

US 70 CORRIDOR

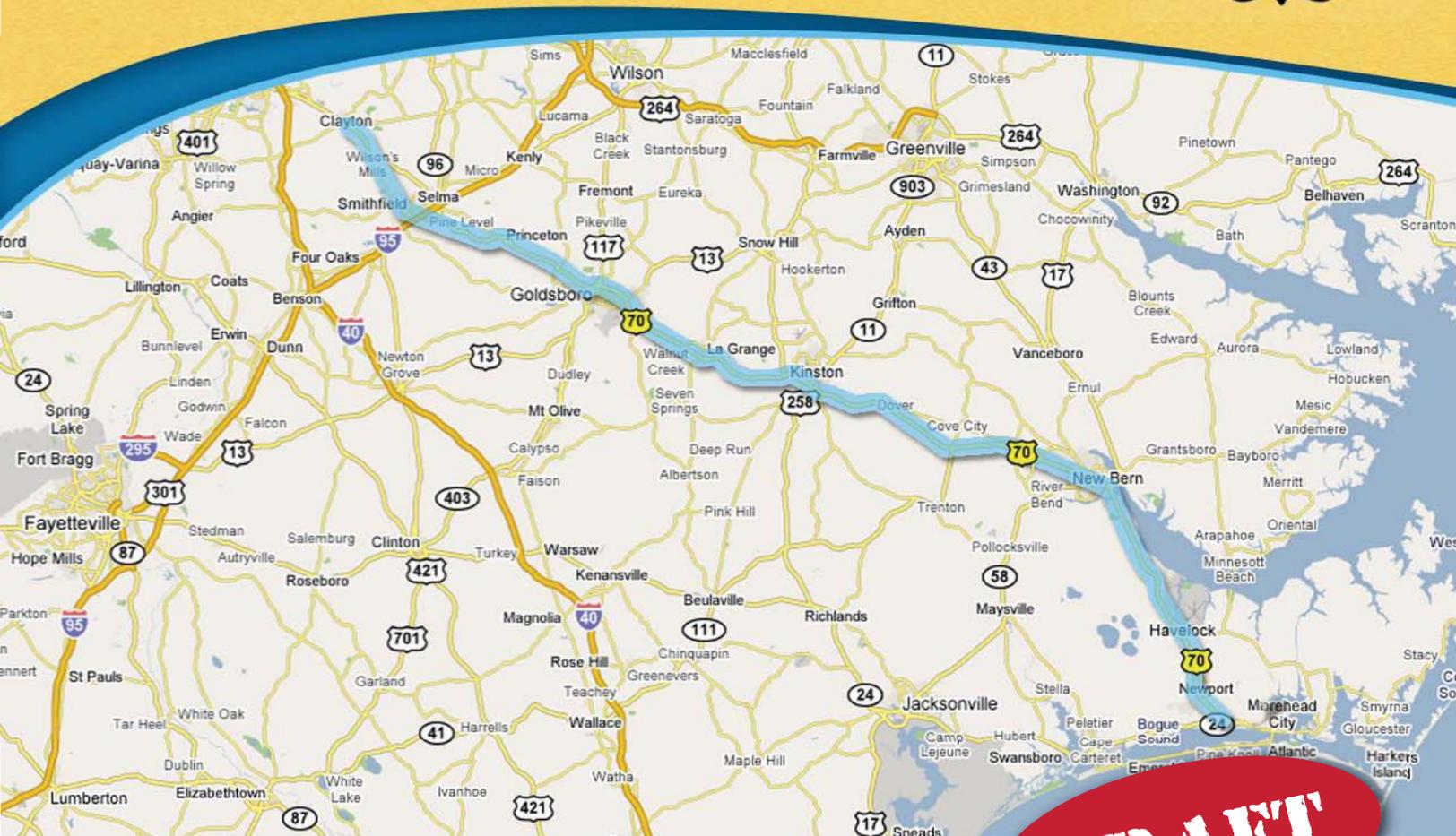
Access Management Handbook

Prepared for

Prepared by



Kimley-Horn
and Associates, Inc.



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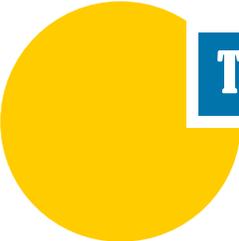


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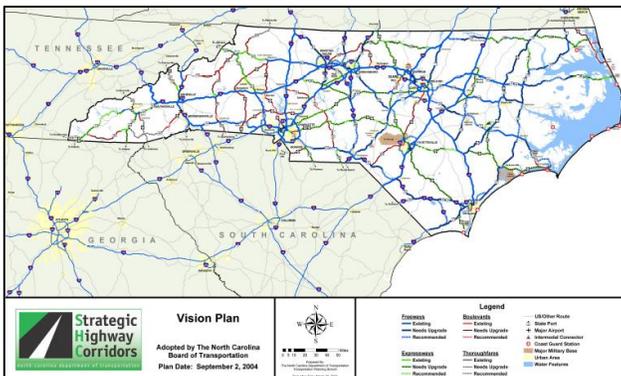
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Chapter 1 – Planning Framework

Challenges along US 70

The US 70 corridor in North Carolina stretches statewide from the Pisgah National Forest in Madison County to the Atlantic coast. The communities linked together along this corridor reflect a mix of urban and rural development patterns with associated transition areas. These communities continue to develop at different rates and intensities, yet each community contributes to the unique challenges facing the corridor.



US 70 between Raleigh and Morehead City is a major arterial link in the state's transportation system. It is identified as Corridor 46 in the North Carolina Department of Transportation (NCDOT) *Strategic Highway Corridor System*. North Carolina has invested significant resources in its transportation system, particularly via its arterial highways. These highways are vital links between communities and serve as essential corridors for commerce, trade, tourism, and recreational travel.

A positive impact of this continued growth is the strengthening of the economic health of the corridor communities and the state overall. The downside, particularly along corridors such as US 70, is the impact on the safe and efficient operation of the roadway. The recently developed *US 70 Access Management Study* presents the traffic and safety history of the corridor.



Reflecting the mix of rural and urban areas along US 70, the reported traffic volumes range from a relatively low 14,000 to a fairly high 54,000 vehicles per day. The crash data included in the report, however, suggest that safety issues are only marginally different between rural and urban areas.

The problems associated with the kind of strip development increasing along US 70 include traffic congestion and safe access, which are beginning to outpace the positive aspects of growth. Addressing impacts to the roadway often requires expensive highway improvements including additional travel lanes, bypasses, turning lanes, and intersection signalization. It also requires communities along the corridor to address the

impacts of development by regulating access and enacting ordinances to manage the rate and quality of this arterial roadside development.



The challenge for communities along US 70 is to comprehensively and strategically address roadway issues, roadside development, and access to the facility in a consistent and cooperative effort. Transportation and land use decisions need to be coordinated between state and local governments to establish the balance between mobility and accessibility through access management. To facilitate this multi-jurisdictional coordination and help establish a consistent balance, the US 70 Corridor Commission was established.

US 70 Corridor Commission

The US 70 Corridor Commission constitutes a joint effort among state and local political jurisdictions along the US 70 corridor in Wayne, Lenoir, Jones, Craven, and Carteret Counties with a long-term, mutual interest in retrofitting the corridor as North Carolina's next major access managed highway. Stakeholders along US 70 agree that consensus among state and local political jurisdictions demonstrates a unified vision for the corridor — "One Vision, One Voice." Grassroots support for short-term and long-term improvements identified by the US 70 Corridor Commission should attract the resources needed for expediting a new access managed highway, which will serve as the catalyst for economic development along the corridor.

As a member of the US 70 Corridor Commission, each local political jurisdiction formally considers and, through the appropriate political process with public input, proposes the adoption of minimum access management standards and design criteria for the existing US 70 corridor provided in the *US 70 Access Management Study*. As a part of the adoption process, each community has the opportunity to work with the state to adjust the access management plan where desired.

The *US 70 Corridor Access Management Handbook* expands upon the recommendations developed in the *US 70 Access Management Study*. This document provides local governmental leaders and their staff with descriptions of access management tools, techniques, statistics, and guidelines that will help develop a better understanding of the need for access

management along the US 70 corridor. These strategies have been used effectively to increase roadway safety and enhance economic development in communities in other states, including Florida, Maryland, and Georgia, and can be transferred to North Carolina for use along the US 70 corridor.

The *US 70 Corridor Access Management Handbook* also supports the adoption of an access management program by participating communities. This document contains a model access management overlay ordinance, as well as defines access management, provides answers to common access management questions, addresses lessons learned from previous studies and community efforts, and presents a toolkit of access management treatments, other design considerations, and policy guidelines.

Corridor Vision

The overarching goal for the US 70 corridor is to make it a safer, more efficient, and more appealing facility. To achieve this goal, access management strategies were identified during the *US 70 Access Management Study*. These strategies and how they can be implemented remain the focus of this document, the *US 70 Corridor Access Management Handbook*.

One option to achieve the vision for a safer facility involves retrofitting US 70 as an access managed facility. Retrofitting will have a significant impact on properties located in proximity to the corridor. All of the land use, building placement, design orientation, landscaping, sign size and placement, and site access requirements included in current local land development ordinances will need to be evaluated and potentially re-written. Communities will need to work together to implement minimum criteria to protect the intended function of the corridor. More importantly, these communities will need to act in unison to adopt plans, policies, and minimum design criteria that will further the vision of US 70 as a safer, more efficient, and more appealing facility.

In comparison with retrofitting US 70, another opportunity to further the concept of an access managed corridor is to consider the potential long-term conversion of the US 70 corridor to a freeway section. Some of the envisioned US 70 freeway retrofit transformation will take place on existing roadways, while other portions of the highway will be built in

new locations. The new access managed highway will combine high mobility with increases in safety for motorists traveling between Interstate 40 and the coast, all while reducing direct access to the highway from adjacent land uses. Traffic signals and driveways will be removed, remaining cross streets will be grade-separated or retrofitted with access ramps, and full access to the freeway will be limited to new interchanges. Direct access to properties abutting the highway will be provided via side or rear connections to a secondary street system. A local example of an access managed freeway facility is the portion of US 70 between Kinston and New Bern.

Creating a Corridor Management Framework

This report is intended to provide information that will encourage a unified approach among state and local political jurisdictions for implementing consistent regulatory policy measures along the corridor. One of these measures includes an access management overlay ordinance that will ultimately guide construction of a new access managed arterial and protect the integrity of this strategic corridor. Short-term improvements recommended by the US 70 Corridor Commission will improve regional mobility along the corridor and preserve the opportunity to build a freeway in the long-term.

Short-Term Corridor Goals

Short-term improvements for the corridor focus on access management. Local governments along the corridor have agreed to support the recommendations included in the *US 70 Access Management Study* developed by the North Carolina Department of Transportation (NCDOT) in July 2005. The recommendations include minimum access management standards for the US 70 corridor to be incorporated into regulatory tools, including zoning ordinances, subdivision ordinances, unified land development codes, and engineering design standards maintained by the local governments.

Building on the study document, the US 70 Corridor Commission provides local governments with model development regulations and administrative policies that could be adopted through legislative action. The minimum development regulations or administrative policies will provide continuity along the corridor for protecting the interests of

regional mobility. It is certainly possible for each local government to adopt more restrictive access management standards in order to fulfill its own local vision established for the corridor.

Long-Term Corridor Goals

The foundation for long-term transformation of the corridor into an access managed freeway will be memorialized in a *Comprehensive Freeway Master Plan*. Local governments along the corridor will be active partners in the planning process, and will implement the plan's recommendations to create a corridor with a more consistent approach to access. Recommendations for the freeway will likely support proposed bypass routes and new roadway locations, and require retrofitting small segments of the corridor in both urban and rural areas.

At the completion of the *Comprehensive Freeway Master Plan*, the US 70 Corridor Commission will partner with state and local governments to designate a proposed corridor protection overlay district for the preferred alignment. This overlay district will be protected by minimum rules and requirements regarding the function of the freeway. It is the expectation that these requirements will be developed by the US 70 Corridor Commission and adopted by local governments. Additional development controls and/or minimum design criteria for the corridor protection overlay district may be adopted by the local governments, in addition to the access management standards, in order to fulfill their own local visions for the corridor.

Protecting Our Investment

Protecting the investment in US 70 as a strategic corridor will depend upon a plan that identifies a clear understanding of what is trying to be achieved through access management, what tools can be used to achieve it, and how local government can use those tools for implementation. The remainder of this report covers these topics and provides guidelines for their use. Making the US 70 corridor a safer, more efficient, and more appealing facility is a realistic goal, and one worth achieving.

What is Access Management?

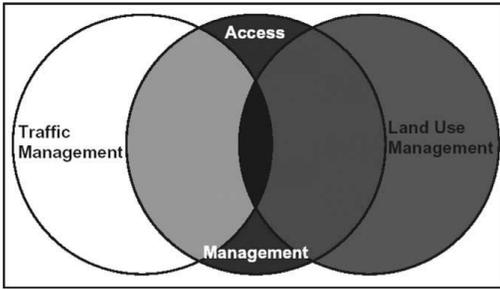
The Federal Highway Administration's (FHWA) official definition of access management is "the process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding system in terms of safety, capacity, and speed." The Transportation Research Board *Access Management Manual* goes on to define access management as "the systematic control of the location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway."

Access management can be used for several different purposes, including:

- Addressing how land is accessed along arterials
- Focusing on mitigating traffic problems arising from development and the increased traffic volume attempting to use these developments
- Proactively dealing with potential traffic problems caused by new development before they occur
- Calling upon local planning and zoning to address overall patterns of growth and the aesthetic issues arising from development

With fewer new arterial roadways being built, the need for effective uses of current transportation systems is significant. Access management offers a variety of benefits to a broad range of transportation system stakeholders, including:

- Motorists, who will experience safer and more efficient travel
- Bicyclists, who benefit when access management strategies improve safety and enhance driver predictability while promoting interconnected alternate travel routes
- Pedestrians, who appreciate the enhanced safety and refuge areas provided by appropriate planning
- Businesses, which receive an expanded market area, are able to promote higher-quality and more consistent development, and stabilize property values through their presence
- Communities, which experience safer road conditions and increasingly consistent aesthetic quality
- Government agencies, which benefit from the increased public safety, the extended life of major roadways, the reduced traffic congestion, the support of alternative



The Relationship between Access Management and Land Use Planning

Source: NCHRP Report 548 A Guidebook for Including Access Management in Transportation Planning

transportation modes, and the improvement in both the appearance and quality of the built environment

On the other hand, the function and character of major roadway corridors can deteriorate rapidly in the face of increasing growth when access management is not properly planned.

Lessons Learned

Research on roadway corridor conditions and their effects on local businesses and safety have provided extensive results regarding the effectiveness of access management as a transportation infrastructure improvement strategy. The section below poses several important questions about access management, and provides explanations to help local governments recognize the value of incorporating access management principles in their land development and regulations.

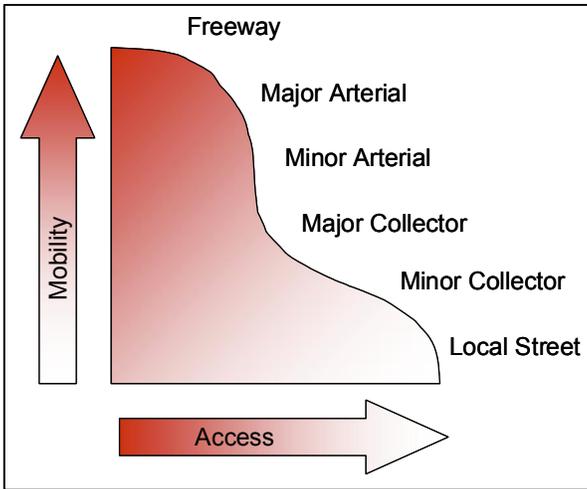
Negative Impacts to Roadways without Access Management

Roadways provide local access to destinations within a town or city. They also serve regional through-traffic and the long-range transport of individuals and goods. As discussed before, access management involves the control, management, and planning of the number and placement of driveways along a roadway, in addition to the roadway's medians and median openings, interchanges, intersections, turn lanes, and traffic signals. The spacing of driveways, intersections, median openings, and traffic signals affects the flow of traffic and can either help or hinder a driver's progress and safety on their journey along the roadway.

As described in the Transportation Research Board *Access Management Manual*, "Failure to manage access is associated with the following adverse social, economic, and environmental impacts:

- An increase in vehicular crashes;
- More collisions involving pedestrians and cyclists;
- Accelerated reduction in roadway efficiency;
- Unsightly commercial strip development;
- Degradation of scenic landscapes;





Relationship between Access and Mobility

- More cut-through traffic in residential areas due to overburdened arterials;
- Homes and businesses adversely impacted by a continuous cycle of widening roads; and
- Increased commute times, fuel consumption, and vehicular emissions as numerous driveways and traffic signals intensify congestion and delays along major roads.”

In spite of these seemingly avoidable negative impacts, access management is not always easy to implement. Property owners along the right-of-way can be particularly vocal about their property rights, especially when they perceive a loss of convenient access to their properties.

Studies have shown, however, that the negative impacts identified above can work against property owners, even when they believe they are losing convenient access. The negative impacts can encourage customers to seek out places of business that they perceive to be more safe and more convenient. Providing better access management can, in fact, result in a positive impact to property owners along the right-of-way, as well as result in an efficient use of public funds.

Financial Benefits to Access Management

Previous solutions to the loss of mobility along a major arterial highway included expanding the roadway to accommodate more traffic or realigning the roadway entirely. Access management allows preservation of the existing roadway corridor while maintaining the ability to access destinations along the roadway. Depending upon the volume of traffic on a roadway, access management can delay or even eliminate the need to widen a road, saving taxpayer money in the process (Gattis, 2005).

Access management presents numerous opportunities for financial savings. These can vary from reduced accident costs, reduced need to purchase additional right-of-way, long-term preservation of roadway capacity and efficiency (which may reduce the need for future investment in additional travel lanes), and improved economic conditions for businesses along busy roadway corridors by reducing real as well as perceived congestion (OCPW, 2006).

Transportation Priority: Access or Mobility

From freeways to local roads, each roadway has a different priority that translates into varying degrees of mobility versus access, as illustrated in this graphic. Freeways — such as those in the Interstate system — provide the highest priority for mobility with the least access. At the other end of the roadway spectrum are local streets, which have the priority of providing access to businesses and homes, but are not designed for a high level of mobility. Generally speaking, roads with higher levels of mobility also have higher speed limits.

At present, US 70 has a mix of access and mobility priorities for the length of the corridor. US 70 is designated as a freeway in certain sections and a major arterial in others, which impacts the degrees of access and mobility expected of each section. The vision for US 70 identified during the *US 70 Access Management Study* involved developing a consistent level of mobility throughout the corridor in order to improve safety and traffic efficiency while managing access — while still maintaining the economic viability of the corridor.

How Access Management Affects Mobility

While roadways move travelers from one place to another, driveways serve as the terminal links connecting motorists to their destinations. In areas with higher levels of accessibility — usually resulting from many driveways spaced closely together — the mobility of the roadway will decrease as through-traffic slows to accommodate turning vehicles. While this is appropriate for local streets, it is not appropriate for roadways designed to accommodate more through traffic, such as US 70.

One strategy to manage the number of vehicles turning into driveways is to install medians. Medians serve to separate traffic and provide access from one side of the roadway to the other.

Two types of medians are used on arterial roadways:

- Flush medians, also called two-way left turn lanes (TWLTL)

- Non-traversable medians, which are either raised or depressed



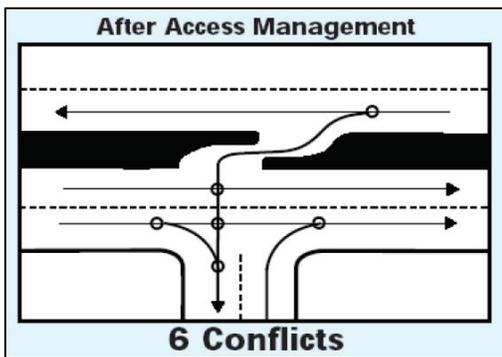
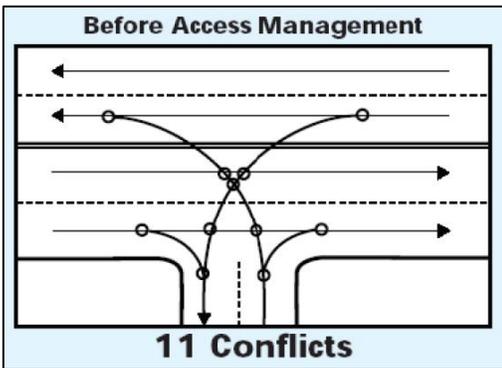
Non-Traversable Median

Source: Assess The Need For Implementing An Access Management Program

Studies over the years have found that roadway corridors with non-traversable medians have lower crash rates than corridors with flush medians or no medians (Gattis, 2005). Median openings allow passage from one side of the roadway to the other, and can be non-directional or directional. Directional openings funnel traffic away from the left lane to provide the opportunity to cross opposing traffic in specific,

predictable routes. Non-directional median openings can be used by either direction of traffic, and can often accommodate vehicles from both directions at the same time. Roadways with non-traversable medians also increase pedestrian safety by providing a refuge area for road crossings.

Another aspect of access management involves the timing and spacing of traffic signals. Signals control the flow of traffic along the roadway. Longer spaces between signals allow for more flexibility in setting the timing cycles of the signals. The more closely the signals are able to match the ranges of traffic flow, based on peak and off-peak volumes and speeds, the less likely there will be delays. In addition to promoting general mobility, reductions in delays can ultimately lead to reduced fuel consumption and pollution levels (Gattis, 2005).

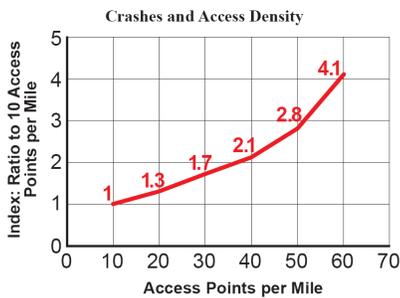


Access Management and Safety

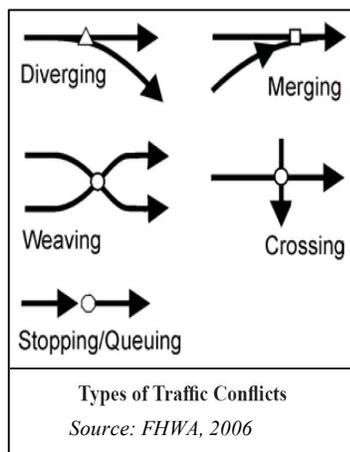
Access management projects tend to have a positive impact on the safety of a roadway. As the number of access points per mile increases, the crash rate for the roadway increases. If the access to commercial properties near intersections is restricted, the number of potential vehicular conflicts can be reduced (Gattis, 2005).

Comparing access managed with non-access managed roadway corridors, a more uniform spacing of driveways and access points allows drivers to focus on specific conflict locations, rather than having to continuously scan the roadway for conflict possibilities. This ability to focus driver attention can ultimately reduce the overall number of conflicts along a roadway corridor (Demosthenes, 2003).

The crash rates for roadways with access management tend to be lower than for those with unmanaged roadway access, mainly as a result of the reduction in the conflicting traffic movements associated with higher crash rates. Data tends to show that access points and crash rates have a positive relationship, and an increase in one will result in an increase in the other. The variety of traffic movements allowed at access points also contributes to an increase in crash rates (MDOT, 2004). Numerous studies and highway reconstruction projects in the past five decades have shown that when access management strategies are applied to a roadway, crashes along the corridor can be reduced by between 30 and 60% (Gattis, 2005).



Transportation Research Board, Access Management Manual 2003



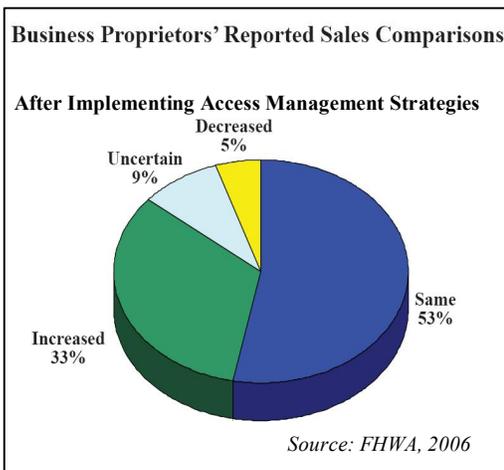
An example of a successful access management strategy includes a demonstration project in Atlanta which altered a 4.3-mile segment of Memorial Drive. The segment consisted of 60 access points per mile before replacing the two-way center left turn lane with a raised median. The project reduced the number of intersections to 14, and all other median openings were closed. In the 10 years prior to the project, the segment recorded 15 fatal injuries, six of which were pedestrians. Since the project, there has been a 37% drop in the total crash rate and a 48% drop in the injury rate, and no fatalities have been recorded (Gattis, 2005).

Other studies have shown that collisions associated with access points along a roadway, such as driveways and intersections, range between 55 and 65% of all vehicular crashes. Additionally, just under half (48%) of all vehicular crash injuries and 22% of all vehicular crash fatalities occur at intersections (Demosthenes, 2003).

Pedestrian safety also is enhanced with the introduction of access management strategies. Raised medians have been shown to provide a refuge for pedestrians crossing the street, and are associated with lower pedestrian crash rates.

Economic Effects of Access Management

Similar to its impact on safety, access management tends to have a positive effect on businesses along a roadway corridor. Customer access and even land values in the vicinity of the project can be affected. Access management reshapes growth, often allowing more property depth to be developed in a particular area than could be developed with more typical strip commercial land uses. In this sense, mobility and accessibility along a roadway are not necessarily in opposition when economic opportunities and redevelopment are taken into account. A roadway with a higher degree of mobility can increase accessibility through increased efficiency of traffic. Likewise, clustering residential and commercial developments can reduce the number of access points onto an arterial, thereby increasing the roadway's mobility (Demosthenes, 2003; Gattis, 2005).



Increased Traffic Efficiency

Source: *Assess The Need For Implementing An Access Management Program*

In the absence of an access management strategy, the existence of closely spaced driveway entrances, median openings, and traffic signals can contribute to a reduction in the mobility of a corridor. This lack of mobility can have repercussions on the corridor's ability to adapt to future increases in traffic that could accompany regional growth. When traffic congestion along a corridor is reduced through an access management project, safety is improved, travel times can be reduced, and site accessibility can be enhanced, all of which can contribute to residential and commercial land use vitality in already-developed areas (MdDOT, 2004).

The ability of customers to access a business location is closely guarded by business owners, and efforts to change the traffic patterns of the roadways are often met with high levels of

resistance. Studies have shown that changing the access points to a location do not usually have a negative impact on the business. In fact, the more important variables in the success or failure of a business are associated with management expertise and the various aspects of customer service. According to these studies, “access will not be the primary cause of whether a business will survive or fail.” Businesses considered to be “drive-by” and based on convenience rather than destination, however, are more susceptible to closure as a result of reduced access (FHWA, 2006).

A study in 1997 determined that businesses along corridors with newly installed access management strategies had turnover rates similar to or lower than those of surrounding areas not on corridors with access management. The study also noted that sales figures for businesses along access managed corridors tended to be the same or higher than those for those businesses not along access managed corridors (FHWA, 2006). In fact, about 93% of business owners surveyed in a 1999 Texas study reported that their regular customers were either equally likely or more likely to continue patronizing their businesses after the installation of medians (TRB, 2003). Additionally, a business with excellent customer service and product has the ability to overcome short-term accessibility difficulties associated with the construction of access management projects.

Business owners generally report that the greatest adverse impacts during an access management project occurred during the construction period, where both sales and employment figures tended to decrease slightly (Williams, 2000). Business owners report high levels of anxiety regarding potential lost sales resulting from an announced access management project, much of which is unjustified based on research results. A majority of business owners report no change in sales following a median improvement project, and one third of business owners reported an increase in sales. Additionally, customers and delivery drivers tended to have higher opinions of the access managed sites due to increased safety and ease of access (Williams, 2000; FHWA 2006).

In a 1999 case study Rees, Orrick and Marx examined 15 businesses that had filed lawsuits against the Kansas Department of Transportation relating to access control projects affecting their businesses. It was ultimately determined

that “changes in access or traffic patterns did not cause a change in the highest and best use of abutting properties” (Williams, 2000). Furthermore, in 1999 Eisele and Frawley published a study of economic impacts associated with the restriction of left-turn lanes in Texas. The authors’ key findings include:

- Business owners reported no change in pass-by traffic after median installations
- Most adverse economic impacts were realized during the construction phase of the median installations
- Employment within the corridors experienced upward trends overall, with some exceptions during construction phases
- Along corridors where property values were studied, the vast majority of land values stayed the same or increased, with very few exceptions (Williams, 2000)



Improved Access Management

Access Management and Redevelopment

Access management projects can provide local communities with the opportunity to enhance their local streetscapes. Installing raised medians in place of TWLTLs provides space for landscaping and public art, as well as for pedestrian refuge to increase safety. These beautification features, as well as buffering parking lots, consolidating driveways, and limiting curb cuts, can attract economic development or raise the caliber of new investments (TRB, 2003).

The street and driveway patterns associated with different types of land use are difficult to change. Additionally, once a community is built, its underlying street network will persist for many decades, with arterial streets and their intersections almost permanently fixed. Specific site access is more easily changed through land redevelopment processes, which is in turn based on market trends and opportunities. The creation of commercial activity centers allows businesses to cluster in areas around major intersections while limiting the number of access points along the roadway. Prospects for redevelopment also depend on the strength of the local economy. Access management strategies provide an opportunity to reshape the pattern of roadway access on a community-wide, or even a regional, scale (Demosthenes, 2003).

Access Management and the Environment

Implementation of access management strategies can help the environment in several ways. Improved signal spacing and progression can decrease acceleration and deceleration as well as reduce idling time, which are the primary contributors of mobile source air pollution. Also, protecting roadway capacity on major roadways can reduce the need to build bypasses or other major roadways. Avoiding the construction of these roads reduces construction pollution and can preserve fragile ecosystems that might be disturbed by a new facility.

Summary

Access management has grown in acceptance among transportation agencies since the mid-1980s. Recognition of the increases in safety to the traveling public, as well as the need to spend funds to improve roadways now in order to save on future costs of roadway improvements have helped spur interest in access management programs.

Local governments with land regulation authority have several strategies available to provide for access management. Ordinances like those proposed for communities along the US 70 corridor can be adopted to address access design elements, internal circulation requirements, amount and spacing of property access, and traffic signal plans. Capital improvements could include raised medians, completing missing links in a street network to improve circulation, and reconstructing private driveways (Demosthenes, 2003).

Providing more uniform highway characteristics through the incorporation of access management strategies, especially when incorporated into local street plans and site development plans, could not only improve the safety of the roadway by eliminating the unpredictability of numerous access points and traffic patterns, but also could increase the region's economic possibilities through more efficient movements of people and goods.

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Introduction

Once access problems have been created, they can be difficult to solve. Reconstructing an arterial roadway is costly and disruptive to the public, as well as to abutting homes and businesses. The shallow property depth, multiple owners, and right-of-way limitations common to older corridors generally preclude effective redesign of access and on-site circulation. In some cases, a new arterial or bypass must be built to replace the obsolete roadway, and the process of addressing access begins again in a new location. Access management programs can help stop this cycle, thereby protecting both the public and private investment in major roadway corridors from becoming out-of-date.

To be effective, access management must be well-planned and supported through appropriate regulations. Communities can encourage access management by creating regulations in support of good land development, or through the development of comprehensive, subarea, corridor, or access management plans. By establishing sound policies to encourage good planning and discourage ineffective development, communities are able to create a framework for quality access that can be supported in a legal setting (Sweger 2003).

The overall goal of access management is to reduce traffic conflicts by:

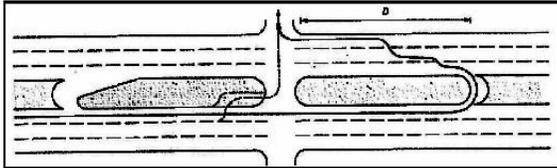
- Limiting the number of conflict points that a vehicle may experience along its travel route
- Separating conflict points as much as possible (if they cannot be completely eliminated)
- Removing slower turning vehicles that require access to adjacent sites from the through-traffic lanes as efficiently as possible

These three basic means of eliminating or separating conflicts can be achieved in many ways. Good land use planning, sensible regulation, and reasonable site planning guidelines can all help reduce congestion and conflict. These techniques are discussed below.

Common Access Management Treatments

With an understanding of current corridor conditions, a “tool box” of suitable access management solutions was created to address the unique characteristics of US 70 through eastern North Carolina. Generally, these solutions provide greater consistency to travel along the corridor by consolidating median openings and/or removing left turns at major intersections in favor of u-turns facilitated upstream or downstream from the intersection.

Median U-Turns and Directional Crossovers



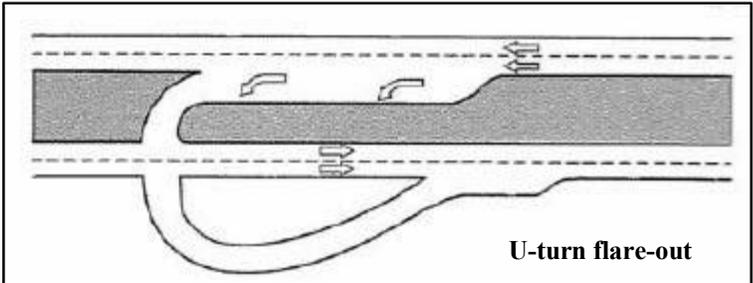
Example of u-turn treatment

Median divided roadways can offer many different benefits to motorists. Studies have shown that median divided roads can improve traffic flow, reduce congestion, and lower crash rates. Median u-turn treatments, as well as directional crossovers, are often used to control turning movements along roadways with

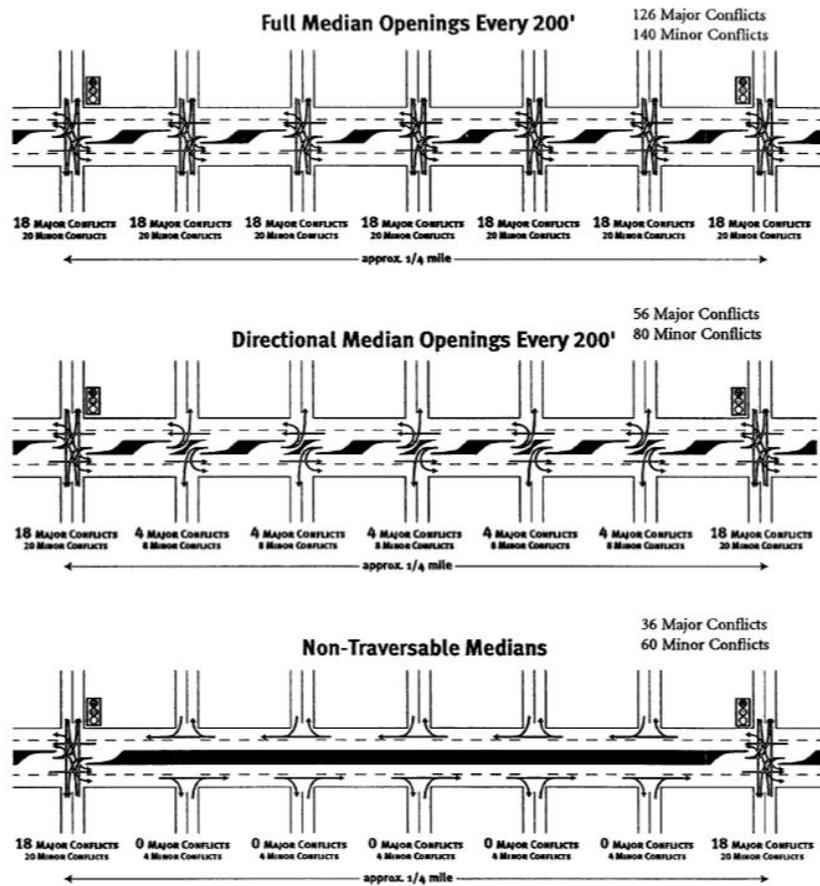
Existing Directional Median Crossover



medians. Typically, crossovers allow for indirect left turns at major intersections and u-turns between full median openings. They reduce delay for through-traffic and remove directional left turns and u-turns from the intersection. They should be used only where sufficient space is available for u-turn maneuvers within the median, however, and be designed sufficiently to accommodate the turning radius of the intended design vehicle. In order to successfully accomplish a u-turn at a particular location, wide medians, median bulb-outs, or flare-outs can be implemented.



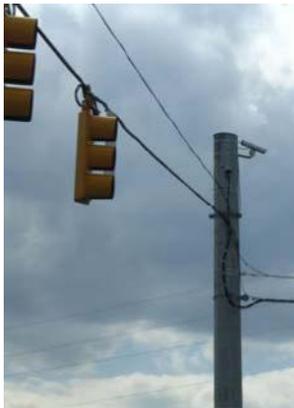
This median u-turn treatment also greatly reduces the number of conflict points for vehicles at an intersection, and is attributed with significantly decreasing the frequency of crashes when compared with intersections that allow for left turns and u-turns. A study published by the Institute of Transportation Engineers (ITE) and the University of Florida, Gainesville, reported that “the results of the before and after study conclude that the implementation of the u-turn concept for roadway access control and safety improvement can reduce the frequency of accidents by 22% which should produce a worthwhile project to enhance roadway safety” (ITE Compendium of Technical Papers, pg 49).



Source: NCHRP

Conflicts at Median Openings

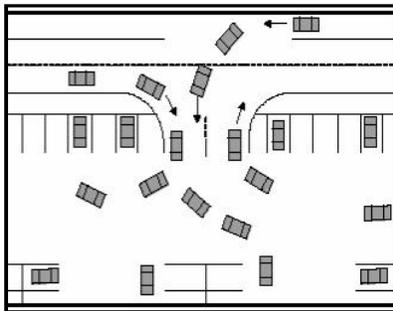
Disadvantages for implementing median u-turn treatments include increased delay, travel distance, and stops for left-turning vehicles, as well as driver confusion immediately after implementation of this access management treatment. Installing median u-turns at multiple locations along a corridor



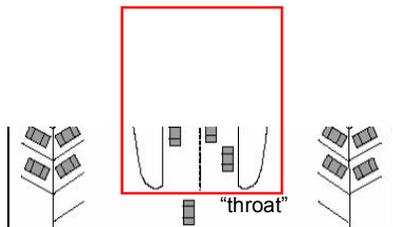
could help alleviate driver confusion. Replacing the numerous openings and intersections along the US 70 corridor would help standardize the corridor from its current “unpredictable nature.”

Traffic Signal Coordination

The distances between most of the traffic signals along the 134-mile section of the US 70 corridor under study are sufficient enough that they operate independently. Coordination of traffic signals in the more urbanized areas of the corridor, however, could improve both travel times and safety. Coordination typically involves synchronizing traffic signals on a corridor to minimize through traffic delay.



Before

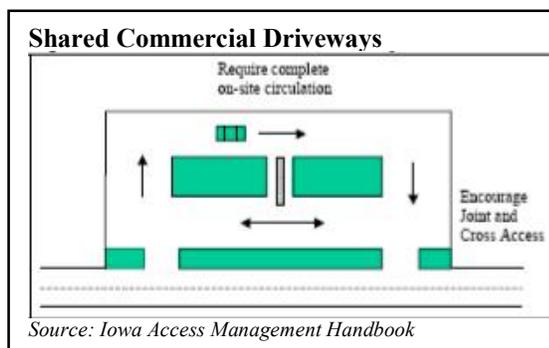


After

On-Site Traffic Circulation

One technique to reduce the number of vehicle conflicts is to promote on-site traffic circulation and shared use driveways through local government ordinances related to development application approval. Pushing back the “throat” of a driveway — as illustrated in the image to the left — helps to avoid traffic spillback onto the highway. Shared use driveways or joint access improve both the safety and efficiency of the roadway. This is accomplished by concentrating vehicles that are slowing down into particular areas while providing right-turn deceleration lanes to facilitate access to abutting properties.

Shared use driveways also limit the number of access points into developments along the corridor. Developments with multiple lots and land uses are considered to be one property for the purposes of access regulation. Only the minimum number of connections necessary to provide reasonable access should be permitted.



Source: Iowa Access Management Handbook



Interchange Retrofitting

For several specific segments of US 70 where difficulties with environmental permitting and right-of-way acquisition for interchange or bypass construction may exist, grade-separated interchanges may provide a viable solution. In certain locations, however, intersection volumes limit the number of feasible solutions that can both increase safety and maintain current levels-of-service. At such locations, grade-separated interchanges may be one of the more feasible alternatives to achieving both of these goals. Although interchanges represent a major construction cost and may require additional right-of-way, in rural locations the land may be available to construct the ramps necessary to provide for traffic flow through the interchange and between facilities.

Access managed facilities in more urban locations are frequently fronted by adjacent businesses, especially at intersection corners where ramps would be located. As a result, innovative practices are required to balance public transportation needs and private business and development interests.

Land Use Guidelines

Land Use and Mobility

The state must both plan and invest in its transportation system. An access management program is one approach designed to improve the traffic flow and safety of a roadway while protecting investments in mobility. Access management can effectively address how properties access a thoroughfare and mitigate congestion, as well as other operational issues triggered by roadside development. Regulating the development abutting corridors within the transportation system is primarily the local government's responsibility. Rarely is a combined approach taken to protect the state's transportation investment in mobility with land use controls supportive of that objective.

An access management program is most effective when it is combined with comprehensive planning and land development regulations that control the quality of roadside development.

Land use policies and regulations need to be designed to support the access management program by distributing the local traffic more evenly throughout the roadway network while also controlling those developments' impact on mobility.



US 70 is characterized by multiple and varied development patterns. The shape of the corridor has evolved for many decades. Each section reflects the history of development along the corridor, ranging from rural and agricultural to urban. The types of development in place affect the corridor differently and require different land use approaches to support access management. The following provides policy guidelines to support the efforts to improve mobility and safety on US 70.

Land Use Impacts

Development along US 70 has had an impact on the corridor's level of mobility and the overall transportation priority of the corridor. Although the development pattern is varied, common issues related to development and accessibility are contributing to mobility and safety on US 70. Common issues that impact the corridor most significantly are listed here.

A. Separation of Uses

Typically, properties along a highway are developed incrementally. Each property is "isolated or separated" from the adjacent development. This forces all trips between the developments onto the corridor, thereby impacting mobility through increases in traffic volumes. In addition, this development pattern results in multiple access points or driveways that increase turning movements and their associated conflicts. All of these impacts combined contribute to congestion on the roadway.

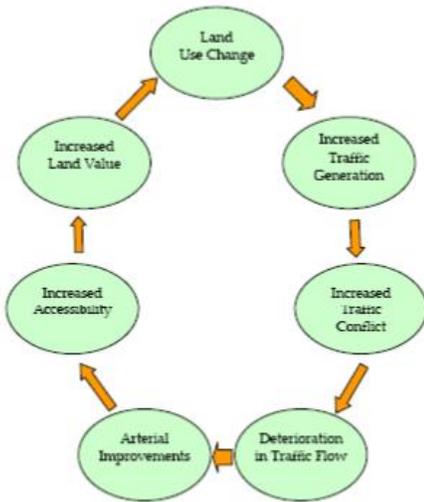


B. Single Access Points

Many larger developments often provide only a single access point, generally with the major thoroughfare. For large residential and commercial developments with higher trip generation, the added traffic to the

thoroughfare compromises mobility and increases congestion levels along the corridor.

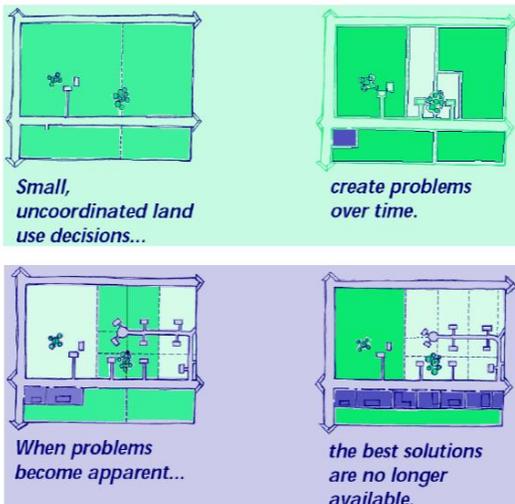
This pattern is often exacerbated by the lack of parallel roads or local streets within the network hierarchy. The absence of a local and collector street network close to an arterial increases the number of trips that are forced onto the arterial with no other route options. Additionally, the lack of local streets is often the reason for no additional access points.



Source: Access Management Guidelines, Nashua Regional Planning Commission

C. Greenfield Development

In terms of land use and transportation, the discussion can be best described as the “chicken and egg” debate. Transportation improvements can create or attract opportunities for development, but development can also create the need for transportation improvements. The best approach in either case is for a community to prepare a comprehensive plan for development focusing the majority of development within core areas and establishing stronger requirements for areas outside of the core areas to avoid greater impacts from these new, or “greenfield” developments.



These three issues have a significant effect on mobility, traffic congestion, and safety. Collectively, the issues support the idea that the strategy for US 70 and similar corridors must be comprehensive and that there is no single, ultimate solution. The issues also suggest that the impacts of development in one community will affect the corridor in both directions along the corridor and can be positively addressed through land use regulations. Coordination of all local governments to improve their growth management and land use planning practices, together with transportation planning, will provide the greatest positive impact to the corridor. Policy guidelines aimed at each of the issues discussed are included below.

Minnesota Department of Transportation (January 15, 1999)
Highway Access Management Policy Study, St. Paul, MN

Policy Guidelines

Access management is a function of the land use controls as well as the design of the transportation corridor. To address the common issues discussed and to minimize the impacts of development on US 70, appropriate land use regulations should be adopted for the entire corridor. Regulation prioritization and application may vary depending on the particular challenges in each community. To the extent possible, these regulations should be applied the entire length, but may vary based upon the context of the corridor. Long-range planning considerations should also be a function of the land use controls to preserve right-of-way, minimize future issues associated with land use, and capitalize on opportunities during redevelopment.



The following land use guidelines are intended to support the access management program through land use regulations. The proposed land use strategies help achieve a more effective land use and transportation connection.

A. Minimize Local Trips on US 70, Increase Connectivity Developments

Street connectivity refers to the directness of routes and the density of connections (i.e., intersections) within a transportation system. As connectivity increases, travel distances decrease and route options increase. This allows the transportation system to be used more efficiently by pedestrians, bicyclists, transit, and automobiles. When the local street network is not sufficient, a highway often becomes the preferred travel route. Unfortunately, this reduces regional mobility for through traffic. This is especially a concern for communities where the transportation system is overwhelmingly oriented toward US 70.



The mix of uses, relationship of adjacent properties, and access is a greater determination of the affect on US 70 than the type of use. Land development regulations that require connections to the local street network and connections to adjacent properties will reduce the number of local trips on the corridor. The reduction of local trips can have significant impacts on congestion and mobility within the corridor.

This strategy also may require the local government to create or maintain a local street network. Maintaining a local street network can be achieved through block length regulations and by placing limits on a closed street system (i.e., cul-de-sacs and dead ends). Long-range planning also can be used to identify future street connections.

B. Manage Access and Reduce Congestion Levels Through Development Design

A highly-connected transportation system includes several options for entering or leaving a new development. Whenever possible, these options are located on secondary roads rather than arterials. Street systems without access to other roads should be limited, just as cul-de-sacs would be restricted to areas where topography, environment, or existing development make other street connections prohibitive. Stub-outs should be encouraged to accommodate future street extensions and connections with neighboring parcels.

Communities can promote even greater street network efficiency through cross-access agreements, which limit the number of driveways and allow multiple parcels to have roadway access across a single property. Communities also should consider the safety benefits of limiting access to local roads on corner lots at the intersection of arterials and local roads.

Communities also should encourage developments to include regulations for minimum street spacing guidelines. From a land use perspective, the number, location, and spacing of driveways along the street network significantly impacts vehicular movements and levels of congestion. Minimum spacing and maximum driveways per development should be regulated. By adopting minimum lot frontage requirements along identified transportation corridors, communities will be able to prevent small frontage lots from being established along the corridor — thereby promoting better access management. Along highways, regulations should encourage building a backage road that can be integrated into the local street system when small frontage lots are unavoidable. This is particularly relevant along US 70, where communities should

advocate for connecting minimum lot frontage requirements to minimum driveway spacing standards.

Other techniques can be utilized to manage the design of access points to reduce impacts on mobility. These include adequate site distance policies, minimum turning radii, minimum driveway widths, and maximum driveway slopes.

Connectivity should not be limited to automobiles. Encouraging a network of connected pedestrian and bicycle facilities can offer better local connections, especially when that network provides access to a variety of land uses, roadways, and developments.

C. Manage the Rate and Direction of Growth Community-Wide

New development should be concentrated in areas of the community that are already developed. Types of development can be clustered in order to limit the impacts on mobility within a particular area of the corridor. In addition, regulating the pace of growth to make sure the development's impacts do not outpace the corridor's ability to handle the level of traffic will ensure that mobility is maintained along the corridor until improvements can be implemented. The following actions support this strategy:

- Restrict the extension of utilities and other related infrastructure
- Conduct planning studies to guide development to certain areas
- Adopt an adequate public facilities ordinance
- Alter local zoning ordinances
- Develop an access management ordinance
- Approve rules and regulations for the subdivision and site plan review process to include application of access management solutions

One recommended option to manage growth would be for communities to require a traffic impact study, prepared by a professional engineer, to accompany all development applications that could generate more than 100 peak hour trips or 1,000 average daily trips, or any

other development deemed necessary by the community's planning director for review. This could facilitate the process of recommending appropriate access management improvements.

Land Use Tools

In order to best create change in an area's land use practices, a number of plans and regulations can be considered for implementation. One such plan designed to serve as a guide for future development and capital improvements is the local comprehensive plan. This plan considered trends and planning issues, and then identifies policies and strategies for implementing the recommendations. The framework set forth in the comprehensive plan can then be enhanced through subarea or thoroughfare plans. As explained in the *Model Land Development and Subdivision Regulations that Support Access Management*, these plans generally present policies that:

- Promote orderly and efficient development
- Protect property values
- Preserve community character, natural resources, and the environment
- Promote economic development
- Increase public awareness of the forces of community change

Subdivision regulations are another way to shape development patterns. Again, the *Model Land Development and Subdivision Regulations that Support Access Management* document explains that these regulations help ensure:

- Proper street layout in relation to existing or planned roadways
- Adequate space for emergency access and utilities
- Adequate water, drainage, and sanitary sewer facilities
- Appropriate site design

In order to enforce these regulations, a set of subdivision ordinances should be adopted. These ordinances assist with the enforcement and review of proper subdividing and platting.

According to the *Model Land Development and Subdivision Regulations that Support Access Management* document, a subdivision ordinance establishes:

- Administrative review and evaluation procedure for processing conceptual, preliminary, and final plats
- Information that must be included on the plat
- Design principles and standards for lots, blocks, streets, public places, pedestrian ways, and utilities
- Required improvements, including streets, sidewalks, water, sewer, and curbs and gutters
- Financing and maintenance responsibilities

Finally, overlay zones are another strategy for managing access along commercial corridors. Corridor overlay zones maintain the integrity of the existing zoning districts, while placing special requirements on specific areas. These corridors can be designated after standards for their use are specified in the area's land development or zoning codes. Overlay districts can be tailored to meet the needs of a specific area. Examples of these issues can include driveway control, driveway and parking lot joint and cross access, and reverse frontage.

Multi-Agency Coordination

As mentioned in other sections, one of the key issues for addressing the need for balance between land use and transportation priorities within the community is how various authorities at different levels of government work together. NCDOT and the local governments have vested interests and responsibilities where transportation and land use interconnectivity along the US 70 corridor is concerned.

Land use is the responsibility of the local governments rather than the state. As a result, NCDOT is limited to providing policy information and training to local governments. However, the state also can provide incentives and funding to local communities that make efforts to practice access management-supported land use planning. For instance, NCDOT might direct state and federal transportation funding to cities and regions that preserve land around key interchanges, facilitate the development of land use plans that foster long-term mobility, or demonstrate improvements in vehicle miles traveled per capita.

Relationship to

The foundation of principles in this toolkit is based on the previously conducted *US 70 Access Management Study*. The *US 70 Access Management Study* provided site-specific access management solutions. In this handbook, available access management measures and minimum standards consistent with the previous planning process are provided to set reasonable expectations for protecting the integrity of the transportation corridor. It is these expectations that influence the provisions set forth in the US 70 Model Access Management Overlay Ordinance (see Chapter 4).

The *US 70 Access Management Study* and the *US 70 Access Management Handbook* should be used together in one comprehensive approach for addressing access management needs along the US 70 corridor.

References

Gluck, J., H. Levinson, and V. Stover. (1999). *Impacts of access management techniques*. National Cooperative Highway Research Program Report 420. Transportation Research Board. National Academy Press; Washington, D.C.

Maze, Tom. (2000). *Iowa Access Management Handbook*. Accessed February 14, 2007 from <http://www.ctre.iastate.edu/research/access/amhandbook/index.htm>.

Model Land Development and Subdivision Regulations that Support Access Management. Accessed March 2, 2007 from http://www.cutr.usf.edu/research/access_m/pdf/Land_Regs.pdf.

Sweger, Brent. (2003). Kentucky Model Access Management Ordinance. Accessed March 2, 2007 from http://www.planning.kytc.ky.gov/traffic/access_files/KY%20Model%20Local%20AM%20Ordinance.pdf.

Chapter 4 – Model Ordinance

The model access management overlay ordinance developed for US 70 provides a legal framework for cities and counties to administer and enforce consistent access management standards along the entire 134-mile corridor. It is intended to improve regional mobility and economic vitality along US 70 and reserve the opportunity to build a freeway in the long-term horizon. Provisions in the model ordinance meet or exceed the minimum rules and requirements set forth in the North Carolina Department of Transportation's *Policy on Street and Driveway Access to North Carolina Highways*.

It is the intent of the US 70 Corridor Commission that all cities and counties along the corridor, as well as the North Carolina DOT, formally adopt the model ordinance for US 70.

The model overlay ordinance is designed to complement existing local zoning and subdivision regulations. The overlay zone does not change any of the rules and requirements associated with the underlying zoning district. Although it is intended solely for use along US 70, it could be modified by the local government in the future to apply to other corridors within the planning jurisdiction.

The model ordinance was developed from a survey of actual access management overlay ordinances enacted by cities and counties throughout the country. It contains rules and requirements for the 'core' components of a comprehensive access management strategy, including established districts along the corridor that vary appropriate access management standards to surrounding land use and development patterns; minimum spacing standards for traffic signals, median openings, and driveways; provisions for corner clearance, joint access, and connectivity; and design requirements for building access connections to US 70. Cities and counties are welcome to adopt more restrictive access management standards for fulfilling their own local vision established for the corridor.

Text in parentheses is intended to be replaced with appropriate local terminology, such as the name of the jurisdiction, date of adoption, or city or county official responsible for administering and enforcing the ordinance. Provisions in the model ordinance should be reviewed by the local city or county attorney prior to initiating any adoption process.



Section 1: Title

Section 2: Purpose and Intent

Section 3: Findings

Section 4: Jurisdiction

Section 5: Administration

Section 6: Definitions

Section 7: US 70 Access Management Overlay Zone Districts Established and Assigned

Section 8: District Standards for Access Connections

Section 9: Corner Clearance

Section 10: Joint and Cross Access

Section 11: Median Openings

Section 12: Design Guidelines for Access Connections

Section 13: Connectivity

Section 14: Requirements for Out-Parcels and Phase Development Plans

Section 15: Minimum On-Site Vehicle Storage Area

Section 16: Interchange Areas

Section 17: Traffic Impact Study

Section 18: Variance Standards

Section 19: Nonconforming Access

Section 20: Effective Date

Section 1: Title

This ordinance shall be known as the “US 70 Access Management Overlay Ordinance for **(city/county)**”, referred to herein as “this ordinance”.

Section 2: Purpose and Intent

As a member of the US 70 Corridor Commission, the **(city/county)** recognizes that short-term improvements will improve regional mobility and economic vitality along the US 70 corridor and reserve the opportunity to build a freeway in the long-term planning horizon. Regulation of access connections from land abutting US 70 will promote public safety, maintain the long-term mobility function of the corridor for the traveling public, and maintain the engineering integrity of the highway.

The intent of this ordinance is to permit reasonably convenient and suitable access to land abutting US 70 while preserving the regional flow of traffic in terms of safety, capacity, and speed. Appropriate access management along US 70 will protect a substantial public investment in the existing corridor and reduce the need for expensive remedial measures. These regulations further the orderly and predictable distribution of land uses regulated in the **(city’s/county’s)** zoning and subdivision ordinances, and serve to protect community character and natural resources within a well-design transportation corridor.

Section 3: Findings

The **(city/county)** hereby finds and declares that:

(A) US 70, between Raleigh and Morehead City, is identified by the North Carolina Board of Transportation (NCBOT) as Corridor 46 in the Strategic Highway Corridor System – a key component of the “core” intrastate highway system. Improvements to US 70 should enhance the mobility function of the strategic highway, and provide opportunities for state and local governments to join together in protecting the long-term vision of the corridor as a new freeway.

(B) The **(city/county)** recognizes that landowners have certain rights of access to US 70 consistent with their needs. However, access connections are a major contributor to traffic congestion and poor operations along the corridor. Indiscriminate roadside and unregulated access connections result in decreased highway capacity, driver and pedestrian confusion, and increased safety hazards. A significant amount of road interference along US 70 can be attributed directly the frequency of vehicles entering or exiting the highway from adjacent development.

(C) The **(city/county)** is an active member of the US 70 Corridor Commission along with other local political jurisdictions from Wayne, Lenoir, Jones, Craven and Carteret Counties that believe consensus among state and local political jurisdictions demonstrates a unified vision for the corridor – “One Vision, One Voice”.

(D) The US 70 Corridor Commission endorsed the *US 70 Access Management Study* developed by Kimley-Horn and Associates, Inc. for the North Carolina Department of Transportation on October 6, 2005, which was also endorsed by the **(city/county)**, as modified, through resolution on **(date of approval)**.

(E) The **(city/county)** entered into a Memorandum of Understanding (MOU), adopted through resolution on **(date of approval)**, to join other state and local political jurisdictions along US 70 in implementing regulatory tools and policy measures that would improve regional mobility along the corridor and reserve the opportunity to build a new freeway in the long-term planning horizon.

(F) Ultimately, the North Carolina Department of Transportation is responsible for regulating the location, design, construction, and maintenance of street and driveway connections to US 70 pursuant to G.S. 136-18(29); however, the **(city/county)** is responsible for regulating land use and development patterns within the corridor. Both the State and the **(city/county)** have a vested interest in working together to address transportation and land use issues that protect the integrity of the strategic corridor.

(G) The *Policy on Street and Driveway Access to North Carolina Highways* published by the North Carolina Department of Transportation (NCDOT) establishes minimum criteria for granting access connections to US 70; however, a provision in the policy manual defers evaluation of a *Street and Driveway Access Permit* to criteria established by the local government when they are deemed more restrictive than NCDOT requirements. The provisions of this ordinance meet or exceed minimum requirements established in the *Policy on Street and Driveway Access to North Carolina Highways*, and should be used by the NCDOT for evaluating access connection permits along US 70.

(H) Approval of a development application by the **(city/county)** does not confer any obligation on the North Carolina Department of Transportation to allow the same number, location, or design of any of the access or traffic control measures illustrated on the approved development plan without first securing a *Street and Driveway Access Permit* from the NCDOT for the exact same improvements.

Section 4: Jurisdiction

This ordinance establishes an Access Management Overlay Zone for US 70 within **(city/county)**, including all properties that directly abut the highway. The requirements of this ordinance apply solely within the Overlay Zone and supplement the requirements of the **(city/county)** zoning, subdivision, and other regulations that govern the use and development of property within **(city/county)**. Therefore, all standards and requirements of this ordinance are in addition to the requirements of the **(city/county)** zoning and subdivision ordinances.

(A) Any parcel of land located within of the Overlay Zone is subject to all requirements of the underlying zoning district.

(B) If there is a conflict between any provision of this ordinance and any provision of the **(city/county)** zoning, subdivision, or other regulations, the more restrictive provision shall apply.

Section 5: Administration

(A) The **(city/county)** Engineer or his designee shall administer and enforce the provisions of this ordinance in cooperation with the North Carolina Department of Transportation and the US 70 Corridor Commission.

(B) Approval of a *Street and Driveway Access Permit* from the North Carolina Department of Transportation is required within the US 70 Access Management Overlay Zone prior to any one of the following events:

(1) The approval of any land subdivision, conditional use permit, interim use permit, site plan, or zoning-related permit for any property located within the Access Management Overlay Zone for US 70.

(2) The construction of any new public or private access to US 70 or to a public street that intersects directly with US 70.

(3) The reconstruction or relocation of any existing public or private access to US 70 or to a public street that intersects directly with US 70.

(4) A substantial enlargement or improvement occurs at an existing development, defined as an increase in gross floor area (GFA) of a primary or accessory structure by 25% or 500 square feet, whichever is greater, or an increase in parking stalls by 25% or 5 stalls, whichever is greater.

(5) A change in land use(s) occurs at an existing development that may change the amount or distribution of traffic using any existing access to US 70.

(C) Application Requirements

(1) An application for a site specific *Street and Driveway Access Permit* shall be submitted to the North Carolina Department of Transportation in accordance with minimum rules and procedures set forth in the *Policy on Street and Driveway Access to North Carolina Highways*.

(2) A request for a new median opening shall be submitted to the North Carolina Department of Transportation in accordance with the minimum rules and procedures set forth in the *Median Crossover Guidelines for North Carolina Streets and Highways*. It is the sole responsibility of the property owner to provide the justification necessary for a new median opening.

(3) The District Engineer for the North Carolina Department of Transportation will notify and consult with the **(city/county)** Engineer and the US 70 Corridor Commission regarding access locations and/or new median openings requested as part of a development application.

Section 6: Definitions

For the purpose of this ordinance, certain phrases, terms, and words are defined in this section. Where terms are not defined, the definitions used in the **(city/county)** zoning or subdivision ordinance or in the *Policy on Street and Driveway Access to North Carolina Highways* or *Median Crossover Guidelines for North Carolina Streets and Highways* published by the North Carolina Department of Transportation shall apply.

Access: Ingress and egress to land fronting on the State Highway System (US 70).

Auxiliary Lane: The portion of the roadway adjoining the traveled way for speed change, turning, storage for turning, weaving, truck climbing, or for other purposes.

Change of Land Use: Any proposed property use that is different from the current use of the property, or current use that is different than the use identified in a pre-existing driveway permit.

Connectivity: A term used to infer connections between adjoining properties for vehicular and/or pedestrian usage.

Corner Clearance: At an intersection of two streets, the distance measured from the edge of pavement curb line or the intersection of the right-of-way lines to the beginning of outside driveway radius.

Cross Access: A service drive providing vehicular access between two or more continuous properties so that the driver need not enter the public street system to travel between adjacent uses.

Directional Median Opening: A directional median opening provides for left-turns in one direction only. These medians are preferred because they provide for the predominant movement and are much safer for the traveling public. Typically, directional median openings only provide for left turns from the major street to the side street. No left turns or straight across movements are allowed from the side street.

Driveway: An entrance used by vehicular traffic to access property abutting a street. As used in this ordinance, the term includes private residential, non-residential, and mixed-use driveways.

Driveway Angle: The angle between the driveway centerline and the edge of the travel way.

Driveway Throat: The portion of a driveway between the public road and the internal circulation system or area where parking maneuvers occur.

Frontage: The length along the street right-of-way line of a single property tract or roadside development area between the edges of the property lines. Property at a street intersection (i.e., corner lot) has a separate frontage along each street.

Full Median Opening: A full median opening provides for all movements at the intersection or driveway. The use of full median openings is reserved for situations where there is sufficient spacing and other crossover designs cannot adequately meet the operational needs of the location.

Functional Area (Intersection): That area beyond the physical intersection of two streets that comprises reaction time and deceleration distance, plus any required vehicle storage length, and is protected through corner clearance standards and driveway connection spacing standards. The following reaction time and deceleration distances should be added to the vehicle storage length to quantify the function area of the intersection.

| Reaction Time and Deceleration Distances | | | | |
|--|----------------------|--------------------|----------|----------|
| Area Type | Reaction Time (sec.) | Posted Speed Limit | | |
| | | 35 MPH | 45 MPH | 55 MPH |
| Rural | 2.5 | 130 feet | 165 feet | 200 feet |
| Urban | 1.5 | 75 feet | 100 feet | 120 feet |

Source: NCDOT Policy on Street and Driveway Access to North Carolina Highways

Joint Access (or Shared Access) Driveway: A single driveway serving two or more lots. A joint access driveway may cross a lot line or be on a lot line, and the owners may have an easement for the shared use function of the driveway.

Major Traffic Generator: A land use or development program estimated to generate more than 1,000 gross vehicle trips (entering/exiting combined). See North Carolina Administrative Code 19A NCAC 02B.0602(b)(3)(c).

Service Road (aka Frontage / Backage Road): A public or private street, auxiliary to and normally located parallel to a controlled access facility that maintains local street continuity and provides access to parcels adjacent to the controlled access facility.

Sight Distance: This is the area that establishes a clear line of sight for a waiting vehicle to see on-coming traffic and make turning movements into or out of a street or driveway connection safely or for traffic to see entering or waiting vehicles.

Storage Length: Additional lane footage added to a turning lane to hold the maximum number of vehicles likely during a peak period so as not to interfere with through travel lanes.

Traffic Impact Study: A report initiated in response to a proposed development that compares the anticipated roadway conditions with and without the development. The report may include an analysis of mitigation measures.

Section 7: US 70 Access Management Overlay Zone Districts Established and Assigned

Three separate Access Management Overlay Zone Districts are established within the Overlay Zone to recognize variations in existing and future land uses and/or development patterns characteristic of the surrounding area. Exhibit A illustrates the extents of the Overlay Zone Districts assigned along the US 70 corridor.

(A) Urban Core Access Management District

The Urban Core District extends through the fully developed center of **(city)** where the road network is characterized by short blocks and a grid system of intersecting streets spaced no more than 600 feet apart. Individual lots are typically small and buildings may be located close to US 70. Sidewalks, pedestrian traffic, and on-street parking are common. US 70 is planned to operate at lower speeds in this District, typically less than 25 miles per hour (mph), as compared to travel speeds intended for the overall corridor.

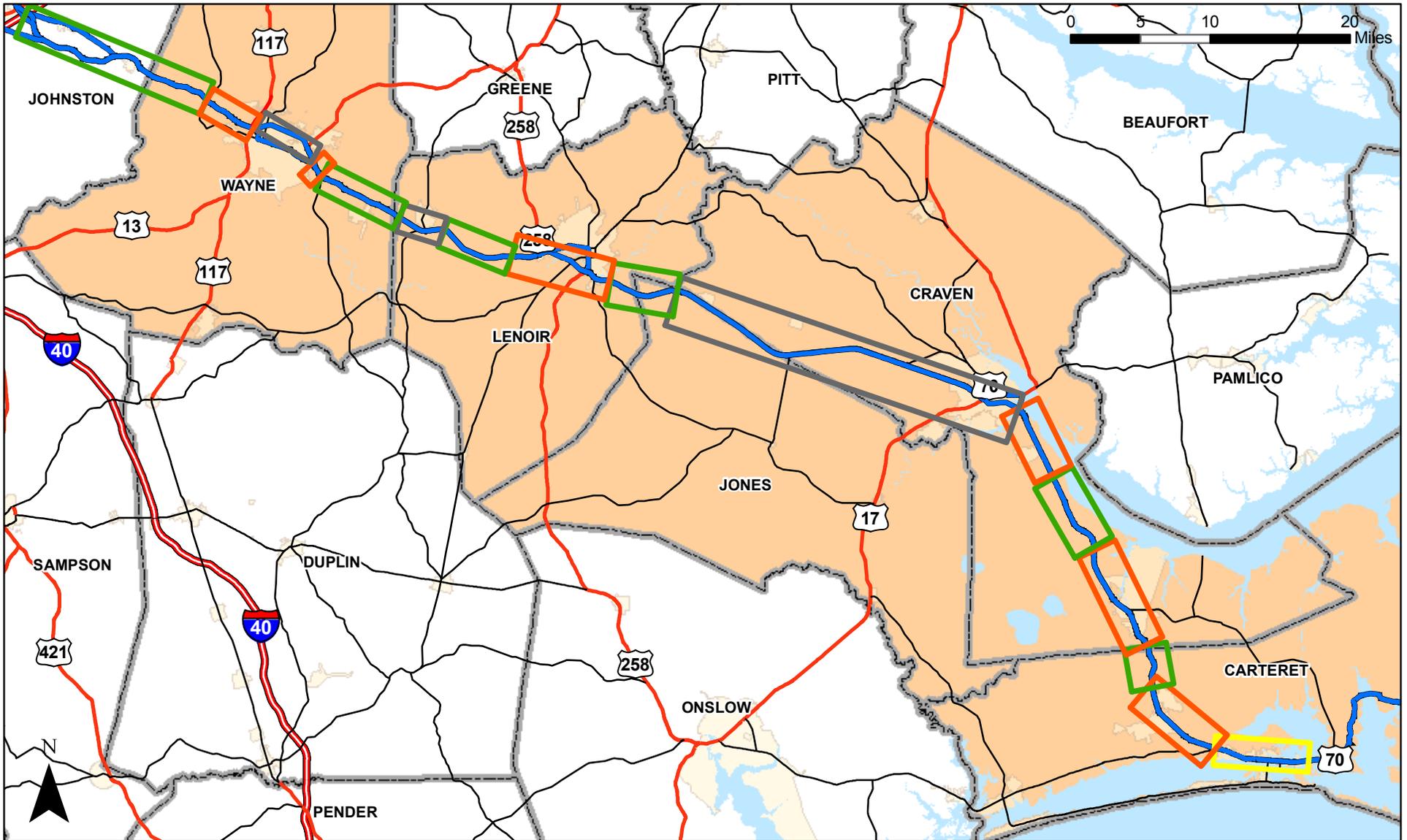
(B) Suburban Access Management District

The Suburban District is established to guide the location and design of access in areas beyond the Urban Core District that are generally urbanized, or planned for future urbanization, with adequate public facilities and services. Land uses in the Suburban District are generally isolated, and the physical distance between complementary uses tends to promote automobile travel. US 70 is planned to operate at somewhat lower speeds in this District, typically between 25 – 45 miles per hour (mph), as compared to travel speeds intended for the overall corridor.

(C) Rural Access Management District

The Rural District is established to guide the location and design of access in areas beyond the urbanized area of cities and counties, characterized by long-term vacant parcels with limited residential and non-residential development, as provided for in the local Comprehensive Plan. US 70 is planned to operate at higher speeds in this District, typically greater than 45 miles per hour (mph).

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Legend

- | | | |
|-------------|--------------------------|-------------------------------|
| US 70 | NC Counties | Overlay Zone Districts |
| Interstate | US 70 Commission Members | Urban Core District |
| US Highway | Municipalities | Suburban District |
| State Route | Bodies of Water | Rural District |
| | | Controlled Access Segment |

Last Revised: March 8, 2007

Exhibit A: Access Management Overlay Ordinance

Overlay Zone Districts

Note: The extents of the overlay zone district are preliminary and based solely on posted speed limit pursuant to Section 7 of the Model Access Management Overlay Ordinance.

Section 8: District Standards for Access Connections

(A) All connections to US 70 shall meet or exceed the minimum connection spacing requirements specified below.

| Minimum Median Opening, Driveway, and Signal Spacing | | | | | | |
|--|--------------------|----------------|---------------------|----------------------------|---------------------------|----------------------------------|
| District | Posted Speed Limit | Signal Spacing | Full Median Opening | Directional Median Opening | Adjacent Driveway Spacing | Opposite Street Driveway Spacing |
| Rural | ≥ 45 MPH | 2,000 feet | 2,000 feet | 1,000 feet | 500 feet | 500 feet |
| Suburban | 26-44 MPH | 1,200 feet | 1,200 feet | 600 feet | 100 feet | 100 feet |
| Urban Core | ≤ 25 MPH | 600 feet | 600 feet | 300 feet | 100 feet | 100 feet |

Note: No median opening shall be placed where it would interfere with the storage length requirements for existing intersections.

(B) Spacing between driveways or medians shall be measured along the right-of-way line between the tangent projection of the inside edges of adjacent driveways, opposite street driveways or median openings, as applicable (See Figure X).

(C) The **(city/county)** Engineer may reduce the connection spacing requirements set forth herein for situations where they prove impractical, but in no case shall the permitted spacing be less than 85% of the applicable standard, except as provided for in this ordinance (see below and Section 18).

(D) For sites with insufficient road frontage to meet minimum spacing requirements, consideration shall first be given to providing access via connection to a side street, utilization of a joint or shared driveway with an adjacent property that meets the recommended spacing requirement, or development of a service road to serve multiple properties.

(E) The **(city/county)** Engineer, in coordination with the North Carolina Department of Transportation, may grant access approval for a permanent use not meeting the spacing requirements of this ordinance on an interim basis if an access plan is submitted that demonstrates how spacing requirements will ultimately be met and appropriate assurances in the form of a recordable and enforceable easement or access agreement will be provided insuring future provision of a conforming access.

(F) Deviation from these spacing standards may be permitted at the discretion of the **(city/county)** Engineer in cooperation with the North Carolina Department of Transportation where the effect would be to enhance the safety and operation of the roadway. Examples might include a pair of one-way driveways in lieu of a two-way driveway, or alignment of median openings with existing access connections. Approval of a deviation from the minimum spacing standards in this ordinance may require the applicant to submit a study prepared by a registered engineer in the State of North Carolina that evaluates whether the proposed change would exceed roadway safety or operational benefits of the prescribed standard.

(G) Existing road and driveway connections for any single parcel along US 70 shall be modified to conform with the minimum connection spacing requirements set forth in this ordinance when safety, capacity, or operational improvements are made within the public right-of-way.

(H) All road and driveway connections to a single parcel must be brought into compliance with the minimum connection spacing requirements set forth in this ordinance when the land use(s) on the single parcel is (are) modified or expanded.

(I) Notwithstanding the foregoing, the North Carolina Department of Transportation may prohibit, restrict, or modify the placement of any connection, at any time, to a single property in the interest of public safety and mobility.

Section 9: Corner Clearance

(A) Corner clearance for connections to US 70 shall meet or exceed the minimum connection spacing requirements set forth in Section 8.

(B) New connections shall not be permitted within the functional area of an intersection or interchange defined by the minimum connection spacing requirements set forth in Section 8, unless:

(1) No other reasonable access to the property is available, and

(2) the **(city/county)**, along with the North Carolina Department of Transportation, determine that the connection does not create a safety or operational problem after review of a site specific study of the proposed connection prepared by a duly registered and licensed engineer in the State of North Carolina.

(C) Where no other alternatives exist, the **(city/county)** may allow construction of an access connection along the property line farthest from an intersection. In such cases, a directional driveway connection (i.e., right-in/right-out or right-out only) may be required. No median breaks will be allowed within the functional area of the intersection.

(D) Near a signalized intersection, the location for a full movement driveway connection may be required to exceed the minimum spacing requirements set forth in Section 8 to avoid interference with the operations of the traffic signal and resulting traffic queues. The radius of a full movement driveway connection shall not encroach on the minimum corner clearance.

(E) The minimum lot size for any new corner lot created through the subdivision process shall be of adequate size to provide for the minimum corner clearance spacing required herein.

Section 10: Joint and Cross Access

(A) Non-Residential and Mixed-Use Projects:

(1) Adjacent land uses classified as major traffic generators shall provide a cross access drive and pedestrian access to allow circulation between sites.

(2) A system of joint use driveways and cross access easements shall be established wherever deemed feasible by the **(city/county)**, and the building site shall incorporate the following:

(a) A continuous service drive or cross access corridor extending the entire length for property frontage required to provide driveway separation consistent with the minimum spacing requirements set forth in Section 8.

(b) A design speed of ten miles per hour and sufficient width to accommodate two-way travel aisles designed to accommodate automobiles, service vehicles, and loading vehicles.

(c) Stub-out connections and other design features that make it visually obvious that the abutting properties may be tied-in to provide cross access via a service drive.

(d) A unified access and circulation system plan that includes coordinated or shared-use parking areas wherever feasible. Shared-use parking areas shall count toward reducing the number of required off-street parking spaces for the two adjacent land uses if the peak parking demand periods do not occur at the same time.

(3) Pursuant to this ordinance, a property owner shall:

(a) Record an easement with the deed for the property that allows cross access to and from other properties served by a joint use driveway, cross access, or service drive.

(b) Record an agreement with the deed for the property that remaining access rights along US 70 will be dedicated to the North Carolina Department of Transportation and pre-existing driveways along the property's frontage will be closed and eliminated after construction of the joint use driveway.

(c) Record a joint maintenance agreement with the deed for the property defining maintenance responsibilities of the adjacent property owners.

(B) Residential Projects

(1) Residential subdivisions with lots fronting along US 70 shall be designed with joint access points to the highway. Normally a maximum of two access points shall be allowed regardless of the number of lots served.

(2) The property owner shall enter into a written agreement with the **(city/county)**, recorded with the deed for the property, that pre-existing connections along the frontage will be closed and eliminated after construction of joint use driveways.

(C) The **(city/county)** may modify or waive the requirements of this section where the characteristics or layout of abutting properties would make implementation of joint use driveways or development of a shared access circulation system impractical, provided that all of the following requirements are met:

- (1) Joint access driveways and cross access easements are provided wherever feasible in accordance with this section.
- (2) The site plan incorporates a unified access and circulation system in accordance with this section.

Section 11: Median Openings

(A) No new median openings shall be allowed along portions of US 70 with a center median unless it is in conformance with the latest edition of *Median Crossover Guidelines for North Carolina Streets and Highways* published by the North Carolina Department of Transportation. In all circumstances, new median openings shall not encroach on the functional area of an existing median opening or intersection. Approval of any new opening along US 70 lies ultimately with the North Carolina Department of Transportation Traffic Engineering and Safety Systems Branch.

(B) Minimum criteria for evaluating a request for a new median opening may include, but not be limited to, the following:

- (1) Median openings shall not be located where intersection sight distance (both vertical and horizontal) can not meet current design criteria required by the North Carolina Department of Transportation.
- (2) Median openings shall not be placed in areas where the grade of the crossover will exceed five percent. Special consideration should be given to the vertical profile of any proposed new median opening that has the potential for future signalization.
- (3) A median opening shall not be provided where the median width is less than sixteen feet.
- (4) Median openings that require a traffic signal, or where one may expected a potential traffic signal in the future, should be avoided.

(C) It is the responsibility of the property owner to provide the justification for a new median opening along US 70. If this information is not provided, the median opening request shall not be reviewed by the North Carolina Department of Transportation.

Section 12: Design Guidelines for Access Connections

The following factors shall be considered by the **(city/county)** Engineer and the North Carolina Department of Transportation when assessing the suitability of a proposed access connection location associated with the proposed development application.

- (A) Offset Access Connections: On undivided portions of US 70, access connections on opposing sides of the highway shall be aligned with one another or offset an adequate distance to minimize overlapping left turns and other maneuvers that may result in safety hazards or operational problems.
- (B) Adequate Sight Distance: An access connection shall be located so as to provide adequate intersection sight distance.
- (C) Auxiliary Lanes: The NCDOT District Engineer may require auxiliary lanes (i.e., left or right turn lanes, bypass lane, acceleration lanes) where deemed necessary due to traffic volumes or where a safety or operational problem is expected without such lane. Left and right turn lanes shall be constructed in accordance with the *North Carolina Standards and Specifications for Roads and Structures*.
- (D) Substandard Frontage: If lot frontage is inadequate to provide the required minimum spacing, consideration shall first be given to providing access via connection to a side street, utilization of a joint or shared driveway with an adjacent property that meets the recommended spacing requirement, or development of a service road to serve multiple properties.
- (E) Future Development: To maintain minimum spacing requirements between non-residential access locations when future development occurs, a proposed access connection may be approved subject to the condition that it serves adjacent property via a joint or shared access located on the common property line or a cross access easement.
- (F) Easements for Joint Access: When required to provide a joint or shared access, the property owners must record an easement allowing cross access to and from the properties served by the shared driveway or cross access. The easement must include a joint maintenance agreement defining the responsibilities of the property owners.
- (G) Restricting Left Turns: Left turning movements to or from a proposed access connection may be restricted at the time of construction or at a future date based upon existing or anticipated roadway operating conditions.
- (H) Angle of Approach: Accesses shall be aligned to be straight and perpendicular to the centerline of US 70 to the maximum extent feasible.
- (I) Driveway Throat Length: For any development plan with an internal roadway network, a minimum storage of 100 feet measured from the near edge of the right-of-way line will be required before any crossing or left-turning conflicts area allowed. The minimum driveway stem distance may be increased on a project-by-project basis based on recommendations from an analysis of traffic operations on the internal roadway network.
- (J) Auxiliary Features: Signs, entrance medians, and fences shall be placed or constructed outside of the public right-of-way for US 70.

(K) Residential Access Design: Residential access must be designed to provide adequate space on the property for vehicles to turn around without the need to back onto US 70. Residential access from a single access street ending in a cul-de-sac shall not exceed 25 lots or dwelling units, and the cul-de-sac shall have a minimum bulb radius of 30 feet. All driveway grades and drainage improvements shall conform to the rules and requirements set forth in the NCDOT's *Policy on Street and Driveway Access to North Carolina Highways*.

(L) Non-Residential and Mixed-Use Access Design: Non-residential and mixed-use access must be designed so that backing, loading, unloading, and other maneuvers are accommodated on-site and not using the US 70 right-of-way, and the access shall provide adequate stacking distance to prevent entering or exiting vehicles from obstructing the flow of traffic on US 70. A driveway median may be required to preserve the length of storage, or to prevent cross access to an out-parcel within the storage area of a driveway. All driveway grades and drainage improvements shall conform to the rules and requirements set forth in the NCDOT's *Policy on Street and Driveway Access to North Carolina Highways*.

(M) Non-Residential and Mixed-Use Access Geometrics: The geometrics of a non-residential or mixed-use access shall provide adequate width, grade, and radii to accommodate all vehicles that will access the site.

(N) Corner Radius: The minimum corner radius of a street or driveway along US 70 shall be within 20 feet minimum and 50 feet maximum.

(O) Reverse Frontage: Access to double frontage lots along US 70 shall be regulated to the street with the lower functional classification. When a residential subdivision is proposed along US 70, it shall be designed to provide through lots along the highway with access from a frontage road or interior local road. Access rights of these lots from US 70 shall be dedicated to the North Carolina Department of Transportation and recorded with the deed for the property. A berm or buffer yard may be required at the rear of through lots to buffer dwelling units from traffic on US 70. The berm or buffer yard shall not be located within the public right-of-way.

Section 13: Connectivity

(A) The internal street system for a proposed development shall be designed to coordinate with existing, proposed, and planned streets outside of the development as provided in this section.

(B) Wherever a proposed development abuts unplatted land or a future development phase of the same development, street stubs shall be provided as deemed necessary by the **(city/county)** to provide access to abutting properties or to logically extend the street system into the surrounding area. All street stubs shall be provided with temporary turn-around or cul-de-sacs unless specifically exempted by the **(city/county)** Engineer, and the restoration and extension of the street shall be the responsibility of any future developer of the abutting land.

(C) Collector streets shall intersect with collector or arterial streets on- and off-site at safe and convenient locations.

(D) Local streets shall connect with surrounding streets to permit the convenient movement of traffic between land uses or facilitate emergency access and evacuation, but such connections shall not be permitted where the effect would be to encourage the use of such streets by substantial through traffic.

(E) Pedestrian connections should be provided between adjacent properties in addition to roadway connections. These pedestrian connections should provide for safe pedestrian travel along roadways and across parking areas to site buildings.

Section 14: Requirements for Out-Parcels and Phase Development Plans

(A) In the interest of promoting unified access and circulation systems, development sites under the same ownership or consolidated for the purposes of development and comprised of more than one building site shall not be considered separate properties in relation to the access standards set forth in this ordinance. The number of connections permitted shall be the minimum number necessary to provide reasonable access to these properties, not the maximum available for that frontage along US 70. All necessary easements, agreements, and stipulations required in this ordinance shall be met. This shall also apply to phased development plans. The owner and all lessees within the affected area are responsible for compliance with the requirements of this ordinance and both shall be cited for any violation.

(B) All access to an out-parcel shall be internalized using the shared circulation system of the principle development. Access to out-parcels shall be designed to avoid excessive movement across parking aisles and queuing across surrounding parking and driving aisles.

(C) The number of out-parcels shall not exceed one per ten acres of site area, with a minimum lineal frontage of 100 feet per out-parcel or greater where access spacing connections require. This frontage requirement may be waived where access is internalized using a shared circulation system within the principle development. In such cases, the right of direct access to US 70 shall be dedicated to the North Carolina Department of Transportation and recorded with the deed for the property.

Section 15: Minimum On-Site Vehicle Storage Area

Adequate storage must be provided within the internal circulation system for properties that include either a drop-off loop or drive-through facility so that vehicles do not queue onto US 70. Specific storage areas will be determined by the **(city/county)** Engineer in cooperation with the North Carolina Department of Transportation on a case-by-case basis during the development review process; however, the following minimum storage lengths are required for specific development types along US 70. Dimensions are measured from the ultimate right-of-way line stipulated by the regional Comprehensive Transportation Plan, State Transportation Improvement Program, or other project plans.

(A) For single-lane drive-in banks, storage to accommodate a minimum queue of six vehicles will be provided. Banks having several drive-in service windows will have storage to accommodate a minimum of four vehicles per service lane.

(B) For single-lane drive-through full-service car washes, storage to accommodate a minimum of twelve vehicles will be provided. Automatic or self-service car washes having a multi-bay design will have minimum vehicle storage to accommodate three vehicles per bay.

(C) For fast-food restaurants with drive-in window service, storage within the site to accommodate a minimum of eight vehicles per service lane from the menu board/ordering station will be provided.

(D) For service stations where the pump islands are parallel to the pavement edge, a minimum setback of 35 feet between the pump islands and the public right-of-way will be provided. For service stations where the pump islands are not parallel to the pavement edge, minimum vehicle storage of 50 feet in length between the pump islands and the public right-of-way will be provided.

(E) For land uses that require an entry transaction or have service attendants, gates or other entry control devices, the vehicle storage will be of adequate length so that entering vehicles do not queue back on the adjacent highway right-of-way. No portion of a parking area, attendant booth, gates, signing or parking activity shall encroach on the public right-of-way.

(F) For schools, adequate storage for parental drop-off and pick-up areas should be provided entirely on the school campus site.

Section 16: Interchange Areas

(A) New interchanges or significant modification of an existing interchange will be subject to special access management requirements that protect the safety and operational efficiency of the limited access facility and the interchange area, pursuant to the preparation and adoption of a small area access management plan by the **(city/county)**. The plan shall address current and future connections and median openings within ¼-mile of an interchange area (measured from the end of the taper of the ramp furthest from the interchange) or up to the first intersection with an arterial road, whichever is less.

(B) The distance to the first access location shall meet the minimum connection spacing requirements in Section 8; however, no driveway connection will be allowed less than 400 feet from the end of the taper of the ramp furthest from the interchange.

Section 17: Traffic Impact Study

A traffic impact study (TIS) may be required by the **(city/county)** Engineer or the NCDOT District Engineer to evaluate one or all access locations proposed in a development application. A TIS will be required when the expected gross trip generation for the development program is 1000 vehicles or more (entering/exiting combined) during a typical weekday period. If required, the traffic impact study shall be completed in conformance with

minimum rules and procedures set forth in the *Policy on Street and Driveway Access to North Carolina Highways* maintained by the North Carolina Department of Transportation.

Section 18: Variance Standards

(A) The granting of a variance shall be in harmony with the purpose and intent of this ordinance and shall not be considered until every feasible option for meeting minimum access management standards is explored.

(B) Applicants for a variance from the standards herein must provide proof of unique or special conditions that make strict application of the provisions impractical. This shall include proof that:

- (1) Indirect or restricted access can not be obtained; and
- (2) No engineering or construction solutions can be applied to mitigate the conditions; and
- (3) No alternative access is available from a side street

(C) Under no circumstances shall a variance be granted, unless not granting the variance would deny all reasonable access, endanger public health, welfare or safety, or cause an exceptional and undue hardship on the applicant. No variance shall be granted where such hardship is self-created.

Section 19: Nonconforming Access

(A) Permitted access locations along US 70 as of **(date of adoption)** that do not conform to the standards herein shall be designated as nonconforming features and shall be brought into compliance with applicable standards only under the following scenarios:

- (1) When new access connection permits are requested
- (2) A substantial enlargement or improvement on the site occurs, defined as an increase in gross floor area (GFA) of a primary or accessory structure by 25% or 500 square feet, whichever is greater, or an increase in parking stalls by 25% or 5 stalls, whichever is greater.
- (3) A change in land use(s) occurs on the site that may change the amount or distribution of traffic using any existing access to US 70
- (4) As road improvements are made within the public right-of-way for US 70 adjacent to the property

(B) Normal maintenance and/or repair of an existing access connection shall not be considered a physical change in the access.

(C) If the principle activity on a property with nonconforming access connections is discontinued for a consecutive period of 365 days or discontinued for any period of time without a present intention of resuming that activity, then that property must thereafter be

brought into conformity with all applicable connection spacing and design requirements set forth herein, unless otherwise exempted by the **(city/county)** or North Carolina Department of Transportation. For uses that are vacant or discontinued upon the effective date of this ordinance, the 365 day period begins on the effective date of this ordinance.

(D) The property owner should be made aware that the North Carolina Department of Transportation may at any time, when deemed necessary for safety, mobility, and efficiency of the roadway, modify, remove, or relocate any access point, and may redesign the roadway including any medians, auxiliary lanes, and turning movement restrictions.

Section 20: Effective Date

The provisions of this ordinance were adopted and become effective on **(date of adoption)**.

Implementation Strategies

Access management tools and ordinances can be applied to reshape the appearance and effectiveness of the US 70 corridor. The *US 70 Access Management Handbook* is recommended to be used as an educational tool when applying access management strategies to the corridor. This document should be used in conjunction with the *US 70 Access Management Study* endorsed by the US 70 Corridor Commission to yield a comprehensive implementation strategy. Additional review of the access management strategies recommended for each community should be conducted in collaboration with the North Carolina Department of Transportation through field reviews prior to implementation.

In order to most fully utilize the information contained in the *US 70 Access Management Handbook*, a series of implementation guidelines are recommended. First, the *US 70 Access Management Handbook* should be formally endorsed by the US 70 Corridor Commission, and representatives for the commission should meet with each stakeholder city and county along the corridor to discuss comments and questions regarding the handbook, including the model access management overlay ordinance. The US 70 Corridor Commission then should adopt a final *Access Management Handbook*, thereby providing each area of US 70 with additional tools for improving regional mobility and economic vitality and reserving the opportunity to build a freeway in the long-term horizon.

Second, the model access management overlay ordinance for US 70 (outlined in Chapter 4) should be formally adopted by all cities and counties along the corridor, as well as by the North Carolina DOT, to administer and enforce consistent access management standards along the entire 134-mile corridor.

Third, cities and counties should review and amend, as necessary, policies and ordinances intended to regulate land use, building placement, design orientation, landscaping, and sign size and placement along the corridor to complement existing and planned investments to the transportation corridor.



In some cases, cities and counties may decide to complete a freeway development plan for the portion of US 70 within their community. This planning process is used to garner public input, evaluate existing conditions and policies, and holistically recommend a plan that protects the integrity of the strategic corridor while instilling a sense of place that ultimately defines the community's identity.

Access Management Glossary

The following glossary provides a common vocabulary for engineers, planners, city council members, county commissioners, business owners, and the general public as they discuss access management principles and projects. Definitions are taken from a variety of access management ordinances and policies enacted by jurisdictions around the country. These include the *NCDOT Policy on Street and Driveway Access to North Carolina Highways* and the *Iowa Access Management Handbook*.

Acceleration Lane – A speed change *lane* that enables a vehicle entering a roadway to increase its speed to a rate at which it can safely merge with through traffic.

Access – Ingress and egress to land fronting on the State Highway System (US 70).

Access Management – The control of *driveways* and *intersections* to maintain safety at a roadway's full capacity.

Access Management Program – The sum of all actions taken by a governing council, board, or agency to maintain the safety and traffic carrying capacity of its roadways. These actions may include enacting ordinances that control driveway location and design. Adopting and implementing a comprehensive planning and zoning ordinance to guide the overall pattern of growth also can be a part of an access management program if it is aimed at avoiding or limiting *strip development*.

Annual Average Daily Traffic (AADT) – The annual average two-way daily traffic volume. It represents the total annual traffic on a road per year, divided by 365.

Arterial – A highway intended primarily for through traffic and where access is carefully controlled.

Auxiliary Lane – The portion of the roadway adjoining the traveled way for speed change, turning, storage for turning, weaving, truck climbing, or for other purposes.

Change of Land Use – Any proposed property use that is different from the current use of the property, or current use that is different than the use identified in a pre-existing driveway permit.



Collector Street – Roads intended to move traffic from local roads to secondary arterials.

Compact Area – A geographic area encompassing roadways along which structures are spaced less than 200 feet apart for a distance of $\frac{1}{4}$ mile or more.

Conflict – A traffic-related event that causes evasive action by a driver to avoid collision with another vehicle.

Conflict Point– Any point where the paths of two through or turning vehicles diverge, merge, or cross.

Congestion – See *traffic congestion*.

Connectivity – A term used to infer connections between adjoining properties for vehicular and/or pedestrian usage.

Controlled Access Highways – Highways that serve through traffic, have very few *access* points, and may prohibit direct *access* from the highway to abutting land.

Corner Clearance – At an intersection of two streets, the distance measured from the edge of pavement curb line or the intersection of the right-of-way lines to the beginning of outside driveway radius.

Corner Lot – A single lot with *frontage* on a road and an intersecting road.

Cross Access – A service drive providing vehicular access between two or more continuous properties so that the driver need not enter the public street system to travel between adjacent uses.

Cul-de-sac – A dead-end road with a circular or T-shaped turnaround at the end, usually built to serve a small *subdivision*.

Deceleration Lane – A speed-change *lane* that enables a vehicle to leave the through traffic *lane* at a speed equal to or slightly less than the speed of traffic in the through *lane*, then to decelerate to a stop or make a slow speed turn.

Design Hour Volume – The hourly traffic volume used to evaluate or design a highway or *driveway*.

Directional Median Opening – A directional median opening provides for left-turns in one direction only. These medians are preferred because they provide for the predominant movement and are much safer for the traveling public. Typically, directional median openings only provide for left turns from the major street to the side street. No left turns or straight across movements are allowed from the side street.

Driveway – An entrance used by vehicular traffic to access property abutting a street. As used in this ordinance, the term includes private residential, non-residential, and mixed-use driveways.

Driveway Angle – The angle between the driveway centerline and the edge of the travelway.

Driveway Throat – The portion of a driveway between the public road and the internal circulation system or area where parking maneuvers occur.

Driveway Width – The narrowest width of the *driveway*, measured parallel to the highway *right-of-way*.

Easement – A grant of one or more property rights by a property owner to or for use by the public, or another person or entity.

Frontage – The length along the street right-of-way line of a single property tract or roadside development area between the edges of the property lines. Property at a street intersection (i.e., corner lot) has a separate frontage along each street.

Frontage Road – A public or private drive that generally parallels a public street between the *right-of-way* and the front building setback time. The *frontage road* provides *access* to private properties while separating them from the *arterial* street (see also *service roads*).

Full Median Opening – A full median opening provides for all movements at the intersection or driveway. The use of full median openings is reserved for situations where there is

sufficient spacing and other crossover designs cannot adequately meet the operational needs of the location.

Functional Area (Intersection) – That area beyond the physical intersection of two streets that comprises reaction time and deceleration distance, plus any required vehicle storage length, and is protected through corner clearance standards and driveway connection spacing standards. The following reaction time and deceleration distances should be added to the vehicle storage length to quantify the function area of the intersection.

| Reaction Time and Deceleration Distances | | | | |
|--|----------------------|--------------------|----------|----------|
| Area Type | Reaction Time (sec.) | Posted Speed Limit | | |
| | | 35 MPH | 45 MPH | 55 MPH |
| Rural | 2.5 | 130 feet | 165 feet | 200 feet |
| Urban | 1.5 | 75 feet | 100 feet | 120 feet |

Source: NCDOT Policy on Street and Driveway Access to North Carolina Highways

Functional Classification – A system used to group public roadways into classes according to their purpose in moving vehicles and providing *access*; it includes design and operational standards.

Functional Integrity – The principle that the highest speed and highest capacity roads should be reserved for longer distance and higher speed travel.

Grade Separated – Structures that physically separate various modes of transportation and intersecting flows of traffic from one another.

Highway Capacity – The maximum number of vehicles that a highway can handle during a specific amount of time at a given *level of service*.

Highway System – All public highways and roads in North Carolina. These include *controlled access highways, arterials, collector streets* and *local streets*.

Intersection – See *functional area*

Joint Access (or Shared Access) Driveway – A single driveway serving two or more lots. A joint access driveway may cross a lot line or be on a lot line, and the owners may have an easement for the shared use function of the driveway.

Lane – The portion of a roadway for the movement of a single line of vehicles, not including the gutter or roadway shoulder.

Level of Service – The description of traffic conditions along a given roadway or at a particular *intersection*. The *level of service* ranges from “A,” which is the best, to “F,” which is the worst. It reflects factors such as speed, travel time, freedom to maneuver, traffic interruptions, and delay.

Local Street – A road whose primary purpose is to provide direct access to abutting properties and to roads of higher functional classification.

Major Traffic Generator – A land use or development program estimated to generate more than 1,000 gross vehicle trips (entering/exiting combined). See North Carolina Administrative Code 19A NCAC 02B.0602(b)(3)(c).

Peak Hour Traffic – The highest number of vehicles passing over a section of a *lane* or roadway during any 60 consecutive minutes. Typically, there is a peak hour condition in the a.m. and a peak hour condition in the p.m. for which a roadway or *intersection* is analyzed for capacity and *level of service*.

Right-of-Way – Land reserved, used, or slated for use for a highway, street, alley, walkway, drainage facility, or other public purpose.

Service Road (aka Frontage / Backage Road) – A public or private street, auxiliary to and normally located parallel to a controlled access facility that maintains local street continuity and provides access to parcels adjacent to the controlled access facility.

Shared Driveway – A single *driveway* serving two or more lots. A shared *driveway* may cross a lot line or be on the lot line, and the owners may have an *easement* for the shared use.

Side Friction – Driver delays and *conflicts* caused by vehicles entering and exiting *driveways*.

Sight Distance – This is the area that establishes a clear line of sight for a waiting vehicle to see on-coming traffic and make turning movements into or out of a street or driveway connection safely or for traffic to see entering or waiting vehicles.

Storage Length – Additional lane footage added to a turning lane to hold the maximum number of vehicles likely during a peak period so as not to interfere with through travel lanes.

Strip Development – A linear pattern of roadside development. It commonly includes residential and/or commercial development. Typically, no *frontage roads* are available to reduce the number of driveways that intersect with the *arterials*.

Subdivision – Any tract of land that is developed by division into a lot or lots along an existing or proposed street, highway, *easement*, or *right-of-way*.

Thoroughfare Plan Map – A map that depicts all roadways contained on the long range traffic circulation map and identifies the *right-of-way* widths for each roadway. The thoroughfare plan map is the official listing of *rights-of-way* to be reserved.

Traffic Congestion – A condition resulting from more vehicles trying to use a given road during a specific period of time than the road can handle with what are considered acceptable levels of delay or inconvenience.

Traffic Impact Study – A report initiated in response to a proposed development that compares the anticipated roadway conditions with and without the development. The report may include an analysis of mitigation measures.

Trip Generation – The estimated volume of traffic going to and from a particular location.

Turn Radius – The radius of an arc that approximates the turning path of a vehicle.

Uncontrolled Access – The unlimited number, spacing, and/or non-standardized design of *driveways* onto a street or road.

Vehicle Trip – The vehicle moving from an origin point to a destination point.

Volume Warrants – The conditions under which traffic management techniques, such as a left-turn or a right-turn *lane*, are justified. For example, the need for a left-turn *lane* will vary according to the volumes of advancing and opposing traffic, and the percentages of traffic turning left.