U.S. Highway 321 Corridor Study

September 2010

Prepared by the Knoxville Regional Transportation Planning Organization
for
Loudon County Planning Commission and Lenoir City Planning Commission

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Acknowledgements

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Loudon County Economic Development Agency
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CHAPTER 1: Purpose and Overview

U.S. Highway 321 through Loudon County is a corridor that serves a multitude of uses. It is an arterial for through traffic, including freight traffic from the Interstates 40 and 75 to points north and south. It is also a route for visitors to the Great Smoky Mountains National Park. At the same time, commuters living in Blount and Loudon Counties who work in Anderson and Knox Counties use U.S. Highway 321 as their route to work. These users each have different needs and different expectations of the roads function, but essentially want to travel quickly and safely between homes and work. Other motorists use U.S. Highway 321 as a local road to access services and retail needs. These users want convenient and safe access to these businesses. The road, especially through Lenoir City, acts like a main street, yet it carries a high volume of automobiles. As a road it operates efficiently moving vehicles with little to no congestion but there are concerns from the community regarding the future of the road. What will U.S. Highway 321 look like in the future? What is the best way to accommodate growth and development while fostering a sense of place and ensuring that the corridor will remain safe? The purpose of this document is to begin the process of scoping out a vision for the future of U.S. Highway 321 through Loudon County.

It is difficult for a road to serve many different functions effectively, such as moving vehicles as quickly as possible and providing safe access to local goods and services. Unfortunately, with the focus on arterials, many of the roads in this region have evolved in such a way that they are expected to serve a multitude of uses that would normally be distributed into a network of collectors. As a result, these arterials eventually end up not serving either role well. Fortunately Loudon County and Lenoir City still have opportunities to guide U.S. Highway 321's development and create a corridor that meets the specific needs of the community. There are many opportunities to retrofit existing sections and provide a guide for the undeveloped portions of the corridor. Retrofitting is always more difficult and more expensive than trying to guide development before it occurs. However, for the sections of the highway that are already developed there are tools that can bring positive and affordable change.

The Importance of Place

The planning and design of transportation networks and streets can be reshaped to encourage economic vitality, civic engagement, human health, and environmental sustainability, in addition to serving peoples' mobility needs. In the competitive globalizing economy, great places are becoming defined more and more by their great public destinations and user friendly, lively squares, great commercial streets, markets or combinations of all of these. By focusing on creating a unique place, communities can redefine their vision around creating or enhancing these destinations.

—Project for Public Spaces

A community's roadway corridors provide the social and economic connection between, and the windows to, neighborhoods and communities. The way road corridors are planned can create places that are a source of pride and offer convenient, pleasant travel or result in a place that over time becomes blighted and congested with traffic, often because of incremental road and land use decisions and investments that were not guided by an overall plan or vision for an area. The value of a corridor plan is that it provides communities with a tool that integrates and balances transportation mobility planning with local goals for land use and community character. The best places to live, work and visit are those places that are willing to uphold their standards in the face of development pressure.

The principal elements of a corridor plan address what the land uses and the character of development should be along the road (the area beyond the pavement) and how the roadway (the pavement and the right-of-way) improvements should be designed to best support the land use and community character goals. A third corridor plan element addresses the non-roadway improvements in the right-of-way, such as bicycle lanes, sidewalks, landscaping, street lighting, drainage, signage, and utilities. Planning tools used to help achieve those three elements include roadway design guidelines, access management that identifies where the access points should be (and not be) to best serve the land uses along the road, and development guidelines and regulations. One way to implement a corridor

plan is the use of a corridor overlay zone to guide the road's development (or redevelopment) and access. An overlay zone can address design features, such as how structures front the road and how far they are set back, how parking is treated, lot sizes, building densities, and landscaping. Because of the range of issues addressed in a comprehensive corridor plan for an area, multiple disciplines are needed (for example, a land use planner, community design expert, environmental planner, and, depending on the project, a sociologist and/or historic preservation or real estate market expert).

A corridor plan can be used for a road corridor within a single community or neighborhood, one that connects several communities, a new road facility, or for retrofitting an existing road that has become undesirable because of an unattractive street environment that works against new investments. Factors that make a street undesirable include: frequent curb cuts, high speeds because of a lack of traffic calming, visual clutter from signs and overhead utilities, poor street lighting, lack of pedestrian or bicycle amenities, outdated land uses, strip development that fronts the street with parking lots, unattractive building design, and lack of a sense of place. Developing a corridor plan generally involves a six-step process. The first three include involving citizens from the earliest stages of planning and continuing through implementation, getting to know the existing corridor (the homework stage), and defining a preferred vision for the corridor. The last three steps focus on developing and agreeing on the practices and policies that will lead to the preferred vision, outlining the implementation strategies, and putting together corridor champions in and outside government who will work to ensure that the corridor plan is achieved.[1]

This document should serve to guide future planning efforts along U.S. Highway 321 to preserve capacity, to improve safety, to help manage land use and to improve traffic flow and its associated environmental impacts. It is important to remember that different approaches should be taken for different parts of the road; the character of the road, the look and feel of it, can change as travelers move along the corridor. A uniform cross-section, speed limit or design standard would not be appropriate for the entire length of the road and should not be applied with little to no regard to the surrounding character. Ultimately U.S. Highway 321 should function in way that allows the road to serve the community as well as facilitate the flow of traffic through the area. There are great opportunities to create a unique sense of place so that all travelers know they are in Loudon County. U.S. Highway 321 through Loudon County should connect communities and destinations and be retrofitted in a way that attracts people rather than merely serve as the thoroughfare for traffic traveling to destinations outside of the county.

Everyone knows an undesirable corridor when they experience one. The challenge is to reinvent the existing corridor, and in the process foster a new sense of place that creates a unique identity where community members and visitors enjoy spending their time and money, and ultimately, economic development flourishes. Communities typically focus on revitalizing their core downtowns but often neglect their gateways. The communities of Loudon County and Lenoir City have an opportunity to transform U.S. Highway 321 into a truly unique corridor by making decisions now on how to best guide development and traffic operations along the corridor.

Guiding principles for the future planning efforts along the 321 corridor should incorporate the following:

- Encourage quality economic development
- Maintain public infrastructure investment
- Focus development intensity
- Create a sense of place where none existed before
- Reflect natural environment and cultural history
- Improve streetscape aesthetics and safety

Chapter 2 includes recommendations for maintaining safe and efficient traffic operations along U.S. Highway 321. The recommendations included in this document were developed in consultation with the Loudon County Planning Commission and Lenoir City Planning Commission. These recommendations are to be used as a guide or a toolbox for future planning efforts along the corridor. Loudon County and Lenoir City should continue to work towards creating a shared vision for U.S. Highway 321 by hosting workshops and developing detailed design and policy recommendations with guidance from the community. There are many tools that can be utilized in effective corridor planning and this is not intended to be an exhaustive list but rather a point in which to begin thinking about how best to plan for the future of U.S. Highway 321 in Loudon County. Additional tools and references are included in the Appendices.

[1] *Bluegrass Corridor Management Planning Handbook*, prepared by the Florida firm Glatting Jackson Kercher Anglin Lopez Rinehart, Inc., for Bluegrass Tomorrow [www.bluegrasstomorrow.org]

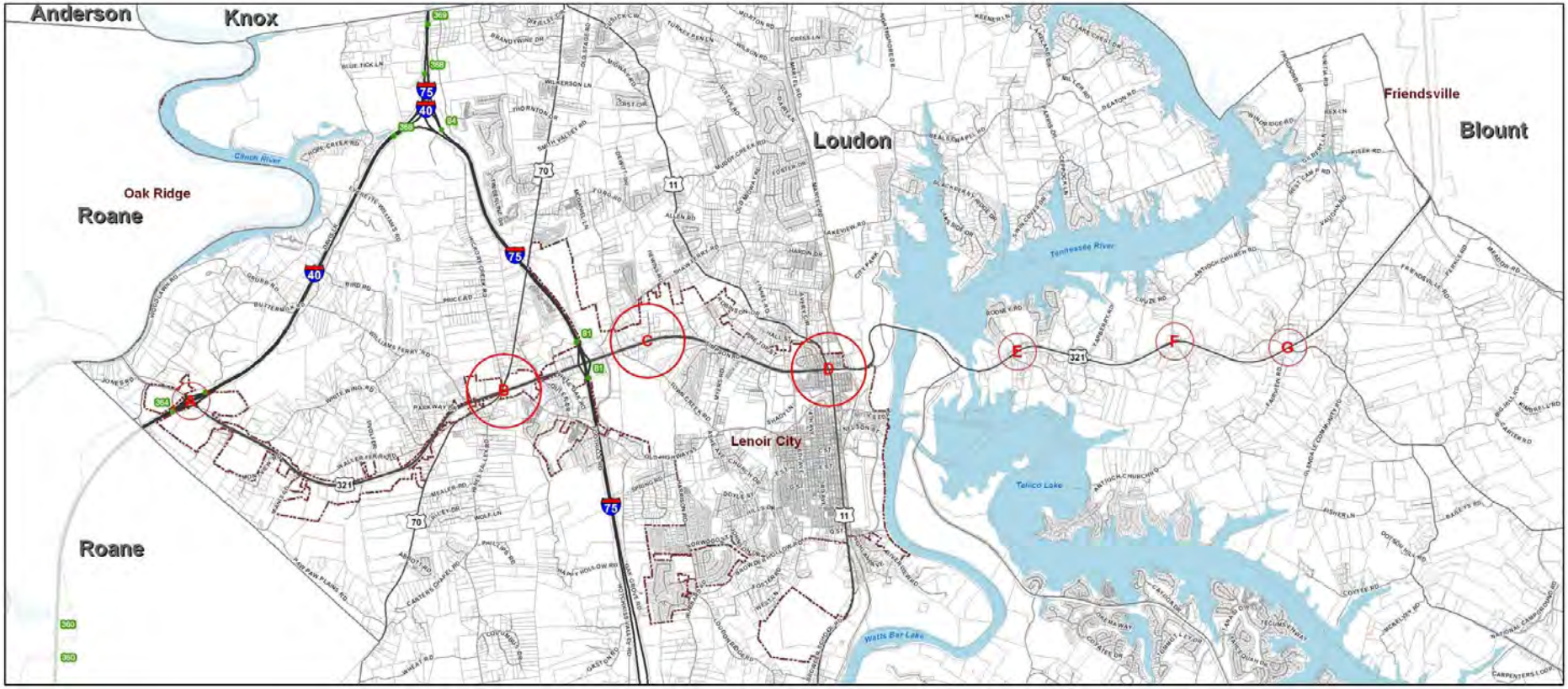
CHAPTER 2: Recommendations

Recommendation I: Identify Nodes

Locating development where there is good existing access and utilities uses land more efficiently. Mixing land uses at these locations is even more efficient and offers choices for residents. This clustering of development is often referred to as node development. The density and the complement of uses vary from site to site. Nodes make the most sense near existing destinations. Although the U.S. Highway 321 corridor and Loudon County's development pattern does not currently support transit, in the future there will likely be the need for modes other than the automobile, and nodes provide logical future transit stops. Nodes also provide a walkable environment for people who wish to park once and access multiple services and amenities. Two of the primary benefits of nodal development are:

1. Goods and services are dispersed throughout the corridor without strip development.
2. Public money is saved by directing new development where services already exist.

Figure 1. Potential and existing nodes in Loudon County and Lenoir City



There are some obvious nodes already in the process of developing along U.S. Highway 321:

- I-40 interchange
- Eaton's Crossroads
- Town Creek Village[2]
- U.S. Highway 11 and U.S. Highway 321
- Allen Shore Drive and U.S. Highway 321
- Antioch Church Road and U.S. Highway 321
- U.S. Highway 95 and U.S. Highway 321

In the southern and northern portions of U.S. Highway 321, there is a need to identify future nodes and plan for their development because of the relatively rural nature of these sections and the likelihood of haphazard development occurring. The intensity of use at nodes in the southern segment would be different from the nodes in the northern segment or within Lenoir City limits. The goal should be to concentrate future development in existing developed areas and utilize nodes in the southern and northern segment for smaller, local serving retail and services rather than regional services such as big box retail and supermarkets. These developments should fit into the context of the surrounding, primarily rural character of the south and northern corridor segments.

Planned nodes can be classified into two categories: large commercial centers/areas and small neighborhood nodes. The two main types of planned commercial areas along U.S. Highway 321 can take on a different character based on geographic size, location and surrounding uses. Access management regulations will provide additional planning oversight as these areas are developed to provide safe travel and ease in general traffic circulation. Nodes are intended to have a variety of uses, determined by the size and geographic location of the planned areas. The larger scale commercial centers will require a large amount of floor space and parking and will cater to a regional market. These centers might include hotels, restaurants, movie theaters, drive-through restaurants, and large retailers, as well as complementary office and service uses.

Large Nodal Centers

Larger concentrations of planned commercial development are intended to include large-scale commercial development and are typically located along major thoroughfares such as U.S. Highway 321. Commercial centers should be sized and located to best interact with surrounding uses while also providing convenience. Large, already developing commercial areas along U.S. Highway 321 (see nodes B, C, and D shown in Figure 1) provide the opportunity for coordinated, high-quality commercial centers that can be integrated with neighboring office and residential areas and designed to minimize congestion and crashes. Design features should include internal circulation throughout the center, pedestrian connections to adjacent areas, overall consistent design elements and identification features to enhance the image of Loudon County and Lenoir City at these gateways.

Small Neighborhood Nodes

Small nodes of neighborhood commercial are intended for the convenience of nearby users. As residential development occurs in an area, the need for a compact node of commercial at main intersections (of 4-5 total acres per intersection)

Figure 2. The planned Town Creek Village in Lenoir City is an example of nodal development.

[2]Redbud Construction Services.com, 2009

would allow their development as a supporting use in an area planned for residential (see the Low Density Residential Intended Uses). In areas with existing residential development, the largest (most sustainable) nodes are retained and will typically be at major intersections around the City. Neighborhood commercial nodes are allowed to develop in residential areas. Existing neighborhood commercial uses may be consolidated into fewer locations. Any new commercial nodes in developing areas should be limited to 4-5 acres of total land at an intersection of main roads and should include landscaping and design features to minimize impacts on adjacent residential neighborhoods.

The small nodes of neighborhood-scale commercial are intended to include uses that support the nearby residential developments without adversely impacting the residents. These uses are naturally constrained by the small geographic size of the nodes, and might include small restaurants, carry-out convenience stores, or small commercial centers. The localized, neighborhood configuration of these nodes also promotes local trips and walkable alternatives.

The best way for Loudon County and Lenoir City to encourage nodal development is by developing planning guidelines and regulations that are clear, consistent and convey what the community envisions for each node. There are some general principles, but how these principles are applied specifically in Loudon County and Lenoir City should be determined by the community and the planning commissions. Guiding principles might include:

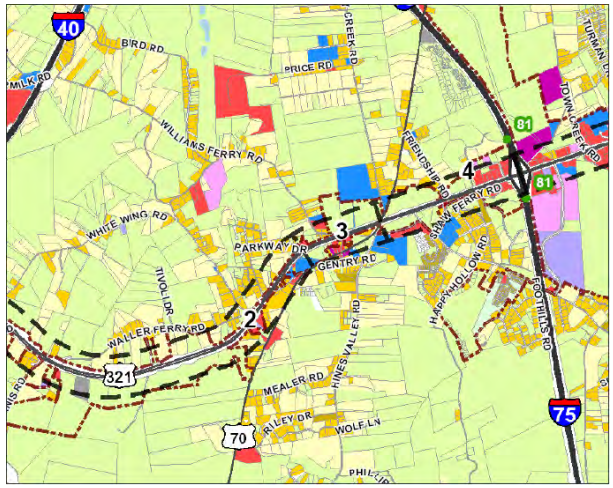
- Strengthen and enhance the existing nodes as vital service centers.
- Increase the amount and concentration of housing, office and retail space in the central business districts throughout the County.
- Promote greater density and walkability by encouraging development of existing "gaps" left by abandoned buildings, vacant parcels and land located behind existing development along roads.
- Save public costs by directing new development to places contiguous to existing development where sewer, water, roads, and other necessary services already exist, or are planned as part of a comprehensive plan to accommodate projected growth.

Recommendation II: Revise zoning along the corridor

Recommendation II. A: Coordinate zoning

Much of the corridor has been annexed by Lenoir City and is zoned Commercial (C-3). Immediately beyond the city's jurisdiction is Loudon County with its own zoning of agriculture. These two zones should be coordinated across the jurisdictions to encourage more desirable and compatible development and areas of transition between the two zones. Figure 3 illustrates the incompatible zones within each jurisdiction. The light green parcels are agricultural uses while the red are commercial, and the gold are residential.

Figure 3. Zoning Along U.S. Highway 321.



Recommendation II.B: Create a corridorwide overlay zone district

One way to create a more consistent and attractive corridor is to create overlay zone districts. An overlay zone is regulatory tool and an alternative to changing individual parcel's zones. The overlay district can address issues like design standards, setbacks, landscaping standards and access management. The controls in such districts are not intended to be substituted for other general zoning district provisions but can be placed over such district provisions and can provide additional development and design guidance to a specific area. This tool can be particularly useful to communities because it applies to both the public right of way and private property and can result in the formulation of a comprehensive rather than piecemeal approach to a corridor retrofit.

Overlay districts are special zones placed "on top" of existing zoning and planning regulations. The overlay district contains requirements that typically supplement the underlying regulations. This approach allows local governments to maintain current codes while addressing the special needs of particularly sensitive areas. This is an attractive option for communities wishing to revitalize a particular strip corridor without more extensive amendments to the jurisdiction's underlying zoning

ordinance. The mapped boundaries of the overlay district do not necessarily have to coincide with other zoning district boundaries, and may not follow parcel boundaries. Instead, natural features and roads often define the perimeter of the overlay district. The overlay district is a tool that is widely used by local jurisdictions throughout the country and very often along aging highway corridors such as U.S. Highway 321.

CASE STUDY: Lexington-Fayette Urban County Government Kentucky

The Model Corridor Overlay District was established to enhance the quality and compatibility of development; to establish consistent architectural and design guidelines; to encourage the most appropriate use of adjacent lands; to promote the safe and efficient movement of traffic; to provide for preservation of scenic vistas, view sheds, and open space; and to preserve property values along a corridor. The ordinance adds regulations on site design, setbacks, building construction, signs, parking areas, landscaping, utilities, access to a corridor, wildlife linkage, and more.

Another overlay districted used by Lexington-Fayette is the Neighborhood Design (ND-1) Overlay District which allows neighborhoods to define design standards to conserve and protect the unique character of neighborhood and ensure compatibility with those regulations on all new home construction and additions. Approval of the ND-1 ordinance requires significant neighborhood support (usually in the form of a petition with a minimum of 51% of owners' signatures). Final passage of the overlay zoning typically takes between 6 to 9 months from the date of initiation.

CASE STUDY: City of Oshkosh, WI

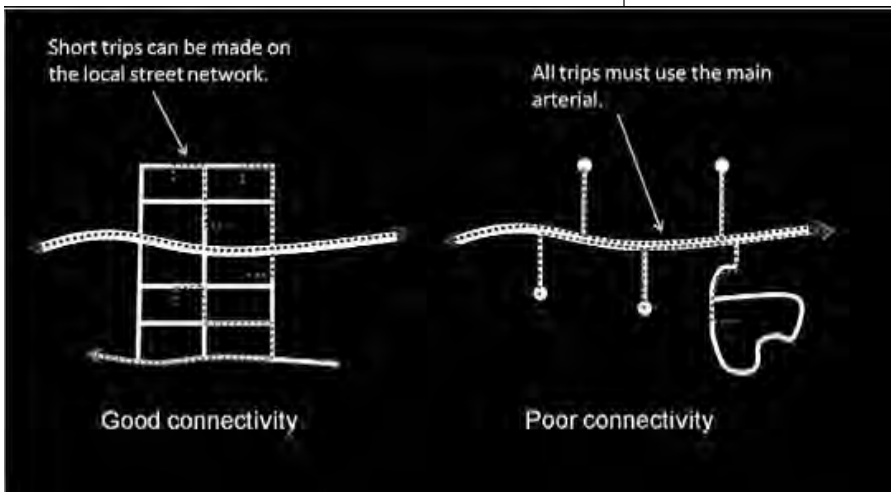
The City of Oshkosh WI has a Highway 41 Corridor Overlay which applies to lots abutting frontage roads adjacent to the highway. It regulates building architecture, orientation and setbacks as well as landscaping, signage, utilities, waste storage and driveways.

When enacting an overlay district, it is important to consider the language of the jurisdiction's comprehensive plan. Well-written comprehensive plans should provide goals, objectives and policies to substantiate the need for, and public purpose of, overlay districts. It may even be advisable to amend the comprehensive plan to further reflect the desire to revitalize strip corridors.

Recommendation III: Implement Access Management Practices

Roads such as U.S. Highway 321, which serve both as an arterial and as a local road, have the greatest need for access control. Thoughtful, fair and consistent access policies are essential for an attractive, economically viable and safe road. The access management principles described below are intended to balance the right of reasonable access to private property with the right of visitors and citizens of Lenoir City and Loudon County to safe and efficient travel.

Figure 4: Good connectivity versus poor connectivity



"In the absence of access management, growing corridors can deteriorate functionally and aesthetically, with rising levels of intersection congestion and turning-movement crashes affecting social, economic, physical and environmental quality."

Too often, communities grow linearly along a road or highway. As homes, businesses and retail buildings are constructed along the road, there is a corresponding proliferation of driveways and traffic signals. The result is a deterioration of the function of our roads, decreased highway capacity and a corresponding increase in traffic congestion and hazards. Access management is a means to control the number, design, and location of curb cuts onto a road. In addition to the more obvious connection to safety, function and capacity of a road to handle traffic, access management has a strong influence on land use and the character of a road corridor. An understanding of the connection between access and land use is critical to understanding the dynamics of road corridor management.

There is a strong connection between access management and development patterns. In areas where frequent curb cuts are allowed with little access planning, road frontages become a clutter of driveways and the development that accompanies them. As access points multiply and development increases,

once open and scenic areas can erode into strip development and sprawling patterns of growth.

Access management involves more than just limiting those curb cuts, although that is a key provision. It also includes planning for more cohesive and efficient access so that safety and road capacity–as well as scenic road character–are preserved. As illustrated by Figure 4, by incorporating access management strategies, combined with smart growth land usepolicies, this community has reduced the curb cuts and preserved open space while accommodating development.

Communities that wish to create or administer an access management program, or to advocate for management that preserves scenic resources and open areas along road corridors while still promoting economic development, should consider the following:

- Compare goals in comprehensive plans for the region or town with the access-management plans and rules in effect to determine if they are compatible. Without an access-management plan that limits curb cuts, a stated goal such as "preventing strip development" may be unobtainable.
- Limit curb cuts to one per lot, particularly in areas at risk of strip development. For lots with frontage of more than one road, limit access to the road best suited to handle the traffic generated by the proposed use.
- Require master planning for larger properties with plans for future access and internal roads as part of the plan. A master plan should ensure that earlier stages of development will not impact the ability to connect later stages in an integrated road and access pattern.
- Require shared access between parcels, and the consolidation of existing driveways to reduce the number of access points.
- Encourage access management plans to also cover ideas for connector roads and street networks that will reduce the number of access point onto main roads.
- Evaluate driveway width, curve radius, spacing and sight distance.
- Incentivize or require shared access.
- Incorporate service roads.
- Require shared parking.
- Plan and require interconnected street networks.

Effective access management includes setting access policies for street and abutting development, keying designs to these policies, having the access policies incorporated into legislation, and having the legislation upheld in the courts.

Good access management contributes to a complete street by minimizing potential conflict points, such as driveways and median openings. The fewer conflict points, the safer a street will become for motor vehicles, bicycles and pedestrians. Access management addresses the basic questions of when, where, and how access should be provided, and what legal or institutional provisions are needed to enforce these decisions. In a broad context, access management is resource management, since it is a way to anticipate and reduce crashes and congestion and to improve traffic flow. It has been shown that good access management can reduce crashes involving all users by 50 percent or more, depending on the condition and treatment used. The following principles define access management techniques:

- Classify the street system by function and land use or context,
- Establish standards or regulations for intersection spacing,
- Limit direct access to streets that primarily serve a vehicular mobility function,
- On streets that have a major access function (most urban/suburban streets), locate driveways and major entrances away from intersections and away from each other to minimize interference with traffic operations, minimize crashes, and to provide for adequate storage lengths for turning vehicles,

What is a Complete Street and a Complete Street Policy?

Complete streets are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists and transit riders of all ages and abilities must be able to safely move along and across a complete street.

Creating complete streets means communities must change their orientation toward building primarily for cars. Instituting a complete streets policy ensures that streets and roads are routinely designed and operated to ensure the entire right of way enables safe access for all users. Places with complete streets policies are making sure that their streets and roads work for drivers, transit users, pedestrians, and bicyclists, as well as for older people, children, and people with disabilities.

—National Complete Streets Coalition

- Use curbed medians and locate median openings to manage access and minimize conflicts, and
- Minimize driveways, driveway widths and driveway entry/ exit speeds to reduce conflicts between motor vehicles and pedestrians and bicyclists.

How the preceding principles are specifically addressed depends on local input and buy-in, although there are some general guidelines that can be useful at this stage presented in Appendix E.

Specific Access Management Recommendations for Highway U.S. Highway 321 include the following:

Recommendation III. A. Regulate minimum spacing of median openings and access connections (driveways and street connections).

Establish minimum requirements for property frontages and use as a guide for curb cuts. The minimum spacing of both signalized and unsignalized intersections depends directly on the posted speed, and therefore the stopping sight distance, of the roadway. The speed along U.S. Highway 321 varies between 45 and 55 mph; to maintain an acceptable Level of Service (delay expressed as congestion) at these speeds, there should be signalized intersections no more than every one to one-half mile and unsignalized driveways every 350 to 500 feet[3]. In Figure 5, the driveway on the left is near a signalized intersection and has been restricted to right-in/right-out by placing flexible posts in the median. This reduces the chances of right-angle collisions.[4]

[3]Source: Design and Development Principles for Livable Suburban Arterials – University of Minnesota research: http://www.lrrb.org/PDF/200117.pdf

[4]Source: http://safety.fhwa.dot.gov/intersection/signalized/presentations/sign_int_pps051508/long/index.cfm

CASE STUDY: Access Management – Charlotte, Vermont

Located between Middlebury and Burlington along the Route 7 Corridor, the nearly 3,500 town residents enjoy the hills and ridges overlooking Lake Champlain. The community is actively engaged in keeping the productive Champlain Valley soils in farming. The result is a variety of agricultural activities that include orchards, dairies, berry farms, a winery, apiaries and community supported agriculture (CSA). Among the community motivations for protecting farmland and open space is maintaining the scenic views along important highway corridors, including Route 7.

Several years ago, Charlotte residents watched as roadside development spread along the Route 7 corridor in neighboring communities to the north, and decided to protect the views and character of their community and avoid excessive strip development. In 1990, they implemented an Access Management strategy to ensure that Route 7 remains a functioning major arterial rather than a congested access for scattered businesses and housing developments.

The Access Management Standards were incorporated into their zoning bylaw as general regulations, which subjected property with frontage on Route 7 to special access standards. These include:

A property with frontage on Route 7 and no frontage on a secondary road are allowed only one access point. This will not be permitted where traffic conditions, topography or any physical site limitations would prevent the construction of a safe access.

If the property does have access to a secondary road, the access point must be located there.

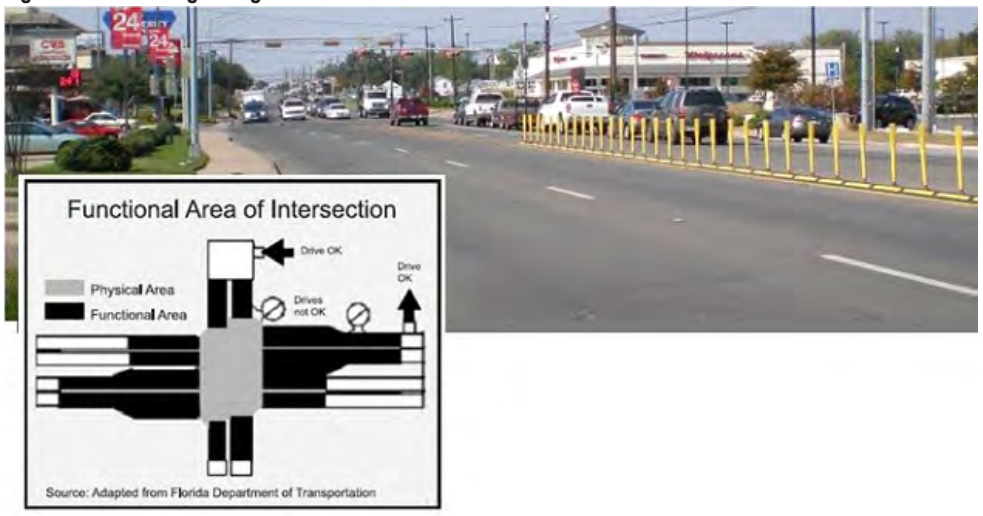
This has given those property owners a "heads up" that this is an important issue for the community and that they are concerned about safety as well as interested in preserving the rural character of their roads.

Lessons Learned:

- **Clearly outline your goals for access management in your town planning documents.**
- **A regulation does not have to be complicated to be effective.**
- **Access management is most effective when combined with good land use planning. In Charlotte, the community opted not to allow most commercial land uses along the Route 7 corridor.**

Source: Smart Growth Vermont

Figure 5. Reduce Right-Angle Crashes



Recommendation III. B. Move access points away from signalized intersections and freeway ramps.

Restricting access to commercial properties near intersections by closing driveways on major streets, moving them to cross streets, or restricting turns into and out of driveways will help reduce conflicts between through and turning traffic. Such conflicts can lead to rear-end and angle crashes related to vehicles turning into and out of driveways and speed changes near the intersection and the driveway(s). Locations of driveways on both the cross street and major street should be determined based on the probability that a queue at the signal will block the driveway. Directing vehicles to exits on signalized cross streets will help eliminate or restrict the access to the main roadway. Restricting turns to right-in and right-out only will address conflicts involving vehicles turning left from the road and left from the driveway. From a commercial viewpoint, driveways and service road entrances farther away from signalized intersections allow easy access for customers, even during times of peak congestion.

Recommendation III. C. Provide a service road or parallel collector roads and side streets for site access along an arterial roadway.

Service roads along the highway allow customers to enter and exit businesses conveniently and safely, away from faster moving through-traffic. Service roads that run behind highway properties are often less disruptive to existing businesses than frontage roads, less costly for an agency and more functional than a frontage road. Rear service roads can provide access to businesses on each side and can operate safely from both directions. Frontage roads provide access only to businesses fronting on the highway and are much safer when designed for one-way traffic. Additional right-of-way will be needed for the frontage or service road and for connecting a service road back to the highway or side street. Consolidating access points increases safety and allows better mobility.[5] It also provides internal circulation instead of requiring vehicles to travel on the arterial for a short distance. Figures 6 and 7 illustrate additional best practices that should be encouraged. Joint and cross access reduces the number of driveways on the arterial.[6]

[5]Source: City of Louisville, (Kentucky) Access Management Design Manual, 2009.
[6]Ibid

Figure 6. Preferred corner development.

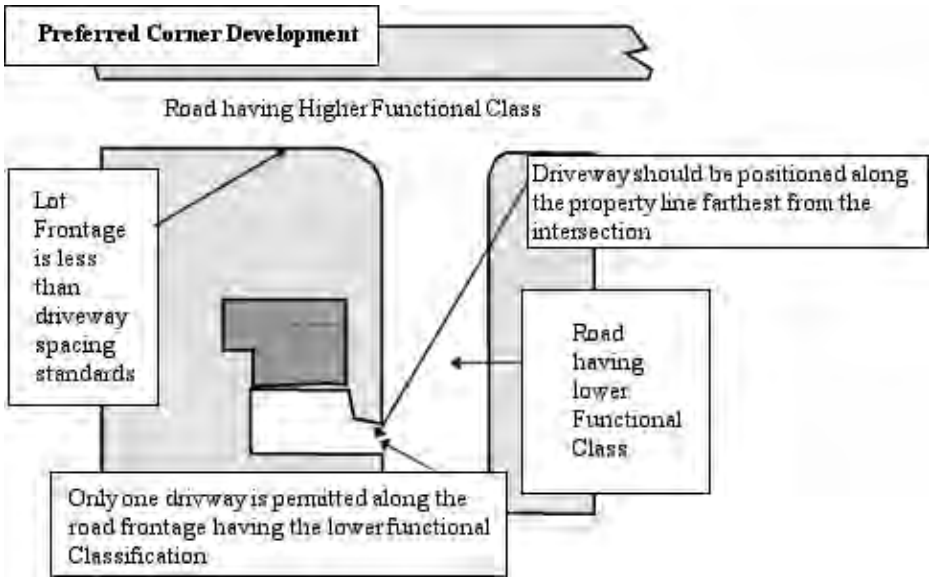
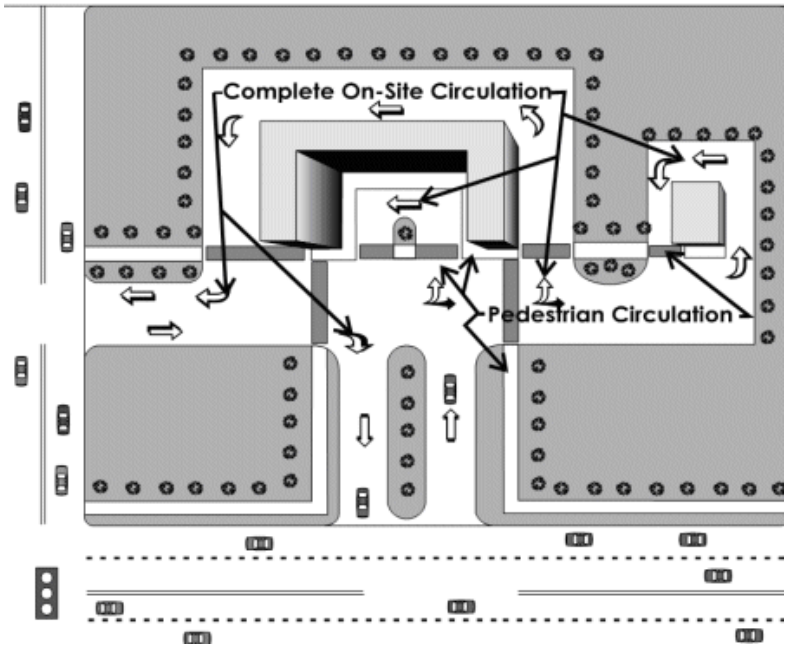


Figure 7. Encourage Joint and Cross Access



Recommendation III. D. Limit the number of access points per property; consolidate access and points and encourage shared driveways.

Ideally arterials would only have property access at intersections and secondary streets as shown in Figure 8. This is not always practical due to lot configurations or topography, but, again, it is the ideal.

Recommendation III. E. Incorporate right-turn only restrictions and limit left-hand turning movements.

Left-turns should be given special consideration as two-thirds of driveway related crashes involve left-turns.[7]

Recommendation III. F. Promote interconnection of parking lots and unified on-site circulation systems.

Properly designed entrances shared by multiple businesses allow more site area for parking, more customer options to access commercial sites and improved landscaping or other site amenities. Internal connections between businesses allow customers to circulate easily, without reentering a busy road.

Recommendation III. G. Establish standards for driveway width, driveway throat length and internal drive aisles to move traffic smoothly off of the adjacent street.

The number of crashes is disproportionately high at driveways, and as result it is important that their design and location receive special consideration.[8]

Recommendation III. H. Install a median on an undivided roadway or replace a continuous two-way left-turn lane with a median.

Openings in the median provide for different turning or crossing maneuvers, depending on how they are designed.

- A directional median opening only allows certain movements, usually a left-turn in or U-turn.
- A full median opening allows all turning and crossing movements and is often signalized. Where too many full median openings exist, agencies may reconstruct the median and close the excess median openings.

Medians can have a profound effect on driver safety compared to two-way left-turn lanes. Adding a median to a road that previously had a continuous two-way left turn lane can reduce the crash rate about 37 percent and the injury rate about 48 percent. For example, when a continuous two-way left turn lane was replaced with a median on Atlanta's Memorial Drive, the crash rate was cut in half.[9]

One reason a two-way left turn lane is less safe than a median is that a driver who is turning left must be able to ensure that the traffic is clear from two directions in multiple lanes. When this is not quite possible, drivers will sometimes use a two-way left-turn lane in the middle of the road while attempting to merge into traffic. Such maneuvers can lead to serious crashes and become more frequent as traffic volumes increase.

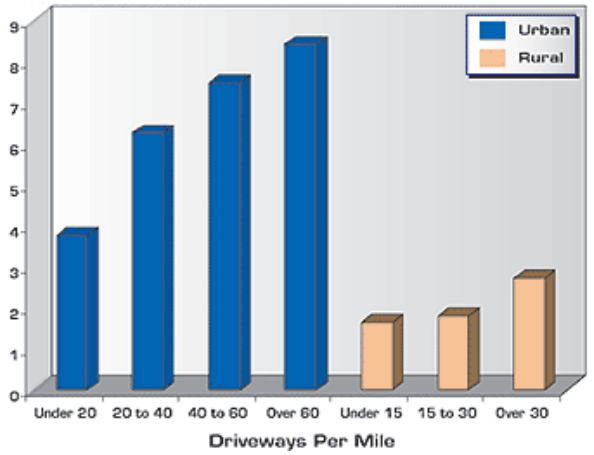
[7]FHWA Office of Operations, 2009

[8]AASHTO Green Book, 2004, p. 729

[9]FHWA, Office of Operations, 2009

Figure 8. Before & After: Incorporating Access Management Techniques

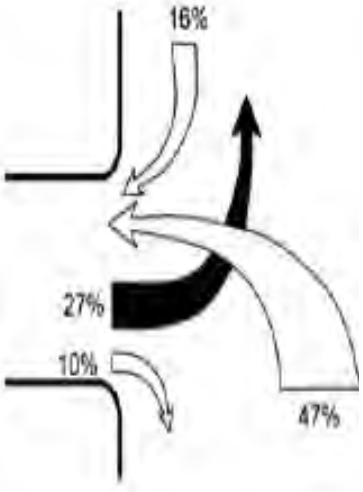
Figure 9. Crashes per million VMT.



Business owners may object to medians and especially to preventing potential customers from turning left into their businesses. The perception is that these access management treatments hurt business and revenue. However, a Federal Highway Administration study shows that this is not necessarily the case. The number of customers making left turns into a business is likely already very low during peak travel periods or if the business is on a congested roadway. This is because left turns into any business become increasingly difficult as traffic volumes in the opposing lanes increase.[10]

Perhaps today, customers wait with apprehension to turn left as cars queue behind them, or must shoot across a busy road to complete a left turn out. A turn lane at a median opening or signalized intersection will allow them to wait safely to complete a U-turn when traffic clears, and that is truly a safer option on a busy road. In fact, the left-turn into and out of a driveway is less safe than a U-turn and comprises the majority of driveway crashes. Studies have shown

Figure 10. Crashes by driveway movement.



that making a u-turn at a median opening to get to the opposite side of a busy highway is about 25 percent safer than a direct left turn from a side street or other access point.[11]

Surveys show that a majority of drivers have no problem making u-turns at median openings to get to businesses on the opposite side of the road. Where direct left-turns are prohibited, studies show that motorists will change their driving or shopping patterns to continue patronizing specific establishments. In fact, most drivers are reporting that access management improvements made the roads safer and that they approve of the changes, despite minor inconveniences associated with u-turns.[12]

Some owners of drive-by businesses have reported a loss of customers following a median project or other change that has eliminated the left-turn-in opportunity (and less often left-turn-out), although the majority do not. For example, a before-and-after study of a median reconstruction project in Florida involving numerous median-opening closures found that the majority of surveyed merchants, 68 percent of the 96 respondents, reported little or no economic impact to their businesses, although 27 percent reported some type of loss. According to the study, businesses that feel they were adversely impacted also have competition nearby or may have experienced reduced visibility of signage.[13]

[10]Safe Access is Good for Business. 2008. Federal Highway Administration. Retrieved 2/16/2010. www.ops.fhwa.dot.gov/access_mgmt.

[11]FHWA, Office of Operations, 2009

[12]Ibid

[13]Safe Access is Good for Business. Office of Operations, U.S. DOT, Federal Highway Administration: August 2008. http://ops.fhwa.dot.gov/publications/amprimer/access_mgmt_primer.htm.

Recommendation III.I. Coordinate among jurisdictions

Develop a method of reviewing curb cut requests between Loudon County, Lenoir City and TDOT. Consistently adhere to adopted standards through Memorandum of Understandings (MOUs). Presently access is managed by TDOT as U.S. Highway 321 is a state-managed road, but TDOT's general policy is to follow the local jurisdiction's lead. Solidifying this policy into a true agreement will help prevent people from trying to sidestep the process.

CASE STUDY: Coordination – City of St Joseph, Missouri

Access requested on Missouri Department of Transportation (MoDot) routes requires the permission of both the City of St. Joseph AND MoDot. Applicants shall initiate the permit process with the City of St. Joseph and, if approved, also obtain a permit from MoDot. No access construction or alteration shall occur without an approved access permit from BOTH MoDot and the City of St. Joseph along MoDot routes. For commercial projects, the coordination of this effort may occur at the City's Development Review meetings, but is the applicant's responsibility.

Upon receiving an access permit from both agencies, the applicant shall comply with MoDot construction standards for accesses located on a MoDot route. Applications on City routes shall conform to the construction standards of the City of St. Joseph.

The City of St. Joseph and MoDot utilize a coordinated permitting process for roadway access and have their own access management standards. Under this standard, the applicant (on a MoDot route) shall comply with the City of St. Joseph access management standards unless in conflict with a more stringent MoDot requirement. In that case, the more stringent of the two standards shall apply.

Source: www.narc.org

Recommendation IV: Increase Street Connectivity

Many communities have major thoroughfare plans, but lack plans for local street connectivity and pedestrian and bicycle accessways. The result is discontinuous street and pedestrian systems, and lack of connections between neighborhoods and activity centers. Each subdivision loads onto adjacent collectors and arterials forcing residents onto the major street system to travel anywhere, clogging major streets with short-distance local traffic.

Local agencies can provide guidance for local street connectivity developed as part of a district-wide or citywide plan. A closely related concept to access management is that of a well-connected street network. Networks disperse traffic over a connected system of streets so that every trip does not funnel to a single arterial. Interconnected networks provide two main benefits for complete streets:

1. They disperse traffic – networks preclude the need for large, congested multi-lane (6+ lane) arterials that do not provide a safe or comfortable experience for motorists, bicyclists, or pedestrians.
2. They result in highly walkable blocks that provide direct routes instead of long, circuitous linear paths.[14]

Figure 11 shows the difference between a good, connected street network and a poor one that puts an undue burden on the arterial; the reliance on the arterial shown in the second illustration makes the public investment obsolete before its time and requires further public investment to add capacity.[15]

Loudon County and Lenoir City should create a master road plan that can be used to guide future growth and development of land adjacent to U.S. Highway 321 and throughout the city and county. Currently there are only 34 connections to the main corridor and only six of those are controlled intersections.

Recommendation V: Increase Transportation Options

While Loudon County has historically been a rural county, it is developing more and more in a suburban fashion that makes accommodating other modes not only appropriate but necessary. Everyone is a pedestrian once they step outside of their automobiles, and it is important that developments provide a safe, pleasant and accessible environment for all users. It is important to remember that decisions made today will affect users of U.S. Highway 321 for decades to come. It is unclear whether or not automobiles will be able to remain the primary source of transportation for this region. For this reason, and to better accommodate all users who may not be able to drive (such as the young, the elderly, the disabled), it is clear that future developments need to accommodate all users.

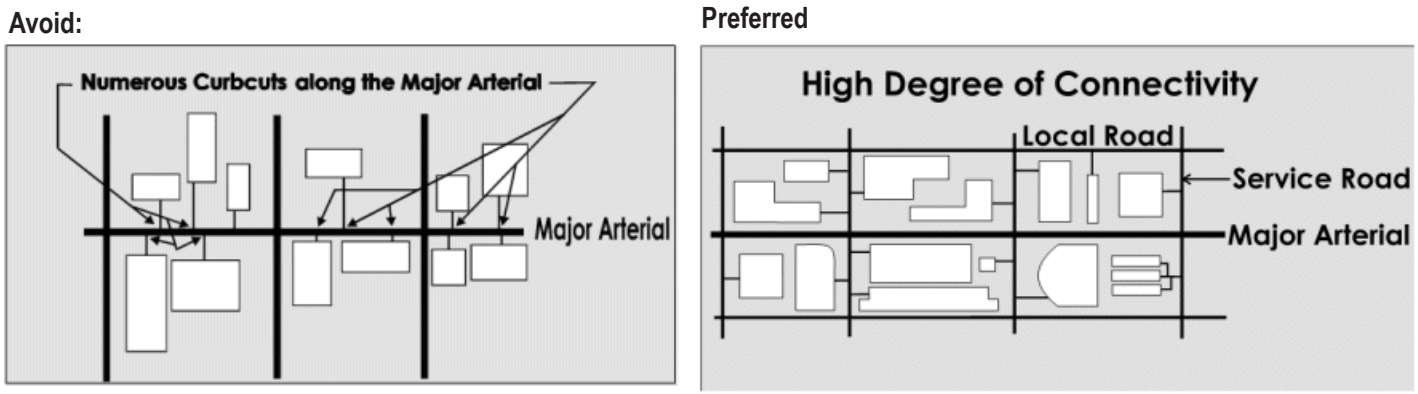
Recommendation V. A. Encourage pedestrian accommodations in new developments

Sidewalks, especially around commercial developments and nodes, increase safety, aesthetics and all residents' and visitors' mobility options. Sidewalks should be considered as part of every site design process.

[14]Gresham Smith and Partners, 2009

[15]City of Louisville, (Kentucky) Access Management Design Manual, 2009

Figure 11. Good and poor connectivity



Recommendation V. B. Explore greenway possibility

Presently there is a greenway planned for Lenoir City. The Town Creek Greenway will run for 1.75 miles along Town Creek from Broadway to Lenoir City Middle School. A more developed greenway network and one that runs along U.S. Highway 321 from the dam to Blount County would help preserve the area's rural characteristics while enhancing economic development through recreation and eco-tourism opportunities. The Great Smoky Mountains Regional Greenway Council is a good resource for future greenway planning efforts. The Council is made up of representatives from Knox County, Blount County, Sevier County and Cocke County. The purpose of the Council is to create a regional greenway system. In the future a greenway network in Loudon County could link to the Blount County greenway system and play a part in the Greenway Council's vision for connecting Knoxville to the Great Smoky Mountains National Park. Greenways have proven to be very popular community amenity both here and throughout the United States. An asset such as a greenway would serve as an attractive amenity for future economic development interests.

Greenways vary in width and function, depending on opportunity and community interests. In urban areas, limited space often dictates that greenways primarily support recreation and non-motorized transportation. In rural areas, large corridors may be established strictly for wildlife or water quality protection. Greenways provide many benefits.[16] They can:

- Enhance our quality of life by providing scenic places for us to enjoy.
- Benefit the economy by increasing adjacent property values, attracting new industry, stimulating re-investment in once blighted urban and suburban areas and encouraging tourism.
- Provide trails for recreation and for transportation routes that connect people, communities, and the countryside.
- Improve personal health and fitness for greenway trail users.
- Provide close to home outdoor recreation opportunities. Because greenways are typically long and narrow, they provide more access to more people.
- Improve water quality and lessen the impact of flooding. Trees and other vegetation along river greenways filter surface runoff (pollutants) and prevent erosion by anchoring the soil along the banks. Also streamside vegetation acts as a sponge to help absorb swollen rivers.
- Enhance or protect forests. Forests filter air pollutants and improve air quality. Forests also provide food and shelter for wildlife and lower summertime city temperatures by providing natural air conditioning.
- Improve wildlife habitat by providing migration corridors that allow wildlife populations to move from one isolated natural area to another. This improves the overall health of some species of wildlife and allows for the survival of others. Greenways also provide shade, keeping water temperatures cool for aquatic life, birds and animals.
- Act as outdoor classrooms.
- Encourage growth while protecting the green landscape for which our state is famous.

[16]Source: Tennessee Parks and Greenways Foundation, 2009.

Figure 12. Existing Regional Greenway Network

Chapter 3: Implementation Strategy

A comprehensive corridor management plan is a key component to managing congestion and reducing the impacts of auto traffic on corridors such as U.S. Highway 321. In order to effectively accommodate expected growth along the corridor while preserving the integrity of the corridor and enhancing the traveler's sense of place, a strategy must be in place to guide future development along the corridor. Recognizing that implementation is the biggest challenge especially for small jurisdictions with limited resources, recommendations should be implemented in stages. Key aspects of good corridor development or redevelopment to keep in mind during the implementation stage include:

- Have the tools in place to create the corridor the community wants when redevelopment does begin.
- Have good, consistent site plan review.

The corridor and its adjacent uses will not change overnight but local governments can begin thinking about what can be done in the public realm to encourage private investment along the corridor. Below is an implementation strategy that can be phased in over a 10-year timeframe:

- Immediate Actions (within one year)
- Short-term Actions (within one-five years)
- Long-term Actions (within the next 10 years)

All of the following recommendations are strategies or actions that have been taken in other communities to better manage major transportation corridors. Throughout this document and within the appendices are examples of tools, strategies and case studies from other communities.

Immediate Actions (within one year)

Recommendation 1.1

Continue the corridor planning process. Provide a forum for public participation through implementation committees or workshops. Create opportunities for education and participation in the planning process for all stakeholders. Utilize these forums to identify problems and opportunities that need to be addressed within the plan. Assemble a group of local technical experts to assist in facilitating and answering technical and policy related questions during the forums (planning staff, utility providers, engineers, TDOT officials, and other groups). It is also important to include outside experts and staff from other communities that have been successful in implementing a corridor management program in their own community.

Recommendation 1.2

Finalize a community vision for the corridor. Refine the recommendations and begin working with key stakeholders to develop a plan.

Recommendation 1.3

Continue to encourage partnerships between jurisdictions. One way to initiate better coordination between jurisdictions would be to develop an interim access management policy and draft a Memorandum of Agreement (MOU) to be signed by Loudon County, Lenoir City and the Tennessee Department of Transportation (TDOT). This policy will help address access issues along U.S. Highway 321 until recommendations 2.1 and 2.2 can be implemented.

Recommendation 1.4

Require a traffic impact and access study for all proposed developments, changes in use, or concept subdivision plans for projects adjacent to U.S. Highway 321.

Short-Term Actions (within five years)

Recommendation 2.1

Coordinate zoning across jurisdictions. Loudon County and Lenoir City should review their zoning ordinances and work to resolve incompatibilities between the two ordinances. These changes should reflect the vision for the future development of U.S. Highway 321 and the adjacent land. Changes to subdivisions and site regulations would likely also be required to implement vision.

Recommendation 2.2

Implement a corridor overlay zone. Develop a boundary for the corridor overlay zone along U.S. Highway 321 and incorporate it into both Loudon County's and Lenoir City's existing zoning ordinances. The overly zone should address streetscape standards, appropriate land uses, parking standards, access management practices,

and a plan for future utility expansions. This may include allowing residential mixed-use development, reducing parking ratios and allowing shared parking, reducing setback requirements and encouraging more street trees. A new MOU would need to be signed by all jurisdictions in order to ensure consistent access management practices.

Recommendation 2.3

Identify key nodes where locating new development makes the most sense. Identify areas with good existing access and utilities. Utilizing incentives and encourage new development to locate within these nodes. Incorporate these nodes and any standards for them into the corridor overlay zone recommended above.

Recommendation 2.4

Initiate transportation improvements as new developments are proposed in order to leverage public and private dollars.

Long-Term Actions (within the next 10 years)

Recommendation 3.1

Increase street connectivity. Develop a road plan for key areas adjacent to U.S. Highway 321 to help relieve congestion and disperse local traffic onto collectors and side streets.

Recommendation 3.2

Explore expanding the greenway network within Loudon County from the planned Town Creek Greenway in Lenoir City. Partner with the Great Smoky Mountains Regional Greenway Council and develop a plan for Loudon County to link to the Blount County greenway system.

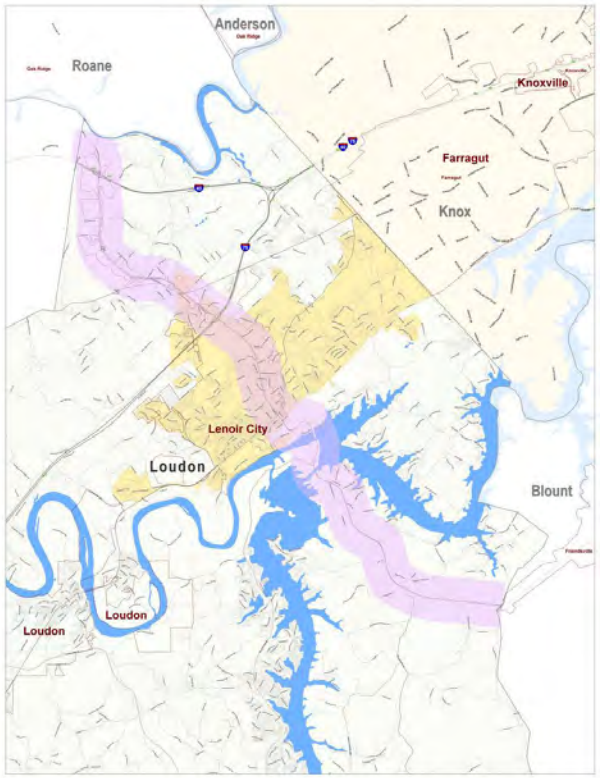
Appendix A: Background Analysis

The purpose of this analysis is to provide London County and Lenoir City with an initial analysis of U.S. Highway 321. This analysis will provide the foundation for future corridor planning at the local and regional level. For many corridors to remain safe and viable they must evolve to meet today's community needs.

Existing Facility

It is important to first take a look at the corridor as it is today. The background of the corridor, as well as its physical characteristics and the resources surrounding it, can set the stage to plan for the future.

Figure A.1 Study Area



Corridor Description

U.S. Highway 321 is a spur of U.S. Highway 21. It runs for 526 miles from South Carolina to Tennessee. The northern terminus of U.S. Highway 321 is between Lenoir City and Oak Ridge, Tennessee, at Interstate 40 exit 364, which is about 4 miles (6.4 km) west of I-40's junction with Interstate 75. The southern terminus is in Hardeeville, South Carolina at the intersection with U.S. Highway 17, less than a mile away from Interstate 95 and 15 miles (24 km) north of Savannah, Georgia.

The remaining portions of the highway through Loudon County are a minimum of 4 lanes, typically a divided highway until it reaches Fort Loudon Dam in Loudon County where it crosses the Tennessee River at just south of Lenoir City and terminates at I-40. The study area for this analysis is limited to U.S. Highway 321 from the Roane County line in the north to the Blount County line in the south. The study area encompasses approximately 12 miles of the U.S. Highway 321.

Socioeconomic Characteristics

Loudon County's employment is projected to grow by 54 percent from 18,720 to 28,861 and its population is projected to grow by 82 percent from 43,411 to 79,010 by 2035.[1] The projected (e.g. anticipated) growth Loudon County will need to absorb over the next 30 years. The Knoxville region is expected to grow by 56 percent between now and 2035. Loudon County's employment is projected to grow by 54 percent from 18,720 to 28,861 and the population is projected to grow by 82 percent from 43,411 to 79,010. These estimates indicate there will be more people than jobs in the county with a high number of retirees expected to continue moving to the area.

The median age in Loudon County is about 42 years old compared to 37 years old in Knox County. Nearly one-quarter of Loudon County's population is 62 years and older.[2]

Land Use and Character

Future land and zoning is guided by the Loudon County Growth Plan from 1999 which informs the 20-Year Land Use Plan. This plan is used by the county currently to guide land use decisions.

The land uses in the southern and northern sections of the corridor are predominantly rural and agricultural. Commercial uses and driveway cuts become more frequent from Eaton Crossroads to the I-75 interchange. From I-75 to U.S. Highway 11, land uses consist of primarily strip commercial developments with a few newer shopping centers and some institutional uses such as, Fort Loudon Medical Center.

The majority of residential land uses are large lot developments from 1 to 5 acres with a few farms still intact along the corridor. According to the Tennessee

[1]Woods & Poole, and MPC, 2009

[2]American Community Survey, 2007

Department of Agriculture there are 15 Century Farms located in Loudon County, two of which are within one-half mile of the corridor.[3]

Utilities

Two utility companies serve the study area: Loudon County Utility Board, Lenoir City Utility Board. This map shows ROW, parcels in pink are within the Lenoir City and the purple lines indicate water and sewer lines. The water line runs out Highway 321 to Rarity Point and Ft. Loudon Estates just beyond the bridge. Water and sewer have been extended from Lenoir City to the I-40 off-ramps.

Roadway Characteristics

U.S. Highway 321's characteristics vary slightly along the mile study area. The corridor consists of two to four lane arterials with 12 foot lanes, 8-11 foot shoulders, median divided with the exception of the roadway segment from Roane County Line to the I-40 westbound ramps. This section is two 12-foot lanes undivided with eight foot shoulders. Posted speed ranges from 45-65. Current average daily traffic ranges from 6,880-19,040; the least amount of traffic is carried from the Roane County Line to the I-40 westbound ramps and the most traffic is carried between U.S. Hwy 70 and Canal Bridge.

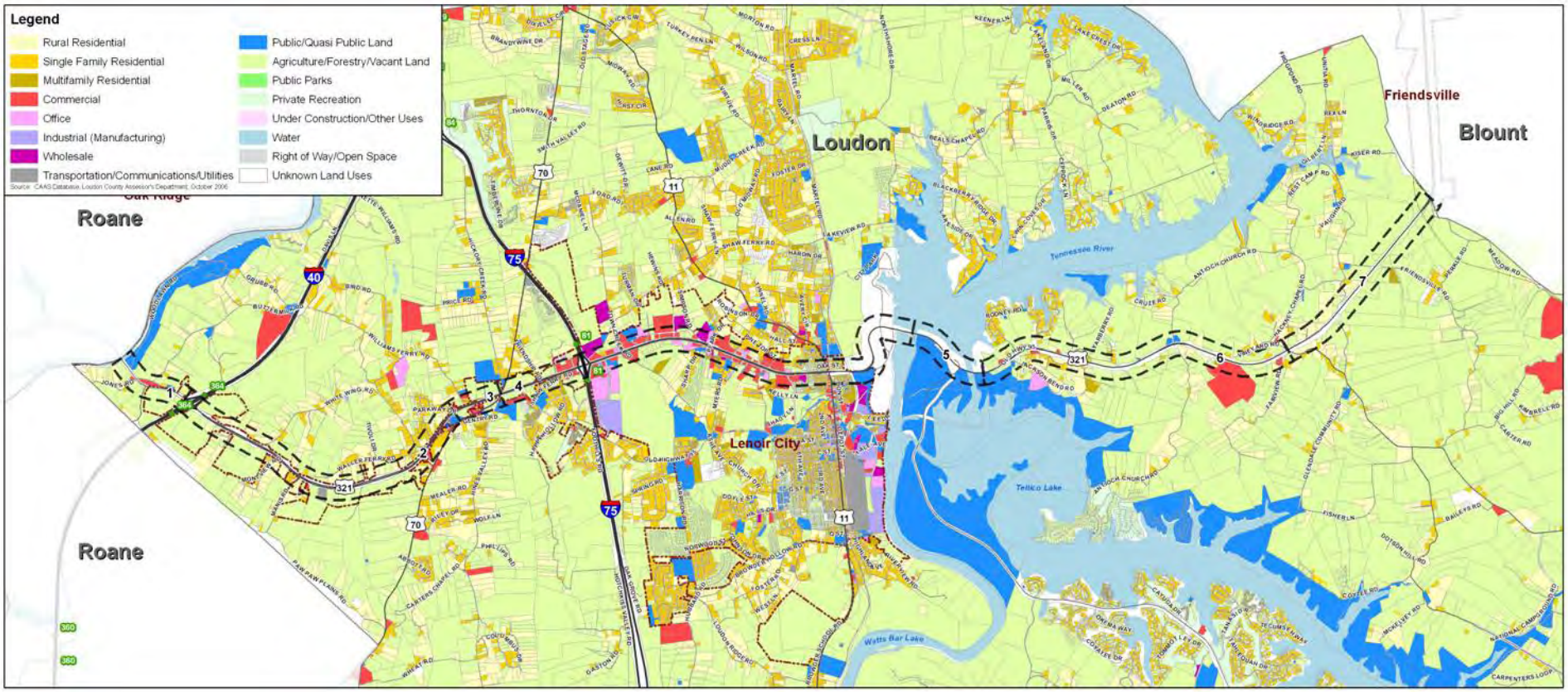
The Tennessee Department of Transportation's (TDOT) varies along the corridor from 50 feet (on the TN River Bridge to the Ramp to Tellico Pkwy) to 300 feet (near White Wing Road).

Safety

In locations where there is a physical median between travel lanes, this should be maintained. Having a separation of travel lanes by a landscaped median helps prevent head on collisions. In order to maintain U.S. Highway 321 in the eastern portion of

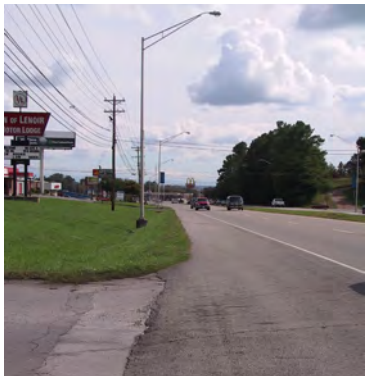
[3]Century Farms is a state program that honors and recognizes the dedication and contributions of families who have owned and farmed the same land for at least 100 years. There are no legal restrictions or protections placed on the property.

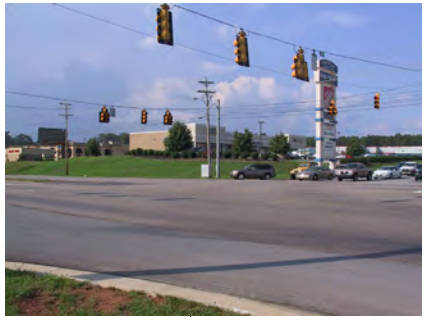
Figure A-2: Existing Land Use



Loudon County, speeds will tend to be higher. Due to this higher speed, the installation of turn lanes should be evaluated for all median crossings to allow for adequate deceleration and turn lane queuing to keep stopped and slowing traffic off of U.S. Highway 321. For all median crossings, "One Way" and "Do Not Enter" signage should be installed for all median crossings in accordance with the Manual on Unifomr Traffic Control Devices.

Figure A-3: Roadway Characteristics





Access Management

The use of access management techniques is crucial to achieving the concept goals and should be implemented along the entire length of the corridor. Access management is defined as the planning, design, and implementation of land use and transportation strategies that maintain a safe flow of traffic while accommodating the access needs of adjacent development. The goal of access management is to balance the need to provide efficient, safe, and timely travel through the state with the desired ability to allow access to the individual destination. Examples of access management techniques include converting facilities with a continuous center turn lane into a median divided facility, consolidating existing median openings and/or converting them to directional crossings (such as a leftover), consolidating or creating shared driveways, constructing rear service roads, and coordinating land use decisions with the transportation function of the highway corridor.

Studies show the safety and capacity benefits of applying access management techniques. Research indicates that as the number of access points and driveways on a roadway increases, the number of accidents on the facility also increases, while the average speed decreases. Reducing and minimizing the number of access points is critical to obtaining high-speed, safe facilities. Additionally, high access managed facilities, such as four-lane divided roadways with shared driveways, provide greater capacity than those that are poorly managed, such as five-lane roadways with multiple driveway connections.

Very little access management has occurred along U.S. Highway 321 to-date.

Figure A-4: Access Management

Table A.1 Corridor Transportation and Safety Statistics 2006-2008

	Roane County Line to I-40	I-40 to Parkway Drive	Parkway Drive to U.S. 70	U.S. 70 to I-75	TN River Bridge to Canal Bridge	Canal Bridge to SR 95	SR 95 to Blount County Line
ADT (2006 - 2008)	6,880	9,210	12,320	18,490	19,040	11,620	10,390
Capacity (vehicles per day)	16,300	34,200	34,200	32,200	16,300	34,200	34,200
Volume to Capacity Ratio (V/C)	0.42	0.27	0.36	0.57	1.17	0.34	0.30
Level of Service (LOS)	B	A	B	C	F	B	B
Posted Speed Limit (mph)	45	55	55	40	40	55/65	65
Peak Hour Average Speed (mph) from Travel Demand Model	34.7	57.2	39.6	33.8	22.4	56.4	66.4
Segment Length (miles)	0.89	3.29	0.51	0.97	0.69	3.33	2.15
Total Crashes (2006 - 2008)	8	39	13	102	16	31	21
Avg. Crashes/Month (2006-2008)	0.2	1.1	0.4	2.8	0.4	0.9	0.6
Injury Crashes	5	9	4	23	7	8	3
Fatal Crashes	0	0	0	0	0	0	0
Crash Rate (Crashes/Million Veh. Miles)	1.20	1.31	2.31	3.48	1.62	0.76	0.88
Statewide Avg Crash Rate	1.70	0.80	1.85	1.85	1.70	0.80	0.80
Ratio of Crash Rate to Statewide Crash Rate	0.71	1.64	1.25	1.88	0.95	0.95	1.10
Average Cross Section & Lane Widths	2 - 12 ft. lanes, 8 ft. shoulders, undivided	4 - 12 ft. lanes, 10 ft. shoulders, median divided	4 - 12 ft. lanes, 8 ft. shoulders, median divided	4 - 12 ft. lanes, 8 ft. shoulders, median divided	2 - 12 ft. lanes, 10 ft. shoulders, undivided	4 - 12 ft. lanes, 11 ft. shoulders, median divided	4 - 12 ft. lanes, 8 ft. shoulders, median divided

** Data is not included for the Lenoir City segment between I-75 and the TN River Bridge

Corridor Challenges

Corridors such as U.S. Highway 321 provide much needed retail and business opportunities for communities along with access to regional amenities such as, the Great Smoky Mountains and Oak Ridge National Laboratories. Over time shopping preferences and additional competition can rob areas of their former luster. Many of our region's corridors are experiencing changes in land uses, building types, and deteriorating historical and cultural resources. U.S. Highway 321 through Loudon County is experiencing many of these challenges today.

Some of those challenges include:

- Uncontrolled driveway cuts
- Overhead utilities that increase visual clutter
- Inconsistent lighting
- Billboards, advertisements and roadway signage that has no standard or consistency
- Lack of unifying architectural or landscape theme
- Limited pedestrian and bicycle amenities
- Safety issues

Figure A-5: Corridor Challenges

Appendix B: Land Use Strategies for Major Transportation Corridors: Examples from Other Communities

Colorado – Intergovernmental Agreements Address Highway Corridor Development

Local and state government agencies in Colorado make widespread use of intergovernmental agreements (IGA) to coordinate land use planning and transportation issues. For example, the Towns of Windsor and Severance entered into an IGA to harmonize planning and govern development along CO State Highway 392 between the two towns. Their goal was to avoid rapid and poorly planned development along this highway corridor that might be exacerbated by municipal competition for tax revenue. The agreement, adopted in 2000, does the following:

- Solidifies the growth boundaries for both Windsor and Severance, agreeing upon areas where the boundaries of the two towns meet and directing development to areas within the towns' boundaries;
- Creates a Cooperative Planning Area (CPA) for joint planning, in which the towns share both the responsibility for and the benefits of development in this area with high industrial and commercial growth potential along CO State Highway 392;
- Requires both towns to develop and implement a Corridor Development Plan for the CPA – containing specific elements – within 12 months of signing the intergovernmental agreement;
- As development occurs in the CPA, the intergovernmental agreement implements revenue sharing in which the towns divide the tax revenue from development in the CPA;
- Coordinates the development of an efficient and well-planned water and sewer service for the CPA; and
- Adopts a consistent and mandatory design standard for the CPA.

For more information see: http://www.sprawlaction.org/halloffame/HWindson.html.

Florida – Corridor Management Ordinance and U.S. Highway 98

Section 337.273, Florida Statutes, provides that local governments may designate a transportation corridor for management by including the corridor in the transportation element of the local comprehensive plan, and may thereafter adopt a corridor management ordinance to include criteria to manage the land uses within and adjacent to the transportation corridor. The statutes acknowledge that coordinating land use and transportation is important to alleviating traffic congestion and maintaining an effective transportation system, and that transportation corridor management can best be achieved through the inclusion of corridors in local government comprehensive plans. The U.S. Highway 98 corridor in Polk County represents a successful example of corridor management. In 2001, as development pressures began north of the city limits of Bartow, local officials saw the need to take action to prevent access and congestion problems along the previously undeveloped corridor. The Polk County Transportation Planning Organization, the MPO for the region, drafted an MOU in cooperation with the Florida DOT, the Cities of Bartow and Lakeland, and Polk County.

The MOU established the basis for widening U.S. Highway 98 to six lanes while providing transit service and developing a multi-use recreational trail. The MOU also outlined state and local objectives that can be met for the roadway through land development and subdivision regulations. Finally, the MOU identified the intention of all three local governments to amend their comprehensive plans to include a designated U.S. Highway 98 corridor (pursuant to state statutes). The plans also would be amended for consistency with a corridor access management plan (CAMP) developed by FDOT in consultation with the jurisdictions.

The CAMP was ultimately adopted in 2004 and municipalities are in the process of updating their plans. A proposed service road system, which is beginning to be developed, will provide access to and between businesses accommodating more "local traffic" while allowing through traffic on the arterial. The Steering Committee charged with developing the CAMP continues to meet to ensure implementation, discussing the details of how proposed developments should comply with the CAMP.

Florida – Martin County Incorporates Access Management in Local Ordinances

Martin County, Florida's Roadway Design Ordinance (no. 561) includes a section on access

management addressing the access classification of the roadway and related intersection spacing standards, corner clearance, access among properties, driveway spacing and design, and overlay zones. The ordinance also includes sections on mobility and connectivity, with the intent of discouraging the use of local streets for cut-through traffic while maintaining the overall connectivity of the roadway system for vehicle traffic, bicyclists, and pedestrians.

For more information: http://webserver.martin.fl.us/GOVT/depts/leg/ords/ord.561.html.

Indiana – Madison County Adopts a Corridor Overlay District

After adopting a new comprehensive plan in 2001, Madison County, Indiana (northeast of Indianapolis) passed adevelopment ordinance that includes new road design standards, access control, corridor preservation, corridoroverlay districts, and non-motorized facility requirements. Excerpts from the Corridor Overlay District Zoning Ordinance include:

- Purpose – The purpose of this Article is to establish an overlay district to address the unique characteristics of the properties adjacent to the major transportation corridors in Madison County except in Planned Unit Development districts.
- Building Orientation – All primary structures shall face the front of the lot on which they are located.
- Landscaping – Landscaping screening shall be provided around the perimeter of all parking areas whichinclude 15 or more parking spaces.
- Entrance Drives – Entrance drives accessing lots from an arterial or collector road may be located no closer than 200 feet from any other drive on the same side of the public road, or 500 feet from any intersection of two public road rights-of-way. Interior driveways passing through front yards parallel to public roads shall be designed and constructed to stub into adjacent properties and included in cross access easements.
- Shared Parking – Parking areas restricted to patrons of the business located on each specific lot shall be prohibited.
- Parking Location – No more than 30 percent of the parking spaces provided on each lot may be placed between the front facade of the primary structure and the abutting public street.
- Pedestrian Walkways – Pedestrian walkways shall be provided across the frontage of all lots, connecting the lot, the primary structure, and parking areas to each other and with adjacent properties.

Source: Madison County Zoning Ordinance Article Four: Corridor Development Overlay District. http://www.mcplanning.net

Kentucky – Zoning Overlay District Complements Arterial Improvements in Bowling Green

In Bowling Green in southwestern Kentucky, the Kentucky Transportation Cabinet and the community had reached an impasse over the widening of Cemetery Road from two to five lanes, first proposed in the early 1980s to address congestion and safety issues on this heavily traveled road. Residents feared that the widened road, which serves as an important gateway connecting downtown Bowling Green to Interstate 65, would be overwhelmed with strip development similar to Scottsville Road to the north.

Reviving the project in the mid-1990s, Cabinet district engineers worked with local stakeholders to select a new alignment for an arterial, redesign it as a four-lane divided boulevard, enact land use protections along the alignment through a zoning overlay district, and incorporate bicycle and pedestrian accommodations into the design. The overlay district, written by the city and county planning commission, specifies allowable uses, building design and landscaping features, and connections to the roadway and the shared-use path. The combination of design changes and land use protections allowed the project to move forward, and reconstruction of Cemetery Road was Kentucky Transportation Cabinet completed in 2004.

For more information: http://www.warrenpc.org/

New Jersey – Corridor Planning Integrates Transportation and Land Use

The New Jersey Department of Transportation (NJDOT) is undertaking nine corridor planning pilot studies throughout the State. The corridors involve arterial roads of two to 30 miles in length with congestion and/or safety problems. The corridor studies are addressing not just the roadway itself, but also local street networks that interface with the arterial roadway as well as adjacent land use patterns. In each case, the NJDOT is working with local jurisdictions to address circulation systems, access management, and land use in the corridor. A significant objective of the corridor studies is to find solutions to transportation problems that are less capital-intensive than building multi-lane and

limited-access highways, as NJDOT has realized that there is no way it can fund all of the statewide capital improvements that have been studied or planned throughout the State.

NJDOT's pilot studies are bringing in specialists to help communities reshape their land use and street network patterns. NJDOT is only funding studies in communities, though, that have expressed a willingness to work with the department to include land use strategies as part of the solution set. In Trenton, for example, the State is working with the city on the redesign of NJ State Route 29, the Riverfront Parkway, currently and a four-lane freeway walling off the downtown from the Delaware River. The city would like to convert the highway to a boulevard and realign it to reduce impacts on the downtown. The state has indicated its willingness to pursue the project, but only as long as the city undertakes land use and local road network planning in conjunction with the state highway redesign.

For more information: http://www.njtpa.org/plan/Need/Corridor/Default.aspx

West Virginia – Putnam County Adopts a Corridor Land Use Plan

In rural Putnam County, West Virginia, the county led the development of a corridor land use plan to accompany the planned widening and realignment of U.S. Highway 35 through the county, which would address safety and capacity problems on a major truck route. County officials expected that the project, in conjunction with planned utility expansions, would result in additional scattered development that would threaten scarce prime agricultural land in the river valley and change the existing rural character of development. Through a public involvement process, the county developed a community-supported plan for the corridor that would concentrate commercial development around interchanges and in specific industrial development areas, while limiting development outside of these areas to rural densities and uses. The county has since adopted zoning consistent with this plan. The project is especially noteworthy because it represents the first application of zoning in this rural area.

For more information: http://planning.putnamcounty.org/zoning.htm

Wisconsin – WisDOT Participates in Local Comprehensive Planning

To preserve mobility and safety, ensure environmental protection, and support state-led smart growth efforts, the Wisconsin Department of Transportation (WisDOT) has begun over the past five to 10 years to work with communities on land use issues, improving the linkage between transportation planning, project development, and land use decision-making. WisDOT's approach has largely focused on outreach to local communities within the corridor planning process as well as within each community's comprehensive planning process. The agency does not have formal authority to participate in the local planning process, but they are working to build relationships with communities in order to be able to provide input on an informal basis.

District staff is provided with information on the status of local comprehensive plan development in their areas and are encouraged to work with local governments to provide input into these efforts. (State legislation passed in 1999 requires communities to adopt comprehensive plans and establishes a tracking system to monitor plan development.) For example, as part of a corridor planning process for WI State Highway 21, an important east-west corridor connecting Lake Winnebago and the Fox Valley to western destinations, WisDOT District 3 staff has worked with communities along the highway to ensure that protections are implemented to contain strip commercial development and to preserve right-of-way for future expansion or realignment. In the Town of Omro, west of Oshkosh, WisDOT staff attended local planning meetings and reviewed and commented on drafts of the town's comprehensive plan. In its adopted plan, the town reserved right-of-way for a limited-access bypass of the town, identified parallel and local street connections, and recommended zoning around interchanges to support commercial development.

For more information: http://www.dot.wisconsin.gov/localgov/land/ or http://www.dot.wisconsin.gov/projects/d3/index.htm

Maryland – The Annapolis Towne Centre

The Annapolis Towne Centre project is an example of how to create a destination by effectively planning for parking. Parking has a significant impact on whether a development will serve a multitude of uses and result in a destination or whether the development with serve only as single purpose. The Towne Centre project includes two parking structures which accommodate mixed-use retail spaces and includes convenient pedestrian connections between the spaces. This project also allows for future expansion opportunities because

the parking structures have been able to integrate safe, efficient, and adequate parking into the development.

For more information: http://www.visitatc.com/ or http://www.ci.annapolis.md.us/info.asp?page=1363

Appendix C: Municipal Planning Tools Related to Corridor Management

Municipal Development Tools (Regulatory)

Zoning Bylaws
Regulate the type and density of development.

Zoning Districts
Standards defining allowed uses and densities of development (lot, setback, frontage, coverage requirements). Examples: Mixed Use, Industrial/Office, Traveler Service, Conservation districts.

Overlay Districts
Designated areas in which additional standards (e.g., design standards) will be applied to supplement or substitute for the standards of the underlying zoning district. May overlay one or more underlying zoning districts and provide more flexibility within those zones.

Corridor Districts
Site Plan Review Standards within a corridor district may apply to all allowed uses, including site layout and design, access, traffic and pedestrian circulation, landscaping and screening, and other standards as specified in the bylaws (e.g., building orientation, parking areas, and lighting).

Conditional Use Review
Standards applying to listed "conditional uses," to evaluate and avoid or mitigate project impacts on the capacity of existing or planned community facilities, the character of the area, traffic on roads and highways in the vicinity, other municipal regulations, the use of renewable energy resources, and other resources or facilities as specified in the bylaws (e.g., the design and location of structures and service areas, signs, landscaping).

Design Review
Standards applying to site layout and building design (typically within a design review district); planning study required to identify design issues and criteria.

Parking Standards
Standards for the number of required parking spaces by district and/or use type; also may include standards for parking area design, layout and screening, loading and service areas.

Access Management Standards
Standards for limiting the number of access points per lot, frontage distance or use by district or road type; also may include access location and design standards, and reference other state and town access permits.

Sign Standards
Standards for the location, height, sign area, design, and illumination of on-premise signs. Also may be adopted as a separate ordinance.

Use Standards
Standards that apply to specific types of use, to more specifically regulate their sitting, layout, and design (e.g., gas stations, industrial/office parks).

Subdivision Bylaws
Regulate the pattern of development and supporting infrastructure.

Resource Protection Standards
Standards that limit the subdivision of, or otherwise protect, significant natural, cultural and/or scenic features (e.g., through the designation and sitting of building envelopes on lots).

Infrastructure Standards

Standards for the provision and design of supporting infrastructure and utilities (e.g., context sensitive road and pedestrian design, water/sewer line extensions). Should be consistent with other municipal infrastructure standards, official map.

Master Planning

May include master plan, phasing requirements for larger projects, especially in relation to an adopted municipal capital budget and improvement program.

Planned Development

Standards for planned unit development (PUD) or planned residential development (PRD), adopted under zoning and administered in association with subdivision review, which allow density modifications to promote clustered development and protect open space. Standards might also encourage or require compatible lot and road layouts. Examples: traditional neighborhood, transit-oriented, or conservation/open space subdivision designs.

Municipal Development Tools (Non-Regulatory)

A municipality may use the following non-regulatory tools, alone or in conjunction with local bylaws, with the purpose of implementing land use and transportation goals.

Capital Budget and Program

A municipality may adopt a five-year capital program, updated annually and divided into annual capital budgets, to provide for maintaining current and acquiring future capital improvements.

Tax Increment Financing

A municipality may issue bonds to pay for new infrastructure, such as roads, water and sewer lines, in a defined growth center, and apply the incremental tax revenues to pay off those bonds for up to 10 years.

Development Agreements

When it furthers the objectives of the municipal plan and is not possible under current regulations, a municipality may adopt a process, with standards and criteria for its application, to negotiate an agreement for review of a particular parcel that establishes the rights and obligations of all parties.

Transfer, Purchase or Acceptance Development Rights

A municipality may specify sending and receiving areas in order to transfer, purchase, or of accept the donation of development rights, to further the conservation or development objectives of a plan.

Supplemental Plans, which may ultimately become incorporated into a general plan may include:

Official Map

A municipality may adopt an official map which identifies future municipal utility and facility improvements, such as road or path rights-of-ways, parkland, utility rights-of-way and other public improvements to provide the opportunity for the community to purchase land identified for public improvements prior to development for other use.

Access Management Plan

A municipality may adopt an access management plan to manage traffic and access onto public roads from adjacent property.

Downtown, Village Center, or New Town Center Plan

A municipality may adopt a plan for the development and revitalization of downtown and village centers, or to plan for a new town center.

Open Space Plan

A municipality may adopt a plan to assess critical natural resources and to guide public and private conservation strategies.

Appendix D: Additional References and Resources

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Appendix E: ITE Design Parameters for Walkable Urban Thoroughfares

Thoroughfare Design Parameters for Walkable Mixed–Use Areas									
	Suburban (C–3)						General Urban (C–4)		
	Residential			Commercial			Residential		
	Boulevard [1]	Avenue	Street	Boulevard [1]	Avenue	Street	Boulevard [1]	Avenue	Street
Context									
Building Orientation (entrance orientation)	front, side	front, side	front, side	front, side	front, side	front, side	front	front	front
Maximum Setback [2]	20 ft.	20 ft.	20 ft.	5 ft.	5 ft.	5 ft.	15 ft.	15 ft.	15 ft.
Off-Street Parking Access/Location	rear, side	rear, side	rear, side	rear, side	rear, side	rear, side	rear	rear, side	rear, side
Streetside									
Recommended Streetside Width [3]	14.5–16.5 ft.	14.5 ft.	11.5 ft.	16 ft.	16 ft.	15 ft.	16.5-18.5 ft.	14.5 ft.	11.5 ft.
Minimum sidewalk (throughway) width	6 ft.	6 ft.	6 ft.	6 ft.	6 ft.	6 ft.	8 ft.	6 ft.	6 ft.
Pedestrian Buffers (planting strip exclusive of travel way width) [3]	8 ft. planting strip	6–8 ft. planting strip	5 ft. planting strip	7 ft. tree well	6 ft. tree well	6 ft. tree well	8 ft. planting strip	8 ft. planting strip	6 ft. planting strip
Street Lighting	For all thoroughfares in all context zones, intersection safety lighting, basic street lighting, and pedestrian-scaled lighting is recommended. See Chapter 8 (Streetside Design Guidelines) and Chapter 10 (Intersection Design Guidelines).								
Traveled Way									
Target Speed (mph)	25–35	25–30	25	25–35	25–35	25	25–35	25–30	25
Number of Through Lanes [5]	4–6	2–4	2	4–6	2–4	2	4–6	2–4	2
Lane Width [6]	10–11 ft.	10–11 ft.	10–11 ft.	10–12 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.
Parallel On-Street Parking Width [7]	7 ft.	7 ft.	7 ft.	8 ft.	7-8 ft.	7-8 ft.	7 ft.	7 ft.	7 ft.
Min. Combined Parking/Bike Lane Width	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.
Horizontal Radius (per AASHTO) [8]	200–510 ft.	200–330 ft.	200 ft.	200–510 ft.	200–510 ft.	200 ft.	200–510 ft.	200–330 ft.	200 ft.
Vertical Alignment	Use AASHTO minimums as a target, but consider combinations of horizontal and vertical per AASHTO Green Book.								
Medians [9]	4–18 ft.	Optional 4–16 ft.	None	4–18 ft.	Optional 4–18 ft.	None	4–18 ft.	Optional 4–16 ft.	None
Bike Lanes (min./preferred width)	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft./6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.
Access Management [10]	Moderate	Low	Low	High	Moderate	Low	Moderate	Low	Low
Typical Traffic Volume Range (ADT) [11]	20,000–35,000	1,500–25,000	500–5,000	20,000–50,000	1,500–35,000	1,000–10,000	10,000–35,000	1,500–20,000	500–5,000
Intersections									
Roundabout [12]	Consider urban single–lane roundabouts at intersections on avenues with less than 20,000 entering vehicles per day, and urban double–lane roundabouts at intersections on boulevards and avenues with less than 40,000 entering vehicles per day.								
Curb Return Radii/Curb Extensions and Other Design Elements	Refer to Chapter 10 (Intersection Design Guidelines)								

Table 6.4 Notes:

1. Multiway boulevards are a special form of boulevards. Generally they add one–way, 16–20 foot wide access lanes adjacent to the outer curb and separated from the through traffic lanes by a longitudinal island at least 6 ft. wide (10 ft. if accommodating transit stops). Access lanes have curb parallel parking plus one moving traffic/bike lane with a target speed of 15–20 mph. All vehicular traffic on the access lanes is local. See Chapter 6 section on multiway boulevards for additional information.
2. For all context zones with predominantly commercial frontage, this table shows the maximum setback for buildings with ground floor retail. In suburban contexts, office buildings are typically set back 5 ft. further than retail buildings to provide a privacy buffer. In general urban and urban center/core areas, office buildings are set back 0–5 ft. Setback exceptions may be granted for important civic buildings or unique designs.
3. Streetside width includes edge, furnishing/planting strip, clear throughway, and frontage zones. Refer to Chapter 8 (Streetside Design Guidelines) for detailed description of sidewalk zones and widths in different context zones and on different thoroughfare types. Dimensions in this table reflect widths in unconstrained conditions. In constrained conditions streetside width can be reduced to 12 ft. in com-

Thoroughfare Design Parameters for Walkable Mixed–Use Areas									
	General Urban (C–4)			Urban Center/Core (C–5/6)					
	Commercial			Residential			Commercial		
	Boulevard [1]	Avenue	Street	Boulevard [1]	Avenue	Street	Boulevard [1]	Avenue	Street
Context									
Building Orientation (entrance orientation)	front	front	front	front	front	front	front	front	front
Maximum Setback [2]	0 ft.	0 ft.	0 ft.	10 ft.	10 ft.	10 ft.	0 ft.	0 ft.	0 ft.
Off-Street Parking Access/Location	rear, side	rear, side	rear, side	rear	rear	rear, side	rear	rear	rear, side
Streetside									
Recommended Streetside Width [3]	19 ft.	16 ft.	16 ft.	21.5 ft.	19.5 ft.	16 ft.	21.5 ft.	19.5 ft.	16 ft.
Minimum sidewalk (throughway) width	8 ft.	6 ft.	6 ft.	10 ft.	9 ft.	6 ft.	10 ft.	9 ft.	6 ft.
Pedestrian Buffers (planting strip exclusive of travel way width) [3]	7 ft. tree well	6 ft. tree well	6 ft. tree well	7 ft. tree well	6 ft. tree well	6 ft. tree well	7 ft. tree well	6 ft. tree well	6 ft. tree well
Street Lighting	For all thoroughfares in all context zones, intersection safety lighting, basic street lighting, and pedestrian-scaled lighting is recommended. See Chapter 8 (Streetside Design Guidelines) and Chapter 10 (Intersection Design Guidelines).								
Traveled Way									
Target Speed (mph)	25–35	25–30 [4]	25	25–35	25–30	25	25–35	25–30 [4]	25
Number of Through Lanes [5]	4–6	2–4	2–4	4–6	2–4	2–4	4–6	2–4	2–4
Lane Width [6]	10–12 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.	10–11 ft.
Parallel On-Street Parking Width [7]	8'	7–8 ft.	7–8 ft.	7 ft.	7 ft.	7 ft.	8 ft.	8 ft.	7–8 ft.
Min. Combined Parking/Bike Lane Width	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.	13 ft.
Horizontal Radius (per AASHTO) [8]	200–510 ft.	200–330 ft.	200 ft.	200–510 ft.	200–330 ft.	200 ft.	200–510 ft.	200–330 ft.	200 ft.
Vertical Alignment	Use AASHTO minimums as a target, but consider combinations of horizontal and vertical per AASHTO Green Book.								
Medians [9]	4–18 ft.	Optional 4–18 ft.	None	4–18 ft.	Optional 4–16 ft.	None	4–18 ft.	Optional 4–18 ft.	None
Bike Lanes (min./preferred width)	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.	5 ft. / 6 ft.
Access Management [10]	High	Low–Moderate	Low–Moderate	Moderate	Low–Moderate	Low–Moderate	High	Low–Moderate	Low–Moderate
Typical Traffic Volume Range (ADT) [11]	15,000–50,000	1,500–30,000	1,000–15,000	15,000–30,000	1,500–20,000	500–5,000	15,000–40,000	1,500–30,000	1,000–15,000
Intersections									
Roundabout [12]	Consider urban single–lane roundabouts at intersections on avenues with less than 20,000 entering vehicles per day, and urban double–lane roundabouts at intersections on boulevards and avenues with less than 40,000 entering vehicles per day.								
Curb Return Radii/Curb Extensions and Other Design Elements	Refer to Chapter 10 (Intersection Design Guidelines)								

width of the transit vehicle plus 1 ft. of clearance on either side. Most modern streetcars or light rail vehicles (LRT) can be accommodated in an 11 or 12 ft. wide lane but designers need to consider the LRT vehicle's "dynamic envelope" when designing on horizontal curves and intersections.

7. An 8 ft. wide parking lane is recommended in any commercial area with a high turnover of parking.
8. For guidance on horizontal radius—see AASHTO's "green book" section on "Minimum Radii for Low Speed Urban Streets—Sharpest Curve Without Superelevation." Dimensions shown above are for noted target speeds and are found on Exhibit 3–16 (Page 151) in *A Policy on Geometric Design of Highways and Streets* (2004), assuming a superelevation of –2.0 percent reflecting typical cross slope. Depending on design vehicle, horizontal curves may require lane widening to accommodate large vehicle off–tracking. See AASHTO's section on "Traveled Way Widening on Horizontal Curves" for guidance.
9. See also Chapter 9 for additional detail on medians. For curb to curb intersection crossing distances of 60 ft. or more, medians should be at least 6 ft. wide to serve as a pedestrian refuge, otherwise the median should be at least 4 ft. wide. Where left turn lanes are to be provided, median widths should be increased by the width of the turn lane(s). Where left turn lanes are not needed (e.g., long blocks) median widths may be as little as 4 ft.
10. Access management involves providing (i.e., managing) access to land development in such a way as to preserve safety and reasonable traffic flow on public streets. Low, moderate and high designations are used for the level of access restrictions. A high level of access management uses medians to restrict mid–block turns, consolidate driveways and control the spacing of intersections. A low level of access management limits full access at some intersections, but generally uses minimal measures to restrict access.
11. These ranges of typical traffic volumes are intended to help determine the characteristics of thoroughfares. Volumes can fluctuate widely on all thoroughfare types. These ranges are not intended to establish guidelines or upper bounds for designing thoroughfares.
12. Double–lane roundabouts are not recommended in urban areas with high levels of pedestrians and bicyclists.


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