



HENDERSONVILLE LAND USE & TRANSPORTATION PLAN

Transportation

Chapter 5



The challenges facing the transportation system in Hendersonville are the collective result of sustained growth since Hendersonville’s incorporation in 1969, continued reliance on the automobile for daily trips, and competing agendas for scarce transportation funds. As the recent high rate of growth quickens and more commuters rely on single-occupancy vehicles, the few projects with committed funding will not be enough to address capacity and safety deficiencies in the transportation network. The Hendersonville Land Use & Transportation Plan provides a multi-modal approach to the congestion and safety problems that plague the transportation system, now and in the future. This chapter provides an overview of transportation planning best practices and outlines the system (roadway), bicycle and pedestrian, and transit solutions that collectively will ensure the future transportation network operates safely and efficiently while serving the recommended General Framework Plan (see Chapter 3).

Access Management

Access management allows local decision-makers to do more with less. As the City and region’s most traveled corridors continue to attract commercial development, protecting the through capacity becomes essential for the efficiency of the transportation system and continued economic growth. Access management balances the needs of motorists using a roadway with the needs of adjacent property owners dependent upon access to the roadway. In an environment with limited funds and route options, access management is not just good policy but crucial to the health of the entire transportation network.

The Federal Highway Administration (FHWA) defines access management as “the process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding system in terms of safety, capacity, and speed.” According to the Access Management Manual¹, access management results from a cooperative effort between state and local agencies and private land owners to systematically control the “location, spacing, design, and operation of driveways, median openings, interchanges, and street connections to a roadway.” Access management requires cooperation between government agencies and private land owners.



Symptoms and Benefits of Access Management

Poor access management directly affects the livability and economic vitality of commercial corridors, ultimately discouraging potential customers from entering the area. A corridor with poor access management lengthens commute times, creates unsafe conditions, lowers fuel efficiency, and increases vehicle emissions. Signs of a corridor with poor access management include:

- Increased crashes between motorists, pedestrians, and cyclists
- Worsening efficiency of the roadway
- Congestion outpacing growth in traffic
- Spillover cut-through traffic on adjacent residential streets
- Limited sustainability of commercial development

Without access management, the function and character of major roadway corridors can deteriorate rapidly and adjacent properties can suffer from declining property values and high turnover. Access management has wide-ranging benefits to a variety of users as shown in Table 5-1.

User	Benefit
Motorists	Fewer delays and reduced travel times
	Safer traveling conditions
Bicyclists	Safer traveling conditions
	More predictable motorist movements
Pedestrians	More options in a connected street network
	Fewer access points and median refuges increases safety
Transit Users	More pleasant walking environment
	Fewer delays and reduced travel times
Freight	Safer, more convenient trips to and from transit stops in a connected street and sidewalk network
	Fewer delays and reduced travel times lower cost of delivering goods and services
Business Owners	More efficient roadway system serves local and regional customers
	More pleasant roadway corridor attracts customers
	Improved corridor aesthetics
Government Agencies	Stable property values
	Lower costs to achieve transportation goals and objectives
Communities	Protection of long-term investment in transportation infrastructure
	More attractive, efficient roadways without the need for constant road widening

Access Management Strategy Toolkit

Access management is not a one-size fits all solution to corridor congestion. Successful strategies differ throughout a region and even along the same road. The Access Management Strategy Toolkit provides a general overview of the various strategies available to mitigate congestion and its effects. A comprehensive access management program includes evaluation methods and supports the efficient and safe use of the corridors for all transportation modes. The purpose of the toolkit is to provide local engineering and planning officials with access management strategies as well as an overview of their application, use, and in some cases unit costs.

¹Access Management Manual, Transportation Research Board, National Academy of Sciences, Washington DC, 2003

Site Access Treatments

The total number of vehicle conflicts can be reduced by promoting on-site traffic circulation and shared-use driveways during development application review. Such improvements should be a key consideration during the approval of redeveloped sites along corridors identified for access management programs.

Improved On-Site Traffic Circulation

One way to reduce traffic congestion is to promote on-site traffic circulation. Pushing back the throat of an entrance, as shown in the figures to the right, helps to avoid spillback onto the arterial. This action improves both the safety and efficiency of the roadway. A minimum separation of 100 feet should be provided to prevent internal site operations from affecting an adjacent public street, ultimately causing spillback problems. Approximate construction cost varies and usually is the responsibility of private development.



Number of Driveways

Only the minimum number of connections necessary to provide reasonable access should be permitted. For those situations where outparcels are under separate ownership, easements for shared access can be used to reduce the number of necessary connections. Reducing the number of access points also decreases the number of conflict points, making the arterial safer and more efficient. Approximate construction cost varies and is usually the responsibility of private development.

Driveway Placement/Relocation

Driveways located close to intersections create and contribute to operational and safety issues. These issues include intersection and driveway blockages, increased points of conflict, frequent/unexpected stops in the through travel lanes, and driver confusion as to where vehicles are turning. Driveways close to intersections should be relocated or closed, as appropriate. As a best planning practice, no driveway should be allowed within 100 feet of the nearest intersection.



Cross Access

Cross access is a service drive or secondary roadway that provides vehicular access between two or more continuous properties. Such access prevents the driver from having to enter the public street system to travel between adjacent uses. Cross access can be a function of good internal traffic circulation at large developments with substantial frontage along a major roadway. Similarly, sidestreet and backdoor access occurs when a parcel has access to an adjacent street and/or parallel street behind buildings and away from the major street. When combined with a median treatment, cross access, sidestreet, and backdoor access ensure that all parcels have access to a median opening or traffic signal for left-turn movements.

Median Treatments

Segments of a corridor with a combination of sidestreet, cross access, backdoor access, and on-site circulation may be candidates for median treatments. A median-divided roadway improves traffic flow, reduces congestion, and increases traffic safety – all important goals of access management. While medians restrict some left-turn movements, access to businesses is enhanced and traffic delays are reduced. Landscaping and gateway features incorporated into median treatments improve the aesthetics of the corridor, in turn encouraging investment in the area. In locations with poor connectivity the implementation of medians may require retrofit and improvements to on-site circulation and provisions for side street access.

Non-Traversable Median

These features are raised or depressed barriers that physically separate opposing traffic flows. Inclusion in a new cross-section or retrofit of an existing cross-section should be considered for multi-lane roadways with high pedestrian volumes or collision rates as well as in locations where aesthetics are a priority. A non-traversable median is benefitted by sufficient cross and backdoor access. As these treatments are considered, sufficient spacing and locations for U- and left-turn bays must be identified.

The advantage of non-traversable medians include increased safety and capacity by separating opposing vehicle flows, providing space for pedestrians to find refuge, and restricting turning movements to locations with appropriate turn lanes. Disadvantages include indirect routes to some destinations, inconvenience, and potential opposition from the general public and affected property owners. To overcome some of these disadvantages, sufficient spacing and location of U- and left-turn bays must be identified. Approximate construction cost varies.

Median U-Turn Treatment

These treatments involve prohibiting or preventing minor street or driveway left turns between signalized intersections. Instead, these turns are made by first making a right turn and then making a U-turn at a nearby median opening or intersection. These treatments can increase safety and efficiency of roadway corridors with high volumes of through traffic, but should not be used where there is not sufficient space available for the provision of U-turn movements. The location of U-turn bays must consider weaving distance, but also not contribute to excessive travel distance.

Advantages of median U-turn treatments include reduced delay for major intersection movements, potential for better two-way traffic progression (major and minor streets), fewer stops for through traffic, and fewer points of conflict for pedestrians and vehicles at intersections. Disadvantages include increased delay for some turning movements, increased travel distance, increased travel time for minor street left turns, and increased driver confusion. Approximate construction cost is \$50,000 - \$60,000 per median opening.

Directional Crossover (Left-Over Crossing)

When a median exists on a corridor, special attention must be given to locations where left turns are necessary. A left-over is a type of directional crossover that prohibits drivers on the cross road (side street) from proceeding straight through the intersection with the main road but allows vehicles on the mainline to turn left onto the cross road. Such designs are appropriate in areas with high traffic volumes on the

major road and lower volumes of through traffic on the crossroad, particularly where traffic needs to make left turns from the main line onto the minor street. A properly implemented left-over crossing reduces delay for through-traffic and diverts some left-turn maneuvers from intersections. These treatments improve safety by reducing the number of conflict points for vehicles along the corridor.

Left-Turn Storage Bays

Where necessary, exclusive left-turn lanes/bays should be constructed to provide adequate storage space exclusive of through traffic for turning vehicles. The provision of these bays reduces vehicle delay related to waiting for vehicles to turn and also may decrease the frequency of collisions attributable to lane blockages. In some cases, turn lanes/bays can be constructed within an existing median. Where additional right-of-way is required, construction may be more costly.

Offset Left-Turn Treatment

Exclusive left-turn lanes at intersections generally are configured to the right of one another, which causes opposing left-turning vehicles to block one another's forward visibility. An offset left-turn treatment shifts the left-turn lanes to the left, adjacent to the innermost lane of oncoming through traffic. In cases where permissive left-turn phasing is used, this treatment can improve efficiency by reducing crossing and exposure time and distance for left-turning vehicles.



In addition, the positive offset improves sight distance and may improve gap recognition. In locations with sufficient median width, this treatment can be easily retrofitted. Where insufficient right-of-way width exists, the construction of this treatment can be difficult and costly. As a result, approximate construction costs vary.

Intersection and Minor Street Treatments

The operation of signalized intersections can be improved by reducing driver confusion, establishing proper curb radii, and ensuring adequate laneage of minor street approaches.

Skip Marks (Dotted Line Markings)

These pavement markings can reduce driver confusion and increase safety by guiding drivers through complex intersections. Intersections that benefit from these lane markings include offset, skewed, or multi-legged intersections. Skip marks are also useful at intersections with multiple turn lanes. The dotted line markings extend the line markings of approaching roadways through the intersection. The markings should be designed to avoid confusing drivers in adjacent or opposing lanes.

Intersection and Driveway Curb Radii

Locations with inadequate curb radii may cause turning vehicles to use opposing travel lanes to complete their turning movement. Inadequate curb radii may cause vehicles to “mount the curb” as they turn a corner and cause damage to the curb and gutter, sidewalk, and any fixed objects located on the corner. This maneuver also can endanger pedestrians standing on the corner. Curb radii should be adequately sized for area context and likely vehicular usage.



Minor Street Approach Improvements

At signalized intersections, minor street vehicular volumes and associated delays may require that a disproportionate amount of green time be allocated to the minor street, contributing to higher-than-desired main street delay. With laneage improvements to the minor street approaches, such as an additional left-turn lane or right-turn lane, signal timing often can be re-allocated and optimized.

Intelligent Transportation System

Intelligent Transportation Systems (ITS) have many potential benefits when implemented in concert with an overall transportation management strategy. ITS solutions use communications and computer technology to manage traffic flow in an effort to reduce crashes, mitigate environmental impacts such as fuel consumption and emissions, and reduce congestion from normal and unexpected delays. Successful systems include a variety of solutions that provide surveillance capabilities, remote control of signal systems components, seamless sharing of traveler information with the public, and even allow emergency vehicles to have priority to proceed safely through signalized intersections.

Signalization

The volume of traffic attracted to some side streets or site driveways is more than can be accommodated acceptably under an unsignalized condition. Delays for minor street movements as well as left-turn movements on the main street may create or contribute to undue delays on the major roadway and numerous safety issues. The installation of a traffic signal at appropriate locations can mitigate these types of issues without adversely affecting the operation of the major roadway provided they are spaced appropriately. Approximate construction cost is \$75,000 to \$100,000 per signal. Additional costs would be expected if enhancing the signal placements with mast arms.

Progressive-Controlled Signal System

A progressive-controlled signal system coordinates the traffic signals along a corridor to allow vehicles to move through multiple signals without stopping. Traffic signals are spaced appropriately and synchronized so when a vehicle is released from one intersection the signal at the next intersection will be green by the time the vehicle reaches it.

Likewise, adaptive signal control involves continuously collecting automated intersection traffic volumes and using the volumes to alter signal timing and phasing to best accommodate actual-real-time-traffic volumes. Adaptive signal control can increase isolated intersection capacity as well as improve overall corridor mobility by up to 20% during off-peak periods and 10% during peak periods. Approximate construction cost is \$250,000 per system and \$10,000 per intersection in addition to 25% of capital costs in training, etc.

The City is currently undergoing a signalization project, TIP #99-New-29. Planning and engineering for the project took place in 2008, with construction underway in 2009.

Dynamic Message Signs (DMS)



Dynamic Message Signs alert vehicles of congestion or incidents. DMS units give general alerts, such as “congestion ahead” or specific details on the location of the incident or predicted travel times so motorists can mentally prepare. Often, drivers are more patient if they can anticipate how long the delay will be or how far the congestion spreads. Perhaps most importantly, DMS informs drivers who can choose alternate travel routes during heavy congestion, thereby reducing the volume on the freeway, the likelihood of additional incidents, and the average travel time for the system as a whole.

Closed Circuit Television Traffic Monitoring

Closed Circuit Television (CCTV) cameras are primarily used on interstate facilities and major arterials to provide visual traffic volume and flow information to traffic management or monitoring centers. These centers use this information to deploy incident response patrols/equipment and to provide roadway travel delay information to motorists. By having visual roadway information, traffic management centers are able to identify incidents quickly and respond appropriately and efficiently, helping to reduce the effect of incidents on a single location or on multiple roadways. Approximate construction cost is \$20,000 per location.



Emergency Vehicle Preemption

This strategy involves an oncoming emergency or other suitably equipped vehicle changing the indication of a traffic signal to green to favor the direction of desired travel. Preemption improves emergency vehicle

response time, reduces vehicular lane and roadway blockages, and improves the safety of the responders by stopping conflicting movements. Approximate construction cost is \$5,000-\$7,000 per intersection plus \$2,000 per equipped vehicle.

Roadway Plan

Increasing demands on the existing transportation system is evident. As improvements are weighed against one another, it is important to recognize the limitation to new construction because of natural and man-made barriers. For this reason, it is important to protect the integrity of the existing system by employing a comprehensive access management strategy using the tools previously mentioned. These actions should be supplemented with strategic investments in road widening projects and carefully planned new roadways.

The recommended roadway improvements plan for Hendersonville considers the planning process and recommendations of the current Major Thoroughfare Plan (adopted in February 1997), and the 2030 Nashville Area Metropolitan Planning Organization Long Range Transportation Plan (adopted in October 2005). The Long Range Transportation Plan represents analysis of existing and planned land uses and development, environmental constraints, and projected future travel demand and safety concerns. At the core of these recommendations are the concerns and ideas expressed through extensive public involvement which is critical to the development and implementation of a balanced transportation plan.

Roadway recommendations are placed into two categories — Arterial Street Recommendations and Collector Street Recommendations. When possible, proposed arterial projects emphasize protection of existing roadways through improved access management techniques. That is, if a corridor warrants widening or other capacity improvements, a median may be proposed to improve safety, control access, and enhance the corridor aesthetics. The collector street recommendations aim to improve connectivity throughout the study area.

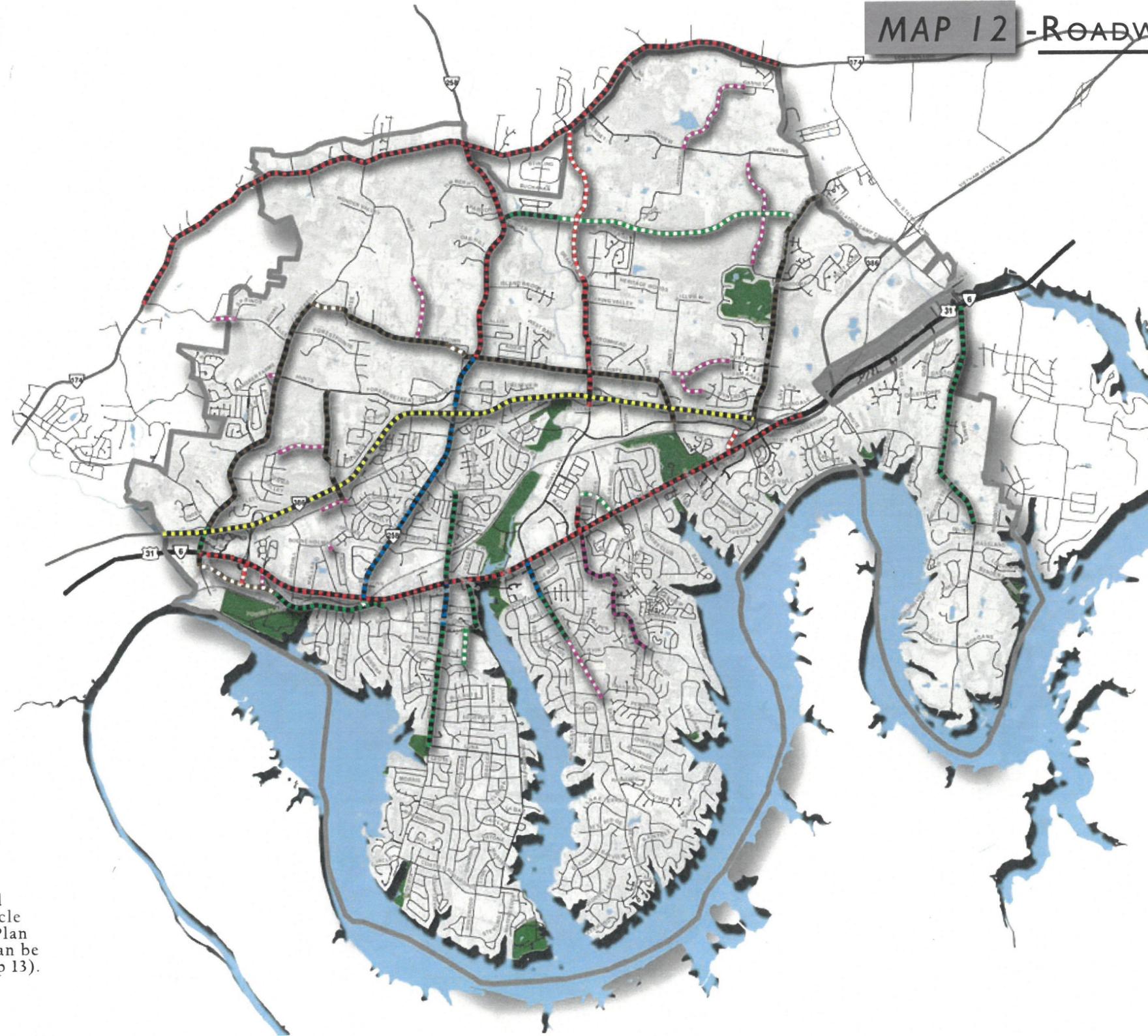
Roadway Recommendations

The Land Use & Transportation Plan balances necessary widening projects with new roadways and a coordinated collector street plan. The recommended roadway improvements plan is shown in the map on the following page and detailed in Table 5-2.

In addition to the corridor recommendations described in the table, several intersections and interchanges were identified for improvements. These include improvements for bicyclists and pedestrians at the Main Street intersection of Old Shackle Island Road/ Walton Ferry Road, and Vietnam Veterans Boulevard (SR 386) at Forest Retreat Road. Improvements are recommended at three existing interchanges: Vietnam Veterans Boulevard (SR 386) at New Shackle Island Road, Vietnam Veterans Boulevard (SR 386) at Indian Lake Boulevard, and Vietnam Veterans Boulevard Connector at Main Street.

LEGEND

-  6-Lane Divided (Existing Location)
-  5-Lane (Existing Location)
-  4-Lane Divided (Existing Location)
-  4-Lane Divided (New Location)
-  3-Lane (Existing Location)
-  3-Lane (New Location)
-  2-Lane Divided (Existing Location)
-  2-Lane Divided (New Location)
-  2-Lane (Existing Location)
-  2-Lane (New Location)
-  Park Land
-  Study Area Boundary
-  Water Bodies



Note: This map represents roadway capacity and access management improvements. Specific Bicycle Recommendations are illustrated in the Bicycle Plan Map (Map 14). Collector Street improvements can be found on the Functional Classification Map (Map 13).

Table 5-2 - Roadway Recommendations

Street	Termini	Cross Section							ROW
		Lanes	Turn/Med	Bike	Curb/ Gutter	Grass/ Buffer	Sidewalk		
Main Street	Mansker Creek - 386	4@12'	12'(T)	2@2	2@2.5'	2@4.5'	2@5'	88'	
Rockland Road	Imperial Blvd to Main St @ Center Point Rd	2@12'	12'(T)	8'	2@2.5'	2@5'	5'	64'	
31E Connector Extended	Hwy 31E to Rockland Rd Extended	2@12'	12'(T)	2@2'	2@2.5'	2@4.5'	2@5'	64'	
Center Point Road	Main St to SR 386	3@12'	12'(T)	2@2'	2@2.5'	2@4.5'	2@5'	80'	
Center Point Road	SR 386 to Goshentown Rd	2@12'	12'(T)	(1)	(1)	(1)	(1)	64'	
Forest Retreat Road	Andrews Run to Molly Walton Dr Extended	2@12'	12'(T)	(1)	(1)	(1)	(1)	64'	
Hunts Lane	Forest Retreat Rd to Center Point Rd	2@12'	12'(T)	(1)	(1)	(1)	(1)	64'	
Molly Walton	Molly Walton to Forest Retreat Rd	2@15'	-	-	2@2.5'	2@7.5'	-	50'	
Township Dr	Township Dr to Forest Retreat Rd	2@12'	-	-	2@2.5'	2@10.5'	-	50'	
New Shackle Island Road	Rockland Road to Main Street	2@12'	12'(T)	2@2'	2@2.5'	2@4.5'	2@5'	66'	
New Shackle Island Road	Main Street to SR 386	4@11'	11'(T)	2@3'	2@2.5'	2@4.5'	2@4.5'	84'	
New Shackle Island Road	SR 386 to Stop 30 Rd	4@12'	12'(T)	2@2'	2@2.5'	2@4.5'	2@5'	88'	
New Shackle Island Road	Stop 30 Rd to Long Hollow Pike (SR 174)	4@12'	12'(T)	(2)	(2)	(2)	(2)	96'	
Old Shackle Island Road	Main Street to Wessington Place	2@12'	12'(T)	2@4'	2@2.5'	2@4.5'	2@5'	68'	
Walton Ferry Road	Main Street to Luna Lane	2@12'	12'(T)	2@4'	2@2.5'	2@4.5'	2@5'	68'	
Sanders Ferry Road	Main Street to Imperial Blvd	2@12'	12'(T)	8'	2@2.5'	2@4.5'	5'	60'	
Lakeside Park Drive	Imperial Blvd to Homestead Drive	2@12'	-	-	2@2.5'	2@4.5'	2@5'	50'	
Indian Lake Road	Main Street to Sequoyah Drive	4@12'	12'(T)	8'	2@2.5'	2@5'	5'	88'	
Indian Lake Road	Sequoyah Drive to Maple Drive	2@12'	12'(T)	8'	2@2.5'	2@5'	5'	64'	
Indian Lake Road/Berryhill Drive	Maple Drive to Trail East Drive	2@12'	-	8'	2@2.5'	2@4'	5'	50'	
Anderson Lane	Home Depot to Main Street	4@12'	12'(M)	-	2@2.5'	2@4.5'	2@5'	84'	
Anderson Lane	Main Street to Bonita Parkway	2@12'	12'(T)	-	-	2@4.5'	5'	50'	
Bonita Parkway	Main Street to Anderson Lane North	2@12'	16'(M)	2@2'	2@2.5'	2@4.5'	2@5'	68'	
Cages Bend Road	City Limits to Sunset Dr	2@12'	12'(T)	8'	2@2.5'	2@5.5'	-	60'	
SR 386	I-65 to Saundersville Rd	6@12'	-	-	-	-	-	-	
Saundersville Road	SR 386 to Lower Station Camp Creek Rd	4@12'	16'(M)	8'	2@2.5'	2@4.5'	-	86'	
Saundersville Road Connector	Saundersville Road to Main Street	2@12'	12'(T)	2@2'	2@2.5'	2@4.5'	2@5'	64'	
Drakes Creek Road	SR 386 to Anderson Road	4@12'	12'(T)	8'	2@2.5'	2@4.5'	-	82'	
Durham Dr	Anderson Rd to Long Hollow Pike	2@12'	14'(M)	8'	2@2.5'	2@2.5'	5'	66'	
Stop 30 Road	Goshentown Rd to Saundersville Rd	4@12'	12'(T)	8'	2@2.5'	2@5.5'	-	84'	
Goshentown Road (Stop 30 Road Ext)	Stop 30 Rd to Center Point Rd	2@12'	12'(T)	8'	2@2.5'	2@5.5'	-	60'	
New East/West/Drakes Creek Collector	New Shackle Island Road to Saundersville Road	2@12'	12'(T)	2@3'	2@2.5'	2@4.5'	2@5'	66'	
Long Hollow Pike (SR 174)	Allen Rd to Lower Station Camp Creek Rd	4@12'	12'(T)	(2)	(2)	(2)	-	96'	

LEGEND:

- Lanes - Travel Lanes
- Turn - Center Turn Lane (T)
- Med - Median (M)
- Grass - Width of grass/landscape/buffer strip between curb and
- ROW - minimum right-of-way width required.

NOTES:

- (1) 4-ft. paved shoulders and 10-ft ditches in lieu of curb/gutter, grass, bike lanes and sidewalks.
- (2) 6-ft paved shoulders and 14-ft ditches in lieu of curb/gutter, grass, bike lanes and sidewalks.

ENTERED
John C. Ireland
Property Assessor

FEB 5 2013

Map Op. Ot. Per.

Collector Street Plan

As mentioned in the Existing Conditions section of Chapter 2, the role of a collector street in a balanced transportation system is to collect traffic from neighborhood and local streets and distribute it to the network of arterials. As such, these streets provide relatively less mobility but higher overall accessibility compared to higher level streets. The lower design speeds and multi-modal amenities make these streets attractive for bicyclists and pedestrians. The proper design and spacing of collector streets is critical to ensuring the balanced transportation network envisioned by the residents and local officials in Hendersonville.

Natural Environment

With natural barriers such as Old Hickory Lake in the area, local planners face challenges related to the natural environment. The local geography has created a network of lakes, creeks, and floodplains that impact land use and transportation decisions. These features affect how the community develops, where streets can be constructed and maintained, and where connections between streets can be made. Collector streets, as part of the development process, must respect the natural environment.

Street Spacing and Access

Local officials also must consider street spacing guidelines to promote the efficient development of an expanding transportation system. Ultimately, these street spacing guidelines could be used as "rules of thumb" during the development review process. Different spacing standards are necessary for different development types and intensities. Table 5-3 below shows the desired collector street spacing for different intensities. In addition, individual driveway access to collector streets should be limited to local streets when possible.

Table 5-3- Desired Collector Street Spacing for Different Intensities

Land Use/Type of Collector Street	Intensity (dwelling units per acre)	Access Function	Approximate Street Spacing
Very Low Intensity Residential	Less than 2	High	3,000 to 6,000 ft
Low Intensity Residential	2 to 4	High	1,500 to 3,000 ft
Medium and High Intensity Residential	More than 4	High	750 to 1,500 ft
Activity Center	Mixed-Use	Medium	750 to 1,500 ft

Collector Street Spacing



Street Spacing 3,000' to 6,000'



Street Spacing 2,500' to 3,000'



Street Spacing 750' to 2,500'

Recommendations — For local and collector streets, recommendations include:

- **Local Streets** — One connection along a collector should be in place every 750 to 1,500 feet. There are cases that will necessitate a variation in this guideline. Approval for these cases will be the responsibility of the City Engineer and State Division Engineer who will consider traffic impacts, land access, property rights, and environmental conditions.
- **Collector Streets** — One public street intersection along a collector or an arterial should be in place every 1,200 to 2,00 feet in a suburban context and every 500 to 1,000 feet in the context of heavily developed areas or the central business district. As determined by the City Engineer, variations in spacing requirements will depend on traffic impacts, land access, property rights, and environmental conditions.

Identifying Future Collector Street Connectors

The following guidelines were used to develop the City's collector street network:

- Avoid steep slopes and otherwise unsuitable topography
- Minimize impact to the built environment
- Avoid FEMA designated floodplains
- Minimize the number of wetland (National Wetland Inventory) impacts
- Minimize the amount of each wetland impact (e.g., don't cross a wide wetland when a narrower one can be crossed)
- Minimize the frequency of stream crossings
- Minimize the number of high-quality (larger) stream crossings
- Minimize the length of stream crossings
- Minimize school impacts
- Minimize the number and size of each impact to other environmental features, such as historic features and districts, threatened and endangered species, hazardous waste sites, and superfund sites
- Avoid impacts to parks and designated open spaces
- Minimize the number of new facilities in critical watershed areas
- Be responsive to existing and planned development patterns
- To the extent possible utilize existing stub streets
- Develop feasible connections (A to B)
- Consider Land Use Plan goals for area development
- Consider land use potential and plan collectors according to established spacing guidelines

Future Collector Street Network

The design of a collector street network must respect present and future conditions, the public's vision for the future, and how the network can best balance the natural environment, connectivity, access, mobility, and safety.

A future collector street network was developed using the policy considerations discussed above and the guiding set of planning principles discussed in Chapter 1. The Functional Classification Map shown on page 5.7, shows the entire future street network, including collector streets.

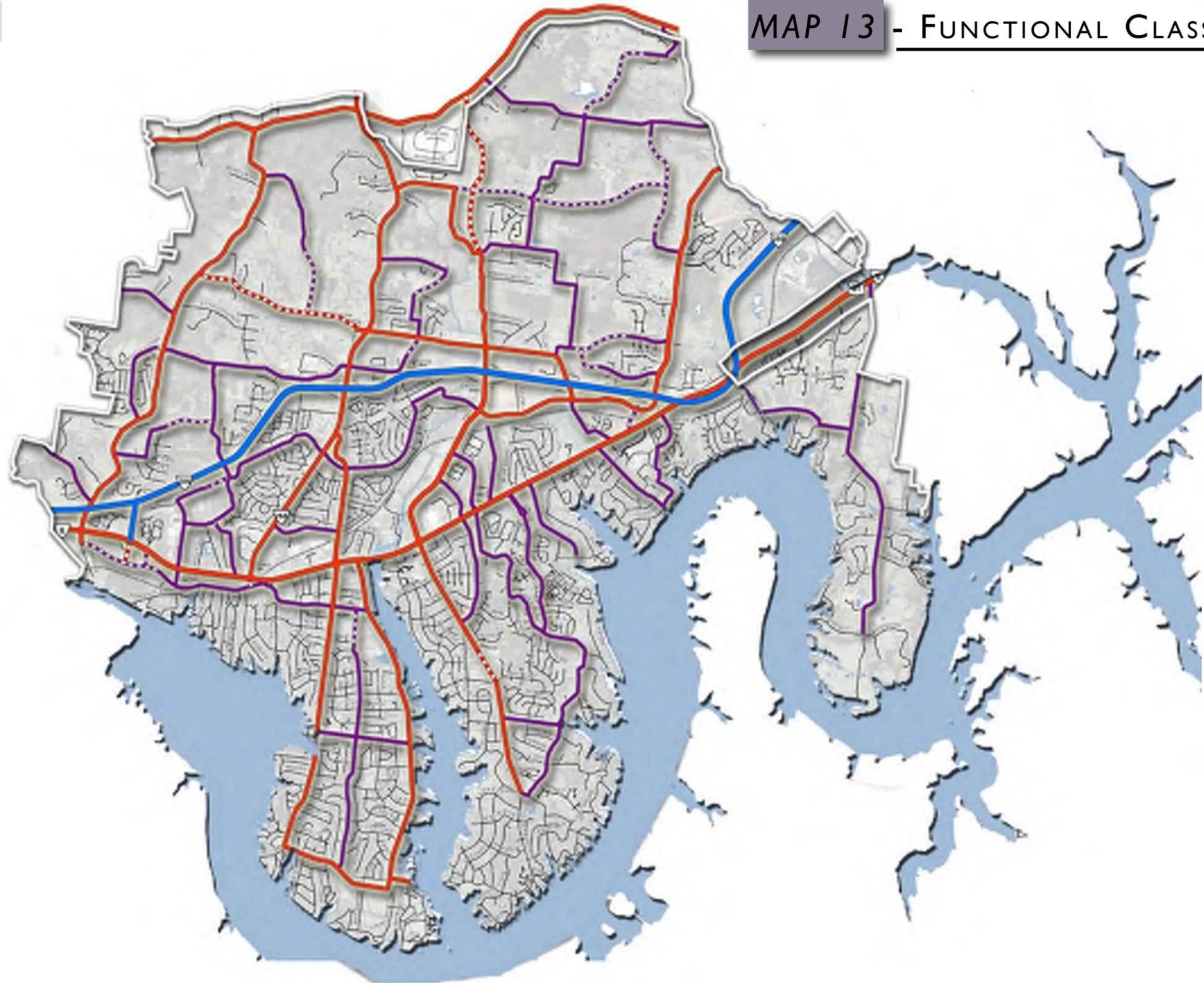
General Policy Recommendations

The following general policy recommendations are offered for consideration in an effort to increase the number of collector streets to better facilitate travel between local streets and arterials:

- Use the future collector street network as a tool to review proposed development projects and plans as they locate and design future collector streets.
- Amend the collector street network to include new streets as they are identified during the development review process.
- Work with the development and real estate community to increase public awareness of future collector street connections through enhanced signage
- Provide temporary turnaround accommodations for collector street stub-outs to allow access by maintenance and emergency vehicles; right-of-way needed for these turnarounds would revert back to property owners once the connection is made.
- Require that new developments reserve right-of-way for, and in most cases, construct, future collector streets.
- Consider adopting policies and dedicating funding to help construct traffic calming measures on existing collector streets that become connected to new collector streets
- Require all new development to provide connections or stub-out streets in each of the four cardinal directions (where applicable).
- Investigate implementation of a connectivity index or adoption of specific guidance in local ordinances in order to facilitate the use of planning recommendations above. This step will depoliticize the process of establishing connections in a development while also providing developers with clear guidance on how to proceed.

LEGEND

-  FREEWAY (EXISTING)
-  ARTERIAL (EXISTING)
-  ARTERIAL (NEW LOCATION)
-  COLLECTOR (EXISTING)
-  COLLECTOR (NEW LOCATION)
-  STUDY AREA BOUNDARY
-  WATER BODIES



Bicycle and Pedestrian

Livable communities balance travel between modes by accommodating pedestrians and cyclists for both recreational and utilitarian trips. The benefits of cycling and walking include improved health, cost savings, and a cleaner environment. But the transition from potential use of non-motorized transportation to its reality is not easy. The increasing demand for bicycle and pedestrian facilities as expressed by the public has culminated in an enhanced focus on these modes during the transportation planning process. As discussed in the Existing Conditions chapter, a Bicycle and Pedestrian Master Plan was completed in 2000. This section seeks to supplement the material covered in that document as well as update the bicycle network recommendations made in that plan.

Users and Facilities

In order to develop and integrate the recommended bicycle and pedestrian network into the overarching vision for the transportation system, the types of users, facilities, and programs must be understood. For bicycling, the most effective set of recommendations addresses the needs and expectations of all advanced, basic, and child users.

- **Advanced** — Usually the most experienced on the road, advanced cyclists have the ability to safely ride in typical arterial conditions of higher traffic volume and speeds. Most advanced cyclists prefer shared roadways in lieu of striped bike lanes and paths, but may be more willing to accept striped bike lanes when the street gutter is cleaned regularly. Although this group represents approximately 20% of all cyclists, they account for nearly 80% of annual bicycle miles traveled.
- **Basic** — Due to being less secure in their ability to ride in traffic without special accommodations, basic cyclists are casual or new adult/teenage riders who typically prefer multi-use paths or striped bike lanes. Such facilities reduce basic cyclists' exposure to fast-moving and heavy traffic. Surveys of the cycling public indicate that about 80% of cyclists can be categorized as basic cyclists.
- **Child** — The children on bicycles that make up this group have a limited field of vision while riding and generally keep to neighborhood streets, sidewalks, and greenways. On busier streets, this group is likely to stay on sidewalks or off-street facilities that protect them from traffic. While in general riding on sidewalks should be discouraged, the comfort level of child and basic cyclists may warrant riding on sidewalks provided they yield to pedestrians.

Like drivers, cyclists gain experience over time by riding. As cyclists ride and gain more experience operating in traffic, they graduate from basic to advanced cyclists. This transition ensures that the needs of all three types of cyclists must be constantly evaluated and accommodated. Roadways need to be designed with an eye toward both the intended use by cyclists and pedestrians and how the facility fits into a system-wide network. Table 5-4 summarizes the major bicycle and pedestrian facilities.

It is also important to consider the different purposes of bicycle and pedestrian travel. Recreational users are often interested in reaching destinations such as parks or playgrounds, or simply traveling in a loop with the bicycle or walking trip serving as the primary purpose. Conversely, utilitarian users bicycle and walk to reach destinations such as work, school, or everyday errands. A component of these users are captive riders or walkers, meaning they do not have access to an automobile and thereby depend on bicycling and walking as their primary form of travel. As a result, it is also important to consider the

key destination points and corridors that may be frequented by these users as a part of the multi-modal network.

When planning for automobile travel, it is critical to plan for the conditions along the route (such as adequate facility levels and well-maintained roads) as well as to make provisions for the trip ends (such as parking spaces). Similarly, design considerations should be given to ancillary bicycle facilities and amenities such as bike racks, bikes on buses and bike amenities at transit stops, and bike-friendly drainage inlets. For pedestrians, attention must be given to curb ramps as well as marked crosswalks and enhancements such as raised crosswalks, pedestrian refuge island, and curb extensions.

Programs and Policies

The friendliest areas for bicyclists and pedestrians balance the Five E's — Engineering, Education, Encouragement, Enforcement, and Evaluation. The facilities described above must be supplemented with coordinated programs and policies that instruct and encourage bicyclists and pedestrians in the full and proper use of the non-motorized transportation network.

Engineering

Engineering refers to the network of pathways that must be planned, designed, and constructed. A well-planned bicycle and pedestrian system can enhance user safety and enjoyment and may increase the attraction of each mode.

Education

Once the pathways are in place, new and experienced cyclists and pedestrians must be made aware of their locations and the destinations that can be reached by using them. Bicyclists, pedestrians, and motorists must be educated on the "rules of the road" to ensure everyone's safety while operating on and adjacent to the bicycle and pedestrian facilities. Education programs can be initiated from a variety of sources. Local governments can host workshops and bike rodeos, law enforcement officers can launch school-based education programs, and local advocacy groups can distribute educational materials.

School-Based Safety Education

More than any other age group, school-age children need to be educated about bicycle and pedestrian safety. Education programs can be incorporated into local school curricula and tailored to specific age groups. Younger children could be taught pedestrian safety, while older students could receive hands-on bicycle safety lessons. The program can be a collaborative effort of the city and county, local law enforcement departments, and local advocacy groups. The bicycle unit of the Hendersonville Police Department would be ideally suited to champion this type of effort.

Table 5-4 Bicycle and Pedestrian Facility Overview

Striped Bike Lanes		
<p>Description</p> <ul style="list-style-type: none"> · Exclusive-use area adjacent to the outermost travel lane · Typical width: 4' to 5' 		<p>Target User</p> <ul style="list-style-type: none"> · Basic and Intermediate Cyclists <p>Estimated Cost</p> <ul style="list-style-type: none"> · \$18,000 per mile
Wide Outside Lane		
<p>Description</p> <ul style="list-style-type: none"> · Extra width in outermost travel lane · Best on roadways with speed limits of 35 mph or higher and moderate to high daily traffic volumes · Typical width: 14' outside lane preferred 		<p>Target User</p> <ul style="list-style-type: none"> · Advanced Cyclists <p>Estimated Cost</p> <ul style="list-style-type: none"> · \$18,000 per mile
Multi-Use Path		
<p>Description</p> <ul style="list-style-type: none"> · Separated from traffic and located in open space (greenway) or adjacent to road with more setback and width than sidewalks (sidepath) · Typical width: 10' preferred; 8' in constrained areas 		<p>Target User</p> <ul style="list-style-type: none"> · All Cyclists; Pedestrians <p>Estimated Cost</p> <ul style="list-style-type: none"> · \$600,000 per mile
Sidewalk		
<p>Description</p> <ul style="list-style-type: none"> · Dedicated space within right-of-way for pedestrians · Should include a landscaped buffer from roadway · Typical width: 5' preferred 		<p>Target User</p> <ul style="list-style-type: none"> · Pedestrians <p>Estimated Cost</p> <ul style="list-style-type: none"> · \$150,000 per mile
Unpaved Trail		
<p>Description</p> <ul style="list-style-type: none"> · Formal/informal hiking trail made of dirt, mulch, or pea gravel · Connects recreational and environmental features of a community · Typical width: 5-8' footpath; 8-10' bike trail 		<p>Target User</p> <ul style="list-style-type: none"> · Off-Road Cyclists; Pedestrians; Hikers <p>Estimated Cost</p> <ul style="list-style-type: none"> · \$10,000 to \$20,000 per mile

Bike Rodeos

At bike rodeos, school-age children learn bicycling skills, rules, and safety tips in a fun, interactive environment. Bike rodeos are flexible in that they can be part of a larger safety education program, an independent program, or part of other fun group riding activities.

Walkable Community Workshops

These interactive workshops bring a variety of experts and stakeholders to the table with residents to identify real-world problems and proactive solutions for their community. The workshops last several hours and include an educational presentation, walking audit, and strategy session. The key to Walkable Community Workshops are the walking audits in which a professional leads participants on a tour to identify problems and solutions.

Public Outreach

Public service messages on television and radio can be created to inform the public about proper bike riding techniques, the meaning of signed bike routes and “Share the Road” signs, and driver courtesy. Other campaigns can be tailored to target any age group and can be directed at pedestrians, bicyclists, or motorists.

Encouragement

People need to be encouraged to bicycle and walk. Encouragement should become easier as the network of pathways makes the region more bicycle- and pedestrian-friendly. Encouragement becomes more critical as these facilities are constructed to justify the investment. Popular encouragement programs include Safe Routes to School, Walk/Bike to School Days, Bicycle to Work Week, Bicycle Rodeos, and Bicycle Mentor Programs.

Safe Routes to School

Safe Routes to School (SRTS), a national initiative, has encouraged many children to bike and walk to school by promoting bicycle and pedestrian education. The City of Hendersonville has already applied for a SRTS grant for Nannie Berry Elementary School. Safe Routes to School grants can be used to establish programs to encourage safe walking and biking near schools or can be used to construct pedestrian infrastructure near schools. More information on the program can be found at www.saferoutestoschool.org.



In addition to the efforts currently underway, Indian Lake Elementary School was analyzed as a part of this Plan to identify areas for infrastructure improvements. This school is adjacent to the Indian Lake Swim and Tennis Club and a neighborhood park, meaning that facility improvements in this area

would serve the residents of the area all year. The diagram on page 5.12 identifies areas for infrastructure improvements in the area surrounding the school. The improvements are shown within the context of a quarter-mile and half-mile walking radius, representing the distance the average person can travel in 5 or 10 minutes, respectively. This information can favorably position the City for grant funding to implement a SRTS program.

Walk or Bicycle to School Day

The City of Hendersonville should work with local schools to increase participation in International Walk and Bicycle to School Day. Walk to school days have been instituted at many schools throughout Tennessee over the past decade. These programs provide local schools a forum in which to promote bicycling and walking as a fun, healthy way for children to travel that also reduces automobile congestion and pollution near schools. At the same time, the programs allow users to identify necessary improvements to make walking or bicycling safer and easier.



Bicycle Rideabout

At a bicycle rideabout, local citizens take part in a short 3- to 5-mile ride along bicycle-friendly roads and attend informational sessions about bicycle safety and ongoing projects in the community. The events should include local law enforcement officers to promote safety and local advocacy groups to recruit new members. A bicycle rideabout can be a stand-alone activity or part of a larger event. A rideabout is also a great way to kick off a new initiative or open a new facility.

Bicycle-to-Work Week

For adults, Bicycle to Work Week can serve as a week-long reminder that bicycling can be a good way to get to work. The League of American Bicyclists sponsors a Bike-to-Work week every May, which has been designated National Bike Month. The success of Bicycle-to-Work Week often depends on local employers. Successful programs have included friendly competition between employers to see which can get the highest percentage of employees to ride bikes to work. Employers could also sponsor a raffle for employees that bike to work during the week to give away a new bicycle, helmet, or gift certificates to local bike shops.



Bicycle Mentor Program

This program matches experienced riders with those who want to learn more about commuting by bicycle. Volunteers from local riding clubs can organize and provide volunteers. The idea is to help a new rider find the best route to work and to educate him or her on how to ride in traffic, in the dark, or in poor weather.

Bicycle Friendly Community

A Bicycle Friendly Community is designated by the League of American Bicyclists as a way to recognize communities that provide safe accommodations for bicyclists and encourages bicycling as a means of transportation and recreation. Currently, one Tennessee community – Chattanooga – has been designated a Bicycle Friendly Community at the Bronze Level. As the network in Hendersonville improves and programs mature, the City should seek this designation.

Enforcement

To ensure the safety of all users and the long-term sustainability of the bicycle and pedestrian system, the formal and informal “rules of the road” must be heeded by all. Effective enforcement programs ensure consistent enforcement of traffic laws affecting motorists and bicyclists. These programs include bicycle licensing/registration efforts and positive reinforcement programs implemented by local law enforcement.

Bicycle Licensing/Registration Program

Bicycle licensing should be considered as a way to enforce bicycle safety and reduce losses to theft. A registered bicycle helps local authorities identify an unresponsive cyclist in the event of an accident and return a stolen bicycle to its owner.

Positive Reinforcement

Positive reinforcement can be a valuable way to encourage safe actions by bicyclists and pedestrians. Police departments across the nation have recognized and rewarded children operating their bicycle in a safe manner. The rewards can include coupons for free ice cream, pizza, or movie tickets, or for discounts at local bicycle shops. This program encourages the child to continue to act safely and encourages their peers to follow their example.

Evaluation

Though often overlooked, evaluation is a critical component of bicycle and pedestrian planning. The friendliest communities for cyclists and pedestrians have a system in place to assess existing programs and outline steps for future expansion.



(Source: www.pedbikeimages.org)

Bicycle and Pedestrian Recommendations

Map 14 shows the recommended bicycle network for the study area. The network is separated to denote the recommended facility types for each area. Key recommendations from the 2000 Bicycle and Pedestrian Master Plan have been vetted and included in the map, while others may have been modified to remain in keeping with other transportation network recommendations. Recommendations resulting from the analysis done for the strategic corridor roadway sections as well as the land use focus areas have also been reflected in this map. It should be noted that the inclusion of bicycle and pedestrian facilities on upgrades of existing roadways and newly constructed roadways will contribute to friendliness of the study area to bicyclists and pedestrians. Some notable recommendations from this map include:

- On Sanders Ferry Road, a combination of multi-use path and striped bicycle lanes is recommended. The northern portion of this road is recommended to have a multi-use path to help promote the Old Town concept in the area. South of this area, a striped bicycle lane will maintain the high level of bicycle facility and be less invasive to neighboring property. Combined with the existing and proposed multi-use path running north along Drakes Creek, these recommendations will result in a continuous north-south bicycle facility.
- The Indian Lake Peninsula features two different facility types. For more advanced riders, a wide outside lane is recommended on Indian Lake Road to serve as a direct route. In addition, a series of signed routes through the peninsula give less experienced riders the opportunity to ride on lower traffic roads and easily navigate the route.
- Wessington Place currently has striped bicycle lanes; however, the existing substandard width, roadside debris, and deep drainage grates make the lane an undesirable travel area. It is recommended that the lanes along this road be improved to a width of 4-5 feet and that the drainage grates be replaced with bicycle-friendly structures. As with all existing and future facilities with striped bicycle lanes, maintenance schedules should be modified so that the lanes remain clear for their intended users.

Transit

As discussed in the Existing Roadway Conditions chapter, Hendersonville currently has park and ride bus service to Nashville. In addition, a study is underway to examine what may be the best long-term strategy for Hendersonville and the rest of the Northeast Corridor area. This study will help evaluate what type of transit service (e.g. commuter rail, bus rapid transit, etc.) will be most appropriate to serve the needs of Hendersonville into the future. However, for these types of transit services to be successful they cannot operate in a vacuum. Land use, density, and infrastructure networks will need to be evaluated and planned to best accommodate transit stations and services. As a part of this effort, the Land Use Chapter examines a focus area around the proposed Rockland Road extension. This area was evaluated with the possibility of sustaining a commuter rail transit station. The land use mix and density proposed for this area exhibits the characteristics of a successful and sustainable commuter rail transit station, while also serving its primary purpose as an employment center.

LEGEND

-  EXISTING STRIPED BIKE LANES
-  PROPOSED STRIPED BIKE LANES
-  PROPOSED SIGNED BIKE ROUTE
-  PROPOSED PAVED SHOULDERS
-  PROPOSED WIDE OUTSIDE LANES
-  EXISTING MULTI-USE PATH
-  PROPOSED MULTI-USE PATH
-  PROPOSED MULTI-USE PATH AND WIDE OUTSIDE LANES
-  STUDY AREA BOUNDARY
-  WATER BODIES

DESTINATIONS

-  GOVERNMENT BUILDING
-  LIBRARY
-  PRIVATE RECREATION
-  SCHOOL

