have few access points. On the most important roadways, the only access may be to public streets spaced at 1/2 mile intervals (CAM 2003).

Principle # 4: Locate traffic signals in such a way as to not impede through movement

Closely spaced traffic signals can restrict the flow of traffic and increase the number of stops, sometimes contributing to rear-end collisions and always contributing to poorer traffic flow. Planning the roadway system in advance so that signalized intersections can be spaced at 1/2 mile intervals can greatly improve the flow of traffic, even during high-volume periods.

Principles # 5, 6: Limit the number of conflict points, Separate conflict areas from each other

A driver faced with an elevated number of conflicts (such as turning paths crossing through traffic -- see Exhibit 3-4) has to cope with an increased workload, which can increase the likelihood of errors leading to crashes (CAM 2003). Reducing the number of points at which traffic paths conflict also reduces the complexity of driving and gives road users (drivers, pedestrians, bicyclists) a better chance of avoiding collisions.

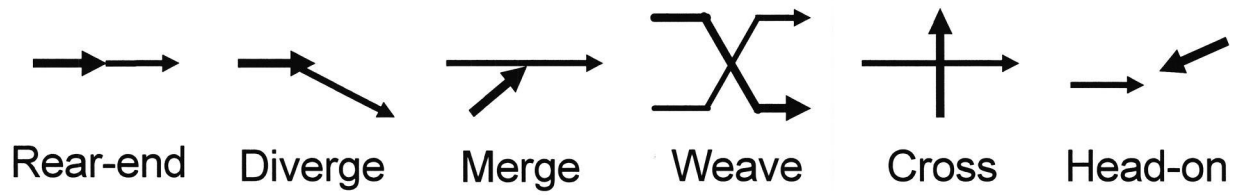


EXHIBIT 3-4 Traffic conflict patterns schematic

Separating conflict areas simplifies the task of driving and reduces the chances of driver error by allowing motorists to deal with only one set of conflicts at a time, rather than overloading motorists by forcing them to evaluate multiple conflicts simultaneously. Exhibit 3-5 illustrates just one example of how allowing too many traffic movements in too little space creates too many conflicts, which overtaxes a driver's ability to monitor and avoid collisions.

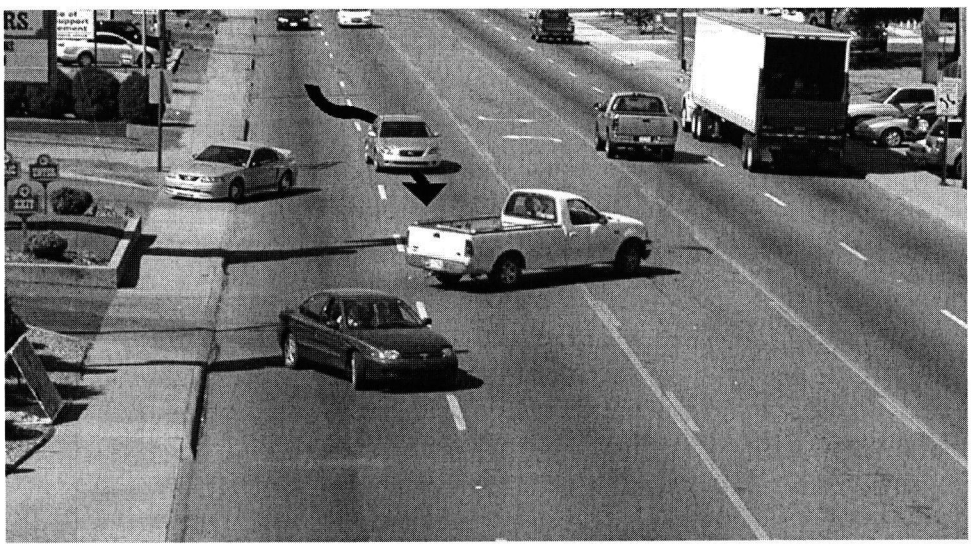


EXHIBIT 3-5 Trying to monitor too many conflicts in too little space

Principle # 7; Preserve the functional area of intersections

The "functional area" of an intersection, depicted in Exhibit 3-6, includes not only the physical area where two roadways cross, but also the approaching roadway and the departing roadway areas in which drivers are decelerating, accelerating, or otherwise maneuvering in response to the intersection. Allowing features such as driveways or median openings within the functional area of the intersection can adversely affect both safety and smooth traffic flow.

Principle # 8: Remove turning vehicles from through traffic lanes

Vehicles traveling on major roadways with signals often proceed down the roadway in platoons (i.e., groups of vehicles). In these conditions with higher volumes and speeds, any vehicle slowing and stopping to make a turn from the through lanes can cause a major disruption to many other drivers. Even when vehicles are not grouped in platoons, those vehicles turning left from through traffic lanes at best impede the other vehicles behind them, and at worst contribute to rear-end collisions.

Principle # 9: Use nontraversable medians to manage left-turn movements

Employing nontraversable (raised or depressed) medians to prohibit left turns at less-than-desirable locations improves both safety and the flow of traffic.

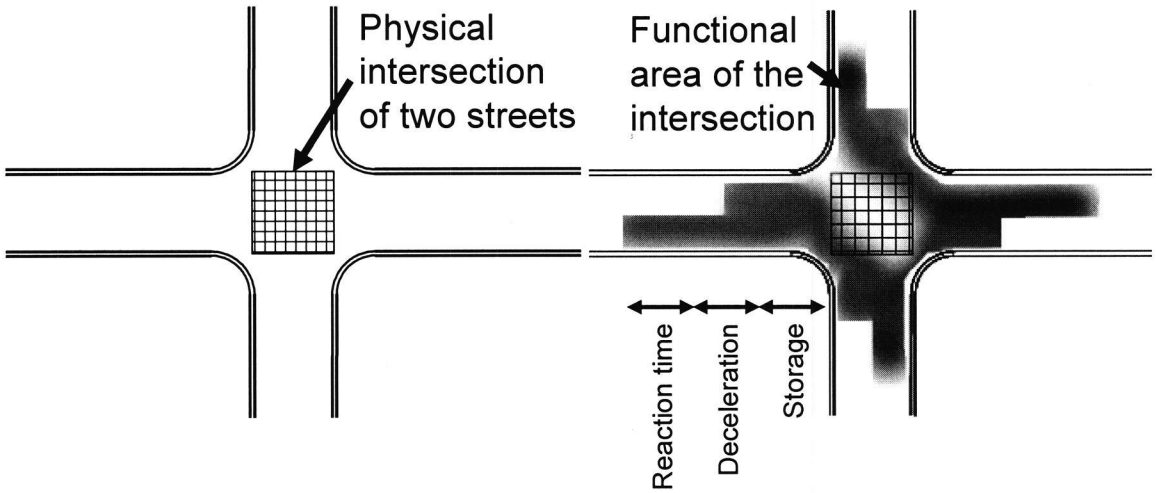


EXHIBIT 3-6 Physical and functional areas of an intersection

Principle # 10: Establish a supporting street network for traffic circulation

A number of traffic problems can be traced to overreliance on a single prime (i.e., arterial) roadway and the failure to develop a traffic circulation network. An examination of city street maps will too often reveal an absence of minor arterial and collector streets. Without a supporting system of interconnected streets, and circulation within and between private tracts, local traffic circulation is severely impaired. Trips that should be made exclusively either on local streets or directly between two sites are forced out onto the arterial for lack of a better alternative. This has the effect of unnecessarily increasing the volume on the arterial, and adding more conflicts in the form of turning movements.

On the other hand, misapplication of this principle can result in overloading the local streets with through traffic. If a network of minor arterials and collector streets has been provided, drivers will have little impetus to use local residential streets for through trips.

These principles influence both access connection standards and roadway geometric design standards.

CONNECTION SPACING ELEMENTS

Driveways are intersections.

As a general rule, driveways are on privately owned land, while streets are publicly owned rights-of-way. But from a driving and traffic perspective, it makes no difference: intersections with either driveways or other streets are all the same -- they are access points or connections. For the benefit of the general public, all types of connections need to be managed (see Exhibit 3-7).

Although different sources may not have identical wording, there is general agreement among sources about what connection spacings should be addressed in an access management policy.

- minimum spacing between driveways
- minimum spacing between streets and driveways
- minimum spacing between unsignalized street intersections
- minimum spacing between signalized intersections
- minimum spacing between ramp-crossroad junctions and other access points
- minimum spacing between median openings

Spacing between connections is managed in order to achieve smoother traffic flow, less delay to travelers, and improved safety. Managing spacings will sometimes require coordination between the state highway agency and local government agencies that regulate land development.

An important but often overlooked aspect of spacing is defining from which point spacing will be measured or referenced: from centerline to centerline, or between the two nearest edges. The ramifications of both methods will need to be evaluated, and the chosen method clearly communicated in policies and publications.

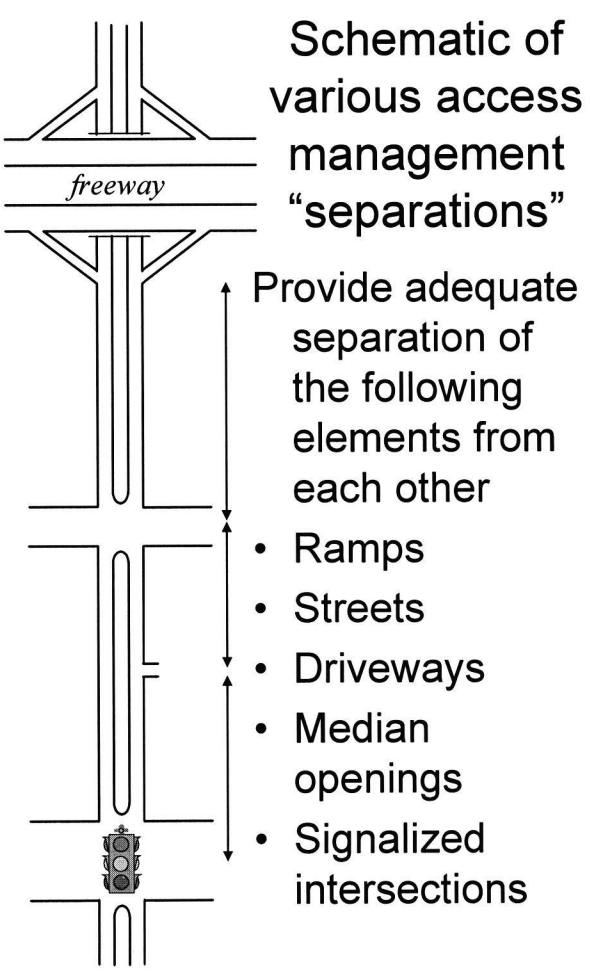


EXHIBIT 3-7 Some locations at which to manage access

Spacing of Unsignalized Access - Background

Spacing controls apply to a number of different types of unsignalized access points.

- spacing between successive driveways along the roadway
- spacing between driveways and streets intersecting the roadway
- spacing between median openings and other access points
- spacing between successive streets intersecting the roadway
- spacing between freeway ramp terminals on the frontage road and other access points

A number of rationales for determining the spacing between unsignalized points-of-access (NHI, CAM 2003) along a roadway have been developed over the years. These rationales attempt to reflect driver behavior and vehicle performance, particularly acceleration and braking.

Spacing Based on Sight Distance

Access spacing can be based on either stopping sight distance or intersection sight distance. Providing sufficient stopping sight distance in advance of a driveway intersection allows a driver in the through lane to bring the vehicle to a stop before crashing into a vehicle that is either entering or exiting

the driveway (this assumes that the driveway vehicle began its maneuver far enough in advance of the through vehicle approaching the driveway so that the through vehicle driver could react). Intersection sight distance is intended to provide the vehicle on the driveway with adequate time to either cross or to turn into the through traffic stream and accelerate, and is usually greater than stopping sight distance.

Spacing Based on Right-turn Exit from Though Roadway Influence

It is desirable to avoid spacings so close that the through street driver has to monitor more than one successive connection (e.g., driveway) at a time for traffic in front turning right. Spacings based on this criterion assume that the preceding right-turn vehicle begins to decelerate at a certain "impact distance" in advance of the driveway, and a following driver needs a certain perception-reaction time to slow in order to avoid colliding with the rear of the right-turn vehicle (CAM 2003).

impact distance + perception-reaction distance = influence distance

A variation of this is the undesirable weaving that results when a freeway exit ramp intersects a frontage road too close to another access off of the frontage road (see Exhibit 3-8). No access (either streets or private driveways) should be allowed in the vicinity of the intersection of a freeway ramp with a frontage road.

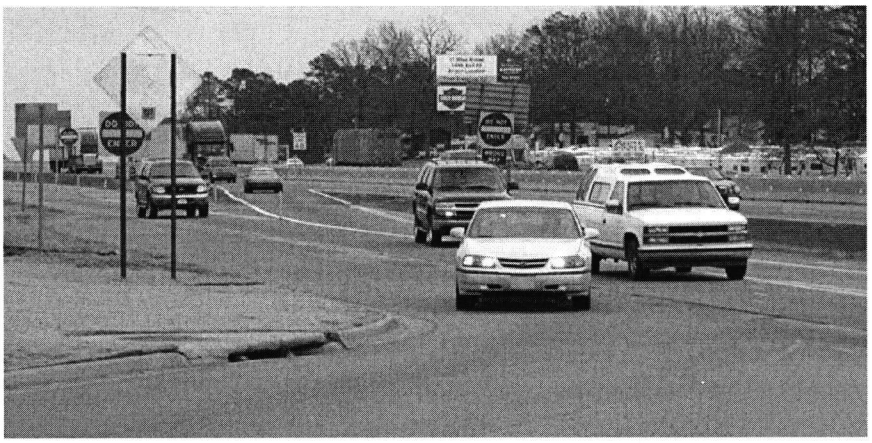


EXHIBIT 3- 8 Frontage road-street intersection too close to upstream exit ramp

Spacing Based on Right-turn Entry into Through Roadway Overlap

It is desirable to avoid spacings so close that the through street driver has to monitor traffic entering the through roadway from more than one successive access point (e.g., driveway) at a time. Spacings based on this criterion assume the following (CAM 2003, NHI).

- a vehicle turning from the driveway into the through road accelerates up to speed at a certain rate
- to avoid a collision with the vehicle from the driveway, a vehicle in the right lane of the through roadway requires a certain perception-reaction time, followed by decelerating at a certain rate

Different sources present differing right-turn conflict overlap spacings, based on different values for reaction, deceleration, etc.

Spacing Based on Egress Capacity

From observations of traffic, Major and Buckley concluded that traffic interactions subsided and traffic flow improved when driveways were spaced at 1.5 times the distance needed for a vehicle to turn from the driveway into traffic and accelerate up to speed (NHI). At this spacing, the street has more ability (i.e., capacity) to absorb traffic entering from the driveway.

Spacing Based on Left Turn Driving Task

This criteria is applicable only in locations where vehicles from an intersecting road- or driveway can turn left into the subject road. One source recommends that these left-turning drivers have at least 2.0 sec of time after finishing the left turn before they would encounter vehicles entering or leaving the road (Gluck et al. 1996).

Spacing of Unsignalized Access - Application

The just-discussed rationales provide a basis for managing the spacing between many types of connections, such as between successive driveways, or between driveways and street intersections. Of course, the spacing of unsignalized access must be coordinated with the spacings of other connections (CAM 2003, NHI). The following unsignalized access spacing distances in Exhibit 3-9 were compiled from various sources.

EXHIBIT 3-9 Example unsignalized spacings for 40 mph roadway

Rationale	Distance
Right-turn entry overlap	185 - 300 ft
Stopping sight distance	301 ft
Right-turn exit influence	340 ft (for 10% failure)
Intersection sight distance	382 - 441 ft
Egress capacity	630 ft
Functional area	varies according to volume (also speed)

from AASHTO Green Book, NHI class manual, TRB *Access Management Manual*

Spacing Between Driveways

Driving experience and structured studies indicate that when the separation distance between adjacent driveways is inadequate, traffic flow problems and conflicts result. Exhibit 3-10 shows one example of a conflict.

In addition to spacing requirements between connections on the same side of the street, there is a need to regulate spacing between connections on opposite sides of the street, unless a permanent non-traversable median is in place (see Exhibit 3-11).

Adequate spacing is needed not only between access points on the same side of the road, but also between access points on opposite sides of the road, unless a nontraversable median divides the road.

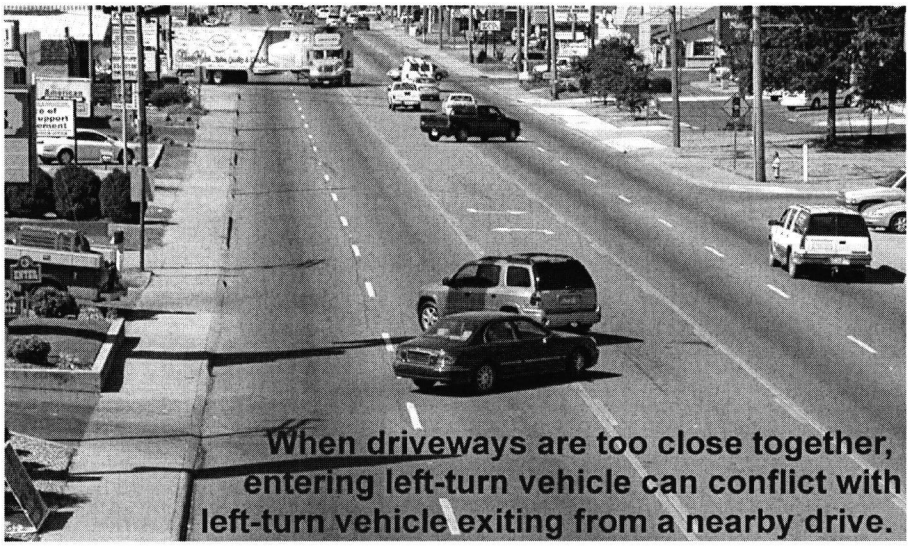


EXHIBIT 3-10 One of the many problems that results from driveways too close together

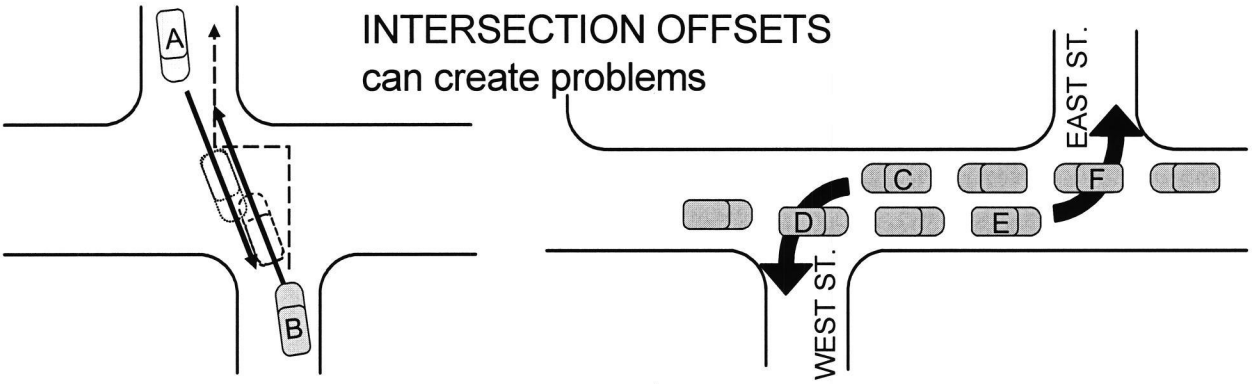


EXHIBIT 3-11 Unregulated connection design can create offset problems

Koepke and Levinson recommended that access connections on opposite sides of undivided roads either be aligned or offset a distance of 150 ft for minor traffic generators and 300 ft for major generators.

Corner Clearance

One application of these unsignalized access spacing rationales is that, as the Green Book states, driveways should not be located within the functional area of the intersection (AASHTO 2004). In order to locate driveways outside of the functional area, adequate "corner clearance" is needed, as depicted in Exhibit 3-12. Driveway corner clearance is the spacing from the intersection to a driveway. Median opening corner clearance is the distance from the intersection to the median opening.

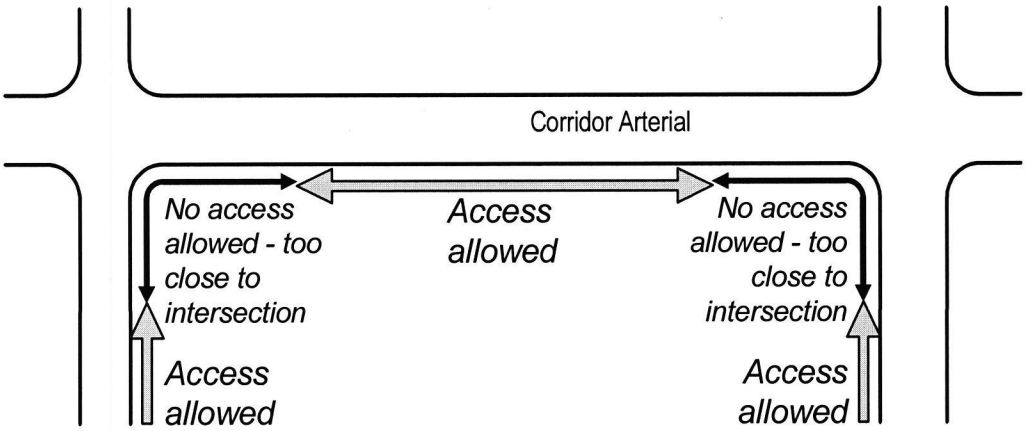


EXHIBIT 3-12 Corner clearance prohibits access too close to an intersection

Adequate intersection corner clearance standards help preserve both safety and good traffic flow at intersections. The ability to provide adequate corner clearance is enhanced if local land development standards ensure that the frontage dimensions of those lots at the street corners are sufficient.

The effects of inadequate corner clearance are perhaps most noticeable at signalized intersections, due in part to the heavier volumes that usually occur there. Exhibit 3-13 shows how vehicles queued up at the traffic signal block driveways that are too close to the intersection, making it difficult if not impossible to enter or leave the blocked driveway. The lower photo shows an undesirable and unsafe condition, when the oncoming vehicle wishing to turn left into the driveway blocks traffic in the through lane. Other traffic operational and safety problems that result from inadequate corner clearance are illustrated in the following Exhibit 3-14.

Exhibit 3-15 shows an intersection with good corner clearance. The major arterial is in the background, at the Stop sign. The commercial developments on both sides of the side street have generous corner clearance distances from the major arterial to the first driveway on the cross street. A vehicle pulling out from the driveway has enough time to detect and react to vehicles turning off of the through street. Also, there is plenty of space to store vehicles queued at the Stop sign without blocking the driveways.

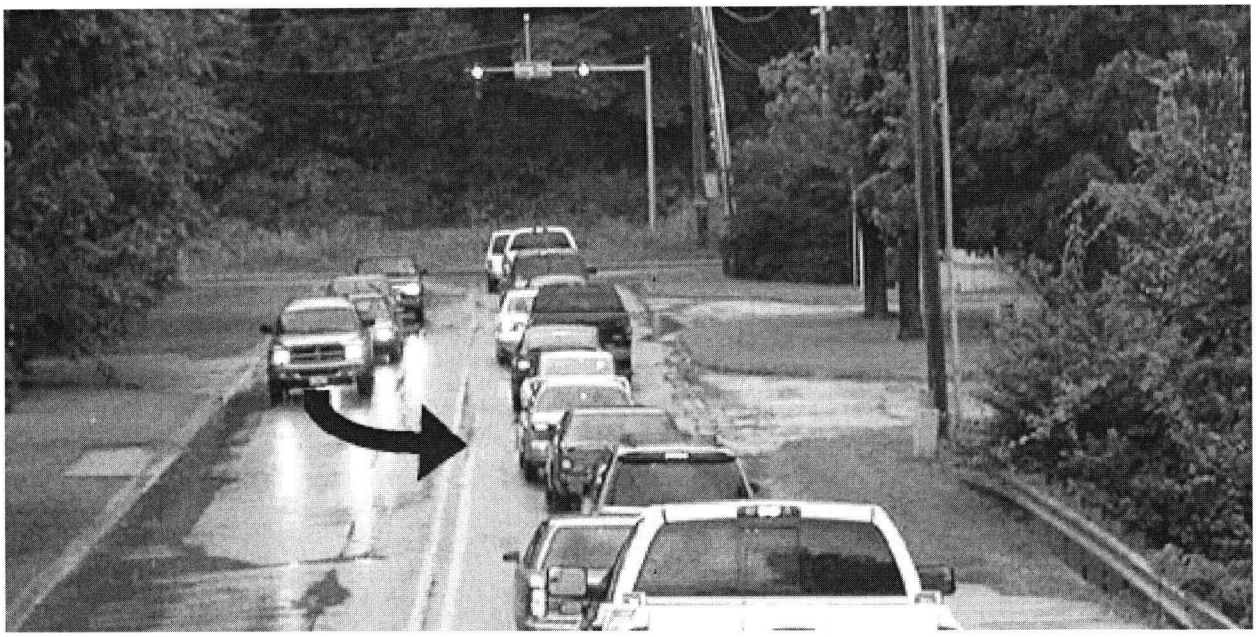
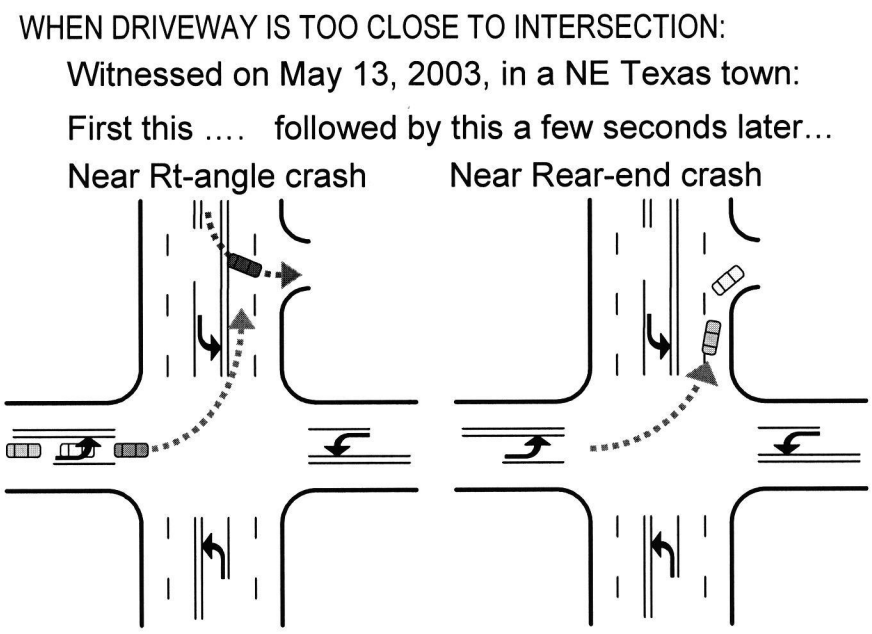


EXHIBIT 3-13 Without good corner clearance



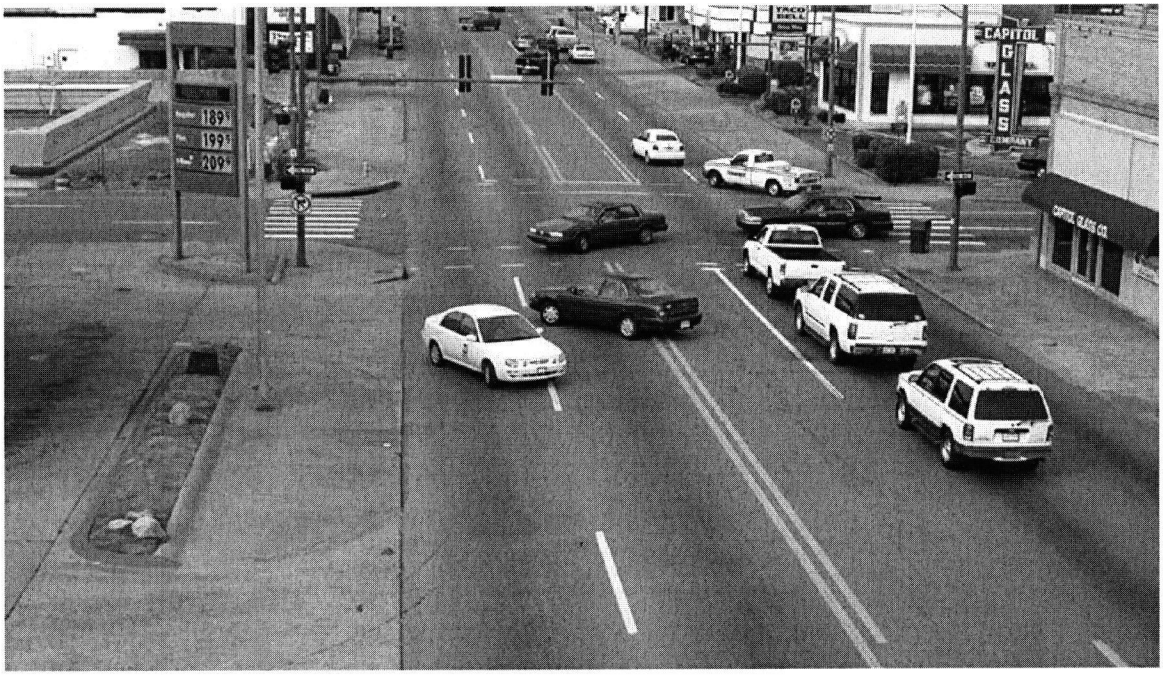


EXHIBIT 3-14 Conflicts arise from inadequate corner clearance

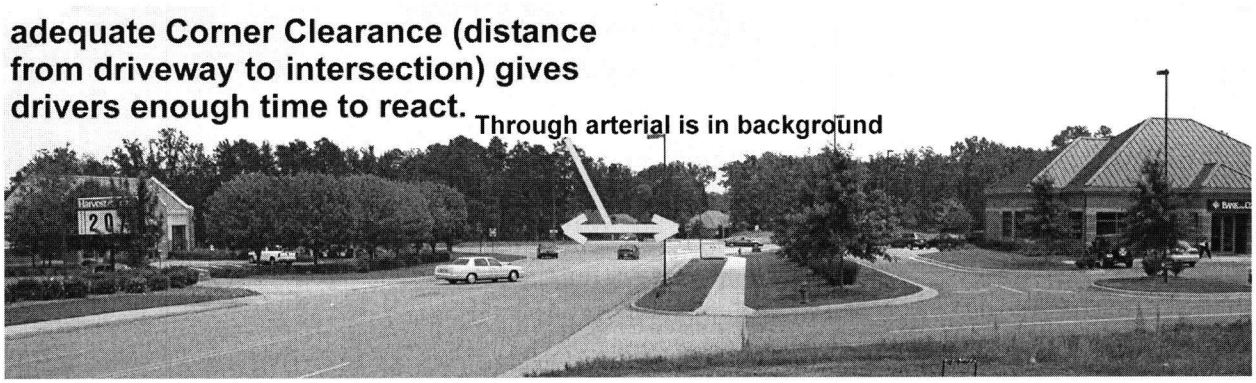


EXHIBIT 3-15 With good corner clearance

To determine just what is an adequate corner clearance, a number of variables are considered. The needed corner clearance distances are affected by speed, traffic volume, and signal timing. In addition to the previously mentioned considerations, the following factors should be taken into consideration (CAM 1996).

- upstream turn lane lengths
- upstream queue lengths
- upstream point at which deceleration begins
- downstream distance for the driver of a vehicle that has turned left into the roadway to get oriented (2 sec, or 45 to 60 ft)
- downstream distance to begin deceleration after clearing the intersection and turn into a driveway
- length of downstream acceleration lane, plus a buffer distance to the first driveway

Spacing of Signalized Intersections

Travel speed, signal cycle length, and signal spacing are not independent of each other -- they are interrelated. In order to provide the best possible two-way traffic progression between traffic signals along a primary highway, the spacing between traffic signals will need to be controlled.

In general, long spacings between signals increase the chances that the signal engineer can devise signal timing plans that are adequate for both the peak and the off-peak volumes, and substantially reduce stop-and-go operation (NHI). Long spacings increase capacity, and reduce fuel consumption and emissions (NHI). The more the signals deviate from a long, uniform spacing, the greater the reduction in the roadway capacity.

The ranges of speed and cycle length combinations more commonly found on suburban arterial streets are better accommodated by uniform 1/2 mile spacing than by shorter spacings. Sources recommend 1/2 mile as preferable to 1/4 mile spacing between signals (CAM 2003). The following Exhibit 3-16, which has appeared in many publications, illustrates why (Gluck et al. 1999). This figure is for two-way progression along a roadway with evenly spaced traffic signals.

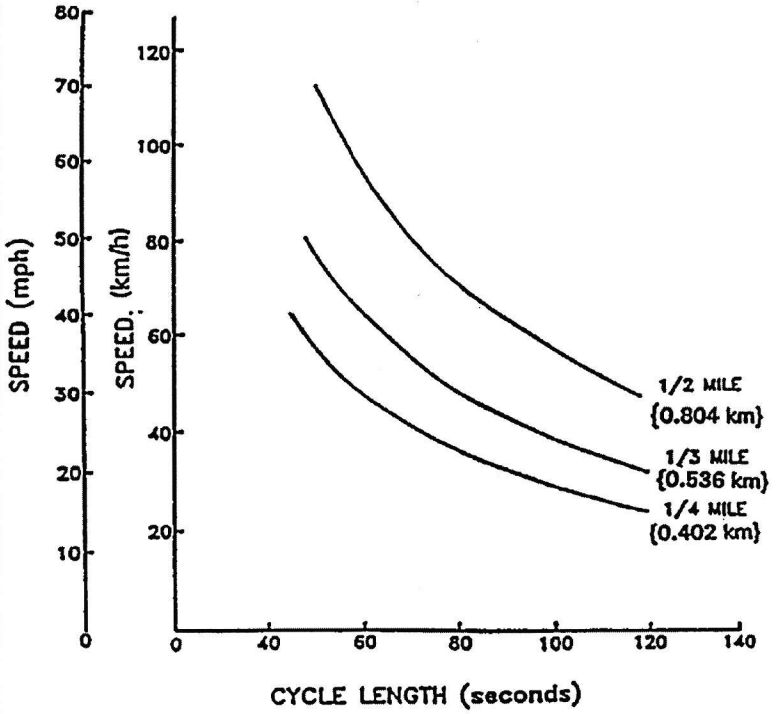


EXHIBIT 3-16 Relationship between signal spacing, cycle length, and speed

For peak period volumes, a uniform 1/2 mile spacing between signals provides progression at 30 mph with a 120 sec cycle. For off-peak periods, this same spacing will allow good progression at 45 mph for an 80 sec cycle, and at 55 mph for a 65 second cycle (CAM 1996).

Spacing of signalized locations should take precedence over unsignalized spacing, because by their very nature, signalized intersections are more critical for traffic flow, and because the laws of physics (i.e., that make velocity times time equal distance, and thus affect signal timing) are unchangeable. Signalized intersections should not be planned at locations where a signal would interfere with the through-band along the corridor. When a corridor is being planned, first identify where future signalized locations may be, then begin to identify where acceptable unsignalized intersections can be sited.

When locating driveways that may need signals now or in the future, other factors being similar, give preference to locations that can

- serve the most tracts;
- serve tracts on both sides of the road, as opposed to only one side; and
- serve the greatest volumes.

Exhibit 3-17 shows how locating driveways at the property line (driveway on the right) can serve traffic to and from four tracts instead of just two (driveway on the left).

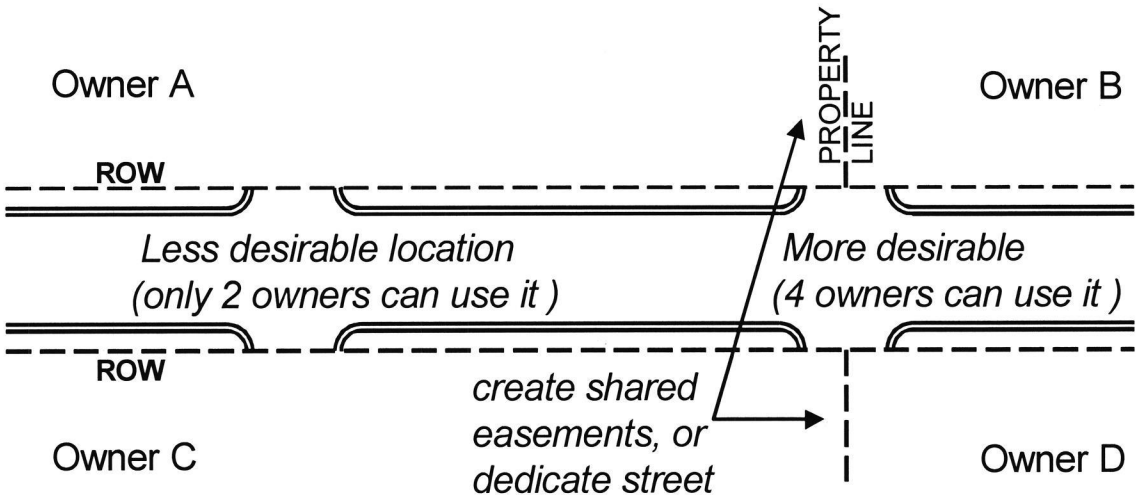


EXHIBIT 3-17 Locating access points so that more tracts can share access

Spacing of Ramp-Crossroad Junctions

Interchanges are a vital link between freeways and other major roadways. When traffic flow at an interchange breaks down, there is a major disruption to the movement of people and goods.

Exhibit 3-18 shows just one of the many problems that can occur when there is not enough space between a ramp terminal and downstream access points. Applying access management to the crossroads in the vicinity of freeway interchange ramps is a strategy to eliminate one source of traffic problems at interchanges. (Although some access management reports do discuss the spacing of interchanges along freeways, that issue is outside the scope of this report.)

On crossroads in the vicinity of freeway interchanges, techniques such as installing a non-traversable median and providing sufficient spacing along the crossroad from the junction of a freeway ramp to the first allowable access points (shown in Exhibit 3-19) need to be considered. These techniques are needed so that the drivers in vehicles coming off of the ramp onto the crossroad are not surprised by a vehicle turning immediately in front of them, and so that the additional weaving maneuvers often found in these areas can be safely accommodated.

Recently completed NCHRP Synthesis 332 (Butorac and Wen) stated:

"Thirty-one of the 36 responding agencies actively manage access to and from crossroads in the vicinity of interchanges. However, the way in which these agencies manage access varies ... In addition, the level of sophistication that the agencies have developed is highly diverse. Those in [six states are named] have adopted legislation and regulations, and have well established planning, operation, and design criteria...."

The report noted that:

"Many states rely on the guidance provided by AASHTO in an earlier publication, the 1991 *A Policy on Design Standards - Interstate System*. This publication recommends that access control be extended beyond the ramp terminal for minimum of 100 ft in urban areas and 300 ft. in rural areas. AASHTO recommends greater spacing for areas in which development has the potential to create traffic problems."

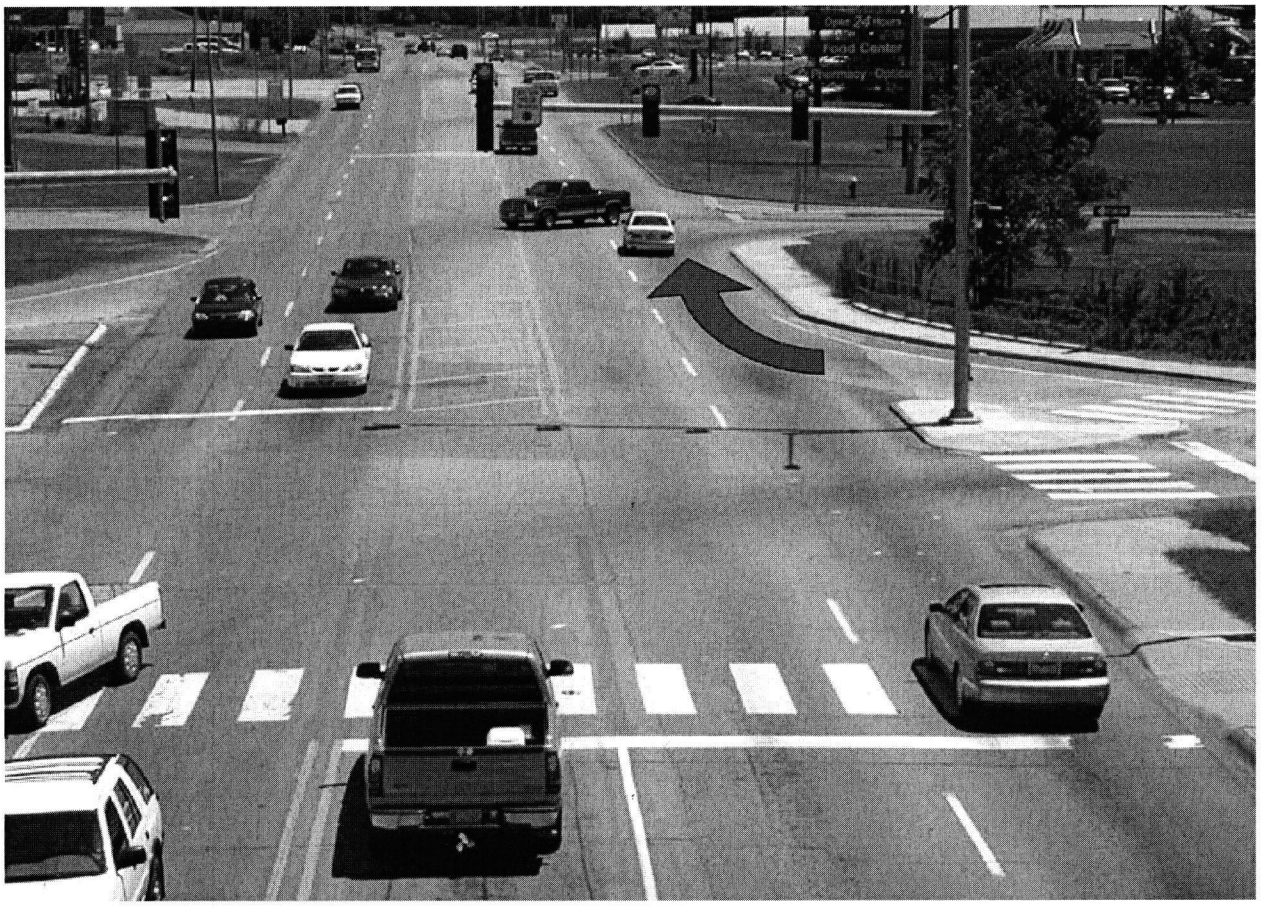


EXHIBIT 3-18 Traffic conflict with close spacing at ramp-crossroad junctions

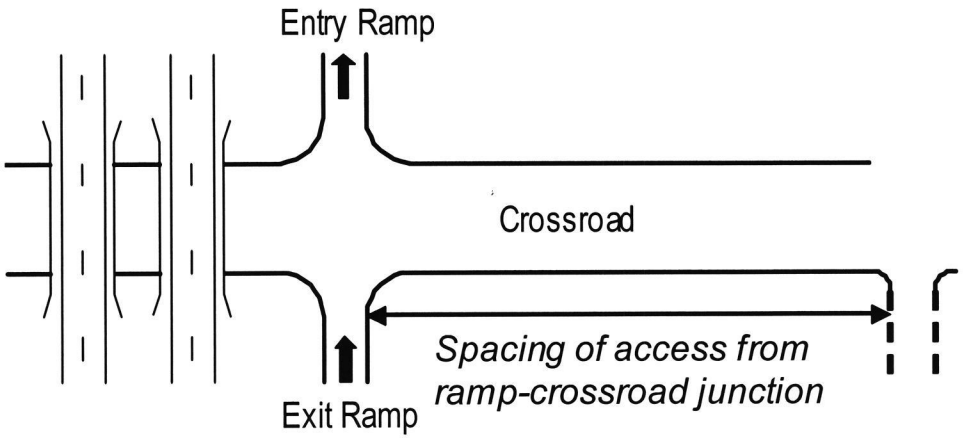


EXHIBIT 3-19 Access spacing at ramp-crossroad junctions

Ramp-Crossroad Spacing Factors

Consider the different traffic situations that a vehicle coming off of the ramp and onto the crossroad might encounter. Obviously, the vehicle exiting the ramp needs to merge into crossroad traffic. But downstream from this merge point, drivers can be faced with varying levels of complexity, including right-turn maneuvers, backup queues from stop-controlled or signal control intersections, or left-turn maneuvers. It would seem that when considering how much separation there should be from the merge point to the first downstream access point, one size does not fit all. For instance, the spacing from a ramp-crossroad junction to a signalized intersection will typically need to be greater than the spacing to a right-in/right-out only driveway.

The following factors help determine how much separation distance from the ramp-cross road intersection to nearby access points is needed (Butorac and Wen).

Interchange form: cloverleaf, diamond

Roadway classification of the crossroad

Type of access: right in/right out; left in/left out

Traffic control: unsignalized or signalized (consider cycle length)

Speed on the crossroad

Volume on the crossroad

Cross section: number of crossroad lanes

Vehicle storage requirement: to accommodate queuing at signals, left-turn lanes, etc.

When establishing standards for spacing between ramp-crossroad junctions and other access points, it is important to clearly define the point from which the spacing will be measured: the ramp centerline, the curb line, or an island nose.

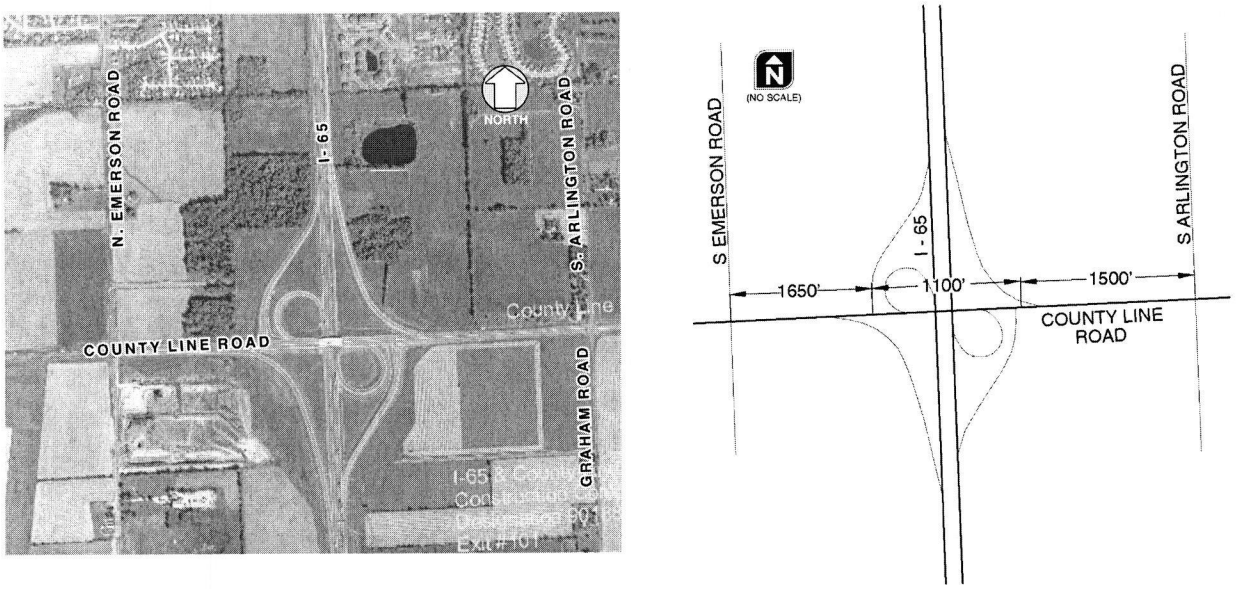
Ramp-Crossroad Spacing Examples

The following descriptions summarize two of the many examples given in NCHRP Synthesis 332 (Butorac and Wen).

I-65 Interchange with County Line Road, Indiana

The area was undergoing a transition from agricultural to suburban use, so the state evaluated the need for constructing an interchange (see Exhibit 3-20). Commercial and residential subdivisions had begun to develop nearby. The southbound ramp terminal had been signalized; little development had occurred to the east of the interchange.

The state established full access-control lines to maintain the operational integrity of County Line Road in the vicinity of the interchange. The state provided access roads to serve land locked parcels in order to avoid having to allow access to County Line Road near the interchange ramp terminals.



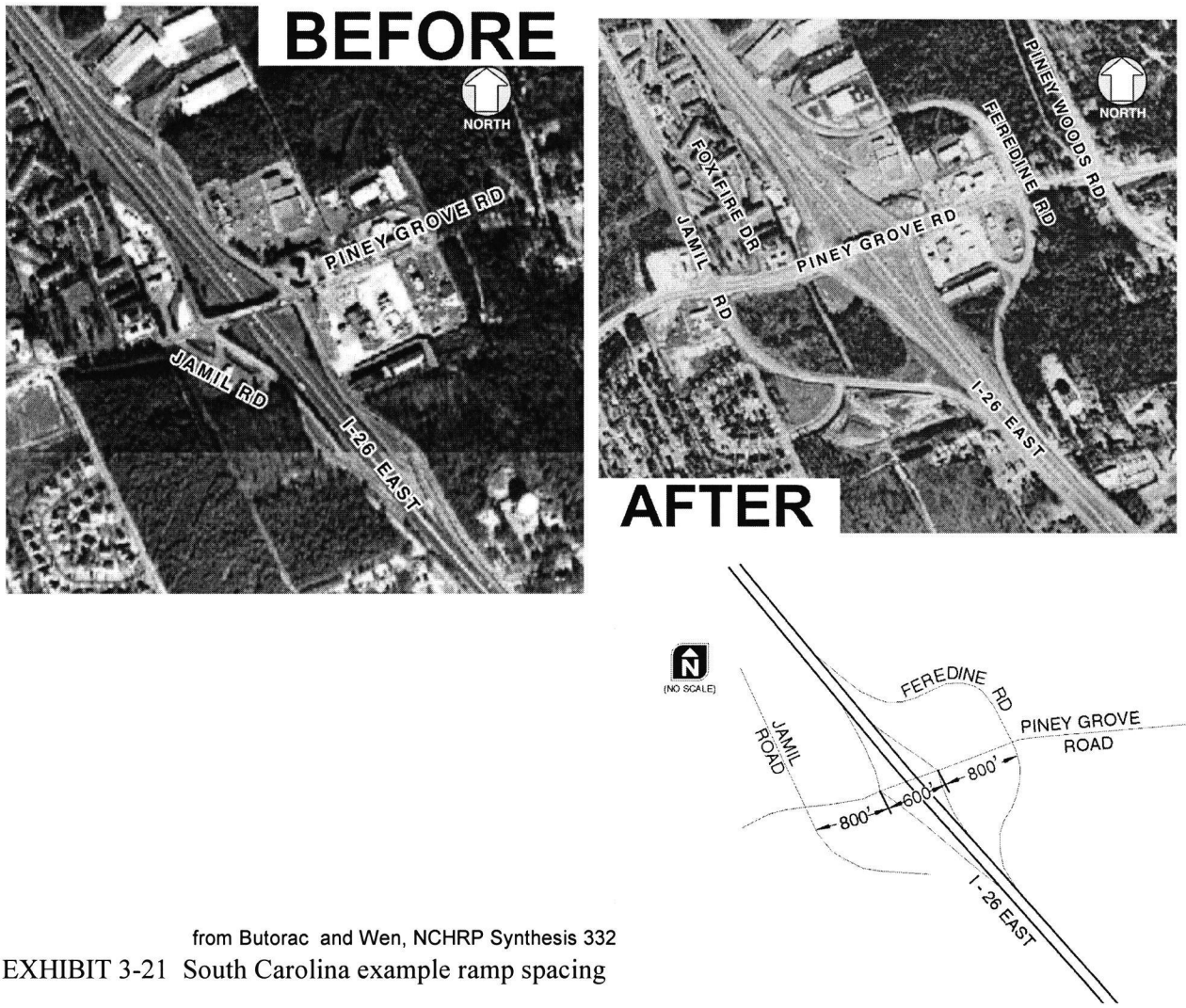
from Butorac and Wen, NCHRP Synthesis 332

EXHIBIT 3-20 Indiana example ramp spacing

I-26 Interchange with Piney Grove Road, South Carolina

This was a developing rural area, occupied by commercial and residential development. Ramps were connected to the two-way frontage roads. Properties in all four quadrants had full access to the frontage roads.

In the early 1990s, South Carolina determined the need to convert a partial interchange into a full interchange. This retrofit also afforded an opportunity to improve access management (see Exhibit 3-21). The state relocated the frontage roads, and constructed a raised median on Piney Grove Road. The new design separated what had previously been overlapping frontage roads and ramp terminals.



from Butorac and Wen, NCHRP Synthesis 332

EXHIBIT 3-21 South Carolina example ramp spacing

Spacing of Median Openings

One report stated that as a minimum, the separation between successive median openings needs to be long enough to accommodate the distance required for a vehicle in the through lane planning to turn left to decelerate from normal roadway speed to a stop, plus the length required to store the queue of vehicles waiting to turn left, plus the length of the opening itself, plus some minimal separation between successive openings (Stover et al.).

In a slightly different vein, a later report about channelizing intersections recommended left-turn lane bay taper lengths. These lengths were based on a 3 sec deceleration, followed by comfortable braking (Neuman). Although this is not exactly the same situation as is a median turn lane, it is interesting to note that the absolute minimums in NCHRP Report 93 are of the same order of magnitude as the desirable distances in NCHRP Report 279. Exhibit 3-22 shows recommended spacings from these two sources.

EXHIBIT 3-22 Minimum spacings between successive median openings

Arterial Speed (mph)	NCHRP 93 Absolute Minimum (ft)	NCHRP 93 Desirable Minimum (ft)	NCHRP 279 Desirable (ft)
30	190 + queue length	370 + queue length	235 + queue length
35	240 + queue length	460 + queue length	
40	300 + queue length	530 + queue length	315 + queue length
45	360 + queue length	670 + queue length	
50	430 + queue length	780 + queue length	435 + queue length
55	510 + queue length	910 + queue length	

NOTE: NCHRP 93 Absolute minimum based on 8.0 ft/sec^2 deceleration; Desirable based on 6.5 ft/sec^2 deceleration

from Stover et al., NCHRP Report 93; and Neuman, NCHRP Report 279

In some situations a full median opening would be unacceptable, but a partial opening -- allowing some but not all possible movements -- can be allowed. Exhibit 3-23 shows a common application, where a left turn into the big-box store site is permitted, but left turns out are denied.

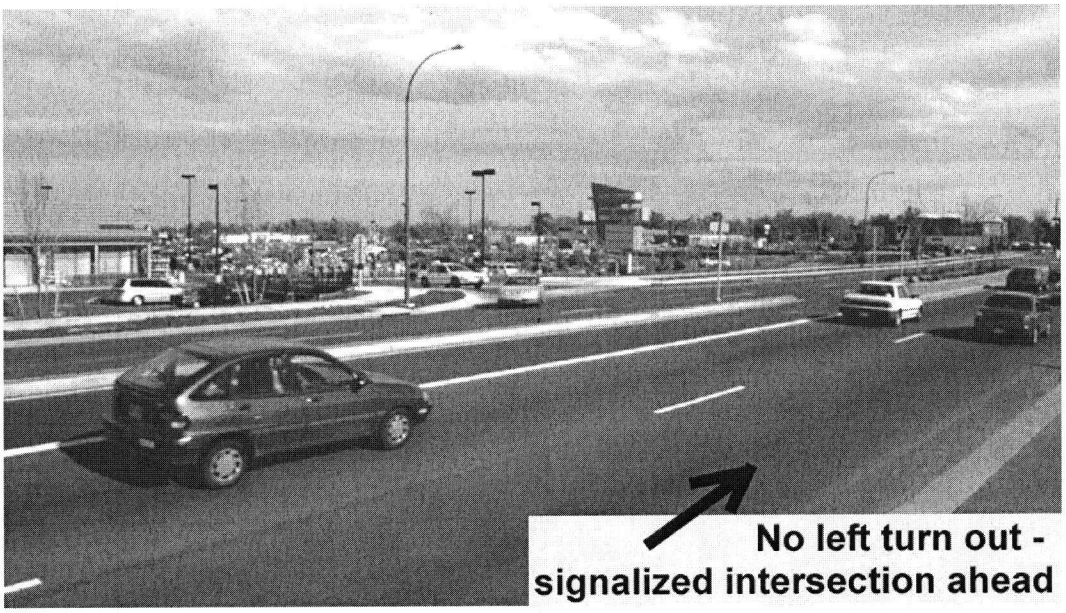


EXHIBIT 3-23 Partial median opening allows only left turn into the site

Where U-turns are allowed at median openings, care needs to be taken to make sure that the U-turn movement will not conflict with other movements. Driveways may need to be prohibited in the vicinity of the median opening. Of course, medians opening should be allowed only where sight distance is adequate.

Example Access Spacing Criteria

Access spacing criteria from three states (Kansas, New Mexico, South Dakota) are presented in Exhibits 3-24, 25, 26 as examples of what other states have implemented. Each of these three standards differs from the others, yet all share the common theme that the more important the road in terms of volume and speed, the greater the minimum spacing between access points.

Exhibit 3-27 displays a composite of access spacing as a function of speed. This graph was created by averaging the access spacings of 14 state transportation departments that use speed as one of the spacing determinants. The information was gleaned from web pages and manuals. Some states list multiple spacing values for different situations. For instance, Nevada lists one set of values for public access and another for private access (i.e., driveways). Therefore, two separate regression lines were fit, one for the average of the lower values and one for the average of the upper values. Note the consistent relationship between the increase in spacing as the roadway speed increased.

EXHIBIT 3-24 Example access spacing - Kansas ... (is continued on following pages)

ACCESS TYPE	AREA TYPE	ROUTE CLASS	POSTED HIGHWAY SPEED LIMIT (mph) 25	30	35	40	45	50	55	60	65
			SPACING "Z" in feet								
1,2,3,4	DEVELOPED	E	65	80	90	100	115	125	140	155	170
		C & D	85	105	120	140	160	175	195	215	230
		B	115	135	160	180	205	230	250	275	300
5,6	DEVELOPED	E	110	135	160	185	205	225	250	275	300
		C & D	135	165	195	225	250	275	305	335	365
		B	185	220	260	300	340	375	415	455	495
1,2,3,4	UNDEVELOPED	E	*	*	*	*	500	500	500	500	500
		D	*	*	*	*	660	660	660	660	660
		C	*	*	*	*	1320	1320	1320	1320	1320
		B	*	*	*	*	2640	2640	2640	2640	2640
5,6	UNDEVELOPED	E	135	165	195	225	250	280	305	330	355
		C & D	190	225	265	305	345	385	420	460	500
		B	235	280	330	380	430	480	520	565	610

NOTES: Adjust access spacing when adjacent Access Types (1 through 6) and Type of Area (Developed & Undeveloped) are adjacent to each other, EXAMPLE: Route Classification B, 45 mph speed, Access Type 4, Developed Area, adjacent to Type 5, Undeveloped Area. (60 m + 130 m = 190 m divided by 2 = 95 m)

Property Clearance (U) is 1/2 the value of Access Spacing (Z) as shown on this page (except for joint-use access.)

*= Low-speed, Types 1, 2, 3, & 4 access in Undeveloped Area are unlikely occurrences. If they do occur, use Type 5 & 6 Undeveloped Area spacing criteria.

**= Routes on the District Plans and the National Highway System are managed as "B" corridors regardless of route classifications.

***= Direct access to the State Highway System is not necessarily a permanent grant. Where necessary, access may be limited at its inception to a specific duration.

ACCESS TYPES

(a) LOW VOLUME (MINIMUM-USE), 0-49 VPD, maximum two-way access traffic count. TYPES 1, 2, 3, & 4.

TYPE 1: Non-commercial: Farm, agriculture, field, timber, cultivated, pasture, duplex, single family residential/home, apartment building containing five (5) or fewer dwelling units.

TYPE 2: Special-use: City water treatment plant, micro wave station, pipeline checkpoint, telephone repeater stations, utilities (electric, gas, telephone and water) check/maintenance stations and Corp. of Engineers dike roads.

TYPE 3: Fire station and/or paramedic emergency facility.

TYPE 4: Commercial: Farm, or residential, which generates less than 10 two-way vehicular movements during the peak hour of the facility or the highway and/or generates 49 VPD or less. If said property generates more than five (5) trucks per day the access driveway shall have adequate geometric and sufficient hard surface of concrete or asphalt.

(b) MEDIUM VOLUME, 50-499 VPD, and/or less than 50 vehicles per peak hour of the highway (two-way vehicular access count).

TYPE 5: Commercial, industrial or local road connections. Includes joint-use/shared access.

(c) HIGH VOLUME, 500 VPD and over, and/or 50 vehicles per peak hour of the highway or more.

TYPE 6: Commercial, industrial, or local road connection. Includes joint-use/shared access.

ROUTE CLASSES

A Routes: All routes on the Interstate Highway System.

B Routes: ... all non-Interstate routes designated on the National Highway System ... Further, this category applies to all segments identified as "growth corridors" in the District Plan.

These routes are to be protected by allowing for direct access only when alternative access is infeasible. When direct access is necessary, shared access will be required wherever possible... Such routes should be

protected by purchase of access rights whenever feasible.

C Routes: ... routes not on the National Highway System and not designated as a "growth corridor."
Alternative access will be utilized wherever feasible, however, direct access is not an option of last resort, and should be utilized wherever it proves more effective. Shared access will be utilized wherever possible.

D Routes: ... routes not on the National Highway System and not designated as a "growth corridor."
These routes are to be protected by a modest level of management...

E Routes: ... routes are to be protected by a minimum level of management.

(Example route classification map from KDOT Dist. 3)

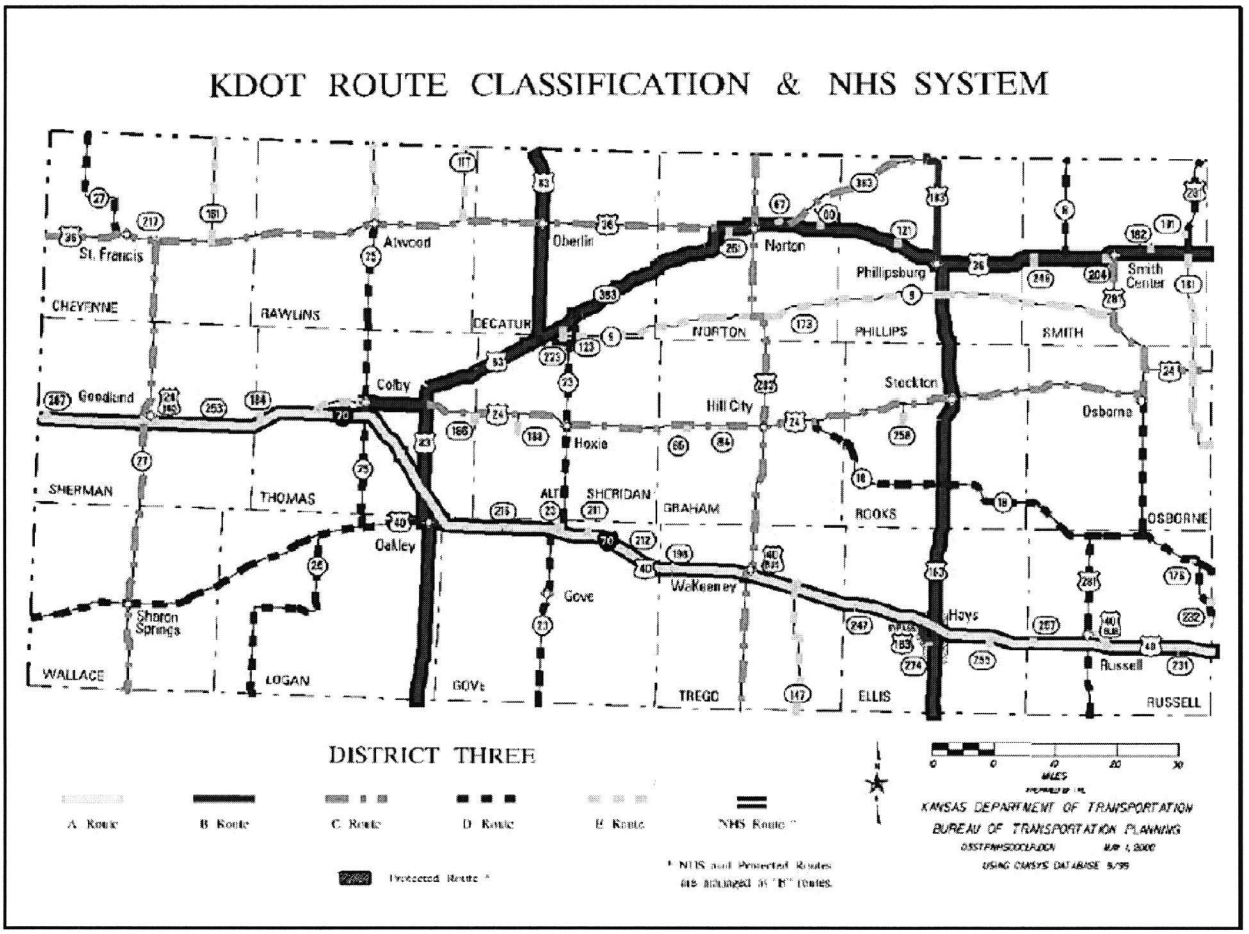


EXHIBIT 3-25 Example access spacing - New Mexico

Access Category	Posted Speed (mph)	Intersection spacing (ft)		Driveway Spacing (feet) Non-Traversable Median		Traversable Median
		Signalized	Unsignalized	Full Access	Partial Access	
Controlled-Access, Non-Interstate Highways	All Speeds	5,280	2,640	2,640	2,640	-NA-
Urban Principal Arterial	=30 mph	2,640	1,320	1,320	200	200
	35 to 40	2,640	1,320	1,320	325	325
	45 to 50	2,640	1,320	1,320	450	450
	=55 mph	5,280	1,320	1,320	625	625
Urban Minor Arterial	=30 mph	1,760	660	660	175	175
	35 to 40	1,760	660	660	275	275
	45 to 50	2,640	660	660	400	400
	=55 mph	5,280	1,320	1,320	600	600
Urban Collector	=30 mph	1,100	330	330	150	150
	35 to 40	1,320	330	330	225	225
	45 to 55	1,760	660	660	350	350
Rural Principal Arterial	=30 mph	2,640	1,320	1,320	225	225
	35 to 40	2,640	1,320	1,320	350	350
	45 to 50	5,280	2,640	2,640	500	500
	=55 mph	5,280	2,640	2,640	775	775
Rural Minor Arterial	=30 mph	1,760	660	660	200	200
	35 to 40	2,640	660	660	325	325
	45 to 50	2,640	1,320	1,320	450	450
	=55 mph	5,280	2,640	2,640	725	725
Rural Collector	=30 mph	1,320	330	330	200	200
	35 to 40	1,760	660	660	300	300
	45 to 50	2,640	1,320	1,320	425	425
	=55 mph	2,640	1,320	1,320	550	550

NOTES: Sept. 2001 Access spacing standards for intersections and driveways (centerline to centerline spacing in feet)
"Intersection" means a public street are other access serving a large area or a major traffic generator where full access is typically provided.
"Driveway means" a public or private access serving a limited area where traffic signal control is not required.
"Traversable median" includes highways with no median or a painted median.

EXHIBIT 3-26 Example access spacing - South Dakota

Access Class	Signal Spacing Distance (mile)	Median Opening Spacing (mile)	Minimum Unsignalized Access Spacing (feet)	Access Density
Interstate	N/A	N/A	N/A	N/A
Expressway	1/2	1/2	2,640	at 1/2 mile increments
Free-Flow Urban	1/2	½ F, ¼ D	1,320	at 1/4 mile increments
Intermediate Urban	1/2	½ F, ¼ D	660	at 1/8 mile increments
Urban Developed	1/4	1/2	100	2 accesses/block face
Urban Fringe	1/4	½ F, ¼ D	1,000	5 accesses/side/mile
Rural	N/A	N/A	1,000	5 access/side/mile

NOTES:
1. F = full movement; D = directional only
2. For all categories, direct access is denied when other access is available
3. May defer to stricter local standards
**

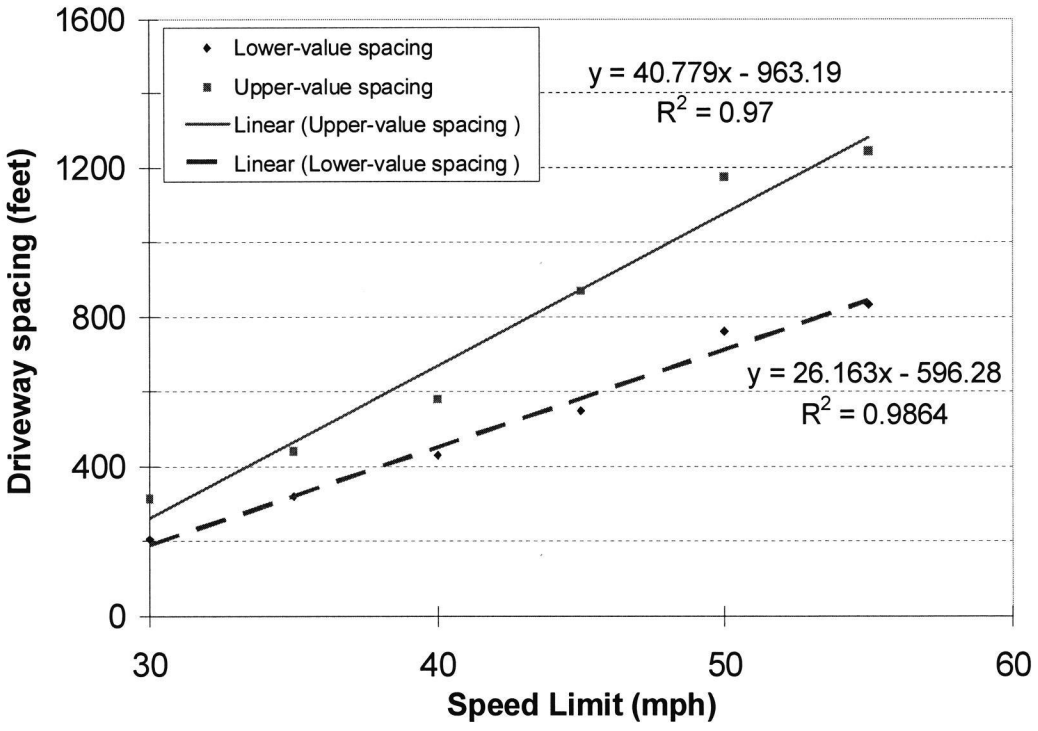


EXHIBIT 3-27 Composite access spacing based on roadway speed

ROADWAY AND DRIVEWAY DESIGN ELEMENTS

The various geometric design treatments that are employed to manage access also make traffic flow smoother and safer. Street design details and driveway design details are one component of an access management program. In addition, a transportation agency will establish warrants (or conditions) which will mandate the installation of design features such as medians and left-turn lanes.

Sight Distance

There are a number of different types of sight distance, such as stopping, passing, decision, and intersection. Of course, all roadways are supposed to be designed so that stopping sight distance is always provided. Designing the road with adequate intersection sight distance (ISD), so drivers entering or leaving side streets and driveways can view through traffic and determine whether or not an adequate gap exists in the through traffic stream, is essential for good management of roadway access. Design plans for major roadways should be checked to make sure that adequate intersection sight distance is provided at all connections. New connections should be allowed only at locations with adequate ISD.

Exhibit 3-28 shows two photos taken near a newly-constructed side street to a state highway. The top photo is the view from the side street. The lower photo, taken a few months later, is a view from the state highway toward the intersection with the new side street. The tire skid marks tell the story.

Medians

The benefits of providing a place out of the through lane for left-turn vehicles to wait for a gap in oncoming traffic are well established. Decades ago, roadway designers learned that inserting a continuous two-way left-turn lane (TWLTL) in a problematic four-lane roadway could eliminate around 1/4 of the crashes. Other safety research has indicated that a nontraversable (raised or depressed) median can be safer than a TWLTL section.

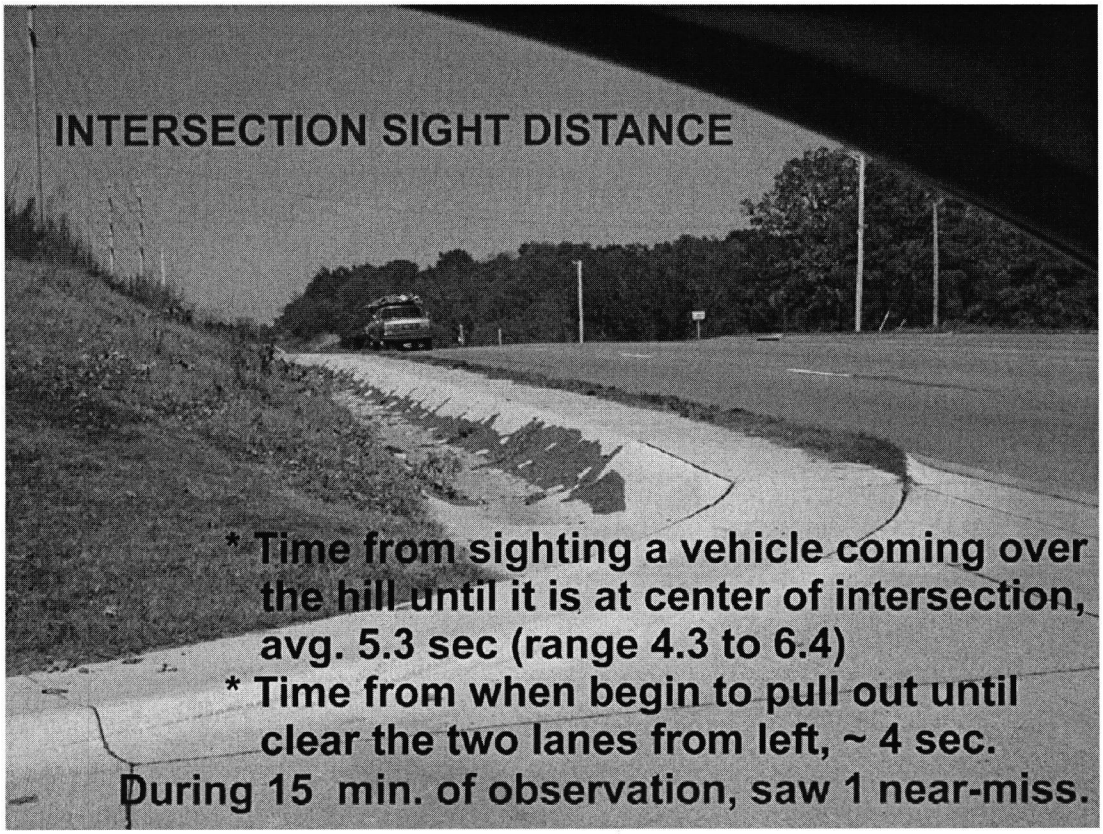
In areas with pedestrian traffic, raised medians offer a safety advantage (Bowman and Vecellio). The raised median provides a refuge for the pedestrian in the middle of a busy street.

With today's traffic volumes, the need for a double left-turn lane is becoming more common. To accommodate a double left-turn lane in a nontraversable median section, a median width of at least 26 ft to 30 ft is needed.

It is not uncommon to find landscaped medians. If medians are landscaped, then plant installation and maintenance criteria need to be established to ensure that the landscaping does not create a safety hazard (see Exhibit 3-29) by blocking drivers' needed lines-of-sight. Queries to a few states indicated that the states do not assume responsibilities for watering landscaping; that is left to local entities.

Turn Lanes

Experience shows that separate left and right-turn lanes improve safety and traffic flow by removing slow moving or stopped turning vehicles from through traffic lanes. Some transportation agencies have established warrants or conditions which will mandate the installation of separate left or right-turn lanes. Exhibit 3-30 presents the left-turn lane installation warrants used by one state.



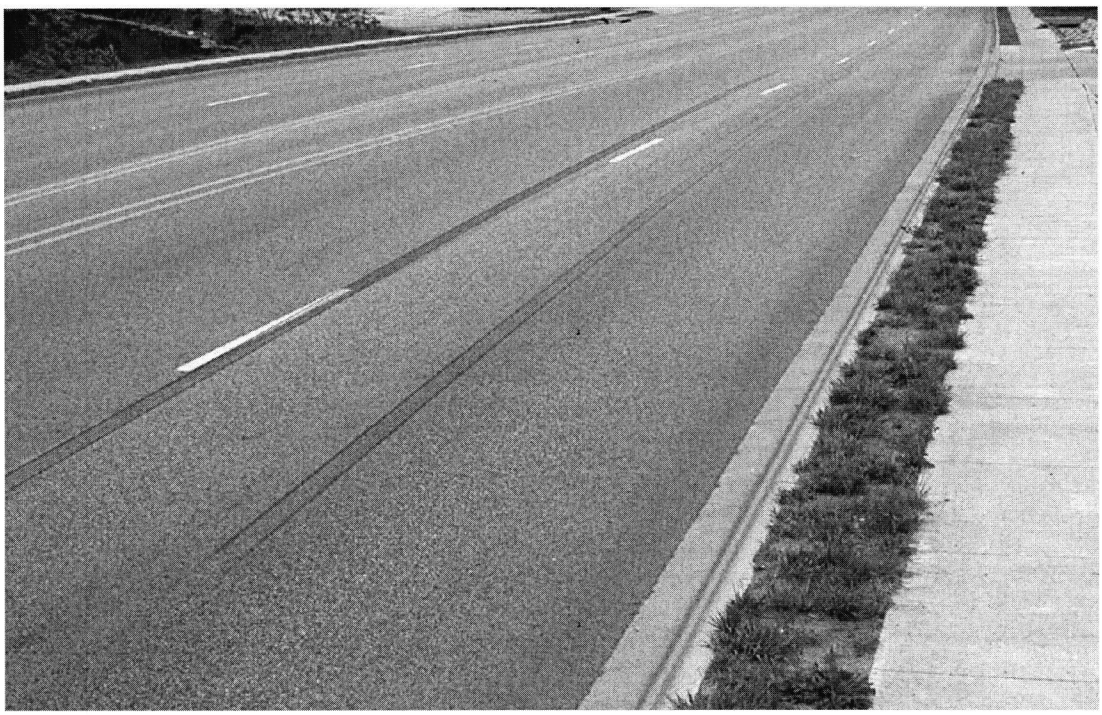


EXHIBIT 3-28 Limited intersection sight distance at a street intersection

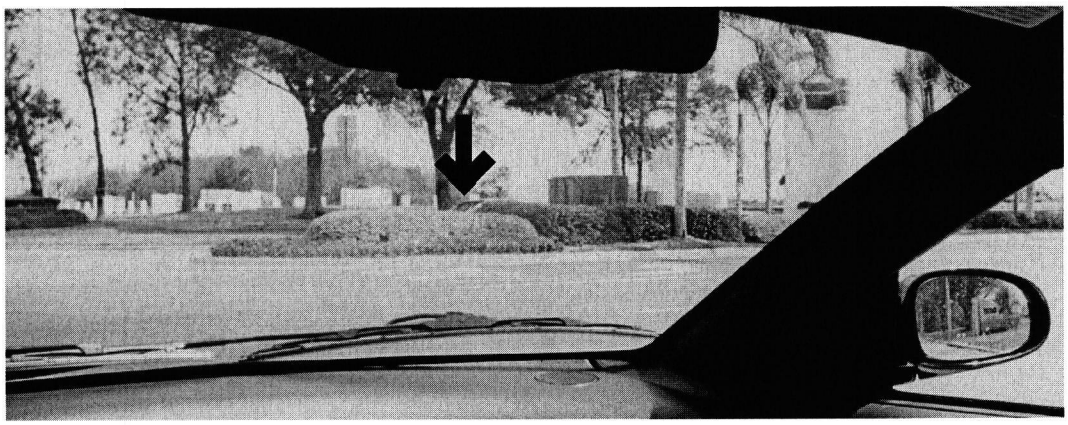


EXHIBIT 3-29 Landscaping in median blocks drivers' view of oncoming traffic

EXHIBIT 3-30 Example criteria for left-turn deceleration lane on urban multilane highways

Turning Volume (vph)	Minimum Volume in the Adjacent Through Lane (veh/lane-hr) (includes through vehicles and turning vehicles)		
	</= 30 mph	35 to 40 mph	45 to 55 mph
< 5	Not Required	Not Required	Not Required
5	Not Required	490	420
10	420	370	300
15	360	290	220
20	310	230	160
25	270	190	130
30	240	160	110
35	210	130	100
40	180	120	Required
45	160	110	Required
50	140	Required	Required
55	120	Required	Required
>/= 56	Required	Required	Required

Left-turn deceleration lanes are required on urban multi-lane highways for the following left-turn volumes:

≤ 30 mph : 56 vph or more

35 to 40 mph : 46 vph or more

45 to 55 mph : 36 vph or more

from New Mexico *State Access Mgmt. Manual*

An adequate left-turn lane will include both length for deceleration (as vehicles shift out of the through lane into the turn lane) and length for storing vehicles queued while waiting to turn left, as shown in Exhibit 3-31.

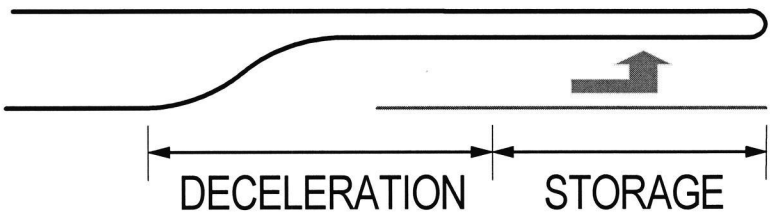


EXHIBIT 3-31 Turn lane deceleration and storage

> "Large speed differentials between through vehicles and maneuvering driveway vehicles create traffic inefficiency and its by-product, increased accident potential. Well-designed acceleration and deceleration lanes ... can minimize this factor by allowing driveway vehicles to enter and leave the arterial roadway at close to average running speed."
>
> Azzeh et al. Evaluation of Techniques for the Control of Direct Access to Arterial Highways

NCHRP Report 279, *Intersection Channelization Design Guide*, contains equations and drawings to determine the total length for a left-turn lane.

length for deceleration and breaking + length for storage = total left-turn lane length

The needed storage length is a function of a number of factors, including left-turn volume. The suggested length for deceleration and braking, as a function of speed, follow.

30 mph = 235 ft 40 mph = 315 ft 50 mph = 435 ft

A turn lane length design can fail when either traffic queued in the turn lane backs up into the through lane, or when through lane traffic backs up and denies entry into the turn lane. Therefore, locations with high volumes or long traffic signal cycles may require in much longer turn lane lengths.

U-Turns

Because nontraversable medians limit left-turn access into and out of some tracts along the roadway, states such as Michigan and New Jersey have used "jug-handle" or other designs to accommodate indirect left-turns. Perhaps the more commonly used roadway design approach is one that makes provisions for accommodating U-turns at certain locations (see Exhibit 3-32). The U-turns allow drivers to, with a little more indirection, get to and from sites that otherwise would not be accessible because direct left turns were prohibited.

In order to facilitate U-turns, one design treatment that may be called for is a localized widening or flaring of the roadway where the U-turns are to be allowed, to supply enough width for a vehicle to make the U-turn without striking the curb on the far side of the road, or running off the road. Of course, sight distance should be checked to make sure it is adequate before making provisions for U-turns at a location.

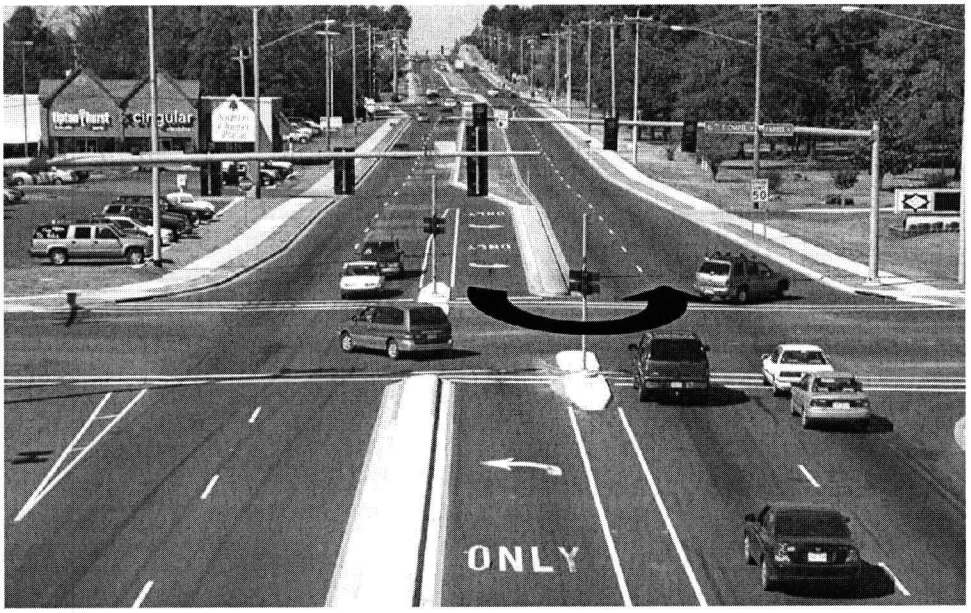


EXHIBIT 3-32 Vehicle making a U-turn on road with raised median

Continuous Right-Turn Lanes

Where a number of low- to moderate-volume driveways intersect the roadway, and the spacing between driveways is not long enough to install separate right-turn lanes for each driveway, then one way to remove right-turning vehicles from the through traffic lane is to install a continuous right-turn lane. A problem with continuous right-turn lanes is that they can be mistaken for through lanes, causing through traffic to unintentionally be trapped where the continuous right-turn lane finally terminates.

The NHI manual suggests that a continuous right-turn lane may be appropriate where the following conditions exist.

- maximum length less than 1/2 mile
- no more than one moderate- or high-volume access within the length of the continuous right-turn lane
- a nontraversable median with no median openings

The lane should both begin and end with triangular right-turn lane islands. The lane line marking separating the continuous right-turn lane from the through the lane to the left should be shorter than the normal lane line. A continuous right-turn lane should not extend through signalized intersections.

Improved Definition of the Border

Continuous, undefined driveways are created where the parking lot surface extends out to the roadway, and the parking lot is not physically separated from the roadway. One report recommended that some treatment be installed at the roadway edge for the purpose of physically defining where the driveway is. This treatment could be either a curb or a guardrail. These treatments would better define the driveway and therefore reduce the area of conflict between street and driveway traffic, improve driveway visibility, and make the area more pedestrian friendly (Dye).

Frontage or Service Road Design

Roadways that are generally parallel and adjacent to the main lanes of a route, and provide access to abutting properties while separating the abutting properties from the main lanes, have been called "frontage roads", "service roads", or "access roads."

One reason the frontage road concept was created was to restore access to tracts that would otherwise be landlocked or cut off from access after a controlled-access roadway was constructed. But experience has shown that some frontage roads can be problematic. With at-grade frontage roads, the close proximity of a crossroad-frontage road intersection to a crossroad-main lane intersection (as depicted in Exhibit 3-33) can create both congestion and safety problems. To address these problems, some frontage roads have been realigned in the immediate vicinity of the crossroad, and street networks have been either initially laid out or retrofitted with "reverse frontage" or "backage" roads, as Exhibit 3-34 shows.

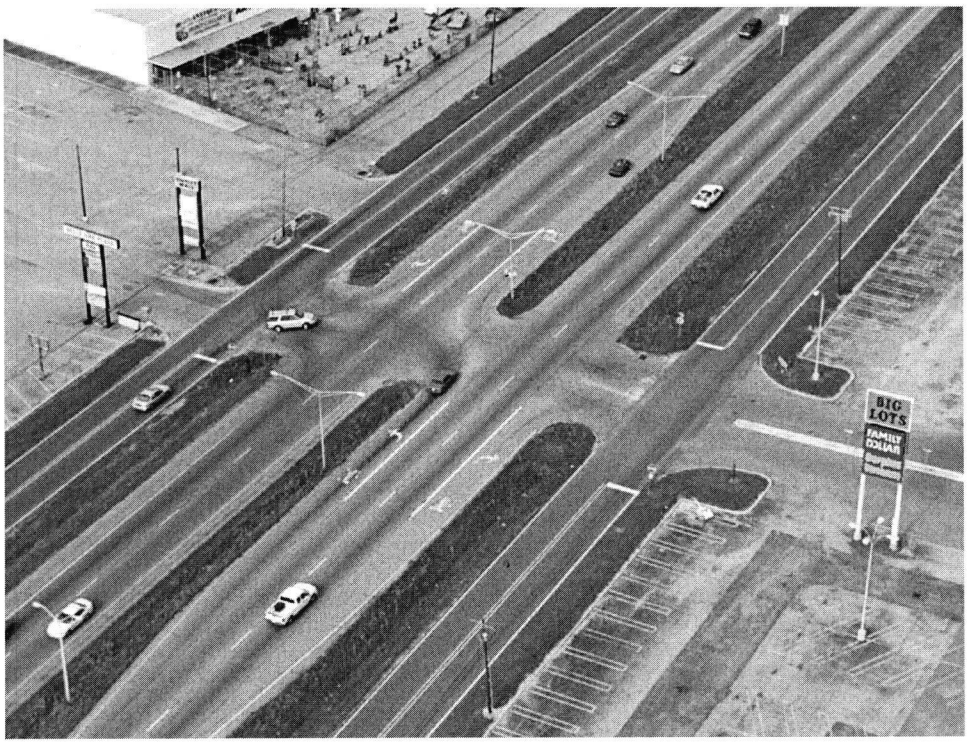


Photo: courtesy Phil Demosthenes

EXHIBIT 3-33 Frontage road intersection with cross street too close

Exhibit 3-35 shows a frontage or service road parallel to and at the same elevation with a through arterial (far left edge). In the background to the right, the frontage road alignment curves right, away from the main arterial, in order to create more separation between the cross street/arterial intersection (on the left) and the cross street/frontage road intersection (on the right). Although a relatively small realignment like this is certainly an improvement, it may not be adequate in some cases.

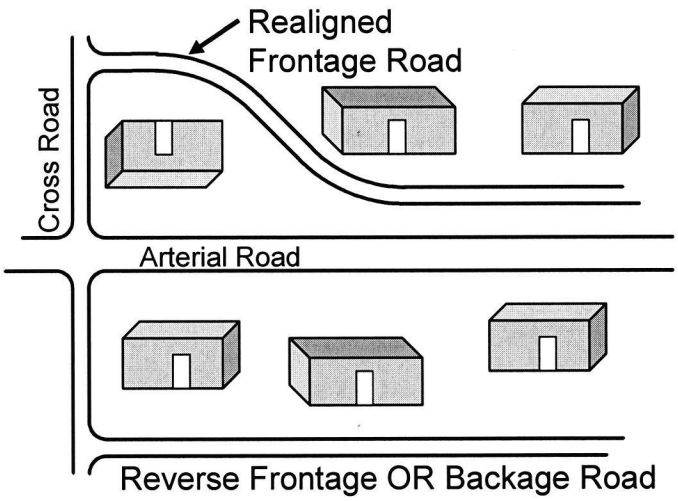


EXHIBIT 3-34 Frontage road treatments

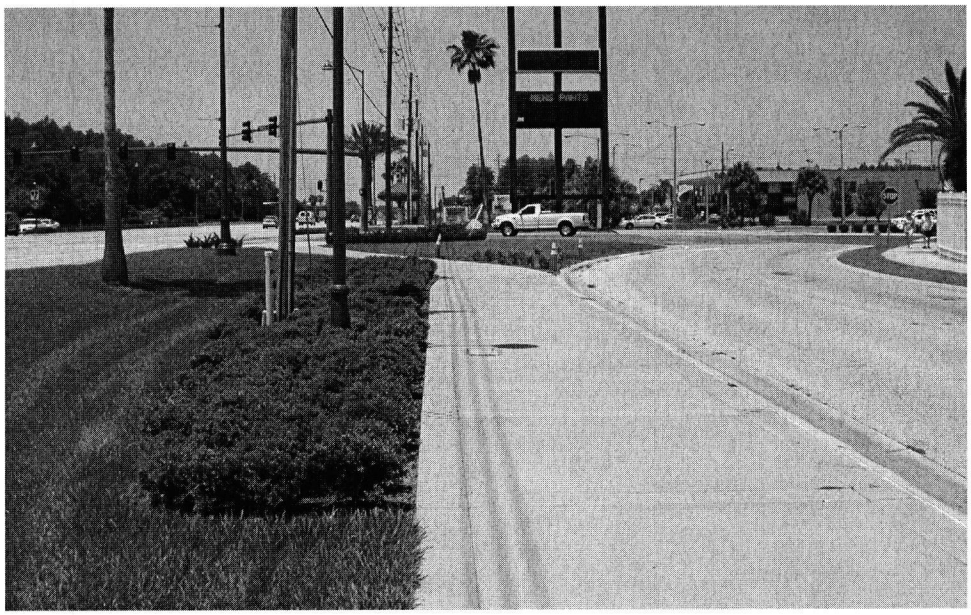


EXHIBIT 3-35 Minor frontage road realignment

Exhibit 3-36 shows a frontage road that had been realigned (to the right) from its original position on the left. This major realignment was constructed in order to create sufficient distance between the cross street/ramp intersection (on the left) and the cross street/frontage road intersection. Although frontage roads can certainly improve traffic flow in some situations, frontage roads alone may not be sufficient. Many cases can be found where an interconnected grid of local streets is needed to provide good traffic circulation to properties in an area.

Photo: courtesy Phil Demosthenes

EXHIBIT 3-36 Major frontage road realignment

Driveway Design Details

Driveway design standards are needed to ensure that drivers can easily and safely maneuver into and out of driveways, avoid pedestrians and other vehicles, and minimize the negative effects to drivers on the main roadway. Any design feature that unnecessarily impedes the flow of vehicles into or out of the driveway not only reduces the driveway capacity, but also possibly introduces a safety hazard by unnecessarily prolonging the exposure of driveway vehicles to the vehicles in the through traffic stream.

Design standards should call for an asphalt- or concrete-paved driveway surface at least within the limits of the right-of-way. This will reduce the tracking of dirt and other debris onto the through roadway, and the good surface will help drivers more quickly enter and leave the through roadway.

Driveway Cross Section

The width of the driveway affects the capacity of the driveway. Also, a driveway so narrow that vehicles entering and leaving are impeded can be a hazard, in that the exposure of slower turning vehicles to faster through traffic is unnecessarily prolonged.

For those driveways where vehicles can turn left out of the driveway, a three-lane cross section with one entry and two exit lanes should be considered (see Exhibit 3-37). This is so that drivers wanting to turn right out of the drive are not backed up behind and delayed by vehicles waiting to turn left. One source (NHI) stated that the ability to turn left out of the driveway is restricted even with volumes of 300 to 600 vehicles per hour (vph) on the through roadway, and that a three-lane cross-section should be considered when the driveway volume exceeds 30 vph.

For wider driveways, adding a median that separates entering traffic from exiting vehicles may help motorists. Questions have arisen about using a median in a three-lane driveway, with one entry and two

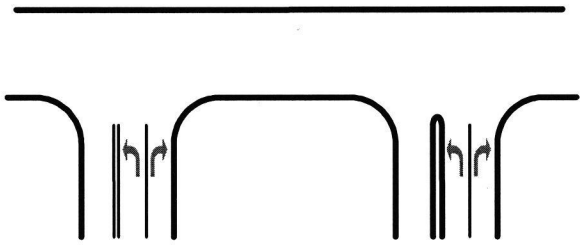


EXHIBIT 3-37 Many driveways need two exit lanes

exit lanes. Some think that drivers are confused by this, and will drive the wrong way on the wrong side of the median, a situation which may be addressed by signs or pavement marking arrows. There have been reports of locations with these designs having problems with oversize vehicles not being able to enter without running over the curb. A properly designed driveway will have been checked with turning templates such those found in Chapter 2 of the Green Book, to determine whether the combination of radius and width are adequate for the vehicles expected to use the drive. When there is only one entry lane, it may need to be 12 to 14 ft wide. Also, the median can be paved and constructed with a low, sloped-face curb that allows vehicles with a larger turning radius to drive over it. New Mexico requires that driveways have medians when there are two or more lanes for both entering and exiting vehicles (NM).

Driveway Radius

Driveway design attempts to balance competing needs: while a radius that is too small will result in vehicles running up over the curb or destroying the grass and making ruts the dirt (see Exhibit 3-38), an excessively large radius unnecessarily lengthens the path of pedestrians crossing the driveway. The driveway radius needs to be coordinated with the driveway width, so that the combination of radius and width can accommodate the vehicles that are regularly expected to use the drive. The design should also be checked to make sure that infrequent larger vehicles, with some encroachment into the adjacent driveway lanes, will also fit.

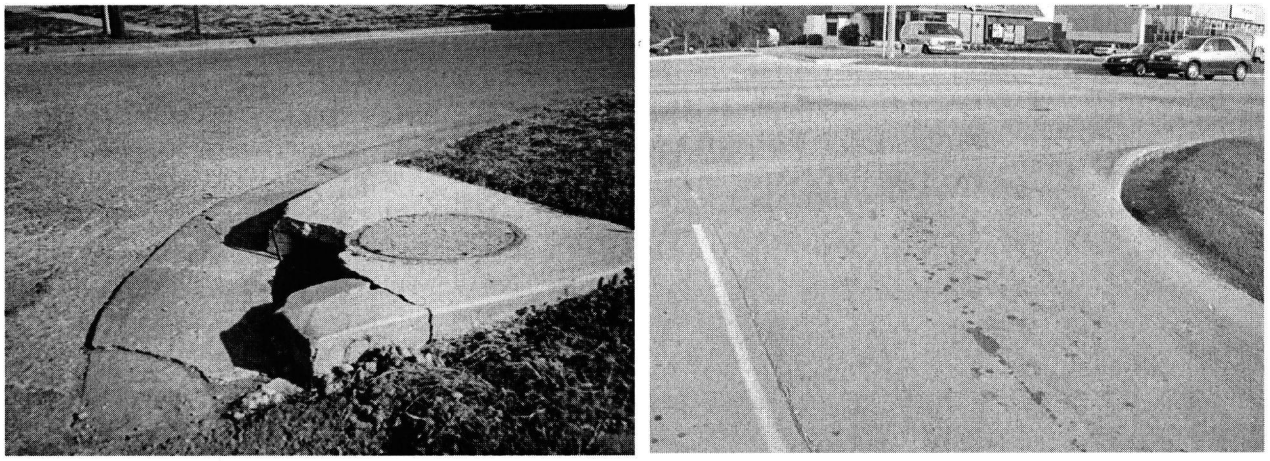


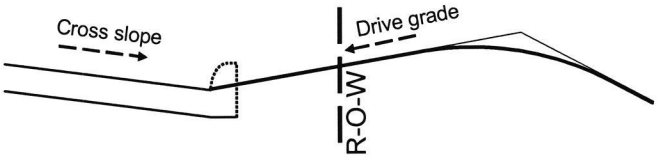
EXHIBIT 3-38 Inadequate radius

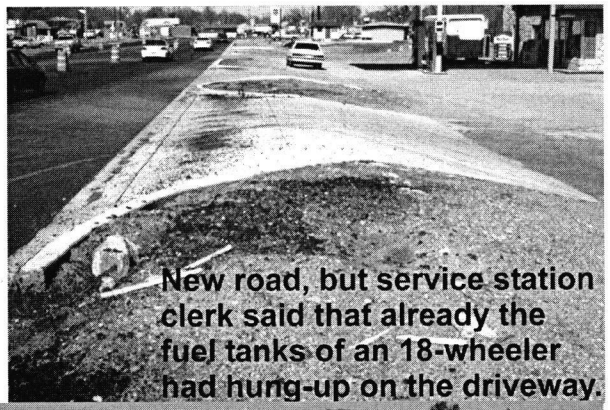
Driveway Profile Gradient

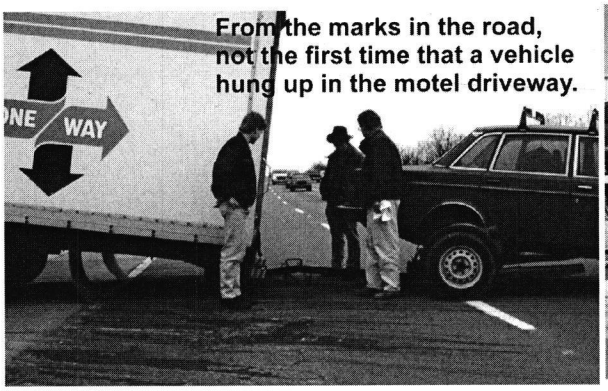
A driveway does not have to be as steep as the ones to the right (Exhibit 3-39) to cause real problems. A driveway profile gradient that is either too steep or has an abrupt grade change can impede the flow of vehicles into and out of the driveway, as vehicles slowdown to lessen the jolt. Even the 1" to 2" high bumps at some driveways, formed with a 2x4 laid on its side at the gutter line, are an impediment that should be prohibited. When vehicles have to slow to a crawl to enter or leave driveways, they not only reduce capacity but also increase their exposure to collisions with through street vehicles.

EXHIBIT 3-39 Obvious driveway grade problems

When designers do not pay attention to the combination of roadway cross slope and driveway grade, vehicles can "hang up" and block not only the driveway but also the through street, as shown in Exhibit 3-40. The combination of driveway grade and street cross slope needs to be controlled.







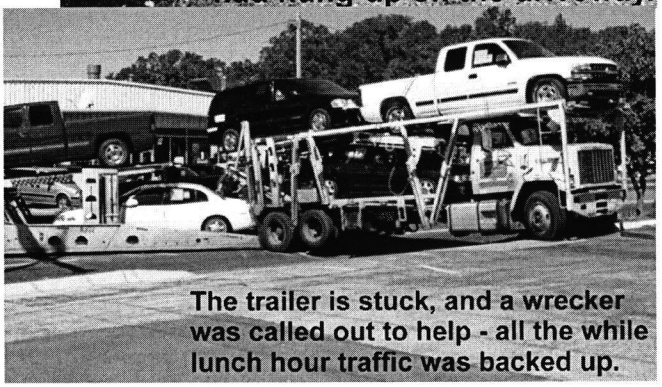


EXHIBIT 3-40 Driveway grade and roadway cross slope problems

In order to ensure adequate sight distance, New Mexico requires that the driveway grade not exceed 2% for a distance of 20 ft. back from the road edge (NM). Behind this, the maximum allowable grade is 8%, except that low-volume residential driveway grades may go up to 10%.

Driveway Connection Depth

Connection depth, also called throat depth or length, is the distance measured along the driveway from the roadway edge to the first point at which there is any traffic movement that conflicts with the driveway. The connection depth should be long enough so that traffic can have an uninterrupted and smooth transition between the main road and the parking lot.

If the connection depth is inadequate, traffic problems can occur in the driveway. Experience has shown that without regulations to ensure adequate driveway connection depths, traffic tie-ups in the driveway can even adversely affect traffic on the through street (see Exhibit 3-41). Exhibit 3-42 is an example connection depth requirement from one state.

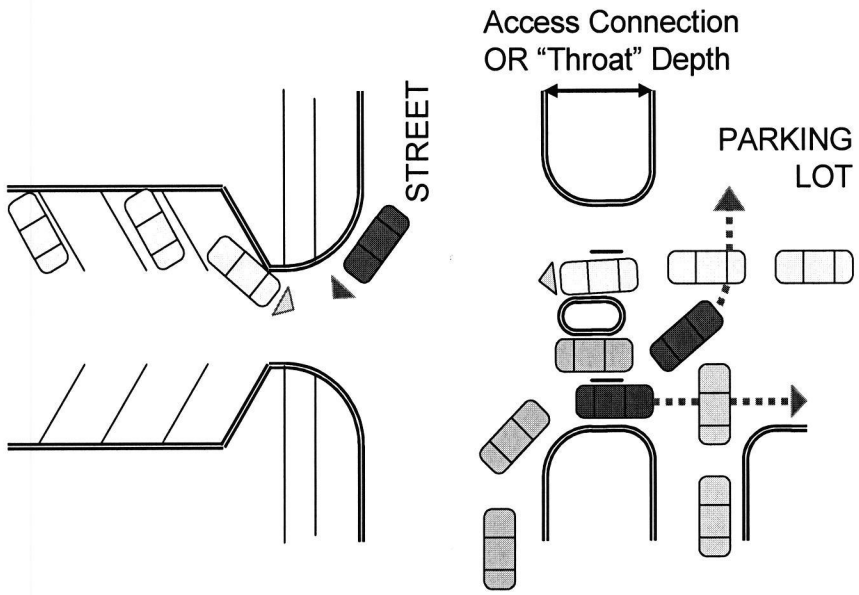


EXHIBIT 3-41 Traffic problems with inadequate connection (throat) depth

EXHIBIT 3-42 Example access connection depths

Land Use(s) Served by Access	Connection Depth
Regional Shopping Centers (malls)	250 feet
Community Shopping Center (supermarket, drug store, etc.)	80 feet
Small Strip Shopping Center	30 feet
Regional Office Complex	250 feet
Office Center	80 feet
Other Smaller Commercial Developments	30 feet

from New Mexico *State Access Mgmt. Manual*

Gated Intersecting Driveways and Streets

Gates and guard houses on driveways and side streets can cause traffic problems when they are placed too close to through roads. Gates, guard houses, and similar features on driveways and side streets should be set back or recessed far enough from the through road edge so that a vehicle or a queue of vehicles turning into the driveway or side street will clear the main road and not protrude out into it while stopped at the gate.

in an article about gated subdivisions...
"[new subdivision] promises to compound the [traffic] problem with the entrance set so close to the intersection..."

Roberts, Stacey. (Feb. 13, 2005) "Haven or hell?" *Arkansas Democrat-Gazette*, p. W-8,9. Lowell, AR.

The needed setback distance is affected by the number and type of vehicles expected to turn into the drive. The types of vehicles to design for may range from farm tractors pulling machinery to moving vans. For industrial sites, it may be a multiple trailer combination.

Driveway Triangular Islands

Some designers will place a triangular island (sometimes known as a "pork chop") in a driveway where it connects with the main road, as a way to allow only right-in and right-out driveway movements. Triangular islands, especially smaller ones, are not fully effective: a certain fraction of drivers will drive around or over a small triangular island in order to make a desired left turn into or out of the driveway, or they may make use the right-turn out lane to make a left turn into the site, driving the wrong way.

Exhibit 3-43 shows a small triangular island in the driveway. Islands like this one, which have neither the size nor the shape to be of any significant benefit, should not be used in an attempt to manage access. A non-traversable median is much more effective.

An AHTD District Engineer noted that in the vicinity of a triangular driveway island, they had installed pylons along the roadway centerline to further discourage wrong-way entry and egress. This installation to some degree replicates the effect of a non-traversable median.

EXHIBIT 3-43 Ineffective small triangular island

A triangular island may be more effective if a larger turn radius is used. A report prepared for the South Dakota DOT (Dye) recommended an alternative (shown in Exhibit 3-44) to the small, ineffective pork chop triangular island to discourage prohibited left-turn maneuvers in and out of a driveway.

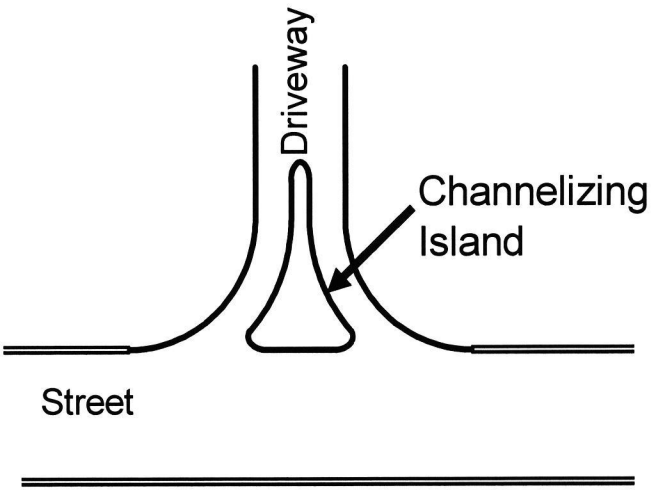


EXHIBIT 3-44 Modified triangular channelizing island to discourage left turns

Driveway Angle

The angle at which a driveway intersects the roadway needs to be regulated, because some driveway angles can create sight distance problems. In certain cases when streets and driveways intersect at angles much less than 90^{o}, the driver's ability to observe oncoming traffic from the right can be adversely affected. One study pointed out problems with angles of less than 70^{o} to the right of the driver on the driveway or side street (Gattis and Low). New Mexico dictates requires that the driveway extend perpendicular from the state highway for a minimum distance of 40 ft. Acute angles of between 75^{o} and 90^{o} may be allowed if significant physical constraints are present (NM).

On the other hand, angled driveways have been used as a device to discourage some turning movements, usually left turns, into or out of a driveway. Angled driveways may not be fully effective at discouraging certain movements, because some drivers will make a greater than 90^{o} turn in order to use them. A non-traversable median would probably be more effective.

APPLYING ACCESS POLICIES

A major aspect of applying access management policies is making sure that intersecting streets, driveways, and median openings are not installed in locations or in ways that violate the policies. To have an effective access management program, agency staff will have to review and evaluate access locations.

The following sections of this chapter and the related appendices discuss and show examples of how locations for present and future access are assigned.

Applying Access Policies to the Functional Intersection Area

It is desirable that no access be taken within the functional area of an intersection. It is undesirable to have a driveway intersect the roadway within a turn lane. New Mexico does not allow access within 50 ft of either the beginning or the end of a speed change lane (NM).

Allowing a driveway opening within the limits of a right-turn lane can lead to situations where a driver in the right lane slows to turn into the driveway, but the driver in the following vehicle thinks the car ahead is not turning until it reaches the intersection farther down the road. The following vehicle rear-ends the car ahead.

Applying Access Policies to Corner Lots

Normally, tracts at the intersection of two streets (i.e., corner lots) take access only from the minor street and have no access to the major roadway. As a general rule, the driveway should be placed as far as possible from the intersection.

Applying Access Policies to Adjacent Lots

One technique to help implement access management is for two adjacent tracts to share a common access driveway. This technique of joint or shared access is especially applicable where a number of small-frontage lots exist.

Joint or shared access agreements should be recorded as legal easements, with both of the adjacent owners granting driveway easement rights on the property of the other. The easement should be wider than the physical driveway, and extend from the right-of-way of line to beyond the first cross-circulation driveway (NHI). The easement should clearly state the responsibility and authority for maintenance of the driveway.

If an area is in the initial stages of development, then temporary driveways may be needed until tracts on both sides of the shared property line are developed.

Appendix C displays Overland Park, Kansas access easement forms, and Appendix D shows shared driveway forms from the Utah DOT. One of the Utah forms is used when one party is presently involved, and future development will create a second party. The other form is used when two parties are involved at the present time.

The state can strongly encourage local governments who have authority over site designs to require developers to install roadway, driveway, and sidewalk connections between adjacent commercial tracts when they are developed or redeveloped. This is so that bicycles and motorized vehicles can travel between adjacent tracts without having to pull out on the through street. Sometimes the design can also facilitate pedestrian travel.

Applying Access Policies to Subdivided Lots

When an owner subdivides or sells part of a tract abutting the state route to another owner, access problems can arise, as the following scenarios illustrate.

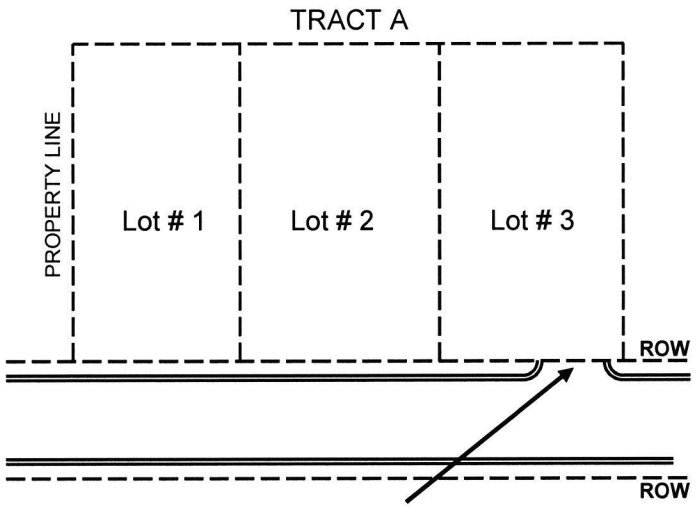
- An existing tract bordered by both the state route and a local road has access solely to the local road. The existing owner sells a portion of the tract along the highway to another buyer. The new buyer

now wants access to the state highway, since the new buyer's part of the subdivided tract is cut-off from the local road.

- An existing tract abuts the state highway, and has one access connection to the highway. The present owner subdivides the tract into three parcels and sells two of them. The two new owners each want an access connection to the state highway to serve their tracts.

Before the larger tract is subdivided, the access permit should be applied to the entire tract. If separate lots are under a common ownership and function as a single tract, the access permit may need to apply to each lot (see Exhibit 3-45). If the property is subdivided or part is sold at a later date, all parcels will still retain access via the original driveway, and the access permit will propagate to each subdivided parcel. This provision should be recorded with the property deed records.

It seems to be generally accepted that local governments, with their authority to control subdivisions and zoning, are better positioned to encourage property owners to share driveways than are state governments (Williams 2002). Local governments sometime offer minor zoning or other concessions to encourage owners to share driveways.



All 3 lots in Tract A are currently under common ownership, so they are permitted to a single access point (in case the three lots are not under the same ownership in the future).

EXHIBIT 3-45 Planning for future shared access

Denying Access

Some access applications will be denied. Conditions which will prompt a denial of access at a particular location include:

- appropriate alterative access is available,
- the spacing between access points is not adequate,
- the sight distance is not adequate, or
- the driveway grade is too steep.

Some, if not many, of these denials will be prompted by site designs which place proposed access points at poor locations. These denials could be avoided if the site designer were better informed and laid out the site so that the access was taken from a better location.

In a survey of states (Williams 2002), all but one reported that they were allowed to deny access. Nineteen states mentioned safety (e.g., inadequate sight distance) as a prime reason for denying access. Other reasons for denial include alternative access being available to another roadway, the driveway being too close to a traffic signal, or the state owning the access rights.

Where access is denied, the reason(s) need to be well documented -- do not just state "does not meet standards." The denial should record the applicable rules, the facts of the situation, and how the combination of the rules and the facts led to the conclusion of denial. A complete record that presents an understandable analysis can be helpful both in the present, if the denial is challenged, and in the future, if the issue is revisited after memories have faded.

Alternative Yet Reasonable Access

One reason to deny access to a tract is if reasonable alternative access is available on a side or lesser street. This raises the question of what constitutes reasonable alternative access.

In New Jersey, an existing access can be revoked without compensation if reasonable alternative access is provided. The alternative access does not have to be from a state highway. For alternative access to be considered reasonable, it must pass five tests (NJ).

1. The alternative access is provided via a parallel or perpendicular street, highway, easement, service road or common driveway.
2. The alternative access is of sufficient design to support commercial traffic to and from the business or use.
   - The path can carry the size and type of traffic for the commercial use
   - Capacity to handle the anticipated volume of traffic, as of the date of the notice to the owner
   - Pavement strength to handle the weight of the anticipated traffic
   - Driveways must handle anticipated volume, size and type of vehicles
3. The alternative access is convenient.
   - The access fits with the site
   - The access lines up with traffic circulation aisles
   - The access serves loading areas, drive-up windows, etc.
4. The alternative access is direct.
   - Relatively straight
   - There are limited choices along the path
5. The alternative access provides a well-marked means of reaching the site and returning to the State highway.
   - Signs are provided to direct motorists from the existing ingress to the alternative ingress, and from the existing egress back to the highway
   - A sign will be provided at each place where a motorist will have to make a decision. Sign size will be 8 square feet, consist of a white message on blue or green background, and be maintained for at least one year.

- Commercial Property

  Access onto any parallel or perpendicular roadway which is of sufficient design to support commercial traffic and is convenient, direct and well marked.
- Industrial Property

  Access onto any improved roadway which is of sufficient design to support necessary truck/employee access as required by the industry.
- Residential/Agricultural Property

  Access onto any improved public street or highway.

Applying Standards to Existing Situations

Many existing roadways -- in particular, older commercial strip developments -- tend to be dotted with undesirable access design features. A project that applies access management design principles to existing, already built-up street corridors is sometimes called a "retrofit" project. Common techniques in these retrofit projects include installing non-traversable (e.g., raised or depressed) medians, eliminating redundant driveways, relocating driveways, improving or widening driveways on side streets, and modifying driveways. Exhibit 3-46 presents a before-and-after retrofit schematic of a retrofit project that reduces and redirects access from the main thoroughfare to the side streets.

Factors which will prompt the closing of an existing driveway include:
- the driveway was installed in violation of a permit (or had no permit);
- the driveway is causing safety or operational problems.

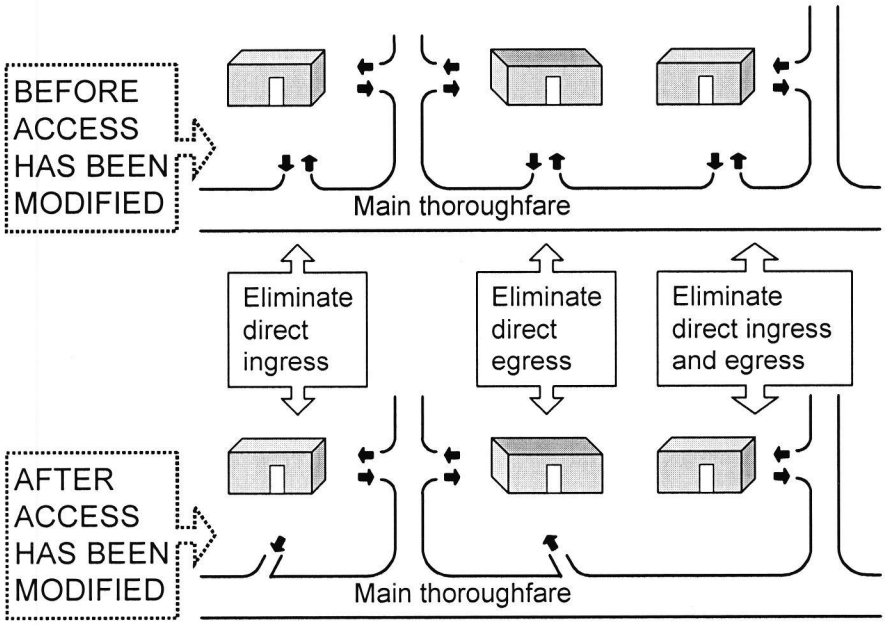


EXHIBIT 3-46 Objectives of a main thoroughfare retrofit project

During the design of a retrofit project, the engineer needs to envision how alternate access and circulation can be developed for each tract along the roadway. When the time arrives to present proposals to property owners, the engineer should be prepared to solve problems in order to help overcome objections to the retrofit project. In some jurisdictions, the state's consultant will help private owners figure out suitable alternative traffic circulation plans for the site at no charge to the property owner.

Retrofit projects can be complex and challenging. Along roadways where the property lines, buildings, and driveways have already been established, the benefits from any access management modifications have to be weighed against the costs and any disruptions that would be caused by modifying, moving, or eliminating driveways and median openings. While bringing such roadways into compliance may not always be a sufficiently high priority to pass the threshold for effort and funding, access management policies and standards can be applied when land along existing roadways redevelops, to keep the situation from further deteriorating.

Interviews with governmental agency staff indicate that retrofit projects tend to be combined state and local efforts, with an added degree of property owner cooperation. A retrofit access management project may be accompanied by other incentives from the local government to the property owners, such as beautification or minor discretionary code variances. The government pays the cost of modifying existing driveways, and may also pay for parking lot modifications to accommodate changes in on-site traffic circulation patterns necessitated by the driveway modifications.

It is not uncommon to find that a retrofit project cannot fully accomplish all access management objectives. Those with experience in this area offer that installing or modifying a median is commonly done. Unneeded multiple driveways can be eliminated, provided the onsite circulation pattern will accommodate the reduced number of driveways. But if lot frontages are small, some driveway spacings may remain less than desired.

Retrofit Example 1: Corridor Retrofit

Exhibit 3-47 shows a corridor extending from an outlying freeway to the downtown. It is lined with tourist-oriented and other commercial establishments, and carries 60,000 vpd. When this segment was reconstructed, nine median openings were closed. Note that in some places, the driveway spacings remained less than optimal after the recent roadway reconstruction project was completed.

Retrofit Example 2: A Spot Retrofit

Exhibit 3-48 shows a retrofit to a small shopping area on the left side of the arterial roadway. Vehicles turning left in to or out of the driveway in the foreground were interfering with traffic flows at a nearby signalized intersection (not visible, behind the viewer). A raised median was installed that prevented left-turn movements to and from the driveway in the foreground. The driveway in the background still serves left-turn ingress and egress movements to and from the shopping area.

Retrofit Example 3 - Modify Existing Raised Median

This example retrofit shows a roadway with an existing raised median (see Appendix E-1). The median opening spacing was modified to improve traffic safety, as the following listing describes.

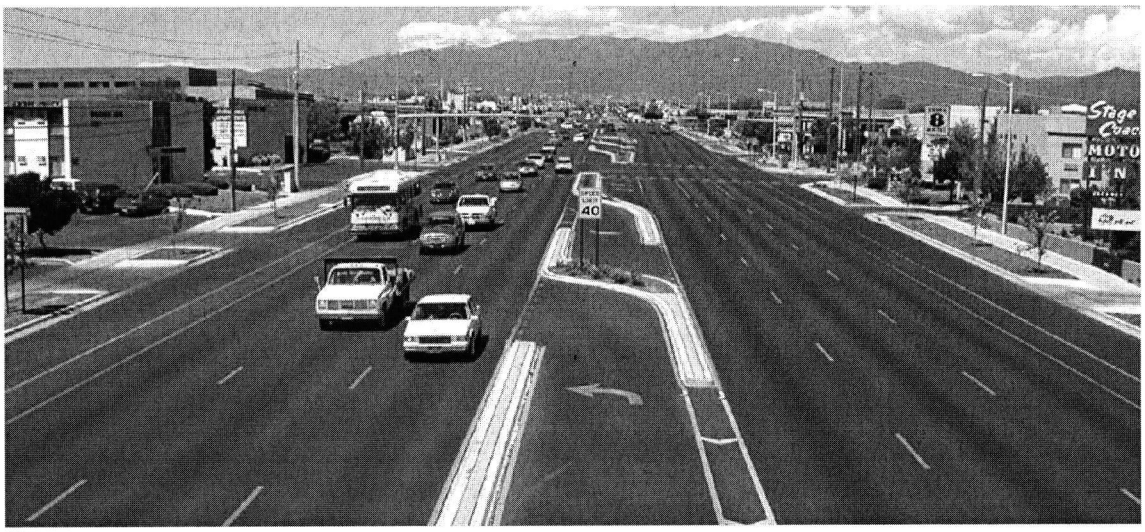


EXHIBIT 3-47 Example corridor retrofit

EXHIBIT 3-48 Example spot retrofit

Existing: State Highway 520, 4-lane divided, ~ 0.9 mile, 35 to 45 mph, 26,500 vpd, 3 traffic signals. Separate left-turn lanes not present at all the median openings. Abutting land use is primarily commercial, with residential uses along the side streets extending north and south from SH 520.

Problem: rear-end collisions near signalized intersections.

Analysis: median openings too close together, left-turn lanes lack adequate deceleration and storage length.

Proposed: after conducting traffic counts to determine need, recommended modifying or eliminating some median openings, providing additional and longer left-turn lanes.

Notes: The distance between the full median openings at Blake and Washington Aves. is slightly less than the standard of 1320 ft.

The distance between the full and partial median openings at Wilson and Washington is less than the standard of 660 ft.

Retrofit Example 4 - Replace Existing TWLTL with Raised Median

This example retrofit shows a two-way left-turn lane being replaced with a raised median (see Appendix E-2).

Existing: State Highway 434, 5-lane (TWLTL), ~2.4 miles, 45 mph, 21,000 to 36,000 vpd, 8 traffic signals. Abutting land uses include commercial and professional, multifamily residential, single family residential, school, golf course.

Problems: high occurrence of rear-end, angle, pedestrian and bicycle crashes; two signalized intersections operating at LOS D.

Analysis: unsatisfactory traffic signal spacing; need to address the crash problem.

Proposed: Traffic volume counts (including peak period driveway turning movements) and traffic simulation were performed. Most of the project length was converted from 5-lane (TWLTL) design to 4-lane with a raised median. The new median includes both full and directional (partial) median openings.

Notes: A written summary of the public meeting stated that the residents did not want medians; they feel the proposed median treatments will negatively impact their businesses and homes without providing substantial benefits. A 0.46 mile segment in the middle of the overall project remained 5-lane (TWLTL).

VARIANCES AND APPEALS

> "The willingness of upper management and elected officials to enforce the standards is critical to maintaining consistency."
>
> Williams, NCHRP Synthesis 304

It is difficult if not impossible to write a set of rules that will always fit all situations -- somewhere there is an exception. Implementing access management, especially after the land along the roadway has been developed, may in some cases produce an unreasonable outcome. For instance, adhering to the rules may totally deprive a property of access. To deal with such cases, an agency will need to develop procedures for an applicant to receive a variance (also referred to as a

deviation, exception, or waiver). When an initial application for access has been denied, there should be a process for the applicant to appeal the decision to a higher level, without having to directly go to court. However, for both variances and appeals, the responsibility falls to the applicant to demonstrate that valid grounds exist for making an exception to the rule.

Variances

Obviously, one justification for a variance is the existence of some unique situation. However, to successfully withstand legal challenges, an agency needs to be consistent in the application of the rules. Some have noted the irony here, since on one level uniqueness and consistency are mutually exclusive. What is desired is consistently applying the rules to unique situations. To strive for consistency in the application of the access management rules, some agencies have established a staff review committee to deal with variance requests.

At least one state has differentiated between "major" and "minor" variances. If the driveway location would deviate from the desired spacing by less than 10%, the deviation is termed minor, and can be approved by staff. When a major deviation is requested, there is a more stringent committee review process. In another state, variances can be handled at the district level. However, the District can, if it chooses, forward the variance request to central administration.

The following situations which may justify a variance are based on material in the NHI access management class manual.

- a strict application of a rule would deny reasonable access
- the site straddles some a boundary, such as a dividing line between two access categories
- conflicting rules among different agencies have created an impasse
- existing social, economic, or environmental constraints

Another situation which may warrant a variance is when the access restriction would deny the necessary vehicular circulation within the site.

Appeals

Having a process for appeals within the transportation agency can both help prevent some cases from going to court, and make those that do go to court be more defensible. An appeal process may somewhat buffer agency administrators from political pressure. Appeals are often handled by a panel of higher-level personnel.

When an initial application for access has been denied, the denial should also inform the applicant of the right and the process to appeal. There should be a set time limit for an appeal, and the appeal should be in writing.

LEGAL CONSIDERATIONS

Private property owners who believe that some aspect of a proposed access management project will adversely affect their property might petition the courts to enjoin the agency from proceeding. An owner also may sue the agency to recover damages alleged to have been caused by access management.

A combination of some advice from lawyers and many comments from access management administrators leads to the conclusion that:

1. courts in each state will have their own particular interpretation of the law relating to access management , and
2. the law dealing with certain aspects can be unclear and unpredictable.

Much of the legal discussion pertaining to access management addresses the question "at what point does the exercise of access management no longer constitute a legitimate exercise of police power and become a taking?"

Legal Principles and Terms

Any legal discussion about access management is likely to involve four terms: police power, eminent domain, reasonable access, and inverse condemnation.

Police Power and Acquisition

Two of the means to regulate access to and from private property are through

1. the exercise of police power, and
2. the acquisition of access rights.

Huntington defines "police power" as:

> "The authority of the governmental agency that owns or manages the roadway to regulate or restrict individual actions for the protection of health, safety and general welfare of the public, including restrictions on access for adjacent property owners and the requirement that any and all persons seeking a driveway to the roadway go through an approval and permitting process."

When exercising police power, the state is asserting that managing access is a legitimate application of regulations and policies to fulfill its responsibility to protect the health, safety, and welfare of the general public.

The state can acquire access rights either through negotiation with the property owner and purchase, or by exercising the power of eminent domain. Access rights acquisitions are recorded in the county property records.

Reasonable Access and Takings

In most states, owners have the right of "reasonable access" to their property, while in a few states owners have the right of full access. In a "reasonable access" state, access management practices cannot deny the property owner "reasonable access" without compensation. This leads to the question "what is reasonable access?" If the private property owner feels that the access restriction has denied them reasonable access to their property, they may take a legal action against the government called "inverse condemnation," essentially suing the government for taking property without just compensation.

At some point along the continuum between unlimited access and no access to a tract, courts may rule that the access restriction has affected the private owner to such an extent that it becomes a "taking" of property, and therefore the private owner is entitled to compensation from the public agency. The government may take private property through the process known as "eminent domain," defined as:

> "A legal power that allows a public agency to take property for public use, provided an owner is compensated for his/her loss" (Huntington).

The U.S. Constitution allows a governmental agency to take private property, but the government must pay the property owner the just compensation of what was taken.

Applications of the Legal Principles

The dispute between the government agency and the private property owner can be centered around the questions of "what is reasonable access" and "was there a denial of reasonable access?" The following interpretations were gleaned from a review of access management publications and discussions with access management managers.

1. Leaving a tract with no access would constitute a taking, and would require compensation.
2. At what point does regulating access become a taking, requiring compensation? If access regulations destroy the total usefulness of a property, compensation will be required (Azzeh et al.). In some jurisdictions, the test is whether the access to the property has been substantially diminished or impaired. A famous U.S. Supreme Court decision stated that a taking occurs when the regulation "denies all economically beneficial or productive use of land", indicating that the threshold for loss of value may be as high as 95% (CAM 2003).
3. The degree of change in the market value due to access restrictions can affect whether a restriction is considered reasonable.
4. Loss of access may be less or more compensable depending upon whether it is deemed a "general burden" or a "specific burden." A general burden is a loss to a group, which all must bear as a consequence of some policy, and is less likely to be compensable. A specific burden is a loss to a very few or one, and is more likely to be compensable. For example, if the number of driveways serving all tracts along the roadway were reduced to one, then all tracts along the roadway were affected equally.
5. Damages may be claimed due to the increased circuity or indirection of travel resulting from the application of access management. However, a certain level of indirect or circuitous access does not constitute a taking.
6. Courts in various states, including "abutter's rights" states, have ruled that a property owner is not entitled to access at every point along every frontage (CAM 2003).
7. The right of access is not the right to traffic flow. Courts have generally held that the private owner has no right to a specific traffic flow on the abutting street. Courts have generally held that the private owner's right of reasonable access does not preclude installing a median which allows traffic to enter and leave the property only by making a right turn, denying left-turn ingress and egress.
8. Some courts may weigh the inconvenience or harm to the property owner against the benefit to the general public in determining what access is reasonable. The right of access is not paramount to the public's right of safe and efficient movement on public roadways (Azzeh et al.). Therefore, presenting crash history or traffic problems in the immediate area or a nearby similar area can affect what access is considered reasonable. For instance, case law allows Colorado to close driveways that might reduce the value of the property because case law also recognizes the value of the safety benefits. These cases tend to be successful if the attorneys for the state have clearly presented the facts showing the benefits to the public in terms of safety and mobility.
9. Inherently separate issues can become mixed and muddled when a change in access occurs at the

same time as right-of-way taking, such as a temporary easement or a permanent purchase. Then it becomes more difficult to determine what if any damages were the result of applying access management. The cost to cure any damages from access management can become mixed with costs of the easement or the taking.

Jurors and judges are likely to think that access is valuable, and the property owner should be reimbursed if access is taken away. Courts are not likely to be aware of the benefits of managing access, so the public agency will need to go to some effort to educate the court about this so the court can understand and appreciate the government's perspective of looking out for and trying to protect the general public. To the extent possible, present evidence that is specific to the route or to similar situations.

Before constructing a new roadway on a new right-of-way, an agency should determine if the applicable law creates any access rights for abutting property owners, even though none existed previously. When applying access management practices, the agency should be able to demonstrate that access restrictions were consistently applied to all properties abutting the roadway which had similar circumstances or were in the same class.

Possibly a Parallel?
The Michigan Court of Appeals ruled against landowners, who claimed that an arbitrary exercise of governmental power had denied them substantive due process. The Court determined that zoning property to avoid overcrowding and to preserve open space is clearly rationally related to legitimate government interests, and therefore not arbitrary.

Stiegler, M. H. (Feb. 2005) "Court Decisions", *Civil Engineering*. American Society of Civil Engineers, p. 74.

Experiences with the Police Power and Purchase

Opinions differ as to whether it is preferable to manage access through the exercise of police power or by the outright purchase of access rights. Informal sources report that one state which has historically used regulations to manage access recently purchased access rights on a project, while another state that had historically purchased access rights is now shifting to the use of police power. One of the stated advantages of outright purchase is that once the state owns the access rights, it is less likely that undesirable access will be later allowed as a result of political pressure. The obvious disadvantage of outright purchase is the cost. In rural farmland, nominal purchase amounts of $100 per farm have been reported. At the other end of the spectrum, denied or removed access has been valued at hundreds of thousands of dollars. In some urban areas the cost to purchase access rights alone may not be much less than the price for the entire property.

One state redesigned an interchange in the 1990s, and did not purchase access in one quadrant. After the reconstruction was completed, the owner of an undeveloped large tract in that quadrant requested access, which would have cost the department $2 million. The department purchased the entire tract.

Those who advocate purchasing access rights think that purchasing access makes it much less likely that access will be inappropriately granted to the tract in the future. Purchasing access also makes it less likely in the future that the frontage along a large tract will be broken into small tracts, each demanding access. Instead, the owner will have to develop internal circulation to subdivided parcels.

A report prepared for one state noted that purchasing access control is expensive, and in some cases a similar outcome can be achieved in a less costly manner. Although purchasing access rights may be appropriate on occasion, and can be effective "when done before development has occurred" (Dye), the report recommended that purchase be used only selectively, as a secondary strategy. Another state usually purchases access only on selected corridors and on urban bypasses. A study for the state of Florida noted that police power may not be particularly effective to restrict access in areas with high poverty value, and included a benefit/cost analysis that demonstrated the advantages of purchasing access rights in the vicinity of interchange ramp terminals (Williams et al. Nov. 2004).

Misunderstanding the Intent of Purchase

An access rights purchase agreement may designate intermittent "openings" in the access line. There are reports that property owners have misunderstood the intent of the openings in an access rights purchase. Although the state's intent may be to simply designate places where an owner could apply for and possibly receive access, the owner's interpretation may be that the state had guaranteed a right of access at the opening into the future. In some cases, the courts have upheld the owner's interpretation. Access purchase agreements need to clearly state the intent, and in general avoid jargon whose meaning is open to interpretation.

For decades in Oregon, the opening in the access line was construed as only the right to apply for access. The State often denied applications for access at these openings. In one case, the owner of an upscale new house applied for access at one of these openings. Since the time of the original access purchase, a passing lane had been installed. The State said this opening was no longer a safe site for access, and denied the application. The court ruled that the state could deny access, but also required the state to compensate the owner $70,000, to compensate for the planned view of the driveway leading to the house, which the owner could not have.

INTERACTION WITH LOCAL GOVERNMENTS

A few states have given the state transportation agency some authority over land use or development. While it might be desirable for all state transportation agencies to have some control over abutting development, in most states the state law gives local governments exclusive authority for many land use planning, subdivision, and zoning regulations. Some of this authority given to local governments can be administered in ways that either enhance or detract from the ability to implement access management (Williams and Forester).

Access management programs are enhanced when corridor land use activities are coordinated and made to complement the transportation system. Given the legal structure and the authority granted to local governments in most states, it is highly desirable that a state or a local transportation department's efforts to manage access be coordinated with the local government's review and regulation of land development and use. Unfortunately, the cooperation between various departments that is needed to ensure a safe and efficient transportation network is not always there.

> "A major problem that often exists in access management today is the lack of coordination among the various levels of government."
>
> Flora and Keitt, *Access Management for Streets and Highways*

Background: Transportation and Land Use Interactions

Roadways (traffic) and abutting properties (development) interact with each other. Factors that affect the operation of a roadway that is adjacent to tracts or parcels of land include:

1. the number of trips produced by or attracted to the various tracts of land,
2. the number and location of the driveways, and
3. aspects of driveway design that affect traffic on the street.

A comprehensive access management program will consider not only what happens within the right-of-way, but also the land development patterns in the roadway corridor.

At numerous locations, one can observe a seemingly never-ending cycle of property development followed by roadway improvements followed by more property development, eventually leading to more traffic congestion and crashes, and eventually the need to reconstruct or replace the roadway. Stover and Koepke (2002) have called this cycle that can lead to premature obsolescence of the roadway and a drain on public funds the "transportation and land use cycle." Obviously, land development patterns on properties abutting the highway have the potential to significantly affect safety and traffic flow on the roadway. To prevent the transportation and land use cycle from evolving into a downward spiral, development of both the transportation system and the adjacent land needs to be managed so that the two will complement rather than conflict with each other.

Land Regulation Practices to Enhance Access Management

Local governments have the authority and should have the familiarity to perform the "micro-level planning on a parcel-by-parcel basis" (Ferranti and Benway) that is sometimes needed to address the details associated with employing access management and finding suitable access solutions for the abutting property owners. Adequate and competent local oversight can avoid cases of inadequate lot frontage, unworkable site plans, and other outcomes that conflict with the implementation of access management practices.

Subdivision and Site Plan Review

A site plan should show both where access will be taken and verify the distances from other nearby existing or already proposed access points. To help prevent access at undesirable locations, the local government can require the developer to dedicate access rights as a condition of approval.

A thorough review as property is subdivided and developed can catch potential problems and keep them from happening. Staff who review subdivision and site plans should check for the following items.

- the number of proposed access points is kept to a minimum
- the spacing between access points does not fall below minimum
- the plan allows for an interconnected system of internal roadways, so local traffic is not forced to use the arterial roadway network
- when applicable, the site takes access through another development rather than directly to the arterial
- the plan has no residential lots fronting (i.e., facing) arterial roadways

Access management will work better if abutting land parcels are interconnected and an interconnected supporting street system is developed in the corridor.

Regulating Lots Splits or Minor Subdivisions

It is not uncommon for local governments to allow one or a very few lots to be carved out of a larger tract without filing a formal subdivision plat. One common situation is when a relative of the original owner purchases a portion of the land upon which to build a house.

These unregulated minor lot splits can lead not only to substandard access spacing, but to squabbles among subsequent property owners over locations of access easements. Local subdivision ordinances, while making exceptions for small subdivisions, should exert enough regulation to make sure that unwanted consequences do not result. To prevent the need for future owners to ask for direct access to the abutting roadway, dedicated easements should be required, along with a statement describing how the easement will be maintained. It would be desirable to prohibit minor lot splits on land that abuts a state highway.

Adequate Lot Frontage, Size, and Shape

Minimum lot frontages are needed to effect minimum driveway spacings, and minimum lot sizes are needed so that after subtracting the building footprint, enough area remains for adequate on-site circulation and driveway connection length. Local governments can establish minimum lot frontages that reflect access spacing standards, with further subdivision along the highway frontage allowed only when the individual lots have internal access.

In order to avoid the costs of platting and constructing a roadway, some land developers have platted lots stacked behind other lots, with each lot connected to the main roadway by a narrow strip. The resulting tracts of land are shaped like a flag on a pole, and therefore have been called "flag lots" or "panhandle lots." Flag-lot platting produces very closely spaced access. Sometimes, it results in substandard private roads and property owner disputes that local governments are called on to settle. Flag-lot plating should be prohibited.

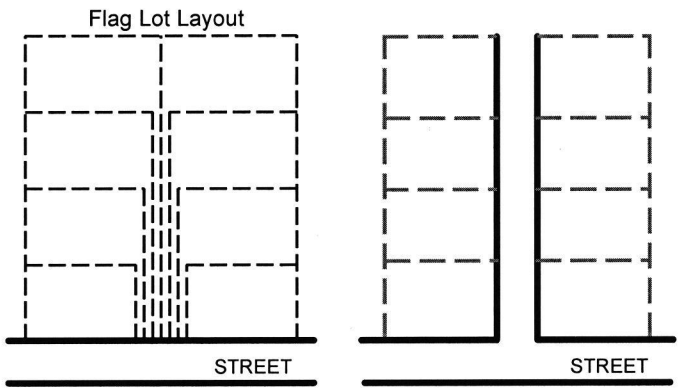


EXHIBIT 3-49 Flag/Panhandle lot layout contrasted with better layout alternative

Corridor Overlay Zones

Some communities apply corridor overlay zones to control and direct development patterns in high priority roadway corridors. These overlays zones can specify not only aesthetic elements, but can also include access management elements.

State and Local Coordination

To facilitate the implementation of access management, states establish relationships that allow them to work with local governments to influence land use decisions. There are a number of means by which state transportation agencies coordinate efforts with local governments. Perhaps the most common means is through informal interagency review arrangements that allow the state to have input during the local subdivision or building permit review process (Williams 2002). Some have made arrangements so that both the state and local governments must sign forms before various types of land development permissions are approved and can become effective. An alternative to this is granting a conditional approval, which makes the permit valid only when the other party (i.e., state or local agency) has also granted an approval.

Incentives to Encourage Cooperation

Kansas DOT sets aside a pool of funds for access management projects. These funds can be used for a range of purposes, such as planning studies, right-of-way acquisition, and construction. This pool serves as one incentive to encourage good corridor management practices at the local level.

Lack of Cooperation

State and local agencies do not always have good working relationships. There are a number of possible reasons that a local government may not be interested in, or even object to, the application of access management.

- lack of knowledge of the problems caused by failure to manage access -- it may take years for the problems to accumulate and become obvious, so there may be a disconnect between cause and effect
- lack of understanding of access management techniques
- being overwhelmed by the perceived complexity of an access management program
- lack of staff or expertise
- roadway safety and mobility is not their concern or responsibility
- perceived conflict with other priorities
- not interested -- other priorities fully occupy the agency

In some cases, staff and design professionals may be more supportive than elected officials. Joint workshops between state and local officials can help promote an understanding of the issues and cooperation.

One national survey reported one state's observation that larger cities and counties tended to support access management, but smaller communities feel that access management interferes with a more important goal of economic development (Chowdhury et al.). When a design cannot be found that serves both through traffic needs as well as local traffic needs, one obvious approach is to construct a bypass with a high level of access control (CAM 2003).

Median Maintenance

An informal survey of a few states found that for non-traversable medians in urban areas, some state transportation agencies will construct either paved or grass medians, while others will only pave the

median unless the local government assumes responsibility for maintaining the vegetation. Median maintenance responsibilities vary from state to state. However, no state reported that they would irrigate the median; in all cases, this is considered a local responsibility.

STATE AND LOCAL GOVERNMENT COORDINATION

A report prepared for the Florida Department of Transportation (DOT) identified a number of access coordination issues.

- Coordinating land development approval conditions

When a local government approves a development subject to the developer meeting certain access conditions (such as sharing a driveway with an adjacent property), these conditions need to be conveyed to the state transportation department so that the state will not issue access permits that allow the developer to circumvent the local rules.

- Coordinating access management plans

If a local government has developed an access management plan for a corridor, the local government needs to inform the state transportation of this so the state will not unknowingly issue driveway access permits that conflict with the local plan.

- Coordinating access standards

Problems can arise when the state and local agencies have different access standards. [Note: some states address this with a rule that calls for the stricter standard to apply.]

Establishing both a procedure and a rapport between local and state authorities who review plans for proposed subdivisions and developments not only helps to eliminate inconsistent or conflicting positions, but also reduces frustration and costs for developers. Procedures for a joint review can allow both levels of government to review a project concurrently and reduce the review time for the applicant.

The state DOT asks local governments to designate a local staff person as an access management contact for the state DOT. Some DOT districts conduct monthly or other regularly scheduled meetings with local governments to review access permits and discuss other access management issues. One observation was that over time, local participation would decline, until a controversy arose, at which point the state again invited the affected local government to participate in the meetings. Differences of opinion or interpretation about roles and regulations between state and local agencies can produce uncoordinated if not differing approaches or positions to a given situation.

The report noted that in some areas the local government has a binding agreement with the state DOT to not issue an occupancy permit until the developer has complied with all of the state access conditions. In some instances in these locales, the developer is not required to post a bond with the state DOT before construction begins, saving the developer money.

Marshall and Williams, *Intergovernmental Coordination in Access Management*

CORRIDOR MANAGEMENT

> "Contributing to the need for corridor management is the historic disconnect between land-use and transportation decision making."
>
> Williams, NCHRP Synthesis 289

Managing access to and from a roadway is one component of the broader subject of managing the transportation corridor in order to preserve and enhance the utility of the corridor for the public. A discussion of access management sometimes evolves into a discussion of managing other related aspects of a roadway corridor. One document defines the practice of corridor management as "the application of multiple strategies to achieve specific land development and transportation objectives along a transportation corridor" (Williams 2000). Corridor management recognizes that given today's political and funding constraints, transportation agencies will not only need to make capital improvements but will also need to employ transportation system management strategies if they are to maximize the ability of the roadways to safely and efficiently accommodate the public's demand for travel.

Corridor management and corridor preservation are accomplished through a combination of planning, design, and operations techniques. These techniques can include advance acquisition of right-of-way, exercise of police powers to control access, and designs that reduce or eliminate traffic conflicts. Conditions which may indicate the greatest need for a corridor management project include the following.

- the pace of land development is about to accelerate
- the price of land is escalating
- failure to protect the corridor now could result in many relocations later
- failure to protect the corridor now could severely limit or totally preclude needed roadway design options in the future

Corridor preservation is applied to both two-lane and to multilane roadways.

In a 1999 survey, 16 state DOTs responded that they had established a program or policy supporting corridor management, and nine more indicated they were in the process of establishing one (Williams 2000). Brief attributes from a few state programs follow.

- Delaware: has a Corridor Capacity Preservation Program
- Kansas: views access management as a component of the corridor management program, and has renamed and broadened their "access management" program into their "corridor management" program. An additional access management category called "Protected Route Segments" allows the DOT to assign higher than minimum access management standards to segments of greater importance and which are experiencing growth pressures.
- Kentucky: the state has engaged in several corridor management plans, and received a Federal transportation grant to develop a corridor master planning handbook
- Wisconsin: does not have a comprehensive access management program, but instead manages access on individual corridors (Frawley and Eisele)

Intergovernmental Agreements

A corridor management plan can involve not only the state transportation agency but also one or more local governments. The cooperation of the various parties produces a plan that addresses the roadway design and the location of access in both the median and the margin (i.e., border). To record and finalize the plan, the state transportation agency and the local governments enter into an "intergovernmental agreement."

An NCHRP synthesis on cooperative agreements for corridor management listed a number of elements normally contained in intergovernmental agreements (Williams 2004).

- a list of the participating government entities
- the geographic area covered
- the need for and purpose of the agreement
- the authority to enact the agreement
- the roles and responsibilities of the participants
- any provisions for renewing, amending, or terminating the agreement
- the adoption and duration of the agreement
- funding and financial arrangements

Appendix F displays example intergovernmental agreements for corridor management. The Colorado example includes a detailed listing that explains how the access to individual sites will be treated.

In addition to a state and a municipal government, a regional metropolitan planning organization (MPO) may be a party to a corridor management plan. It has been observed that when an MPO is a party to an intergovernmental access management agreement, it can be better positioned to "take the heat" and not sacrifice access management principles and practices in the face of political pressure (Williams Oct. 2004).

Corridor Management Plans

A corridor management plan will focus on the planning and design of a specific highway segment, perhaps including multiple municipal and even county jurisdictions. The plan will address questions such as will additional lanes be needed, or will a bypass be needed? Corridor management plan elements may include traffic signal coordination, traffic control device inventorying and evaluation, and right-of-way preservation.

Corridor Plan General Process

After agreeing to examine a given corridor, the following steps are taken to develop a corridor management plan.

1. define the study area
2. determine the functional class and the access category
3. catalog and quantify existing roadway design access features
4. analyze land use patterns: ascertain the property boundaries, existing and proposed zoning
5. obtain and analyze pertinent traffic data (existing and future traffic volumes, crash data and patterns, travel time and delay studies)
6. inventory the access and circulation characteristics of abutting sites

Based on this information, alternative access management plans are evaluated, and finally a plan is chosen. Other planning concerns such as number of lanes needed, or replacement of structures may also be considered. After adopting a plan, the agency should notify all local governments that are affected by the plan. The agency then plans and programs any near-future construction that will implement part or all of the corridor management plan. Corridor management plans will need to be reexamined and modified or updated as conditions change over time.

Access Management Aspects of a Corridor Plan

The corridor management plan can include and apply access management techniques to a particular corridor, incorporating those elements that are appropriate for the particular context (CAM 2003). Example tasks include the following.

- Prepare a map showing the location of existing and future driveways.
- Identify driveways that are too close to each other or to intersecting streets.
- Identify situations that would benefit from shared access or "cross access" (access across adjacent parcels).

One application of access management techniques that the corridor management process can include is the designation of "access windows" (i.e., where access can be allowed). For a given corridor, an imaginary boundary line is drawn along the right-of-way line at areas that are too close to intersecting streets, interchange ramps, and existing driveways -- at these locations, access is to be prohibited. Other locations at which, for some reason, access needs to be denied are also marked. The remaining unmarked right-of-way lines will constitute those locations or "windows" that are suitable for access (see Exhibit 3-50).

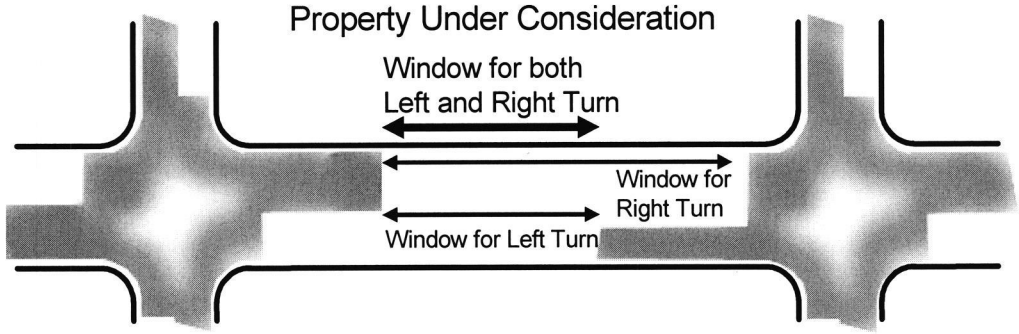


EXHIBIT 3-50 Identifying access windows

One small state has a program in four corridors that restricts the number of trips that sites will generate, in order to keep the highway volume below capacity. If the state DOT anticipates that trips from a site will overload the road in the future, the DOT will pay for development rights for highest-and-best use of the tract, and then the owner is limited to a lesser use that will not produce more than a certain number of trips.

Corridor Planning Examples

Presenting a few brief examples taken from actual state corridor management projects helps to illustrate how access management has been implemented. Some state programs allow the use of state funds on streets that are within the corridor but off the state system, if so doing would benefit the state route.

Delaware Example

Responding to existing congestion on State Route 1 (SR 1) between I-95 and Dover, the state began developing a controlled access relief route in the mid-1980s. At that time, the remainder of the four-lane SR 1 from Dover to the ocean (about 30 miles) did not have serious congestion, but there were pockets of residential and commercial development in the predominantly agricultural roadside.

Not wanting to sit back and watch continuing roadside development diminish the roadway capacity, the state initiated a corridor preservation project. Goals included:

- maintain or improve capacity;
- accommodate adjacent economic development;
- eliminate the need to build a replacement road on a new alignment.

Access is managed by combining the exercise of police power (to restrict access) with acquisitions. Types of acquisitions include the purchase of access rights, the purchase of development rights, or fee simple acquisitions. The state retains a consulting firm to help property owners identify alternative access schemes, at no cost to the property owner.

The state feels that the cooperative effort between them and local planning agencies has been quite successful in preventing the loss of roadway capacity. The concept of protecting the corridor to preserve capacity makes sense, and little opposition has been seen. Land owners and developers have seemed willing to make adjustments in order to accommodate the corridor preservation program (Kleinburd).

CORRIDOR PLAN ILLUSTRATION:
LIST OF BASIC FACTORS

State Highway 26

- Done many years in advance of an expected 7 year construction period
- Expansion from 2- to 4-lanes
- Extends 48 miles, over 3 counties
- Provides for limited access bypasses
- Noted that interchanges act as both traffic magnets and as funnels

Fortney, Darren. (undated slide presentation) "Corridor Planning: Thinking Beyond the Pavement." Short Elliott Hendrickson, Madison, WI.

CORRIDOR PLAN ILLUSTRATION:
ACCESS MANAGEMENT AS ONE ELEMENT IN THE OVERALL PROJECT

RUTLAND, VT—The city of Rutland has selected the Vermont-based engineering firm Dufresne-Henry to lead a $4 million improvement project for the U.S. Route 7 ... corridor that runs through the city.

The project involves slightly widening the Main Street section of Route 7 to allow for a center turn lane, as well as **combining and reducing existing access** and enhancing the street lighting, crosswalks, and sidewalks along the road. These improvements will ease traffic congestion, improve safety for turning vehicles, and provide safer means for pedestrians to travel along this urban route.... [highlight added]

www.dufresne-henry.com (March 22, 2005)

Kansas Example

Hays, Kansas, with a population of about 20,000, is at the junction of Interstate 70 and US Highway 183. US 183 is a major north-south corridor in the region and is called Vine Street within the city of Hays. The 4-lane roadway serves a commercial area, and has many signalized and unsignalized intersections. The following description was excerpted and condensed from *Effective Strategies for Comprehensive Corridor Management* (Williams and Seggerman).

In 1998, city, county and state officials developed and adopted the Corridor Master Plan (US-183/US-183 Alternate Corridor, Ellis County, Kansas) which augmented a previous Memorandum of Understanding by "defining parameters for transportation management, access management, land use and development characteristics." General corridor management standards were laid out for defined segments of the corridor, specifically addressing planning aspects (through zoning and site plan requirements) and operational aspects (through retrofits and improvements). The Corridor Master Plan called for the creation of alternative access for existing and future development, and obligated the City and County to "adopt all necessary ordinances and/or resolutions and to take such legal steps as may be required to give full effect to the terms of this Plan."

In 1999, the City and the Kansas Department of Transportation (KDOT) constructed improvements to a one-mile segment of US 183 from 27th Street to I-70, such as curb and gutter replacement, concrete pavement, median landscaping, storm sewer installation, street lighting, and the addition of three traffic signals. State and local officials concluded without some retrofitting and a higher level of management, greater development pressure would "jeopardize operational efficiency and would likely increase the magnitude of safety issues."

In May 2000, KDOT, with support from city officials, identified the corridor as a "Protected Corridor" within the agency's Corridor Management Plan. The designation defines corridors "in need of an increased level of management to preserve capacity and functional integrity." To formalize coordination efforts, KDOT implemented Kansas Statute (KSA) 68-169 that authorizes the Kansas Secretary of Transportation "to enter into written agreements with political subdivisions of the State for highway purposes, including establishment of access control." This agreement establishes a mutual commitment to manage access and right-of-way issues in the corridor. The US Highway 183 widening from I-70 north to 55th Street was funded as part of the state's System Enhancement Program, in which projects are selected based on potential economic impact, traffic volume, safety, and design. Funding responsibilities are shared by both state and local agencies. In 2003, the Hays City Commission passed a resolution authorizing the City to participate in KDOT's Corridor Management Grants Program that would outline funding sources for acquiring additional right-of-way and associated improvements to US Highway 183.

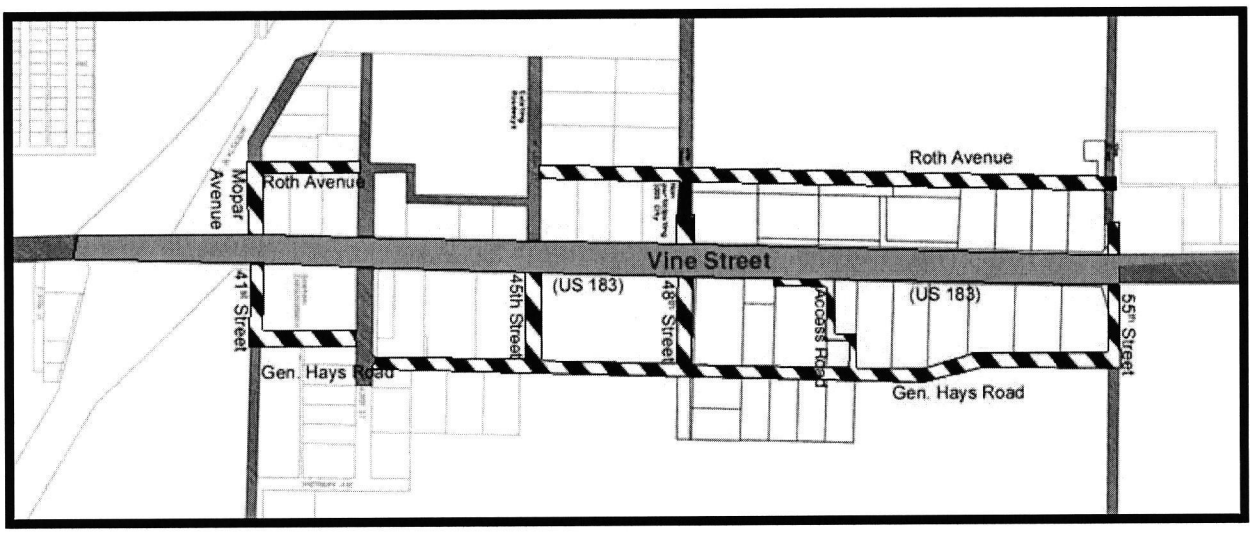
Concurrent with the U.S. Highway 183 System Enhancement project, the City of Hays, Ellis County, and KDOT also worked to create alternative access along the corridor. Development pressures on the corridor north of I-70 required the City to devise alternative access approaches.

Using KDOT Corridor Grant funding, the City will construct a reverse access road between 45th and 55th Street (Roth Avenue) and extend 48th Street to the east to intersect with the extension of General Hayes Road (see Exhibit 3-51). The few businesses abutting US Highway 183 will gain temporary access through frontage roads along the roadway. By 2006, KDOT plans to remove the

frontage roads and allow access solely from the newly constructed reverse frontage access roads. Roth Avenue, General Hays Road, and 48th Street were designated "main trafficways" by the City of Hays to comply with Corridor Grant guidelines.

In order to provide the 1/3 local match required by the Corridor Grant, the City persuaded property owners to dedicate public right-of-way across their property for the purpose of constructing reverse access roads. The City's $515,000 share of the $4.6 million project cost would be offset by the dedicated land value combined with some inspection services the city provided. Although there is a cap of $250,000 per grant, the City made numerous grant applications to obtain the necessary funding. Another alternative access road located further south along the US Highway 183 corridor is the extension of General Hays Road from 22nd Street to Cody Avenue and is also funded through Corridor Grants.

These improvements were important to Hays because of traffic congestion and safety, and from an economic perspective as well. Based on this experience, the City has embarked upon smaller corridor management projects along other roadways within the City.



NOTE: right is North

EXHIBIT 3-51 Hays corridor

PROBLEM AREAS, LESSONS LEARNED, AND ADVICE

Challenges and obstacles to administering an effective access management program can come from the general public, political leaders, other agencies, or within the administering agency.

Public Concerns

Although this may be an oversimplification in some cases, there are two general classes of the public: those whose travel patterns may be affected by access management, and those whose property or business may be directly affected by access management. The former class is more of a "general" public -- examples include motorists and area residents. The latter class will include property developers and

business owners. The different classes and groups within the classes may be expected to have somewhat differing concerns. For instance, large developers and business owners with successful experiences along access managed roads in other communities may be more supportive than a local business person with no knowledge of access management practices in other locales.

One trait that may be found in many groups is the desire that all are being treated equally: for instance, that a business competitor or a neighbor is not getting some advantage (such as a median opening) that they were ineligible for. Those administering an access management program should be conscious of the need to not even have the appearance that someone is getting preferential treatment.

Since the benefits of access management are known as a result of study, these benefits may not be obvious to the public, elected officials, or transportation agency staff. Pointing out the benefits that offset or even outweigh some of the perceived disadvantages may cause some opponents to rethink their positions and view access management more favorably. This highlights the need for a transportation agency to incorporate education into the public involvement process.

One lesson that has been learned the hard way is to either avoid using engineering jargon or make sure the audience understands it. One interviewee recounted where the technical team explained the proposed installation of a raised median to the public as a "barrier median." The team had to deal with an intense negative reaction from the community, who thought the engineers were wanting to put up a vertical concrete wall which would divide their neighborhood.

Developers

The developer typically wants to maximize profit from the property. It is not uncommon for a developer to believe that more driveways are necessary to maximize profit. The developer may initially not care one way or the other about traffic engineering concerns such as safety or improved traffic flow. Demonstrating how the following traffic engineering questions can affect the development may help ease concerns from developers.

- Does decreasing the travel time to and making your site easier to get to make your site more attractive?
- Do concerns about hectic traffic and crashes or near misses make your tract more or less valuable?

One outcome of applying access management to a roadway system layout can be that some traffic movements which previously were accommodated on the public streets system are instead directed onto the traffic circulation system within a site. One illustration of this is the requirement that adjacent parking lots be interconnected: without the interconnection, vehicles traveling between the two lots would have to use the public street, but with an interconnection in place, the movement is made without entering the public street. Adding features such as the interconnection of adjacent parking lots slightly increases the cost of construction to the developer, and this cost may be another cause for opposition.

Developers opposed to access management regulations may try to pit state and local agencies against each other, hoping that the friction will create a political climate that allows the developer to evade the regulations.

Some developers recognize the benefits of access management and perceive the implications. These developers understand that increased safety, roadway capacity, and long-term roadway viability only enhance the long-term value of their property.

Business Owners

Business owners and managers may fear any action that affects or changes traffic flow patterns, and therefore view access management as a threat to the continued viability of their establishment. Past studies have indicated that businesses can and do often fail for a number of reasons, and it is not always easy and straightforward to determine what effect, if any, access management has on a given business.

The *Access Management Manual* states that to arrive at solutions for individual tracts, it is more effective to meet with concerned property owners individually rather than to hold public meetings (CAM 2003). When meeting with a property owner, listen to their specific concerns about the effects of access management on their site, and try to devise workable traffic patterns to serve the site after access management has been implemented. If possible, try to mitigate any adverse impacts by means such as joint or cross access easements with adjacent property owners. The willingness to negotiate can help reduce opposition to the project.

Even though customers (who are also motorists) may generally favor changes that improve access management, business owners may be concerned with and oppose these changes. Ways to address such opposition to access management projects include the following (Butorac and Wen).

- Involve business owners and managers as early as possible in access management project planning and development.
- Inform them of the experiences of other businesses.
- Let businesses know that they may experience temporary disruption of sales during construction.
- In instances where peak-period traffic is a concern, emphasize the improved flow of traffic and increased capacity in front of their business.
- Be innovative in finding alternative access solutions.
- Institute measures to help direct motorists to businesses where access is changed during and after the project.

Even when a transportation agency does its best to inform and work with business owners, opposition to access management from business owners may not go away.

Illustrating the principle of working with individual landowners, one interviewee described a situation where left turns into the business were allowed, but not left turns out. The staff emphasized to the owner that they want its customers to be able to get into the business safely, and customers can leave to the left with a reasonable amount of indirection by turning right and proceeding to a nearby U-turn location.

Another interviewee stated that talking one-on-one with people in the corridor was the key to gaining acceptance -- if this had not been done, access management would not have been successful. This firm has conducted driveway traffic counts, because owners may have inflated perceptions of their businesses' left-turn volumes. When driveway volumes are low and the line-of-sight is unobstructed, one technician may be able to count four or five in nearby driveways over a four-hour peak period. The results may show the property owner that right-turn volumes heavily predominate.

Other Owners

Occasionally, residential property owners will have concerns about the effects of a proposed access management project. They may object to a proposed median disrupting their established pattern of

turning left into and out of their driveway, or they may just in general not want any construction occurring in front of their property.

General Public

The general public is less likely to be upset about a proposed access management project than are developers, business owners, or others whose property abuts the roadway. Explaining the benefits of access management to public groups can produce support. The absence or presence of any negative reaction from the general public almost seems to be somewhat random, perhaps dependent upon the personalities of those who happen to be involved. Those interviewed during this project reported public reactions ranging from strong opposition to no one even showing up at a public hearing.

Using Visualization

Again, experience suggests that well thought out and prepared public presentations can help promote access management plans. No matter what group is being addressed, employing visualization techniques can help the public better understand what the finished project will look like and overcome unfounded fears. Visualization techniques include three-dimensional mockups, and computer-generated three-dimensional mockups.

Political Opposition and Concerns About Economic Development

Political leaders may support access management if they understand and appreciate how access management increases safety, improves mobility, and in the long-term saves taxpayer money. Opposition from politicians may reflect complaints they received from affected developers and business owners, or it may reflect concerns about broader economic impacts and whether access management will stifle development. Again, experience suggests that political support or opposition may reflect the personalities involved, and a transportation agency can do no more than explain what access management is, why it is important, and relate other actual experiences with access management.

The level of concern about impacts on economic development and possible opposition may to some degree be a function of a particular area, such as rural versus urban, or an economically depressed area versus a thriving area. Those in a depressed rural area may consider the access management regulations as another impediment to economic development, while officials in an urban area overwhelmed with development may think the regulations are too lax.

Council approves driveway on 40th

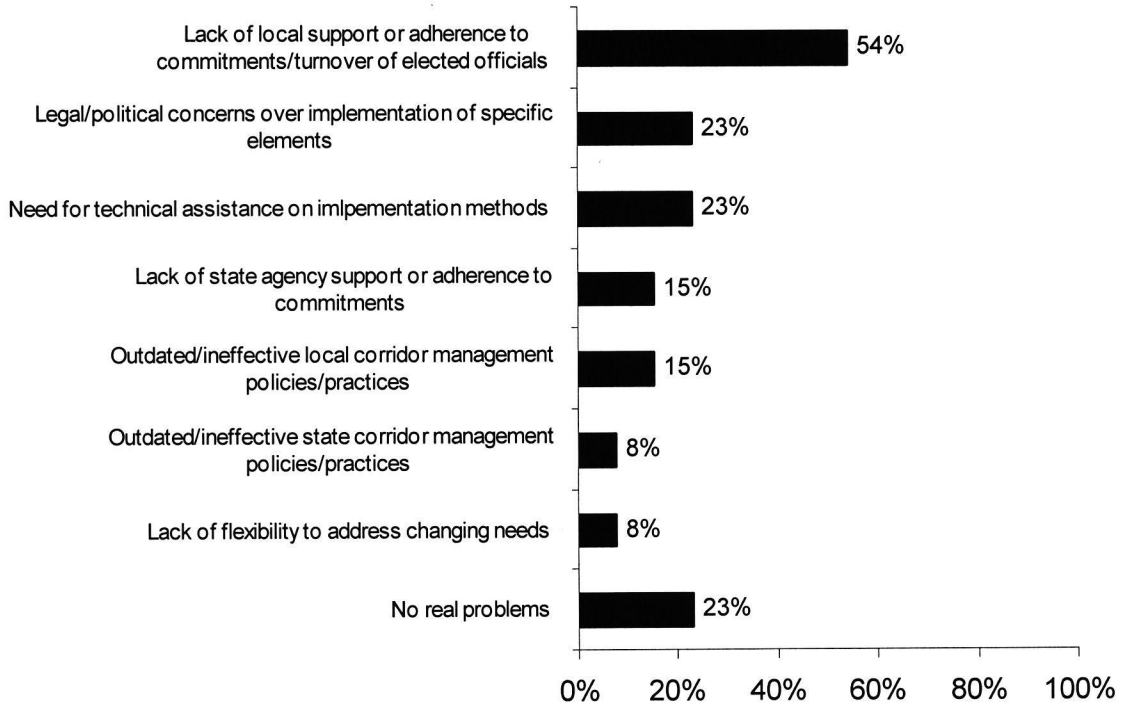
"The City Council approved a driveway Tuesday night to allow a retailer to open on 40th Street, in part out of concern for projected shortfall in tax revenue.

The approval came despite a Planning Commission decision that the entrance will pose safety risks..."

Brad Brannon (September 26, 2001) "Council approves driveway on 40th," *Arkansas Democrat-Gazette,* p. 1 B. Lowell, AR.

Local Government Participation

A state access management program will certainly be more effective and easier to administer if local government land use plans and regulations complement access management practices. However, there are many local factors which can work against access management. In a national survey, states reported the following types of problems (Exhibit 3-52) when dealing with local access management agreements.



Survey question 11: What, if any, problems are you aware of have you experienced related to implementing corridor management agreements with local agencies? [check all that apply]

from Williams, NCHRP Synthesis 337

FIGURE 3-52 Problems encountered with implementing agreements

One state engineer noted that when the access management program first began, some cities would approve something without state input. Also, there were some philosophic differences, as local staff thought that the state should not be telling the city where to put driveways.

The combination of local concerns about economic development, over reliance on the state highway routes to serve local traffic, and inadequate local planning practices can work in concert to make access management more difficult to implement. As previously explained, many local planning practices, such as those that mandate adequate lot frontage and require access from side streets, can facilitate the implementation of access management.

Incentives to Encourage Local Participation

Some states have used incentives to encourage local governments to participate in access management programs.

- Colorado will contribute to construction of local streets in order to achieve access management, such as extending a street in order to affect better spacing of traffic signals (CAM 2003).
- As previously mentioned, Kansas DOT sets aside funding exclusively for projects that include an access management component. Cities that agree to participate may receive funding, much sooner than if they waited their turn through other funding channels.

Enforcing Intergovernmental Agreements

Intergovernmental agreements should be written in such a way that they can be enforced by any of the parties. Legal council will need to be consulted to arrive at the proper wording. However, collaboration and compromise are preferable to legal confrontations.

Loss of Emphasis Within an Agency

> "The agency administration must be patient and understanding of the time and resources required to establish an access management program."
>
> Frawley and Eisele, "Lessons Learned: Access Management Programs in Selected States"

The success of an access management program is dependent upon enthusiasm and commitment both at the beginning of the program and continuing into the future. As time passes and leaders and personnel change, the access management program administrator will need to maintain the program by continuing to educate politicians, agency administration, and staff, reinforcing what the benefits are, and why the objectives are important and worth the effort.

A lack of support from top management can weaken an access management program, demoralize the staff, and render a program ineffective. In a survey of state agencies (Williams 2002), observed weaknesses in programs included:

lack of understanding by the public,
political interference, and
inadequate staffing, training, and resources.

An interviewee mentioned two factors that contributed to the relative ease with which the second incarnation of the access management policy was adopted, compared to the first. One was having experience the second time around. The other factor was that management did not impose time pressures on the staff, so the program was not rolled out until sufficient time had been taken to address and resolve most issues.

INFORMATION AND RESOURCES

Access management informational materials can be divided into two broad categories: information for the public and resources for the practitioner. The public, for the most part, will be served by materials that explain what access management is, why the program has been implemented, and how they can apply for permits. Material aimed mainly practitioners will address issues related to establishing and operating an access management program.

Public Information

Transportation agencies with access management programs have developed information for the public that explains what access management is, and how to apply for a permit. A number of state and local transportation agencies have developed a wide array of media to inform the public about access management. These media include brochures, videos, slide presentations, and Internet sites.

Resources for Practitioners

Since access management has been in existence for decades and has been adopted by a number of state and local governments, there are numerous publications, brochures, videos, and web sites that one can turn to for assistance. Perhaps the single best website is associated with the Transportation Research Board Access Management Committee.

Website: www.accessmanagement.gov
(also has links to other university and state transportation agency web pages)

Publication: *Access Management Manual*, Transportation Research Board
Access Management, Location and Design, manual for NHI training class

A national access management teleconference to promote access management implementation and administration has been conducted since 1991. The teleconference provides a medium for agencies, mostly DOTs, to share questions, comments, and opinions about anything related to access.

The quarterly teleconference currently usually occurs on the first Wednesday in March, June, September, and December. To participate, contact Philip Demosthenes (pdemosthenes@parametrix.com) of Parametrix Consulting in Denver prior to the meeting to register and receive the agenda and the conference phone number.

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CHAPTER 4
SUMMARY OF CURRENT PRACTICES WITHIN THE STATE

This chapter summarizes current access management laws and practices in the state. Since practices can change at any time, it is possible that some of the practices reported herein have been revised.

STATE LAW AFFECTING ACCESS MANAGEMENT

In 1953, Act of 123 directed the Arkansas State Highway Commission to adopt reasonable regulations to control the use of and access to highways. The regulations have the force and effect of law (ASHC).

A 1983 review of state access control regulations noted that the Department's driveway handbook was designed to apply primarily to non-urban problems rather than to urban access situations. It stated that the responsibility and concern for access were not focused in any one unit of the Department, and that actual access management took place within the Construction Division, a unit that "lacks long-range planning, traffic engineering or safety monitoring capability." The report recommended that AHTD develop a statewide access code and disseminate information to local governments through the municipal league and the Association of Arkansas Counties (Bonner et al.).

Arkansas state laws addressing access management-related topics were previously reviewed and summarized during work conducted for Metroplan. The following excerpts are from this review (Williams and Stover Dec. 1999).

State Law Affecting Access Control

Any state or local highway authority can establish and regulate a controlled-access facility provided that "present or future traffic conditions justify such special facilities" (Chapter 27-68-104). Arkansas statutes specifically allow state and local highway authorities to design and regulate, restrict, or prohibit access to controlled-access highways. These facilities are defined as roadways "designed for through traffic over, from or to which owners or occupants of abutting land have no right or easement." No person has a right of ingress or egress between these facilities and abutting land except at designated points (Chapter 27-68-105). Local governments are allowed to regulate access (Chp. 14-56-417 (a)).

The state or "any of its subdivisions" has the authority to eliminate at-grade intersections through a designated controlled-access highway. Elimination of these intersections can be performed through roadway separation, construction of service roads, and/or road closures (Chapter 27-68-105).

State Law Affecting Local Street Plans and Corridor Preservation

State law allows local governments to adopt a master street plan, which can designate the "general location, characteristics, and functions of streets and highways." In addition roadways can "be reserved for public acquisition" (Chp. 14-56-414 (d)).

To carry out the Master Street Plan, local governments are granted the right to administer regulations that address access, subdivisions, and extension of utilities (Chapter 14-56-417(a)(1-2)). Statutory language suggests several regulatory techniques that can be adopted to achieve the goals of the Master Street Plan.

1. Design standards for lots and roadways, as well as improvement standards for developers, can be enforced.
2. Regulations governing the division of an existing lot into two or more parcels, commonly referred to as a lot split, can be established.
3. Local ordinances can also provide for the dedication of all rights-of-way to the public (Chapter 14-56-417(b)).

To protect future transportation corridors identified in the Plan, several right-of-way preservation techniques are permitted by the Arkansas Statutes. First, local regulations can "require the reservation for future public acquisition of land for community or public facilities" indicated in the Master Street Plan. A reservation can be in effect for no more than one year from the time the developer notifies the governing body of the intent to develop (Chapter 14-56-417(b)(5)(B)(ii)). Secondly, statutory language also permits local governments to establish setbacks from roadways identified in the Master Street Plan and prohibit any new construction or other improvements within the setback lines (Chapter 14-56-418). Finally, local ordinances can be enacted that "control entry into any of the major streets and highways shown in the plan" (Chapter 14-56-419).

The provisions regarding reservations and dedications discussed above are not applicable to service roads along controlled access highways. In these cases, landowners whose subdivisions abut controlled access facilities adhere to different statutory provisions (Chapter 27-68-105) and would be compensated for turning over right-of-way along the corridor (Case Notes, Chapter 14-56-419).

State Law Affecting Property Acquisition for Roadways

State and local highway authorities are permitted to acquire private or public property and rights for controlled-access facilities and service roads. Property can be acquired by gift, purchase, or condemnation. All property rights acquired under Arkansas Statutes are to be in fee simple.

CURRENT PRACTICES AT THE STATE LEVEL

The Arkansas State Highway and Transportation Department for some time has operated a driveway permit program. This program requires that any party desiring access to a state-controlled roadway first apply for a driveway permit, and meet certain conditions.

A 1982 handbook of access regulations categorized driveways as either noncommercial or commercial. The noncommercial category included both private driveways and public (e.g., church, school, noncommercial cemetery) driveways. Commercial driveway permits required a bond of the 5% of the project cost, with a minimum of $200. If an applicant wanted a driveway within the limits of the city that also requires driveway permits, the applicant was required to have a permit from both the city and the state. Lots with 50 feet or less frontage were limited to one driveway, and no more than two driveways were allowed for frontages of less than 600 feet (ASHC).

Interviews conducted with District Permit Officers in each of the ten AHTD districts indicated that the chief focus of the current driveway permit process is drainage, particularly ensuring that drainage in the ditch along the roadside is not impeded by driveway construction. Other concerns included the number and location of driveways, the condition of the driveway surface, and not tracking debris onto the public roadway. AHTD requires a refundable performance bond or deposit from applicants, to insure

that the driveway is constructed according to the permit requirements and standards.

A minor lack of uniformity in current practices among the ten Districts may not be a problem, or may in some cases reflect underlying differences in various parts of the state and even permit a desirable degree of flexibility. However, a noticeable lack of uniformity in aspects of a new program, such as an access management program if it were to be adopted, could be a source of complaints and not reflect well upon the Department. If an access management program is implemented, then the Department should consider either standardizing the following, or explicitly justifying the differences among the Districts.

1. driveway widths (maximum and minimum)
2. number of driveways allowed per tract
3. bond amount required

Current Access and Median Opening Criteria

By Commission Minute Order on February 18, 1998, the Arkansas State Highway Commission adopted the following criteria for access control and median opening spacing on full and partial controlled facilities.

1. Access Control
   - A. FULL CONTROL
     - Access allowed at interchanges only
   - B. PARTIAL CONTROL
     1. Two Lane Facilities
        - At-grade access allowed at selected intersecting public roads/streets
        - Each abutting property ownership to have access based on amount of frontage, as follows:
          Less than 1200 feet frontage - 1 access
          1200 feet or more frontage - 1 access for each full 600 feet of frontage
        - One driveway to be provided for each property ownership
        - Criteria applies to each side of highway when highway divides a parcel

     2. Four Lane Divided Facilities

     a. High Type Control
        - At-grade access provided at selected intersecting public roads/streets
        - No direct private access permitted

     b. Low Type Control
        - Access control provided as set out for "Two Lane Facilities"

     3. Others
        - As established by Arkansas Highway Commission
2. Median Opening Spacing
   - A. RURAL
     - Openings to be spaced generally at 1/2 mile intervals

   - B. SUBURBAN/URBAN
     - Openings may be spaced generally at 1/4 mile intervals

In determining median opening locations, terrain, local service needs and location of major public roads will be considered.

CURRENT PRACTICES AT THE LOCAL LEVEL

A few municipal governments in Arkansas are considering or have adopted some aspects or components of access management. The metropolitan planning agency for central Arkansas has adopted an access management policy for regional roads in the planning area.

Bentonville

The subdivision regulations adopted in 2003 are, with respect to access management, perhaps among the more comprehensive ones in Arkansas. Section 1100.9 (Ben) states:

> "This section is intended to implement access management standards of the City of Bentonville as set forth in the City of Bentonville's General Plan. In addition, this section conforms with policies and objectives of the NWARPC Metropolitan Planning Organization's long range transportation plan, the authority to control access to property as derived from Arkansas State Statutes, the policy and planning directives of the federal Intermodal Surface Transportation Efficiency Act of 1991, and the Transportation Equity Act for the 21st Century. These regulations apply to all new development and construction."

The number of driveways is limited to one for properties with a frontage of 200 ft or less, and two for tracts with a frontage of 201 to 600 ft. Widths of nonresidential driveways must be between 24 and 40 ft. The maximum grade for a driveway to a major arterial is 5%.

Centerlines of driveways are to be no closer than 250 feet from the right-of-way line of an intersecting arterial roadway; for intersecting collector streets, this distance is 100 ft. On 40 mph roadways, the minimum distance between successive driveways is 200 ft.

The regulations mandate that the centerlines of nonresidential driveways on opposites sides of the street shall either align or be offset no less than 75 ft. This regulation does not apply where a permanent median exists without a break for the driveways.

Other design elements addressed include radius, acceleration and deceleration lanes, joint and cross access, site triangles, and driveway throat length. Property owners with joint or cross access are required to record access easements and joint maintenance agreements.

Central Arkansas

Metroplan, the council of local governments and metropolitan planning organization for the Little Rock-North Little Rock metropolitan area, was established in 1955. In the 1970s and 1980s, a few access-managed roadways were developed within the Metroplan study area. In the mid-1990s, prompted by concerns about safety, negative land use impacts, preserving roadway capacity, and the efficient use of limited transportation financial resources, Metroplan adopted policies that gave greater emphasis to access management. Although there were provisions for exceptions, the policies strongly discouraged the extension of continuous two-way left-turn lane (TWLTL) roadway sections. Nontraversable medians were preferred on principal arterials. Metroplan reviewed all project designs for compliance with the

long-range transportation plan policies and to ensure that the constructed projects reflected the original concept as proposed.

State Highway (SH) 183 in Bryant, between I-30 and SH 5, was the first road developed under the new policy. In 2000, the City of Conway, Metroplan, and the State Highway Commission entered into a multiparty agreement to implement access management for the planned upgrade of SH 60, or Dave Ward Drive. At the request of the City, Metroplan staff met individually with property owners along the corridor to address specific concerns about the project. In the final project, some tracts did have shared access. The involvement of the MPO in the central Arkansas area helped maintain consistent application of the access management policy and avoided unwarranted exceptions.

In 2004, the Metroplan Board removed the prohibition against TWLTLs, but roadways with nontraversable medians remain the preferred cross-section.

Cherokee Village

Along parts of SH 175 and 175-Spur, there is a "common strip" between the state right-of-way and private property. This "common strip" or buffer is owned by the subdivision and is used for utility rights-of-way and walking paths. The city asked AHTD not to allow driveways along this strip unless the city concurred. The city usually denies driveways across the strip where the residential properties have access to another road (i.e., double frontage).

Conway

Ordinance No. 0-91-54 requires that except for single-family residential driveways, there be no less than 40 ft of separation between curb cuts.

Fayetteville

According to Chapter 7 of the recent Bucher, Willis and Ratliff *Traffic and Transportation Study* for Fayetteville (Fay), the current ordinance (section 166.08) requires 60 ft. of separation from a curb cut to an intersection with a collector or arterial street, and 30 ft between curb cuts. The report proposed a variety of greatly increased spacing distances. For instance, driveway corner clearance along an arterial street would be 250 ft. For some time, the Planing Commission has required cross access between new developments.

In 1994, a planning overlay was enacted for the I-540 bypass area. Within this district, driveways are to be 250 ft from intersections, and 200 ft from each other.

Little Rock

The City of Little Rock's street design handbook shows commercial driveway widths range from 10 ft to 36 ft; the minimum radius is 10 ft, and the radius should accommodate expected vehicle types (LR). For residential driveways, a 10 ft minimum spacing between the inner edges of two driveways on adjacent lots (LR).

Unless the driveway falls away from the street (i.e,, downhill), the maximum driveway grade is 11% or 16% (depending upon the sidewalk location) between the gutter and the sidewalk, and 19% for the first 6 ft behind the sidewalk (LR). The details show a 1.5 inch high driveway lip at the gutter line.

Maumelle

Maumelle, which began to develop in the mid-1970s, was one of the Federal government's 13 "new towns." Most parts of the main thoroughfare, Maumelle Boulevard, were developed with a high level of access control.

Van Buren

In 1996, Van Buren adopted Ordinance No. 23 for the control of access to streets and highways. For a commercial subdivision or site, the following restrictions are based on the amount of frontage along the public right-of-way, with a maximum of 4 driveways for any one subdivision or site.

$\leq$ 80 ft = 1 driveway 81–500 ft = 2 driveways $\geq$ 501 ft = 3 driveways (minimum of 100 ft spacing)

A TALE OF TWO NEWSPAPER ARTICLES

Some Local Governments Are Beginning to Recognize Access Management ...

Bentonville city planners will unveil a proposed ordinance designed to improve traffic flow and reduce accidents as the city grows.

By limiting curb cuts, or entrances and exits, on Bentonville streets, planners hope to reduce the number of conflicting turns, which slowed traffic can cause accidents on major roads such as Walton Boulevard....

"It's nothing new there around the country, it's just taken its time to filter into the Midwest," Galloway said.

To help reduce the number of accidents caused by a conflict and turns, entrances will be required to be at least 250 feet from major or minor arterial intersections and 100-350 feet from other driveways.

If the city had such an ordinance twenty years ago, Walton Boulevard would be in better shape today, Galloway said.

Kelley, Ashley. (Jan. 31, 1999) "Planners unveil traffic-flow ordinance," *The Morning News*, p. A9.
Kelley, Ashley. (Feb. 24, 1999) "Council passes rule to limit new developments access," *The Morning News*, p. A4.

... but Local Decisions Do Not Always Support Access Management

...Commissioners briefly debated whether the development needed one or two curb cuts to provide access to the property. Commissioner E said he favored two curb cuts to accommodate the traffic patterns associated with separate structures, but commissioner H said she thought one entryway would actually be safer for motorists and pedestrians. H said the commission approved single entrances for ... two other restaurants...[on the same street], and urged her fellow commissioners to handle new development along the busy thoroughfare in a consistent manner.

"Access management is something we've proposed to work on this year," said Senior Planner W.

Commissioners ultimately approved the development with two access points.

Wagner, Matt. (Mar. 4, 2003) "Planning Commission approves Superior Industries expansion,"*Northwest Arkansas Times*, p. A1, A8.

Survey of Cities and Towns

A survey of representatives from the following municipal governments was conducted at the April 2005 Arkansas Transportation Planning Conference.

Bono
Brookland
Ft. Smith
Jacksonville
Jonesboro
Little Rock
Lowell
Mayflower
Pine Bluff
Springdale
West Memphis
White Hall

The following responses were submitted for questions related to current year practice, not past or future practices.

1. (a) Does your city currently impose a limit to the number of driveways per **nonresidential** tract?

   NO 4 YES 8

   (b) If "YES" to Question 1 (for usual cases, when a lot is NOT on a corner) then does the **policy** (not the actual practice) limit the maximum number of driveways to ...?

   a fixed value of 1 2
   varies with the size of the tract . . . 5
   varies according to other factors . . 1

2. In actual practice, after all factors have been considered, what number of driveways does a typical **nonresidential** tract NOT on a corner normally get? 1 6 2 4 more than 2 1

3. Does your city currently require a minimum spacing between a **nonresidential** driveway and a public street?

   NO 4 YES 8 If "YES", what is that minimum spacing? 20, 25, 40, 200 ft

4. Does your city currently require a minimum spacing between **nonresidential** driveways on the same side of the street?

   NO 5 YES 7 If "YES", what is that minimum spacing? 25, 40, 200, 200 ft

5. Does your city currently require a minimum spacing between **nonresidential** driveways on opposite sides of the street?

   NO 7 YES 4 If "YES", what is that minimum spacing? 25, 200, 200 ft

6. For smaller commercial tracts, does your city currently require a connection to the adjacent tracts, so a driver will not have to enter a public street to go from one tract to an adjacent tract?

   NO 7 SOMETIMES 4 YES 1

7. If someone in your city makes an application to develop or build on a site abutting a US or State highway, does the City require the applicant to contact AHTD about their proposed driveways before they can get local government approvals? ..... NO 2 YES 10

8. Is your city currently publically considering more restrictive access regulations for new developments? ..... NO 8 YES 4

CONTRASTING CURRENT PRACTICES WITH THE STATE OF THE PRACTICE

As chapters 2 and 3 explained, access management makes the roadways safer and more convenient for the traveling public. However, access management is challenging to organize and implement.

As of 2005, access management has been applied to a few roadways in Arkansas, such as Dave Ward Drive (urban) and US 412 from Siloam Springs to Tontitown (rural). Under the aegis of the regional transportation authority, Metroplan, access management is promoted on the regional roadways in the Central Arkansas area. Bentonville has recently taken significant steps to begin to implement access management on city roadways. But overall, a large gap remains between the state of the practice in Arkansas and the state of the art.

Raising a number of questions can help one assess how satisfactory the current situation is.

- Is the State's current driveway permitting system addressing the safety and congestion problems that can arise from the accumulated impacts from driveway and side street access?
- By allowing a high degree of access to properties abutting arterial streets and highways, does an agency placate a few and sometimes grant them perceived economic benefits at the expense – i.e., more crashes and delay – of the broader general public?
- Does the current practice wisely manage the public's investment in the roadway system, or does the practice require repeated reinvestment?
- Would the implementation of a comprehensive access management program improve safety and reduce congestion for roadway users, and give taxpayers a better return for their dollars invested in the transportation system?

Considering questions such as these has led many state and local transportation agencies to implement comprehensive access management programs.

CHAPTER 5
IMPLEMENTING ACCESS MANAGEMENT

This chapter lists and discusses a number of steps that need to be taken in order to establish an access management program. Although each state's situation is obviously unique, experience suggests that it takes from one to four years to establish and begin operating an access management program (Frawley and Eisele).

ADOPT THE GOAL TO ESTABLISH A PROGRAM

When a state transportation agency decides to establish an access management program, the leaders should lay out a plan to reach that goal. The subsequent steps should be viewed as a somewhat iterative process. Information gathered and experiences in later steps may lead to the revisiting of some decisions made in previous steps.

> "You won't get it right the first time - 'perfection is the enemy of good' - you will spend too much time trying to perfect it and won't ever finish."
>
> Frawley and Eisele, "Lessons Learned: Access Management Programs in Selected States"

ESTABLISH AN ORGANIZATIONAL FRAMEWORK

Once an agency has decided to adopt access management, the next step is to establish a steering committee and identify a person to lead the formation of the program. The steering committee will determine how to proceed with the process of developing the program. One or two committees will need to develop both the general policy and the technical details. A "two committee" approach would have the following scopes.

Program Oversight/Policy Committee - broader policy and process

Technical Committee - details

At such time as the oversight committee has established the general direction of the process, it may wish to adopt a short written policy statement to help guide the process. Throughout the entire process, an individual or small group will need to review all documents to assure consistency in wording (Frawley and Eisele 2000).

ASSESS THE LEGAL FRAMEWORK

One of the first steps should be to assess the legal framework within which the access management program will operate. Legal staff will need to review current laws and pertinent court cases in order to determine what levels and types of access control are permitted or prohibited under the police powers of the state, and what actions might constitute a taking and therefore would require payment to the property owner. One question to ask is does the state currently have any authority related to the planning, subdividing, or zoning of property abutting the state highway right-of-way? This review can also identify any additional legislation that would be desirable to have enacted.

EXAMPLE POLICY

It shall be the policy of the North Carolina Department of Transportation (NCDOT) to implement access management techniques and practices on any public highway under the jurisdiction of the Department of Transportation, and to promulgate policies, procedures and guidelines for the proper exercise of those techniques. NCDOT will implement these access management techniques in order to protect the public safety, preserve or improve highway capacity to expedite flow; to reduce traffic hazards and accident causes; to achieve the best possible balance of benefits to the roadside landowner, the highway user, and the community at large; to protect the public investment by preventing premature functional obsolescence; to improve the appearance of the highway and roadside areas; to improve air quality; to support local, regional and state land use policies, plans and programs; and to protect private investment by providing workable ground rules for owners of property adjacent to highways.

NCDOT will also coordinate with local jurisdictions to ensure that the state's access policy and criteria are addressed early in decisions affecting land use. The Department will provide advocacy, educational and technical assistance to promote access management practices among local jurisdictions. NCDOT will emphasize proactive corridor preservation through coordinated state/local planning; provide a consistent statewide management of the state highway system; maintain and apply access criteria based upon best engineering practices to guide driveway location and design; establish and maintain an access classification system that defines the planned level of access for different highways in the state; establish procedures for determining developer responsibilities for paying for improvements that address the safety and capacity impacts for major development; and enhance existing regulatory powers and statutory authority to further implement NCDOT access management policies and procedures. In addition, in order to protect high mobility highways such as those identified as strategic corridors, full control of access should be acquired when the initial transportation improvement is implemented.

This policy is intended to streamline decision-making while promoting statewide consistency and best practice in the planning, design, and regulation of access to the State Highway System.

NCDOT May 1, 2003 Board of Transportation Minutes
Approval – North Carolina Department of Transportation Access Management Policy
http://www.ncdot.org/board/minutes/years/03/May/add2_0503.html (accessed Feb. 25, 2005)

ESTABLISH THE SCOPE OF THE PROGRAM

The Policy Committee should tentatively establish the proposed scope of the access management program and some general policies. These decisions will take into account legal, political, financial, and staffing constraints.

Applying Access Management to the System

The committee will need to determine how narrowly or broadly to apply the access management program. The matrix in Exhibit 5-1 presents some of the possible combinations.

EXHIBIT 5-1 Matrix of varying scopes and scales of implementation

	implement a few of the practices	implement most or all of the practices
implement only as a pilot at a few locations		
implement only along the NHS corridors		
implement only in growing urban areas		
implement on all state highways		

Perhaps a state transportation agency responsible for a network larger than most, such as Arkansas' is, should not immediately try to apply a high degree of access management to every road in the system, but instead concentrate on those roadways that are more significant in terms of providing mobility to the state, a region within the state, or an urban area. One possible strategy would be to initially focus the efforts on:

1. specific corridors, and
2. roadways at the fringe of urban development, especially in growing urban areas.

Growing urban areas are especially important to target because as urbanization spreads, what were simple situations to address either become difficult or nearly impossible to correct without huge expenditures (and increased public conflict). Later, as an agency gains experience with access management, it could evaluate the desirability of expanding the scope of an access management program.

For individual driveways, the following policies are suggested.

- Unless an accident or congestion problem exists, the policy does not affect existing non-conforming connections to existing establishments; these driveways are grandfathered in.
- If a site is substantially modified or redeveloped, or the land use changes, then any existing connections become subject to the access management policies in effect, and must be brought into conformance with the policies, to the extent feasible.

Other System Policies

Over time, a transportation agency will find that various system policies affect the viability of the access management program. The following policies can help promote access management.

- Earmark a part of the transportation project budget exclusively for corridor management/access management projects. This will create an incentive for local governments to cooperate with the state, in order to receive project funding sooner.
- Do not construct any additional freeway interchanges unless access rights are acquired and access is denied to properties abutting the crossroad for an appropriate distance along the crossroad away from the ramps. This distance might be 1/4 mile in urban areas and ½ mile in rural areas.

ESTABLISH A ROADWAY ACCESS CLASSIFICATION SYSTEM

The Department will need to establish a roadway access classification system, and assign each roadway to one of the several access classes, even if the class is essentially a "does not apply" grouping. The different roadway access classes will allow different levels of access, and have different restrictions from the others. In some locations, the state may wish to consult with the MPO or local government before classifying a roadway.

The access classification system will probably not be the same as any existing functional classification system. While there will probably be some co-relationships (e.g., major statewide arterials are probably candidates for the more restrictive access classes), differentiations are needed to avoid inappropriate applications of the access policy. Also, consider that a roadway that is classified as an Arterial from a municipal or metropolitan perspective may from a statewide perspective may be classified as a Local. When passing through an urban area, these statewide "Local" roadways can easily carry more traffic and have more traffic conflicts than many statewide arterials in rural areas, and may warrant a higher degree of access control.

Process to Establish the Classes

A state may follow the following outline to establish an access classification system.

1. Determine to what extent access management will be applied.

   This issue is closely related to the previous "establish the scope" topic. On what roadways is the need to preserve or achieve mobility more important? Possibly

   NHS routes,

   roadways leading into/out of urban areas, and

   present or future through routes within or around an urban area.

   One issue to address is how to categorize roadways which at present warrant a lower degree of access management (for example, presently 6,000 ADT, residential and agricultural) but have the real possibility of evolving in the future (to perhaps 20,000 ADT, commercial).

2. What factors does a state wish base an access classification system on? Some factors may be problematic to administer.

   Some states employ speed and surroundings (such as rural or urban, or land use) as factors which determine access class. One consideration is that when there are different access criteria for rural, suburban, and urban surroundings, it can be difficult to objectively and consistently define the boundary between rural and urban surroundings.

3. Establish the access categories.

   Probably six or more access categories will be needed. If there are too few, the scheme

will not adequately reflect real differences in roadways and surroundings. If there are too many, the classification scheme will be unwieldy. Since there are a myriad of possible combinations of roadway and land development attributes, no access classification scheme will address all situations perfectly. But the classification system should establish a logical framework by which roadways with related traffic characteristics can be grouped.

WORKING WITH STAKEHOLDERS AND THE PUBLIC

At some point in time, the public will become aware of an access management program. If the program were developed in secret, that time may not be until the first developer comes in to apply for a permit, but the time will come. At what point in time should the public be brought into the process of developing an access management program?

Experiences and opinions about bringing the public into the process vary among agencies. In some states, the state DOT did not engage in an extensive outreach, communication, and consensus-building program. Although no one interviewed reported making absolutely no contacts and conducting no hearings, in some cases these were made on a very limited scope. This approach has produced what seem to be quite effective access management programs.

Others stress the necessity of in some way bringing the public into the process of developing an access management program. Two avenues of doing this are establishing an advisory panel and holding public meetings. Perhaps the previously-mentioned Program Oversight/Policy Committee could include members from the public. Whatever the process, the agency will need to identify stakeholder groups.

Identify Stakeholder Groups

Stakeholders are those who are likely to be either more interested in or more directly affected by access management. They are more likely to want to participate in forming or commenting on an access management program.

Stakeholders within AHTD include those in Planning, Right-of-way, Design, and the District Engineers. Outside stakeholders may include:

- developers/land owners,
- business owners,
- development consultants,
- community interest groups,
- local governments,
- school districts,
- metropolitan planning organizations (MPOs), or
- state-level elected officials.

Subject to the limitations of open meeting laws, the agency can communicate with stakeholder groups in either private meetings, public meetings, or public hearings.

Advisory Panel

A transportation agency may or may not choose to establish an advisory committee, comprised of members from outside of the agency, when forming an access management program. The National

Highway Institute class manual has the following advice for forming and working with an advisory committee (NHI).

- Select members for the advisory committee who can work with others and understand points of view and needs outside of their own.
- Assign technical staff to work with and explain technical issues to the group.
- The agency, not the advisory committee, must retain ultimate responsibility for the program.

ESTABLISH SPACING, DESIGN, AND RELATED POLICIES

Shifting from policy to technical detail, the Department will need to identify and define the physical features to be managed -- what elements will be controlled? From the sources reviewed, standards are preferred over guidelines (CAM 2003).

Guidelines that are administered on a case-by-case basis are too easily compromised and lead to inconsistent application of the program. Inconsistent application of the rules can be the basis for a successful legal challenge to the program.

Managing Access at the Edge of the Roadway

For each access class, the access classification system will specify the minimum spacing between successive driveways and between driveways and nearby streets (i.e., corner clearance). Normally, each tract abutting the state highway will be allowed only one access from the state highway. For properties at intersections, all access usually will be taken from the lower classification or the lower volume street. In practice, this will often mean that the driveway will be from the side street and not from the state highway.

Preference should be given to driveways that serve multiple tracts. When the access will be signalized, preference should be given to public streets or to locations which will serve four tracts (one tract on each quadrant), or to connections that will serve high volumes.

After obtaining legal advice, a practice for dealing with the number of access points allowed in the cases of single ownership of multiple tracts, and future subdivision of single tracts, will need to be devised.

Managing Access Across the Roadway

The same aspects of the access classification system that establish a minimum spacing between driveways also establish a minimum spacing between intersecting streets. The spacing of unsignalized streets should be subordinate to the spacing of intersections with traffic signals, since the combination of vehicle speed on the primary roadway and signal cycle length affects progression, which in turn affects traffic flow and capacity of the primary roadway.

In addition, there will need to be adequate spacing from other driveways, streets, or median openings on the access managed roadway to the point at which freeway ramps intersect. Since ramp characteristics vary greatly (speeds of vehicles exiting a slip ramp are often much higher than speeds off of right-angle intersecting ramps), different separation distances for different types of ramps are desirable.

One element of the access classification system will be establishing links between the classes and the median type. The higher classes will have raised or depressed medians. The access classification system will also establish minimum spacings between successive median openings on the various classes.

Establish Connection Spacing and Geometric Design Criteria

Policies that create minimum separation between connection points and that address the geometrics of certain design features are at the heart of any comprehensive access management program. The policies and design standards should be formulated with a recognition of the needs of all roadway users, not just automobile drivers. It is likely that some modifications to internal design guides will be required in order to integrate access management principles into the design process.

Connection Spacing Criteria

In order to manage access, spacing criteria should be established to provide adequate separation between connections such as the following.

intersecting driveway spacing
spacing from property line (perpendicular to the street) to the beginning of the driveway radius
intersecting street spacing
median opening spacing
traffic signal spacing
interchange/ramp spacing from crossroad

Driveway Geometric Design Criteria

In order to improve traffic flow into and out of driveways, and reduce the negative effects that driveway traffic can have on through street traffic, adequate design criteria are usually established for the following elements.

driveway cross section (width, number of lanes)
driveway radius
driveway angle
driveway profile gradient
driveway connection depth (throat length)
setbacks for gates across driveways
driveway surface design details

Roadway Geometric Design Criteria

To implement access management principles, the following design guidelines or details will be needed.

turn lane warrants
turn lane design
U-turn design
frontage road design
median type (what conditions will warrant a specific median type)

When establishing a policy to determine when a more restrictive median cross section is called for, consider the following factors.

- If a high threshold for mandating a certain cross section (such as a non-traversable median) is set, then that type of cross section may be rarely employed, and the public will be unfamiliar with it. When that type of cross section is selected for a project, then the local citizens, not being aware of differences in volumes or safety problems from one town to another, may just think that the agency is treating their area differently and unfairly, because "no one else has it."
- When any threshold for mandating a certain cross section (such as a non-traversable median) is volume-based, it should be recognized that volumes often increase over time. The cross section selected for a project today needs to be suitable for traffic conditions far into the future, since the cross section is unlikely to change for decades. Exhibit 5-2 shows projection of a present 10,000 ADT growing at a compounded rate over the years. If a less-restrictive cross section were constructed and remained in place unchanged for 40 years, it could be entirely inadequate for a considerable portion of the life of the design.
- Retrofitting an existing roadway with a non-traversable median can difficult. It may be less challenging to install a non-traversable median in a lightly-developed corridor now rather than waiting until volume has risen or a corridor has fully developed.

Taken together, these considerations suggest not setting too high of a threshold for non-traversable median, so that non-traversable medians will not be rare and the installed median type will not soon be outdated.

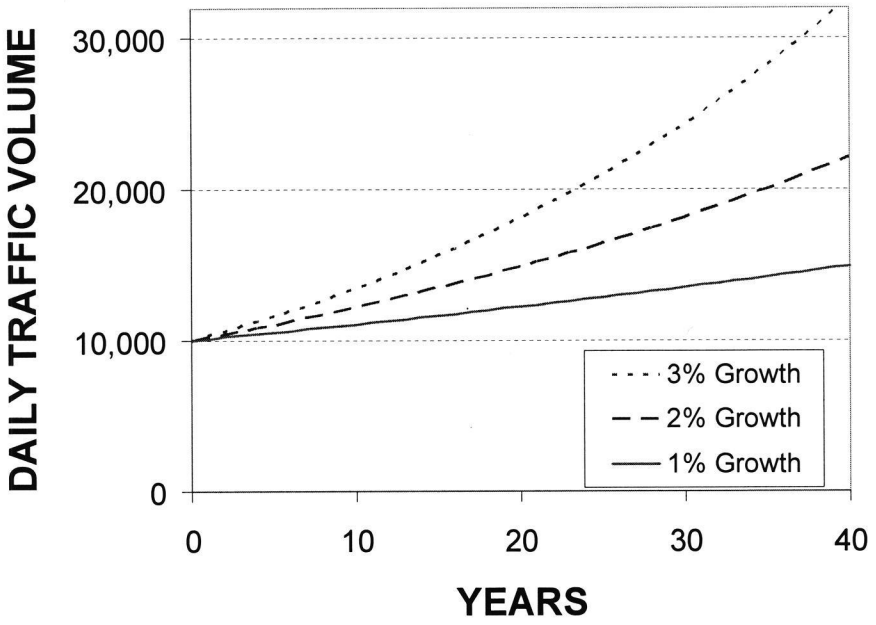


EXHIBIT 5-2 Effect of traffic growth on volume thresholds

Addressing the Details

To eliminate ambiguity that can lead to different interpretations and lawsuits, the inspection procedure and the subsequent permit document should address a number of issues. Before initiating an access management program, a transportation agency will need to establish policies addressing these questions.

Number of and Location of Driveways

The number of driveways allowed per tract will normally be one. Situations which may warrant additional driveways will need to be described.

When a parcel abuts both a state route and an intersecting side street, access to the parcel is usually taken from the side street and is prohibited from the state route.

Multiple Lots

How should a permit be handled when an owner applies for a permit for one lot, but the owner controls two adjacent lots? The first question to ask if whether state law allows the transportation agency to group or "bundle" adjacent lots under a single ownership into one permit. If it does, then the application form needs to ask whether the applicant owns any adjacent parcels, and then take steps to insure that only one access is granted to the grouped lots, unless it is otherwise determined that more are justified.

Sight Distance

Locations proposed for access points will need to be evaluated to determine if adequate sight distance exists. Granting a permit for access should be conditional upon the property owner maintaining adequate sight distance at the driveway intersection with the highway, and not blocking sight lines by placing signs, structures, trees and shrubs, or other obstacles within the sight triangle.

Future Site Modifications

The permit will need to state that modifications to the site may be cause to terminate the current permit and re-evaluate the site. If the tract is further subdivided or a part is sold to another owner, all of the tract will legally maintain access to and from the state highway via the permitted driveway, and the owners of each part of the tract are obligated to maintain a usable route from the permitted access point to parcels within the overall tract.

ESTABLISH A PERMIT AND APPEAL SYSTEM

From the public's perspective, all steps up until now have been relatively academic. Most of the public will first encounter an access management program during the actual process of applying for an access permit. The permit application process and the appeals system are the program components that involve the most personal interaction with the public.

Permit Principles

Any agency operating an access management program will need to prepare information and

instructions that the public can reasonably be expected to comprehend, so the public can know that any person desiring access to a state roadway needs to apply for a permit, where to apply for the permit, how to apply for a permit, and in general what is expected of them. The instructions need to spell out the steps in the permit application process.

An agency will need to develop a permit form that is both easy for the applicant to fill out and that contains enough information for the Permit Officer to sufficiently examine and investigate proposed access locations, and to make a correct decision. It is desirable to require different amounts of information for different environments or types of development. For example, it is reasonable to have more complexity for a commercial development and a simpler application and permit for connections to a farm or a single family residence.

When an access management program is in effect, the person charged with processing the permit application and evaluating a particular driveway location will have to consider a wide range of issues. Additional time will be required to evaluate the spacing from nearby existing access points and measure the available sight distance at the proposed access location. Some of the common tasks needed to conduct an access permit review follow.

- ascertain that the application contains sufficient information
- review highway and a right-of-way plans
- conduct a field review
- measure and record available sight distance
- measure spacing to other nearby access points, signals, median openings, ramp terminals
- measure the distances to the side-property lines
- obtain traffic volumes and turning movements
- review recent accident history
- coordinate the application/review with any local governments
- issue permits with any stipulations or conditions

If any aspect of a local government's access management standards is more restrictive, then that aspect should govern.

Perhaps during the first few weeks of a program, a review panel could help the district staff get started by examining and critiquing the recommended findings, before responding to the applicant. This could be done on a rotating basis among the districts, and the start date of the program would be staggered in each district to allow the panel to devote a few weeks per district before moving on to the next district.

Fees

Some states charge fees to help offset the cost of administering an access management program, while others do not. An agency will have to determine if fees (i.e., separate and apart from refundable deposits or bonds) will be charged. It may be worthwhile to investigate the possibility of charging no fee to single family residences, and a fee for other uses. Those requesting multiple driveways or proposing large, complex developments may warrant a higher fee.

Process for Variances and Appeals

Some situations that require an exercise of judgment to make exceptions can be addressed with a written set of guidelines, and administered at the district level. These guidelines should contain guidance as to what conditions or situations will justify issuing a variance (i.e, waiver or exception to the general rule). One example would be if a lot on a road with a raised median has no other frontage, then right in/right out will be allowed, even if spacing is less than desirable.

No matter how well thought out a policy or program is, when dealing with complex situations it is doubtful that one policy will always fit 100% of the situations that arise. No process is perfect, and even if one were, there is no guarantee that every applicant will agree with the permit officer's decision. The Department will need to develop processes for granting variances and appeals.

One state differentiates between minor and major variances (CAM 2003). If the requested deviation from the specified access spacing is within 10% of the standard, then the situation is handled at a lower level. If the difference exceeds 10%, then a higher level of review is required before a variance is granted.

For appeals, using a review panel is preferable to relying solely on one person. It is recommended that at least at the beginning of a program, a transportation agency establish a single committee to review variance requests. This will help establish a history of statewide consistency.

Maintaining and Using Records

The application process needs to be tracked from the beginning. All applications for access should be recorded and stored. Obviously, maintaining readily retrievable records will enable the Department to correctly process an application and respond to requests for information. A good record system will also retain a history in the event that an owner reapplies in the future, even after a change in agency personnel.

One potential problem that can occur after purchasing access rights to a tract is that of not discovering that purchase when processing an access application years later. This may lead to erroneously permitting access to the tract. A number of states are trying to find more reliable ways of documenting, storing, and retrieving map data that shows where along the existing rights-of-way access is to be denied, where access is to be allowed, where there is shared access, or there are other types of agreements in effect. Geographical information systems can be utilized to record the positions of existing, proposed, or denied access locations.

DEVELOP SUPPORTING DOCUMENTS AND MATERIALS

Two general categories of documents and supporting materials will need to be developed: those for guidance and direction within the Department, and those to assist the public. The materials for the Department will be much more involved and technical than those for the public. A listing of both types follows.

Documents for Staff

Staff will need both training materials and documents to assist them as they carry our their duties. In-house documents also help reduce the loss of institutional memory. The following types of documents

will need to be created or revised.

Access management policy directives
Access management guidebook
Revisions to construction plan typical detail sheets
Permit application checklists and procedures for field inspections
In-house informational and training documents

Before the program begins, the Department will need to develop and conduct training programs for planners, right-of-way agents, design engineers, and permit officers. Training for local officials, local staff, and consultants would be beneficial.

Documents for the Public

A transportation agency trying to inform the public of an access management program will need to develop non-technical educational materials for the public. Other states have created brochures, videos, and seminars to explain what access management is, why it is needed, and how it will be implemented. The following types of documents will be helpful.

Brochures explaining access management to the public
Brochures explaining the application process to the public
Access Permit application forms
Simplified technical drawings for the public, explaining what is expected when they construct their access

Before finalizing and releasing documents (especially those intended for the public), always pretest them to a group that has not been involved in developing them, to determine if any part of the document is confusing or can have an unintended interpretation.

When dealing with the public and their concerns, it is important to not lose sight of the reasons for having access management. These documents should emphasize the objectives of safety (access management reduces crash rates and saves lives), mobility (access management makes travel easier and less stressful), and economy (access management makes more efficient use of the taxpayer's dollars). Other benefits include aesthetics, increasing the market area for commercial tracts (by shortening travel times), and the decreased need for repeated reconstruction and the disruption it causes.

ESTABLISH AN ORGANIZATION TO OPERATE THE PROGRAM

To establish and carry out an effective access management program, a transportation agency needs a skilled manager to supervise the effort and staff trained to carry out the day-to-day operation of the program, all supported by a committed administration. The program manager will need to be a person who has the enthusiasm to persevere with a challenging program, and has been given the authority to deal with challenges. Both the supervisory staff and the permit officers should be people who can handle controversy and conflict. In addition, those who administer the program need to be reasonable and not prone to exceed their authority. Both the training and the written policies need to make it clear that the rules are not intended to deny access (unless administrators deem it necessary to purchase the tract), and a variance is appropriate when not granting it would deny access to the property. Abuses by those operating the program will generate complaints to higher authorities, who may move to kill the program

not because the concept is flawed, but because the operation of the program is flawed.

Responsibilities and authority will need to be delegated, and their limits defined so employees will know what is expected of them. The Department will need to identify people to perform these tasks.

Who will be the in-house resource, and the keeper of the policies and procedures?

Who will receive and process permit applications from the public?

Who will establish and maintain a record-keeping system?

Who will process and rule on appeals?

Who will provide legal advice?

Who will monitor the access related work of others, to insure that the program is being followed?

Many have stated that an access management program needs to be directed by a "champion," a manager who will enthusiastically support it and carry it out.

OPERATING THE PROGRAM

When the date arrives for actually putting the access management program into effect, many operations and activities will be regularly affected, including planning, designing, and permitting. The programming of future projects and the design of current projects will need to consider and incorporate access management principles and practices. More effort will probably be needed to process an access permit than is currently needed to process a driveway permit. Three aspects requiring special attention will be corridor planning, retrofit situations, and interactions with local governments.

Corridor Studies and Plans

Corridor studies are conducted to bring together many different considerations, including access management, and integrate them as needed in a comprehensive manner along a route. With respect to access management, corridor studies will designate where access for each tract can be taken. If the spacing and other criteria are such that a given tract should receive only one access point, then there should be provisions so that if a tract is further subdivided, all access remains via that originally designated opening, and no additional accesses will be created by subdividing. In some instances it may be necessary to purchase access rights.

Initially, corridor studies should be targeted at growth areas, where opportunities may soon be lost if action is not taken, and at roadway segments with elevated crash rates where a significant component is access-related crashes.

Retrofit Situations

Any state which undertakes access management will quickly identify many miles of roadway in the state network which do not conform with the adopted access management standards. Many of these non-conforming situations will be grandfathered in and allowed to remain until the property is modified. Other corridors will be candidates for retrofit projects, to bring the corridor closer to compliance. It is not uncommon for access management retrofit actions to be accompanied by other treatments, such as landscaping, in a project.

A retrofit project may be prompted by a crash problem, or just an overall roadway upgrade. During the planning of a retrofit, an agency will consider where to close driveways, street intersections, and

median openings, among other things. Specifically focusing on driveways, an agency will evaluate the need for and the feasibility of closing or modifying each driveway. A main focus of evaluating the suitability of a site for driveway consolidation is assessing how well the site could function if the proposed consolidation were implemented. This evaluation can consist of a series of steps (NJ).

1. Define the design vehicles -- what vehicles are likely to use the site?
   Typical examples include passenger cars, single unit trucks (UPS®, FedEx®, etc.), fuel delivery vehicles for gas stations, tractor trailers
2. Establish the "before" (i.e, current) vehicle travel paths
   Getting to and from the site, circulating within the site
3. Determine the travel plans the vehicles will need to take after driveways are modified
   Analyze getting to and from the site, analyze circulating on the site
4. Analyze the alternatives
   The ability of alternative access roadways to handle traffic, the ability of alternative access driveways to handle traffic

Working with Local Governments

Some planning and design components which contribute to the success of access management are more affected by local government controls than by state agency control. The interviews conducted in a number of states always elicited the same response: good working relationships with local governments contribute significantly to the success of a state access management program. The following is a partial list of activities that local governments need to promote during the subdivision, zoning, and building permit processes.

- When lots are being platted, require that the lot frontage be large enough so that with one driveway per lot, there will still be adequate spacing between successive driveways
- When lots are being platted, require a lot size that is large enough to accommodate on-site circulation
- Encourage or require shared driveways
- Require inter-site connections
- Require inter-subdivision connections
- Develop a supporting street system to provide adequate circulation

States also reported creating arrangements with local governments, so that when plans are reviewed for proposed developments that abut or affect a state route, the state transportation agency is included. Conflicts can be avoided if the local government will not issue a building permit until the applicant holds a valid access permit from the state, and the state access permit is conditional upon receiving all of the required local approvals.

The State agency should notify local governments of general access management policies and of access management proposed for any corridor that will affect the local area. One means to encourage local government participation is for a state transportation agency to establish financial inducements, such as special funding and/or elevated priority, to encourage local government participation in corridor planning.

Continuing an Access Management Program

When a transportation agency decides to implement an access management program, there is always the possibility that some future administration will be less interested and that ground gained will be subsequently lost -- this is true of any program or practice. To improve chances of succeeding and surviving into the future, there should be group of people within the organization with access management as one of their prime responsibilities, led by an able spokesperson for the benefits of access management.

After starting an access management program, an agency will gain experience and perspectives which will lead to changes ranging from tweaking the program to significant adjustments. Some changes may be due to realizing some unintended effects of certain procedures or design treatments, while other changes may be made to better serve those applying for access. A number of states with older programs reported at least one instance of a major reformulation of the program.

> Philip Demosthenes of Colorado DOT, stated that after many years [over two decades] he is still selling, still problem solving, and still acting like it's a new program that is always under pressure.
>
> Frawley and Eisele. "Lessons Learned: Access Management Programs in Selected States"

With the turnover that occurs over time in public offices, administrators, and staff, there will be an ongoing need for training and education. The National Highway Institute offers classes on access management programs. One means of gaining new ideas and re-energizing the staff is attending the TRB National Access Management Conferences. The program leader needs to continually emphasize the reasons for access management: safety, mobility, and protecting the public's investment in the roadway network.

ONE OPTION FOR PROCEEDING

Comprehensive access management involves considerable detail, and a relatively high level of complexity. It takes a lot of cooperation and coordination to create and operate a successful access management program. It is not uncommon to find that after a state program has been in existence for a number of years, the accumulated experience prompts major revisions.

Instead of embarking upon a full-blown program, a state transportation agency may elect to begin with an incremental approach. An incremental program will still require many of the steps that would be needed to create an encompassing program, but with an incremental program, the actual implementation would be limited during the initial stages.

Initially, the transportation agency's efforts would be directed toward education and demonstration projects, as described below.

- Selected staff develops a framework for the program. This includes developing trial access categories, design practices, and connection spacings.
- Identify preliminary candidate projects, such as urban bypass routes, routes at the fringe of a developing urban area, or routes with congestion or safety problems.
- Approach local leaders to evaluate their receptivity, and if favorable, explain what access management is and what its benefits are.
- Where further study finds the project to be feasible, and the local government(s) support and enact measures necessary to complement access management, then proceed with project development and construction of the access managed roadway.

Perhaps the agency could earmark a category of funds, sufficient in size to be an incentive for local governments to participate, for access management demonstration projects.

Starting with a small-scale incremental approach would allow a transportation agency to gain experience with the processes and details of access management. Management could more easily track the effort, and reassess and modify the practices as needed. This is similar to the concept in other fields of building and testing a prototype before going into full-scale production. After the time needed to create a cadre of personnel with experience, then the scope of the program could be expanded.

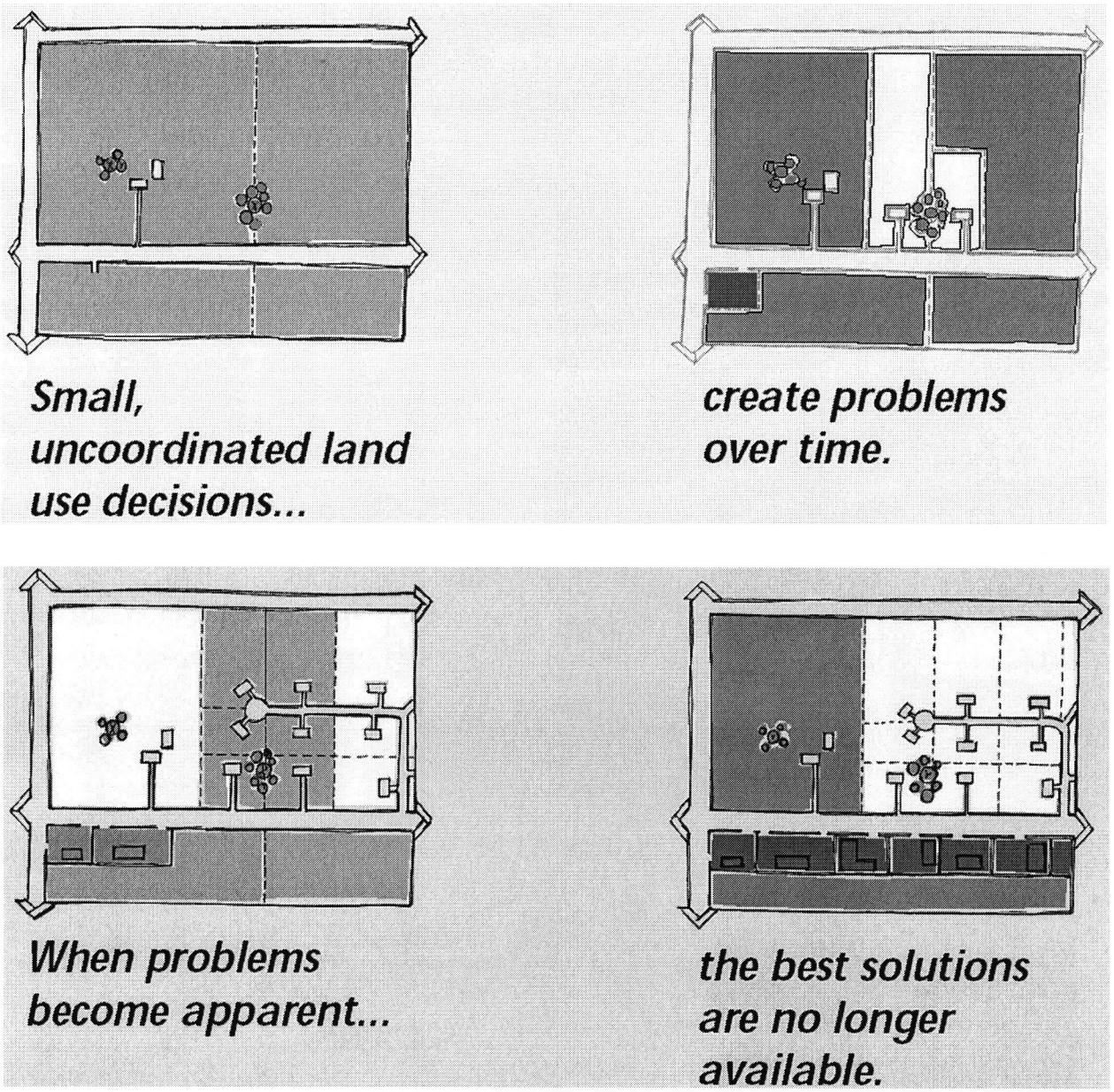
CHAPTER 6
SUMMARY AND CONCLUSION

Access management is the systematic control of the location, spacing, design, and operation of interchanges, medians and median openings, and driveway and street connections to a roadway (CAM 2003). Access management is implemented in order to better balance the two competing and sometimes incompatible roadway functions of providing access and moving people and goods. With access management, a small but important fraction of the roadway network is preserved to provide a high degree of mobility for the public. Access management is implemented and applied to roadways by means of policy, planning, and design procedures.

While a number of unanswered questions remain, many research studies or observations related to various aspects of access management have been performed over the decades. With respect to multilane, arterial roadways, published documents have presented the following **general** statements.

- Providing a separate lane for left-turn maneuvers, out of the through traffic lane, significantly improves safety.
- Having an arterial roadway with a raised, flush, or depressed median is preferable to having an undivided (i.e., no median) cross section.
- Various sources recommend that a raised or depressed median be used instead of a two-way left-turn lane (TWLTL) when volume exceeds somewhere between 10,000 to 28,000 vehicles per day.
- The U-turn movements necessitated by a non-traversable median do not seem to adversely affect safety.
- Reducing the frequency of access points, especially commercial access points, improves roadway safety.
- Providing a median improves pedestrian safety.
- Spacing of traffic signals at no less than 1/2 mile intervals improves traffic flow and roadway capacity.
- Managing access improves traffic flow and roadway capacity.
- The impacts of access management on abutting commercial properties are difficult to measure and may vary from location to location. Some studies evaluating conditions before and after the construction of a raised median have found cases where business improved and other cases where business declined. Access management may not affect all types of businesses equally, and a business that is barely surviving may be vulnerable during construction or after the installation of a median. A number of studies have found that property values increase after the installation of access management treatments. There are certainly many examples of access managed roadways surrounded by thriving businesses.

Exhibit 6-1 shows one state's graphic to explain why a proactive program like access management is needed to avoid repeating mistakes from the past.



Minnesota Department of Transportation (January 15, 1999)
Highway Access Management Policy Study. St. Paul, MN

EXHIBIT 6-1 Recognizing a flawed process

ONE STATE'S SUMMARY

1. Access management is a key feature of the DOT's strategy to preserve and maintain the safety, capacity, and mobility of the state's highway system and link the communities and businesses it serves.
2. The continued growth and vitality of the entire state depend largely on the ability of our transportation system to provide the mobility we need.
3. Access-related crashes cost lives, injure people, and damage property.
4. Managing access involves the use of medians, turn lanes, and traffic signals; the spacing and design of intersections and driveways; and the construction of service roads and supporting local streets.
5. Authority to regulate access under the police powers of the state is limited by the constitutionally protected access rights of abutting land owners.
6. Purchasing access control is effective if done before major development has occurred, but is very costly and disruptive if required to address retrofit situations.
7. Successful access management requires careful coordination between land use and transportation objectives. In the state, the responsibilities for managing transportation and land use are segmented.
8. Local government land use decisions have major impacts on the access conditions along the highway.
9. Although some local governments consider access management in their land use decisions, many do not, for a variety of reasons.
   - Lack of knowledge and understanding.
   - Problem time lags [too much time passes before the consequences appear].
   - Local desire for development.
   - Lack of shared vision and common guidelines.
   - Complex access laws.
   - Limited funding options.
10. At present, few formal linking mechanisms exist to encourage and support coordination and partnership between those jurisdictions responsible for managing the major highways - the state DOT and the counties - and those jurisdictions responsible for managing land use - primarily cities.
11. Strengthening the partnership among the state DOT, counties, and cities will require a comprehensive strategy. There is no simple solution to address the full range of obstacles.

among the Recommendations ...

Take an Incremental Approach

Start with Guidelines, Education, and Demonstration Projects

Minnesota Department of Transportation (January 15, 1999)
Highway Access Management Policy Study St. Paul, MN

THINKING IT THROUGH

For an access management policy to work effectively, the policy has to include, combine, and adequately address a number of complementary design elements. Leaving out some of these complimentary elements may result in traffic operations problems on the roadway. Some of the critical component elements, depending upon the particular situation, may include the following.

- A driveway policy that provides adequate separation between sequential driveways.
- A driveway policy that encourages access from the perpendicular side street, not the main arterial.
- Sufficient right-of-way width to include a raised median (which usually will be wider than a TWLTL), and width for U-turning movements, and still leave space an adequate-width border and for sidewalks.
- A supporting system of connected streets and interconnected sites, for traffic circulation.
- Local subdivision and zoning practices that produce abutting tracts with a sufficient length of frontage along the arterial.

In extreme situations, where the necessary design elements have not been addressed, access management may restrict circulation and access to private tracts to such a degree that motorists encroach upon other properties, such as making U-turns in the driveways or parking lots of other sites.

Obviously, under current law some of these necessary elements can only be adequately controlled at the local government level. When too many of the pieces don't "fit", you can have a problem design with the blanket use of raised medians, just like you can with a TWLTL.

Evaluating the pluses and minuses of any pair of options can be perplexing. No new program will easily or flawlessly adapt to every scenario. The question becomes "which option has more flaws -- the existing approach or the proposed alternative?" Other states have adopted access management and found that the advantages outweigh the problems.

CLOSING

Even though the concepts of access management can be found in documents from the mid-1900s, only since the 1980s has the AASHTO *Green Book* begun to stress its importance and have a number of states embarked upon access management programs. Perhaps the growing acceptance of access management has been in part sparked by the growing realizations of the benefits it provides to the traveling public, the fiscal constraints which cause agencies to spend money now to save more money later, and observing the cumulative negative impacts of doing nothing.

Access management design concepts are based on studies conducted in many different locales by a variety of researchers. Although these concepts are rather straightforward, the implementation and administration cuts across organizational boundaries. Therefore, an effective access management program requires interaction and cooperation not only among different working groups within the organization, but also among different governmental agencies. In the near term, an access management program will add to the workload. In the long term, this increase will be offset by eliminating physical factors that contribute to congestion and crashes, therefore preventing some problem situations from ever happening in the first place.

A logical question to ask is "why adopt a program with these complexities?"

Transportation agencies have adopted access management because the benefits make the effort worthwhile. By implementing an access management program, a transportation agency can

- improve roadway safety, by controlling some of the elements that contribute to roadway crashes;
- improve mobility, by removing impediments to smooth traffic flow; and
- protect the public's investment in the roadway system by greatly extending the functional life of roadways.

An access management program allows a transportation agency to elevate its ability to improve the quality of life of the citizens in a fiscally conservative manner.

Finally, an access management program will not be effective unless upper management supports the program and firmly enforces the access management policies and practices. Experience has shown that some people believe they will be adversely affected by or even fear the implementation of access management, and attempt to use their political influence to quash the implementation of access management. Top officials then have to determine if their responsibility is to acquiesce to the fears of a few or to address the safety and mobility needs of the overall traveling public.

> "The idea is to improve the future, even at the cost of losing some of the past, and enduring some pain in the present."
>
> Editorials. *Arkansas Democrat-Gazette*, Lowell, AR, April 27, 2005, p. 4B.

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APPENDICES

NOTE: some documents have been reformatted or otherwise modified to facilitate incorporating them into this publication.

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APPENDIX A : Example Access Permit Application Documents

Colorado

INSTRUCTIONS FOR COMPLETING APPLICATION FOR ACCESS PERMIT (CDOT FORM NO. 137) December 2004

To construct, relocate, close, or modify access(es) to a State Highway or when there are changes in use of such access point(s), an application for access permit must be submitted to the Colorado Department of Transportation (CDOT) or the local jurisdiction serving as the issuing authority for State Highway Access Permits. Contact the CDOT Regional Access Unity in which the subject property is located to determine where the application must be submitted. The following link will help you determine which CDOT Region office to contact:

http://www.dot.state.co.us/AccessPermits/PDF/Region_Address_and_Map.pdf

All applications are processed and access permits are issued in accordance to the requirements and procedures found in the most current version of the State Highway Access Code (Access Code). Copies of the Access Code and the application form are available from the CDOT Headquarters, Access Unit located at 1325 South Colorado Boulevard, Denver, CO 80222 and in each of the six Regional CDOT offices. The locations of CDOT Regional Offices, the Access Code and the application form are also available from CDOT's web site at:

http://www.dot.state.co.us/AccessPermits/index.htm

Please complete all information requested accurately. Access permits granted based on applications found to contain false information may be revoked. An incomplete application will not be accepted. If additional information, plans and documents are required, attach them to the application. Keep a copy of your submittal for your records. Please note that only the original signed copy of the application will be accepted. Do not send or enclose any permit fee at this time. A permit fee will be collected if an access permit is issued. The following is a brief description of the information to be provided on each enumerated space on the application form (CDOT Form 137,2004).

1. Property Owner (Permittee): Please provide the full name, mailing address and telephone number and the E-mail address (if available) of the legal property owner (owner of the surface rights). Please provide a telephone number where the Permittee can be reached during business hours (8:00 a.m. to 5:00 p.m.). Having a contract on the property is not a sufficient legal right to that property for purposes of this application. If the access is to be on or across an access easement, then a copy of the easement MUST accompany this application. If federal land is involved, provide the name of the relevant federal agency AND attach copy of federal authorization for property use.

2. Agent for permittee: If the applicant (person completing this application) is different than the property owner (Permittee), provide entity name (if applicable), the full name of the person serving as the

Agent, mailing address, telephone number, and the E-mail address (if available). Please provide a telephone number where the Agent can be reached during business hours (8:00 a.m. to 5:00 p.m.). Joint applications such as owner/lessee may be submitted. Corporations must be licensed to do business in Colorado: All corporations serving as, or providing, an Agent as the applicant must be licensed to do business in Colorado.

3. Address of Property to be Served: Provide if property to be served has an official street address. If the access is a public road, note the name (or future name) of the road.

4. Legal Description of Property: Fill in this item to the extent it applies. This information is available at your local County Courthouse, or on your ownership deed(s). A copy of the deed may be required as part of this application in some situations. To determine applicability, check with the CDOT's Regional Access Manager or issuing authority staff.

5. State Highway: Provide the State Highway number from which the access is requested.

6. Highway Side: Mark the appropriate box to indicate what side of the highway the requested access is located.

7. Access Mile Point: Without complete information, we may not be able to locate the proposed access. To obtain the distance in feet, drive the length between the mile point and the proposed access, rounding the distance on the odometer to the nearest tenth of a mile; multiply the distance by 5,280 feet to obtain the number of feet from the mile point. Then enter the direction (i.e. north, south, east, west) from the mile point to the proposed access. Finally, enter the mile point number. It is helpful in rural or undeveloped areas if some flagging is tied to the right-of-way fence at the desired location of the access. Also, if there is a cross street or road close to the proposed access, note the distance in feet (using the same procedures noted above) from that cross street or road.

8. Access Construction Date: Fill in the date on which construction of the access to planned to begin.

9. Access Request: Mark items that apply. More than one item may be checked.

10. Existing property use: Describe how the property is currently being used. For example, common uses are Single Family Residential, Commercial or Agricultural.

11. Existing Access: Does the property have *any other legal alternatives to reach a public road* other than the access requested in this application? Note the access permit number(s) for any existing state highway access point(s) along with their issue date(s). If there are no existing access point(s), mark the "no" box.

12. Adjacent Property: Please mark the appropriate box. If the "yes" box is marked, provide a brief description of the property (location of the property in relation to the property for which this access application is being made).

13. Abutting Streets: If there are any other existing or proposed public roads or easements abutting the property, they should be shown on a map or plan attached to this application.

14. Agricultural Acres: Provide number of acres **to be served**.

15 and 16. Access Use: List the land uses and square footage of the site as it will be when it is fully developed. The planned land uses as they will be when the site is fully developed are used to project the amount of traffic that the site will generate, peak hour traffic levels and the type of vehicles that can be expected as a result of the planned land uses. There may be exceptional circumstances that would allow phased installation of access requirements. This is at the discretion of the CDOT Regional Access Unit or issuing authority staff.

17. Estimated Traffic Count: Provide a reasonable estimate of the traffic volume expected to use the access. Note the type of vehicles that will use the access along with the volume (number of vehicles in and out at either the peak hour or average daily rates) for each type of vehicle. A vehicle leaving the property and then returning counts as two trips. If 40 customers are expected to visit the business daily, there would be 80 trips in addition to the trips made by all employees and other visitors (such as delivery and trash removal vehicles). If the PDF on-line version of this application is being used, the fields for each type of vehicle will automatically be added together to populate the last field on the page.

18. Documents and Plans: The CDOT Regional Access Manager or issuing authority staff will determine which of these items must be provided to make the application complete. Incomplete applications will not be accepted. If an incomplete application is received via U.S. mail or through means other than in the hand of the Access Manager or issuing authority staff, it will not be processed. ***It is the responsibility of the applicant to verify with the CDOT Regional Access Manager or issuing authority staff whether the application is complete at the time of submission.***

Signature: Generally, if the applicant is not the property owner, then the property owner or a legally authorized representative must sign the application. With narrow exceptions, proof of the property owner's consent is required to be submitted with the application (proof may be a power of attorney or a similar consent instrument). The CDOT Regional Access Manager or issuing authority staff will determine if the exception provided in the Access Code (2.3 (3) (b)) is applicable.

If CDOT is the issuing authority for this application, direct your questions to the CDOT Regional Access Manager or the issuing authority staff serving the subject property.

http://www.dot.state.co.us/AccessPermits/PDF/Region_Address_and_Map.pdf

If the application is accepted, it will be reviewed by the CDOT Regional Access Manager or the issuing authority staff. If an Access Permit is issued, be sure to read all of the attached Terms and Conditions before signing and returning the Access Permit. The Terms and Conditions may require that additional information be provided prior to issuance of the Notice to Proceed.

The CDOT Regional Access Manager (or issuing authority staff) MUST be contacted prior to

commencing work on any Access Permit project. ***A Notice to Proceed that authorizes the Permittee to begin access related construction MUST be issued prior to working on the access in the State Highway right-of-way***. The Notice to Proceed may also have Terms and Conditions that must be fulfilled before work may begin on the permitted access.

Instructions for completing Application for Access Permit (CDOT Form 137), December, 2004

COLORADO DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ACCESS PERMIT APPLICATION

Issuing authority application acceptance date:

Instructions: *Please print or type*

- Contact the Colorado Department of Transportation (CDOT) or your local government to determine your issuing authority.
- Contact the issuing authority to determine what plans and other documents are required to be submitted with your application.
- Complete this form (some questions may not apply to you) and attach all necessary documents and Submit it to the issuing authority.
- Submit an application for each access affected.
- If you have any questions contact the issuing authority.
- For additional information see CDOT's Access Management website at http://www.dot.state.co.us/AccessPermits/index.htm

1) Property owner (Permittee)		2) Agent for permittee (if different from property owner)	
Street address		Mailing address	
City, state & zip	Phone #	City, state & zip	Phone # (required)
E-mail address		E-mail address if available	

3) Address of property to be served by permit (required)

4) Legal description of property: If within jurisdictional limits of Municipality, city and/or County, which one?

county	subdivision	block	lot	section	township	range

5) What State Highway are you requesting access from?

6) What side of the highway? ☐ N ☐ S ☐ E ☐ W

7) How many feet is the proposed access from the nearest mile post?

_____ feet ☐N ☐S ☐E ☐W) from:_____

How many feet is the proposed access from the nearest cross street?

_____ feet ☐N ☐S ☐E ☐W) from:_____

8) What is the approximate date you intend to begin construction?

9) Check here if you are requesting a:

☐ new access ☐ temporary access (duration anticipated:) ☐ improvement to existing access

☐ change in access use ☐ removal of access ☐ relocation of an existing access (provide detail)

10) Provide existing property use

11) Do you have knowledge of any State Highway access permits serving this property, or adjacent properties in which you have a property interest?

☐ no ☐ yes, if yes - what are the permit number(s) and provide copies: and/or, permit date:

12) Does the property owner own or have any interests in any adjacent property?

☐ no ☐ yes, if yes - please describe:

13) Are there other existing or dedicated public streets, roads, highways or access easements bordering or within the property?

☐ no ☐ yes, if yes - list them on your plans and indicate the proposed and existing access points.

14) If you are requesting agricultural field access - how many acres will the access serve?

15) If you are requesting commercial or industrial access please indicate the types and number of businesses and provide the floor area square footage of each.

business/land use	square footage	business	square footage

16) If you are requesting residential developement access, what is the type (single family, apartment, townhouse) and number of units?

type	number of units	type	number of units

17) Provide the following vehicle count estimates for vehicles that will use the access. Leaving the property then returning is two counts.

Indicate if your counts are ☐ peak hour volumes or ☐ average daily volumes.	# of passenger cars and light trucks at peak hour volumes	# of multi unit trucks at peak hour volumes
# of single unit vehicles in excess of 30 ft.	# of farm vehicles (field equipment)	Total count of all vehicles 0

18) Check with the issuing authority to determine which of the following documents are required to complete the review of your application.

a) Property map indicating other access, bordering roads and streets.
b) Highway and driveway plan profile.
c) Drainage plan showing impact to the highway right-of-way.
d) Map and letters detailing utility locations before and after development in and along the right-of-way.
e) Subdivision, zoning, or development plan.
f) Proposed access design.
g) Parcel and ownership maps including easements.
h) Traffic studies.
i) Proof of ownership.

1- It is the applicant's responsibility to contact appropriate agencies and obtain all environmental clearances that apply to their activities. Such clearances may include Corps of Engineers 404 Permits or Colorado Discharge Permit System permits, or ecological, archeological, historical or cultural resource clearances. The CDOT Environmental Clearances Information Summary presents contact information for agencies administering certain clearances, information about prohibited discharges, and may be obtained from Regional CDOT Utility/Special Use Permit offices or accessed via the CDOT Planning/Construction-Environmental-Guidance webpage **http://www.dot.state.co.us/environmental/Forms.asp**.

2- All workers within the State Highway right of way shall comply with their employer's safety and health policies/ procedures, and all applicable U.S. Occupational Safety and Health Administration (OSHA) regulations - including, but not limited to the applicable sections of 29 CFR Part 1910 - Occupational Safety and Health Standards and 29 CFR Part 1926 - Safety and Health Regulations for Construction.

Personal protective equipment (e.g. head protection, footwear, high visibility apparel, safety glasses, hearing protection, respirators, gloves, etc.) shall be worn as appropriate for the work being performed, and as specified in regulation. At a minimum, all workers in the State Highway right of way, except when in their vehicles, shall wear the following personal protective equipment: High visibility apparel as specified in the Traffic Control provisions of the documentation accompanying the Notice to Proceed related to this permit (at a minimum, ANSI/ISEA 107-1999, class 2); head protection that complies with the ANSI Z89.1-1997 standard; and at all construction sites or whenever there is danger of injury to feet, workers shall comply with OSHA's PPE requirements for foot protection per 29 CFR 1910.136, 1926.95, and 1926.96. If required, such footwear shall meet the requirements of ANSI Z41-1999.

Where any of the above-referenced ANSI standards have been revised, the most recent version of the standard shall apply.

3- The Permittee is responsible for complying with the Revised Guidelines that have been adopted by the Access Board under the American Disabilities Act (ADA). These guidelines define traversable slope requirements and prescribe the use of a defined pattern of truncated domes as detectable warnings at street crossings. The new Standards Plans and can be found on the Design and Construction Project Support web page at: **<http://www.dot.state.co.us/DesignSupport/>**, then click on *Design Bulletins*.

If an access permit is issued to you, it will state the terms and conditions for its use. Any changes in the use of the permitted access not consistent with the terms and conditions listed on the permit may be considered a violation of the permit.

The applicant declares under penalty of perjury in the second degree, and any other applicable state or federal laws, that all information provided on this form and submitted attachments are to the best of their knowledge true and complete.

I understand receipt of an access permit does not constitute permission to start access construction work.

Applicant's signature	Print name	Date

If the applicant is not the owner of the property, we require this application also to be signed by the property owner or their legally authorized representative (or other acceptable written evidence). This signature shall constitute agreement with this application by all owners-of-interest unless stated in writing. If a permit is issued, the property owner, in most cases, will be listed as the permittee.

Property owner signature	Print name	Date

New Jersey

Form MT-32 6/96

NEW JERSEY DEPARTMENT OF TRANSPORTATION

DRIVEWAY ACCESS PERMIT APPLICATION

Application No.
Control Section
Amount Received
Check No.
Date Received
Department Use Only

Please Print or Type

APPLICANT: _____
(Name of Lot Owner)

_____
(Street)

_____
(City) (State) (Zip Code)

(____) _____
(Phone Number)

LOCATION: BLOCK: _____ LOT: _____

MUNICIPALITY: _____ COUNTY: _____

DESCRIPTION: Between _____ And _____

THE TYPE OF PERMIT REQUESTED IS: *(CHECK ONE):*

*Submit to the **REGIONAL MAINTENANCE OFFICE**:*
( ) Single Family Residential
( ) Combined Residence and Business
( ) Government Driveway
( ) Minor

*Submit to the **BUREAU OF MAJOR ACCESS PERMITS**:*
( ) Major
( ) Major with Planning Review
( ) Concept Review

THIS PERMIT REQUEST INCLUDES:
(Check those that apply.)
( ) Lot Consolidation
( ) Lot Subdivision
( ) Drainage
( ) Curb
( ) Sidewalk

PLEASE FILL IN THE FOLLOWING INFORMATION:

1) ROUTE: _____ 2) SUFFIX: _____ 3) MILEPOST: _____ 4) DIRECTION _____

5) LIST THE DEVELOPMENT THE ACCESS WILL SERVE:

LAND USE TYPE	LAND USE SIZE	EXISTING OR PROPOSED

6) TOTAL SIZE OF DEVELOPMENT THE ACCESS WILL SERVE _____

7) IS THE LOT A CORNER LOT? (YES OR NO) _____

IF YES, IS THE INTERSECTING ROAD ALSO A STATE HIGHWAY? _____

8) IS A TRAFFIC SIGNAL INVOLVED AT THE LOT? (YES OR NO) _____

9) IS THE LOT SHARING ACCESS WITH A NEIGHBORING LOT? (YES OR NO) _____

IF YES, SHARING ACCESS WITH LOT ON WHICH SIDE? _____

10) HOW MANY TWO-WAY DRIVEWAYS ARE REQUESTED? _____

(ON DIVIDED HIGHWAYS 2, ONE-WAY DRIVEWAYS MAY BE SUBSTITUTED FOR 1, TWO-WAY DRIVEWAY)

11) WHAT SIZE IS THE LOT (TO HUNDREDTHS OF ACRE)? _____ ACRES

12) WILL THE LOT BE SERVED BY ALTERNATIVE ACCESS? (YES OR NO) _____

13) IF YES, WHAT IS THE PERCENTAGE OF TRAFFIC USING THE ALTERNATIVE ACCESS? _____

14) DOES THE DEPARTMENT OWN ANY DENIAL OF ACCESS ALONG THE LOT FRONTAGE? (YES OR NO) _____

IF YES, IS IT ON THE LEFT OR RIGHT SIDE OF THE LOT, WHEN FACING THE LOT? _____

FOR HOW MANY FEET? _____ FEET

15 HOW MANY FEET OF FRONTAGE DOES THE LOT HAVE ON THE STATE HIGHWAY? _____ FEET

16) LOOKING AT THIS LOT FROM THE HIGHWAY, WHAT ARE THE FRONTAGES OF THE NEIGHBORING LOTS WITHIN 330' AND ARE THE LOTS SINGLE FAMILY RESIDENTIAL?

LEFT: _____ FEET YES OR NO: _____ RIGHT: _____ FEET YES OR NO: _____

LEFT: _____ FEET YES OR NO: _____ RIGHT: _____ FEET YES OR NO: _____

(NOTE: Not applicable if this application is for a single family residential lot)

17) HAVE YOU ATTACHED AN AFFIDAVIT FOR ANY AFFORDABLE HOUSING ON THE LOT? (YES OR NO) _____

Please provide the information for those items that have parentheses under your application type.

APPLICATION CHECKLIST

For Applicant's Use *For Dept. Use*

N.J.A.C. 16:47 –	SINGLE FAMILY RESIDENTIAL/ RESIDENCE & BUSINESS 4.9	OTHER MINOR TRAFFIC GENERATORS 4.10	MAJOR 4.12	MAJOR WITH PLANNING REVIEW 4.14	CONCEPT REVIEW 4.16	
1. Lot location map.	–	( )	( )	( )	( )	( )
2. Copy of tax map.	( )	( )	( )	( )	( )	( )
3. Right of way line from Department desirable typical section	( )	( )	( )	( )	( )	( )
4. Topography showing all highway features within 500 feet of the lot frontage on both sides of undivided highways and one side of divided highways.	–	( )	( )	( )	–	( )
5. Setback and location of structures.	( )	( )	( )	( )	–	( )
6. Curb: existing & proposed.	( )	( )	( )	( )	–	( )
7. Sidewalks: existing & proposed.	( )	( )	( )	( )	–	( )
8. Trees within Department right-of-way.	( )	( )	( )	( )	–	( )
9. Signs.	( )	( )	( )	( )	–	( )
10. Utility Poles.	–	( )	( )	( )	–	( )
11. Highway electrical installations.	( )	( )	( )	( )	–	( )
12. Locations of all lot driveways – existing and proposed.	( )	( )	( )	( )	( )	( )
13. Locations of nearest driveway on adjacent lots, including type of operation using adjacent driveways.	–	–	–	( )	–	( )
14. Driveway/street width.	( )	( )	( )	( )	( )	( )
15. Driveway/street alignment with respect to the highway.	( )	( )	( )	( )	( )	( )
16. Curbline openings.	( )	( )	( )	( )	( )	( )
17. Edge clearance.	( )	( )	( )	( )	–	( )
18. Type of driveway/street.	( )	( )	( )	( )	( )	( )
19. Contours - existing & proposed.	–	( )	( )	( )	–	( )
20. Corner clearance.	( )	( )	( )	( )	–	( )
21. Driveway/street & island radii.	–	( )	( )	( )	–	( )
22. Estimated 24-hour & highway peak-hour traffic count for the lot & access point.	( )	( )	( )	( )	( )	( )
23. Number of lanes on the highway.	–	( )	( )	( )	( )	( )
24. Speed-change lanes (acceleration, deceleration, left-turn).	–	( )	( )	( )	( )	( )
25. Lane and shoulder widths.	–	( )	( )	( )	( )	( )
26. Typical highway pavement sections.	–	( )	( )	( )	( )	( )
27. Location of centerline on undivided highways and median on divided highways.	–	( )	( )	( )	( )	( )
28. Location of existing median openings on divided highways.	–	( )	( )	( )	( )	( )
29. Location of existing driveways on opposite side of undivided highways.	–	( )	( )	( )	( )	( )

For Applicant's Use *For Dept. Use*

N.J.A.C. 16:47 –	SINGLE FAMILY RESIDENTIAL/ RESIDENCE & BUSINESS 4.9	OTHER MINOR TRAFFIC GENERATORS 4.10	MAJOR 4.12	MAJOR WITH PLANNING REVIEW 4.14	CONCEPT REVIEW 4.16	
30. Dimensions from the lot line to the edge of pavement.	–	( )	( )	( )	( )	( )
31. Number of new units for residential units; rooms for hotels & motels; square footage for retail, office or warehouse; or appropriate unit of measure for other land uses.	–	( )	( )	( )	( )	( )
32. Parking facilities & internal traffic circulation.	–	–	( )	( )	( )	( )
33. Traffic patterns: existing & proposed.	–	( )	( )	( )	( )	( )
34. Highway traffic striping: existing & proposed.	–	( )	( )	( )	–	( )
35. Construction details.	–	( )	( )	( )	–	( )
36. Type of vehicles anticipated.	–	–	( )	( )	–	( )
37. Attachments to Department drainage system: existing and proposed.	–	–	( )	( )	–	( )
38. Drainage calculations: existing and proposed.	–	–	( )	( )	–	( )
39. Changes to existing traffic signals.	–	–	( )	( )	( )	( )
40. New traffic signals & MUTCD warrant numbers.	–	–	( )	( )	( )	( )
41. Proposed lot & highway transportation improvements.	–	–	–	( )	–	( )
42. Length of lot frontage along highway.	( )	( )	( )	( )	( )	( )
43. Distance to nearest traffic signal if less than 250 ft.- preceding (in feet), following (in feet).	( )	( )	–	–	–	( )
44. Distance to nearest traffic signal if less than 500 ft. - preceding (in feet), following (in feet).	–	–	( )	–	–	( )
45. Distance to nearest traffic signal - preceding (in feet), following (in feet).	–	–	–	( )	–	( )
46. Zoning designation for lot.	( )	( )	( )	( )	( )	( )
47. Waivers requested	( )	( )	( )	( )	( )	( )
48. Copies of transmittals of duplicate applications to the municipal clerk & county planning board.	–	–	( )	( )	( )	( )
49. Location of any access easement on the lot.	( )	( )	( )	( )	( )	( )
50. Applicability of Pinelands Act.	( )	( )	( )	( )	( )	( )
51. Justification for exceptions to design standards.	( )	( )	–	–	–	( )
52. Proposed use and size of buildings	–	–	–	–	( )	( )
53. Detailed plan or sketch : scale 1 in. = 30 ft. or 1 in. = 50 feet (Plan sheets shall not exceed 24 by 36 inches). Number of sets.	( ) 6	( ) 6	( ) 7	( ) 7	–	( )
54. Submitted plan sets 1 in. = 100 feet or 1 in. = 50 feet (Plan sheets shall not exceed 24 by 36 inches). Number of sets.	–	–	–	–	( ) 9	( )
55. Traffic impact studies, include TIS if concept review requires a planning review. Number of copies.	–	–	–	( ) 3	( ) 3	( )
56. A copy of current deed for the lot.	( )	( )	( )	( )	( )	( )

PLEASE SUBMIT ONLY THE APPLICATION FEE WITH THIS APPLICATION.
SUBMIT CHECK OR MONEY ORDER, PAYABLE TO:

NEW JERSEY DEPARTMENT OF TRANSPORTATION

CASH WILL NOT BE ACCEPTED
FEES ARE NOT REFUNDABLE

FEES:

APPLICATION TYPE	APPLICATION FEE EACH LOT	PERMIT FEE EACH LOT	RENEWAL FEE EACH LOT
SINGLE FAMILY RESIDENTIAL DRIVEWAY	$ 35.00	$ 15.00	$ 15.00
RESIDENCE AND BUSINESS DRIVEWAY	75.00	25.00	25.00
GOVERNMENT DRIVEWAY	150.00	500.00	250.00
MINOR	265.00	85.00	85.00
MAJOR	3,750.00	1,250.00	250.00
MAJOR WITH PLANNING REVIEW	9,000.00	3,000.00	250.00
CONCEPT REVIEW	500.00	-------	-------

FEES FOR LOW AND MODERATE INCOME HOUSING ONLY

FOR APPLICATIONS WITH LOW AND MODERATE INCOME HOUSING, THE APPLICANT SHOULD SUBMIT AN AFFIDAVIT FROM THE MUNICIPAL APPROVING AUTHORITY WITH THIS APPLICATION, CERTIFYING TO THE DEPARTMENT THAT THE DEVELOPMENT CONTAINS AT LEAST 10 PERCENT SET-ASIDE FOR LOW AND MODERATE INCOME HOUSING PURSUANT TO THE FAIR HOUSING ACT P. L. 1985, c.222 (N.J.S.A.52:27D-301 ET SEQ.) OR COURT SETTLEMENT AS PER N.J.A.C. 16:41-2 ET SEQ. THE DEPARTMENT, UPON APPROVAL OF ACCESS, WILL REDUCE THE PERMIT FEE BY 10 PERCENT OF THE TOTAL APPLICATION AND PERMIT FEES COMBINED. THE RENEWAL FEES ARE NOT SUBJECT TO REDUCTION.

APPLICATION TYPE	APPLICATION FEE	PERMIT FEE	RENEWAL FEE
MINOR	SAME AS ABOVE	$ 50.00	$ 85.00
MAJOR	SAME AS ABOVE	750.00	250.00
MAJOR WITH PLANNING REVIEW	SAME AS ABOVE	1,800.00	250.00

THE DEPARTMENT WILL NOT ACCEPT THIS APPLICATION IF IT IS NOT SIGNED.

IF THE SIGNATURE BELOW IS AN AUTHORIZED REPRESENTATIVE OF THE LOT OWNER, PLEASE ATTACH A COMPLETED POWER OF ATTORNEY FORM.

AUTHORIZED REPRESENTATIVE_____

(Name of Lot Owner)

_____

(Street)

_____

(City) (State) (Zip Code) (Phone Number)

ENCLOSED IS THE $_____APPLICATION FEE.

I CERTIFY THAT THE ABOVE INFORMATION IS TRUE AND ACCURATE. I AM AWARE THAT IF ANY OF THE ABOVE INFORMATION IS FALSE, I AM SUBJECT TO PUNISHMENT. I AGREE NOT TO PERFORM ANY WORK WITHIN STATE RIGHT OF WAY UNLESS IT IS AUTHORIZED BY A PERMIT ISSUED BY THE DEPARTMENT. THE APPLICANT ALSO AUTHORIZES THE DEPARTMENT REPRESENTATIVES TO ENTER UPON THE LOT FOR THE PURPOSE OF PERFORMING A SITE INVESTIGATION. FURTHERMORE, THERE ARE NO OBJECTIONS IN PARKING OF A DEPARTMENT VEHICLE ON THE LOT IF NECESSARY WHILE TAKING FIELD MEASUREMENTS AND OTHER DATA.

_____ _____

(Signature of owner or authorized representative) (Print or type your title)

_____ _____

(Print or type your name) (Date)

South Dakota

INSTRUCTIONS
Applying for permission for driveway or intersection on a South Dakota state highway

1) Contact the South Dakota Department of Transportation as soon as possible. Personnel at the locations listed below can help you plan your approach in compliance with South Dakota laws and regulations.

SDDOT Area Offices .....(list follows)

2) Complete the top part of the application form and submit it to the Area Engineer. Also, provide any additional information requested. Such information could include:
   a) An access approach design
   b) A vicinity map showing the location of the proposed access
   c) Estimated traffic volumes for the property
   d) Three copies of a proposed site plan for the property
   e) A traffic control plan
   f) Proof of liability insurance
   g) A detailed development plan
   h) A drainage plan
   i) A traffic impact study
   j) A revegetation plan

3) Allow time for review of your application. If not completed within 30 days, a Department employee will contact you with an update on the status of your application.

4) If approved, construct and maintain the access approach as indicated in the permit and standard conditions.

Application for Highway Access Permit
South Dakota Department of Transportation

Permit Application (to be completed by applicant).

Instructions: Please contact the local South Dakota Department of Transportation office to determine what supporting documents must accompany this application. Please submit a separate application and supporting documentation for each access requested. Attach additional sheets as necessary. Please print or type. Owner and applicant agree to comply with special and standard conditions if access permitted.

Property Owner:	**Applicant (if different from Owner):**
Name(s): Mailing Address: City, State, Zip Daytime Phone:	Name(s): Mailing Address: City, State, Zip Daytime Phone:
Property to be Served by Approach: County: Section: Township: Range: **Or** Subdivision: Block/Lot: Street Address: City:	**State Highway to be Accessed by Approach:** State Highway Number: Access would be _____ feet (north, south, east or west) from _____ (nearest cross street).
Land Use of Property to be Served (check one): ❑ Agricultural: acres served _____ ❑ Business: type _____ total square footage of buildings:____ number of employees _____ ❑ Residential: number of single-family dwellings _____, or number of multi-family dwellings _____. ❑ Other: describe _____	**Type of Permit Requested (check one)** ❑ New approach ❑ Change in use ❑ Temporary access ❑ Improve existing access ❑ Relocate existing access ❑ Remove existing access **Requested Approach Width (circle one)** 24' 30' 36' 40'
Local Government Reviews:	
County: Comments: Concurrence signature:_____ Date:____	**Municipality:** Comments: Concurrence signature:_____ Date:_____
Estimated Date of Construction:	
I, the undersigned, request permission to construct or modify an access approach subject to the rules and regulations set forth in SDCL 70:09.	
Signature of Applicant:	**Date:**___/___/___

Permit Decision (to be completed by SDDOT).

Supporting Materials Required: (Required)		(Received)
❑	Access Approach Design	❑
❑	Vicinity Map	❑
❑	Traffic Volumes	❑
❑	Three Copies of Site Plan	❑
❑	Traffic Control Plan	❑
❑	Proof of Liability Insurance	❑
❑	Detailed Development Plan	❑
❑	Drainage Plan	❑
❑	Traffic Impact Study	❑
❑	Revegetation Plan	❑
❑	Other _____	❑

Received by SDDOT: Date:___/___/___

Decision: (to be made after Application Review)

❑ Access Approved
❑ Access Approved with Variance: _____

_____

❑ Access Denied

Terms and Conditions of Approval (or Reason for Denial)

Access Must be Constructed By: ___/___/___

SDDOT Area Engineer Signature: **Date:** ___/___/___	**SDDOT Area:** **Area Office** _____ **Contact Person** _____ **Contact Phone** _____ **Permit Number** _____

SDDOT Highway Access Permit Application Review Sheet (to be completed by SDDOT)

Highway Access Classification: (check one)

- ❑ Expressway
- ❑ Free Flow Urban
- ❑ Intermediate Urban
- ❑ Urban Developed
- ❑ Urban Fringe
- ❑ Rural

Highway _____
MRM + Displacement ___+___
Left □ **Right** □
Average Daily Traffic _____
Accidents (three years)_____

Highway Alignment to Left of Access (as seen when standing on access)

- ❑ Straight
- ❑ Turns left
- ❑ Turns right

- ❑ Flat
- ❑ Slopes up
- ❑ Slopes down

Stopping Sight Distance: ____ ft.
Entering Sight Distance: ____ ft.
Posted Speed Limit: _____ mph

- ❑ 0-3% grade
- ❑ 3-5% grade
- ❑ >5% grade

Highway Alignment to Right of Access (as seen when standing on access)

- ❑ Straight
- ❑ Turns left
- ❑ Turns right

- ❑ Flat
- ❑ Slopes up
- ❑ Slopes down

Stopping Sight Distance: ____ ft.
Entering Sight Distance: ____ ft.
Posted Speed Limit _____ mph

- ❑ 0-3% grade
- ❑ 3-5 % grade
- ❑ >5% grade

Significant Design and Potential Impact Considerations (check all that apply and explain checked items):

- ❑ Sidewalks or Bike Paths
- ❑ Curb & Gutter
- ❑ On-Street Parking
- ❑ Shoulder Width
- ❑ Historical Resources
- ❑ Surface Drainage
- ❑ Drainage Structures
- ❑ Major Structures
- ❑ Guard Rail
- ❑ Above-Ground Utilities
- ❑ Railroad Tracks
- ❑ Distance to Nearby Streets, Both Directions
- ❑ Distance to Nearby Driveways, Both Directions
- ❑ Others Streets with Access or Available Access
- ❑ Traffic Control Devices or Relocation Needed
- ❑ Median Crossovers

Explain impact on design:

SDDOT Region Traffic Engineer Review (optional):
Comments:

Signature: _____ date: ___/___/___

SDDOT Access Management Review (optional):
Comments:

Signature: _____ date: ___/___/___

APPROACH DESIGN SKETCH

List Attachments:

- ❑ Driveway details
- ❑ Culvert details
- ❑ Mailbox details
- ❑ Fencing details
- ❑ Cattle guard
- ❑ Sidewalk details
- ❑ Median crossovers
- ❑ Recreation paths
- ❑ Rail crossings
- ❑ Auxiliary lanes
- ❑ Storm sewer
- ❑ Pavement
- ❑ Curb & gutter
- ❑ Traffic Control
- ❑ Sign/signal/marking
- ❑ Other

SDDOT Review Performed by: **Date:** ___/___/___

South Dakota includes the following with each permit.

State Highway Access Approach Permit
Standard Conditions

When this permit was issued, the Department made its decision based in part on information submitted by the applicant, what alternative access to other public roads and streets was available, the operation of the highway and safety and design standards. Changes in access approach use or design not approved by the Department may cause the revocation or suspension of the permit. The permittee is responsible for the costs of construction, maintenance, and removal (if necessary) of the approach.

PERMIT EXPIRATION

A permit shall be considered expired if the access is not under construction within one year of the permit issue date or before the expiration of any authorized extension. When the permittee is unable to commence construction within one year after the permit issue date, the permittee may request a one-year extension from the Department. Only one extension may be granted. Any request for an extension must be in writing and submitted to the Department before the permit expires. The request should state the reasons why the extension is necessary, when construction is anticipated, and include a copy of page 1 (face of permit) of the access permit. Extension approvals shall be in writing. Any person wishing to reestablish an access permit that has expired may begin again with the application procedures.

CONSTRUCTION

1. The construction of the access and its appurtenances as required by the terms and conditions of the permit shall be completed at the expense of the permittee. All materials used in the construction of the access within the highway right-of-way or on permanent easements, become public property. Any materials removed from the highway right-of-way will be disposed of only as directed by the Department. Only clean fill material may be used for construction. Rubble and organic materials are prohibited. Permittee is responsible for salvaging and replacing topsoil, erosion control and revegetation of access.
2. The permittee shall notify the Area Office at least two working days prior to any construction within state highway right-of-way. Construction of the access shall not proceed until the access permit is issued. The access shall be completed in an expeditious and safe manner and shall be finished within 45 days from the initiation of construction within the highway right-of-way. One construction time extension may be requested from the Area Engineer. The permittee shall also notify the Area Office two days prior to substantial completion of the access construction.
3. A utility permit shall be obtained for any utility work within highway right-of-way. Where necessary to remove, relocate, or repair any traffic control device or public or private utility for the construction of a permitted access, the relocation, removal or repair shall be accomplished by the permittee without cost to the Department, and at the direction of the Department or utility company. Any damage to the state highway or other public right-of-way beyond that which is allowed in the permit shall be repaired immediately. The permittee is responsible for the repair of any utility damaged in the course of access construction, reconstruction or repair. Utilities are responsible for salvaging and replacing topsoil and must have an approved erosion control and revegetation plan. A final inspection must be held with the utility at the completion of the work.
4. The Department and the local government may inspect the access during construction and upon completion of the access to determine that all terms and conditions of the permit are met. Inspectors are authorized to enforce the conditions of the permit during and after construction and to halt any activities within state right-of-way that do not comply with the provisions of the permit,

that conflict with concurrent highway construction or maintenance work, that endanger highway property, natural or cultural resources protected by law, or the health and safety of workers or the public.

5. Prior to using the access, the permittee is required to complete the construction according to the terms and conditions of the permit. Failure by the permittee to abide by all permit terms and conditions shall be sufficient cause for the Department to initiate action to suspend or revoke the permit and close the access. If in the determination of the Department the failure to comply with or complete the construction requirements of the permit create a highway safety hazard, such shall be sufficient cause for the summary suspension of the permit. If the permittee wishes to use the access prior to completion, arrangements must be approved by the Department and included in the permit. The Department may order a halt to any unauthorized use of the access pursuant to statutory and regulatory powers. Reconstruction or improvement of the access may be required when the permittee has failed to meet required specifications of design or materials.
6. The permittee shall provide construction traffic control devices at all times during access construction, in conformance with the Manual on Uniform Traffic Control Devices as required by state statute.
7. In the event it becomes necessary to remove any right-of-way fence, the posts on either side of the access shall be securely braced with an approved end post before the fence is cut to prevent any slacking of the remaining fence.
8. The permittee shall ensure that a copy of the permit is available for review at the construction site at all times. The permit may require the contractor to notify the individual or office specified on the permit at any specified phases in construction to allow the field inspector to inspect various aspects of the construction such as concrete forms, subbase, base course compaction, and materials specifications. Minor changes and additions may be ordered by the Department or local authority field inspector to meet unanticipated site conditions.
9. Each access shall be constructed in a manner that shall not cause water to enter onto the roadway or shoulder, and shall not interfere with the existing drainage system on the right-of-way or any adopted municipal system and drainage plan.
10. By accepting the permit, permittee agrees to save, indemnify, and hold harmless to the extend allowed by law, the Department, its officers, and employees from suits, actions, claims of any type or character brought because of injuries or damage sustained by any person resulting from the permittee's use of the access permit during construction of the access.

CHANGES IN ACCESS USE AND PERMIT VIOLATIONS

1. It is the responsibility of the property owner and permittee to ensure that the use of the access to the property is not in violation of the permit terms and conditions. The terms and conditions of any permit are binding upon all assigns, successors-in-interest, heirs and occupants. If any significant changes are made or will be made in the use of the property that will affect access operation, traffic volume and or vehicle type, the permittee or property owner shall contact the Department to determine if a new access permit and modification to the access are required.
2. When an access is constructed or used inconsistent with the terms and conditions in violation of the permit, the Department may summarily suspend an access permit and immediately order closure of the access.

MAINTENANCE

The permittee shall be responsible for the repair and maintenance of the access beyond the edge of the roadway including:

(1) surfacing ,
(2) curb and gutter,
(3) cattle guard and gate,

(4) vegetation control,
(5) removal or clearance of snow or ice upon the access even though deposited on the access in the course of department snow removal operations,
(6) repair and replacement of any access-related culverts of 36 inch diameter or smaller within the right-of-way in unincorporated areas,
(7) obtaining department approval for all culvert repairs, drainage repairs, resurfacing, and changes in access design or configuration, and
(8) all other maintenance required for continued safe and satisfactory operation of the access point.

The department shall perform no maintenance of access points, except:

(1) modification of access point as necessary to meet adjacent highway reconstruction, as determined by the department,
(2) access surface maintenance only when the department performs similar type maintenance on the highway at the access,
(3) maintenance of new approaches required for construction under §31-24-1 and §31-24-2.
(4) culvert cleaning in unincorporated areas, and
(5) repair and replacement of culverts larger than 36" diameter in unincorporated areas.

In the event that the permittee fails to maintain an access point, the department may declare the negligently maintained access point a public nuisance, and upon notice to the permittee, may correct maintenance deficiencies at cost to the owner.

*

APPENDIX B : Example Access Permit Internal Processing Documents

DRAFT CONCEPT

CDOT Highway Access Approach Internal Processing Sheet	Highway Location
	County
	Municipality
Permittee/Development name Consultant Name	Application Date Est. Due date
Development/Access use	Access Type New, Change, temp
Expected Traffic Volume	

Consider, Collect, Investigate and Review the following as needed and if applies

Most recent construction project reference	Most recent Right of way acquisition reference
Developer Plans submitted? What is potential buildout?	Is there access control by deed?
Detailed Drainage report needed?	Field Review Scheduled / Completed
Traffic Impact Study Needed?	Will this impact a traffic signal or need a signal
Does the scale require review by Region Traffic Engineer Intersection, or >100 per day	Sent to HQ? Received Back?
Was there an earlier Subdivision or zoning review associated with this request.	Zoning
Local Government Contacted? Their Comments?	Owner Contacted
Construction Traffic Control Plan needed?	Environmental Clearances
New or relocation of traffic control devices needed	Any structures (engineering)
Comments from Maintenance	

Completion of Permit Form	Completion of Denial Letter
Select Terms and Conditions	Letter with explanation
Prepare Transmittal cover	Contact applicant
Transmit to Permittee	

Concept Form, Rough Draft, 4/11/2000

Access Approach Construction Inspection Form
South Dakota Department of Transportation

To: (person who will conduct field inspection)	After completion, return form to person/office:
address	
address	
Address/zip	

The assigned field inspector is to complete this form for each newly completed access and return the form as noted in the upper right. This form is to confirm installation of an access. If during construction, the inspector should determine problems, such as poor traffic control, materials, or failure to adhere to the permit, they are to order the problems corrected, work may be shut down if necessary, and/or area office contacted for direction. All construction shall be completed within 45 days unless extension granted in writing by Area Engineer.

Permittee name and phone:

Access location:	Permit number:
Local jurisdiction:	Permit issue date:
SDDOT Area:	Permit construction began: _____ Permit construction ended: _____ Permit extension granted: _____

This access has been constructed in reasonable conformance with the issued access permit:
Inspector signature _____ Date _____

This access has NOT been constructed in reasonable conformance with the issued access permit:
Inspector signature _____ Date _____

Items not in conformance or inspector comments:

APPENDIX C : Example Access Easement -- from Overland Park, KS

(much of the signature area is omitted)

from http://www.opkansas.org/Documents_and_Forms/Index.cfm (January 2005)

DO NOT WRITE, TYPE OR STAMP ANYTHING ABOVE THIS LINE OR IN THE MARGINS.

ACCESS EASEMENT (option 1)

For and in consideration of the sum of Ten Dollars ($10.00) and other valuable considerations, the receipt and sufficiency of which is hereby acknowledged, by this Easement Agreement, made and entered into this _____ day of _____ , 20____ ,

_____

_____ , as

Grantor, hereby grants and conveys to the owner(s) of the tract(s) described in **Exhibit A** attached hereto and incorporated herein by reference, as Grantee, a perpetual access easement giving the right of access, ingress and egress over and across the following described property:

in order that the customers, invitees, licensees, agents and employees of the Grantee shall have vehicular and pedestrian traffic access and circulation to the adjacent tract(s).

This easement is executed and delivered by Grantor, as owners of the above-described property.

The rights granted herein shall not be construed to interfere with or restrict the Grantor, its successors or assigns and any claiming under Grantor from the use of the premises with respect to the construction and maintenance of improvements adjacent to or over the property herein described so long as the same are so constructed as not to impair the strength or interfere with the intended use of the easement.

DO NOT WRITE, TYPE OR STAMP ANYTHING BELOW THIS LINE Rev. Dec. 2003

DO NOT WRITE, TYPE OR STAMP ANYTHING ABOVE THIS LINE OR IN THE MARGINS.

This easement shall run with the land and apply to all interests now owned or hereafter acquired to the above-described property. It shall be filed of record with the Register of Deeds, Johnson County, Kansas.

_____
Signature

_____
Printed Name

_____
Signature

_____
Printed Name

INDIVIDUAL ACKNOWLEDGMENT

STATE OF _____)
) SS.
COUNTY OF _____)

BE IT REMEMBERED, That on this _____day of _____ , 20 ____, before me, the undersigned, a Notary Public in and for the County and State aforesaid, came _____
_____
who is/are personally known to me to be the same person(s) who executed the within instrument of writing and duly acknowledged the execution of same.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my official seal the day and year last above written.

My Appointment Expires Notary Public

****

APPENDIX D-1 : Example Shared Access Agreement -- one owner, from Utah

SINGLE ACCESS AGREEMENT

State Route:_____ Access Address:_____

This is an agreement between the Utah Department of Transportation, hereinafter referred to as UDOT; and Property owner "A" and their successors and assigns.

1. PREMISE: Property Owner "A" _____ owns the real property, as shown in "Exhibit A", hereinafter referred to as the Development Name _____ property. This property is adjacent to the properties shown in Exhibit A. The adjacent property on the side, hereinafter referred to as "Property B"; does not currently have intentions to construct or to reconstruct access to State Route , but may desire to do so in the future.

2. AGREEMENT: In consideration of the mutual covenants contained herein, and other good and valuable considerations, the parties agree as follows: Property Owner "A"_____ will grant shared access to Property B as shown in the submitted site plans and attached hereto with the provision that when Property B is ready to develop or redevelop, Property Owner "A" _____ and their successors and assigns will allow the construction or reconstruction of a common access to the properties.

a) Easement. Property Owner "A" _____ and their successors and assigns will provide for a shared access between their property and Property B. When the said construction occurs, the parties will provide for the construction and maintenance of the shared access under separate agreement. Property Owner "A" _____ hereby grants to Property B, their successors and assigns, a perpetual nonexclusive easement for ingress and egress over _____ feet of the Development Name _____ property, as shown in the plans attached and made a part hereof. The easements granted hereunder are created for the purpose of allowing the nonexclusive right of pedestrian and vehicular ingress and egress across the access for themselves, their successors, and their respective customers, employees and invitees.

b) Relinquishment. When said shared access is constructed, Property Owner "A"_____ and Property B agree to relinquish all prior rights of access to their respective properties.

c) Obstructions. Both parties will keep the shared access clear of any obstructions and shall not allow any structures or sign to be placed so close to the access as to inhibit free ingress and egress for either property. Property Owner "A" _____ shall not allow any vehicles to be parked on the access so as to obstruct ingress or egress. The access is to be used for all purposes reasonably necessary for the full use of the properties.

d) Permit. The access shall be subject to all restrictions specified by the Utah Department of Transportation Highway Encroachment Permit to be issued for the access.

3. DUPLICATE ORIGINALS. This agreement shall be executed in duplicate; each copy shall be

deemed an original.

DATED this of , 20

Owner Operation Engineer

Witnessed as to

STATE OF UTAH
COUNTY OF SALT LAKE

The foregoing instrument was acknowledged before me this day of , 20
by to me or who as produced as identification, and who did (did not) take an oath.

Notary Public in and for the
State last aforesaid.
My Commission Expires:

APPENDIX D-2 Example Shared Access Agreement – two owners, from Utah

---

SHARED ACCESS AGREEMENT

1. PREMISE: owns the real property as described in "Exhibit A", hereinafter referred to as the " " property. owns the real property as described in "Exhibit B", hereinafter referred to as the " " property. The parties wish to provide for a common access over feet of the property and feet over the property. Each party will receive the nonexclusive right of pedestrian and vehicular ingress and egress across the access for themselves, their successors, and their respective customers, employees and invitees. The parties also wish to provide for the construction and maintenance of the access on the said property easement.

2. AGREEMENT: In consideration of the mutual covenants contained herein, and other good and valuable considerations, the parties agree as follows:

a) Relinquishment. The parties agree to relinquish all prior rights of access to their respective properties.

b) Easement. The parties agree to the creation of the perpetual nonexclusive easement for ingress and egress on their respective properties as shown in the plans and made a part hereof. The easements granted hereunder are created for the purpose of allowing ingress and egress to both properties from , SR- .

c) Construction of Access. shall construct the access over the said easement to Utah Department of Transportation Standards and Specifications. will fund the construction.

d) Maintenance. Before any maintenance is started, the parties shall agree on the type of maintenance required and the cost of such maintenance. In the event that the parties are unable to agree as to necessity or costs of such maintenance, the parties agree that the question of necessity or costs, or both, shall be submitted to arbitration under the rules of the American Arbitration Association. Each party may temporarily close portions of the easement parcels on its parcel to permit the construction, remodeling, repair and maintenance of the improvements on its respective parcel, provided that any inconvenience created thereby is kept to a minimum and provided that each party pursues with due diligence to completion of such construction, remodeling, repair or maintenance.

i. All maintenance of the easements shall be performed at hours which will cause minimal interference with the normal daily use of such easement parcels.

ii. Each party shall be responsible for the costs and expenses incurred in the maintenance of their respective parcels.

e) Snow Removal. Each party shall be responsible for the removal of snow from their respective properties. Each party shall be responsible for the removal of snow for one-half (½) of the access. Snow shall be removed from the access in a prompt and timely manner.

f) Obstructions. All parties will keep the shared access clear of any and all obstructions and shall not allow any structures or sign to be placed so close to the access as to inhibit free ingress and egress from

either property. Neither property shall allow any vehicles to be parked on the shared access so as to obstruct ingress or egress. The access is to be used for all purposes reasonably necessary for the full use of the properties.

g) Permit. The access shall be subject to all restrictions specified by the Utah Department of Transportation Highway Encroachment Permit to be issued for the access.

h) Enforcement. The cost of maintenance hereunder shall be due and payable no later than thirty (30) days following completion of such maintenance, unless sooner required under the contract for such maintenance. Should either party default in payment for such maintenance as provided herein, the other party may pay the defaulting party's share of such maintenance, and the amount so paid shall become immediately due and payable and shall bear interest at the highest rate allowed by law. In the event that the defaulting party fails to reimburse the other party for payment of the defaulting party's share of maintenance, plus interest for more than thirty (30) days following written demand for such reimbursement, the other party shall be entitled to a lien upon the property of the defaulting party as described for the amount of such unimbursed payment plus interest. Such lien may be recorded in the public records and shall be enforceable in the same manner as other liens are enforceable under the laws of the State of Utah. If either party seeks to enforce any term or condition of this agreement through the Courts, the prevailing party shall be entitled to recover all costs of such action, including a reasonable attorney's fee from the losing party.

3. DUPLICATE ORIGINALS This agreement shall be executed in duplicate, each copy of which shall be deemed an original.

DATED this of ,

Owner Owner

District Operations Engineer

Witnessed as to

STATE OF UTAH

COUNTY OF

SHARED ACCESS AGREEMENT NOTES

1) It should be specified that this agreement is between the two land owners. UDOT is involved only in the inception of the agreement.

2) Upon accepting of the shared access agreement, each owner should relinquish their prior rights of access to the road in exchange for the shared access.

3) The shared access agreement should contain the legal description of both properties being accessed.

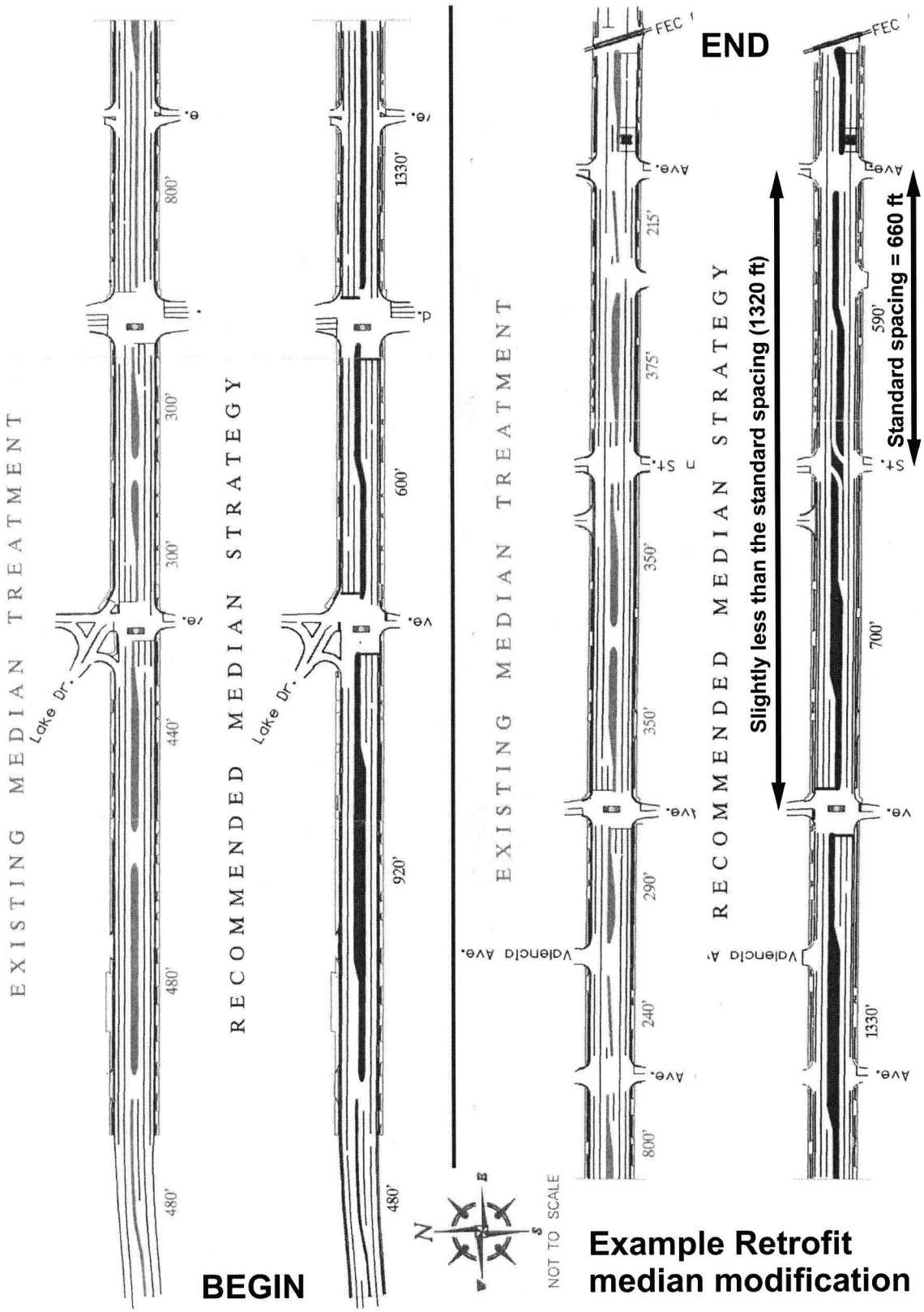
4) The agreement should specify that the access is to be used for all purposes reasonably necessary for the full use of the properties.

5) The agreement should address snow removal.

6) The agreement should specify that the access be kept to UDOT maintenance standards. The source of these standards needs to be cited and reference given.

7) A copy of the access permit should be attached to the agreement, or referenced to in the shared access agreement.

APPEND. E-1: Example Retrofit Projects -- modifying an existing raised median (SH520)



Example Retrofit median modification

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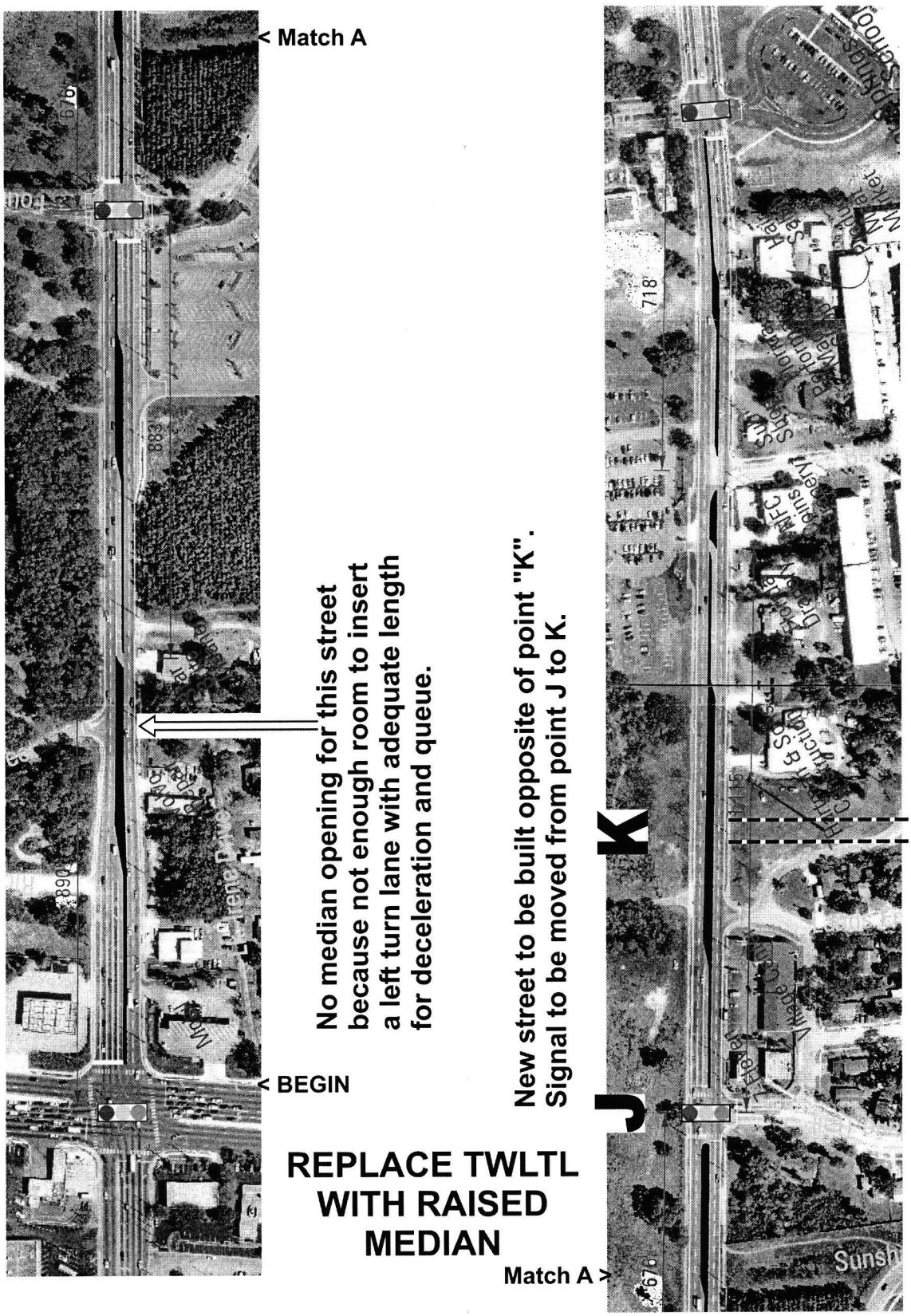
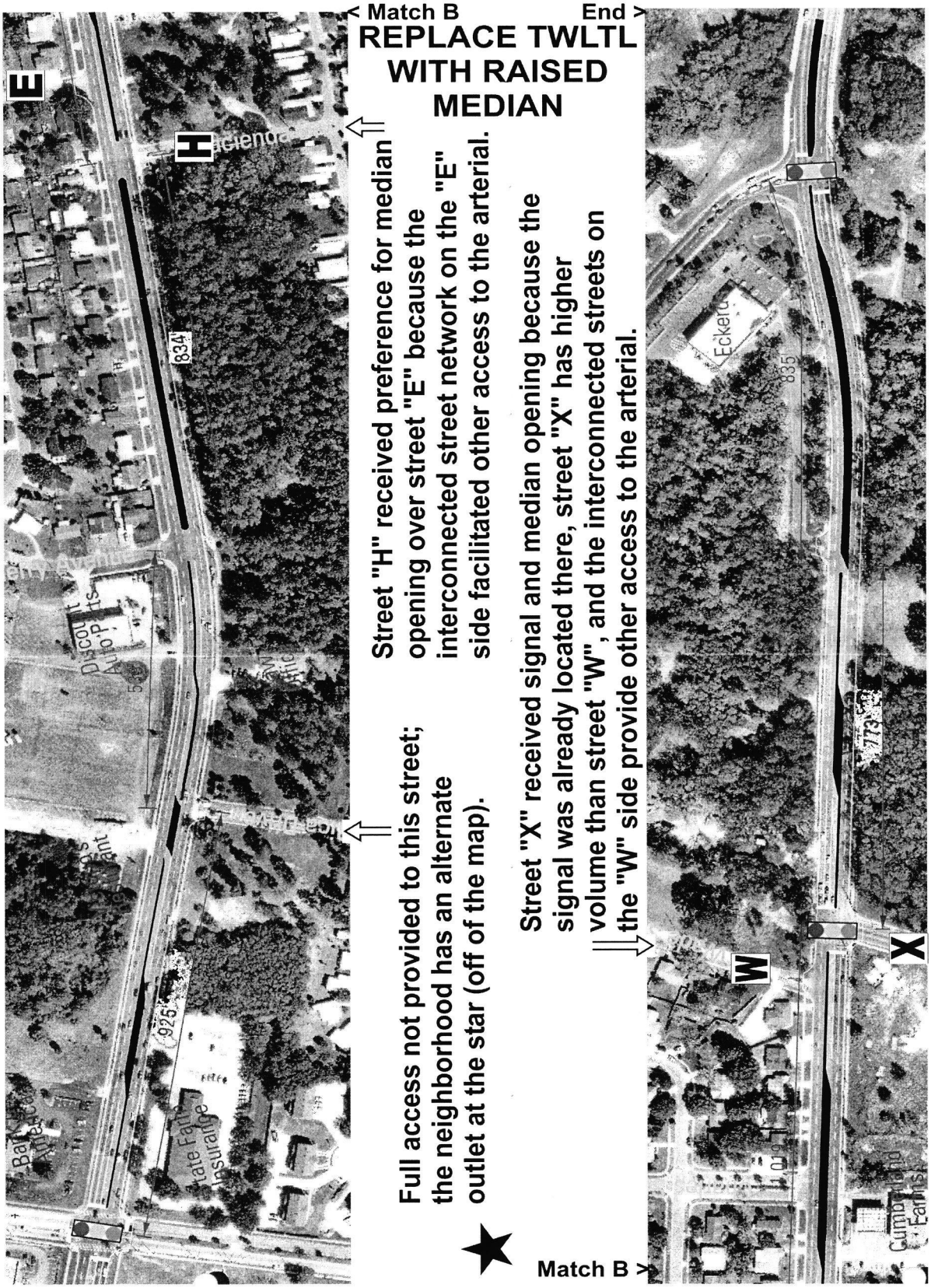
APP. E-2: Example Retrofit Projects -- replace TWLTL with a raised median (SH 434)




< Match B
End >
REPLACE TWLTL WITH RAISED MEDIAN
Street "H" received preference for median opening over street "E" because the interconnected street network on the "E" side facilitated other access to the arterial.
Street "X" received signal and median opening because the signal was already located there, street "X" has higher volume than street "W", and the interconnected streets on the "W" side provide other access to the arterial.
Full access not provided to this street; the neighborhood has an alternate outlet at the star (off of the map).
Match B >
E
H
W
X
834
835
925

APPENDIX F-1: Example Intergovernmental Agreements for Corridor Plans

-- Arkansas Example

ACCESS MANAGEMENT PLAN
For
STATE HIGHWAY 60/DAVE WARD DRIVE

I. PARTIES – This agreement is made between the City of Conway (the City), the Arkansas State Highway Commission (the Commission) acting through the Arkansas State Highway and Transportation Department (the Department) and Metroplan as the designated metropolitan planning organization for central Arkansas under federal transportation regulations (the MPO).

II. ROUTE – This access management agreement pertains to State Highway 60, also known as Dave Ward Drive, from the overpass at Harkrider (State Highway 365) west to the Arkansas River, (the Roadway). For the purposes of this agreement, the route is divided into two segments. See Appendix A. Route Map.

A. Segment I from SH 365 to Tucker Creek is subject to a Specific Access Management Plan as contained in Appendix B.

B. Segment II from Tucker Creek to the Arkansas River is subject to a General Access Management Plan as contained in Appendix C.

III. STATEMENT OF PURPOSE – Highway 60/Dave Ward Drive is a principal arterial on the City master street plan and serves as an intraregional arterial roadway connecting the City to its economic region. The primary purpose for this agreement is to protect the capacity of the roadway to carry significant local and intra-regional traffic. The secondary purpose is to increase the safety for drivers and pedestrians that use this facility. It is the intent of this agreement to provide access to abutting properties consistent with the primary and secondary objectives.

IV. AUTHORITY – Both the City and the Commission have specific legal authority to regulate access to public roads. In the case of the City, it is found in Arkansas Code Annotated 14-56-419. In the case of the Commission, it is found in Arkansas Code Annotated 27-65-107. The MPO is hereby granted standing in this access management agreement by the City and the Commission in consideration of the financial contribution which the MPO contributed to improvements on the Roadway and in recognition of its role in transportation planning within the metropolitan area.

V. ACCESS PLAN – Management of access to the roadway is necessary to achieve both the primary and secondary purposes of the agreement. The access management plan (the Plan) is detailed in Appendices B and C. The Plan for Segment I is a Specific Access Management Plan in which all median breaks and curb cuts are specifically identified. Standards for driveways are established to be applied during plat review prior to development approval by the City. In addition, local street

networks, property interconnect agreements and requirements, new local roadways developed as part of this project and land use and zoning plans that are necessary to achieve the objectives of this agreement are specified in this Specific Plan. The Plan for Segment II is a General Access management Plan which specifies the typical roadway cross-section, right-of-way requirements, the location of median breaks and standards for location and construction of driveways.

VI. AGREEMENT ADOPTION/TERMINATION/MODIFICATION – This agreement will be deemed adopted when passed in identical form by the Conway City Council, the Metroplan Board of Directors and the Arkansas State Highway Commission and signed by their proper representatives. This agreement may be terminated or modified, in whole or in part only by mutual agreement of all of the parties as evidenced by resolutions adopted by each governing body.

VII. PLAN ADMINISTRATION –

A. Permit Application. A permit issued by the Department will be required for new driveway access to the Roadway. Any legal person owning property abutting the Roadway may request a driveway access permit. The permit will be requested through a designated administrative process from the City of Conway. The applicant is required to submit a detailed plan for the driveway including a map showing its exact location and a design that shows the curb radii, driveway throat length and that specifies the projected volume of turns into and out of the driveway. Any joint access agreements with other property owners should also be submitted.

After review of the application, the City determines whether the request is within the allowable parameters established by the Plan. If so, the City communicates the request to the MPO for review and approval. Upon MPO approval, the City will submit the application to the Department for review and approval. If the City and the MPO have approved the application as evidenced by the signatures of properly designated administrative representatives and if the application meets all Department criteria for issuance of such a permit, the Department will issue a permit to the applicant. If the signatures of any of the parties to this agreement are missing from the permit application, the Department will not issue a permit.

If any of the parties determine that the request is not within the allowable parameters of the Plan, that party will deny the request and instruct the applicant how they may amend the request to receive approval or that they may seek to amend the Plan pursuant to the following section.

B. Amending the Plan.

A Plan amendment will be considered at the request of any of the parties to this agreement or at the request of an applicant whose permit request has been denied by any of the parties.

The proposed amendment must be adopted in identical form by the Conway City Council, the Metroplan Board of Directors and the Arkansas State Highway Commission to become effective.

Pursuant to Resolution No. 99-60 of the Conway City Council approved on the 23rd day of November, 1999 and Ordinance 0-00-38 approved on 11th day of April, 2000.

signatures ....

APPENDIX A
HIGHWAY 60/DAVE WARD DRIVE DESIGN CONCEPT

As a principal arterial, the proposed design for Highway 60 is intended to balance the need to provide for long distance travel on the roadway and reasonable access to abutting properties while at the same time maintaining the capacity of the roadway to operate in a safe and efficient manner. Consequently, access to abutting property is subordinate to the goal of traffic movement and subject to necessary management of entrances and exits.

Definitions –

Full directional breaks - breaks in which vehicular movements, including left turns, are allowed from all directions of a four-point intersection (see diagrams).

Partial directional breaks - breaks in which vehicular movements, including left turns, from one or more directions are unavailable (see diagrams).

Bi-directional quick turnarounds – breaks which allow passenger vehicles to negotiate U-turns from opposing directions only (see diagrams).

Left-only directional turn bays - breaks which allow protected left-only turns from the main travel lanes into existing commercial areas (see diagrams).

(See route map on following page)

APPENDIX B

a series of maps, rationales for access control, conditions, and assignment of financial responsibility

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APPENDIX F-2: Example Intergovernmental Agreements for Corridor Plans

-- Colorado Example

INTERGOVERNMENTAL AGREEMENT
AMONG
THE CITY OF EVANS, CITY OF GREELEY
TOWN OF KERSEY, COUNTY OF LARIMER,
CITY OF LOVELAND, COUNTY OF WELD, TOWN OF WINDSOR
AND
THE STATE OF COLORADO
DEPARTMENT OF TRANSPORTATION

THIS AGREEMENT (hereinafter referred to as the "Agreement") is entered into effective as of the _____ day of _____ 2004, by and among the Cities and Towns of Loveland, Windsor, Greeley, Evans, and Kersey and the Counties of Larimer and Weld (hereinafter referred to collectively as the "Cities and Counties"), and the State of Colorado, Department of Transportation (hereinafter referred to as the "Department"), said parties being referred to collectively herein as the "Agencies."

RECITALS:

A. The Agencies are authorized by the provisions of Article XIV, Section 18(2)(a), Colorado Constitution, and Sections 29-1-201, et. seq., C.R.S., to enter into contracts with each other for the performance of functions that they are authorized by law to perform on their own; and
B. Each Agency is authorized by Section 43-2-147(1)(a), C.R.S., to regulate access to public highways within its jurisdiction; and
C. The coordinated regulation of vehicular access to public highways is necessary to maintain the efficient and smooth flow of traffic, to reduce the potential for traffic accidents, to protect the functional level and optimize the traffic capacity, to provide an efficient spacing of traffic signals, and to protect the public health, safety and welfare; and
D. The Agencies desire to provide for the coordinated regulation of vehicular access for the section of SH 34 between Interstate 25 (MP 96.25) and Weld County Road 55 (MP 120.23) (hereinafter referred to as the "Segment"), which is within the jurisdiction of the Agencies; and
E. The Agencies are authorized pursuant to Section 2.12 of the 1998 State Highway Access Code, 2 C.C.R. 601-1 (the "Access Code") to enter into a written agreement adopting and implementing a comprehensive and mutually acceptable highway Access Control Plan for the Segment for the purposes recited above; and

The development of this Access Control Plan adheres to the requirements of the Access Code, Section 2.12.

NOW THEREFORE, for and in consideration of the mutual promises and undertakings herein contained, the Agencies agree as follows:

1. The Access Control Plan, dated February 21, 2003, for the Segment (hereinafter referred to as the "Access Control Plan") is attached hereto as Exhibit A and incorporated herein. The Access Control Plan Illustration, dated February 24, 2003, is attached hereto as Exhibit B, and is incorporated herein by this reference. The Access Control Plan Amendment Process, dated February 20, 2003 is attached hereto as Exhibit C, and is incorporated herein by this reference.
2. The Agencies shall regulate access to the Segment in compliance with the Access Control Plan, section 43-2-147, C.R.S., (the "Access Law") and the applicable sections of the Access Code. Vehicular access to the Segment shall be permitted when such access is in compliance with this Agreement, the Access Control Plan, the Access Law and the applicable sections of the Access Code. Per section 2.12 (a) of the Access Code, design waivers necessary for access design and construction within state highway right-of-way, may be approved if agreed upon by the Department.
3. Accesses that were in existence in compliance with the Access Law prior to the effective date of this Agreement may continue in existence until such time as a change in the access is required by the Access Control Plan, the Access Law and the Access Code, in the course of highway reconstruction, or as determined appropriate in the course of development or subdivision actions which require local jurisdiction approval. When closure, modification, or relocation of access is necessary or required, the Agency(ies) having jurisdiction shall utilize appropriate legal process to effect such action.
4. Actions taken by any Agency with regard to transportation planning, transportation facilities and traffic operations within the areas described in the Access Control Plan shall be in conformity with this Agreement. The Cities, Towns, and Counties agree to develop and adopt, to the best of each Agency's ability considering legal, financial, and protocol constraints, such ordinances, official documents, plans and maps that are necessary to fulfill their responsibilities under this Agreement.
5. Parcels of real property created after the effective date of this Agreement that adjoin the Segment shall not be provided with direct access to the Segment unless the location, use and design thereof conforms to the provisions of this Agreement.
6. This Agreement is based upon and is intended to be consistent with the Access Law and the Access Code as now or hereafter constituted. An amendment to either the Access Law or the Access Code that becomes effective after the effective date of this Agreement and that conflicts irreconcilably with an express provision of this Agreement may be grounds for revision of this Agreement.
7. This Agreement does not create any current financial obligation for any Agency. Any future financial obligation of any Agency shall be subject to the execution of an appropriate encumbrance document, where required. Agencies involved in or affected by any particular or site-specific undertaking provided for herein will cooperate with each other to agree upon a fair and equitable allocation of the costs associated therewith, however, notwithstanding any provision of this Agreement, no Agency shall be required to expend its public funds for such undertaking without the express prior approval of its governing body or director. All financial obligations of the Agencies hereunder shall be contingent upon sufficient funds therefore being appropriated, budgeted, and otherwise made available as provided by law.

8. Should any section(s) or provision(s) of this Agreement be judicially determined to be invalid or unenforceable, such judgment shall not affect, impair or invalidate the remaining provisions of this Agreement, the intention being that the various provisions hereof are severable unless such provision that is judicially determined to be invalid or unenforceable is such an essential portion of the agreement that the remaining provisions of the agreement do not support the original intent and objectives of the parties entering into the agreement.
9. This Agreement supersedes and controls all prior written and oral agreements and representations of the Agencies concerning regulating vehicular access to the segment. No additional or different oral representation, promise or agreement shall be binding on any Agency. This Agreement may be amended or terminated only in writing executed by the Agencies with express authorization from their respective governing bodies or legally designated officials.
10. By signing this Agreement, the Agencies acknowledge and represent to one another that all procedures necessary to validly contract and execute this Agreement have been performed, and that the persons signing for each Agency have been duly authorized to sign.
11. No portion of this Agreement shall be deemed to constitute a waiver of any immunities the parties or their officers or employees may possess, nor shall any portion of this Agreement be deemed to have created a duty of care that did not previously exist with respect to any person not a party to this Agreement.
12. It is expressly understood and agreed that the enforcement of the terms and conditions of this Agreement, and all rights of action relating to such enforcement, shall be strictly reserved to the undersigned parties and nothing in this Agreement shall give or allow any claim or right of action whatsoever by any other person not included in this Agreement. It is the express intention of the undersigned parties that any entity other than the undersigned parties receiving services or benefits under this Agreement shall be an incidental beneficiary only.

A series of signatures, most of which have been deleted, followed.

IN WITNESS WHEREOF, the Agencies have executed this Agreement effective as of the day and year first above written.

City of Loveland , Colorado

_____

Mayor, City of Loveland

APPROVED AS TO FORM:

_____

City Attorney

State of Colorado

Department of Transportation

_____

Chief Engineer

CONCUR:

_____

Regional Transportation Director

ATTEST:

_____

City Clerk

ATTEST:

_____

Chief Clerk

EXHIBIT A

ACCESS CONTROL PLAN
FEBRUARY 21, 2003
SH 34, INTERSTATE 25 TO WELD COUNTY ROAD 55
CITY OF EVANS, CITY OF GREELEY
TOWN OF KERSEY, LARIMER COUNTY,
CITY OF LOVELAND, WELD COUNTY, TOWN OF WINDSOR
AND THE STATE OF COLORADO DEPARTMENT OF TRANSPORTATION

I. PURPOSES

The purpose of this Access Control Plan is to provide the Cities, Towns, and Counties with a comprehensive roadway access control plan for SH 34 from the junction of Interstate 25 to the junction of Weld County Road 55 ("the segment").

II. AUTHORITY

The development of this Access Control Plan was completed pursuant to the requirements of the Access Code and adopted by the attached Agreement.

III. RESPONSIBILITIES

The costs of access improvements, closures and modifications shall be determined pursuant to section 43-2-147(6)(b) C.R.S., the Agreement, and this Access Control Plan.

All signatories are encouraged to acquire dedicated right-of-way for future interchange construction when the opportunities exist. Jurisdictions agree to reserve necessary right-of-way for future purchase toward the construction of an interchange to the extent of their legal abilities. Said right-of-way may be usable for the interim time frame for minor considerations such as excess parking, landscape, and signing, but no permanent buildings of any kind or storm water detention would be allowed within the reserved right-of-way area.

The Department's Region 4 Access Unit will be responsible for arranging meetings with the signatory jurisdictions (Access Plan Advisory Committee) at least once every six months. Jurisdictions agree to inform impacted property owners and interested developers about the Access Control Plan and any amendments that are made to the Access Control Plan.

IV. ACCESS REVISIONS

Accesses described in Section V, below, may be closed, relocated, or consolidated, or turning movements may be restricted, or the access may be brought into conformance with this Access Control Plan, when in the opinion of the Cities and Counties with Department concurrence, or in the opinion of the Department, any of the following conditions occur: a) the access is determined to be detrimental to the public's health, safety and welfare, b) the access has developed an accident history that is correctable by restricting the access, or c) the access restrictions are necessitated by a change in road or traffic conditions, or d) there

is a change in the use of the property that would result in a change in the type of access operation, or e) a highway reconstruction project provides the opportunity to make highway and access improvements in support of this access control plan. Access construction shall be consistent with the design and specifications of the Access Code.

V. ACCESS LOCATIONS

The following is a description of all existing and future access points along the Segment including their current status and required changes. All access locations are defined by the approximate milepoint (in hundredths of a mile) along SH 34 to the centerline of the access as further illustrated on Exhibit B.

Access Control Plan

Individual Access Point Descriptions

The following is a description of all existing and future access points, including their current status and changes, which are included in the Access Control Plan. All locations are defined by the approximate milepost (in hundredths of a mile) along SH 34 at the centerline of the access.

- Frontage Road (MP 96.48): An existing public road access on both sides of SH 34. This access currently functions as a full movement, unsignalized intersection. In the interim, the turn movements in this intersection may be restricted. Ultimately, the north access will be removed when property is re-developed and alternate access is available. The south access will be relocated into Thompson Ranch and the access to SH 34 will be closed.

- MP 96.49 (south): Existing private access with median opening. Access will be removed when property re-develops.

- MP 96.55 (south): Existing private access without median opening. Access will be removed when property re-develops.

- MP 96.55 (median): Existing median opening. Access will be closed immediately by the Department..

- MP 96.79 (south): Existing private access with median opening. Access will be removed when adjacent property develops and/or a future public road is established on both sides of SH 34. Before the establishment of a public road at this location, turn lanes would be added in accordance to current Access Code standards to improve U-turn operations and safety.

- LCR 5 (MP 96.79): A future public road access on both sides of SH 34. In the interim, this access will be a signalized intersection once signal warrants are met. The new intersection shall be constructed in accordance with current Access Code standards. Ultimately, a split diamond interchange with LCR 3E requiring the west ramps to be braided with flyover ramps from the

I-25/SH 34 interchange will be allowed based on the availability of funding and approval of the Department and the local authority.

.....

- WCR 49 (MP 117.25): An existing public road access on the south side of SH 34. This access currently functions as a full movement, unsignalized intersection. In the interim, the intersection will continue to function as a full movement, unsignalized intersection with improvements in accordance with current Access Code standards to address capacity and safety concerns. Ultimately, this access will function as a full movement, signalized intersection.

.....

The original document contained about 12 pages of access listings.

- WCR 49.5 (MP 117.74): An existing public road access on the south side of SH 34. This access currently functions as a full movement, unsignalized intersection. In the interim, the intersection will continue to function as a full movement, unsignalized intersection with improvements in accordance with current Access Code standards to address capacity and safety concerns. Ultimately, this access will be modified to a ¾ movement intersection.

.....

- MP 118.74 (north): Existing private access with median opening. Access will be removed when properties re-develop.

- Kersey Road Business Route (MP 118.86): An existing public road access on the south side of SH 34. This access currently functions as a one-way movement, unsignalized

intersection. In the interim, intersection improvements may be necessary to address capacity and safety concerns. Ultimately, this access will remain a one-way movement, unsignalized intersection.

- SH 37/1st Street (MP 119.17): An existing public road access on both sides of SH 34. This access currently functions as a full movement, unsignalized intersection. In the interim, this access will allowed to be upgraded to a signalized intersection once signal warrants are met. Before and after signalization, intersection improvements in accordance with current Access Code standards may be necessary to address capacity and safety concerns. Ultimately, this access will function as a full movement, signalized intersection.

- MP 119.69 (north): Existing private access with median opening. Access will be removed when property re-develops and/or a public road is established at this location.

- 9th Street (MP 119.69): An existing public road access on the south side of SH 34. This access currently functions as a full movement, unsignalized intersection. In the interim, the intersection will continue to function as a full movement, unsignalized intersection with improvements in accordance with current Access Code standards to address capacity and safety concerns. Also, a future public road from the north will be allowed to access SH 34 at this intersection. Ultimately,

this access will be allowed to function as a full movement signalized intersection.

- WCR 56/WCR 55 (MP 120.02): This access currently functions as a full movement, unsignalized intersection. In the interim, the intersection will continue to function as a full movement, unsignalized intersection with improvements in accordance with current Access Code standards to address capacity and safety concerns. Ultimately, this access will be closed when a new intersection to the east (MP 120.02) is provided.

- New WCR 55 Intersection (MP 120.22): A future public road access on both sides of SH 34 that provides a connection to WCR 56. In the interim, this access does not exist. Ultimately, the new intersection shall be constructed in accordance with current Access Code standards and would be allowed to function as a full movement unsignalized intersection once signal warrants are met.

EXHIBIT B: ACCESS PLAN ILLUSTRATED

The attached Exhibit B is for general illustration and only for the ease of locating access points. Refer to the text of Exhibit A for accurate access location information.

FELSBURG HOLT & ULLEVIG

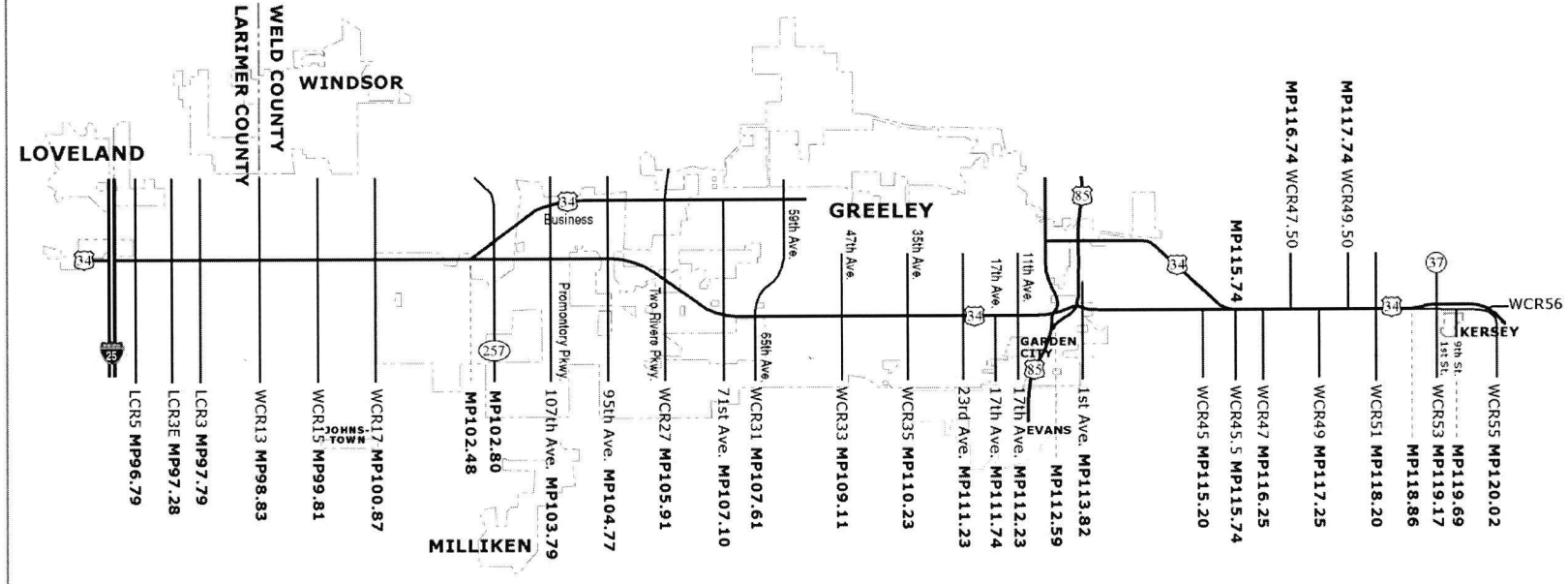

Exhibit B
(February 21,2003)

US 34 Corridor Map

North

01-096 2/24/03

EXHIBIT C

ACCESS CONTROL PLAN AMENDMENT PROCESS
February 20, 2003
SH 34, INTERSTATE TO WELD COUNTY 55
CITY OF EVANS, CITY OF GREELEY, TOWN OF KERSEY, LARIMER COUNTY,
CITY OF LOVELAND, WELD COUNTY, TOWN OF WINDSOR
AND THE STATE OF COLORADO DEPARTMENT OF TRANSPORTATION

1. Any request for amendment must be submitted to the Department by a signatory of the IGA (an Agency). The amendment must be located within the jurisdiction and have the written support of the submitting signatory. The amendment request shall include the following documents:
   - Description of Access
   - Justification for Amendment
   - Supporting Traffic Analysis
   - A List of Design Waivers and Corresponding Action
   - A Plan Clearly Depicting the Access Modification including Dimensions as Appropriate
2. The Department shall review the submittal for completeness and for consistency with the Access Control Plan and the Access Code.
3. If the amendment request is found to be complete, it will be forwarded to all members of the Advisory Group designated below with a brief report prepared by the Department.
   - The Advisory Group will be comprised of one representative from each signatory.
   - With all amendment requests, the Department will schedule a meeting within 45 days of receiving a complete amendment request. At that meeting, the sponsoring signatory will be given an opportunity to present its request. Also, the Department will present a review of the request, addressing technical features, operational issues and resulting design waivers. All signatories will have the opportunity to comment on the request and ask questions.
4. After the Advisory Group has reviewed and discussed the amendment request, each signatory will have 30 days to make a decision on whether to accept or decline the amendment. The signatories of the Advisory Group will submit their vote to the Department in writing, and an affirmative vote of 2/3 or more of the signatories will be necessary to approve the amendment. The lack of response of an Advisory Group signatory within the 30-day period will be interpreted as a "decline" decision. The Department will notify all signatories within 35 days of the meeting relative to the Group's decision; a tally sheet documenting each signatory's vote will be provided. Any amendment request that results in a violation of the Access Code or is not an improvement of a substandard situation will not be considered. Further, any amendment request that relaxes the restrictive nature of the Access Control Plan must include an affirmative Department vote as part of the 2/3 signatories' approval.

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APPENDIX F-3: Example Intergovernmental Agreements for Corridor Plans

-- from South Dakota, within an urban area

NOTE: This document is not in its original form; some material, such as cover sheet, table of contents, and some drawings have been removed, and the document has been reformatted.

ACCESS PLAN

US 14B/Garfield Avenue

Pierre, SD

PREPARED BY

South Dakota Department of Transportation and City of Pierre

June, 2003

Introduction

The City of Pierre and the South Dakota Department of Transportation have prepared this plan for future access to US 14B on the east side of Pierre. US 14B, also named Garfield Avenue, runs north and south and was originally built to provide an alternate route for truck traffic. Trucks using US 14B avoid a low-height railroad overpass, several tight turns, a steep grade, and driving through part of Pierre's central business district.

This access plan serves as part of local and state access management efforts. Access management is the process of providing safe, efficient ways of getting on and off our streets and highways. The concept "concentrates on restricting the number of direct accesses to major surface streets, providing reasonable indirect access, effectively designing driveways, and enforcing safe and efficient spacing and location of driveways and signals," according to Ron Giguere, former chairman of the Transportation Research Board Access Management Committee. "There are a variety of techniques available for achieving access control. These include geometric design considerations such as medians and channelized islands that prohibit certain turning movements, consolidation actions such as shared driveways and service roads, and others such as removal and relocation of existing access and the introduction of auxiliary lanes for left and right turns. If these types of improvements are implemented correctly, users can expect smoother vehicle flow, reduced delay and fewer crashes. These benefits equate to larger aggregate cost savings in travel time, fuel consumption, property damage and injuries. In addition, there is potential for expanding market area for local businesses, reducing vehicular emissions and fostering quicker emergency response."

Planning of access is particularly important for Garfield Avenue. Pierre is experiencing steady growth and advance identification of access points will help prevent future accidents and congestion.

This study includes the following work items:

- Inventory of existing access points
- Consideration of land ownership, zoning, planned infrastructure, access criteria and physical constraints
- Analysis of future transportation service
- Determination of future access points

Study Area

The area studied includes the US 14B right-of-way and adjacent properties. The study area extends from the intersection at SD 34/Wells Avenue on the south to the intersection with US 14 on the north, a distance of about 2.8 miles.

Along this section of Garfield Avenue, land uses range from agricultural to commercial and industrial. Some major adjacent uses include Wal-Mart, the Pierre Mall, automobile, equipment and manufactured home dealers, and other retailers. Much of the development in the southern portion of the study area is well established. New commercial development is moving into the agricultural land in the northern portion of the study area.

The roadway is five lanes wide from the south end of the study area to approximately the intersection of Fourth Street/Airport Road. A two-lane rural roadway extends north from Fourth Street to US 14.

Existing Access Points

The existing access points were identified through field survey. They are listed in Table 1 by MRM (mile reference marker). The MRM system is used to locate features along all state highways. The access points listed in the table are also mapped on Figures 1 and 2.

Land Ownership

Land ownership adjacent to the roadway was reviewed to determine whether existing parcels are served by existing access points, or whether new access points may be needed. Land ownership records for this area are not fully mapped and are too voluminous to copy in this report.

Zoning

Projected land uses are shown on Map 3 in the appendix, provided by the City of Pierre. The map indicates that developed land in the southern portion of the study area is expected to retain its existing land uses. Undeveloped land in the northern portion of the study area is slated for commercial and industrial uses. This undeveloped land exists in large parcels with combined or well-spaced access points.

Planned Infrastructure

The South Dakota State Transportation Improvements Program (STIP) includes two minor construction projects on US 14B:

- Roadway lighting from Wells Avenue to Buffalo Street in 2003
- Milling and asphalt concrete resurfacing on the westbound ramp from US 14B to Wells Avenue and from 4th Street to US 14 in 2003.

SDDOT and the City of Pierre have also completed an environmental assessment for the extension of Elizabeth Street east of Garfield Avenue to connect to Northstar Avenue and serve a new development area. This planned improvement would also include an extension of Arthur Avenue from Elizabeth Street to connect to Garfield Avenue opposite of Harrison Avenue. Maps 1, 3, and 5 from the environmental assessment are included in the appendix to this report.

This project would alter traffic patterns and change the character of the existing intersections at

Garfield/Elizabeth and Garfield/Harrison. Both of these locations may see increased traffic and may be candidates for future improvements. Traffic signals may be warranted at either of these two locations in the future. The Harrison intersection already handles a fair volume of turning traffic and is located on fairly level terrain. The Elizabeth intersection is located on a significant grade on Garfield Avenue. SDDOT experience shows that traffic signals on significant grades can create more traffic safety problems than they solve because trucks have difficulty stopping for the signals, particularly during inclement weather.

The intersection of Garfield/4th may also become a candidate for traffic signalization in the future. No signal project is planned for any of these locations at this time.

Access Criteria

South Dakota administrative rules 70:09 provide criteria for spacing of new access points on the State-administered highway system. Access points determined by a detailed planning effort, like this one, take precedence over the criteria contained in the rules. The criteria, however, can serve as useful guidelines for planning.

The access criteria indicate that new access points should be spaced no closer than 660' apart, between Wells Avenue and 4th Street. North of 4th Street, new access points should be no closer than 1000'. Traffic signals should be no closer than ¼ mile apart. Existing access points have grandfathered approval under the rules for their existing uses. When the uses change, the access points and spacing need to be re-evaluated.

Physical Constraints

The study area lies in the bluffs of the Missouri River, typified by deeply-cut draws between hills, poor soils and frequent slide areas. There is an overall elevation gain of over 300' within the study area. Several deep drainages abut the highway in the undeveloped areas. These gullies affect how the land might be developed and the feasible locations for access points.

Future Transportation Service

Garfield Avenue is expected to continue to play a significant role in providing regional transportation service in the future. There are currently two competing concepts for that role:

- Garfield Avenue will continue to carry the US 14B designation. As such, it will need to provide service to a combination of traffic demands, including interstate passenger and freight and local circulation. In this case, Garfield will need to provide high-end function with minimum traffic delay.
- Garfield Avenue will be a local major street and through-traffic delay will be less of an issue. Currently, the City of Pierre has identified a future through-traffic route on Dry Run Gulch Road to serve interstate passenger and freight functions.

No project commitment or funding has been assigned to the Dry Run Gulch Road concept. Until this, or some other alternative, comes to fruition, Garfield Avenue will need to continue providing through-traffic service.

Future Access Points

The location of future access points was determined by comparing property boundaries, planned zoning, planned infrastructure, physical constraints, existing access points, and SDDOT access spacing criteria. The goals of the analysis were:

- to maintain existing access points for existing property uses, and
- to provide access to undeveloped parcels while maintaining the safety and efficiency of the transportation facility.

The planned access is shown on Table 2. Note that many of these access points do not meet current access standards, but are allowed because they predate current access rules. If properties adjacent to the roadway redevelop, they are subject to being re-evaluated.

Spacing of the planned access points north of 4th Street have been constrained by property ownership patterns. If properties are combined, access spacing may be increased.

TABLE 1 - EXISTING
US 14B - PIERRE

#	MRM	+DISP	SIDE
1	95.00	+.000	BOTH
2	95.01	+.110	RIGHT
3	95.13	+.000	BOTH
4	95.23	+.000	BOTH
5	95.23	+.034	LEFT
6	95.23	+.051	RIGHT
7	95.23	+.054	LEFT
8	95.30	+.000	LEFT
9	95.30	+.094	RIGHT
10	95.30	+.159	RIGHT
11	95.30	+.184	RIGHT
12	95.51	+.000	LEFT
13	95.51	+.000	RIGHT
14	95.56	+.000	RIGHT
15	95.73	+.000	LEFT
16	95.73	+.000	RIGHT
17	95.73	+.076	RIGHT
18	95.75	+.000	LEFT
19	95.75	+.050	RIGHT
20	95.75	+.052	LEFT
21	95.75	+.188	RIGHT
22	96.05	+.000	LEFT
23	96.05	+.000	RIGHT
24	96.05	+.065	LEFT
25	96.05	+.164	RIGHT
26	96.43	+.000	LEFT
27	96.43	+.000	RIGHT
28	96.43	+.024	LEFT
29	96.43	+.032	RIGHT
30	96.43	+.065	RIGHT
31	96.54	+.000	LEFT
32	96.73	+.000	RIGHT
33	96.73	+.000	LEFT
34	96.73	+.049	LEFT
35	96.73	+.226	BOTH
36	97.00	+.079	BOTH
37	97.00	+.249	LEFT
38	97.00	+.249	RIGHT
39	97.00	+.381	RIGHT
40	97.00	+.414	LEFT
41	97.81	+.000	BOTH

TABLE 2 - PLANNED ACCESS POINTS
US 14B - PIERRE

#	MRM	+DISP	SIDE	NOTE	PLANNED ACCESS ACTION
1	95.00	+.000	BOTH	SD 34	MAINTAIN EXISTING STREET INTERSECTION
2	95.01	+.110	RIGHT	CENEX C-STORE	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS
3	95.13	+.000	BOTH	IRWIN STREET	MAINTAIN EXISTING STREET INTERSECTION
4	95.23	+.000	BOTH	HUMBOLDT STREET	MAINTAIN EXISTING STREET INTERSECTION
5	95.23	+.034	LEFT	HOPE REFORMED CHURCH	**COMBINE** WITH ACCESS 7 DURING RECONSTRUCTION OR REDEVELOPMENT
6	95.23	+.051	RIGHT	COMBINED DRIVEWAY	**MOVE** SOUTH TO MIDBLOCK WITH RECONSTRUCTION OR REDEVELOPMENT
7	95.23	+.054	LEFT	HOPE REFORMED CHURCH	**COMBINE** WITH ACCESS 5 DURING RECONSTRUCTION OR REDEVELOPMENT
8	95.30	+.000	LEFT	FRANKLIN STREET	MAINTAIN EXISTING STREET INTERSECTION
9	95.30	+.094	RIGHT	DOT REGION/AREA OFFICE	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS
10	95.30	+.159	RIGHT	LARIAT BOWL	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS
11	95.30	+.184	RIGHT	LARIAT BOWL	**CONSOLIDATE** WITH PROPERTY TO NORTH WITH RECONSTRUCTION OR REDEVELOPMENT
12	95.51	+.000	LEFT	CAPITOL AVENUE	MAINTAIN EXISTING STREET INTERSECTION
13	95.51	+.000	RIGHT	MINI STORAGE	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS
14	95.56	+.000	RIGHT	BUSHFIELD DRIVE	MAINTAIN EXISTING STREET INTERSECTION
15	95.73	+.000	LEFT	BUFFALO STREET	MAINTAIN EXISTING STREET INTERSECTION
16	95.73	+.000	RIGHT	STANTON DRIVE	MAINTAIN EXISTING STREET INTERSECTION
17	95.73	+.076	RIGHT	STANTON DRIVE	MAINTAIN EXISTING STREET INTERSECTION
18	95.75	+.000	LEFT	SKYLINE DRIVE	MAINTAIN EXISTING STREET INTERSECTION
19	95.75	+.050	RIGHT	FIELD ENTRANCE	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS, ACCESS TO SERVE AREA FROM STANT
20	95.75	+.052	LEFT	PIONEER OF PIERRE	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS
21	95.75	+.188	RIGHT	OAK STREET	MAINTAIN EXISTING STREET INTERSECTION
22	96.05	+.000	LEFT	FLAG MOUNTAIN DRIVE	MAINTAIN EXISTING STREET INTERSECTION
23	96.05	+.000	RIGHT	ELIZABETH STREET	MAINTAIN EXISTING STREET INTERSECTION
24	96.05	+.065	LEFT	WAL-MART	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS, REDIRECT ACCESS TO ELIZABETH STR
25	96.05	+.164	RIGHT	PIERRE SPORTS CENTER	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS
26	96.43	+.000	LEFT	HARRISON AVENUE	MAINTAIN EXISTING STREET INTERSECTION
27	96.43	+.000	RIGHT	PIERRE SCHOOL DISTRICT BUILDING, STATE SHOPS & STORAGE	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS OR ARTHUR AVENUE IS CONNECTED
28	96.43	+.024	LEFT	C-STORE	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS
29	96.43	+.032	RIGHT	COMMUNICATIONS CENTER	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS, CONSIDER CONSOLIDATION WITH 30
30	96.43	+.065	RIGHT	BAS HOMES	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS, CONSIDER CONSOLIDATION WITH 29
31	96.54	+.000	LEFT	PIERRE MALL	MAINTAIN EXISTING DRIVEWAY UNTIL PROPERTY REDEVELOPS
31A	96.54	+.000	RIGHT	(PROPOSED NEW ACCESS POINT)	POTENTIAL SITE FOR COMBINED ACCESS TO SERVE PROPERTIES TO NORTH AND SOUTH
32	96.73	+.000	RIGHT	AIRPORT ROAD	MAINTAIN EXISTING STREET INTERSECTION
33	96.73	+.000	LEFT	FOURTH STREET	MAINTAIN EXISTING STREET INTERSECTION
34	96.73	+.049	LEFT	RESIDENTIAL DRIVEWAY	**MOVE** TO '+.095 TO SERVE FUTURE DEVELOPMENT
34A	96.73	+.095	BOTH	(PROPOSED NEW ACCESS POINT)	PLANNED POINT TO SERVE FUTURE DEVELOPMENT
35	96.73	+.226	BOTH	FIELD ENTRANCE	SERVE ADJACENT DEVELOPMENT AT THIS LOCATION
36	97.00	+.079	BOTH	FIELD ENTRANCE	SERVE ADJACENT DEVELOPMENT AT THIS LOCATION
37	97.00	+.249	LEFT	FIELD ENTRANCE	SERVE ADJACENT DEVELOPMENT AT THIS LOCATION
38	97.00	+.249	RIGHT	CONTRACTOR'S YARD	SERVE ADJACENT DEVELOPMENT AT THIS LOCATION
39	97.00	+.381	RIGHT	FIELD ENTRANCE	SERVE ADJACENT DEVELOPMENT AT THIS LOCATION
40	97.00	+.414	LEFT	FIELD ENTRANCE	**MOVE** WITH DEVELOPMENT TO PROVIDE ADEQUATE SPACING FROM ACCESS 39
40A	97.00	+.600	BOTH	(PROPOSED NEW ACCESS POINT)	SERVE ADJACENT DEVELOPMENT AT THIS NEW LOCATION, LOCATION MAY BE ADJUSTED BUT NO CLOSER THAN 500' FROM US14 INTERSECTION RADIUS OR NEAREST DRIVEWAY TO THE SOUTH
41	97.81	+.000	BOTH	US 14	MAINTAIN EXISTING STREET INTERSECTION

NOTE: "DISP" means displacement; distance in thousanths of a mile (~ 5 ft) from the reference point mile marker

PUBLIC NOTICE

The City of Pierre Planning Commission will hold a Public Hearing at 5:15 P.M. on Monday, April 28, 2003, at the Pierre City Hall Commission Room at 222 E. Dakota Avenue, Pierre, South Dakota to consider the following planning and zoning issue:

A draft access plan for US 14B/Garfield Avenue prepared by the Department of Transportation and the City of Pierre. The study includes an inventory of existing access points, consideration of land ownership, zoning, planned infrastructure, access criteri

All interested parties are welcome to give written or oral comments. If special accommodations are necessary, please notify the Public Works Office at 773-7341 at least 24 hours prior to the scheduled meeting.

CITY OF PIERRE PLANNING COMMISSION

Comment Summary on the Draft Access Plan - US 14B/Garfield Avenue

Name	Approach #	Business	Comments	Response
Beck, Trace & Parsons, Ted	34, 34A & 35	Vacant	Wanted info. on where approach #34 was to be moved.	Added a set of approaches at 34A & noted that approach 34 is to be moved to 34A.
Carter, Jody	28	Cowboy Country Store	Wanted to be sure the existing approach would remain.	Advised the location of the approach is a concern but the location would be maintained until the property redevelops or reconstruction and then DOT would negotiate with
Gardella, Char	37 & 40	Vacant	Was not advised of an adjacent zoning change Would like to move truck bypass to N.Airport Road and have the area adjacent to the bypass reserved for residential use	Sent a letter advising Gardella was not property owner of record at time notices were sent & hearing was held City Comprehensive Plan recommends relocating Bypass further east when traffic and development warrant it. Comp. Plan shows local business use for west side of bypass due to traffic volume, noise, airport proximity.
Kayser, Ron	N/A	Pepsi Inc.	Wants to be notified of improvements in Airport Road Area. Not affected by Access Plan.	Advised that adjacent property owners will be sent notices and neighborhood meetings/public hearings will take place for improvements on Airport Road for the proposed Wal-Mart.
Lamb, Daniel	40A	Vacant	Was reluctant to make any decisions on approach locations without his partners input and without knowing what business might locate on the property. Requested the plan be as flexible as possible in the location of approach 40A.	Reworded the planned access action for approach 40A to "Serve adjacent development at this new location, location may be adjusted but no closer than 500' from US 14 intersection radius or nearest driveway to south."
Lindquist, Eldon	29 & 30	Communications Center	Concerned that the wording for these 2 approaches said "Consolidate with access 29 or 30 with reconstruction or redevelopment."	Reworded the planned access action to "maintain existing driveway until property redevelops, consider consolidation with 29 or 30."
Maher, Tom	40A	Vacant	Requested that another set of approaches be added between 40A & 41 and/or that approach #40A be moved as far north as possible	Reworded the planned access action for approach 40A to "Serve adjacent development at this new location, location may be adjusted but no closer than 500' from US 14 intersection radius or nearest driveway to south."
Maher, Tom & Mike Schlachter	34A	Future Building Supply	Indicated the Corporate Office would not build a store at this location without direct access off the Bypass.	Negotiated with property owner and added a set of approaches at 34A with conditions
Nelson, Clayton	N/A	Vacant		
Specker, Donald	Between #21 & #23	Vacant	Was issued an approach permit 200' N. of Oak Street several years ago & was notified by DOT that permit expired because approach was not constructed. Requested consideration for this approach.	Oak Street is within 200' and will serve as access for the parcel.
Swenson, Joe	N/A	Vacant		
Wagner, Duane	30	Wagner Landscaping	Utilizes approach #30 at BAS Homes for access to Wagner Landscaping at the rear & wanted information.	Provided info. that existing driveway would be maintained until property redevelops and then would consider consolidation with approach 29.

APPENDIX F-4: Example Intergovernmental Agreements for Corridor Plan

-- from South Dakota, rural and urban

South Dakota Highway 42 Corridor Study

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2.0 Issue Identification and Confirmation

2.1 Data Collection Summary

To begin the study, existing data were inventoried from a variety of sources and aggregated according to type of issue to determine interrelatedness and begin to examine the corridor's opportunities and constraints. The following list illustrates a summary of the types of data that were collected and examined in July, August, and September, 2003, for the project:

- Project Statement
- SD Corridor Process Preservation Chart
- Access planning/permitting administrative rules (SD)
- 2000, 2001, 2002 Average Daily Traffic in project area
- SD 42 Geometric data and existing right-of-way
- Hourly Automated Traffic Recorder data for Jan.-Dec. 2002 for corridor
- East Sioux Falls and Arboretum Master Plan
- Arrowhead Park Master Plan and Costs
- "Assessment of Techniques for Corridor Preservation in South Dakota" – SDDOT Publication, March 2002
- SD42 Public Involvement Plan
- Intersection Geometry
- ARC Map with speed limits

- SD42 Traffic Forecasts
- Historic AADT for SD42 (last 20-30 years)
- 24 hour average hourly traffic counts outside city limits for state highways and county roads near corridor
- 24 hour average hourly counts on major roadways within city limits
- Intersection directional turning movement counts
- Crash data over last 3 years in study area
- Current transportation planning studies in the area
- Minnehaha County Comprehensive Plan
- Minnehaha County Zoning and Subdivision Ordinances
- Transit service in the study
- Demographic/census data for area
- Road File (Base map)
- Minnehaha County CIP
- Draft copy of Years 2004-2008 Transportation Improvements Plan
- Shape files of Historical Landmarks
- Wetlands, floodplains, slopes, and parcels
- Minnehaha County Zoning map
- 10th Street Travel Time Study
- Threatened and endangered species
- Contacts with Iowa and Minnesota transportation agencies

2.2 Existing Conditions

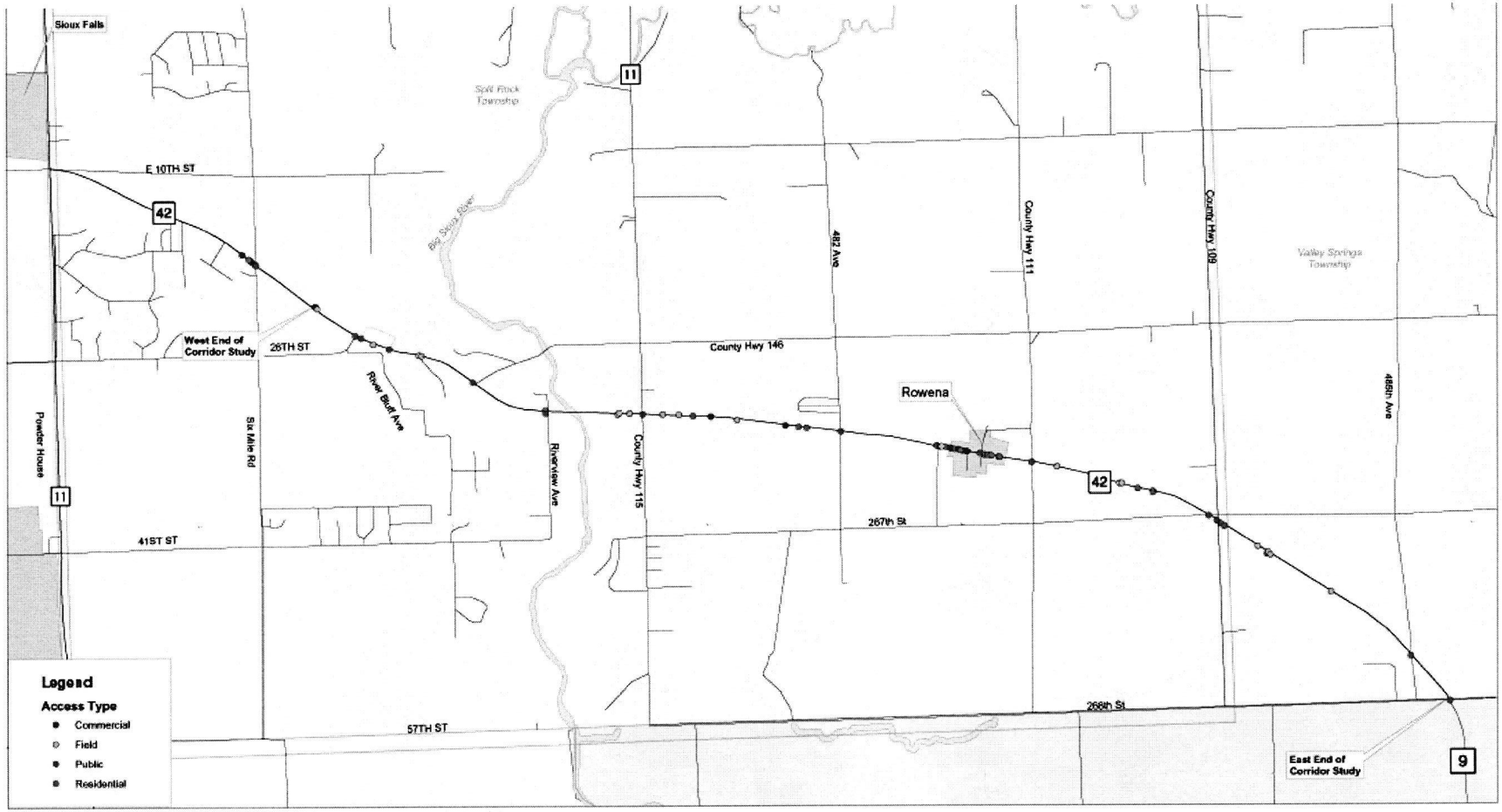
2.2.1 Transportation System and Land Development Features

SD Highway 42 has been identified as a "commuter" corridor for persons living in Southeastern Minnehaha County, Rock County, Minnesota, and Lyon County, Iowa that commute to Sioux Falls for business, shopping, and recreation trips. SD 42 is classified as an Arterial highway in South Dakota and besides I-90, is the only major east-west state highway connection on the rapidly developing east side of Sioux Falls.

The six-mile SD 42 Corridor is characterized by three distinct landscapes:

1) Rural Agricultural (eastern half)
2) River Valley/Natural Environment (middle quarter)
3) Suburban and Urbanizing Development (western quarter)

... continues



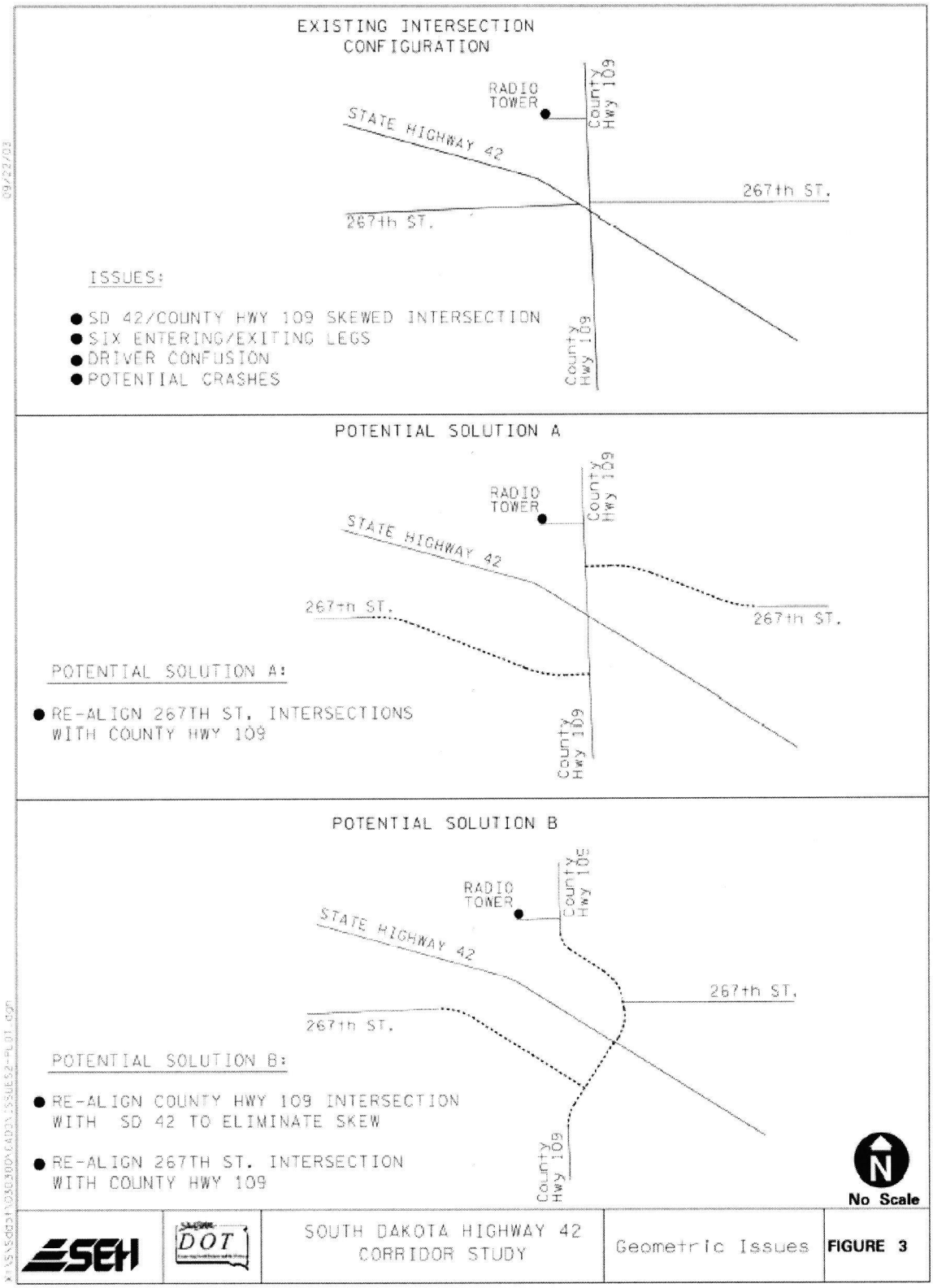
Data Sources: SDDOT, Minnehaha County, City of Sioux Falls, SECOG,South Dakota State Historical Society, Archeological Research Center

* See G.I.S. Disclaimer note

South Dakota Highway 42 Corridor Study

Access Locations

Figure 4


EXISTING INTERSECTION CONFIGURATION
RADIO TOWER
County Hwy 109
STATE HIGHWAY 42
267th ST.
267th ST.
County Hwy 109
ISSUES:
● SD 42/COUNTY HWY 109 SKEWED INTERSECTION
● SIX ENTERING/EXITING LEGS
● DRIVER CONFUSION
● POTENTIAL CRASHES
POTENTIAL SOLUTION A
RADIO TOWER
County Hwy 109
STATE HIGHWAY 42
267th ST.
267th ST.
County Hwy 109
POTENTIAL SOLUTION A:
● RE-ALIGN 267TH ST. INTERSECTIONS WITH COUNTY HWY 109
POTENTIAL SOLUTION B
RADIO TOWER
County Hwy 109
STATE HIGHWAY 42
267th ST.
267th ST.
County Hwy 109
POTENTIAL SOLUTION B:
● RE-ALIGN COUNTY HWY 109 INTERSECTION WITH SD 42 TO ELIMINATE SKEW
● RE-ALIGN 267TH ST. INTERSECTION WITH COUNTY HWY 109
N
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SEH
DOT
SOUTH DAKOTA HIGHWAY 42 CORRIDOR STUDY
Geometric Issues
FIGURE 3