MPO Walkability Study

Planning for the transportation needs of the region.

Radcliff - Elizabethtown
Metropolitan Planning Organization

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EXECUTIVE SUMMARY

INTRODUCTION TO WALKABILITY

Walking is the most basic form of transportation. However, it is often taken for granted and has become an afterthought of developers, planners, engineers, government officials, and local citizens. The transportation mindset for the past few decades has focused on moving people and goods and minimizing travel times for highway users.[1] This included constructing new limited access roads, modifying existing ones, reducing the number of accidents, reducing congestion through transit, and optimizing traffic signal timing.

There has recently been a shift in this mindset in many communities, including Portland, OR; Charlotte, NC; and Kansas City, MO. Instead of simply moving people and goods quickly through an area, there is a renewed emphasis on creating places people want to travel to, while improving the efficiency of the entire transportation network. One way to do this is by making communities more walkable.

WHAT IS WALKABILITY AND WHY IS IT IMPORTANT?

Walkability is defined as:

> "The extent to which the built environment supports and encourages walking by providing for pedestrian comfort and safety, connecting people with varied destinations within a reasonable amount of time and effort, and offering visual interest in journeys throughout the network."[2]

The concept of walkable communities has recently been receiving much attention in both planning and health-related fields because of an increasing amount of evidence linking neighborhood structure and transportation networks to overall physical and mental health.[3] The major determinant of physical activity is generally considered to be the "quality of the built environment and patterns of development."[4] "Evidence from transportation and urban planning studies suggests that persons living in neighborhoods with greater population densities, land-use mix, street connectivity, and walking and biking infrastructure … tend to walk and cycle more frequently."[5]

Moudon and Lee cite physical inactivity as "one of the major preventable health risks among the U.S. population." Because it is easily incorporated into everyday routines, walking is seen as an easy and economically feasible way to encourage frequent and regular physical activity for the general population.[6] Research suggests that walkable environments reduce the level of obesity in communities and may contribute to improved cognitive functions later in life.[7] Besides the direct health benefits, creating walkable communities can decrease the overall stress level through a reduction in congestion and can also improve air quality.[8]

Another important aspect of walkable communities is that they are in demand. Homebuyers are looking for neighborhoods that are "family-friendly, with sidewalks and calm traffic, green space and trails." Aging populations require alternative options to maintain a basic level of personal mobility and access to services. Disabled populations are assured, through the Americans with Disabilities Act, "full access to public facilities and services."[9]

KEY ELEMENTS OF WALKABLE COMMUNITIES

Walkable communities are those that encourage walking for both utilitarian and recreation purposes. These communities have:

- Well connected pedestrian path networks,
- Land use patterns that provide access to "everyday" type destinations,

- A level of safety that makes people feel comfortable,
- Well-maintained pathways and landscaped features, and
- Aesthetically pleasing pathways that offer pleasant visual experiences. [10]

Within walkable communities, there is a realization that walking and bicycling are essential components of a well-integrated and intermodal transportation system that provides options for residents.[11] These options are critical elements of moving toward a more sustainable community. As Southworth mentions, "Walkability is the foundation for the sustainable city; without it, meaningful resource conservation will not be possible."[12] Since both the City of Radcliff and the City of Elizabethtown have "ingredients" of sustainable planning efforts within their respective Comprehensive Plans, it is hoped that both will strive towards becoming a more walkable community.

GRADES FOR EACH STUDY AREA

RADCLIFF

The City of Radcliff received an overall walkability grade of "C" based on a 5-point scale. There are obviously some areas of improvement for the city. The lack of adequate connections, maintained sidewalks, and other pedestrian amenities contributed to the low walkability grade. The two projects currently being designed or constructed will definitely improve the pedestrian infrastructure along US 31W. Hopefully, these efforts will continue and spread to other high volume corridors such as Lincoln Trail Boulevard, Wilson Road, and Veterans/Logsdon Parkway.

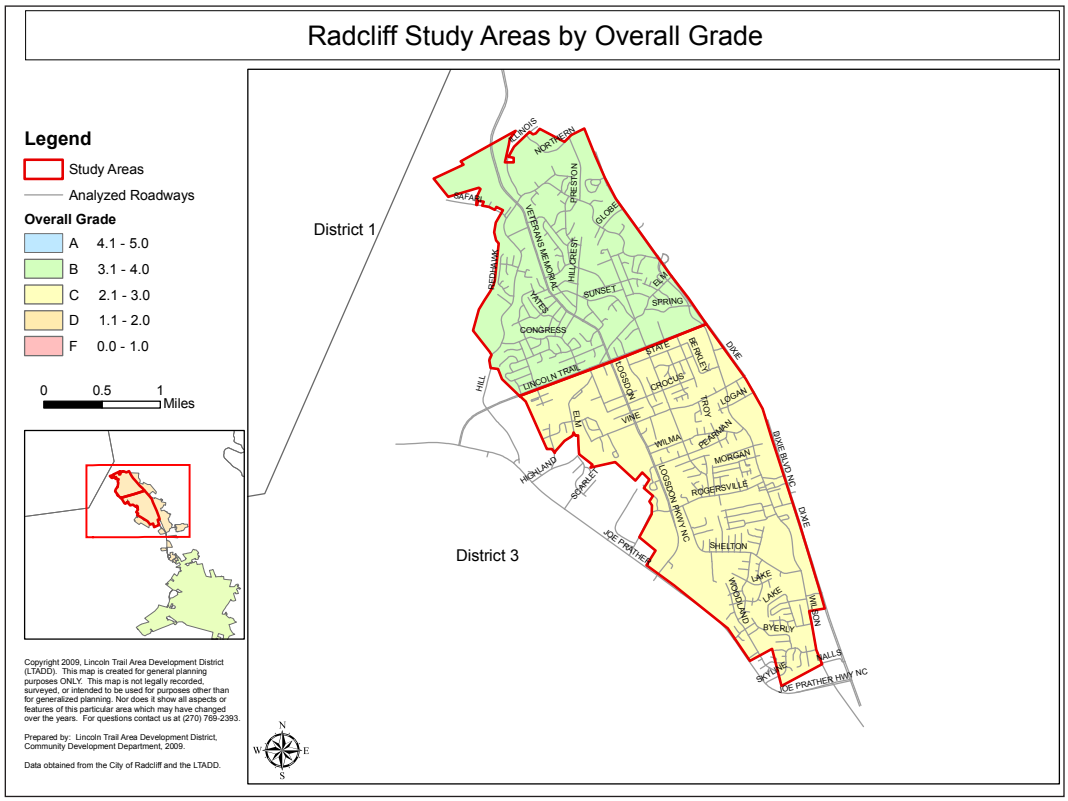
As shown below, the highest grades were in the Land Use Variation and Safety categories. The land use grade was a "B," based on the proportion of 16 different land uses among 4,096 acres. The safety grade was also a "B" based on several factors including the low number of crashes involving pedestrians and the low traffic volumes.

The grades for the remaining categories were C and below. The Connectivity grade was a "D" due to the high number of endpoints, cul-de-sacs, and lack of roadway connections. The Path Quality grade was an "F" overall and for the Planning Districts individually. These failing grades are due to the lack of sidewalks and the high number of conflict points. The Path Context grade was a "C," based on many factors including limited surveillance from existing structures, the lack of lawn maintenance, and the attractiveness of the pathways.

ELIZABETHTOWN

The City of Elizabethtown received an overall walkability grade of "C" based on a 5-point scale. As shown below, the highest combined grades were in the Land Use Variation and Safety categories. The land use grade was a "B," based on the proportion of 18 different land uses among 6,855 acres. The safety grade was also a "B" based on several factors including the low number of crashes involving pedestrians and the low traffic volumes.

The grades for the remaining categories were "C" and below. The Connectivity grade was a "D" due to the high number cul-de-sacs and lack of roadway connections. The Path Quality grade was an "F" overall and for the Planning Subareas individually. These failing grades are due to the lack of maintained sidewalks and the high number


Radcliff Study Areas by Overall Grade
Legend
Study Areas
Analyzed Roadways
Overall Grade
A 4.1 - 5.0
B 3.1 - 4.0
C 2.1 - 3.0
D 1.1 - 2.0
F 0.0 - 1.0
0 0.5 1 Miles
District 1
District 3
Copyright 2009, Lincoln Trail Area Development District (LTADD). This map is created for general planning purposes ONLY. This map is not legally recorded, surveyed, or intended to be used for purposes other than for generalized planning. Nor does it show all aspects or features of this particular area which may have changed over the years. For questions contact us at (270) 769-2393.
Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Radcliff and the LTADD.

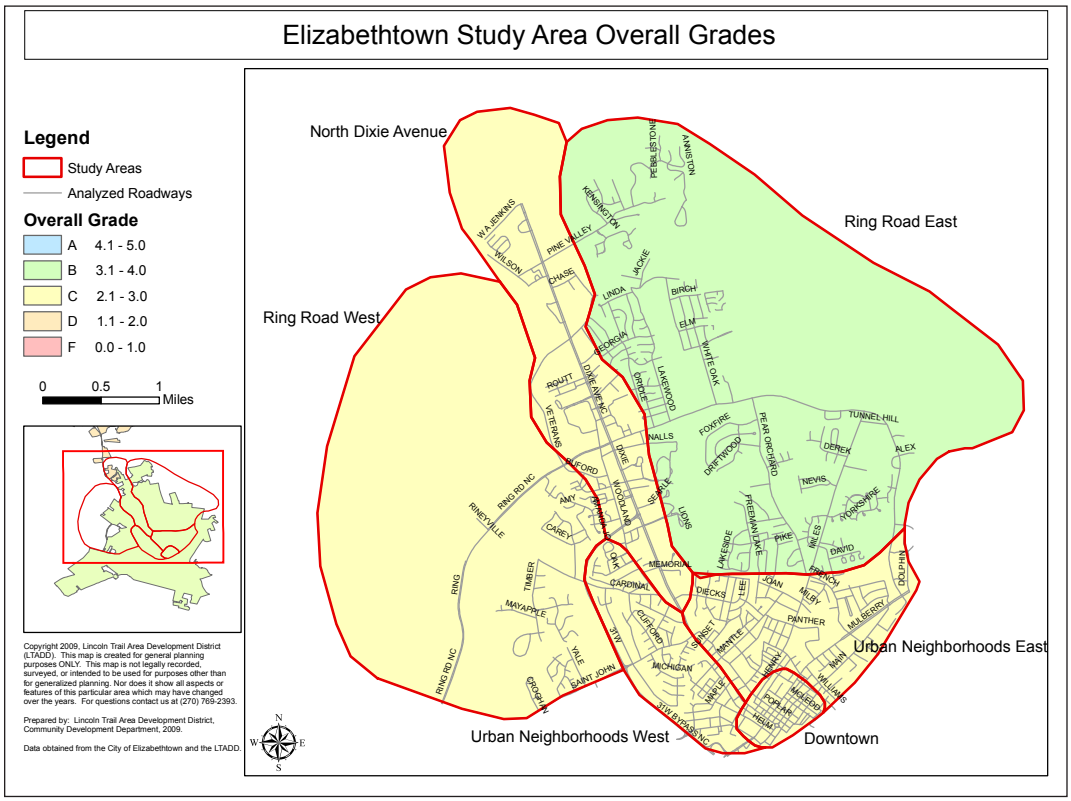

Elizabethtown Study Area Overall Grades
Legend
Study Areas
Analyzed Roadways
Overall Grade
A 4.1 - 5.0
B 3.1 - 4.0
C 2.1 - 3.0
D 1.1 - 2.0
F 0.0 - 1.0
0 0.5 1 Miles
North Dixie Avenue
Ring Road East
Ring Road West
Urban Neighborhoods East
Urban Neighborhoods West
Downtown
Copyright 2009, Lincoln Trail Area Development District (LTADD). This map is created for general planning purposes ONLY. This map is not legally recorded, surveyed, or intended to be used for purposes other than for generalized planning. Nor does it show all aspects or features of this particular area which may have changed over the years. For questions contact us at (270) 769-2393.
Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.

Table 1. Radcliff Area Grades

RADCLIFF					
	Connectivity	Land Use Variation	Safety	Path Quality	Path Context
DISTRICT 1	C	A	B	F	B
DISTRICT 3	D	B	B	F	C
COMBINED	D	B	B	F	C

of conflict points along the path.
The Path Context grade was a "C," based on many factors including the attractiveness, difficulty, and general continuity of the pathways.

Of the six distinct Planning Subareas, Ring Road East had the highest point total of 3.4. This area had the highest Path Context grade of "A" based on the high level of surveillance from existing structures, well maintained lawns, and overall design and attractiveness.
The subarea with the lowest point total of 2.6 was Ring Road West, which had similar grades in each category except Land Use Variation and Path Context.

Table 2. Elizabethtown Area Grades

ELIZABETHTOWN					
	Connectivity	Land Use Variation	Safety	Path Quality	Path Context
DOWNTOWN	B	C	B	F	C
URBAN NEIGH WEST	C	B	B	F	C
URBAN NEIGH EAST	C	C	B	F	B
RING RD WEST	C	C	B	F	D
RING RD EAST	C	B	B	F	A
N DIXIE AVE	C	C	B	F	C
COMBINED	D	B	B	F	C

RECOMMENDED POLICIES & PROGRAMS

POLICIES

Zoning and Development Regulations

- Modify outdated Zoning Ordinances and Development Regulations to reflect current regulations.

- Amend Zoning Ordinances to include Kentucky Street Connectivity Zoning and Subdivision Model Ordinance.

- Incorporate "Complete Street" principles in subdivision regulations, such as routine accommodation for pedestrians and bicyclists, pedestrian scale lighting, and smaller building setback requirements.

- Include internal pathway connectivity requirement on new non-residential developments.

- Require a minimum sidewalk width of 5 feet. Depending on roadway classification, the sidewalks should be constructed with 4 to 8 foot buffer zones along all roadways.

Maintenance Requirements

- Dedicate funds from City's General Fund to maintain and repair sidewalks.

OR

- Develop database to inventory sidewalks that includes location, property owner information, quality, and repair costs assessed to owner (if applicable).

- Inspect all sidewalks within City limits on a 10-year cycle.

- Allocate funds for sidewalk maintenance grant program that pays 25-50% of repair costs.

- Enforce property owner sidewalk maintenance requirement.

- Allow "in-lieu-of" payments for sidewalk maintenance or sidewalk construction, especially when granting sidewalk installation waivers. These funds should be dedicated to the pedestrian infrastructure development.

Sidewalk Priority List

- Identify streets to be included on Sidewalk (or Complete Street) Priority List.

- Provide methods for residents to identify problem locations or potential areas to be improved and included on Priority List.

- Allocate percentage of Capital Improvement Program for pedestrian infrastructure, especially for those projects listed on Sidewalk Priority List.

- Hold Bicycle/ Pedestrian Forums to gather information on potential pedestrian districts and bicycle/ pedestrian corridors.

- Budget funds for Safe Routes to School and other grant programs to leverage financial resources and improve pedestrian infrastructure and associated landscaping.

Pedestrian Corridor Plans

- Annually fund and develop small scale Pedestrian (or Complete Street) Corridor Plans to inventory and evaluate existing infrastructure, develop specific improvement projects and implementation strategies.

- Coordinate with local Chambers of Commerce, Tourism Commissions, and Parks and Recreation staff to develop Corridor Plans.

- Incorporate Corridor Plans into Transportation Component of Comprehensive Plan and Capital Improvement Program.

PROGRAMS

Kid Safe Streets Program

- Develop and allocate funds for a Kid Safe Streets Program.

- Collaborate with local school districts and police departments in developing ways to increase the number of students walking to school.

- Identify target walking corridors/ areas for students.

- Identify elements of these areas that may be unsafe, serve as obstacles, or would otherwise need to be improved.

- Address issues along these corridors and construct or repair existing sidewalks near bus stops and schools.

- Install Kid Safe Street signage along routes.

Outreach Program

- Create and distribute brochures, fact sheets, flyers, etc. for students, parents, and recreation walkers and bicyclists explaining benefits and "stay safe" practices.

- Organize community-wide events, such as marathons, running and bicycle races, and other sporting events to raise awareness of the benefits of walking and bicycling.

- Distribute reflective belts, brochures, fact sheets, flyers, etc. at community-wide events.

RECOMMENDED PROJECTS

Crosswalk Projects

- Strategically locate and install a very limited number of crosswalks with differentiated paving across US 31W, Ring Road, Wilson Road, and Lincoln Trail Boulevard at low volume intersections or highly visible mid-block locations.

- Add cameras to existing traffic signals near these locations in an effort to reduce the number of vehicles running red lights.

- Modify signal timing near these locations to include delay for pedestrian crossings.

Sidewalk Construction/ Enhancement

- Identify and improve sidewalk internal and external connections and landscaping between high volume commercial and nearby residential areas. For example, pathways within and between the Old Navy Plaza and Towne Mall in Elizabethtown, and along Wilson Road in Radcliff.

- Enhance high volume or high visibility pedestrian facilities by strategically locating landscaped areas with pedestrian-scale lighting, street furniture, and public art.

Urban Core Development

- Hire a firm, specializing in pedestrian-oriented developments, to redesign the downtown centers of both Radcliff and Elizabethtown. Create and apply overlay districts for these downtown core areas.

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INTRODUCTION

PURPOSE OF STUDY and ORGANIZATION

There is a renewed interest in sustainable development both nationally and globally. Much literature discusses opportunities to improve the level of sustainability of the transportation system. These opportunities often revolve around walking, since it is the most basic mode of transportation. This study was developed with the primary purpose of evaluating the walkability of the Radcliff/ Elizabethtown Metropolitan Planning Organization (MPO) area. The secondary purpose was to review specific urban issues that have impacted or currently impact the pedestrian infrastructure in our country.

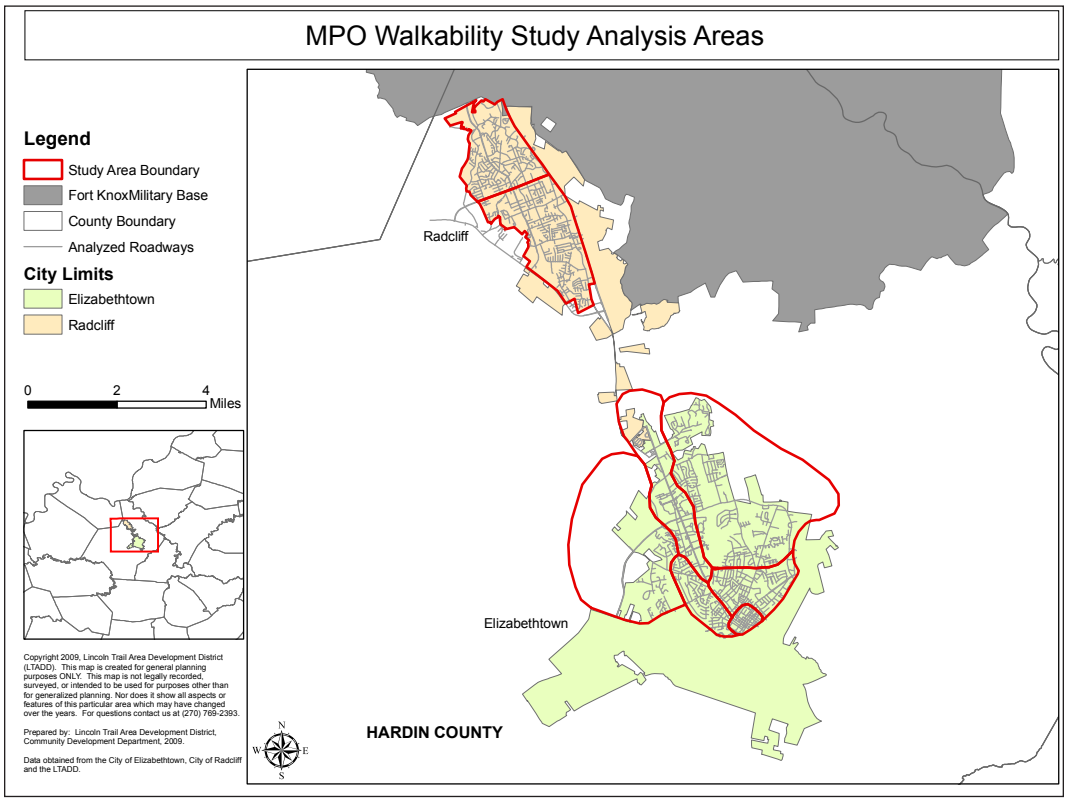
RESEARCH GOALS AND OBJECTIVES

The first goal of this study was to determine the current level of walkability in specific areas of the MPO. To do so, the term "walkability" had to first be defined in the context of the pedestrian infrastructure. Once this was completed, a method to measure the level of walkability had to be developed. Lastly, the MPO area had to be evaluated based on these criteria.

The second goal was to identify general recommendations to improve the level of walkability in the MPO area. In an effort to learn more about the current situation for pedestrians, concerns of residents were identified through surveys sent to a sample of local citizens. Then, current pedestrian-oriented policies, programs, and projects within the MPO were reviewed. Lastly, new policies, programs, and projects that would improve the level of walkability were developed.

STUDY AREA

The Radcliff/ Elizabethtown MPO planning area includes Hardin and Meade Counties, which are just south and west of the City of Louisville. The



MPO urbanized area includes the Cities of Radcliff and Elizabethtown, as well as portions of the Fort Knox Military Reservation.

This study examined portions of both Radcliff and Elizabethtown. In Radcliff, the areas analyzed were District 1 and District 3. In Elizabethtown, the planning areas analyzed were Downtown, Urban Neighborhoods West, Urban Neighborhoods East, Ring Road West, Ring Road East, and North Dixie Avenue. These areas contain much of the residential and commercial land uses in both cities.

ORGANIZATION

This paper describes the completed study in detail. Part C of this section briefly describes the organization of the Lincoln Trail Area Development District and the MPO, as well as their relationship to the surrounding jurisdictions. Part D reviews the urban issues of sprawl, sustainability, and sustainable transportation from a much broader perspective. Section III explains the methodology used to evaluate the MPO urbanized area, including the development of walkability criteria, the methods used to collect data, as well as the methods used to analyze the data. Section IV reviews the findings of the study. An overview for each city and sub-area are included with regard to each category of determination. Section V describes the involvement of local citizens and both the MPO Policy and Technical Advisory Committees. Section VI identifies generalized recommendations that would help to improve the level of walkability in the MPO urbanized area. These recommendations were based on successful practices employed by other cities or MPO's.

INTRODUCTION TO AGENCY

LINCOLN TRAIL AREA DEVELOPMENT DISTRICT

The regional planning agency, which encompasses the Radcliff/ Elizabethtown MPO, is the Lincoln Trail Area Development District (LTADD). This body provides a variety of services for local, state, and federal entities, which can be classified as public administration, aging and social, employment and training, and infrastructure-related services. Within the Community and Economic Development Section, LTADD staff work with state, county, and city officials in developing comprehensive plans, long-range transportation plans, and specific area-wide plans by providing technical and research assistance with ordinances, regulations, and public meetings. Funds are allocated from local, state, and federal entities "to provide management and program assistance … and to carry out specific planning and community development programs and services."[13]

RADCLIFF/ ELIZABETHTOWN METROPOLITAN PLANNING ORGANIZATION

The major transportation planning component within the Community and Economic Development Section, is the Radcliff/ Elizabethtown Metropolitan Planning Organization (MPO). This agency is responsible for identifying, evaluating, and prioritizing transportation improvement projects within the planning area, which includes Hardin and Meade Counties and the Fort Knox Military Reservation. In carrying out its purpose, as defined by Federal SAFETEA-LU legislation, the MPO relies on two essential committees: the MPO Policy Committee and the MPO Technical Advisory Committee. The Policy Committee is the policy board responsible for directing the transportation planning process. The Technical Advisory Committee is responsible for providing technical advice with regard to "the type and extent of transportation improvements for the MPO."[14]

Both Hardin and Meade Counties have planning commissions responsible for developing a comprehensive plan and establishing development regulations within their jurisdictions. The Cities of Radcliff and Elizabethtown also have planning commissions with generally the same function.

All of these jurisdictions financially support the MPO with a local match and are represented with membership on both of the MPO Committees. Remaining funds are drawn from both the state and federal levels.

URBAN PLANNING ISSUES

Three specific urban issues have impacted or currently impact the level of walkability in many communities. As mentioned above, these are the decentralization of the urban core (or sprawl), sustainability, and sustainable transportation.

DECENTRALIZATION OF URBAN CORE

Before the automobile era, walking was an essential activity in early American cities. Employment, retail, and entertainment centers were located in central business districts (CBDs) and workers, shoppers, and other citizens lived in residential areas very close by. Different land uses were by necessity densely organized to allow people to access various everyday activities.[15] As transportation technology improved, suburbanization quickly became a method to obtain a better way of life. "Walkable" became an afterthought as citizens pushed further and further out.

The reasons for suburbanization are many and complex. As discussed by Mieszkowski and Mills, it is a phenomenon that has spanned several decades. Researchers have identified various circumstances that fueled the decentralization of cities, such as the home mortgage insurance during the 1950's, the interstate highway system in the 1960's, and crime and schooling during the 1980's.[16] Since 1810, American cities have seen a decreasing population while suburbs or "edge cities" have seen a steady increase.[17] Early in the 19th century rapid urban growth contributed to high levels of congestion, filth, and disease. Many residents sought a way to get out. Early on, this way out was provided by horse-drawn carriages, steam-powered ferryboats, and steam locomotives.[18]

In his 1942 article, Hoyt identified 27 of 93 cities with populations of over 100,000 that lost population from 1930 to 1940.[19] During the same time period, unincorporated areas increased 14.5 times faster than central cities and 9.5 times faster than incorporated suburbs in 43 of the largest metropolitan districts. This was made possible, he states, "because the automobile, the septic tank, and the power-driven pump made a vast number of sites available and freed the new developments from dependency on fixed transportation routes and established sewer and water systems.[20] In addition, he cited the failure of cities to "expand employment opportunities" as a major cause of decentralization.[21]

Mieszkowski and Mills discuss two classes of theories for suburbanization. The first is described as a natural evolution theory and involves the initial history of the central business district.[22] As employment concentrates in a city, residential development begins to take shape. Locations within the CBD are developed first to minimize commuting costs. As the saturation level of the CBD increases, so does the distance of new residential properties. Higher income groups that can afford new housing then settle in the new residential areas. Lower income groups then move in to fill the void in the CBD. Technological advances in transportation reinforced this movement away from the center beginning with horse-drawn streetcars and then the automobile. Firms then moved to the suburbs

to take advantage of lower wages and land costs. This act reinforced the movement of employees and employers away from the central city to the suburbs. The emphasis of this theory is on the "distance of residential sites to central work places, the effects of rising real incomes over time, the demand for new housing and land, and the heterogeneity of housing stock."[23]

The second class of theories emphasized the financial and social ills associated with central cities. The problems that Mieszkowski and Mills describe influence residents' decision to move from the central city to the suburbs. Furthermore, residents seem to prefer living among people of similar income, education, race, and ethnicity. The benefits of doing so include avoiding non-benefit taxation, enhanced education quality, and moving away from crime-prone black residents. These attractive suburban locations become magnets for other residents with similar preferences. This theory is often called the "flight from blight" theory.

From an economist's perspective, suburbanization has resulted from an input market failure. The externalities associated with urban living, such as crime, pollution, and congestion, are not properly internalized in each market. If they were, Graves notes, urban planners would not be needed.[24]

In "Non-Optimal Levels of Suburbanization," Graves describes suburbanization "as a spatial reaction to the failure to produce optimal quantities of local public goods in the urban core."[25] To substitute for the lack of these goods, residents move to the suburbs where higher output levels of these goods may be found. However, the commuting costs and reduced availability of amenities offset the benefits of moving to the suburbs. Graves further states, "The spatially optimal distribution of public goods will favor the central urban areas, because for any given marginal costs, any provision there has more marginal benefits because of greater population density."[26]

INTRODUCTION TO SUSTAINABILITY

There has been much discussion and debate over what sustainable means, what it does not mean, how it can be measured. The implications of being unsustainable, whether environmentally, socially, or economically, appear grim and unfortunately not too distant. Jared Diamond in his book *Collapse* discusses our ancestor's history of unsustainable practices that have led to many localized collapses of one civilization after another.[27] Van Gelder, among others, warns of the challenges facing our current globalized civilization. She states, "We have the opportunity to compromise global ecosystems to the point where it can no longer sustain life," something our ancestors never had to deal with.[28]

As with all important issues, there are people that proscribe to extreme points of view, as well as those that fall somewhere in the middle. Two identifiable extreme positions are the human-centered (or anthropocentric) and the Gaia views. The philosophy of those leaning toward the first position is one in which there is a strong belief that nature exists for human use and that human ingenuity can always find a way to replicate or replace whatever nature can no longer provide. The philosophy of those of the second position involves a strong belief in the earth as a living system and that humankind is succeeding in destroying this system through a total "disregard for nature."[29]

Regardless of where one stands within this spectrum, there are obviously some unprecedented challenges that our society is going to have to address in the very near future, if not immediately. As van Gelder notes, past

campaigns like "Don't be litterbug," are just not enough to provide that fundamental shift in thinking critical for sustainability to become a reality.[30] The global scale of issues such as air pollution, long-lasting effects from manufactured toxins, degraded natural resources, and climate instability requires a broad integrative approach to move towards the goal of being sustainable.[31] Once the complexities are identified and have begun to be unwoven, it will be easier to pinpoint which processes are sustainable and which are not.

Interestingly, the renewed interest in urban planning, which followed the "dark days of the 1980's, seemed to coincide with the renewed interest in environmental matters.[32] This resurgence, however, was accompanied by serious difficulties when deciding between environmental protection and economic growth. Environmentally-conscious planners found themselves, either directly or indirectly, defining strategies that were "deep-green" (or preservationist), "techno-green" (or technical solutions), or "shallow-green" (primarily growth-based).[33] Regardless of the strategy being pursued, planning provided a good foundation for helping to define sustainable development for many communities.

Unfortunately, as of 2008, there is still no universally accepted definition of sustainable development. There are several though, that seem to make sense, such as the following:

> "Sustainable development 'meets the needs of the present without compromising the ability of future generations to meet their own needs." (Brundtland Commission, 1987).

> "…sustainability is about systems analysis. Specifically, it is about how environmental, economic, and social systems interact to their mutual advantage or disadvantage at various space-based scales of operation." (Transportation Research Board, 1997).[34]

> "…a concept that…represents diverse local to global efforts to imagine and meet a positive vision of a world in which basic human needs are met without destroying or irrevocably degrading the natural systems on which we all depend."[35]

Various definitions will probably continue to be developed, improved, or tweaked far into the future. The beauty of the Brundtland definition is that it "provided an attractive proposition that sustainable development can at the same time improve environmental quality and human welfare." This definition paved the way for sustainability to be seen as a 'win-win' situation for those primarily concerned with nature and those primarily concerned with economic growth.[36]

SUSTAINABLE TRANSPORTATION

The connection between sustainability and transportation systems is all too obvious. In an effort to improve mobility and accessibility, the designers of our transportation network, have added lanes, increased parking requirements, and located facilities in open space far from congested areas. These strategies do not seem to have paid off and are being revisited in many communities around the globe.

Kibert notes that "Without rapid, large increases in resource efficiency, primary emphasis on renewable resources, huge reductions in waste and pollution production…international accords

limiting greenhouse gas emissions…sustainable development will be nothing more than a grand illusion."[37] Without detailed statistical analysis, there seems to be a strong relationship between these issues and our transportation networks. Especially since, the growth in travel over the last 50 years "has taken the form of a considerable increase in the distances traveled by car…."[38]

Hine notes that the transport "policy challenge for the 21st century [is] finding publicly acceptable ways of reducing the growth in transport demand and altering household travel behavior in such a way as to curb car use…." This, in part, depends on land use policies that influence the demand for travel as well as the mode.[39]

A sustainable transportation system, as cited by Litman

- Allows the basic access and development needs of individual, companies, and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations.

- Is affordable, operates fairly and efficiently, offers a choice of transport mode and supports a competitive economy, as well as balanced regional development.

- Limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes, while minimizing the impact on the use of land and the generation of noise.[40]

The difficulty seems to be more with determining the appropriate indicators of a sustainable transportation system. Transportation quality indicators that are most often used are roadway level of service, average traffic speeds, parking convenience and price, and crash rates per vehicle mile. These, however, tend to favor automobile travel and do not consider alternative modes of travel such as walking, bicycling or public transit use. This approach stems from a division of labor among organizations that focus on transportation issues. One agency focuses on congestion, another focuses on collisions, another focuses on the environment, while yet another focuses on improving access for those that are traditionally disadvantaged.[41] Yet another reason for enhanced cooperation among key players.

Fortunately, Litman and Burwell provide a simple alternative that can be easily applied. Because being "sustainable reflects a *parallel model*, which assumes that each mode can be useful, and strives to create balanced transport systems that use each mode for what it does best," sustainable transportation would include an acceptable level of service of various modes of transport.[42] At a minimum, sustainable communities would have to have an acceptable level of service for the most basic mode, walking.

METHODOLOGY

ESTABLISHING CRITERIA

ELEMENTS OF A WALKABLE CITY

An important characteristic in developing the criteria to evaluate the walkability of the study areas was general applicability. As reviewed by Moudon and Lee, there are many ways to measure both the walking and biking service levels in an area.[43] These methods range from simple resident surveys to more developed level

of service measurements. Many of these "audit instruments" focused only on specific corridors. As explained above, this study took a broad approach in evaluating the study areas. Therefore, it was important to find specific attributes present in a walkable city or area. In "Designing the Walkable City," Southworth describes six key attributes, which are listed below.[44]

- Connectivity of path network
- Linkage with other modes
- Fine grained and varied land use patterns
- Safety
- Quality of path
- Path context

Using these criteria as a guide, indices were found that would provide a method to analyze the study areas. Unfortunately, it became apparent that the "Linkage with other modes" category was not applicable to the MPO area, since there are not alternative fixed route modes available to the general public. Therefore, overall area grades were determined based on a 5.0-point scale.

Table 2A.

Overall Area Grades	
A	4.1 to 5.0
B	3.1 to 4.0
C	2.1 to 3.0
D	1.1 to 2.0
F	0.0 to 1.0

For this study, the Connectivity and Land Use Variation categories were applicable only on an area-wide scale. The remaining categories were applicable on the roadway level. Therefore, a threshold of 75% was used to determine a clear majority for the Safety, Path Quality, and Path Context categories, as shown below.

Table 3.

Subarea Grade Determination for Roadway Level Data	
A	75% are A
B	75% are at least B
C	75% are at least C
D	75% are at least D
F	75% are F or better

METRICS AND GRADING SCALE

Connectivity

The Connectivity Index, as described in the KYTC Street Connectivity Model Ordinance, was used to evaluate the path networks in each study area. The Connectivity Index is calculated as the number of street links divided by the number of nodes. Street links are defined as any roadway segment between two nodes. Nodes are defined as any intersection between two roadways, sharp turns in the same roadway, and roadway ends. Index values were obtained by simply counting the number of links and nodes of each study area on a map.[45]

The first step in this process, was to separate the roads based on the specific subarea. This was accomplished by using the "Select by Attributes" feature in ArcMap. Roadways in each subarea were exported as separate shapefiles. With these shapefiles, maps of each subarea were developed and printed in order to be able to manually count the number of intersections, nodes, and roadway segments. Based on these values, a connectivity index was calculated for each subarea. Finally, the subarea values were aggregated to calculate an index value for each city.

To avoid duplication and to obtain a more accurate value, divided roadway segments were counted only once. Segments between the divided roadway were not counted at all. For example, the joining segment of Logsdon Parkway in Radcliff (joining North and South Logsdon Pkwy) that crosses West Lincoln Trail Boulevard was not counted and only one node was counted, rather than two.

Roadways bordering more than one study area were counted only once. The grading scale for this index is as follows:

Table 4.

Connectivity Index	
A	1.76 – 2.50
B	1.31 – 1.75
C	1.01 – 1.30
D	0.80 – 1.00

Land Use Variation

A logarithmic entropy land use score was used to evaluate land use variation in each study area. This score is roughly defined as the sum of the area for each land use divided by the number of land uses. The formula used was the following: $\sum_k(p_k \ln p_k) / \ln N$, where k is the land use category; p is the proportion of the land area devoted to a specific land use; N is the number of land use categories.[46]

To calculate scores for the study areas, zoning GIS files with individual parcels, were first obtained from both the City of Radcliff and Elizabethtown. Then, the individual parcels were filtered based on the study area and exported. These new database files were saved as Excel files to perform the necessary operations. Next, the land area for each land use zone was summed appropriately, the total land area for each study area was found, and the proportion of each zone was found. This proportion was then multiplied by the natural log of the proportion for each zone. The negative sum (to get a positive number) of these proportions was then calculated and divided by the natural log of the number of different land use categories. The grading scale for this category is as follows:

Table 5.

Entropy Land Use Score	
A	0.81 – 1.00
B	0.61 – 0.80
C	0.41 – 0.60
D	0.21 – 0.40
F	0.00 – 0.20

Safety

The Pedestrian Safety Deficiency Index, as developed by the Georgia Department of Transportation and modified by the Arizona DOT, was used as a metric for safety. The sub-categories used include sidewalk availability, crossing risk, crossing opportunities, pedestrian crashes, traffic speed, and traffic volume.[47]

The sidewalk availability sub-category evaluates the path based on the size of the shoulder and the existence of a sidewalk. The crossing risk was determined by the number of lanes in each direction and the type of median. Crossing opportunities were determined by the number of signals along the segment or number of segments, depending on the segment length. The pedestrian crashes category was determined based on the number of crashes per mile, which was not normalized by length. Both the traffic speed and volume evaluated the path based on associated highway information. See Table A1 in the Appendix for complete Safety Sub-Categories and Criteria.

Aerial photographs obtained from both the City of Radcliff and Elizabethtown and added into ArcMap were used to gather information regarding sidewalk availability, crossing risk, and crossing opportunities. Pedestrian crash data and traffic volumes were obtained from the Kentucky Transportation Cabinet. Crash data used were from June 2004 to June 2009. Traffic volumes listed for major roadways were obtained from the Highway Information System maintained by the KYTC. Traffic speed for all roadways was collected by either driving to the specific segment or by using the Street View feature on Google Maps.

Each segment was scored based on the criteria described above. The entire subarea was graded based on the 75% threshold as explained above. The grading scale for this category is as follows:

Table 6.

Safety Deficiency Index	
A	1 – 7
B	8 – 11
C	12 – 15
D	16 – 19
F	20 +

Path Quality

The Pedestrian Level-of-Service Performance-Measure Point System was used to determine the quality of the existing path or sidewalk. This was first used in the Gainesville Mobility Plan Prototype, which was developed as a congestion management plan for the City of Gainesville, Florida. As explained in detail by Dixon, this point system measures pedestrian level-of-service for specific roadway corridors using six sub-categories.[48]

The first category is Pedestrian Facility Provided. The criterion included in this category evaluates the path based on the existence of a facility, type of facility, size of the sidewalk, and the existence of a parallel facility. The second category is Conflicts. The criterion in this category evaluates the path primarily on any potential conflict points along the path and mitigation efforts or facilities currently in place. The third category is Amenities in Right-of-Way. This category examines elements of the path that would make it more appealing, such as shade trees, benches and pedestrian-scale lighting. The fourth category is Motor Vehicle LOS, which was not used in this study due to the unavailability of data. The fifth category, Maintenance, allocates points based on the frequency of problems in the path. The last category, Transportation Demand Management (TDM) and Multimodal Support, evaluates the path based on current efforts to encourage alternative modes of transportation along the corridor, such as bicycle facilities and bus stops.[49]

Data used in the first two categories and part of the third category were collected from aerial photographs added into ArcMap. The remaining information was gathered using the Street View feature in Google Maps, discussions with members of the MPO Technical Advisory Committee, and by driving to locations not mapped in Google Maps.

Each segment was scored based on the criteria described above. The entire subarea was graded based on the 75% threshold as explained above. See Table A2 in the Appendix for complete Quality Sub-Categories and Criteria. The grading scale for this category is as follows:

Table 7.

Quality Index	
A	16 – 19
B	12 – 15
C	8 – 11
D	4 – 7
F	-2 – 3

Path Context

The last category was developed from the SPACES Assessment worksheet created by Pikora. The components of this worksheet used in this category were Surveillance, Garden [or Lawn] Maintenance, Verge Maintenance, Number of Trees, Cleanliness, Building Design Similarity, Overall Attractiveness, and Continuity of Path.

The level of surveillance was determined by the number of existing buildings in close proximity to the path and how well the path could be observed from these buildings. The lawn maintenance level was determined by the percentage of the lawn area along a specific segment that was well maintained. Verge was defined in this study as the area between the roadway edge and the existing sidewalk or within three of the roadway edge. The level of maintenance was determined in the same manner as the lawn maintenance level. Points for the number of trees sub-category were determined by counting the trees per house block or parcel and estimating an average for the specific segment.

The overall cleanliness of a segment was determined

by the amount of trash, litter, and discarded items along the corridor. The level of building design similarity was primarily determined by the number of different building uses and styles along the segment. The overall attractiveness was determined by evaluating several other categories, sub-categories, and by using Street View in Google Maps. The last sub-category was determined by looking at the level of continuity of the path.

The surveillance, number of trees, and continuity of path categories were evaluated based on aerial photography and Street View. The lawn and verge maintenance, cleanliness, building design, and overall attractiveness were determined by using the Street View feature.

Each segment was scored based on the criteria described above. The entire subarea was graded based on the 75% threshold as explained above. See Table A3 in the Appendix for complete Context Sub-Categories and Criteria. The grading scale for this category is as follows:

Table 8.

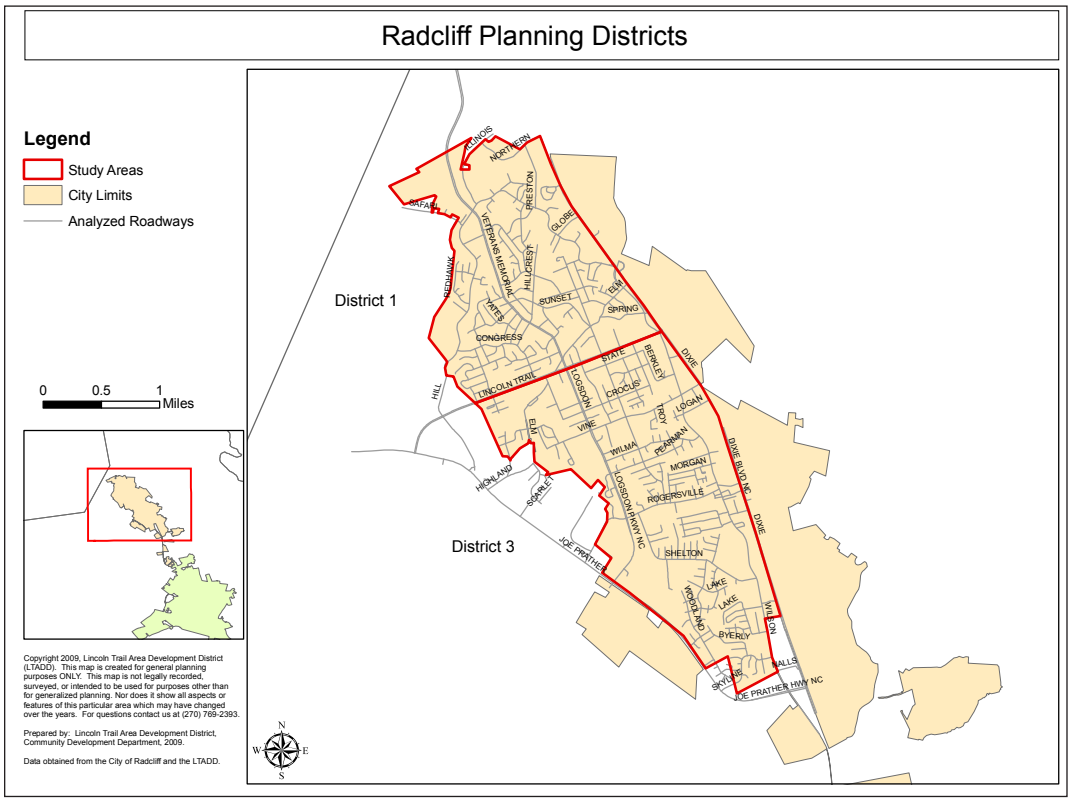
Context Index	
A	8 – 12
B	13 – 16
C	17 – 20
D	21 – 24
F	24+

FINDINGS

RADCLIFF

DEMOGRAPHIC ANALYSIS[50]

In 2000, the population of the City of Radcliff was 21,850. The working population aged 16 years or over was 10,144. Of this population, 80.7% drove a personally owned vehicle alone to work; 13.3% carpooled; 0.8% used public transportation (including taxicab); 1.36% walked; 1.6% used other means; and 2.3% worked at home. According to 2005-07 American Community Survey estimates, the mean travel



time to work was 19.4 minutes. According to the same estimates, the population of the City of Radcliff was 22,001.

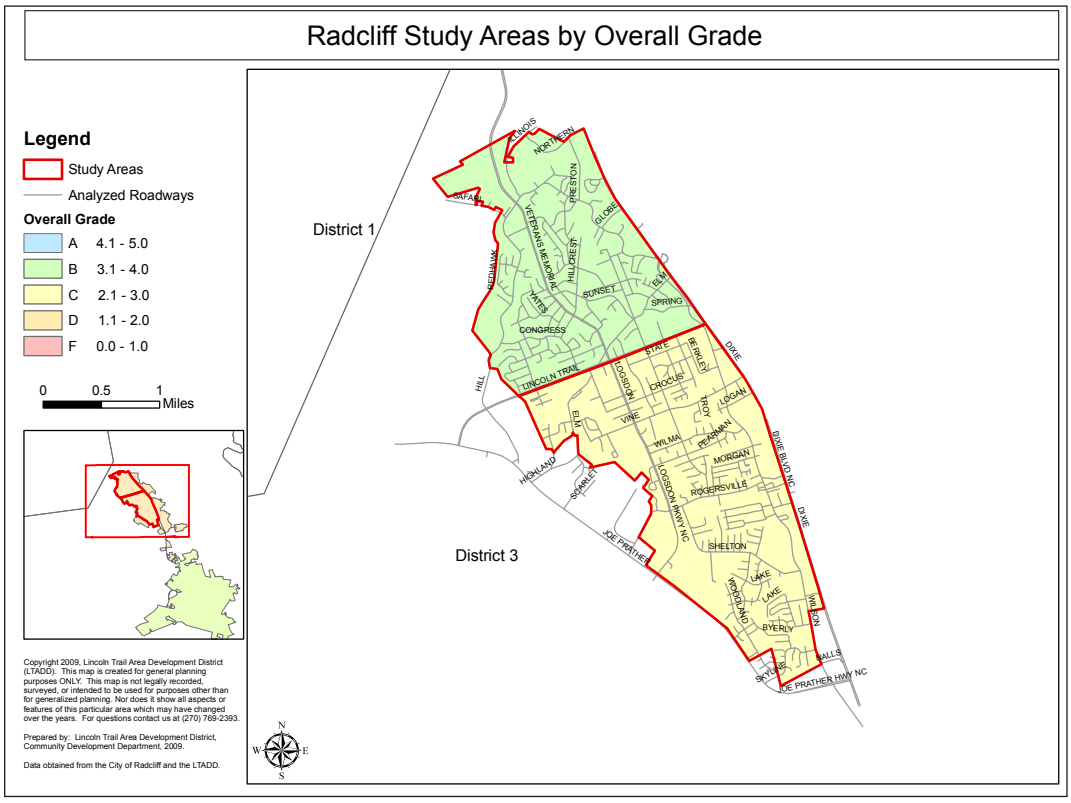
According to the 2005-07 ACS, there were 10,190 households in the city. The median household income and benefits (in 2007 inflation-adjusted dollars) was $44,804. Approximately 12.1% of households made less than $15,000 per year; 25.6% of households made between $15,000 and $35,000; and 42.6% of households made more than $50,000.

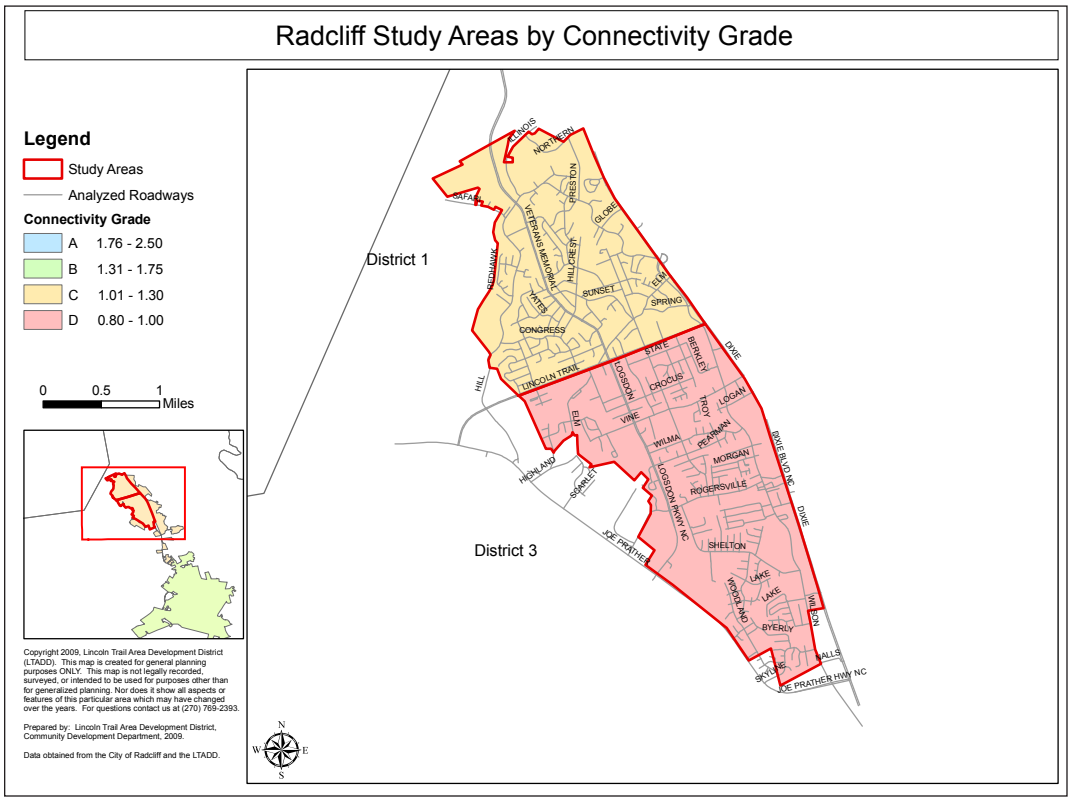
The total number of occupied housing units was 8,532. Of these, 3.4% had no vehicle available; 39.0% had one vehicle available; 39.8% had two vehicles available; and 17.8% had three or more vehicles available. Approximately 4,921 were specified owner-occupied housing units. Of these, there were 3,554 housing units with a mortgage. About 32.9% spent less than 20.0% of their household income on selected monthly owner costs; 13.7% spent 20.0 to 24.9%; 9.1% spent 25.0 to 34.9%; and 16.5% spent 35% or more. About 3,611 were specified renter-occupied housing units. Of these 42.9% spent less than 20.0% of their household income on gross rent; 11.7% spent 20.0 to 24.9%; 14.3% spent 25.0 to 34.9%; and 20.3% spent 35% or more.

ANALYSIS BY CATEGORY

The Radcliff study area included Planning Districts 1 and 3, as shown in Map 3. Combined these two districts encompass 4,096.3 acres of land or 59.1% of the total land area in the city. This area also includes 81.93 miles of roadway.

Overall the Radcliff study area received 2.8 out of 5.0 points. Based on the grading scale described in Section III, Radcliff received a walkability grade of "C." The connectivity grade was a "D"; the land use variation grade was a "B"; the safety grade was a "B"; the path quality grade was an "F"; and the path context grade was a "C." A detailed explanation of each category grade is provided below.




Radcliff Study Areas by Connectivity Grade
Legend
Study Areas
Analyzed Roadways
Connectivity Grade
A 1.76 - 2.50
B 1.31 - 1.75
C 1.01 - 1.30
D 0.80 - 1.00
0 0.5 1 Miles
District 1
District 3
ILLINOIS
NORTHERN
SAFARI
PRESTON
GLOBE
VETERANS MEMORIAL
HILLCREST
REDHAWK
SUNSET
ELM
SPRING
YATES
CONGRESS
LINCOLN TRAIL
STATE
BERKLEY
DIXIE
HILL
LOGSDON
CROCUS
TROY
LOGAN
VINE
WILMA
PEARMAN
MORGAN
ROGERSVILLE
DIXIE BLVD NC
HIGHLAND
SCARLET
LOGSDON PKWY NC
SHELTON
JOE PRATHER
LAKE
WOODLAND
WILSON
BYERLY
FALLS
SKYLINE
JOE PRATHER HWY NC
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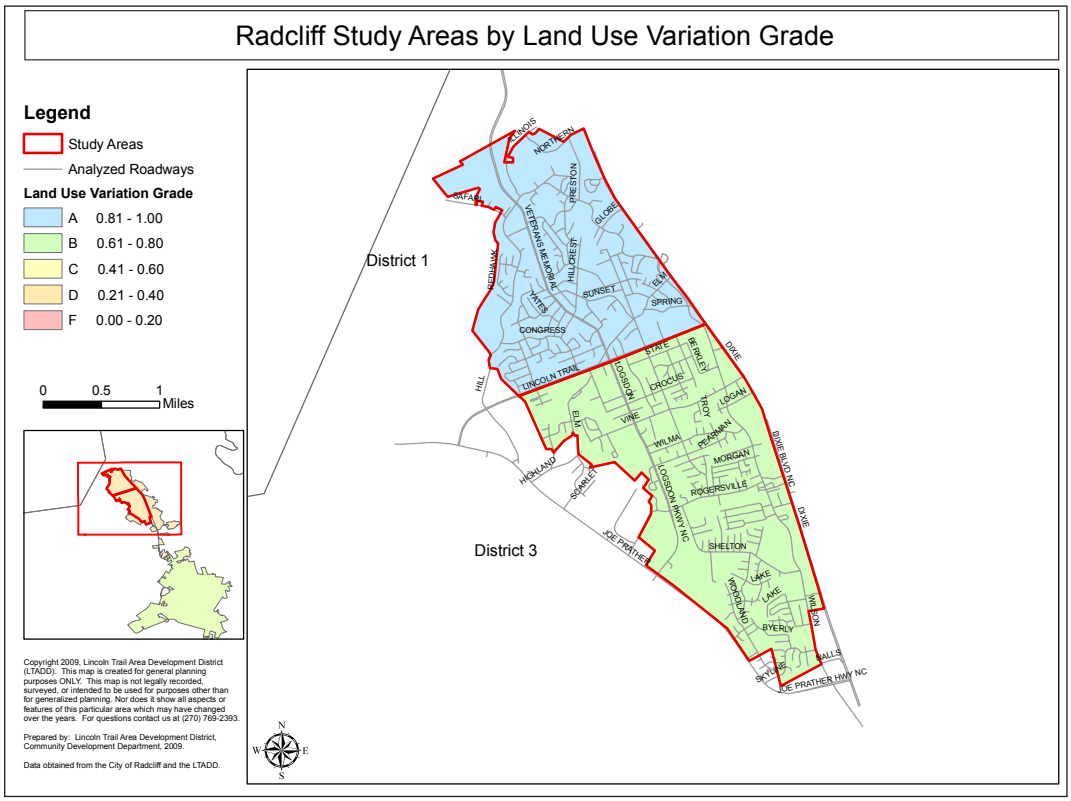
Data obtained from the City of Radcliff and the LTADD.


Radcliff Study Areas by Land Use Variation Grade
Legend
Study Areas
Analyzed Roadways
Land Use Variation Grade
A 0.81 - 1.00
B 0.61 - 0.80
C 0.41 - 0.60
D 0.21 - 0.40
F 0.00 - 0.20
0 0.5 1 Miles
District 1
District 3
ILLINOIS
NORTHERN
SAFARI
PRESTON
GLOBE
VETERANS MEMORIAL
HILLCREST
REDHAWK
SUNSET
ELM
SPRING
YATES
CONGRESS
LINCOLN TRAIL
STATE
BERKLEY
DIXIE
HILL
LOGSDON
CROCUS
TROY
LOGAN
VINE
WILMA
PEARMAN
MORGAN
ROGERSVILLE
DIXIE BLVD NC
HIGHLAND
SCARLET
LOGSDON PKWY NC
SHELTON
JOE PRATHER
LAKE
WOODLAND
WILSON
BYERLY
FALLS
SKYLINE
JOE PRATHER HWY NC
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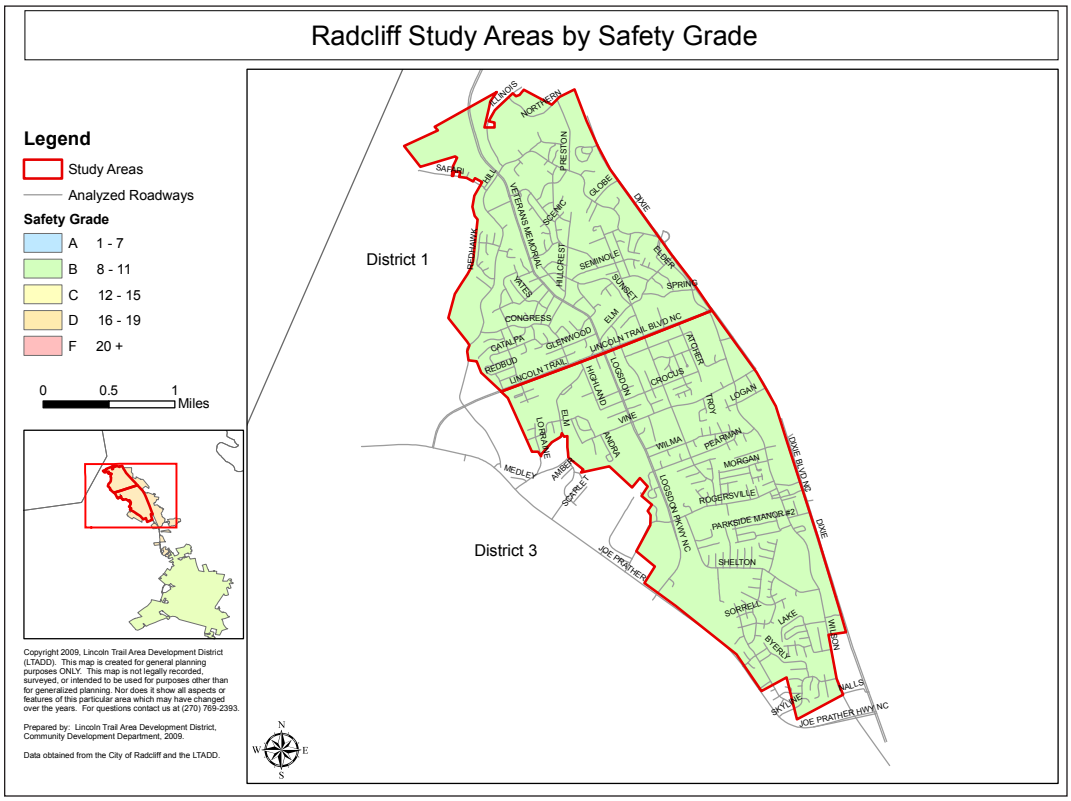
Radcliff Study Areas by Safety Grade
Legend
Study Areas
Analyzed Roadways
Safety Grade
A 1 - 7
B 8 - 11
C 12 - 15
D 16 - 19
F 20 +
0 0.5 1 Miles
District 1
District 3
ILLINOIS
NORTHERN
PRESTON
GLOBE
DIXIE
SAFARI
HILL
VETERANS MEMORIAL
SCENIC
REDHAWK
HILLCREST
SEMINOLE
ELDER
SUNSET
SPRING
YATES
CONGRESS
ELM
CATALPA
GLENWOOD
LINCOLN TRAIL BLVD NC
REDBUD
LINCOLN TRAIL
JACQUELINE
HIGHLAND
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JOE PRATHER
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JOE PRATHER HWY NC
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Data obtained from the City of Radcliff and the LTADD.
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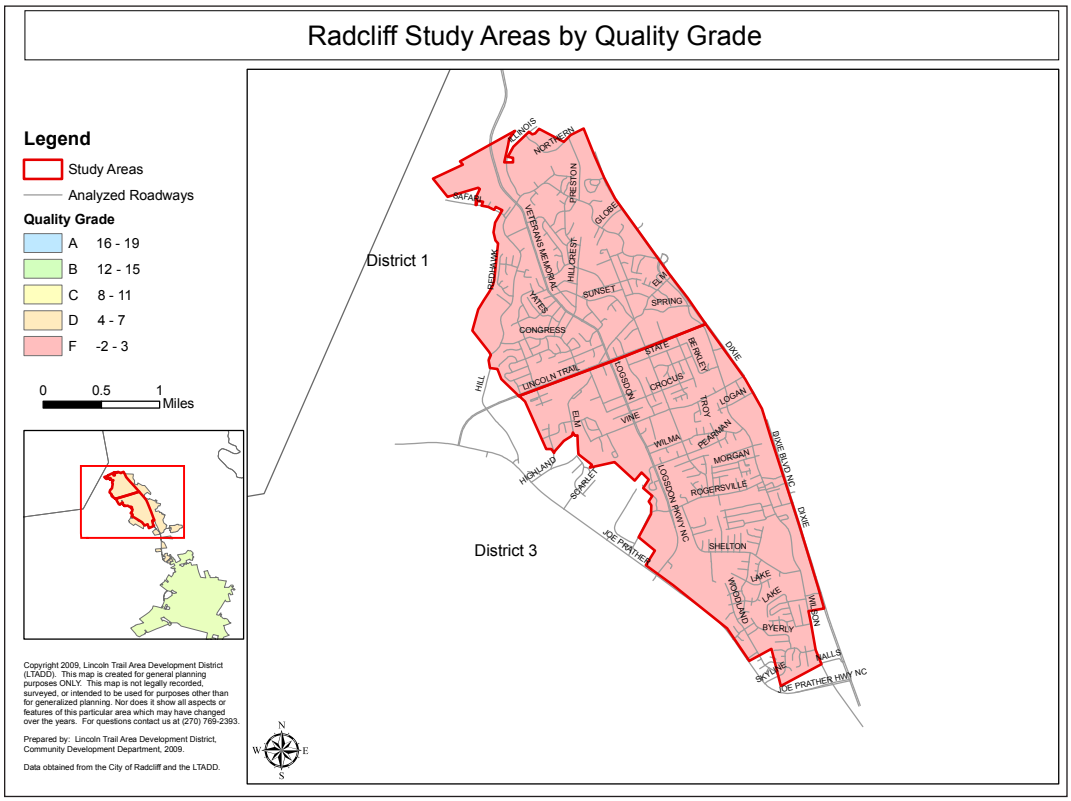
Radcliff Study Areas by Quality Grade
Legend
Study Areas
Analyzed Roadways
Quality Grade
A 16 - 19
B 12 - 15
C 8 - 11
D 4 - 7
F -2 - 3
0 0.5 1 Miles
District 1
District 3
ILLINOIS
NORTHERN
PRESTON
GLOBE
SAFARI
VETERANS MEMORIAL
REDHAWK
HILLCREST
ELM
SUNSET
SPRING
YATES
CONGRESS
STATE
BERKLEY
DIXIE
HILL
LINCOLN TRAIL
LOGSDON
CROCUS
TROY
LOGAN
VINE
ELM
WILMA
PEARMAN
DIXIE BLVD NC
HIGHLAND
MORGAN
SCARLET
ROGERSVILLE
LOGSDON PKWY NC
JOE PRATHER
SHELTON
LAKE
WOODLAND
LAKE
BYERLY
WILSON
SKYLINE
WALLS
JOE PRATHER HWY NC
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Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Radcliff and the LTADD.
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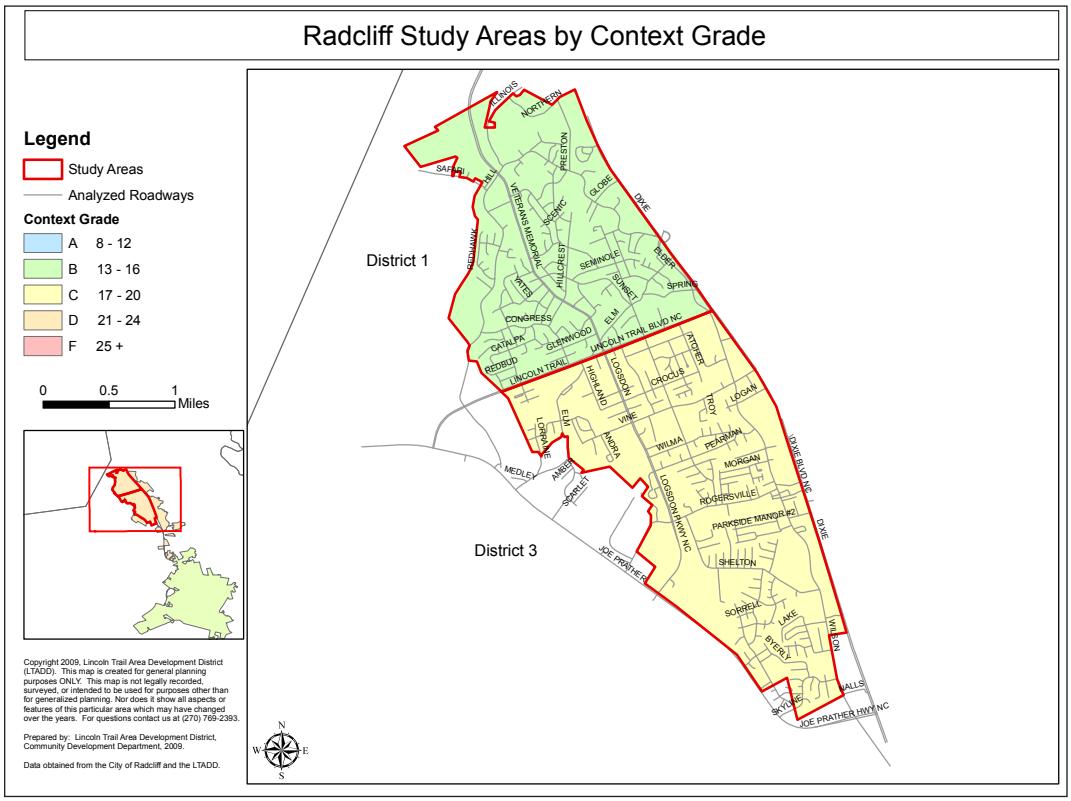


Connectivity

Within the Radcliff study area, there are 636 distinct roadway segments and 640 distinct nodes. Dividing the number of segments by the number of nodes results in a connectivity index value of 0.99. Based on the grading scale described in Section III, this translates to a connectivity grade of "D."

Land Use Variation

Within the Radcliff study area, there are 4,876 individual parcels and 16 different land use categories. The area for each land use category is shown in Table B4 in the Appendix. The land use variation, as calculated using the entropy land use score, is 0.75. Based on the grading scale described in Section III, this translates to a land use variation grade of "B."

Safety

Within the Radcliff study area, there are 81.93 miles of roadways. The 75% majority received a grade of "B" or better. About 36.13 miles or 44.1% were rated "A"; 39.84 miles or 48.6% were rated "B"; and the remaining 5.96 miles or 7.3% were rated "C."

Path Quality

Of the total miles of roadways in Radcliff, the 75% majority received a grade of "F" or better. About 28.58 miles or 34.9% were rated "C"; about 8.65 miles or 10.6% were rated "D"; and about 44.70 miles or 54.6% were rated "F."

Path Context

Of the total miles of roadway in Radcliff, the 75% majority were rated "C" or better. About 32.42 miles or 39.6% were rated "A"; approximately 22.38 miles or 27.3% were rated "B"; about 19.99 miles or 24.4% were rated "C"; about 6.69 miles or 8.2% were rated "D"; and about 0.45 miles or 0.6% were rated "F."

DISTRICT 1

The total land covered by Planning District 1 is approximately 1,727.53 acres or 25.0% of the total land area in the city. This area also includes 36.19 miles of roadway.

Overall District 1 received 3.4 out of 5.0 points. Based on the grading scale described in Section III, Radcliff received a walkability grade of "B." The connectivity grade was a "C"; the land use variation grade was an "A"; the safety grade was a "B"; the path quality grade was an "F"; and the path context grade was a "B." A detailed explanation of each category grade is provided below.

ANALYSIS BY CATEGORY

Connectivity

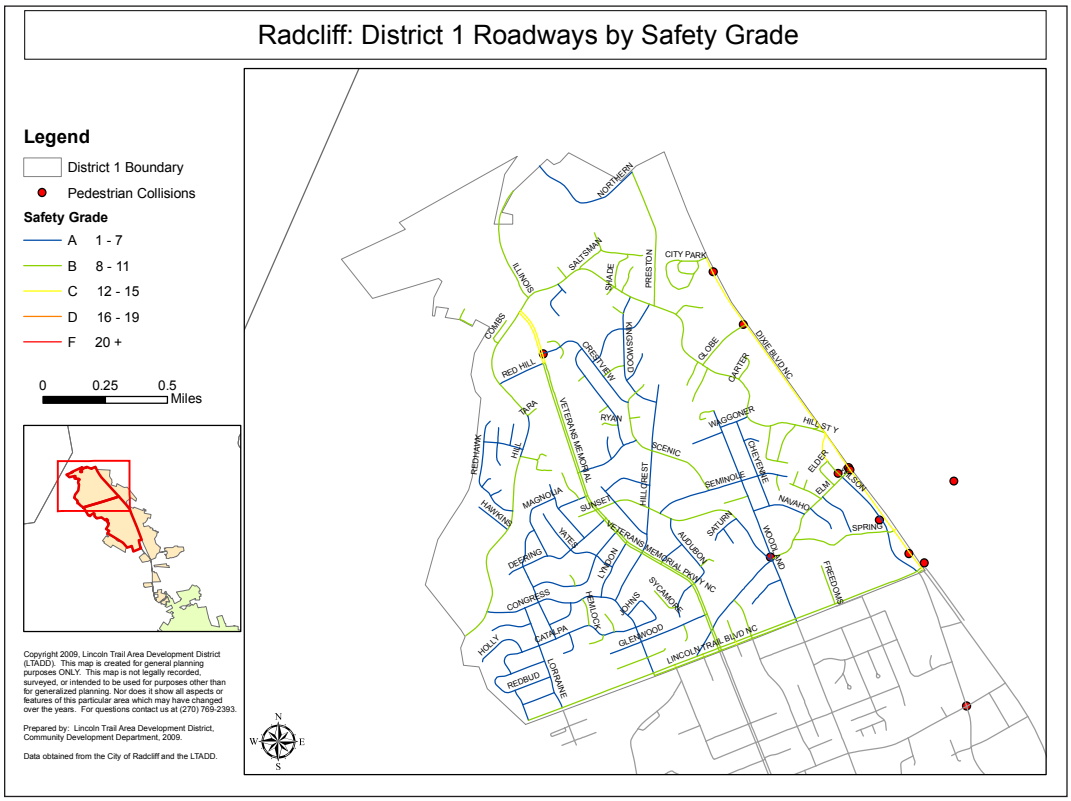
Within Planning District 1, there are 293 distinct roadway segments and 262 distinct nodes. Dividing the number of segments by the number of nodes results in a connectivity index value of 1.12. Based on the grading scale described in Section III, this translates to a connectivity grade of "C."

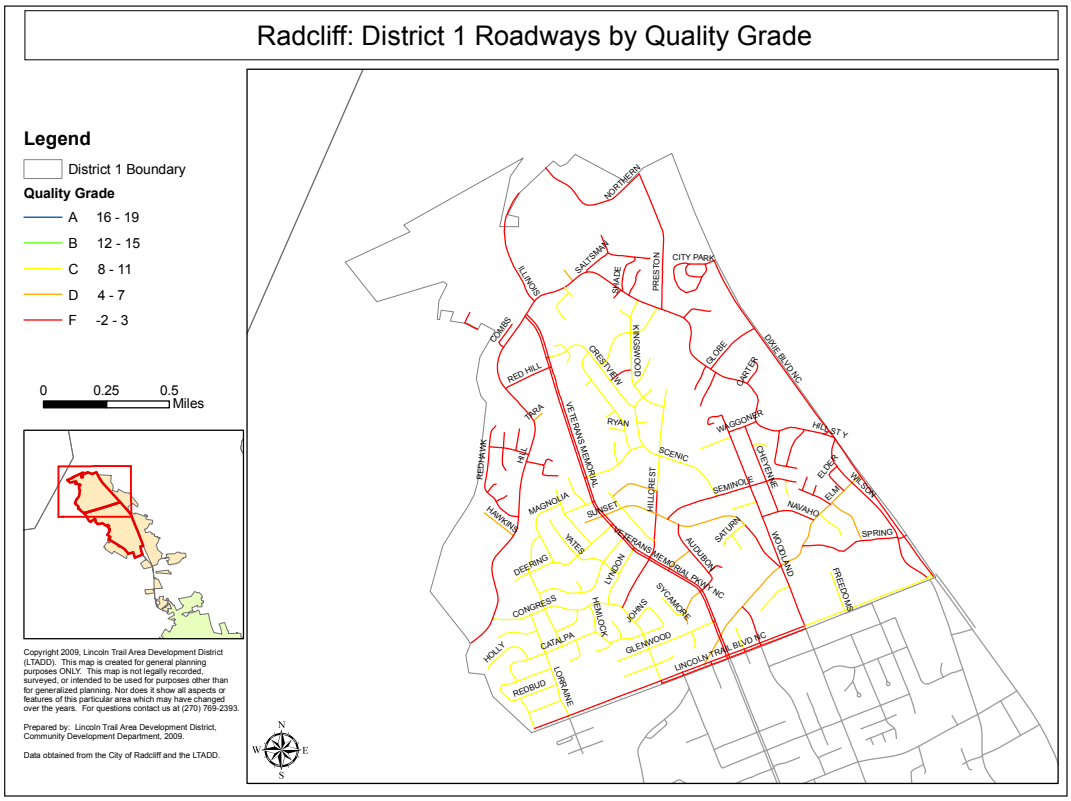
Land Use Variation

Within Planning District 1, there are 2,098 individual parcels and 12 different land use categories. The area for each land use category is shown in Table B5 in the Appendix. The land use variation, as calculated using the entropy land use score, is 0.84. Based on the grading scale described in Section III, this translates to a land use variation grade of "A."

Safety

Within Planning District 1, there are 36.19 miles of roadway. The 75% majority received a grade of "B" or better. About 17.21 miles or 47.5% were rated "A"; approximately 16.83 miles or 46.5% were rated "B"; and the remaining 2.16 miles or 6.0% were rated "C."




Radcliff: District 1 Roadways by Quality Grade
Legend
District 1 Boundary
Quality Grade
A 16 - 19
B 12 - 15
C 8 - 11
D 4 - 7
F -2 - 3
0 0.25 0.5
Miles
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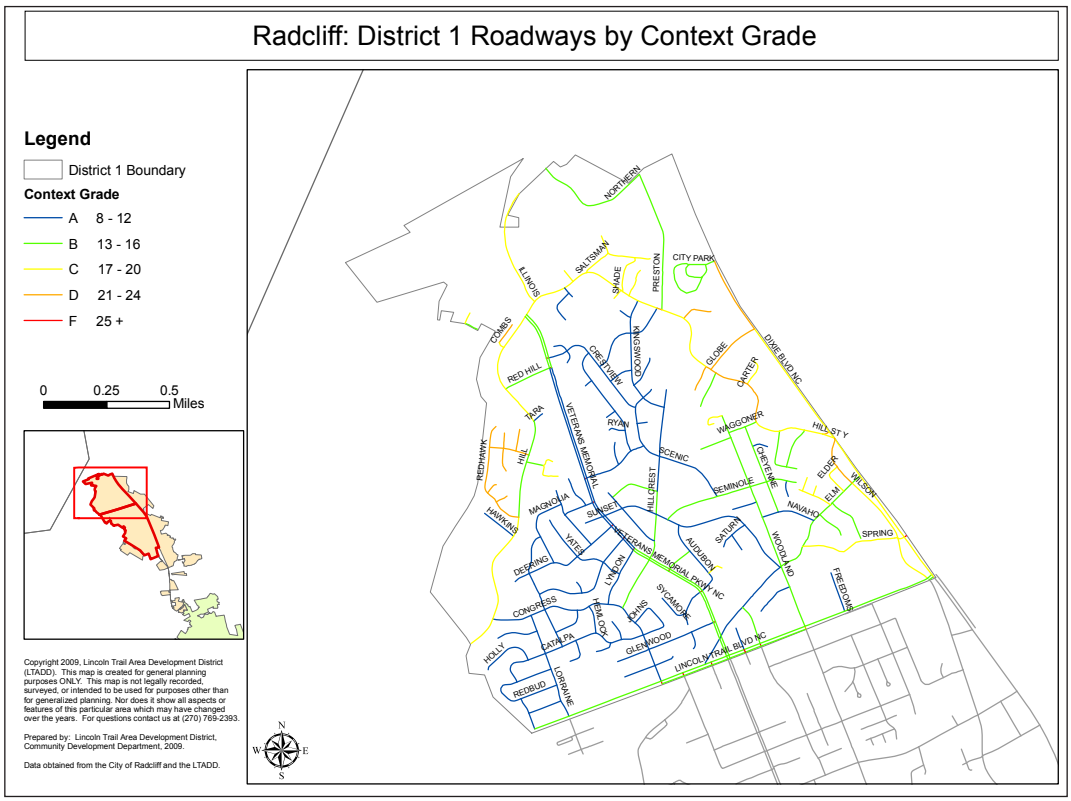
Data obtained from the City of Radcliff and the LTADD.
NORTHERN
SALTSMAN
ILLINOIS
SHADE
PRESTON
CITY PARK
COMBS
RED HILL
CRESTVIEW
KINGSWOOD
GLOBE
CARTER
DIXIE BLVD NC
TARA
VETERANS MEMORIAL
RYAN
WAGGONER
HILLCREST
SCENIC
CHEYENNE
ELDER
ELM
WILSON
REDHAWK
HILL
SEMINOLE
NAVAHO
MAGNOLIA
SUNSET
HAWKINS
YATES
VETERANS MEMORIAL PKWY NC
AUDUBON
SATURN
WOODLAND
SPRING
DEERING
LYNDON
SYCAMORE
FREEDOM
CONGRESS
HEMLOCK
JOHNS
CATALPA
GLENWOOD
HOLLY
LINCOLN TRAIL BLVD NC
REDBUD
LORRAINE


Radcliff: District 1 Roadways by Context Grade
Legend
District 1 Boundary
Context Grade
A 8 - 12
B 13 - 16
C 17 - 20
D 21 - 24
F 25 +
0 0.25 0.5
Miles
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Data obtained from the City of Radcliff and the LTADD.
NORTHERN
SALTSMAN
ILLINOIS
SHADE
PRESTON
CITY PARK
COMBS
RED HILL
CRESTVIEW
KINGSWOOD
GLOBE
CARTER
DIXIE BLVD NC
TARA
VETERANS MEMORIAL
RYAN
WAGGONER
HILLCREST
SCENIC
CHEYENNE
ELDER
ELM
WILSON
REDHAWK
HILL
SEMINOLE
NAVAHO
MAGNOLIA
SUNSET
HAWKINS
YATES
VETERANS MEMORIAL PKWY NC
AUDUBON
SATURN
WOODLAND
SPRING
DEERING
LYNDON
SYCAMORE
FREEDOM
CONGRESS
HEMLOCK
JOHNS
CATALPA
GLENWOOD
HOLLY
LINCOLN TRAIL BLVD NC
REDBUD
LORRAINE

Path Quality
Of the total miles of roadway in Planning District 1, the 75% majority received a grade of "F" or better. About 13.26 miles or 36.6% were rated "C"; approximately 2.57 miles or 7.1% were rated "D"; and approximately 20.36 miles or 56.3% were rated "F."

Path Context
Of the total miles of roadway in Planning District 1, the 75% majority were rated "B." About 16.42 miles or 45.4% were rated "A"; approximately 10.64 miles or 29.4% were rated "B"; about 6.55 miles or 18.1% were rated "C"; about 2.42 miles or 6.7% were rated "D"; and about 0.16 miles or 0.4% were rated "F."

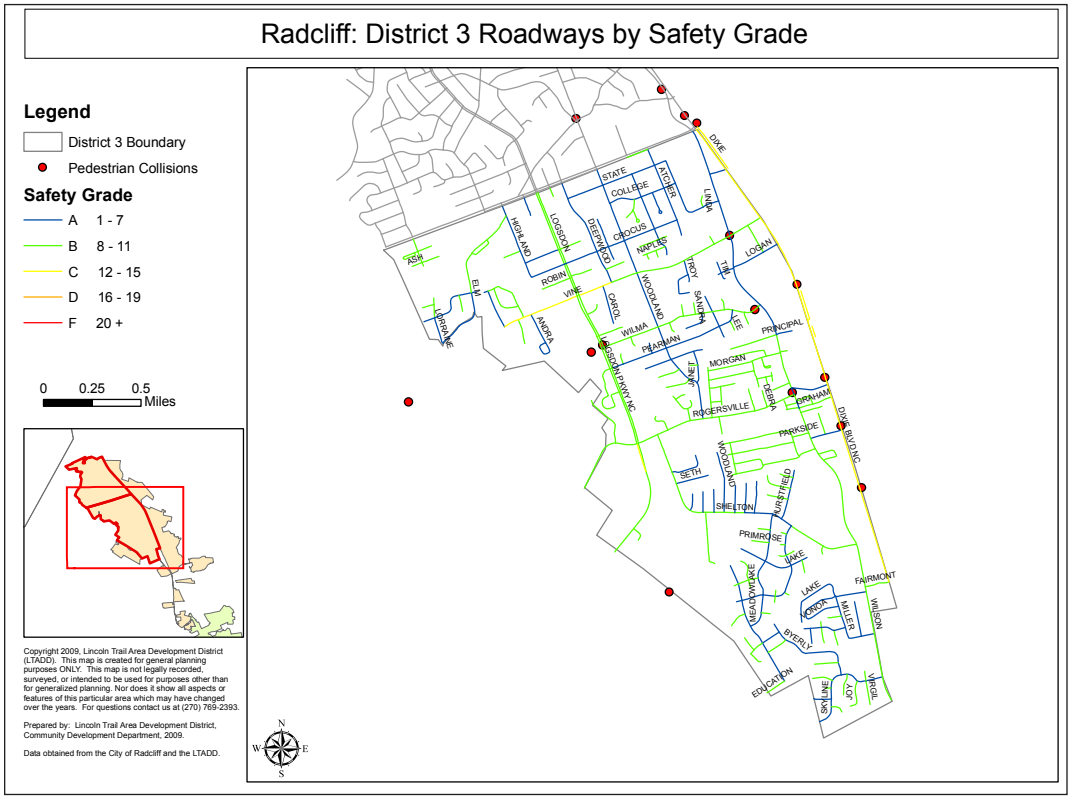
DISTRICT 3
The total land covered by Planning District 3 is approximately 2,368.76 acres or 34.1% of the total land area in the city. This area also includes 45.74 miles of roadway.

Overall District 3 received 2.8 out of 5.0 points. Based on the grading scale described in Section III, Radcliff received a walkability grade of "C." The connectivity grade was a "D"; the land use variation grade was a "B"; the safety grade was a "B"; the path quality grade was an "F"; and the path context grade was a "C." A detailed explanation of each category grade is provided below.

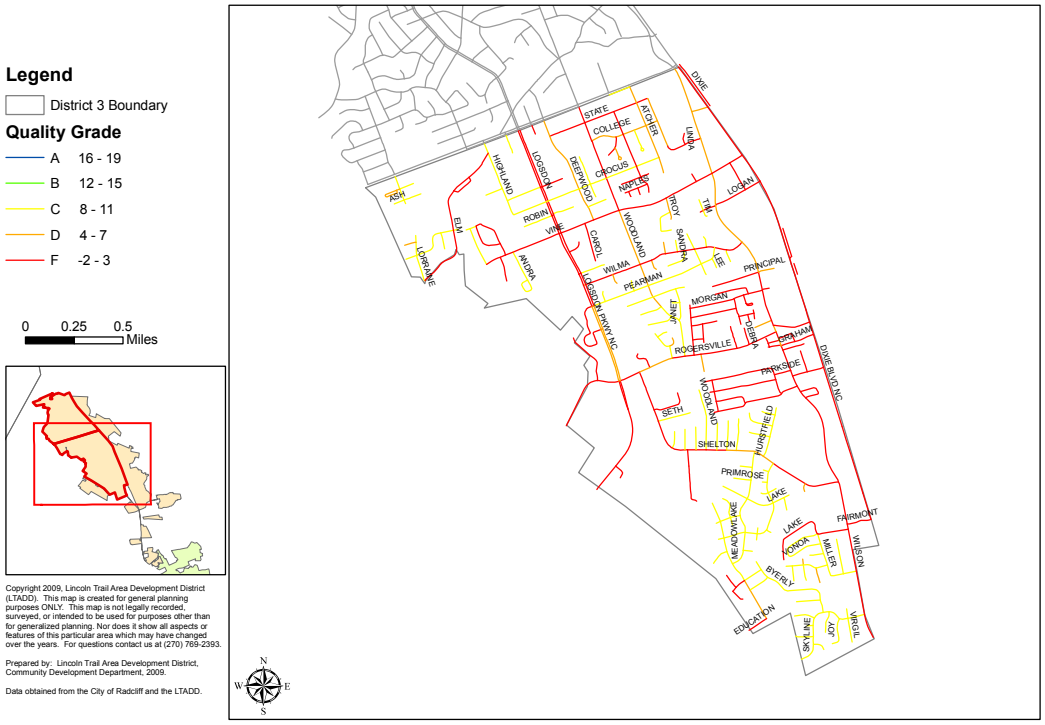
ANALYSIS BY CATEGORY

Connectivity
Within Planning District 3, there are 343 distinct roadway segments and 378 distinct nodes. Dividing the number of segments by the number of nodes results in a connectivity index value of 0.91. Based on the grading scale described in Section III, this translates to a connectivity grade of "D."

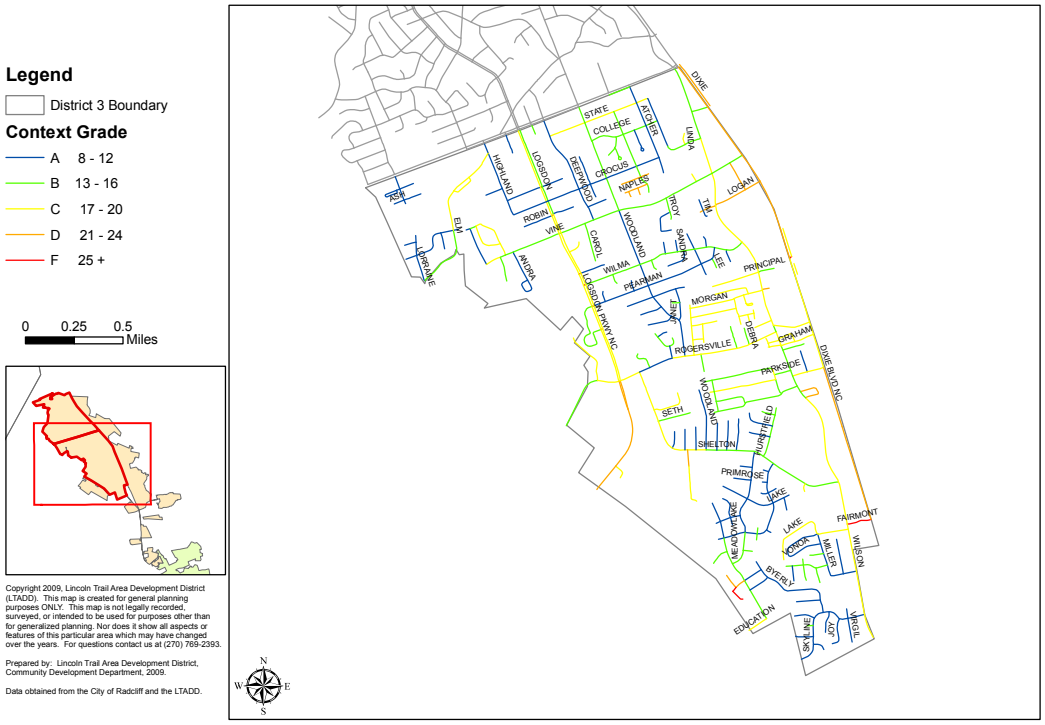
Land Use Variation
Within Planning District 3, there are 2,778 individual parcels and 15 different land use



Radcliff: District 3 Roadways by Quality Grade



Radcliff: District 3 Roadways by Context Grade



categories. The area for each land use category is shown in Table B6 in the Appendix. The land use variation, as calculated using the entropy land use score, is 0.74. Based on the grading scale described in Section III, this translates to a land use variation grade of "B."

Safety

Within Planning District 3, there are 45.74 miles of roadway. The 75% majority received a grade of "B". About 18.92 miles or 41.4% were rated "A"; approximately 23.01 miles or 50.3% were rated "B"; and the remaining 3.80 miles or 6.0% were rated "C."

Path Quality

Of the total miles of roadway in Planning District 3, the 75% majority received a grade of "F." About 15.32 miles or 33.5% were rated "C"; approximately 6.08 miles or 13.3% were rated "D"; and approximately 24.34 miles or 53.2% were rated "F."

Path Context

Of the total miles of roadway in Planning District 3, the 75% majority received a grade of "C". About 15.99 miles or 35.0% were rated "A"; approximately 11.74 miles or 25.7% were rated "B"; approximately 13.44 miles or 29.4% were rated "C"; approximately 4.27 miles or 9.3% were rated "D"; and approximately 0.30 miles or 0.6% were rated "F."

ELIZABETHTOWN

DEMOGRAPHIC ANALYSIS[51]

According to 2005-07 American Community Survey estimates, the population of the City of Elizabethtown was 25,369. The working population aged 16 years or over was 11,089. Of this population, 86.5% drove a personally owned vehicle alone to work; 10.5% carpooled; 0.0% used public transportation (excluding taxicab); 0.7% walked; 0.2% used other means; and 2.1% worked at home. The mean travel time to work was 18 minutes.

According to the same estimates, there were 10,224 households in the city. The median household income was $41,913. Approximately 11.4% of households made less than $15,000 per year; 30.3% of households made between $15,000 and $35,000; and 42.5% of households made more than $50,000.

The total number of occupied housing units was 10,224. Of these, 6.2% had no vehicle available; 35.5% had one vehicle available; 43.4% had two vehicles available; and 14.9% had three or more vehicles available. Approximately 6,348 were specified owner-occupied housing units. Of these, there were 4,369 housing units with a mortgage. About 35.0% spent less than 20.0% of their income on selected monthly owner costs; 12.1% spent 20.0 to 24.9%; 0.8% spent 25.0 to 34.9%; and 1.9% spent 35% or more. About 3,876 were specified renter-occupied housing units. Of these 31.7% spent less than 20.0% of their household income on gross rent; 16.5% spent 20.0 to 24.9%; 27.1% spent 25.0 to 34.9%; and 21% spent 35% or more.

ANALYSIS BY CATEGORY

The Elizabethtown study area included the Planning Subareas of Downtown, Urban Neighborhoods West, Urban Neighborhoods East, Ring Road West, Ring Road East, and North Dixie Avenue, as shown in Map 16. Combined these six planning study areas encompass 6,855.43 acres of land or 43.4% of the total land area in the city. This area also includes 145.31 miles of roadway.

Overall the Elizabethtown study area received 2.8 out of 5.0 points. Based on the grading scale described in Section III, Elizabethtown received a walkability grade of "C." The connectivity grade was a "D"; the land use variation grade was a "B"; the safety grade was a "B"; the path quality grade was an "F"; and the path context grade was a "C." A detailed explanation of each category grade is provided below.

Connectivity

Within the Elizabethtown study area, there are 1,167 distinct roadway segments and 1,200 distinct nodes. Dividing the number of segments by the number of nodes results in a connectivity index value of 0.97. Based on the grading scale described in Section III, this translates to a connectivity grade of "D."

Land Use Variation

Within the Elizabethtown study area, there are 144 differentiated polygons, containing many individual parcels, and 18 different land use categories. The area for each land use category is shown in Table B7 in the Appendix. The land use variation, as calculated using the entropy land use score, is 0.79. Based on the grading scale described in Section III, this translates to a land use variation grade of "B."

Safety

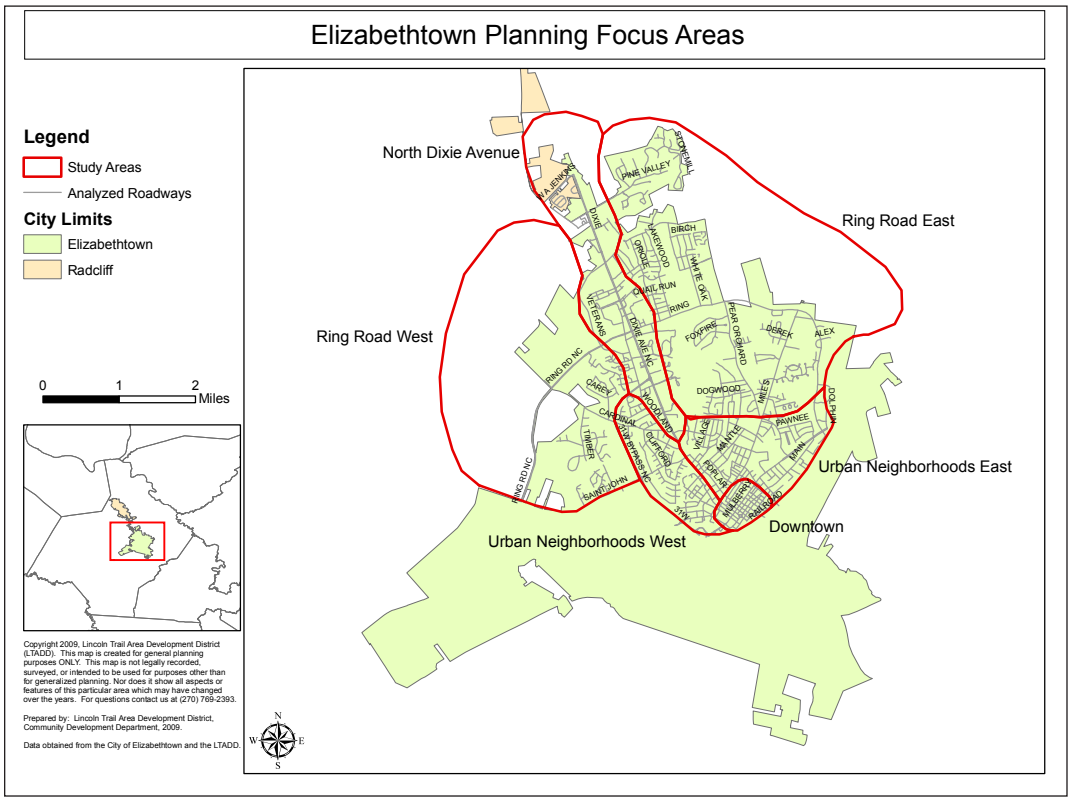
Within the Elizabethtown study area, there are 145.31 miles of roadway. The 75% majority received a grade of "B". About 40.67 miles or 28.0% were rated "A"; approximately 100.96 miles or 69.5% were rated "B"; and the remaining 3.68 miles or 2.5% were rated "C."

Path Quality

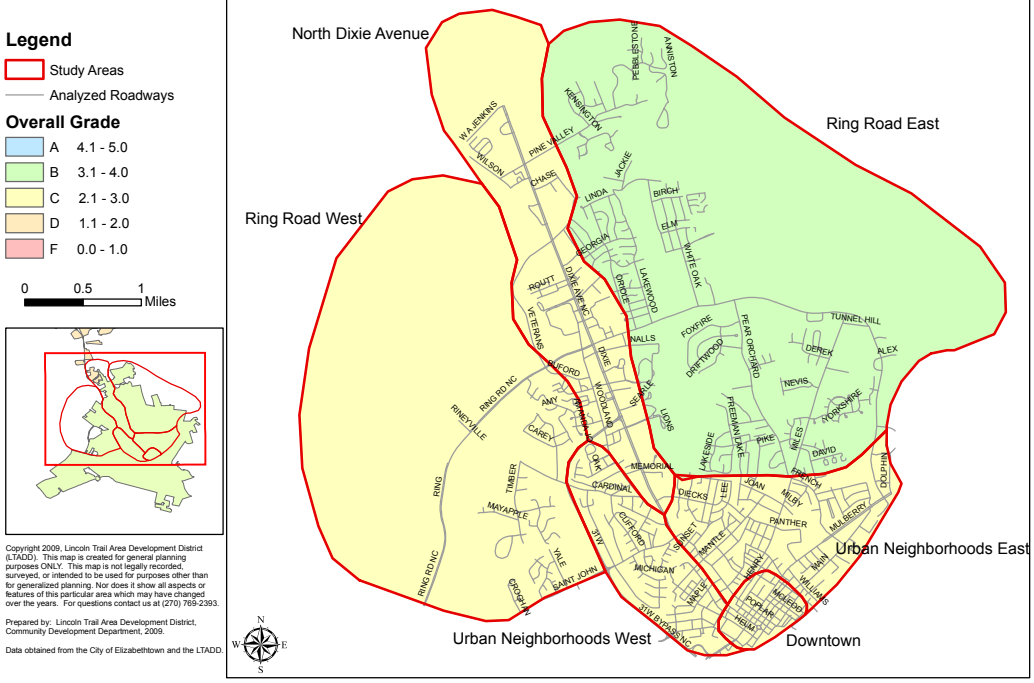
Of the total miles of roadway in Elizabethtown, the 75% majority received a grade of "F." About 24.51 miles or 16.9% were rated "C"; approximately 19.19 miles or 13.2% were rated "D"; and approximately 101.61 miles or 69.9% were rated "F."

Path Context

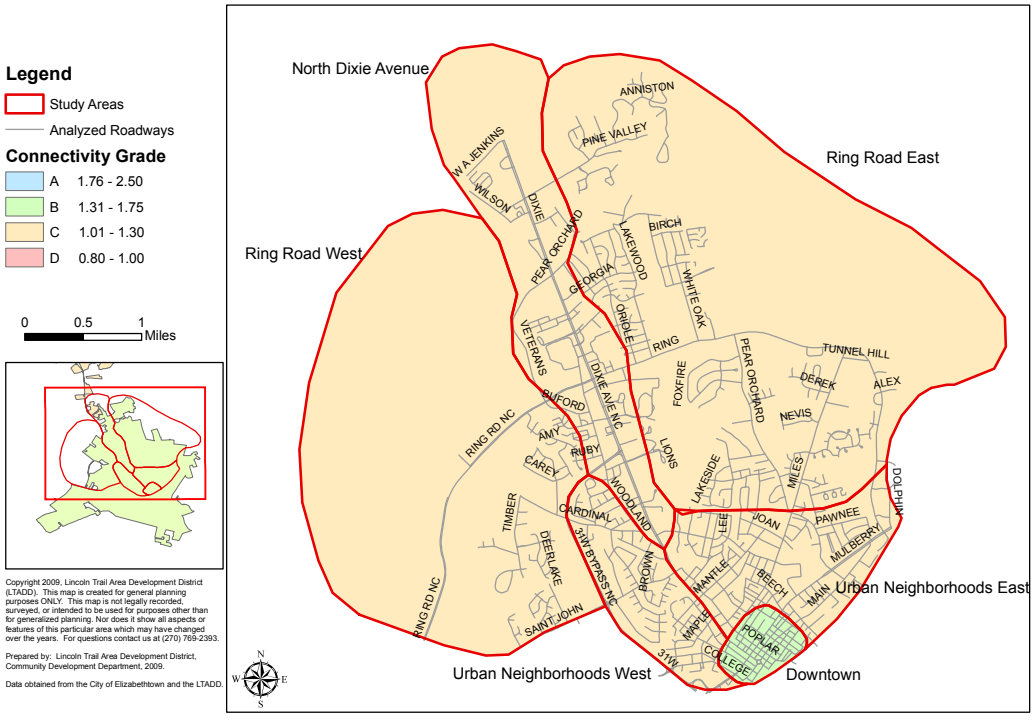
Of the total miles of roadway in Elizabethtown, the 75% majority received a grade of "C." About 41.51 miles or 28.6% were rated "A"; approximately 50.95 miles or 35.1% were rated "B"; approximately 35.81 miles or 24.6% were rated "C"; approximately 15.46 miles or 10.6% were rated "D"; and approximately 1.58 miles or 1.1% were rated "F."

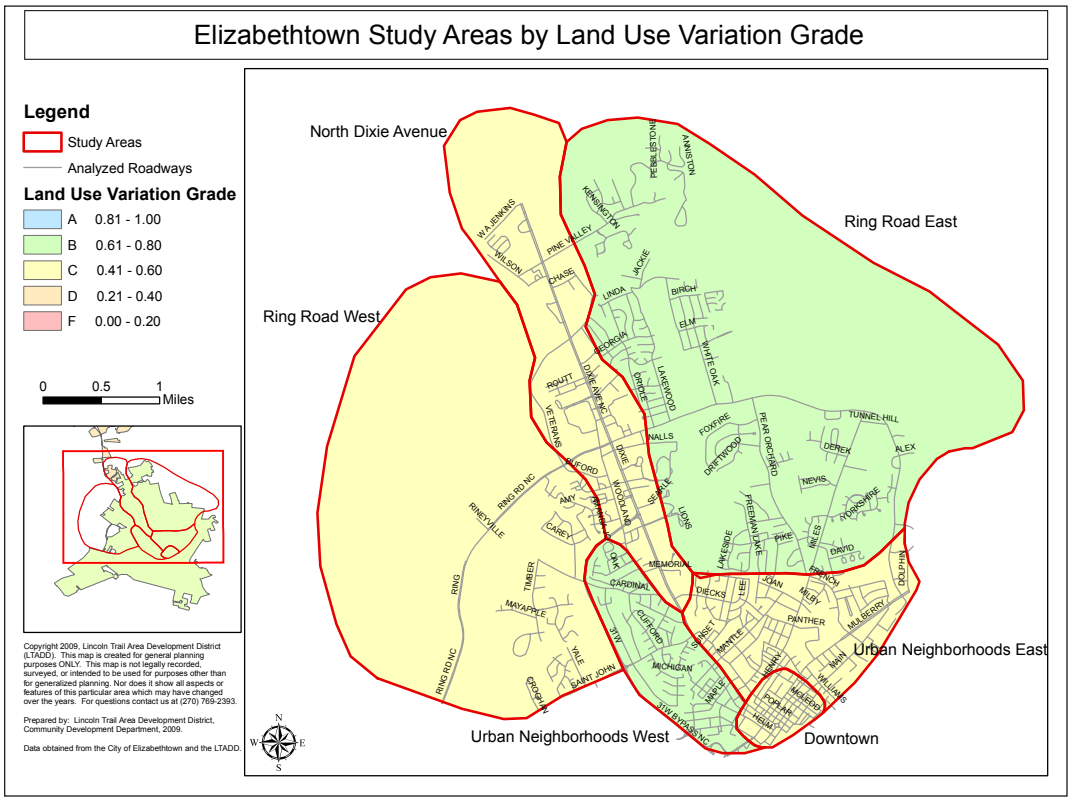


Elizabethtown Study Area Overall Grades



Elizabethtown Study Areas by Connectivity Grade




Elizabethtown Study Areas by Land Use Variation Grade
Legend
Study Areas
Analyzed Roadways
Land Use Variation Grade
A 0.81 - 1.00
B 0.61 - 0.80
C 0.41 - 0.60
D 0.21 - 0.40
F 0.00 - 0.20
0 0.5 1 Miles
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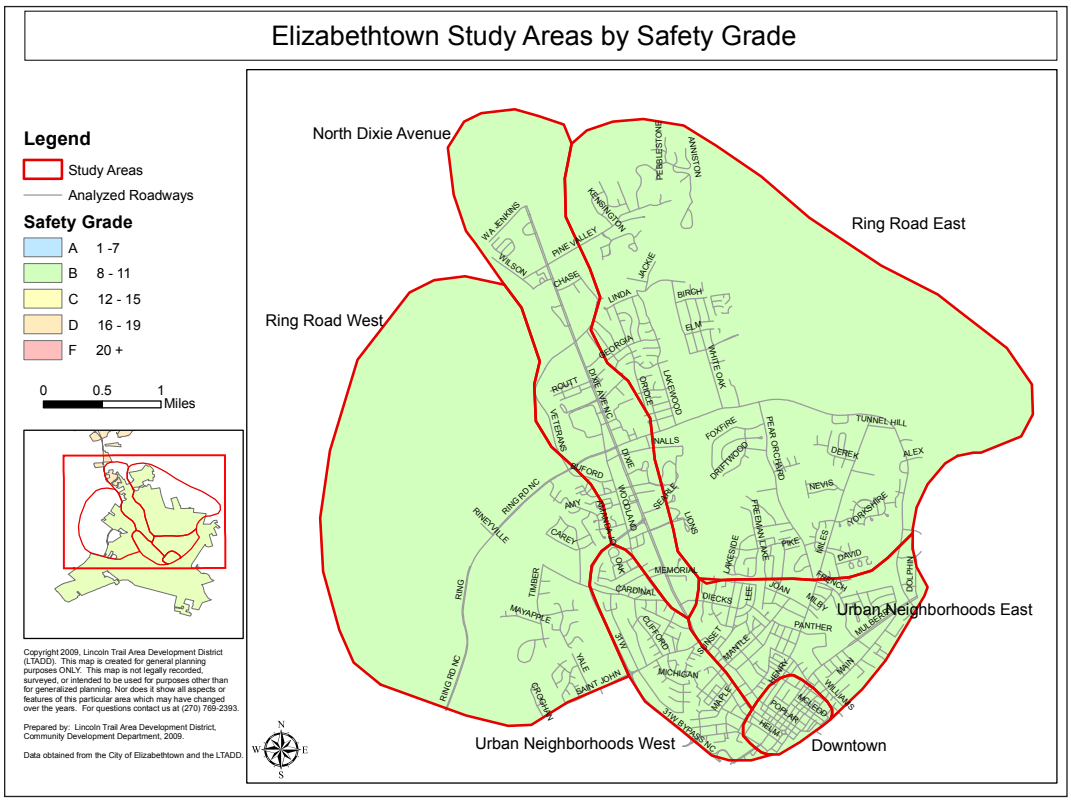
Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.
North Dixie Avenue
Ring Road East
Ring Road West
Urban Neighborhoods East
Urban Neighborhoods West
Downtown


Elizabethtown Study Areas by Safety Grade
Legend
Study Areas
Analyzed Roadways
Safety Grade
A 1 -7
B 8 - 11
C 12 - 15
D 16 - 19
F 20 +
0 0.5 1 Miles
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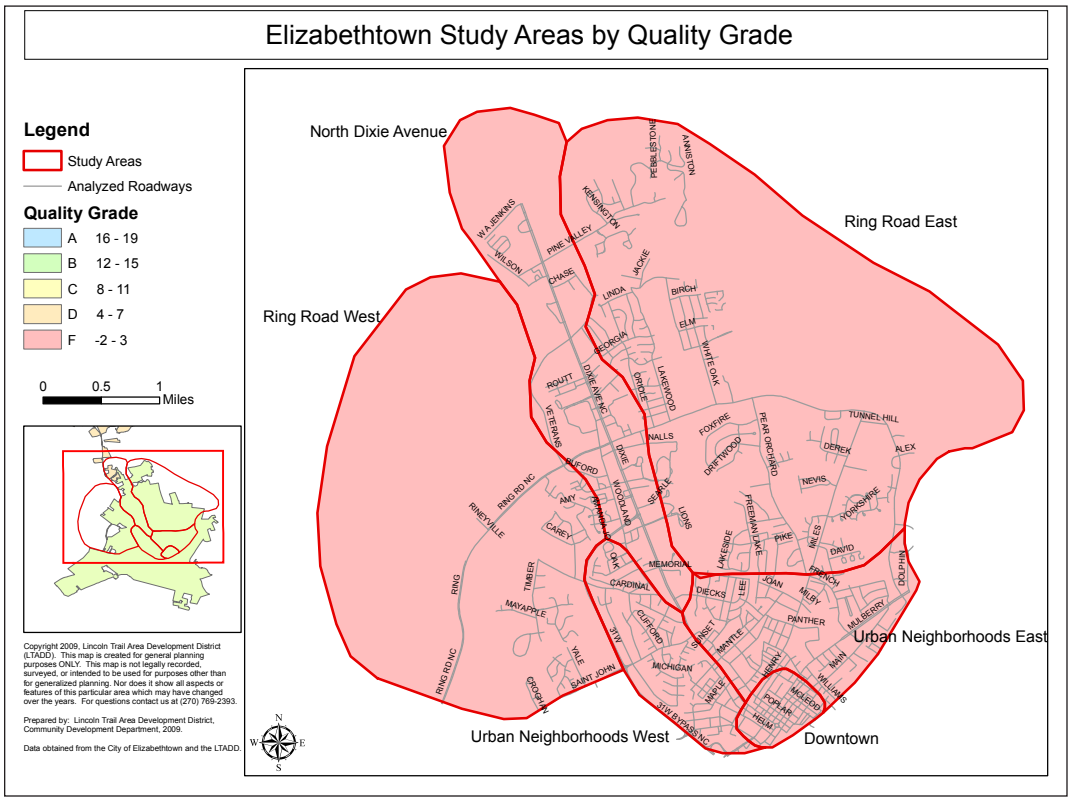
Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.
North Dixie Avenue
Ring Road East
Ring Road West
Urban Neighborhoods East
Urban Neighborhoods West
Downtown


Elizabethtown Study Areas by Quality Grade
Legend
Study Areas
Analyzed Roadways
Quality Grade
A 16 - 19
B 12 - 15
C 8 - 11
D 4 - 7
F -2 - 3
0 0.5 1 Miles
North Dixie Avenue
Ring Road East
Ring Road West
Urban Neighborhoods East
Urban Neighborhoods West
Downtown
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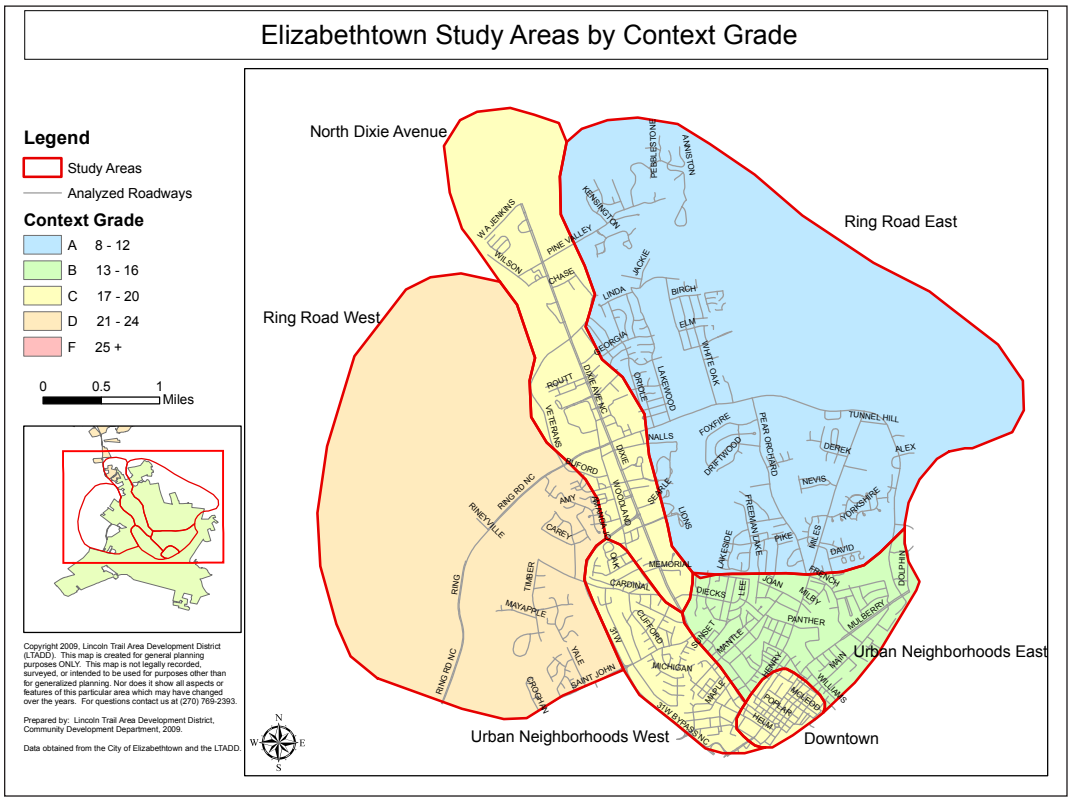
Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.


Elizabethtown Study Areas by Context Grade
Legend
Study Areas
Analyzed Roadways
Context Grade
A 8 - 12
B 13 - 16
C 17 - 20
D 21 - 24
F 25 +
0 0.5 1 Miles
North Dixie Avenue
Ring Road East
Ring Road West
Urban Neighborhoods East
Urban Neighborhoods West
Downtown
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Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.

DOWNTOWN

The total land covered by the Downtown Subarea is approximately 155.81 acres or 0.99% of the total land area in the city. This area also includes 9.20 miles of roadway.

Overall, the Downtown Subarea received 3.0 out of 5.0 points. Based on the grading scale described in Section III, the subarea received a walkability grade of "C." The connectivity grade was a "B"; the land use variation grade was a "C"; the safety grade was a "B"; the path quality grade was an "F"; and the path context grade was a "C." A detailed explanation of each category grade is provided below.

ANALYSIS BY CATEGORY

Connectivity

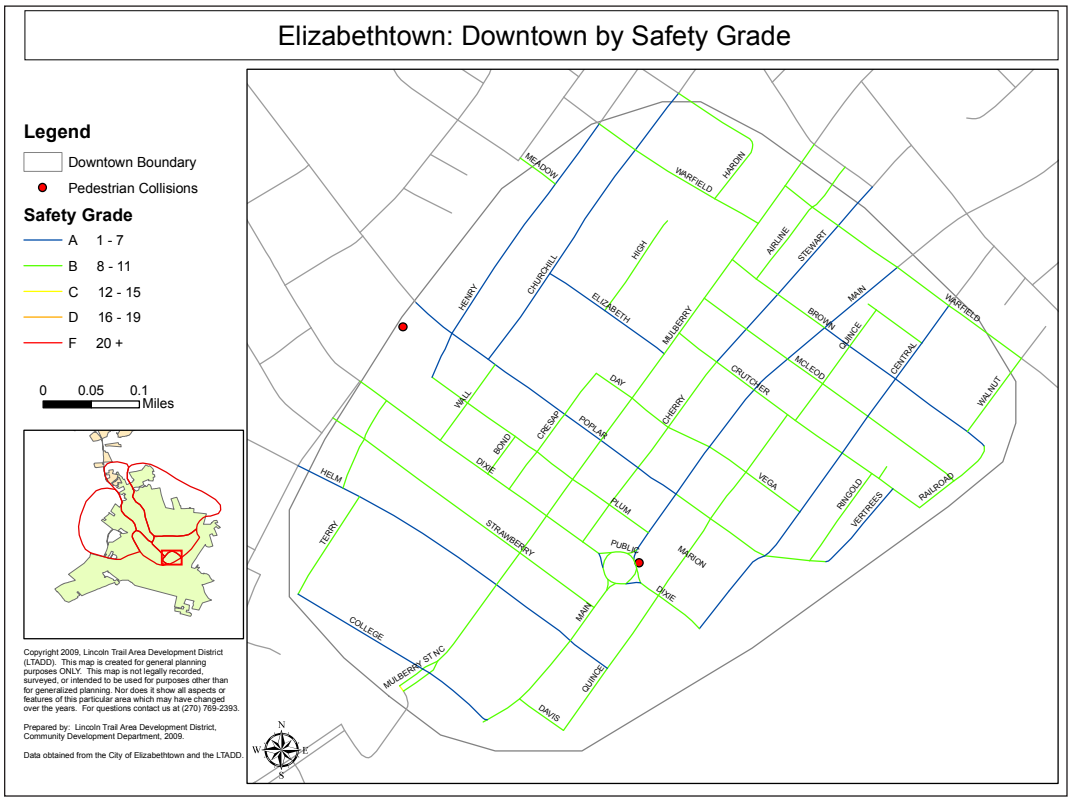
Within the Downtown Subarea, there are 179 distinct roadway segments and 134 distinct nodes. Dividing the number of segments by the number of nodes results in a connectivity index value of 1.34. Based on the grading scale described in Section III, this translates to a connectivity grade of "B."

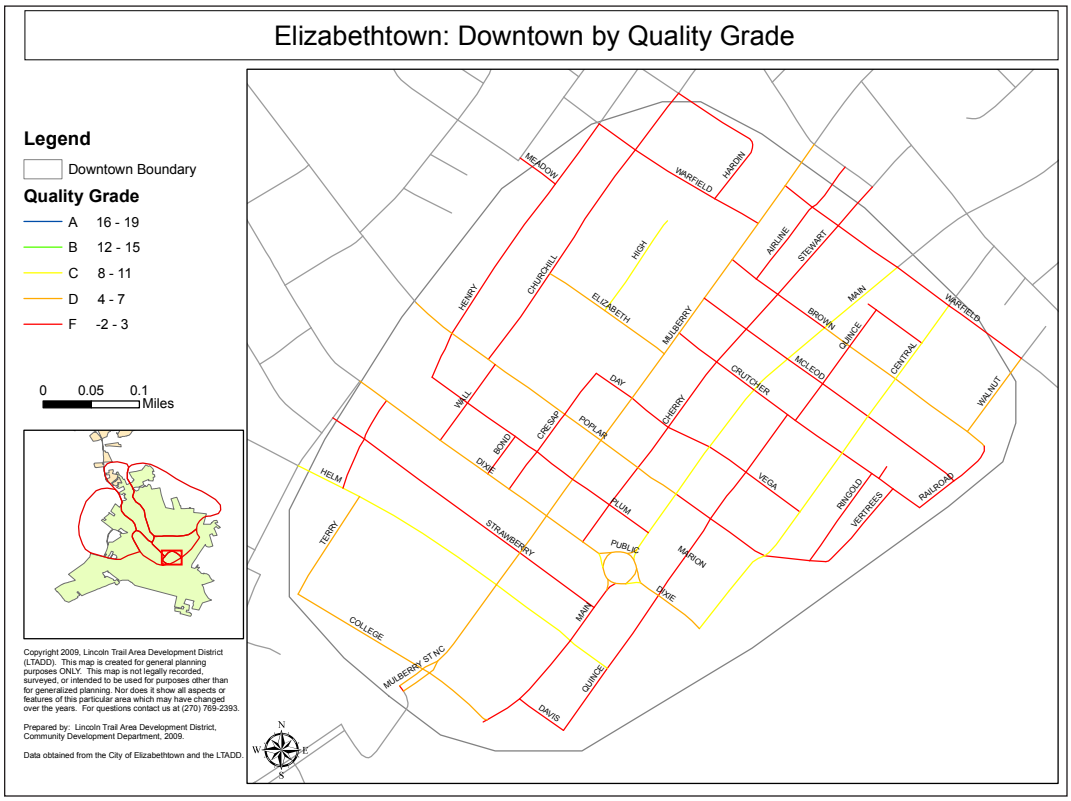
Land Use Variation

Within the Downtown Subarea, there are 10 differentiated polygons and 5 different land use categories. The area for each land use category is shown in Table B8 in the Appendix. The land use variation, as calculated using the entropy land use score, is 0.47. Based on the grading scale described in Section III, this translates to a land use variation grade of "C."

Safety

Within the Downtown Subarea, there are 9.20 miles of roadway. The 75% majority received a grade of "B." About 3.18 miles or 34.6% were rated "A"; approximately 6.01 miles or 65.3% were rated "B"; and the remaining 0.007 miles or 0.1% were rated "C."




Elizabethtown: Downtown by Quality Grade
Legend
Downtown Boundary
Quality Grade
A 16 - 19
B 12 - 15
C 8 - 11
D 4 - 7
F -2 - 3
0 0.05 0.1
Miles
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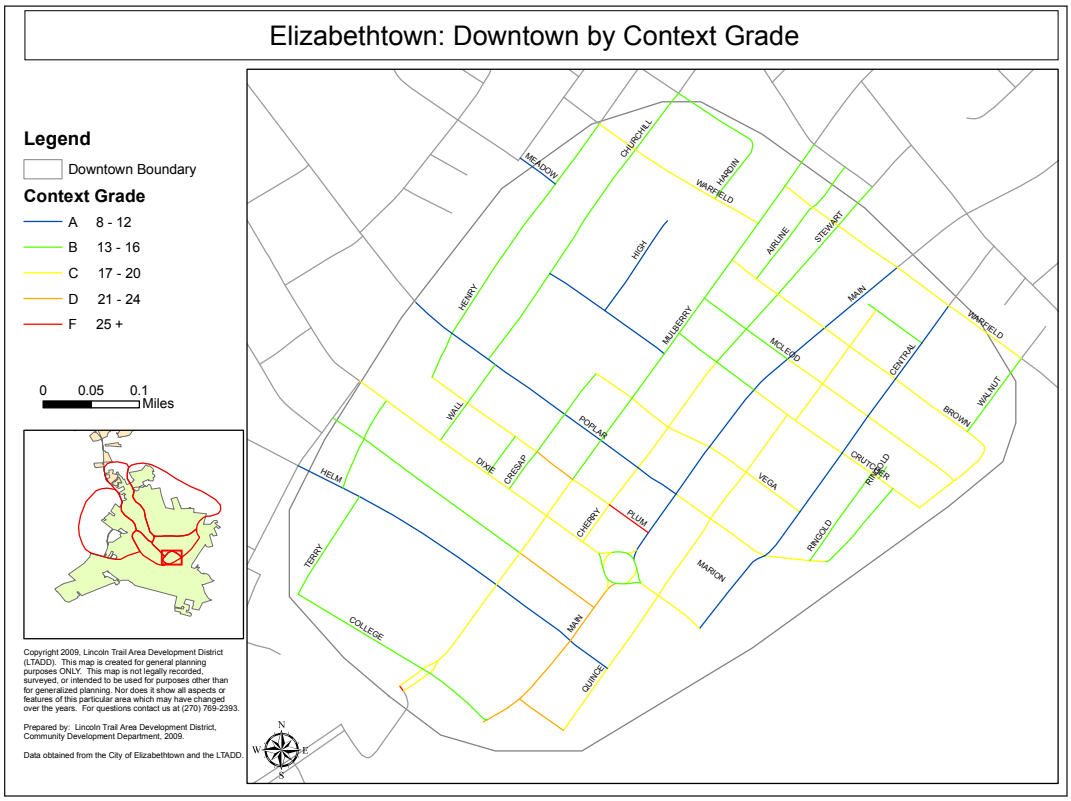
Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.
MEADOW
WARFIELD
HARDIN
CHURCHILL
HIGH
HENRY
ELIZABETH
MULBERRY
AIRLINE
STEWART
MAIN
BROWN
QUINCE
CENTRAL
WARFIELD
MCLEOD
CRUTCHER
WALNUT
WALL
DAY
CHERRY
CRESAP
POPLAR
BOND
DIXIE
HELM
VEGA
RINGGOLD
VERTREES
RAILROAD
PLUM
TERRY
STRAWBERRY
PUBLIC
MARION
DIXIE
COLLEGE
MULBERRY ST NC
MAIN
QUINCE
DAVIS
N
W
E
S


Elizabethtown: Downtown by Context Grade
Legend
Downtown Boundary
Context Grade
A 8 - 12
B 13 - 16
C 17 - 20
D 21 - 24
F 25 +
0 0.05 0.1
Miles
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Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.
MEADOW
CHURCHILL
HARDIN
WARFIELD
HIGH
AIRLINE
STEWART
HENRY
MULBERRY
MAIN
MCLEOD
CENTRAL
WARFIELD
WALNUT
BROWN
WALL
POPLAR
DIXIE
CRESAP
HELM
VEGA
CRUTCHER
RIVER
CHERRY
PLUM
RINGGOLD
TERRY
MARION
COLLEGE
MAIN
QUINCE
N
W
E
S

Path Quality
Of the total miles of roadway in the Downtown Subarea, the 75% majority received a grade of "F" or better. About 1.37 miles or 14.9% were rated "C"; approximately 2.44 or 26.5% were rated "D"; approximately 5.39 or 58.6% were rated "F."

Path Context
Of the total miles of roadway in the Downtown Subarea, the 75% majority received a grade of "C." About 1.87 miles or 20.3% were rated "A"; about 3.35 miles or 36.4% were rated "B"; about 3.53 or 38.3% were rated "C"; about 0.40 miles or 4.3% were rated "D"; and 0.60 miles or 0.6% were rated "F."

URBAN NEIGHBORHOODS WEST

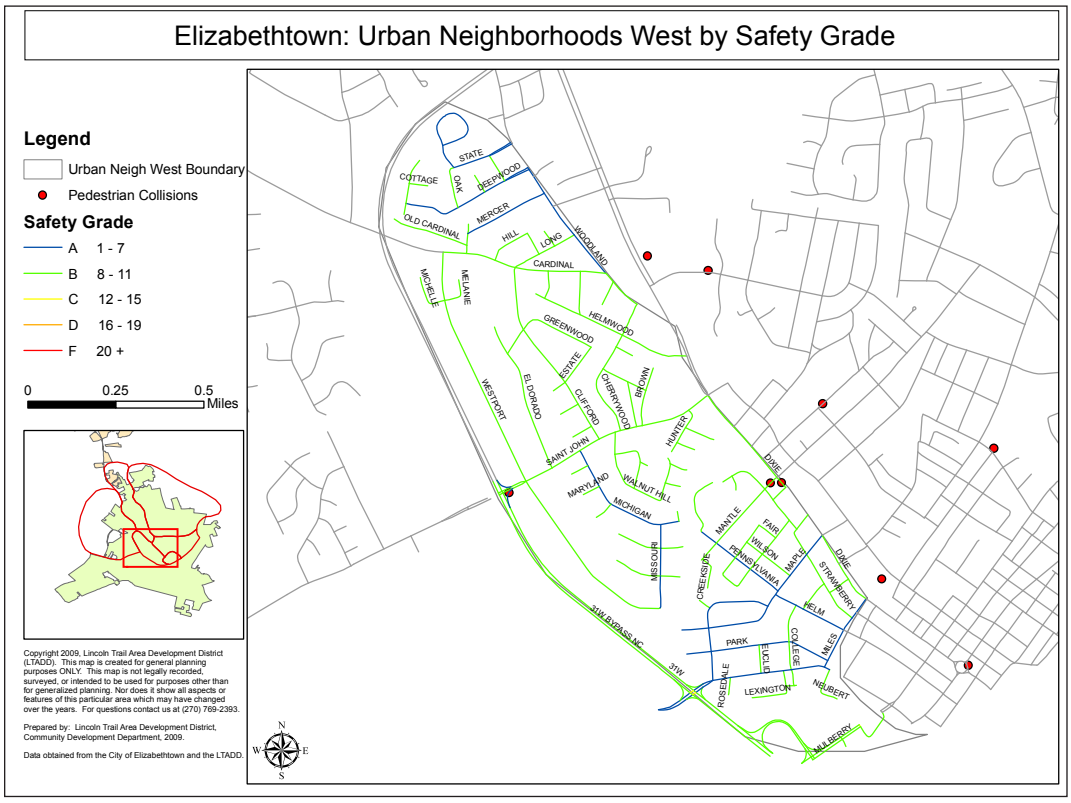
The total land covered by the Urban Neighborhoods West Subarea is approximately 454.90 acres or 2.9% of the total land area in the city. This area also includes 21.01 miles of roadway.

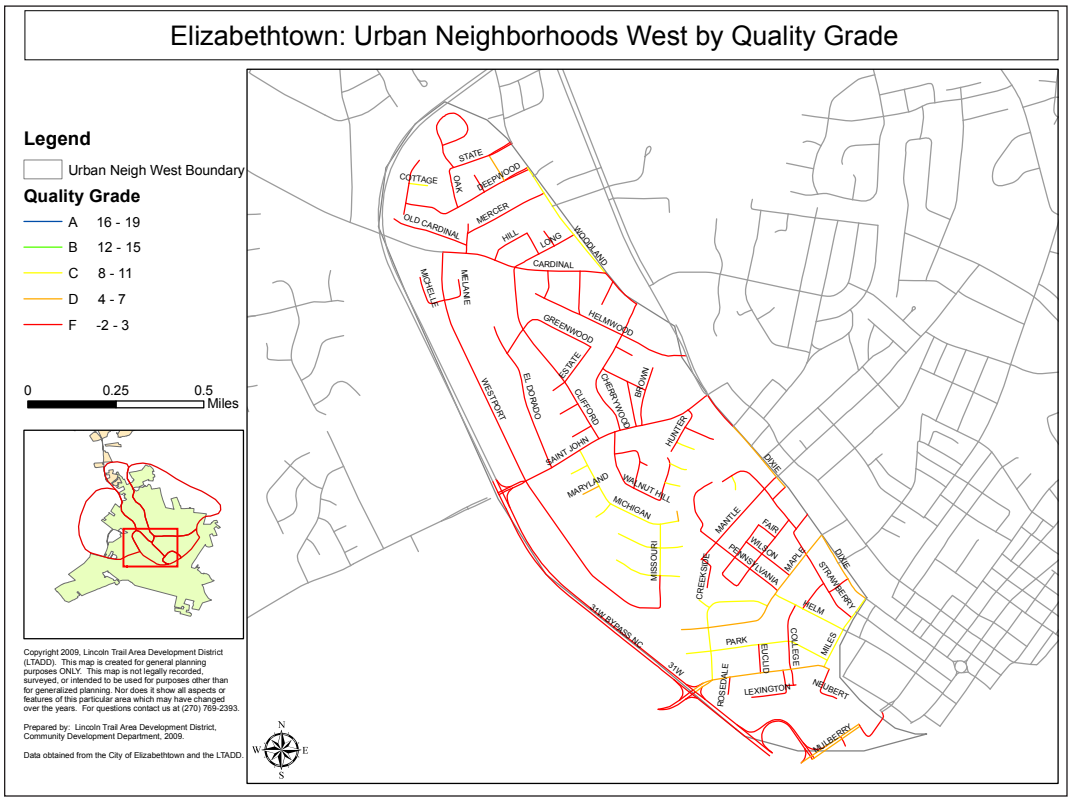
Overall, the Urban Neighborhoods West Subarea received 3.0 out of 5.0 points. Based on the grading scale descried in Section III, the subarea received a walkability grade of "C." The connectivity grade was "C"; the land use variation grade was a "B"; the safety grade was a "B"; the path quality grade was an "F"; and the path context grade was a "C." A detailed explanation of each category grade is provided below.

ANALYSIS BY CATEGORY

Connectivity
Within the Urban Neighborhoods West Subarea, there are 204 distinct roadway segments and 185 distinct nodes. Dividing the number of segments by the number of nodes results in a connectivity index value of 1.10. Based on the grading scale described in Section III, this translates to a connectivity grade of "C."

Land Use Variation
Within the Urban Neighborhoods West Subarea, there are 20 differentiated polygons and 8




Elizabethtown: Urban Neighborhoods West by Quality Grade
Legend
Urban Neigh West Boundary
Quality Grade
A 16 - 19
B 12 - 15
C 8 - 11
D 4 - 7
F -2 - 3
0 0.25 0.5 Miles
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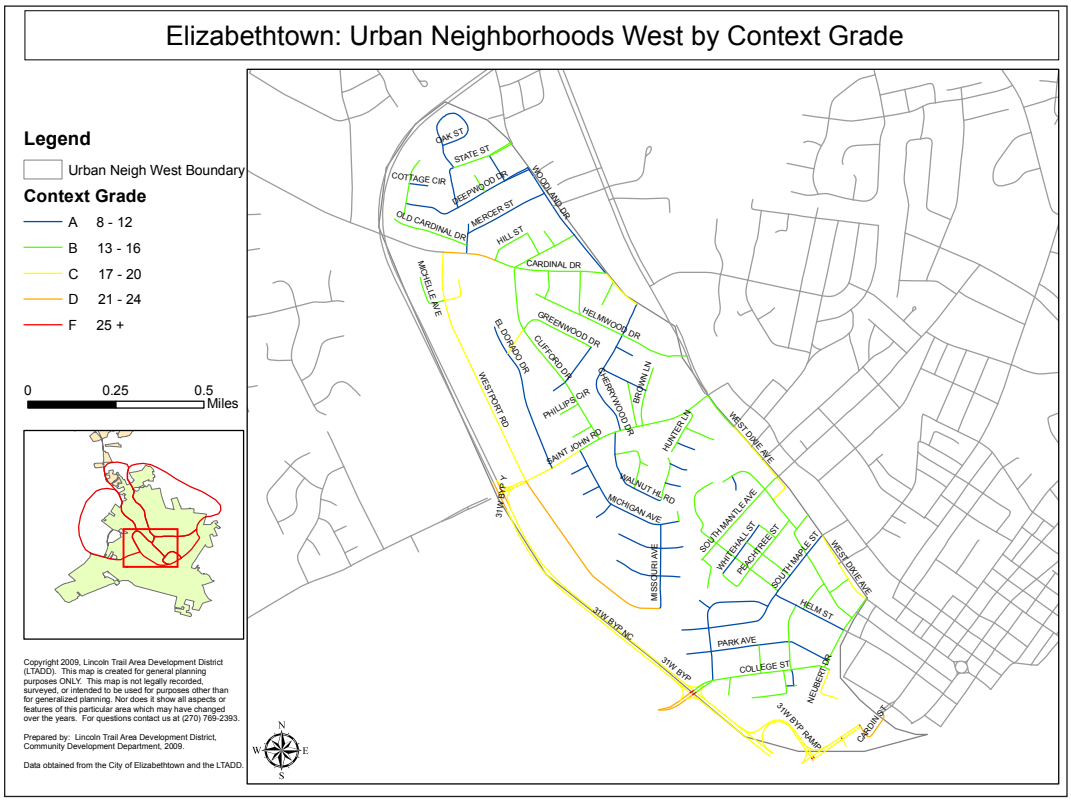
Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.
STATE
COTTAGE
OAK
DEEPWOOD
OLD CARDINAL
MERCER
HILL
LONG
WOODLAND
CARDINAL
MICHELLE
MELANIE
GREENWOOD
HELMWOOD
WESTPORT
EL DORADO
CLIFFORD
CHERRYWOOD
BROWN
HUNTER
SAINT JOHN
MARYLAND
WALNUT HILL
MICHIGAN
MISSOURI
CREEKSIDE
DIXIE
MANTLE
FAIR
WILSON
PENNSYLVANIA
MAPLE
DUKE
STRAWBERRY
HELM
MILES
COLLEGE
BLVD
PARK
ROSEDALE
LEXINGTON
NEUBERT
MULBERRY
31W BYPASS NC
31W
N
S
E
W


Elizabethtown: Urban Neighborhoods West by Context Grade
Legend
Urban Neigh West Boundary
Context Grade
A 8 - 12
B 13 - 16
C 17 - 20
D 21 - 24
F 25 +
0 0.25 0.5 Miles
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Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.
OAK ST
STATE ST
COTTAGE CIR
DEEPWOOD DR
WOODLAND DR
OLD CARDINAL DR
MERCER ST
HILL ST
CARDINAL DR
MICHELLE AVE
HELMWOOD DR
GREENWOOD DR
EL DORADO DR
CLIFFORD DR
PHILLIPS CIR
CHERRYWOOD DR
BROWN LN
HUNTER LN
WEST DIXIE AVE
WESTPORT RD
SAINT JOHN RD
WALNUT HILL RD
MICHIGAN AVE
SOUTH MANTLE AVE
WHITEHALL ST
PEACH TREE ST
SOUTH MAPLE ST
MISSOURI AVE
HELM ST
PARK AVE
COLLEGE ST
NEUBERT DR
CARDINAL ST
31W BYPASS NC
31W BYP
31W BYP RAMP
N
S
E
W

different land use categories. The area for each land use category is shown in Table B9 in the Appendix. The land use variation, as calculated using the entropy land use score, is 0.73. Based on the grading scale described in Section III, this translates to a land use variation grade of "B."

Safety
Within the Urban Neighborhoods West Subarea, there are 21.01 miles of roadway. The 75% majority received a grade of "B." About 5.13 miles or 24.4% were rated "A"; approximately 15.85 miles or 75.5% were rated "B"; and the remaining 0.03 miles or 0.1% were rated "C."
Map 25.

Path Quality
Of the total miles of roadway in the Urban Neighborhoods West Subarea, the 75% majority received a grade of "F." About 2.91 miles or 13.9% were rated "C"; approximately 1.95 miles or 9.3% were rated "D"; and approximately 16.14 miles or 76.8% were rated "F."

Path Context
Of the total miles of roadway in the Urban Neighborhoods West Subarea, the 75% majority received a grade of "C." About 6.39 miles or 30.4% were rated "A"; approximately 7.96 miles or 37.9% were rated "B"; approximately 5.39 miles or 25.6% were rated "C"; approximately 1.21 miles or 5.8% were rated "D"; and approximately 0.06 miles or 0.3% were rated "F."

URBAN NEIGHBORHOODS EAST

The total land covered by the Urban Neighborhoods East Subarea is approximately 1145.74 acres or 7.2% of the total land area in the city. This area also includes 25.16 miles of roadway.

Overall, the Urban Neighborhoods East Subarea received 3.0 out of 5.0 points. Based on the grading scale described in Section III, the subarea received a walkability grade of "C." The connectivity grade was a "C; the land use variation grade was a "C"; the safety grade was a "B"; the path quality grade was an "F"; and the path context grade was a "B." A detailed explanation of each category grade is provided below.

ANALYSIS BY CATEGORY

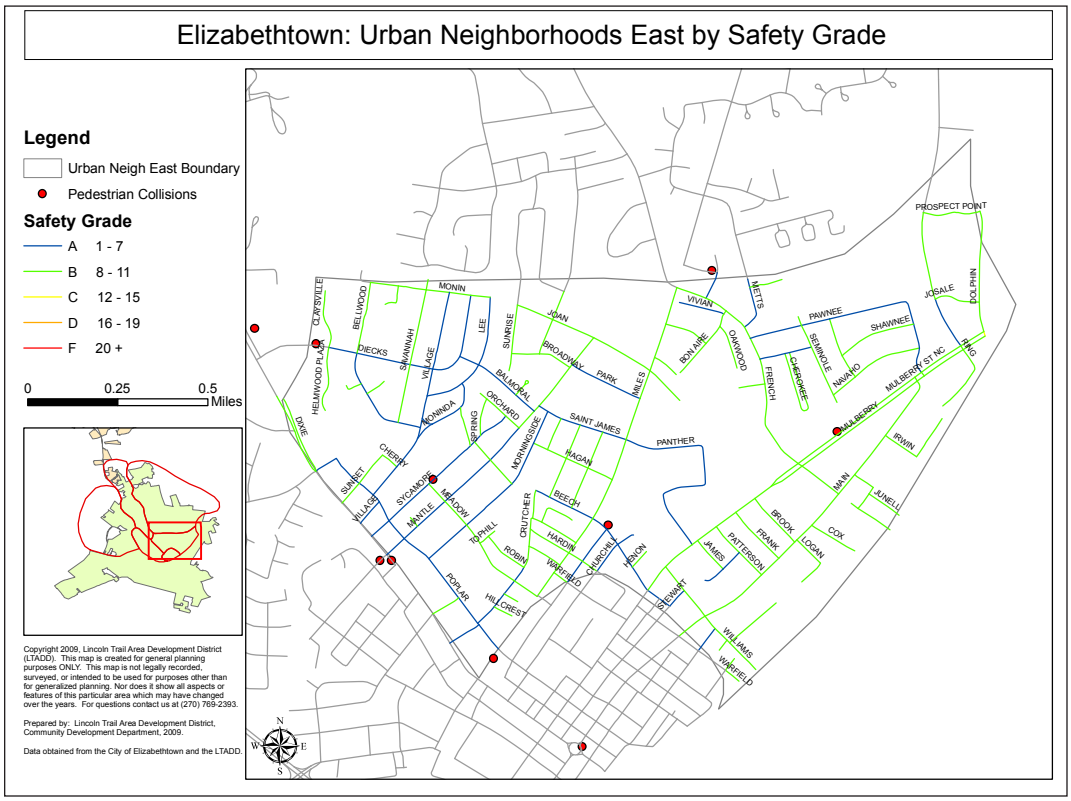
Connectivity
Within the Urban Neighborhoods East Subarea, there are 271 distinct roadway segments and 229 distinct nodes. Dividing the number of segments by the number of nodes results in a connectivity index value of 1.18. Based on the grading scale described in Section III, this translates to a connectivity grade of "C."

Land Use Variation
Within the Urban Neighborhoods East Subarea, there are 29 differentiated polygons and 9 different land use categories. The area for each land use category is shown in Table B10 in the Appendix. The land use variation, as calculated using the entropy land use score, is 0.57. Based on the grading scale described in Section III, this translates to a land use variation grade of "C."

Safety
Within the Urban Neighborhoods East Subarea, there are 25.16 miles of roadway. The 75% majority received a grade of "B" or better. About 8.53 miles or 33.9% were rated "A"; approximately 16.62 miles or 66.0% were rated "B"; and the remaining 0.01 miles or 0.1% were rated "B."

Path Quality
Of the total miles of roadway in the Urban Neighborhoods East Subarea, the 75% majority received a grade of "F" or better. About 3.25 miles or 12.9% were rated "C"; approximately 5.79 miles or 23.0% were rated "D"; and approximately 16.13 miles or 64.1% were rated "F."

Path Context
Of the total miles of roadway in the Urban Neighborhoods East Subarea, the 75% majority received a grade of "B" or better. About 8.32 miles or 33.0% were rated "A"; approximately 12.79


Elizabethtown: Urban Neighborhoods East by Safety Grade
Legend
Urban Neigh East Boundary
Pedestrian Collisions
Safety Grade
A 1 - 7
B 8 - 11
C 12 - 15
D 16 - 19
F 20 +
0 0.25 0.5 Miles
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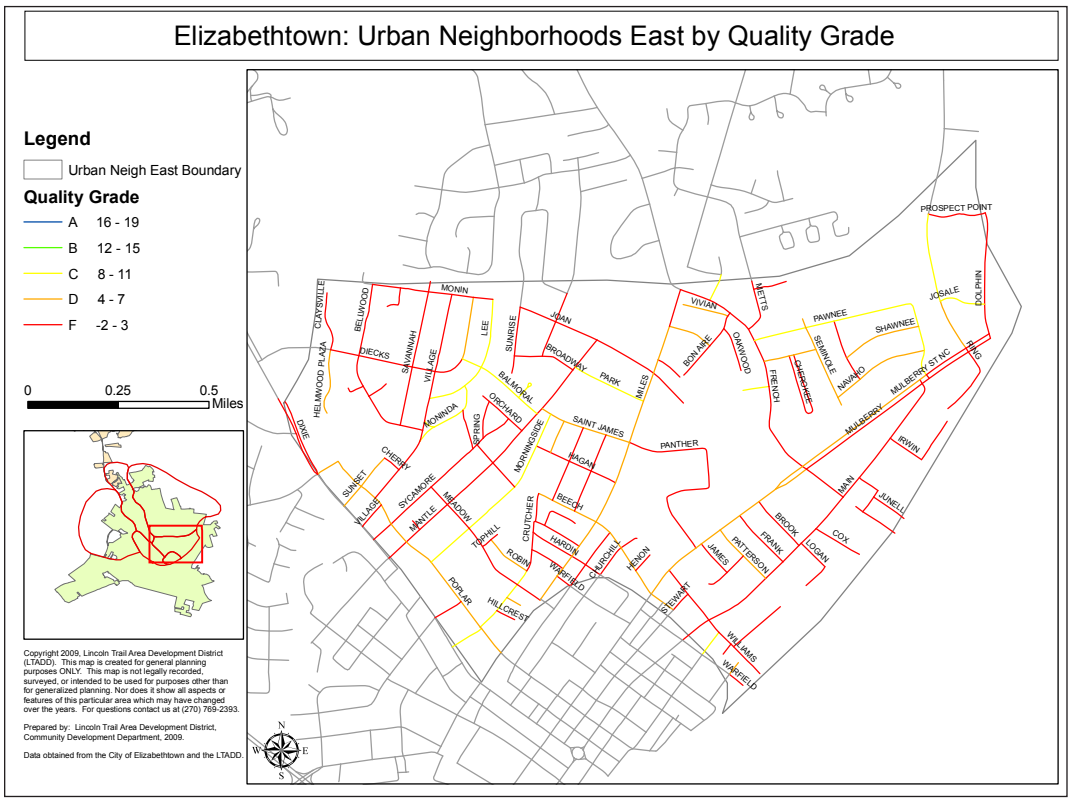
Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.
PROSPECT POINT
MONIN
CLAYSVILLE
BELLWOOD
HELMWOOD PLAZA
DIECKS
SAVANNAH
VILLAGE
LEE
SUNRISE
JOAN
BROADWAY
PARK
MILES
VIVIAN
METTS
BONAIRE
OAKWOOD
FRENCH
PAWNEE
SEMINOLE
CHEROKEE
NAVAHO
SHAWNEE
JOSALE
DOLPHIN
RING
MULBERRY ST NC
MULBERRY
IRWIN
MAIN
JUNELL
BROOK
FRANK
COX
LOGAN
JAMES
PATTERSON
STEWART
WILLIAMS
WARFIELD
HILLCREST
POPLAR
ROBIN
RALPHILL
CRUTCHER
HARDIN
CHURCHILL
HENON
WARFIELD
BEECH
HAGAN
SAINT JAMES
PANTHER
MORNINGSIDE
SPRING
ORCHARD
MONINDA
BALMORAL
MEADOW
MANTLE
SYCAMORE
CHERRY
SUNSET
VILLAGE
DOVE


Elizabethtown: Urban Neighborhoods East by Quality Grade
Legend
Urban Neigh East Boundary
Quality Grade
A 16 - 19
B 12 - 15
C 8 - 11
D 4 - 7
F -2 - 3
0 0.25 0.5 Miles
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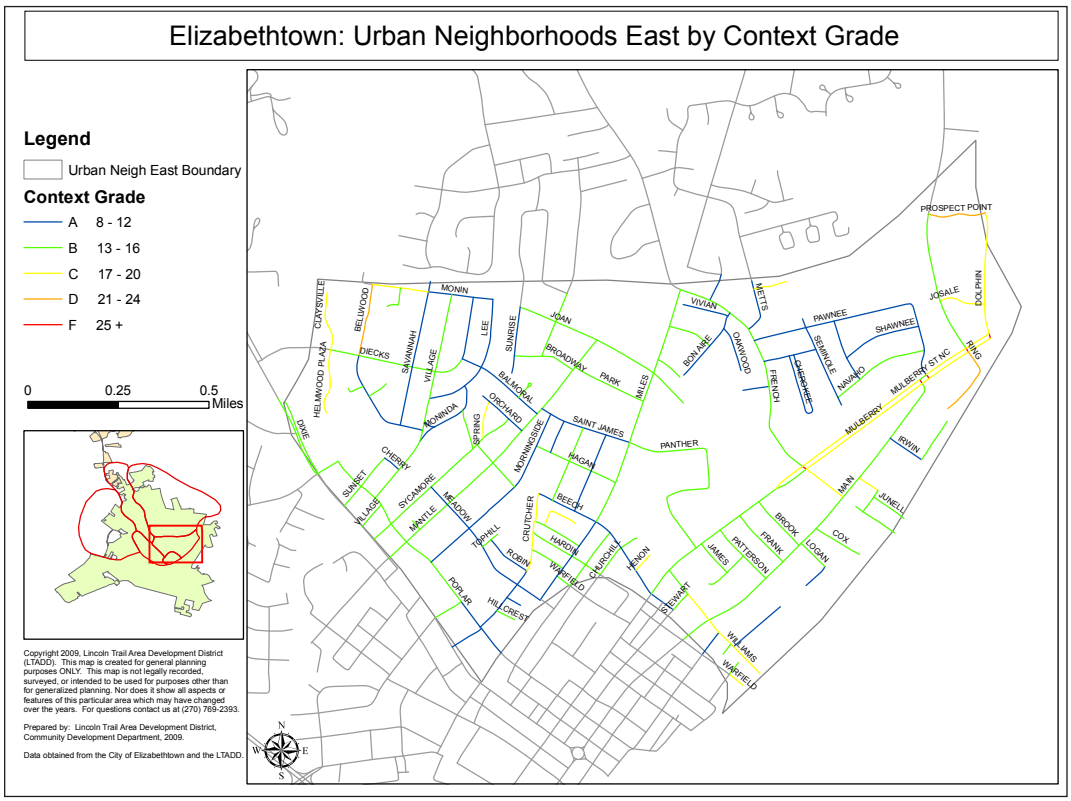
Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.
PROSPECT POINT
MONIN
CLAYSVILLE
BELLWOOD
HELMWOOD PLAZA
DIECKS
SAVANNAH
VILLAGE
LEE
SUNRISE
JOAN
BROADWAY
PARK
MILES
VIVIAN
METTS
BONAIRE
OAKWOOD
FRENCH
PAWNEE
SEMINOLE
CHEROKEE
NAVAHO
SHAWNEE
JOSALE
DOLPHIN
RING
MULBERRY ST NC
MULBERRY
IRWIN
MAIN
JUNELL
BROOK
FRANK
COX
LOGAN
JAMES
PATTERSON
STEWART
WILLIAMS
WARFIELD
HILLCREST
POPLAR
ROBIN
RALPHILL
CRUTCHER
HARDIN
CHURCHILL
HENON
WARFIELD
BEECH
HAGAN
SAINT JAMES
PANTHER
MORNINGSIDE
SPRING
ORCHARD
MONINDA
BALMORAL
MEADOW
MANTLE
SYCAMORE
CHERRY
SUNSET
VILLAGE
DOVE



miles or 50.8% were rated "B"; approximately 3.43 miles or 13.6% were rated "C"; approximately 0.56 miles or 2.2% were rated "D"; and approximately 0.07 miles or 0.3% were rated "F."

RING ROAD WEST

The total land covered by the Ring Road West Subarea is approximately 2,239.02 acres or 14.2% of the total land area in the city. This area also includes 19.17 miles of roadway.

Overall, the Ring Road West Subarea received 2.6 out of 5.0 points. Based on the grading scale described in Section III, the subarea received a walkability grade of "C." The connectivity grade was a "C"; the land use variation grade was a "C"; the safety grade was a "B"; the path quality grade was an "F"; and the path context grade was a "D." A detailed explanation of each category grade is provided below.

ANALYSIS BY CATEGORY

Connectivity

Within the Ring Road West Subarea, there are 124 distinct roadway segments and 116 distinct nodes. Dividing the number of segments by the number of nodes results in a connectivity index value of 1.07. Based on the grading scale described in Section III, this translates to a connectivity grade of "C."

Land Use Variation

Within the Ring Road West Subarea, there are 15 differentiated polygons and 9 different land use categories. The area for each land use category is shown in Table B11 in the Appendix. The land use variation, as calculated using the entropy land use score, is 0.43. Based on the grading scale described in Section III, this translates to a land use variation grade of "C."

Safety

Within the Ring Road West Subarea, there are 19.17 miles of roadway. The 75% majority received a grade of "B" or better. About 2.43 miles or 12.7% were rated "A"; approximately 13.86 miles or 72.3% were rated "B"; and the remaining 2.87 miles or 15.0% were rated "C."

Path Quality

Of the total miles of roadway in the Ring Road West Subarea, the 75% majority received a grade of "F" or better. About 2.47 miles or 12.9% were rated "C"; approximately 0.05 miles or 0.3% were rated "D"; and approximately 16.65 miles or 86.9% were rated "F."

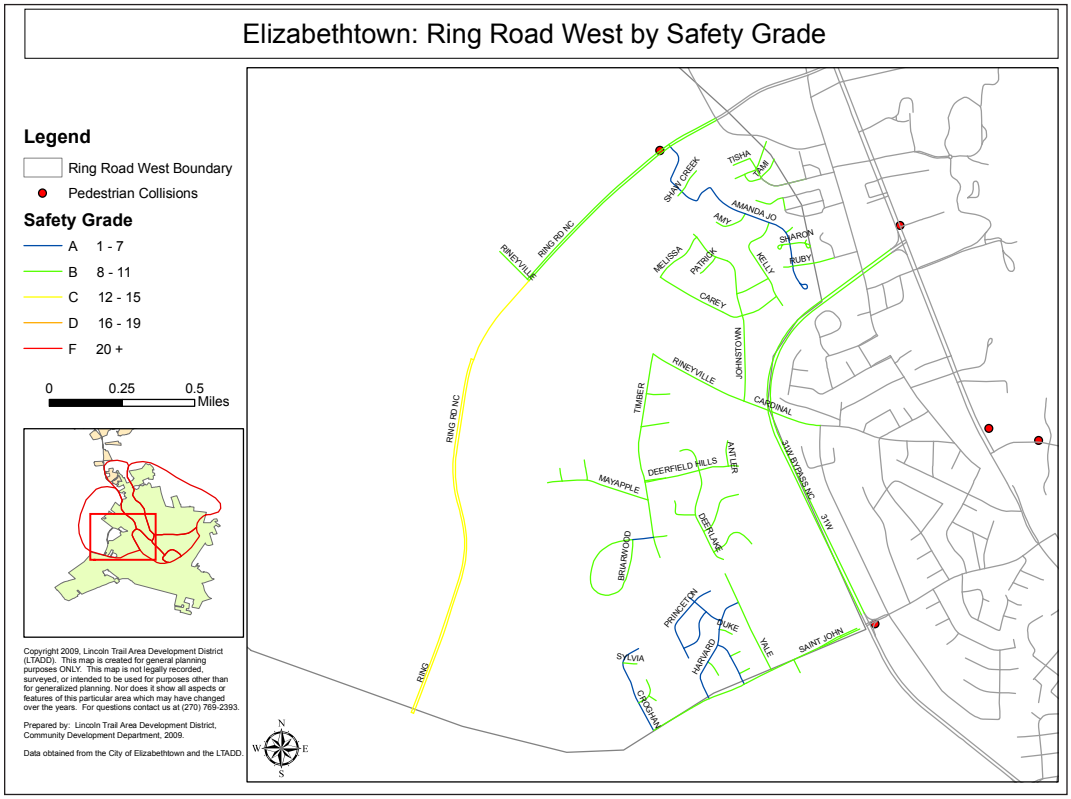
Path Context

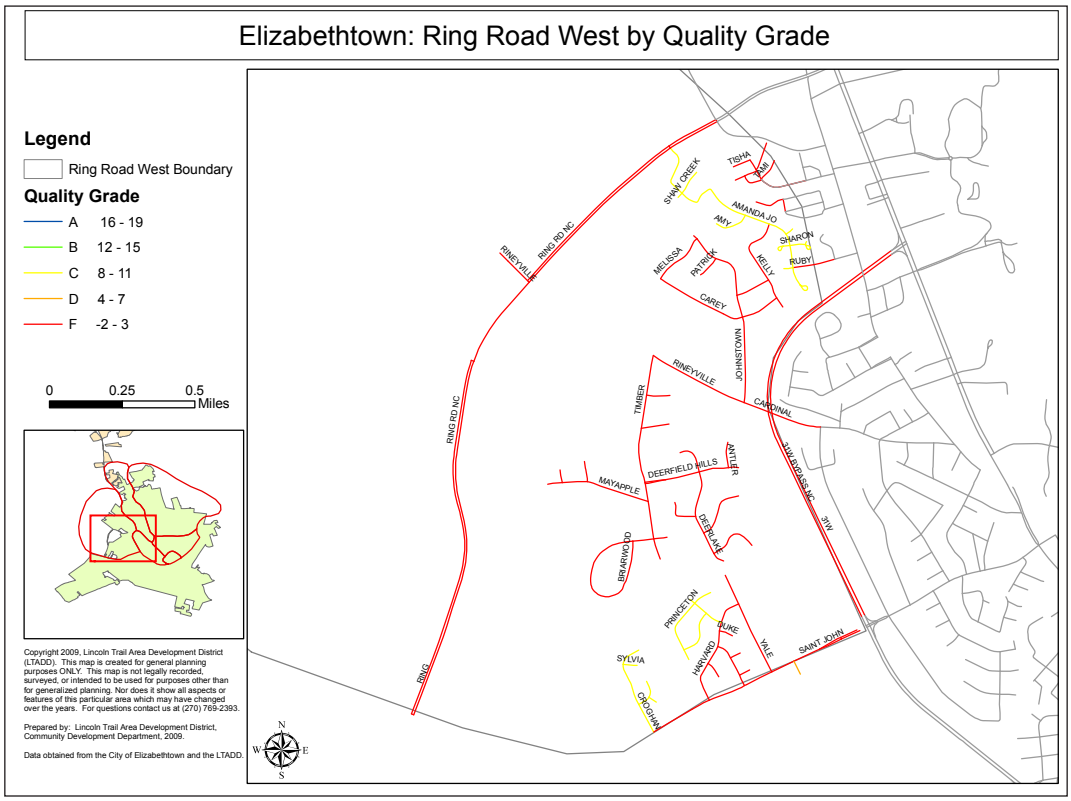
Of the total miles of roadway in the Ring Road West Subarea, the 75% majority were rated "D" or better. About 4.73 miles or 24.7% were rated "A"; approximately 3.86 miles or 20.1% were rated "B"; approximately 4.98 miles or 26.0 were rated "C"; approximately 5.56 miles or 29.0% were rated "D"; and approximately 0.04 miles or 0.2% were rated "F."

RING ROAD EAST

The total land covered by the Ring Road East Subarea is approximately 3,204.53 acres or 20.3% of the total land area in the city. This area also includes 44.54 miles of roadway.

Overall, the Ring Road East Subarea received 3.4 out of 5.0 points. Based on the grading scale described in Section III, the subarea received a walkability grade of "B." The connectivity grade was a "C"; the land use variation grade was a "B"; the safety grade was a "B"; the path quality grade was an "F"; and the path context grade was an "A." A detailed explanation of each category grade is provided below.




Elizabethtown: Ring Road West by Quality Grade
Legend
Ring Road West Boundary
Quality Grade
A 16 - 19
B 12 - 15
C 8 - 11
D 4 - 7
F -2 - 3
0 0.25 0.5 Miles
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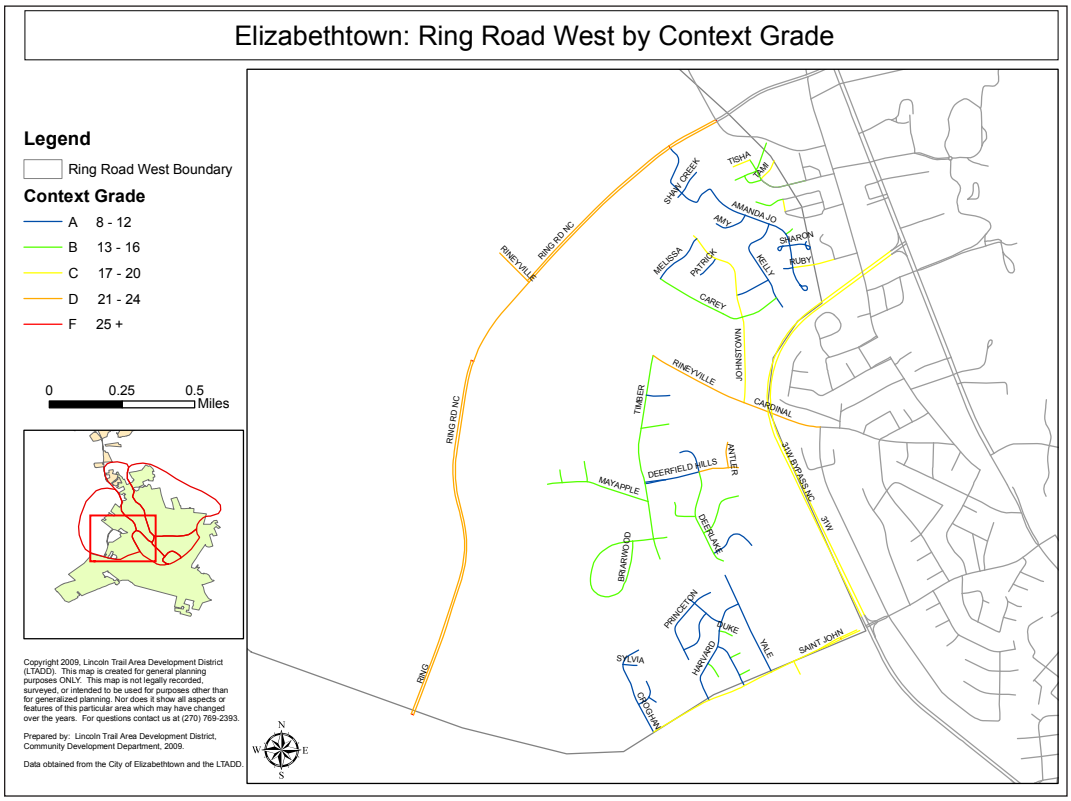
Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.
RING RD NC
RINEYVILLE
SHAW CREEK
TISHA
AMY
AMANDA JO
SHARON
RUBY
KELLY
PATRICK
MELISSA
CAREY
JOHNSTOWN
TIMBER
CARDINAL
DEERFIELD HILLS
ANTLER
MAYAPPLE
DEERLAKE
BRIARWOOD
PRINCETON
DUKE
HARVARD
YALE
SAINT JOHN
SYLVIA
ORCHARD
RING
3WBYPASS
3W
N
S
E
W


Elizabethtown: Ring Road West by Context Grade
Legend
Ring Road West Boundary
Context Grade
A 8 - 12
B 13 - 16
C 17 - 20
D 21 - 24
F 25 +
0 0.25 0.5 Miles
Copyright 2009, Lincoln Trail Area Development District (LTADD). This map is created for general planning purposes ONLY. This map is not legally recorded, surveyed, or intended to be used for purposes other than for generalized planning. Nor does it show all aspects or features of this particular area which may have changed over the years. For questions contact us at (270) 769-2393.
Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.
RING RD NC
RINEYVILLE
SHAW CREEK
TISHA
AMY
AMANDA JO
SHARON
RUBY
KELLY
PATRICK
MELISSA
CAREY
JOHNSTOWN
TIMBER
CARDINAL
DEERFIELD HILLS
ANTLER
MAYAPPLE
DEERLAKE
BRIARWOOD
PRINCETON
DUKE
HARVARD
YALE
SAINT JOHN
SYLVIA
ORCHARD
RING
3WBYPASS
3W
N
S
E
W

ANALYSIS BY CATEGORY

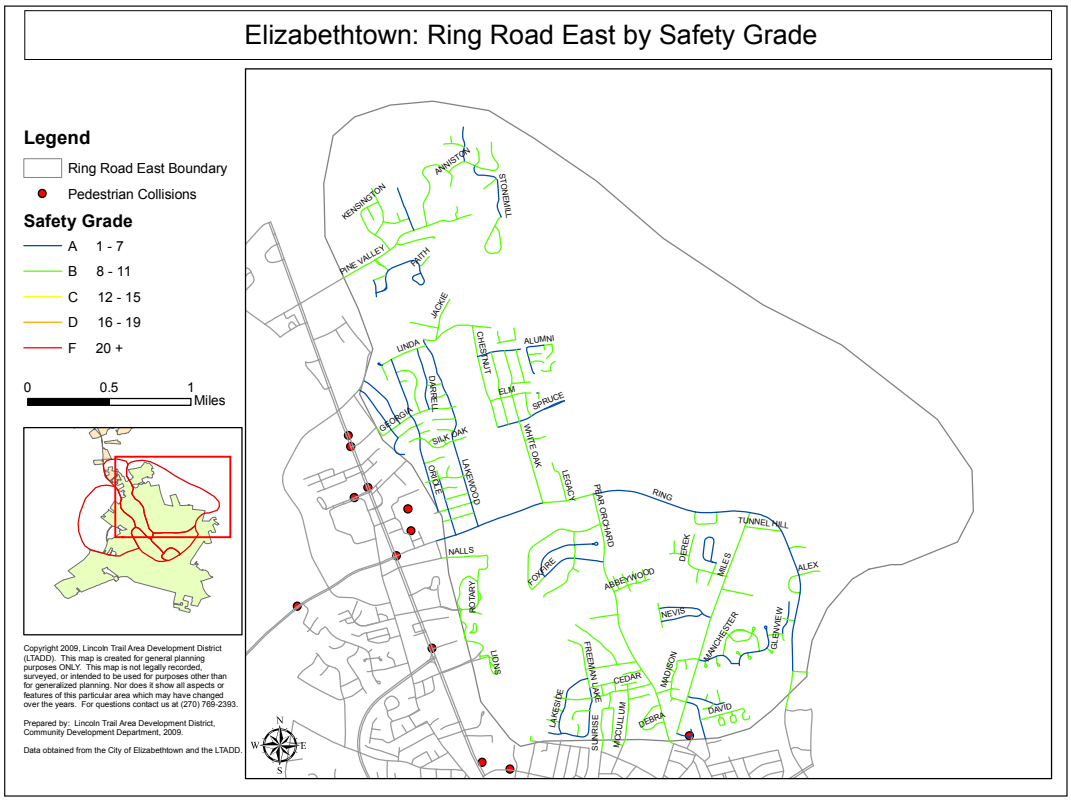
Connectivity
Within the Ring Road East Subarea, there are 376 distinct roadway segments and 374 distinct nodes. Dividing the number of segments by the number of nodes results in a connectivity index value of 1.01. Based on the grading scale described in Section III, this translates to a connectivity grade of "C."

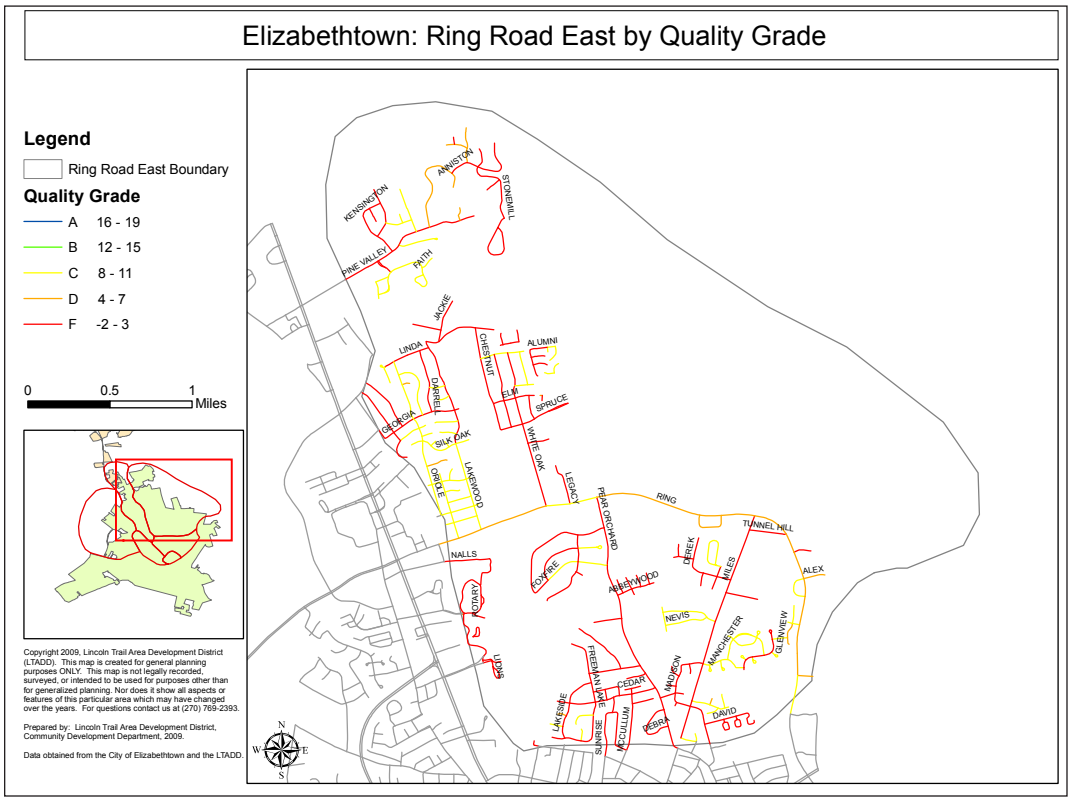
Land Use Variation
Within the Ring Road East Subarea, there are 45 differentiated polygons and 9 different land use categories. The area for each land use category is shown in Table B12 in the Appendix. The land use variation, as calculated using the entropy land use score, is 0.68. Based on the grading scale described in Section III, this translates to a land use variation grade of "B."

Safety
Within the Ring Road East Subarea, there are 44.54 miles of roadway. The 75% majority received a grade of "B" or better. About 14.01 miles or 31.5% were rated "A"; and the remaining 30.53 miles or 68.5% were rated "B."

Path Quality
Of the total miles of roadway in the Ring Road East Subarea, the 75% majority received a grade of "F" or better. About 12.37 miles or 27.8% were rated "C"; approximately 4.78 miles or 10.7% were rated "D"; approximately 27.39 miles or 61.5% were rated "F."

Path Context
Of the total miles of roadway in the Ring Road East Subarea, the 75% majority received a grade of "A." About 18.81 miles or 42.2% were rated "A"; approximately 17.57 miles or 39.4% were rated "B"; approximately 6.27 miles or 14.1% were rated "C"; and the remaining 1.89 miles or 4.3% were rated "D."




Elizabethtown: Ring Road East by Quality Grade
Legend
Ring Road East Boundary
Quality Grade
A 16 - 19
B 12 - 15
C 8 - 11
D 4 - 7
F -2 - 3
0 0.5 1 Miles
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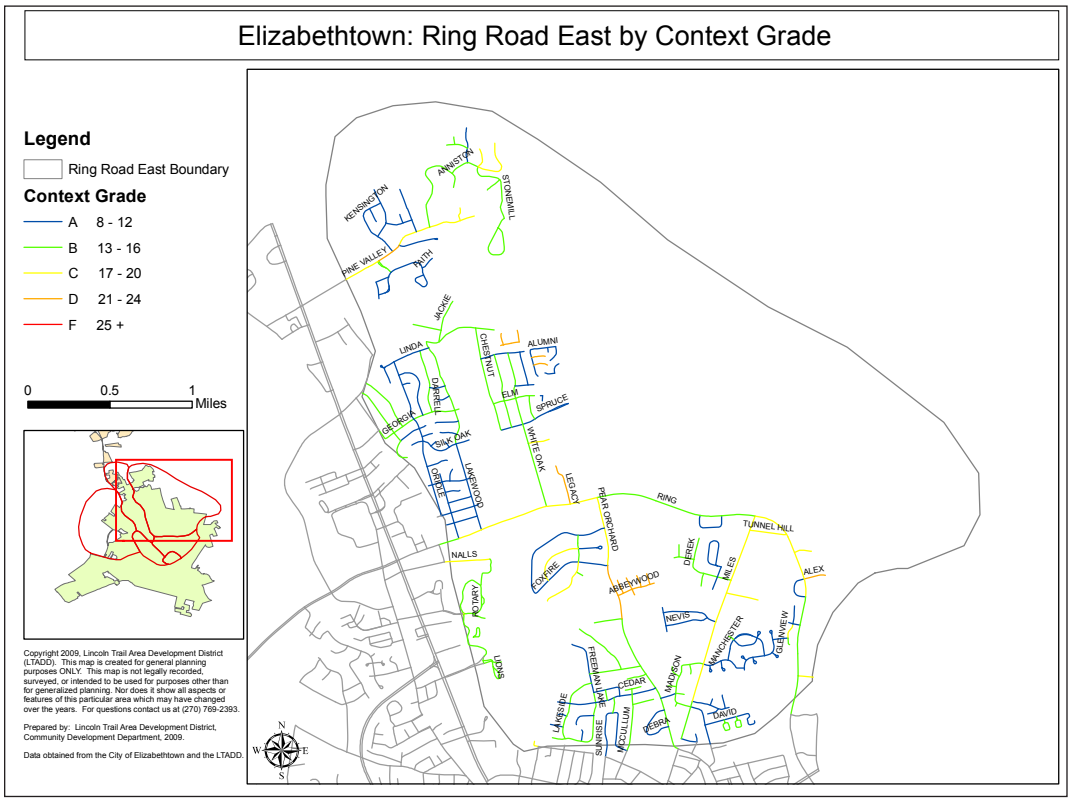
Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.
ANNISTON
STONEMILL
KENSINGTON
PINE VALLEY
FAITH
JACKIE
LINDA
CHESTNUT
ALUMNI
ELM
SPRUCE
DARRELL
GEORGIA
SILK OAK
ORIOLE
LAKEWOOD
WHITE OAK
LEGACY
PEAR ORCHARD
RING
TUNNEL HILL
DEREK
MILES
ALEX
NALLS
ROBYN
ABBEYWOOD
FOXFIRE
NEVIS
MANCHESTER
GLENVIEW
LEWIS
FREEMAN LANE
CEDAR
MADISON
LAKESIDE
SUNRISE
MCCUTCHEON
PEBRA
DAVID


Elizabethtown: Ring Road East by Context Grade
Legend
Ring Road East Boundary
Context Grade
A 8 - 12
B 13 - 16
C 17 - 20
D 21 - 24
F 25 +
0 0.5 1 Miles
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Prepared by: Lincoln Trail Area Development District, Community Development Department, 2009.
Data obtained from the City of Elizabethtown and the LTADD.
ANNISTON
STONEMILL
KENSINGTON
PINE VALLEY
FAITH
JACKIE
LINDA
CHESTNUT
ALUMNI
ELM
SPRUCE
DARRELL
GEORGIA
SILK OAK
ORIOLE
LAKEWOOD
WHITE OAK
LEGACY
PEAR ORCHARD
RING
TUNNEL HILL
DEREK
MILES
ALEX
NALLS
ROBYN
ABBEYWOOD
FOXFIRE
NEVIS
MANCHESTER
GLENVIEW
LEWIS
FREEMAN LANE
CEDAR
MADISON
LAKESIDE
SUNRISE
MCCUTCHEON
PEBRA
DAVID

NORTH DIXIE AVENUE

The total land covered by the North Dixie Avenue Subarea is approximately 1,362.47 acres or 8.6% of the total land area in the city. This area also includes 26.23 miles of roadway.

Overall, the North Dixie Avenue Subarea received 2.8 out of 5.0 points. Based on the grading scale described in Section III, the subarea received a walkability grade of "C." The connectivity grade was a "C"; the land use variation grade was a "C"; the safety grade was a "B"; the path quality grade was an "F"; and the path context grade was a "C." A detailed explanation of each category grade is provided below.

ANALYSIS BY CATEGORY

Connectivity

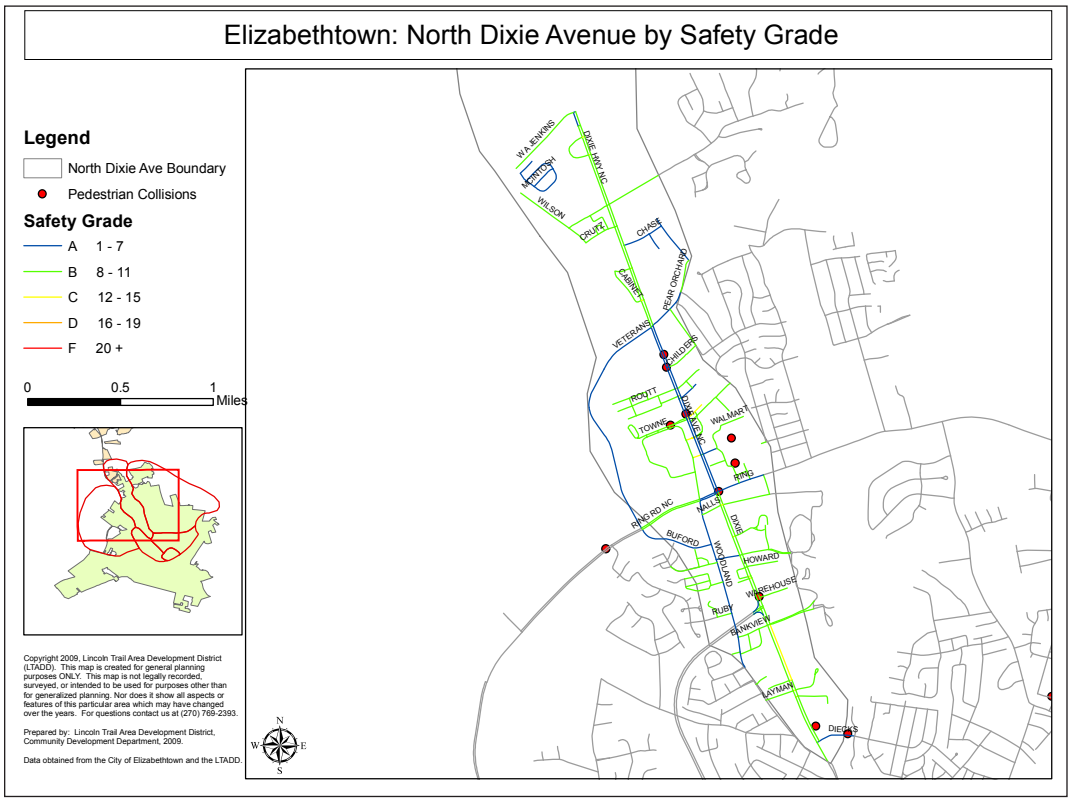
Within the North Dixie Avenue Subarea, there are 192 distinct roadway segments and 162 distinct nodes. Dividing the number of segments by the number of nodes results in a connectivity index value of 1.19. Based on the grading scale described in Section III, this translates to a connectivity grade of "C."

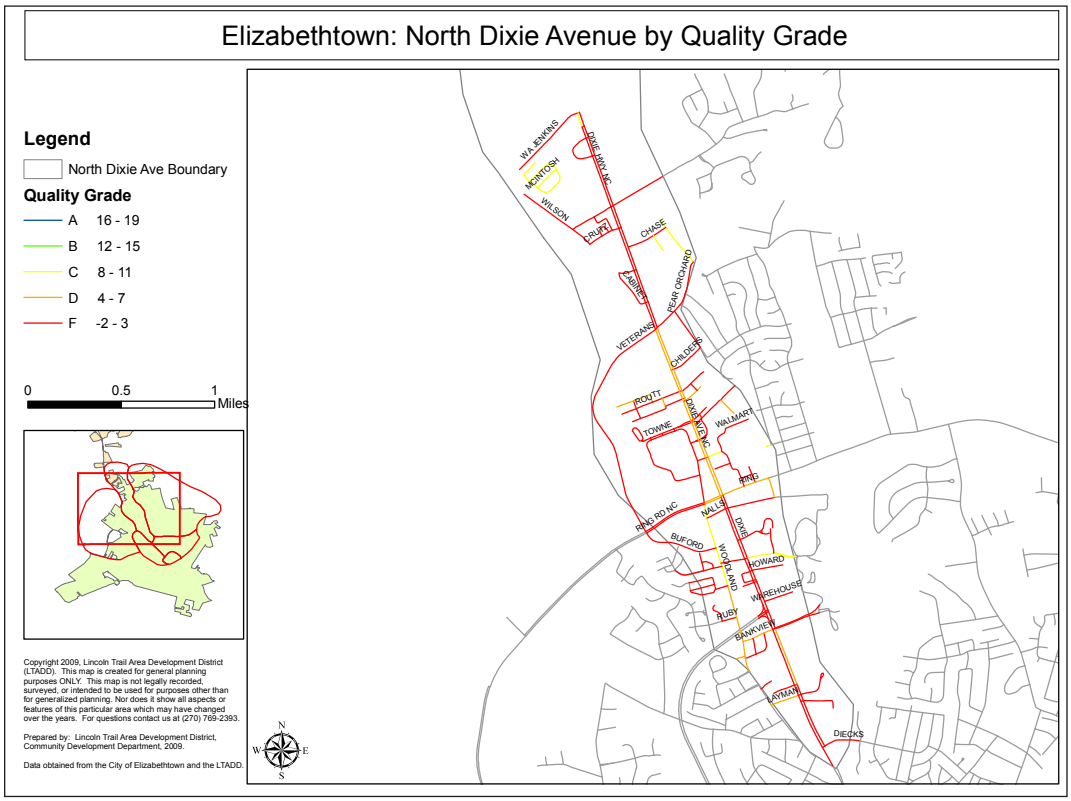
Land Use Variation

Within the North Dixie Avenue Subarea, there are 25 differentiated polygons and 13 different land use categories. The area for each land use category is shown in Table B13 in the Appendix. The land use variation, as calculated using the entropy land use score, is 0.59. Based on the grading scale described in Section III, this translates to a land use variation grade of "C."

Safety

Within the North Dixie Avenue Subarea, there are 26.23 miles of roadway. The 75% majority received a grade of "B" or better. About 7.39 miles or 28.2% were rated "A"; approximately 18.09 miles or 69.0% were rated "B"; and the remaining 0.76 miles or 2.9% were rated "C."




Elizabethtown: North Dixie Avenue by Quality Grade
Legend
North Dixie Ave Boundary
Quality Grade
A 16 - 19
B 12 - 15
C 8 - 11
D 4 - 7
F -2 - 3
0 0.5 1 Miles
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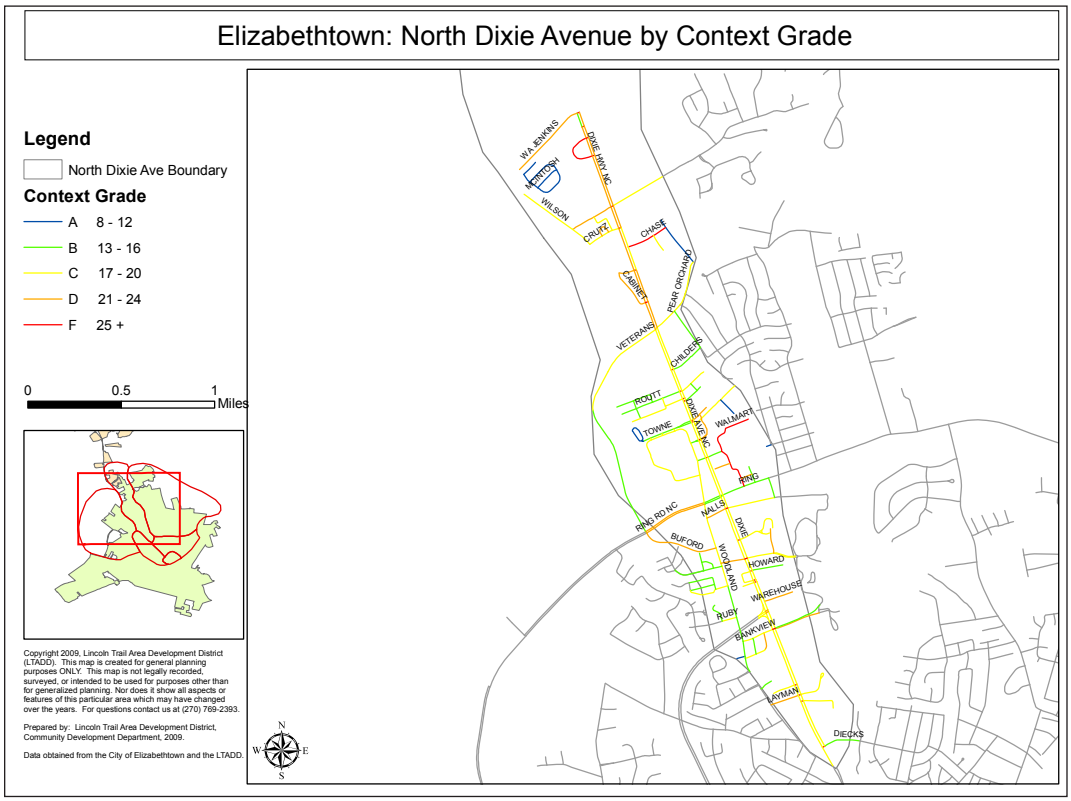
Data obtained from the City of Elizabethtown and the LTADD.
W.A. JENKINS
MCINTOSH
WILSON
DIXIE HWY NC
CRUFF
CHASE
CABINET
PEAR ORCHARD
VETERANS
CHILDERS
ROUTT
TOWNE
DIXIE AVE NC
WALMART
RING
RING RD NC
NALLS
DIXIE
BUFORD
WOODLAND
HOWARD
WAREHOUSE
RUBY
BANKVIEW
LAYMAN
DIECKS


Elizabethtown: North Dixie Avenue by Context Grade
Legend
North Dixie Ave Boundary
Context Grade
A 8 - 12
B 13 - 16
C 17 - 20
D 21 - 24
F 25 +
0 0.5 1 Miles
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ROUTT
TOWNE
DIXIE AVE NC
WALMART
RING
RING RD NC
NALLS
DIXIE
BUFORD
WOODLAND
HOWARD
WAREHOUSE
RUBY
BANKVIEW
LAYMAN
DIECKS

Path Quality
Of the total miles of roadway in the North Dixie Avenue Subarea, the 75% majority received a grade of "F" or better. About 2.14 miles or 8.2% were rated "C"; approximately 4.18 miles or 15.9% were rated "D"; approximately 19.91 miles or 75.9% were rated "F."

Path Context
Of the total miles of roadway in the North Dixie Avenue Subarea, the 75% majority received a grade of "C" or better. About 1.40 miles or 5.3% were rated "A"; approximately 5.42 miles or 20.7% were rated "B"; approximately 12.22 miles or 46.6% were rated "C"; approximately 5.83 miles or 22.2% were rated "D"; and approximately 1.36 miles or 5.2% were rated "F."

STAKEHOLDER INVOLVEMENT

An important component of the walkability study was involvement from local stakeholders. As this study was completed for the MPO, members from both the MPO Policy and Technical Advisory Committees were identified as key stakeholders. Through the course of several regularly scheduled meetings, both committees were able to provide input for the study and also raise any concerns or questions. Regular project status updates were provided during these meetings as well as by email. A questionnaire was developed and distributed to both committees to further provide another channel of communication and identify any specific concerns or project ideas members may have had. Final meetings will be held to present the findings of this report and address any other questions that may arise.

In an effort to inform the public about the study and opportunities to provide input, a press release was created and distributed to the *News-Enterprise* and major radio stations in Hardin County. Input from the general public was sought through a public survey. Due to resource constraints, a random sample of residents in the combined study area was identified and mailed a letter of introduction and a survey. An electronic version of the survey was also posted on the Lincoln Trail Area Development District website.

MPO TECHNICAL ADVISORY COMMITTEE

Committee Members include:
Murray Wanner, City of Radcliff Planning & Development
Toby Spalding, City of Radcliff Engineering
Ed Poppe, City of Elizabethtown Planning & Development
Scot Reynolds, City of Elizabethtown Engineering
Chris Hunsinger, Hardin County Planning & Development
Mike Hall, Transportation Management Systems
Patty Dunaway, Chief District Engineer, KYTC District 4
Kevin Young, KYTC District 4 Planning
Barry House, KYTC Division of Planning
Sam Clements, Transit Authority of Central Kentucky

June 3, 2009. During this initial project meeting, the impetus for the study was explained and the purpose was defined. There was a discussion on the general methodology to be used to conduct the study and opportunities to provide technical guidance.

August 12, 2009. The second meeting involved a discussion of the goals and objectives of the study, a more detailed explanation of the methodology used to evaluate the study areas, and an update of the status of the study. Committee members were asked to complete a questionnaire that would identify any specific problem areas or potential solutions.

September 11, 2009. The third meeting involved an update on the study and a discussion of information still needed for the study.

MPO POLICY COMMITTEE

Committee members include:
Honorable Harry Barry, Hardin County Judge/ Executive
Honorable Sheila Enyart, Mayor, City of Radcliff
Honorable David Willmoth, Mayor, City of Elizabethtown
Honorable Harry Craycroft, Meade County Judge/ Executive
Emmet Holley, Fort Knox Garrison Manager
Sam Clements, Transit Authority of Central Kentucky
Patty Dunaway, Chief Dist. Eng., KYTC Dept of Highways District 4
Kevin Young, KYTC District 4 Planning
Barry House, Kentucky Transportation Cabinet
Bernadette Dupont, Federal Highway Administration

July 23, 2009. During this meeting, the project was introduced to committee members, the purpose of the study was defined, goals and objectives were reviewed, the methodology was explained, and an update of the progress to date was given. Also, the public survey was distributed and committee members were asked for suggestions on specific collections points for the survey.

RESIDENTS

SAMPLE IDENTIFICATION

To obtain a sample of local residents, parcel identification numbers were obtained from the Hardin County PVA office. Using a random number generator, a sample of 200 parcels was identified. The names of property owners and addresses were again obtained from the Hardin County PVA office. After reviewing property owner information, a number of properties had to be excluded. Exactly 177 property addresses were able to be verified. Therefore, 177 surveys were mailed to the current resident for every given address. Of these, 18 were returned to sender. Of the remaining 159 surveys, 18 completed surveys were returned (an adequate response rate of about 11%). A summary of the responses is listed below.

RESPONSES

- Approximately 865 of all trips were made with a personal vehicle. Only 13% of all trips were made by walking.
- When asked to check all that apply, the highest percentage (89%) of respondents classified their trips as "Shopping"; 67% classified them as "Recreation"; 56% classified them as "Medical"; 50% classified them as "Work-Related."
- Of those that responded to the optional question, all of the respondents stated they walk to retail or recreational destinations.
- About 39% of respondents said they could walk to at least one destination they currently drive to.
- Of those that responded to the optional question, 66% of respondents stated they could walk to both retail and recreational destinations.
- When asked to check all that apply, the highest percentage of respondents (72%) stated "Distance" was a factor that prevented them from being able to walk to a location; 56% gave "Lack of Pedestrian Infrastructure" as a factor; and 50% gave "Safety Concerns" as a factor.
- Respondents stated they would walk to schools, retail locations, restaurants, libraries, and for recreational purposes if there were not limitations preventing them from doing so.
- Only 22% of respondents had school-aged children, none of whom currently walk to school. When asked to check all that apply, 75% of respondents stated "Distance" was a limiting factor; 75% also stated "Safety Concerns" were a factor; and 50% stated "Weather" was a factor in preventing their children from walking to school.

Additional comments regarding improvement of the pedestrian infrastructure included maintenance issues, problems stemming from the lack of sidewalks, safety and convenience concerns, connectivity, and someone wishing "good luck."

RECOMMENDATIONS

The second goal of this study was to identify general recommendations to improve the level of walkability in the MPO planning area. This includes policy, program, and general project recommendations. Specific capital projects that would require engineer cost estimates were not identified, but hopefully could be developed using the recommendations listed below.

The first step in developing these recommendations involved reviewing pedestrian plans, studies, and guidelines implemented in other MPOs or cities, such as Atlanta, Kansas City, Nashville, Pinellas County, and Portland. The second step involved reviewing projects in the study area, which are geared toward improving the pedestrian infrastructure. The third step was to review the development regulations in both the City of Radcliff and the City of Elizabethtown with regard to pedestrian-oriented regulations. The fourth step was to identify specific policies, programs, and projects that could be applied in the study area.

ACTIONS TAKEN BY OTHER CITIES

ATLANTA[52]

POLICIES AND PROGRAMS

- Incorporate the concepts of routine accommodation and complete streets into planning, design, and construction of all future roadways and adopt development review regulations requiring developers to build bicycle and pedestrian facilities as integral components of their transportation infrastructure.
- Adopt guidelines or standards that recommend appropriate crossing facilities and treatments for pathways (sidewalks and shared use paths) as they cross streets at uncontrolled locations.
- Establish guidelines for ensuring bicycle and pedestrian connectivity between neighborhoods and among adjacent land uses.
- Develop and promote programs that promote bicycling and walking through education, encouragement, enforcement, and awareness.

KANSAS CITY[53]

PRINCIPLES

- The pedestrian is the foundation for mobility within Kansas City
- The City's sidewalk and pathway system should provide direct, continuous, and safe pedestrian mobility for all ages and abilities and link neighborhoods to activity centers, transit stops, schools, parks, and other neighborhoods.
- The City's transportation impact analysis guidelines for new developments should be expanded to comprehensively address pedestrian mobility, with special attention paid to pedestrian infrastructure, including an assessment of directness, continuity, street crossings, visual interest and amenity, and security.
- Pedestrian network mobility improvements should be considered an integral part of all new transportation improvements, including major reconstruction of roadways.
- Subdivision standards should be modified to require pedestrian improvements that connect residential areas to nearby

commercial centers, schools, parks, and other neighborhoods with sidewalks and bike lanes and/or paths.

- Design standards should be modified to promote pedestrian mobility. These design standards would include requirements that commercial retail and office developments provide internal sidewalk systems that connect with the adjacent pedestrian network.

- A pedestrian education program should be developed as part of the City's overall communication and education program.

NASHVILLE[54]

POLICIES AND PROGRAMS

- Require a minimum sidewalk width of 5 feet regardless of street classification. The sidewalks should be constructed with 4 to 6 foot buffer zones along all roadways.

- Allow "in-lieu-of" payments to the community's sidewalk fund, which would allow for the more strategic locating of sidewalks.

- Develop a maintenance and spot improvement program to be run by a Public Works or Parks & Recreation Department.

- As part of the development review process, evaluate the potential for new developments to provide pedestrian connections to existing sidewalks and nearby destinations.

- The MPO and its member jurisdictions should encourage local school boards to establish school siting policies that favor sites with good walking and biking access.

- The MPO and local communities should adopt a Complete Streets policy, which is designed to accommodate bicyclists, pedestrians, transit users, and motorists of all ability levels.

- The MPO should encourage greater use of the Safe Routes to School Program locally and work to provide a coordinated approach to such initiatives within the region.

PINELLAS COUNTY[55]

KEY DESIGN PRINCIPLES AND FEATURES

- Drawing buildings to the edge of the street creates a human-scaled pedestrian environment with a clearly defined edge.

- Trees break down the overall scale of the roadway, making it more welcoming for pedestrians.

- Special landscape treatments may be used to highlight 'gateways' and important public spaces.

- Lighting should guide pedestrians along intended walkways and highlight destination points.

- Parking lots should be placed to side or rear of buildings.

PORTLAND[56]

POLICIES

- Complete a pedestrian network that serves short trips and transit

- Improve the quality of the pedestrian environment

- Increase safety and convenience

- Encourage walking

- Explore a range of funding options for pedestrian improvements

OBJECTIVES

- **Street Classification Relating to Pedestrian Transportation –** The Transportation Element of the Comprehensive Plan lists four classifications for pedestrian facilities: Pedestrian District, City Walkway, Local Service Walkway, and Off-Street Path. The pedestrian classifications indicate not only what types of pedestrian use should be accommodated, but also suggest where public funds for pedestrian improvements should be directed when they become available.

- **Pedestrian Districts –** Pedestrian Districts are typically compact walkable areas of intense pedestrian use with a dense mix of land uses and good transit service, where walking is intended to be the primary mode for trips within the district.

PROJECTS

- **Pedestrian District Projects and Main Street Pedestrian Design Projects –** projects to plan and develop specific districts or areas that have, or are expected to have, intense pedestrian use. Includes widened sidewalks, curb extensions, street lighting and signing.

- **Pedestrian Corridor Projects –** projects to plan and construct improvements along a street corridor. Includes sidewalk construction and extension.

- **Crossing Improvement Projects –** projects to modify an intersection to improve crossing conditions for pedestrians. Includes curb extensions, raised crosswalks, median refuges, installation, replacement or modification of traffic signals.

- **Pedestrian Connection Projects –** projects to improve connections where they are needed for access to schools, transit and shopping, with particular emphasis on areas where street connectivity is low. Includes public stairways, pedestrian overcrossings at major impediments, and pathways linking cul-de-sacs.

- **Greenstreet Projects –** projects to plan and construct improvements to a local street corridor that can serve as a through route for trips by walking and bicycling. Includes signing, street lighting, and crossing improvements at arterial cross streets. Emphasis should be placed on project amenities, such as "pocket" parks, and community gardens.

CURRENT PEDESTRIAN PROJECTS IN STUDY AREA

RADCLIFF MIDDLE SCHOOL SIDEWALK PROJECT[57]

This $248,000 project was funded under the Kentucky Safe Routes to School Program. The primary purpose of this project is to provide students living east of South Dixie Boulevard (US 31W) a safe pathway to Radcliff Middle School located west of South Dixie Boulevard. This roadway is a heavily used route with a current average daily traffic count of 29,400.

The project consists of the construction of a continuous sidewalk along the east side of Dixie Boulevard from Blackjack Road to the existing crosswalk. From the crosswalk, the western portion of the proposed sidewalk continues north to the entrance of Radcliff Middle School. Students will greatly benefit from this project by the improved path connectivity, safety, and path quality.

NORTH DIXIE BOULEVARD STREETSCAPE PROJECT[58]

This $742,000 project was funded under the Kentucky Transportation Enhancement Program. The primary purpose of this project is to improve the level of pedestrian safety along Dixie Boulevard. It is also intended to promote new economic development opportunities by providing a connection between new and existing housing areas to commercial locations.

The project consists of the construction (or reconstruction) of a continuous sidewalk on both sides of North Dixie Boulevard from Lincoln Trail Boulevard to Knox Boulevard. It also includes the placement of landscaped areas with trees and planting beds that will buffer pedestrians from the existing high volume roadway. Wrought iron park benches will also be provided along the roadway to "further enhance the walking environment." Overall, this project will significantly enhance the pedestrian infrastructure along this corridor by improving connectivity, safety, path quality and path context.

LOCAL DEVELOPMENT STANDARDS

RADCLIFF

All of the goals of the Radcliff Comprehensive Plan are indirectly related to improving the level of walkability in the City. However, Goals Eight and Nine specifically mention objectives that relate to the pedestrian environment. The objectives of these two goals include discouraging sprawling development, encouraging street and sidewalk connectivity, and "ensur[ing] that proposed developments do not adversely affect the level of service on existing streets."[59]

The Transportation component of the Comprehensive Plan calls for the installation of sidewalks on all new developments as an essential component of the transportation infrastructure, without exception. It also, recommends that a percentage of annual infrastructure funding be used to install sidewalks on undeveloped property, using a Sidewalk Priority List.[60]

Again, there are several sections of the Subdivision Regulations that indirectly relate to walkability. However, Article IV Section 4.3 specifically discusses street and sidewalk standards. Section 4.3.15 requires that interior and exterior adjacent streets of a subdivision are interconnected. Cul-de-sacs and curvilinear streets are discouraged, except where connections are impractical. In Section 4.3.2 five-foot wide sidewalks are required on both sides of the street except in Industrial areas, unless a better alternative pedestrian pathway is proposed. A six-foot buffer is required for sidewalks on all curb and gutter streets, and within a sidewalk easement on ditch-line streets. Section 3.5.7.2 identifies lot owners as the custodians "of all required sidewalks adjacent to their property."[61]

Article IV Section 4.7 of the Zoning Ordinance and Development Regulations require the construction of sidewalks on new development properties an significant modifications to existing developments. There is a list of areas exempted from this requirement included in this document, which may currently be null and void.[62]

Section 18-17 of the Code of Ordinances discusses property line sidewalks. Contrary to the Subdivision Regulations, four-foot sidewalks are required to be constructed with a two-foot setback from the edge of the curb.[63]

ELIZABETHTOWN

There are several goals of the Elizabethtown Comprehensive Plan that could arguably relate to the level of walkability in the City. Goals F and I directly relate to the pedestrian environment. The objectives of these two goals recommend aesthetically pleasing development and interconnected developments.[64]

The Transportation Plan of the Comprehensive Plan calls for the installation of four-foot sidewalks on all new developments except where "alternative forms of pedestrian pathways" are proposed. It also recommends an absolute minimum number of cul-de-sacs. Lastly, Traffic Impact Studies are mentioned "as a method to assure safe traffic flow for developments of a significant use and/ or size…"[65]

Section 4.3 of the Elizabethtown Subdivision Regulations recommends "Adequate vehicular and pedestrian access should be provided to all lots." Section 4.3.1.15 requires proposed streets to continue to existing streets where applicable. Section 4.3.2 calls for four-foot wide sidewalks to be constructed on both sides of the street except in Industrial areas, unless a better alternative pedestrian pathway is proposed. A three-foot buffer is required for sidewalks on all curb and gutter streets, and within a five-foot pedestrian easement on ditch-line streets.[66]

Section 4.5.4 of the Zoning Ordinance requires the construction of five-foot sidewalks along street frontages of a property or six foot for "buildings along any façade featuring a customer entrance, and along any façade abutting off-street parking areas." Section 9.5.6.1 requires all new site developments or buildings to include provisions for a "sidewalk across or adjoining the site" for all residential and commercial uses. "Excepted from this requirement is: 1) Suburban Residential-1 (R-1) zoned property with 200 feet or greater street frontage; 2) Industrial uses; and 3) Single family residential uses when more than 75% of the lots in the applicable section of the subdivision are developed without sidewalks."[67]

RECOMMENDED POLICIES & PROGRAMS

Zoning and Development Regulations

- Modify outdated Zoning Ordinances and Development Regulations to reflect current regulations.

- Amend Zoning Ordinances to include Kentucky Street Connectivity Zoning and Subdivision Model Ordinance.

- Incorporate "Complete Street" principles in subdivision regulations, such as routine accommodation for pedestrians and bicyclists, pedestrian scale lighting, and smaller building setback requirements.

- Include internal pathway connectivity requirement on new non-residential developments.

- Require a minimum sidewalk width of 5 feet. Depending on roadway classification, the sidewalks should be constructed with 4 to 8 foot buffer zones along all roadways.

Maintenance Requirements

- Dedicate funds from City's General Fund to maintain and repair sidewalks.

OR

- Develop database to inventory sidewalks that includes location, property owner information, quality, and repair costs assessed to owner (if applicable).

- Inspect all sidewalks within City limits on a 10-year cycle.

- Allocate funds for sidewalk maintenance grant program that pays 25-50% of repair costs.

- Enforce property owner sidewalk maintenance requirement.

- Allow "in-lieu-of" payments for sidewalk maintenance or sidewalk construction, especially when granting sidewalk installation waivers. These funds should be dedicated to the pedestrian infrastructure development.

Sidewalk Priority List

- Identify streets to be included on Sidewalk (or Complete Street) Priority List.

- Provide methods for residents to identify problem locations or potential areas to be improved and included on Priority List.

- Allocate percentage of Capital Improvement Program for pedestrian infrastructure, especially for those projects listed on Sidewalk Priority List.

- Hold Bicycle/ Pedestrian Forums to gather information on potential pedestrian districts and bicycle/ pedestrian corridors.

- Budget funds for Safe Routes to School and other grant programs to leverage financial resources and improve pedestrian infrastructure and associated landscaping.

Pedestrian Corridor Plans

- Annually fund and develop small scale Pedestrian (or Complete Street) Corridor Plans to inventory and evaluate existing infrastructure, develop specific improvement projects and implementation strategies.

- Coordinate with local Chambers of Commerce, Tourism Commissions, and Parks and Recreation staff to develop Corridor Plans.

- Incorporate Corridor Plans into Transportation Component of Comprehensive Plan and Capital Improvement Program.

PROGRAMS

Kid Safe Streets Program

- Develop and allocate funds for a Kid Safe Streets Program.

- Collaborate with local school districts and police departments in developing ways to increase the number of students walking to school.

- Identify target walking corridors/ areas for students.

- Identify elements of these areas that may be unsafe, serve as obstacles, or would otherwise need to be improved.

- Address issues along these corridors and construct or repair existing sidewalks near bus stops and schools.

- Install Kid Safe Street signage along routes.

Outreach Program

- Create and distribute brochures, fact sheets, flyers, etc. for students, parents, and recreation walkers and bicyclists explaining benefits and "stay safe" practices.

- Organize community-wide events, such as marathons, running and bicycle races, and other sporting events to raise awareness of the benefits of walking and bicycling.

- Distribute reflective belts, brochures, fact sheets, flyers, etc. at community-wide events.

RECOMMENDED PROJECTS

Crosswalk Projects

- Strategically locate and install a very limited number of crosswalks with differentiated paving across US 31W, Ring Road, Wilson Road, and Lincoln Trail Boulevard at low volume intersections or highly visible mid-block locations.

- Add cameras to existing traffic signals near these locations in an effort to reduce the number of vehicles running red lights.

- Modify signal timing near these locations to include delay for pedestrian crossings.

Sidewalk Construction/ Enhancement

- Identify and improve sidewalk internal and external connections and landscaping between high volume commercial and nearby residential areas. For example, pathways within and between the Old Navy Plaza and Towne Mall in Elizabethtown, and along Wilson Road in Radcliff.

- Enhance high volume or high visibility pedestrian facilities by strategically locating landscaped areas with pedestrian-scale lighting, street furniture, and public art.

Urban Core Development

- Hire a firm, specializing in pedestrian-oriented developments, to redesign the downtown centers of both Radcliff and Elizabethtown. Create and apply overlay districts for these downtown core areas.

CONCLUSION

This study was primarily focused on transportation planning. The urban issues discussed in the Introduction section were included to tie sprawl and sustainability into the study and relate them to walkability. As discussed above, sprawl is a symptom of both failing transportation networks and financial inefficiencies in cities. Unfortunately, the farther people move away from the urban core, the more unsustainable development becomes.

The concept and value of sustainability has been around for quite some time. However, applying elements and metrics seems to be somewhat elusive, and at times impractical. Yet the stakes are too great to simply move the issue to the background by citing "vagueness" or "unsubstantiated claims." Regardless of one's position on sustainability or climate change, sound planning involves taking environmental, economic, and equity values into account for both current and future generations.

Planning for walkable communities incorporates all three sustainability elements. Air quality has been shown to be degraded by an increase in vehicle miles travelled and walking obviously reduces this number. The costs associated with an investment in the pedestrian infrastructure could be offset by the decrease in the costs of maintaining and operating a vehicle, constructing new vehicle lanes, and the increase in safety. Lastly, pedestrians are people from all walks of life. Often low-income people are not able to support the "driving habit" and are forced to walk to work, shopping centers, and other destinations. Without an adequate and functioning pedestrian transportation network, this can be difficult.

Social justice is the idea that all people's considerations are taken into account regardless of race, ethnicity, social class, religion, etc. People with much economic interest in a community tend to participate more in the planning process, either directly or indirectly. Providing for walkable communities helps to balance these influences and improves the livability for all residents.

APPENDIX

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Center: http://msnbcmedia.msn.com/j/msnbc/Components/Photo_StoryLevel/071204/071204_walkable_hmed_730a.hmedium.jpg
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TABLES

Table A1. Safety Criteria

Safety Sub-Categories	Value	Description
Availability	0	Maintained 8’ shoulder (R) or existing sidewalks (U)
	1	Damaged 8’ shoulder (R) or existing sidewalks (U)
	2	Discontinuous sidewalks
	3	No sidewalks or shoulder
Risk	0	Roadway segments with 1 lane in each direction
	1	Multilane roadway with a center median
	2	Multilane with a two-way center left turn lane
	3	Multilane with no median or two-way center left turn
Crossing	0	Segments with average signal spacing of < 1,000 ft
	2	Segments with average signal spacing of > 1,000 ft
Crashes	1	0 crashes
	2	1-5 crashes per mile
	3	6-10 crashes per mile
	4	11-15 crashes per mile
	5	16-20 crashes per mile
	6	21+ crashes per mile
Speed	1	Speed limit ≥ 25 mph
	2	Speed limit ≥ 35 mph
	3	Speed limit ≥ 45 mph
	4	Speed limit not posted
Volume	1	100 – 7,500 vehicles per day (vpd)
	2	7,501 – 12,500 vpd
	3	12,501 – 17,500 vpd
	4	17,501 – 25,000 vpd
	5	25,001+ vpd

Table A2. Path Quality Criteria

Quality Sub-Categories	Value	Description
Facility	0	Not continuous or non-existent
Max 10 pts	4	Continuous on one side
	6	Continuous on both sides
	2	Minimum 5 ft wide and barrier free
	1	Sidewalk width > 5 ft
	1	Off-street/ parallel alternative facility
Conflicts	1	Less than 22 driveways and side streets per mile
Max 4 pts	0.5	Signals greater than 1 mile apart (along corridor)
	0.5	Reduced turn conflict implementation (restricted turns)
	0.5	Crossing width ≤ 60 ft (along corridor)
	0.5	Posted speed
	1	Medians present (along corridor)
Amenities	0	No sidewalks or shoulder
Max 2 pts	1	Buffer not less than 3.5 ft
	0.5	Benches or pedestrian scale lighting
	0.5	Shade trees
Maintenance	-2	No sidewalks or shoulder
Max 2 pts	-1	Major or frequent problems
	0	Minor or infrequent problems
	2	No problems
Multimodal support	0	No support
Max 1 pt	1	Support exists

Table A3. Path Context Criteria

Context Sub-Categories	Value	Description
Surveillance	1	Can be observed from more than 75% of buildings
	2	Can be observed from 50-75% of buildings
	3	Can be observed from less than 50% of buildings
	4	Not applicable
Lawn Maintenance	1	More than 75% well maintained
	2	Between 50-74% well maintained
	3	Less than 50% well maintained
	4	Not applicable
Verge Maintenance	1	More than 75% well maintained
	2	Between 50-74% well maintained
	3	Less than 50% well maintained
	4	Verge undergoing work
	5	Not applicable
Trees	1	1 or more per house block
	2	Approx. 1 tree for every 2 house blocks
	3	Approx. 1 tree for every 3 house blocks
	4	No trees at all
Cleanliness	1	None or almost none
	2	Yes, some
	3	Yes, lots of litter, discarded items, etc
Design	1	All of similar design
	2	Range of different designs
	0	Not applicable
Attractive	1	Very attractive
	2	Attractive (if no sidewalks, at least 2)
	3	Not attractive at all
Difficulty	1	Easy
	2	Moderately difficult (if no sidewalks, at least 2)
	3	Very difficult
Continuity	1	Path forms useful and direct route
	2	Path is disjointed (no sidewalks)

Table B4. City of Radcliff Land Use

Land Use	Area (in acres)	# Land Uses	Total Area (in acres)	Proportion
C	503.93	16	4,096.291	0.123
CH	4.04			0.001
CON	31.52			0.008
COR	95.86			0.023
I	47.71			0.012
PUD	13.42			0.003
R1	95.63			0.023
R2	1523.46			0.372
R3	314.90			0.077
R4	356.18			0.087
R5	24.03			0.006
R6	265.84			0.065
R7	392.66			0.096
RE	53.68			0.013
RH	332.15			0.081
UA	41.29			0.010

Table B5. Planning District 1 Land Use

Land Use	Area (in acres)	# Land Uses	Total Area (in acres)	Proportion
C	202.19	12	1727.530	0.117
CON	11.71			0.007
COR	45.45			0.026
I	38.17			0.022
R1	84.69			0.049
R2	595.30			0.345
R3	144.56			0.084
R4	148.22			0.086
R5	24.03			0.014
R6	110.54			0.064
R7	158.95			0.092
RH	163.71			0.095

Table B6. Planning District 3 Land Use

Land Use	Area (in acres)	# Land Uses	Total Area (in acres)	Proportion
C	301.74	15	2368.761	0.127
CH	4.04			0.002
CON	19.81			0.008
COR	50.41			0.021
I	9.53			0.004
PUD	13.42			0.006
R1	10.94			0.005
R2	928.15			0.392
R3	170.34			0.072
R4	207.96			0.088
R6	155.30			0.066
R7	233.71			0.099
RE	53.68			0.023
RH	168.45			0.071
UA	41.29			0.017

Table B7. City of Elizabethtown Land Use

Land Use	Area (in acres)	# Land Uses	Total Area (in acres)	Proportion
C-1	55.79	18	6855.430	0.008
C-2	522.71			0.076
C-3	1456.54			0.212
C-4	39.18			0.006
C-5	120.70			0.018
I-1	41.95			0.006
NIC	226.14			0.033
PNC	124.11			0.018
PNR-1	93.61			0.014
PNR-2	2.65			0.000
R-1	582.59			0.085
R-2	1679.52			0.245
R-3	476.62			0.070
R-4	738.06			0.108
R-5	222.88			0.033
R-6	340.19			0.050
WCD-1	80.82			0.012
WCD-2	51.36			0.007

Table B8. Downtown Land Use

Land Use	Area (in acres)	# Land Uses	Total Area (in acres)	Proportion
C-1	2.45	5	155.814	0.016
C-2	22.39			0.144
C-5	120.70			0.775
R-5	7.54			0.048
R-6	2.73			0.018

Table B9. Urban Neighborhoods West Land Use

Land Use	Area (in acres)	# Land Uses	Total Area (in acres)	Proportion
C-1	5.54	8	454.901	0.012
C-2	76.29			0.168
C-3	36.24			0.080
I-1	24.17			0.053
PNR-2	2.22			0.005
R-4	219.28			0.482
R-5	21.66			0.048
R-6	69.51			0.153

Table B10. Urban Neighborhoods East Land Use

Land Use	Area (in acres)	# Land Uses	Total Area (in acres)	Proportion
C-1	6.08	9	1145.736	0.005
C-2	15.65			0.014
C-3	526.60			0.460
PNR-2	0.44			0.000
R-2	24.98			0.022
R-3	29.59			0.026
R-4	450.56			0.393
R-5	26.75			0.023
R-6	65.10			0.057

Table B11. Ring Road West Land Use

Land Use	Area (in acres)	# Land Uses	Total Area (in acres)	Proportion
C-2	77.45	9	2239.019	0.035
NIC	222.30			0.099
PNC	56.03			0.025
PNR-1	32.86			0.015
R-1	93.57			0.042
R-2	1707.04			0.762
R-3	31.42			0.014
R-4	5.34			0.002
R-6	13.01			0.006

Table B12. Ring Road East Land Use

Land Use	Area (in acres)	# Land Uses	Total Area (in acres)	Proportion
C-1	13.50	9	3204.531	0.004
C-2	317.89			0.099
C-3	43.90			0.014
R-1	489.03			0.153
R-2	1654.54			0.516
R-3	415.61			0.130
R-4	30.79			0.010
R-5	154.07			0.048
R-6	85.20			0.027

Table B13. North Dixie Avenue Land Use

Land Use	Area (in acres)	# Land Uses	Total Area (in acres)	Proportion
C-1	28.23	13	1362.472	0.021
C-2	13.04			0.010
C-3	849.81			0.624
C-4	39.18			0.029
I-1	17.77			0.013
NIC	3.84			0.003
PNC	68.09			0.050
PNR-1	60.74			0.045
R-4	32.10			0.024
R-5	12.86			0.009
R-6	104.63			0.077
WCD-1	80.82			0.059
WCD-2	51.36			0.038

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