



whiskey road

Corridor Study

Aiken County, South Carolina



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Acknowledgments

This Project was made possible with the hard work and dedication of many citizens, business people, officials and others that gave generously of their time and talents, including the following people:

Aiken County

Clay Killian Ashley Jacobs
Ronnie Young
Camille Furgieuele
Joseph Berry
Stephen Strohmingner
Gerald Jefferson
LJ Peterson

Town of New Ellenton

Mayor Vernon Dunbar
Roger Leduc

City of Aiken

Michelle Jones
Ryan Bland
George Grinton
John Poole
John Klimm
Dick Dewar
Phillip Merry

Lower Savannah Council of Governments

Dr. Bill Molnar
Amanda Sievers

Chamber of Commerce

David Jameson
Mandy Collins

Edgefield County

Tommy Paradise

ARTS Augusta

Carletta Singleton

SCARTS BPAC

Stantec Consulting Services Inc.

Mike Rutkowski
Scott Lane
Michelle Peele
Chandler Hagen
Jaquasha Colon
Erin Convery
Sam Williams
Hagen Hammons
Amanda Morrell
Tucker Jarvis
Andrew Kohr
Nathan Aarons
Ashley Bonawitz
Marie Langlois

Rose Associates

Kathleen Rose

Cranston Engineering Group, P.C.

D. Scott Williams
Thomas Parrott

Alta Planning +Design

Katie Pitstick

Thank You!

Introduction Project & Purpose

1

The Whiskey Road Corridor Study is a collaborative planning effort to create a vision for mobility, stormwater and development along this vitally important roadway.

“Whiskey Road is dangerous for cyclists.”

—Survey Respondent

Whiskey Road (from South Boundary Avenue to US 278) – a road labeled by Aiken County and City officials as the “busiest and most dangerous road in the area” is a critical link between the City of Aiken, the Town of New Ellenton, and ultimately the Savannah River Nuclear Site. Whiskey Road is a main artery heading into Aiken from the Southside that also serves as highly developed commercial area, and there are many levels of improvement needed. This Road carries between 15,000 - 20,000 cars daily. Unfortunately, the Road was never designed to accommodate this type of traffic. Therefore if growth is not managed properly along Whiskey Road, the corridor will likely go the way of so many roads - endless driveways, signage clutter and sub-standard building designs that will negatively impact the quality of life in the region. The Whiskey Road Corridor Study must provide a future vision that improves safety, traffic congestion, access management, storm water drainage, and land use.

First and foremost, this study will concentrate on the safety of residents and those traveling the road. Three of the top five most dangerous intersections in the city are located along Whiskey Road. South Carolina Department of Public Safety data also shows there have been five fatalities, more than 2,000 crashes and close to 800 injuries on Whiskey Road from 2004 to 2013. It is essential that this study identify appropriate safety counter-measures to reduce crashes along Whiskey Road, while maintaining a high level of quality development and economic vitality.

Whiskey Road, Yesterday & Today

First named in 1836, Whiskey Road serves as the main arterial for the Aiken region. Commuters travel daily along the corridor for work and shopping, experiencing heavy congestion and delays at times. The area has experienced significant change since the early to mid 1800's. Currently, the area is filled with commercial uses serving the 30,000 residents that call Aiken home. Once a dirt road, Whiskey Road was a dirt path serving the sparse population that occupied the unincorporated area of the County. Large tracts of land were attractive to large farm and equestrian enthusiasts.

Sporting life became a tradition for Aiken and helped define a unique history. Thousands flock to the area each year to enjoy a round of golf on beautiful award winning courses, catch a polo match or place a bet at the historical steeplechase race. The first rail charter in the area occurred in 1835 allowing locals and visitors more opportunity for travel and started the growth boom that has shaped the Aiken we know today. By the turn of the century, Aiken had become a favorite tourist spot for many around the world. The economy and demographics began to change as businesses were developed to support the tourism. The street network in Aiken made driving easier for carriages and allowed more choices for walking. Today, the dirt filled streets have been replaced with concrete and carriages with cars but the love of sporting life continues to run deep in a community built by generations of horse lovers.

Businesses today continue to support the sporting events. Without the support of the community, Aiken would not be the sport haven it is known for. Over the course of the 20th century Aiken has continued to grow, both in residential and commercial development. Aiken has a thriving downtown full of shopping, rich local foods and Southern culture. The Savannah River Site to the south of the study area continues to develop technology and brings economic prosperity to the area.



▲ 1956 map identifying Aiken Hounds drag lines near Whiskey Road - *Imaging of America Aiken's Sporting Life.*



▲ Hitchcock Track - 1941 - *Imaging of America Aiken's Sporting Life.*

► *Equestrian Parade in Aiken- Imaging of America
Aiken's Sporting Life*



► *Equestrian farm near Whiskey Road-
Imaging of America Aiken's Sporting Life*



► *Celebration of chartered railroad in Aiken-
Imaging of America Aiken's Sporting Life*



Identifying the built environment and travel characteristics of the corridor provides a better understanding of how the system is currently operating.

Physical Corridor Characteristics

The physical characteristics of the Whiskey Road study corridor varies over its eleven-mile length. The following baseline information provides a foundation of the conditions that comprise the character of the corridor, separated into the four transitional areas from north to south:

- » Historic District- South Boundary Avenue to Brandy Road
- » Suburban Zone- Brandy Road to Powderhouse Road
- » Rural Transition Zone- Powderhouse Road to Dry Branch Road
- » New Ellenton- Dry Branch Road to US 278

Historic District- South Boundary Ave. to Brandy Road (1 mile)

This corridor segment starts in the neighborhood grid of the historic part of town as a two lane road (with varying center turning lane) surrounded by single family homes bounded by either a barrier fence or decorative wall and thick vegetation. This narrow passageway includes thick vegetation and provides a tunnel effect with heavy shading. For the first .8 mile, the road has a 4" vertical curbing and there is a continuous 4 to 5-foot sidewalk on the west side of the roadway mostly separated by a 2 to 3-foot landscape strip. At Summerall Court and to the end of this first segment, the road accommodates 5' sidewalks on both sides with no separation from the roadway and abruptly transitions from vertical curbs to no curb. The last half of this segment has surrounding land uses that include a botanical garden, a golf course, and an equestrian club, with limited residential frontage lots. The presence of equestrian use is prevalent. So, special attention to safe crossing will be critical. This segment has approximately 18K vehicles per day (AADT) and, in total, has four signalized intersections

with two having pedestrian activated signals and transverse crosswalks. Consequently, bordering Aiken's famed equestrian district, one intersection also accommodates horse riders with the signal activated crossing button placed high on a utility pole.



▲ Shaded street canopy along Whiskey Rd. through the historic equestrian district



▲ Decorative walls in the Historic District



▲ Figure 1.1: Historic District

Aiken, South Carolina

Suburban Zone - Brandy Road to Powderhouse Road (3.3 miles)

At the beginning of this segment, the road transitions from two-lanes to a four-lane (with varying center turn lane) cross section. The surrounding land uses include commercial, retail and office buildings, and strip malls. South of Hitchcock Drive, there are no sidewalks on either side of the road which continues for most of the segment except for the block between Pine Log Road and Corporate Parkway. Curb and gutter are also inconsistent in the northern half of this segment with some edges having vertical curbs. The southern half of this segment is a ditch section, having no curb having no curb and gutter. Approaching Pine Log Road, the study corridor runs adjacent to the heavily used Virginia Acres Park, South Aiken High School, and Kennedy Middle School, as well as, a mix of commercial and office uses, with sporadic residential development. The road corridor stays consistent with a mix of uses, that are set back with no direct building frontage, including the Aiken Mall.



▲ At intersection of Corporate Parkway, entry to South Aiken High School



▲ Deep ditches adjacent to Whiskey Road



▲ Caption text here



▲ Drainage pipes in disrepair



▲ Figure 1.2: Suburban Zone

Rural Transition Zone – Powderhouse Road to Dry Branch Road (4.3 miles)

For the first mile of this segment, the cross section is a 5-lane road with a suicide lane (i.e., center turn lane). The remaining segment of the corridor is a consistent four lane undivided cross section with an approximately 50' wide roadway. The segment is zoned "Urban Development" along its entire east side, with a mixed zone of Residential and Urban Development along its west side. The entire segment consists of separated single family lots, large farmland lots, subdivisions, and a handful of independent commercial/light industrial buildings. The AADT falls below 20K, including two signalized intersections with no pedestrian activated signals, and there are no sidewalks or curbs along this entire segment.



▲ No Pedestrian friendly infrastructure along this segment



▲ Start of Rural Transition segment



▲ Figure 1.3: Rural Transition Zone

New Ellenton - Dry Branch Road to US 278 (3.1 miles)

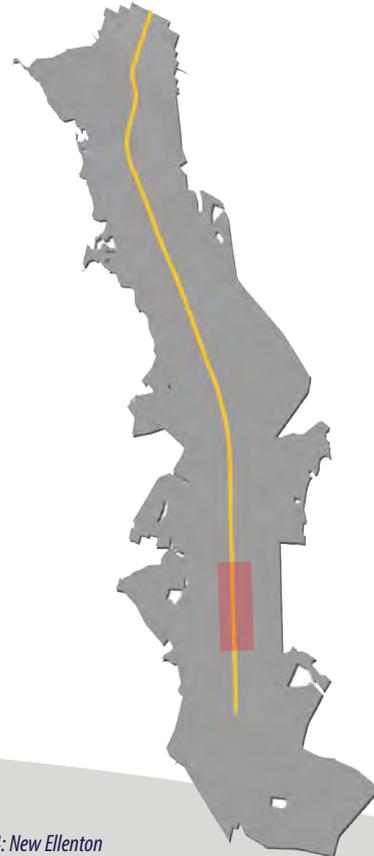
The last segment of this corridor consists of the small bedroom community and farming town of New Ellenton. This segment is four lanes, with an additional 5th turning lane through the center of town. Through this segment, there are wide shoulders on both sides of the road for approximately 3/4 of a mile. Most of this segment is zoned “Incorporated Area”, with “Urban Development” and “Multi-Family Residential” at the southern terminus. The AADT ranges from 12K to 20K, and there is one signalized intersection in the center of town and one at the end of the segment at US 278. None of the signals have pedestrian activated crosswalks on opposite ends of the middle school to serve the residential areas.



▲ Center of the town of New Ellenton

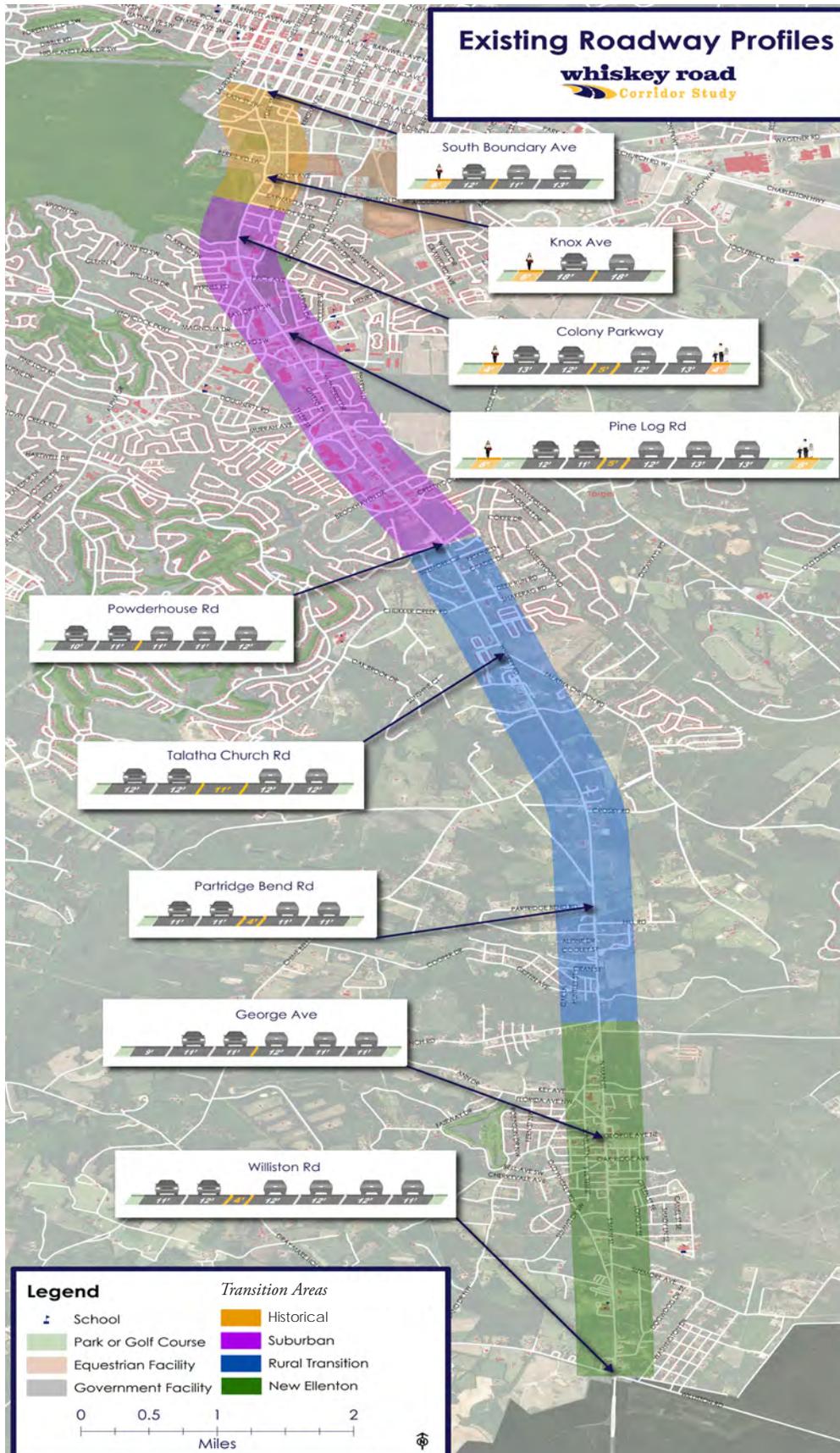


▲ Approaching New Ellenton



▲ Figure 1.4: New Ellenton

Existing Roadway Cross Sections within the Transition Areas



Understanding the dynamics of an area helps define the context for recommendations that are best suited for communities.

Defining the Problem

During the early stages of project development, stakeholders were asked what they saw as the key problems along the Whiskey Road corridor. Predominate responses include:

- » Flooding
- » Speeding
- » Safety concerns: vehicle, bicycle and pedestrian
- » Traffic Congestion
- » Underperforming development
- » Lack of bicycle and pedestrian amenities

Once a farm to market road, Whiskey Road has transitioned into a workhorse corridor serving many purposes. Whiskey Road is the primary corridor for commercial and retail development. Home to the Aiken Mall, WalMart and several civic and institutional uses including the Community Center. The vitality of this corridor is an important economic engine for the region. It also serves as an important mobility corridor for the region as a commuter route and direct connection between Downtown Aiken and the Savannah River Site. Lastly, but certainly not least important, Whiskey Road has been widened over the past several decades to serve the increasing demand of congestion. Unfortunately, the stormwater drainage system has not been adequately improved. Old infrastructure and the lack of stormwater drainage systems have created problems with flooding and subsequently a higher rate of crashes. Within the Historic District (South Boundary Avenue to Pine Log Road), the stormwater infrastructure is deficient or non-existent. However, the primary flooding problems and safety issues (related to the deep ditches) is primarily concentrated within the Mall area (from Pine Log to Powderhouse Road). These issues related to stormwater must be addressed. This includes improving infrastructure along the corridor, as well as, “down stream” facilities to create positive flow and adequate runoff reservoirs.

These problems have driven the analyses and solutions described in this plan. The following section explores the content of these problems today and looks ahead 10-20 years into the future. Analysis of these perceptions will uncover answers to questions such as: Will population growth slow or speed up? What jobs are anticipated for the future in the area? What changes would the citizens like to see in the area? Understanding the demographics and dynamics of an area helps define the context for recommendations that are best.

This study has identified several existing safety constraints along the corridor including lack of pedestrian and bicycle facilities and unsafe crossings at signalized intersections. Vehicle accident data reveals a high number of crashes for the area. There is clear opportunity for improvements in these area and this study identifies changes for the road that improve the conditions.



▲ High level of traffic at key intersections



Whiskey Road is the primary corridor for commercial and retail development.

Accidents

An assessment of high-crash severity intersections was completed using crash data from the State of South Carolina's Department of Transportation safety database. Analysis of vehicle crashes was conducted for the study area. The data was derived from January 2013 to December 2015 reported crash data along the corridor. (See Figure 1.6.) The data indicated a higher rate of accidents occur near the Pine Log Road intersection, particularly in the areas around the Walmart and the Aiken Mall. The majority of the accidents were reported as rear end collision type crashes (46%) with angular crashes coming in second representing 35% of the crashes. Figure 1.5 identifies the amount of crashes occurring at intersections along the study corridor.

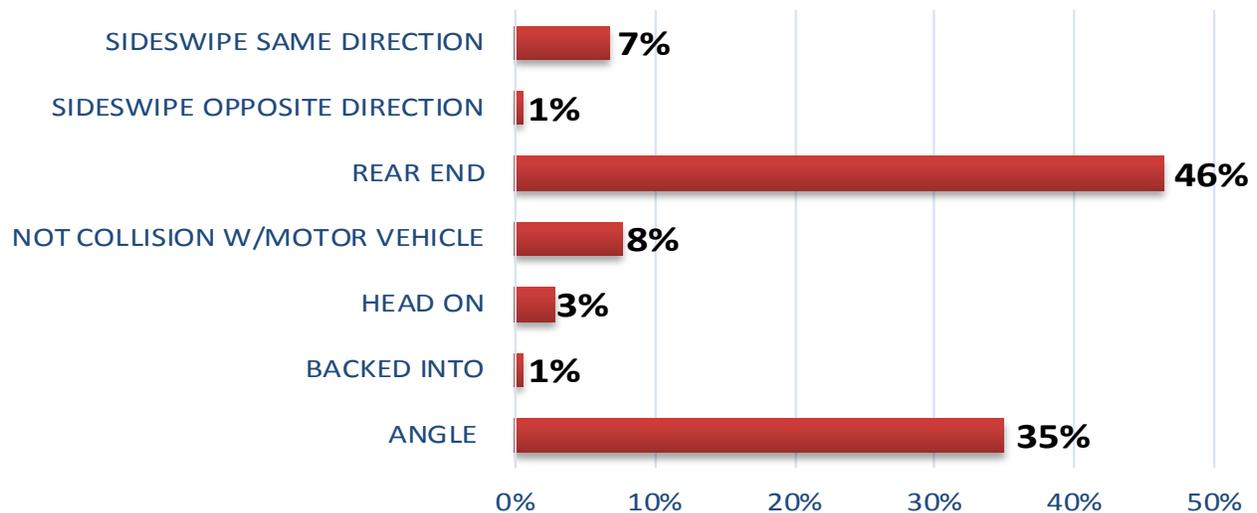
Final recommendations will define safety enhancements needed to reduce the number of accidents in the high crash areas.



▲ Major turning movements make for dangerous intersections

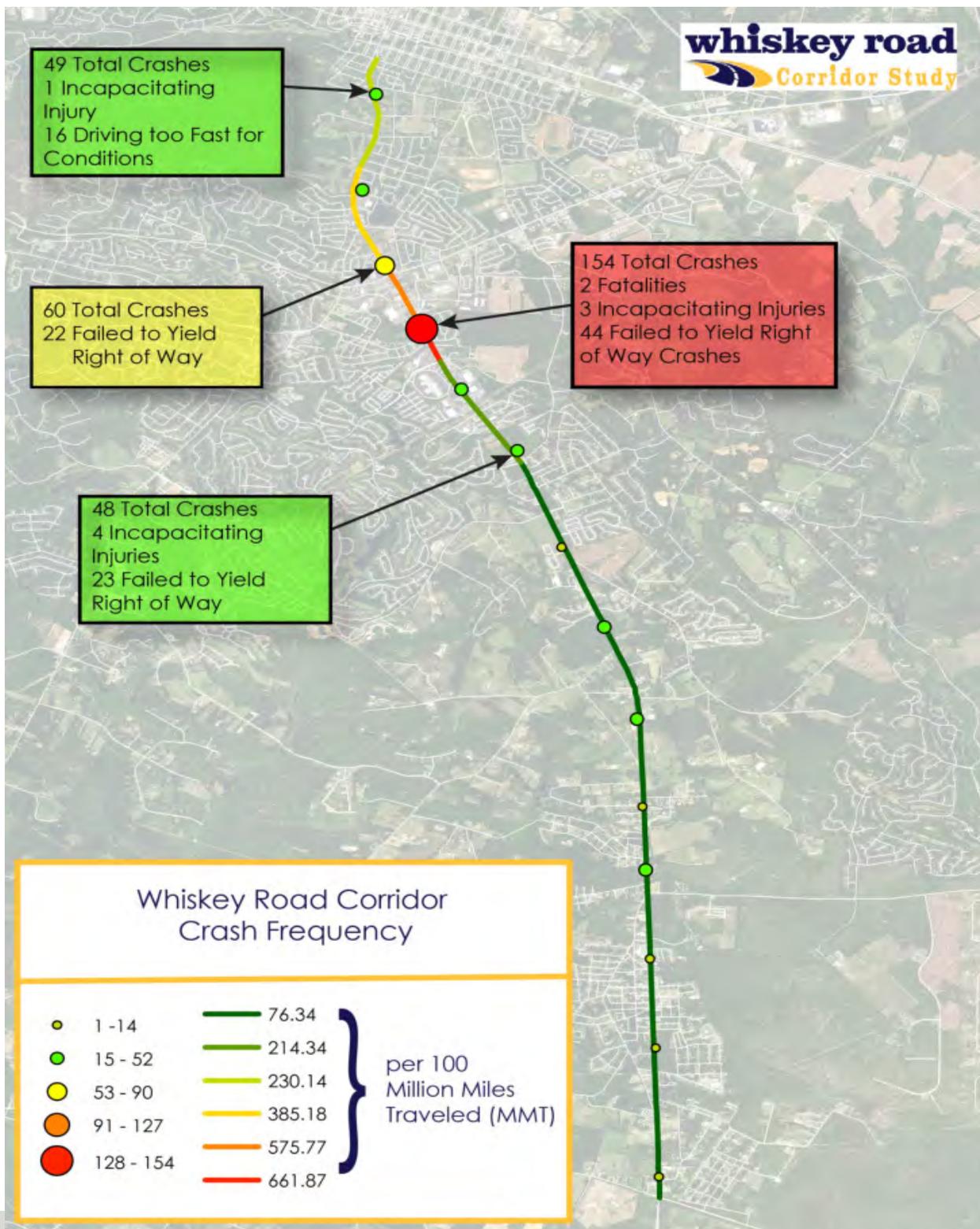
“There have been over 600 crashes along Whiskey Road over the past 3 years alone.”

Accident Graph by Type



▲ Figure 1.5: Accident by Type Graph

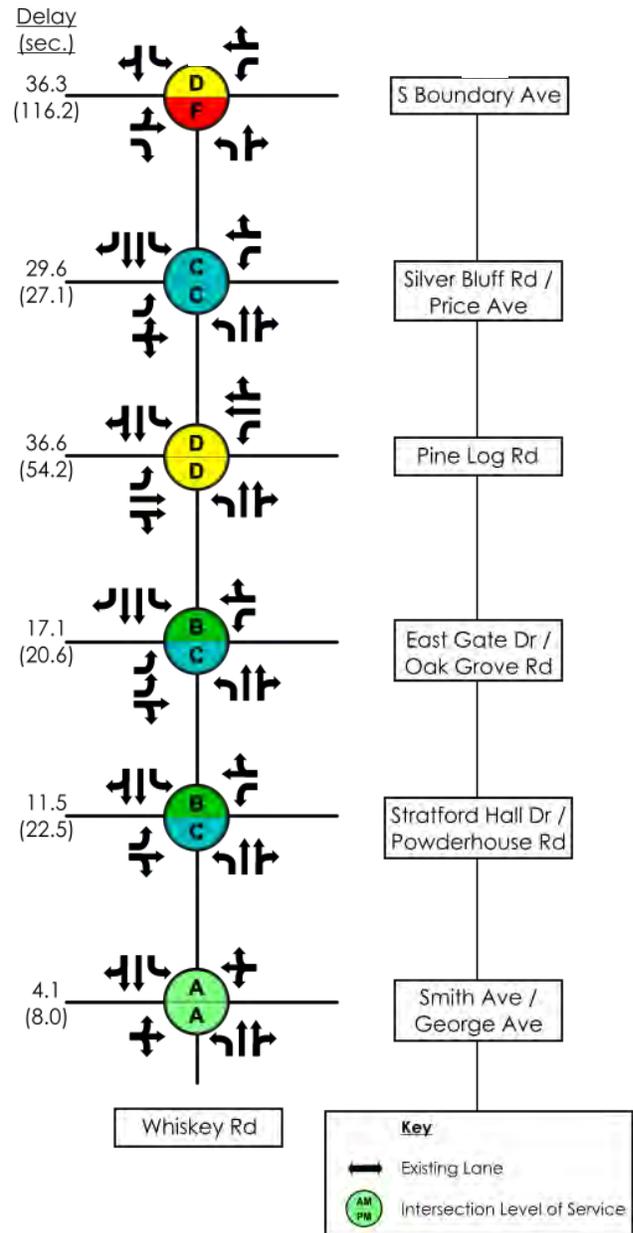
Figure 1.6 Crash Locations Map



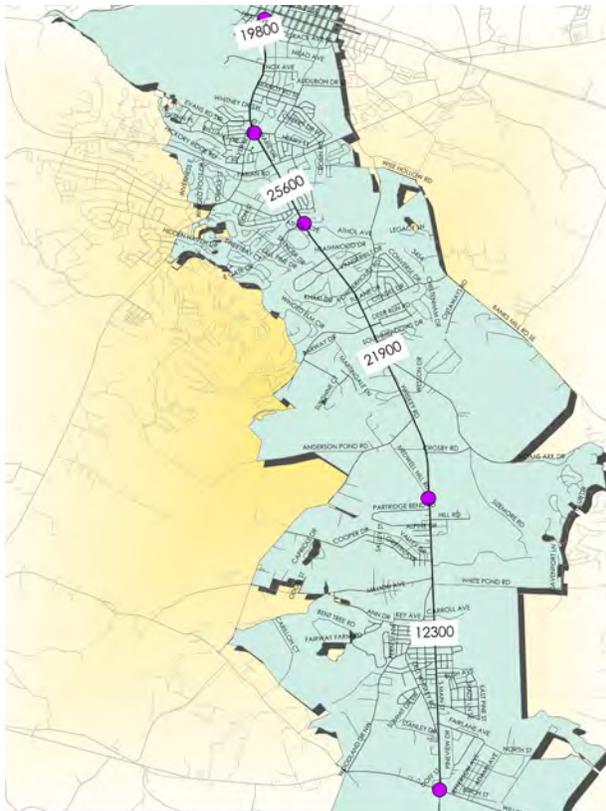
Transportation planning models are tools used to predict future roadway and travel conditions for all users. These tools are used to identify deficiencies, define needs, and assist in building project recommendations.

Level of Service

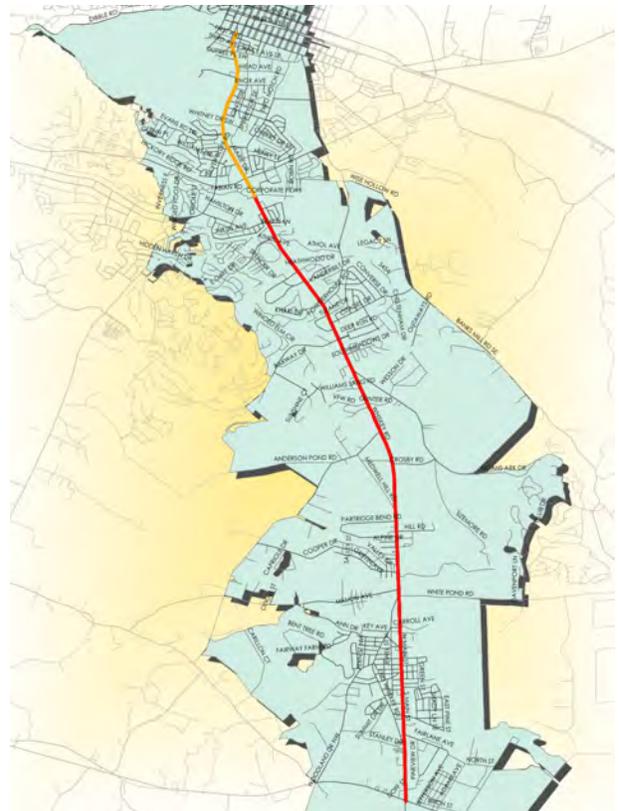
Level of Service (LOS) describes measures of effectiveness for various transportation operations. The idea of LOS is to present a report card on how area roadways are performing in regards to moving vehicles, pedestrians and cyclist. LOS is ranged from A to F. LOS D and E indicate roads that are operating with longer vehicle delays and are getting closer to capacity. LOS F indicates a road has exceeded capacity and vehicles are experiencing the longest delays. The LOS analysis indicates pedestrians and cyclists experience safety issues and delays as they maneuver area roadways.



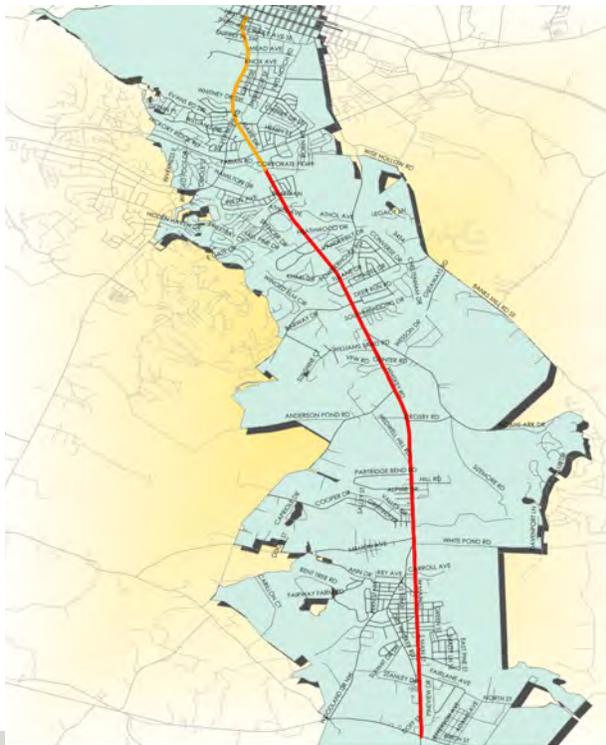
▲ Figure 1.7: Intersection Level of Service (2016)



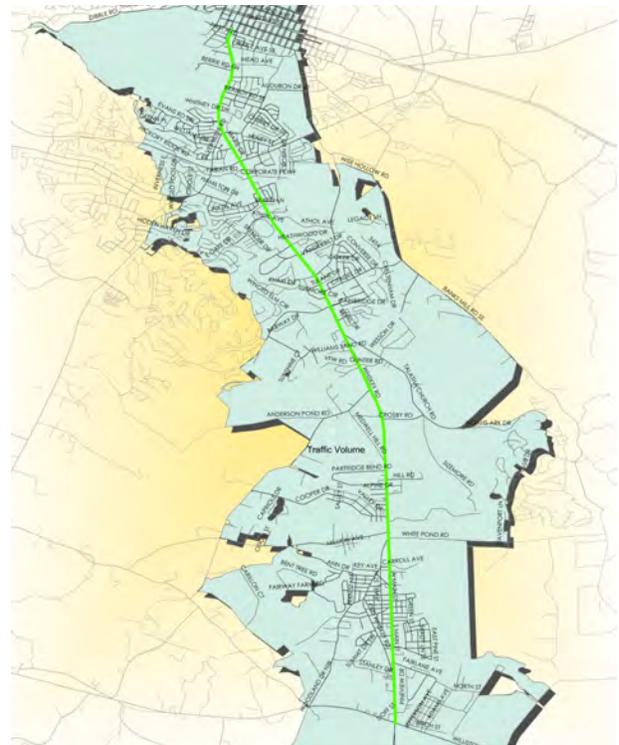
▲ Figure 1.8: Average Daily Traffic



▲ Figure 1.9: Bicycle Level of Service



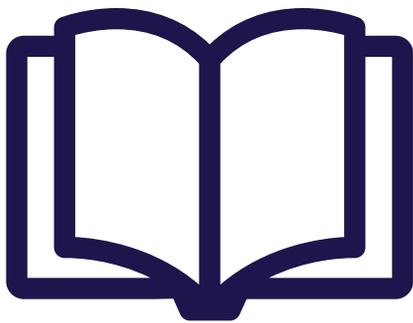
▲ Figure 1.10: Pedestrian Level of Service



▲ Figure 1.11: Vehicular Level of Service

Past planning documents provide valuable insight and background on the community and have influenced the development of this Plan.

The following plans were reviewed early in the planning process as they relate to existing conditions and future needs for transportation improvements.



“A goal without a plan is just a wish.”

—Antoine de Saint-Exupery

Past Planning Efforts

Aiken County Bicycle and Pedestrian Plan (2012)

In partnership with the Augusta Regional Transportation Study (ARTS), Aiken County developed a Bicycle and Pedestrian Plan to improve multi-modal accommodations for the area. Objectives for the Plan include Improving the quality of access between communities, schools, public transportation features and employment centers, ensuring accommodations are included in future development plans and improving the network of existing facilities.

Suitability analysis was completed during the project development. The northern portion of Whiskey Road near the City of Aiken showed a higher demand for cycling and walking than the southern portion of the study road. During the public outreach portion of the project a survey was conducted to further understand where residents are walking and biking to and where they want to get to in the future. Many responded that it was important to be able to walk and/or bike along Whiskey Road to various destinations as the Aiken Mall and the Savannah River Site. Whiskey Road was identified as a 3rd Tier Priority for sidewalk facility additions. The final plan recommended paved shoulders for bicycling from Citadel Drive South to New Ellenton and buffered bike lanes from Citadel Avenue North to South Boundary Avenue.

ARTS 2040 Long Range Transportation Plan

The Augusta Regional Transportation Study, collaborating with local, state and federal agencies, developed a plan to address long and short term multi-modal transportation needs. Objectives of the plan address congestion, mobility and accessibility, safety, system efficiency, land use and transportation integration, economic feasibility, and economic vitality. The Transportation Plan identifies future growth potential in New Ellenton and within the area of the City of Aiken. Growth in this area will place pressure on Whiskey Road, considered a seriously congested corridor in the study. Recommendations for Whiskey Road include an unfunded plan to widen Whiskey Road from South Boundary Avenue to Barnard Avenue to a four lane roadway (\$7.2million). Bicycle and pedestrian facilities were not included for the study area, but the Plan did encourage all municipalities to adopt a Complete Streets Policy to enhance multi-modal transportation in future design projects.

Comprehensive Land Use and Transportation Plan (2012)

The City of Aiken undertook the effort of studying land use and transportation to understand the correlation and needs for the future. General and project specific goals were outlined in the study in hopes to design a balance transportation system and define land uses that will help Aiken grow but yet keep the small town character feel that the Town

would like to keep. The Plan proposes a streetscape project for Whiskey Road to make the area more attractive. The project should include future paths for pedestrians and bicyclists. Several recommendations were also included for future roadway expansions. This includes Hamilton Drive and Dougherty Road, as well as a, new roadway connecting Powderhouse Road to Whiskey Road to allow alternate routes for Whiskey Road travelers. Whiskey Road is the primary corridor for commercial and retail development.

Whiskey Road Corridor Study (2001)

In 2001 the City of Aiken completed a corridor study for a three mile portion of Whiskey Road. The study included the area just north of the East Pine Log Road intersection and south to Talatha Church Road. The purpose of the study was to enhance the appearance and function of the corridor through multi-modal transportation improvements and various landscaping and streetscaping projects. Recommendations in the report include:

- » Create a uniform speed limit (35mph) between East Pine Log Road and Chukker Creek Road .
- » Reduce the speed limit between Chukker Creek Road and Talatha Church Road from 55 mph to 45 mph.
- » Establish a design theme for the primary and secondary gateways.
- » Install curb and gutter.
- » Utility relocations.
- » Add acceleration and deceleration lanes.
- » Add left/right turn lanes.
- » Access management.
- » Provide traffic calming measures.
- » Provide pedestrian crossings at intersections.

Whiskey Road-Silver Bluff Road Connector Study (2003)

The purpose of the study was to examine alternative alignments for connector roads between Silver Bluff Road and Whiskey Road. The connector road would provide relief from the traffic pressure along Dougherty Road and Pine Log Road. The recommended connection is the route that connects Silver Bluff Road at Glenwood Drive and Whiskey

Road near Talatha Church Road. This connection is proposed as a two lane parkway type facility with limited access. The design also includes a multi-use trail for multi modal travel.

Aiken Strategic Plan (2010)

The City of Aiken developed a Strategic Plan for the area that outlined projects to preserve the rich heritage of the City, build on opportunities for events and tourism, build transportation opportunities and promoting healthy lifestyles. An action plan was developed in terms of short and long term goals to accomplish the concerns outlined in the Plan. Two goals were identified that would impact traffic along Whiskey Road:

- » Build a connection from Whiskey Road to Corporate Way and Centennial Parkway.
- » Build a connection from Whiskey Road to Powderhouse Road from East Gate Drive.

These two goals for Whiskey Road will help eliminate some traffic as well as, provide connections to land uses that currently are not served by the existing network.



▲ Corporate Way proposed connector to Whiskey Road



▲ Powderhouse Road proposed connector to Whiskey Road

Public Engagement

Very few public meetings take us to a place we want to go: in-depth, relevant interactions with people that have a deep understanding of a place, and that want to share their ideas for how to make it better. By going out of the meeting space, using traveling roadshows, tagging to existing events, and on-site discussion forums - our process generates more contacts.

To date public participation opportunities include:

- » 6 Advisory Committee Meetings
 - August 3, 2016
 - September 23, 2016
 - December 7, 2016
 - February 22, 2017
 - March 30, 2017
 - June 2, 2017
- » 1 Project Symposium
- » 1 Stormwater Meeting
- » Four (4) Day Public Design Charrette (February 20 - 23rd, 2017)
- » 1 Public Open House (3/30/2017)
- » 1 Council Presentation (6/16/2017)
- » 647 participants in the online survey

Advisory Committee

The Advisory Committee represents many of the key stakeholders affected by and involved with the project, including staff from Aiken County, City of Aiken, Town of New Ellenton, SCDOT, active transportation advocates, and equestrian advocates. The Committee provides a venue for sharing information, raising and discussing ideas, increasing participation, identifying other stakeholders, fostering communication, focusing resources, suggesting ideas, and helping to set direction and priorities.



September 23, 2016: Trolley Tour

In the September Advisory Committee meeting Committee members went in the field to observe and document existing conditions of the study area. This collaboration provided invaluable context and insight with regard to the public perception of the conflicts, needs, and limitations of construction within the corridor. The following issues were identified to consider and discuss:

» At **Pine Log Road**

- Silver Bluff Road has major traffic delays - may need to widen.
- Pine Log Road is the most dangerous intersection in study area.
- Intersection is over-capacity. North to West traffic will continue to increase due to development in the west.
- Some biking takes places at this location.
- Need to identify alternate routes around this intersection.
- Entry to Wendy's creates an issue - Council said no to barrier/island.
- Drivers are not stopping on red because they have waited so long in traffic.
- Access management will be key as there are several redundant driveways for business.

» At **East Gate Drive**

- George's Pond Road will see new development including a public walking trail. Developer fees to help fund road potentially (1,000 acres private development/includes multi-family and assisted living).
- The extension of East Gate Drive to the east over Powderhouse Road projects to relieve 30% of traffic.
- Aiken Mall slated for redevelopment into a lifestyle center.

» At **Powderhouse Road**

- New and future development at this intersection
- Investigate closing Old Whiskey Road or create a "T" intersection. Consider Smith Avenue as the logical connection for this shift.
- Location of recent civic investments by New Ellenton.

WHISKEY ROAD COMMUNITY WORKSHOP

WHEN

February 20th
5:30 PM
to 7 PM

WHERE

Odell Weeks
Activity Center
1700 Whiskey Road
Aiken, SC

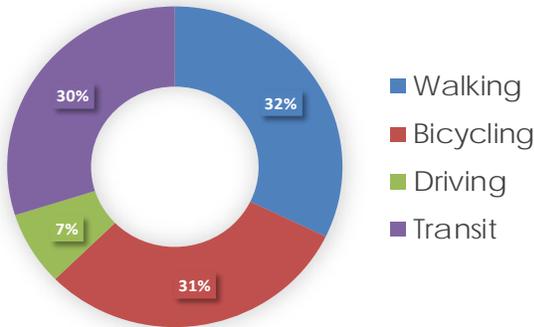
WE
NEED
TO HEAR
FROM
YOU!



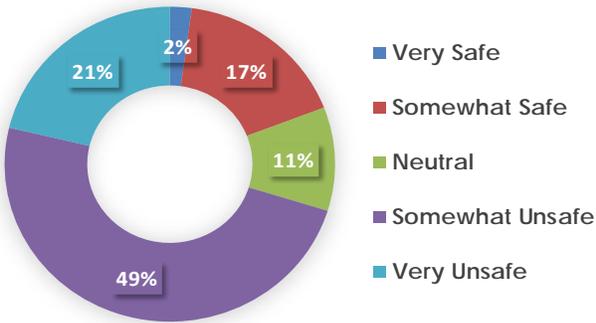
Project Symposium

The Project Symposium was held on October 26, 2016 to generate feedback from residents and key stakeholders to gather local opinions for positioning the project. Push-Button polling technology (i.e., instant polling) included a 16 question survey that generated discussion with 83 participants.

Which modes are most important to improve relative to Whiskey Road?



How safe would you rate Whiskey Road?



▲ *Public Symposium: Visual Preference Exercise*



▲ *Public Symposium: Consultant Presentation*

Stormwater Infrastructure Plan Meeting

On December 15, 2016 members of the Advisory Committee met to discuss stormwater drainage management and the key problems:

- » No place for the stormwater to go
- » Inadequate stormwater appurtenances
- » Limited options for relief

A completed stormwater inventory is available that includes the condition, type of material, size of pipes, and photographs of each stormwater feature along the Whiskey Road corridor. The preliminary inventory results revealed:

- » Stormwater inlets
 - 129 structure assessed, 47 (36%) were clogged, broken, in poor or very poor condition
- » Stormwater pipes
 - 225 pipes assessed over a distance of 4 miles, 96 (43%) were clogged, in poor or very poor condition
- » Open ditches
 - 124 ditches assessed over a 16 mile distance, 28 (23%) were in poor or very poor condition

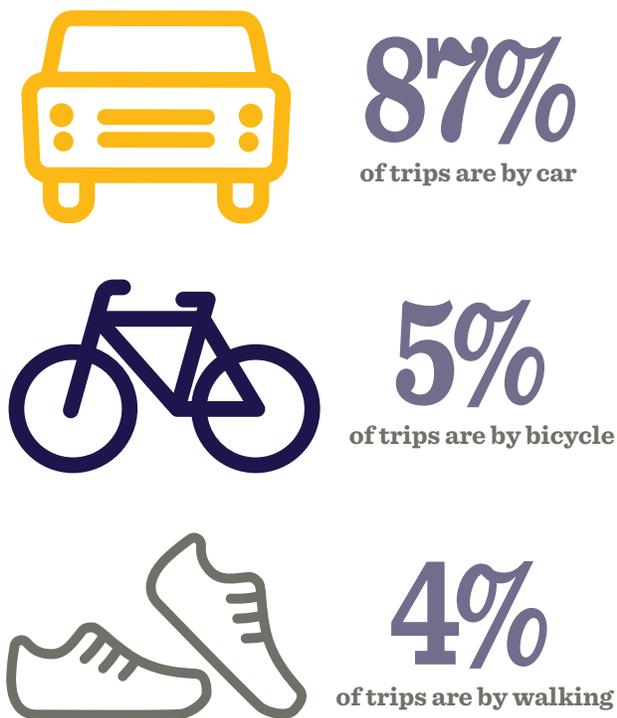
Public Design Charrette

A four day charrette occurred February 20-23 at the Aiken Community Center. The charrette process ensures that 80% of design happens on site with a constant feedback loop from citizen participants. This facilitates a plan that has substantial public buy-in and ownership. Attendees included local citizens, as well as many key stakeholders from local and state agencies.

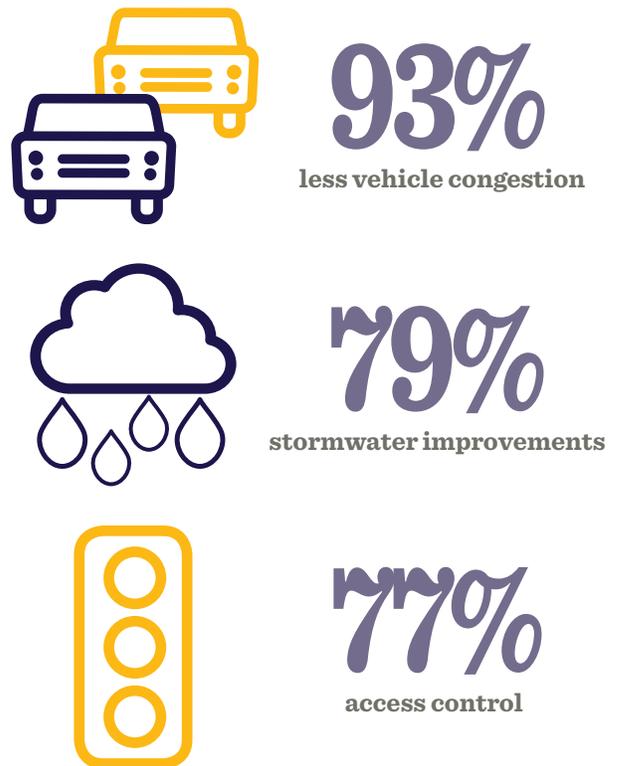
Online Survey

As of February 13, 2017, 647 individuals have responded to the Whiskey Road Corridor Study survey located on the project website: www.whiskeyroadstudy.com.

The results show the percentage of trips on Whiskey Road:

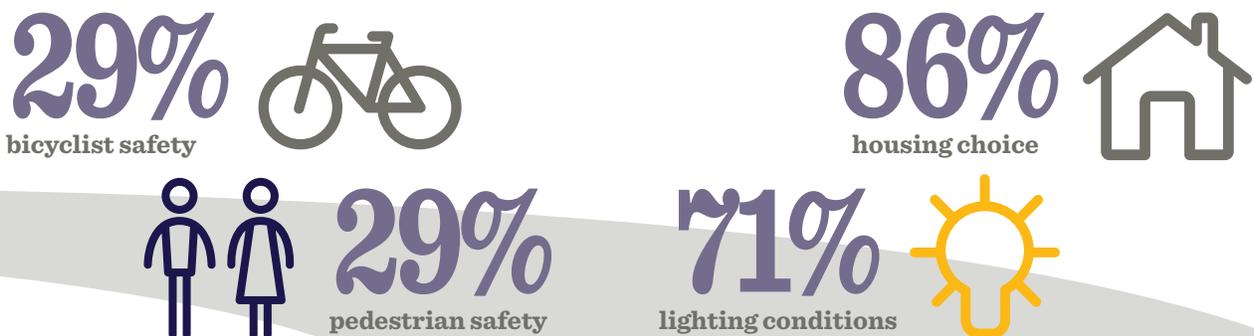


The top three improvements by importance:



Satisfaction with the following aspects:

Least Satisfied➔ Most Satisfied



Guiding Principles

The premier challenge of this project is balancing the needs of the community in a confined physical space. Though the project carries constraints, it is important to recognize that all streets serve a combination of functions, all of which are intimately tied to the travelway, pedestrian, and building zones. The basic context zones of streets help define the role of the street and its design throughout its lifecycle.

Based on the direction provided by the community, its leadership, development community and residents, the following Guiding Principles were developed to guide the design team along the planning process. It is here that the core values were applied to decisions related to Complete Streets, stormwater, multi-modal elements, safety and development along the Whiskey Road corridor.



▲ *Public Symposium: Informing Residents*

Issues

Issue #1: Stormwater must be addressed

Neglected for decades, the stormwater issues along some segments of Whiskey Road has become problematic and a safety issue for the traveling public. Addressing the stormwater problems will alleviate other issues along the corridor.

Issue #2: Pedestrian and Bicyclist Considerations Come First

Although automobile travel is substantial – over 20,000 vehicles per day in some places – the corridor is heavily used by visitors and residents of the surrounding communities. The vulnerability of these users is high compared to automobile drivers and passengers. Furthermore, substantial increases in carrying capacity of the roadway for automobiles will be costly, potentially damaging to existing developments, and create an unfavorable aesthetic along the corridor. It is better to create an environment where walking and biking are not only encouraged but make the most sense for traveling.

Issue #3: The Safety of All Users is Critical

Hand-in-hand with creating pedestrian- and bicycle-friendly environments is the concept that the corridor should be safe for everyone to move across and through. Many of the comments received from the public invoked safety-related language, whether it be for a lack of lighting, unsafe design, or poor accommodations for pedestrians, bicyclists and horses crossing the street. The most outstanding example of which is that three-fourths (76%) of the Project Symposium respondents felt that Whiskey Road is “unsafe” or “very unsafe” today. As traffic pressures mount from redevelopment and intensification of uses within and without the corridor, these safety concerns are likely to increase.



▲ *Public Symposium: Design Development*



▲ *Public Symposium: Mapping Exercise*

Issue #4: Automobile Delays in the Corridor Should be Reduced if the Actions Taken are not in Conflict with Other Values

Although pedestrians, cyclists and overall safety come first, ensuring the smooth, if not high speed, movement of cars in the corridor is very important. Frequently, traffic studies focus almost exclusively on quantifying the effects of recurring delay, and then only for cars, not people. One way of integrating across the Issues and Values identified here is to account for traffic delays created by automobile crashes, since any lane closure or partial closure is

felt acutely due to the limited range of options and constrictive terrain. Another suggestion is to account for the delay and quality of service incurred by people, whether in automobiles, on foot, cycling, in transit vehicles or using any other mode of transport. Cleaning up the corridor using access management and quality cross sections will help to address this issue.

Issue #5: The Corridor has to Support Surrounding Uses through Attractive Design

Whiskey Road is more than how rapidly it can move people and things through space, it serves as a way of getting to jobs, commercial areas, upholding land values, and encouraging favored redevelopment. Creating an aesthetic environment through the use of improved streetscaping details and repair/maintenance is vital to this objective.

Issue #6: Supporting Quality Development/Redevelopment

The space limitations (north of Powderhouse Road) and future development trends of the corridor itself are pushing towards better urban design. Aiken has charted a course towards investment in quality development, community design and public space. This study will need to provide quality design principles and development design standards to create a long-term sustainable corridor.

Environmental Analysis

An environmental review was completed for the study area. The purpose of this environmental screening is to identify obvious environmental concerns and potential impacts requiring mitigation, permits, consultations, or other agency coordination. This discussion is based on a desktop review of available GIS data and aerial photography for a 1,000-foot wide corridor along Whiskey Road from just north of Colleton Avenue Southwest in Aiken, South Carolina to 1,000 feet south of Williston Road in New Ellenton, South Carolina. Because individual project elements and funding sources are not known at this time, this screening evaluates a broad range of actions, noting any potential implications for specific resources. As planning and design studies move forward, additional investigations will be necessary to confirm the presence and exact locations of environmental features and evaluate potential impacts.

Whiskey Road travels along a ridge that forms a boundary between three watersheds: Horse Creek

watershed, Hollow Creek watershed, and Upper Three Runs watershed. The entire corridor is within regulatory floodplains, the majority of the northern area is considered a 100-year floodplain and the remaining area is a 500-year floodplain. Because Whiskey Road is along a watershed boundary, there are no major hydraulic crossings or wetland systems along the project corridor.

Endangered/Threatened Species

The US Fish and Wildlife Service lists five endangered species and one threatened species for Aiken County.

Scientific Name	Common Name	Federal Status
<i>Mycteria americana</i>	Wood Stork	Threatened
<i>Picoides borealis</i>	Red-cockaded Woodpecker	Endangered
<i>Acipenser brevirostrum</i>	Shortnose Sturgeon	Endangered
<i>Prilimnium nodosum</i>	Harperella	Endangered
<i>Trillium reliquum</i>	Relict Trillium	Endangered
<i>Echinacea laevigata</i>	Smooth Coneflower	Endangered

Historic Resources

The project corridor traverses two historic districts: the Aiken Winter Colony Historic District I & II. These districts are associated with many visitors from the northern United States who wintered in Aiken, SC between 1880 and 1948.

Minority/Low-Income Populations

There are a number of mobile home communities along the project corridor, primarily in the southern portion of the corridor. These low-income communities are identified as Potential Environmental Justice populations. If project elements involve federal funding additional investigations may be required as the project moves forward.

Hazardous Materials

There are sixty-one hazardous waste sites within potential future right-of-way along Whiskey Road. The Savannah River site, located at the southern end of the project area, is a 310 square mile nuclear reservation area owned by the U.S. Department of Energy. Located on land that was formerly farm and swamp, the site now hosts a timber and forestry research center managed by the U.S. Forest Service - Savannah River.

Stormwater Analysis & Recommendations

2

Stormwater issues prevail along the Whiskey Road corridor. Detailed studies were performed to develop recommendations for addressing the issues in the area.

Existing Conditions

The following are characteristics of each section of the roadway as defined by the transition areas.

Historic District

The Historic District section starts at South Boundary Avenue and ends at East Pine Log Road. It includes parts of the horse district, and the earliest developments along Whiskey Road. The west side of the section drains to Hitchcock Woods. The east side is flat with most drainage connected to the Carolina Bay then pumped out through a series of ponds.



The area from South Boundary Avenue to Banard Avenue is a two-lane curb and gutter section with limited Right-of-Way (ROW) and is bounded by multiple historic properties. The storm inlets along this section are inadequately spaced and gutter spreads commonly and significantly spill into the travel lanes which are common during times of heavy rain. Due to the limited ROW and historic properties, this section provides little opportunity for the addition of enhanced stormwater BMPs improvements. However, additional inlets and system maintenance can provide more capacity to alleviate on-street flooding.

From Banard Avenue to East Pine Log Road, the cross section expands to a four-lane section with

valley gutters and little to no drain inlets. The lack of drain inlets is evident along the Palmetto Golf Course frontage where stormwater runoff collects along the edge of the street until it tops the sidewalk and sheet flows onto the golf course property. There are opportunities for enhanced stormwater BMPs in this section as part of the overall streetscape improvements.

Suburban Zone

The Suburban Zone is bounded by East Pine Log Road to the north and Powderhouse Road to the south and it is densely developed with commercial businesses and single-family residential homes. The topography of this section provides little relief from one end to the other. In addition to the relatively flat topography, the downstream systems on the east side are inadequately sized to handle significant storm events. The result is both roadway and ditch/yard flooding along the corridor and downstream flooding within College Acres and Elmwood Park subdivision.



The road section is a four-lane section with a center two-way left turn lane. It includes a mix of curb and gutter and large open ditches. This area has seen redevelopment recently, as well as, continued growth outside of the main corridor. Opportunities exist for enhanced BMPs as part of redevelopment projects. Any improvements along this section must limit or even reduce impacts to downstream areas already experiencing flooding.

Rural Transition Zone

The Rural Transition Zone contains mostly open ditches and runs from Powderhouse Road to White Pond Road. The existing storm system issues along this section are ditch capacity and maintenance. There are no known downstream flooding or capacity concerns. As Aiken grows and development continues pushing further south into this area, a comprehensive plan should be considered to ensure smart growth in this area, including utilization of enhanced BMPs to control/manage storm runoff.

New Ellenton

The New Ellenton area is bounded by White Pond Road to the north and Williston Highway to the south. The typical roadway section for this area consist of four-lanes with a sporadic two-way left turn lane throughout the City proper and a mixture of asphalt valley gutter with limited inlets and paved or grassed ditches outside of the City. This area is defined by its limited stormwater infrastructure. There are no known downstream flooding or capacity concerns. There is an excellent opportunity for enhanced stormwater BMPs throughout the area as part of the overall roadway/streetscape redevelopment.

Stormwater Inventory

An inventory of the stormwater facilities was completed as a part of the study. This inventory provides information about condition, size of pipes, materials used, and types of facilities. The results of this survey were reviewed through a quality control and quality assurance process that required field verification, as well as, in office reviews. These results indicated that in general most of the system was in fair condition.

Inventory Results			
	# of Facilities Assessed	Length (mi)	# in Poor Condition
Stormwater Inlets	129	N/A	47
Stormwater Pipe	225	4	96
Open Dithces	124	16	28

▲ Figure 2.1: Stormwater Inventory Results



▲ Various locations along Whiskey Road where stormwater issues are prevalent

Recommendations

Recommendations for the area are based on the information gathered during the study review of the existing conditions. A limited stormwater analysis was completed in the Wise Hollow Creek basin. The other basins along the corridor were mapped and identified. The Wise Hollow Creek basin contains almost the entirety of the Suburban Zone and is the area that has been identified as the section that has the most need for improvements due to mismanaged development.

It was found that the drainage way for the Wise Hollow Creek runs through developed properties with homes and has no cross drainage along roadways. The areas that have flooding are located within the FEMA Floodway and Zone AE. Further upstream development, in the Suburban zone will be limited due to this fact. To continue development the city and county have already required more stringent stormwater control measures like zero discharge in new developments or 2 year predeveloped discharge limit for a 25-year storm event.

To allow further growth in this area without fixing the underlying drainage issue will continue to be irresponsible and potentially dangerous for the citizens downstream.

The following provides recommendations by the four designated areas.

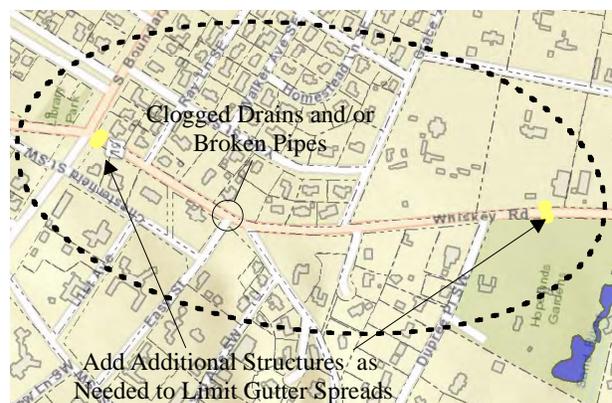
Historic District

As streetscape improvements and redevelopment takes place, upgrades should be made to increase the quality and the amount of stormwater infrastructure. Examples of upgrades that should be considered include:

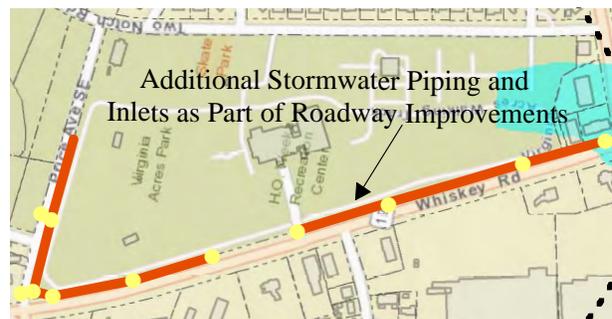
- » Additional stormwater inlets to reduce the gutter

- » spreads and remove ponding from roadway
- » Additional detention and retention areas

During the study, several different options were reviewed to provide additional infrastructure by piping, enhanced BMP'S, or upgrade existing systems. An infrastructure improvement plan using a combination of these options is provided in the Area 1 – Infrastructure Improvement Plan in Figures 2.2 - 4. These recommendations are based on the corridor study redevelopment recommendations and existing infrastructure. It should be noted that downstream impacts to Hitchcock Woods and the Carolina Bay Nature Preserve should be evaluated and minimized for all improvements.



▲ Figure 2.2: Historic Aiken I, Maintenance, Repair, Additional Infrastructure



▲ Figure 2.3: Historic Aiken II, Streetscape and Drainage Improvements



▲ Figure 2.4: Historic Aiken II, Streetscape and Drainage Improvements

Suburban Zone

Several different options to alleviate the core problems of this area were evaluated. These known issues have been reviewed previously and summarized as follows:

- » Unsafe Open Ditches along Roadway
- » On Street Flooding
- » Downstream Flooding

Any solution to these problems will likely require a multi-phased approach that does not increase downstream flooding impacts, provides additional storage, and improves the safety along the corridor. Using these parameters, three generalized categories of improvements were reviewed. They are as follows:

- » Stormwater Storage Expansion
- » Downstream Infrastructure Improvements
- » Reroute Drainage Areas

Stormwater Storage Expansion

While many different scenarios were evaluated, two stood out as viable alternatives for providing additional storage, a new regional detention pond and converting the existing open ditches into underground detention chambers. The new regional detention pond would be located on property currently owned by Aiken County behind Hobby Lobby.

- » Will require downstream channel improvements
- » Storm design should be at least 100 year event
- » Minimize impacts to existing power facilities crossing parcel
- » Detain a volume of water between six million and nine million cubic feet

The second alternative is not feasible to provide sufficient storage to eliminate the need of a new regional detention feature; however, it is a viable alternative for providing additional storage should it be determined necessary during the implementation/detailed development stage.

- » Will reduce pond volume required
- » Converts open ditches into underground detention chambers
- » Provides additional infiltration opportunities
- » Detention volume 600,000 to 800,000 cubic feet
- » Estimated cost approximately \$10 per cubic foot of storage
- » Higher maintenance costs

Downstream Infrastructure Improvements

Two approaches have been identified to alleviate downstream flooding with a property buyout option on the east side of Whiskey Road in the area that has been previously identified as Wise Hollow Creek at Powderhouse Road and the Converse Road area. The two approaches with a property buyout option are as follows:

- » Stormwater Pumping Station
- » Piping and Open Channel
 - Property Buyout

The piping and open channel option would create a new stormwater piping network with the use of open channels that would begin in the Elmwood Park Subdivision and go all the way to Banks Mill Road. The improvements that are needed in this section would need to be completed regardless of the type of upstream improvements that are made. The drainage way for the entire basin in this area flows through this section and does not have an unrestricted path.

- » Provides flood relief to the area
- » Allows detention pond volumes up stream to be smaller
- » If used with BMPs could provide peak flow reductions
- » Estimated cost of project is \$2.5 to \$3 million

Property Buyout of homes and properties affected most by potential flooding could be used in parallel to the piping and open drainage to reestablish the natural drainage way. This option would buy properties that are directly in the FEMA floodway or have significant portions in the floodway and 100-year flood plain. The structures would then be removed and the property turned into a natural floodway.

- » Provides permanent relief from future property damage
- » Re-establishes the natural drainage way
- » Would decrease the peak discharge volumes created by piping the entire system
- » Estimates Cost for buyout of homes and properties range from \$1.5 to \$2.5 million

A pumping option uses the regional pond as detention while pumping the stormwater to a different detention pond further downstream and release into Wise Hollow Creek or if possible directly into Wise Hollow Creek. There would still need to be design considerations made for the potential risks associated with a pumping station of the size required on the

areas below the pumping pond.

- » Would still require some improvements downstream
- » Would need to be designed to handle at a minimum of a 100 year storm event
- » Additional maintenance and operation costs
- » Estimated cost of 50,000 gpm stormwater pumping station \$9.5 million

Drainage Routing Improvements

Rerouting the storm infrastructure to allow the flows on the western side of whiskey to remain on the western side. This would reduce the detention volumes and infrastructure sizes required on the eastern side. Three drainage areas have been identified that drain from the west side of Whiskey Road to the east that are feasible to be removed from the overall basin. The three areas are with a description of where they can be rerouted.

- » The businesses on the corner of East Pine Log.
 - Rerouted through the regional pond behind Walmart
- » The area at the west end of Dougherty Road
 - Rerouted through stormwater dry pond behind Hampton Inn on East Gate Drive
- » The area around Brookhaven Drive
 - Rerouted through the drainage pond behind Target

Each of these options would need to be thoroughly evaluated to ensure that the increased flows routing would not create additional problems downstream.

Additional Detention and /or downstream infrastructure improvements may be required.

Rural Transition Zone

The Rural Transition Zone stormwater recommendations include proper land development through implementation of current County development guidelines, a stormwater master plan and implementation of Low Impact Development (LID) methods. As growth continues along this section of the corridor, ensuring that proper design practices are followed along with an overall development strategy will help to prevent future stormwater issues.

Furthermore, the existing shoulders and vegetative ditches should be maintained to ensure they remain effective and paved ditches should be cleaned and repaired as needed.

New Ellenton

New Ellenton needs better-defined drainage paths within the municipal limits. This can be accomplished through streetscape measures that should include curb and gutter mixed with other structural BMPs. Outside of this area it is recommended to follow the same guidelines provided in the Rural Transition Zone including maintenance.

Action Plan

Three individual project areas were identified that would improve the corridor's safety, appearance, and overall benefit to the community.

- » Historic Aiken Repair and Drainage Improvements
- » Historic Aiken - Boardman Road to Pine Log Road Infrastructure Enhancements
- » Wise Hollow Creek and Suburban Zone – Restoration and Ditch Improvements

Historic Aiken Repair and Drainage Improvements

This project is needed to repair existing infrastructure, evaluate existing infrastructure capacity and add additional inlets as needed to minimize gutter spreads. These enhancements will help to ensure that this section of Whiskey Road's infrastructure will continue to operate efficiently and effectively for another forty years.

- » Repair and replace broken pipes and structures
- » Review the need and placement of additional infrastructure

Estimated Cost \$400k – \$600k

Historic Aiken Boardman Road to Pine Log Road Infrastructure Enhancements

This project should be completed as part of an overall streetscape project in this section. The goals of the project should address the known issues along this section of the corridor.

- » Define a curb line with curb and gutter and add sidewalk
- » Additional inlets along the west side from Boardman Road to Silver Bluff Road
- » Consistent cross-section

Estimated cost \$750k

Wise Hollow Creek and Suburban Zone

Two alternatives have been created for this zone using the projects discussed in the Project Review Process section.

Alternative A

Alternative A provides a new large regional detention pond with downstream piping and channel improvements to allow for the improvements along Whiskey Road to be completed. A summary of each phase with the primary goal(s) is provided below with a cost estimate.

- » Phase I – Wise Hollow Creek Drainage Project
 - Downstream drainage remediation
 - Conceptual Cost Estimate \$5 million
- » Phase II – Regional Pond
 - Storage and peak flow attenuation
 - Conceptual Cost Estimate \$5.4 million
- » Phase III – Elmwood Park and Whiskey Road Improvements
 - Repair and add additional infrastructure in Elmwood Park
 - Close open ditches along Whiskey Road and update crossing at Brookhaven Drive
 - Add additional structures and piping along Brookhaven Drive
 - Conceptual Cost Estimate \$5.2 million
- » Phase IV – Whiskey Road Drainage Project
 - Close open ditches on both sides of Whiskey Road
 - Conceptual Cost Estimate \$5.6 million

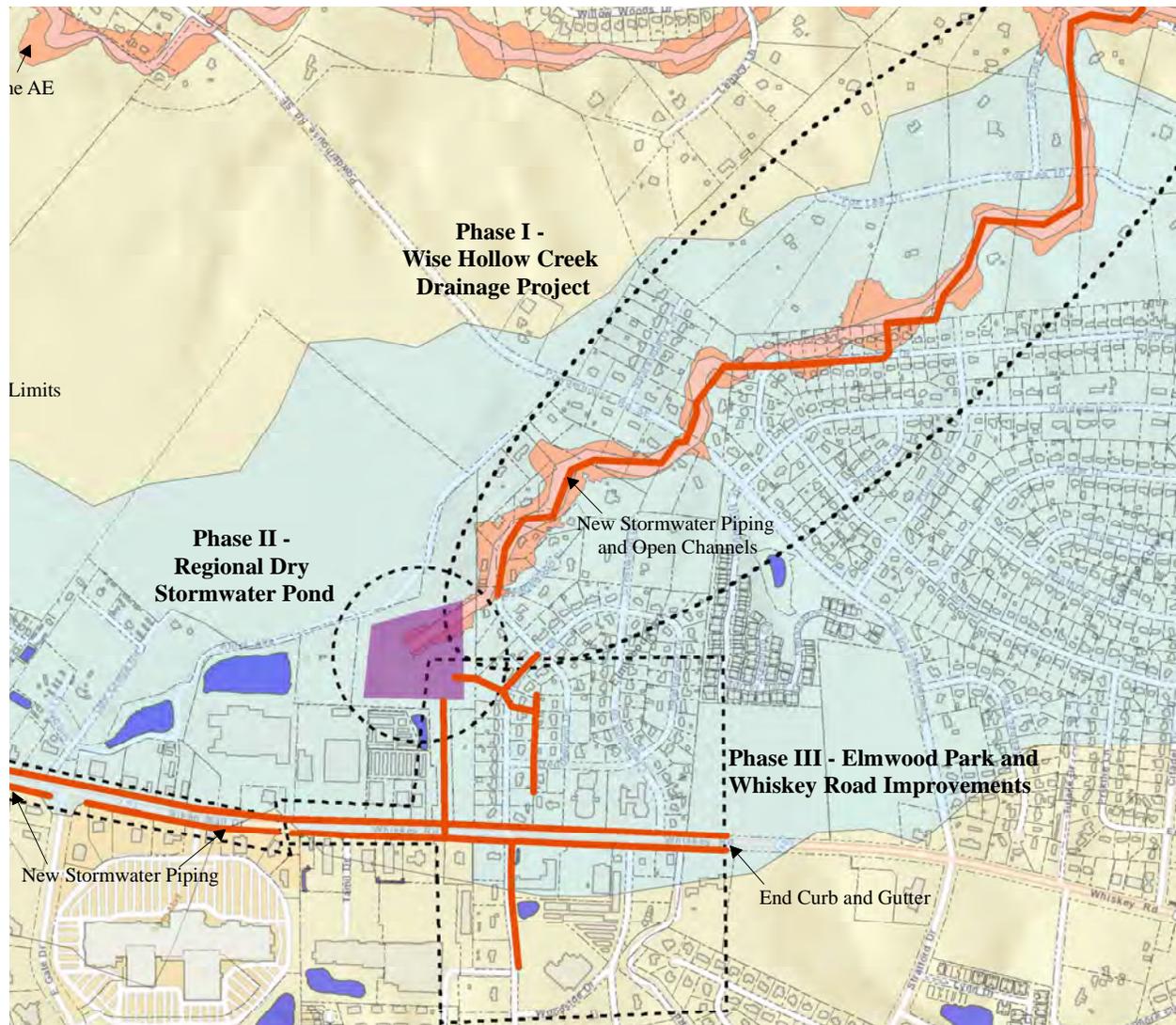
Alternative A Total Costs \$21.2 Million



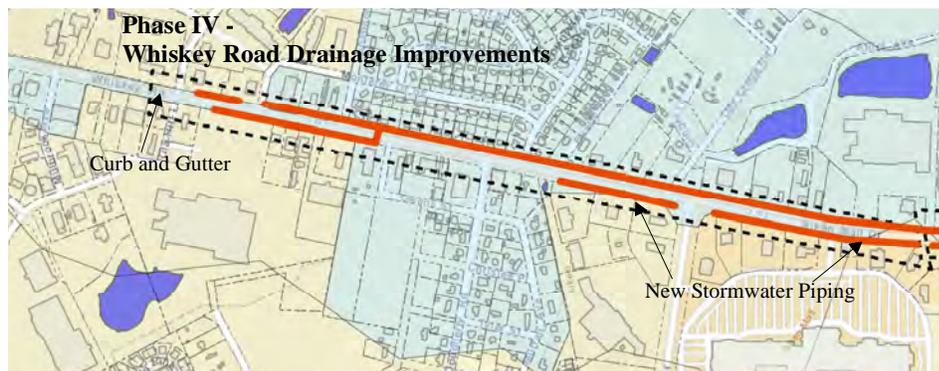
▲ Residual sediment highlighting poor drainage along Whiskey Road



▲ Example of Infiltration Basin



▲ Figure 2.5: Stormwater Recommendations-Alternative A (Suburban Zone) - Phase I, II, and III



▲ Figure 2.6: Stormwater Recommendations-Alternative A (Suburban Zone) - Phase IV

Pumping Station uses a large pumping station to move stormwater from Whiskey Road to another area further downstream. This will avoid the immediate need to repair downstream flooding and allow the improvements along Whiskey Road to be completed. a separate project will still need to be completed to address the downstream flooding identified before. A summary of each phase with its primary goals is provided along with a cost estimate.

- » Phase I - Pumpstation
 - Construct pump station and regional pond
 - Piping installation to downstream area
 - Conceptual Estimate \$20.3 million
- » Phase II – Regional Pond
 - Storage and peak flow attenuation
 - Conceptual Cost Estimate \$5.4 million
- » Phase III – Elmwood Park and Whiskey Road Improvements
 - Repair and add additional infrastructure in Elmwood Park
 - Close open ditches along Whiskey Road and update crossing at Brookhaven Drive
 - Add additional structures and piping along Brookhaven Drive
 - Conceptual Cost Estimate \$5.2 million
- » Alternative A - Pumping Station
 - Conceptual Cost Estimate - \$31 million

Alternative B

Alternative B uses sub-basin rerouting to remove some of the stormwater flows from the overall basin. This should allow for some savings on the size of the regional pond and potentially reduce the pipe size requirements along Whiskey Road. A summary of each phase with the primary goal(s) is provided below with a cost estimate.

- » Phase I – Sub-Basin Rerouting
 - Removing some of the flows to the downstream
 - 3 sub-phases that could be completed separately
 - Total all phases \$7.2 million
- » Phase II – Wise Hollow Creek Drainage Project
 - Downstream drainage remediation
 - Conceptual Cost Estimate \$4 million
- » Phase III – Regional Pond
 - Potential to be a smaller regional pond
 - Conceptual Cost Estimate \$2.9 million
- » Phase IV – Elmwood Park and Whiskey Road Improvements
 - Repair and add additional infrastructure in Elmwood Park
 - Close open ditches along Whiskey Road
 - Conceptual Cost Estimate \$5 million
- » Phase V – Whiskey Road Drainage Project
 - Close open ditches on both sides of Whiskey Road
 - Add curb and gutter and sidewalk/multi use path
 - Conceptual Cost Estimate \$4.9 million

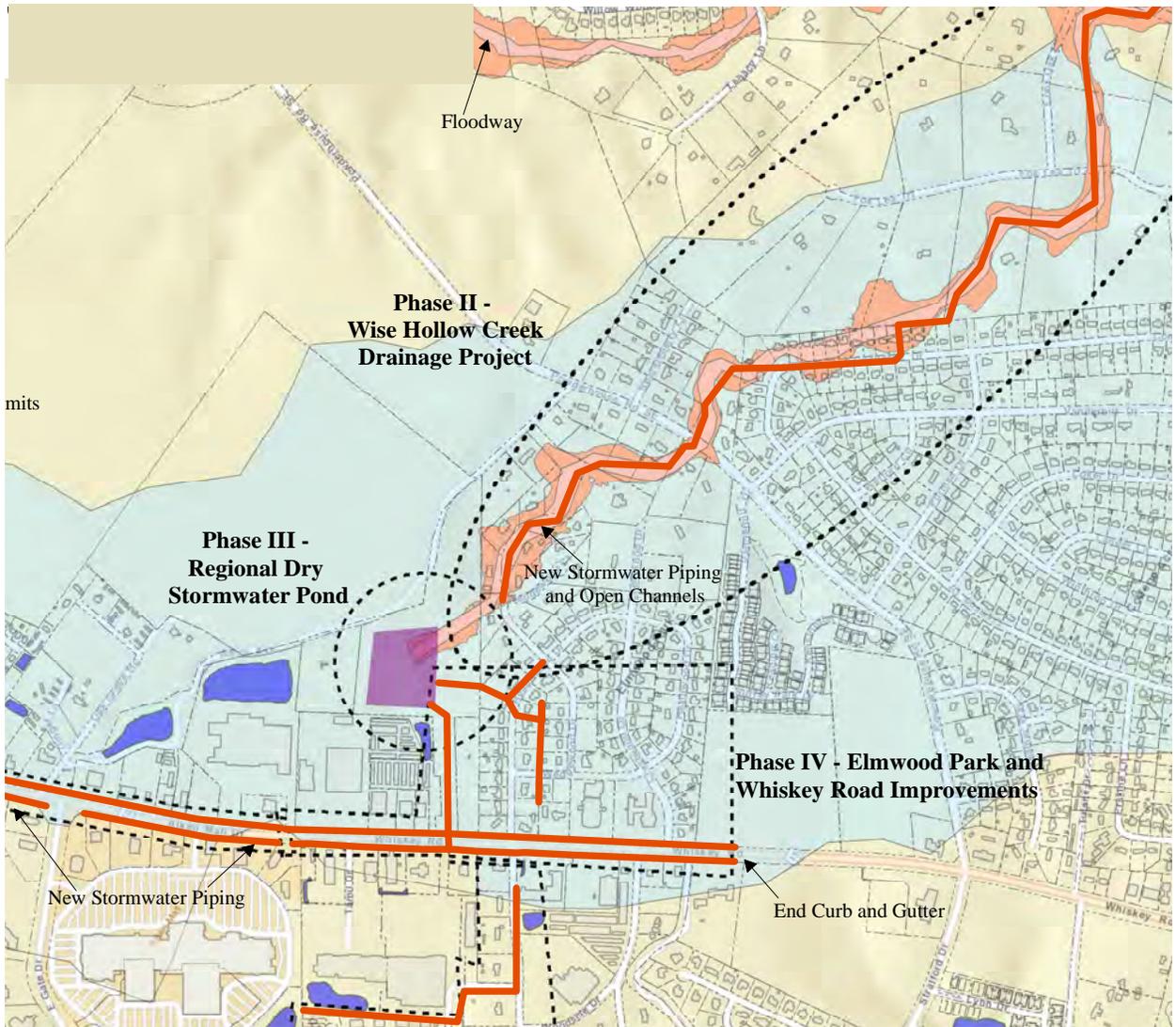
Alternative B Total Costs \$24 Million



▲ Stormwater erosion along Whiskey Road



▲ Example of Enhanced Swale



▲ Figure 2.7: Stormwater Recommendations-Alternative B (Suburban Zone) - Phase II, III, and IV



▲ Figure 2.8: Stormwater Recommendations-Alternative B (Suburban Zone) - Phase I-A, B, C, and V

Stormwater Best Management Practices

An important factor in the design of Whiskey Road is the impact that stormwater has on its operations and safety, as well as, that of nearby homes and businesses.

The Stormwater Best Management Practices (“BMPs”) Infrastructure Plan (Appendix A) summarized here provides a collection of generic stormwater BMPs for potential use along the Whiskey Road Corridor. The proposed stormwater BMPs address a range of stormwater volume and pollution control tools. Many BMPs have the potential to be scalable to match the discharge volumes, pollutant loads, and anticipated site conditions.

The BMP Infrastructure Plan emphasizes structural BMPs and includes a recommendation for incorporating both Green-Infrastructure (“GI”) and Low-Impact Development (“LID”) techniques. This document could be incorporated within the development document standards currently in place, and used by the City of Aiken and Aiken County during private development site plan reviews and municipal capital improvement projects along the corridor. The complete BMP Infrastructure Plan contains

- » Guidance on the selection of BMPs,
- » Fact sheets for each BMP,
- » A BMP selection matrix (reproduced below),
- » A technical guidance section that focuses on Low Impact Development Techniques (LID), and
- » General guidance of BMP placement based on location along the corridor.

The BMP Infrastructure Plan should be updated as new regulations and guidelines are implemented and accepted by SCDHEC and the engineering community.

BMP Type	TARGET POLLUTANTS				APPLICABILITY						
	Nutrients	Bacteria	Metal	TSS Removal	Suitable for Redevelopment	Provides Ground Recharge	Land Requirement	Maintenance Needs ³	Requires Pretreatment	Soil Requirements	Drainage Area (Acres)
Bioretention	M	H	H	H	●	●	M	H	●	None	1-2
Constructed Stormwater Wetland	M	L	H	H			H	L		None	Varies
Disconnect Impervious Areas	H	L	L	H	●		M	L		None	Varies
Dry Stormwater Ponds	L	L	M	M			VH	M		None	Varies
Dry Wells	L	L	L	H	●	●	L	H		Perm.	0-1
Enhanced Swales	L	L	M	H	●	●	H	L	●	Perm.	5 Max
Green Roofs	H	L	L	L	●		N/A	M		None	N/A
Infiltration Basins	H	H	H	H	●	●	M	H	●	Perm.	5 Max
Infiltration Trenches	H	M	M	H	●	●	M	H	●	Perm.	5 Max
Manufactured Separator Devices	L	L	L	M	●		L	H		None	N/A
Open Vegetated Conveyance	M	L	M	M	●		M	M		None	5 Max
Planter Box	M	H	H	H	●		M	M	●	None	0-1
Porous Pavement	M	L	H	H	●	●	H	M		Perm.	Varies
Sand Filters	M	M	H	H	●		H	H	●	None	5 Max
Subsurface Infiltration Systems	L	L	L	H	●	●	M	M	●	Perm.	Varies
Tree Box	H	H	M	H	●		L	M		None	0-1
Underground Detention Structures	L	L	L	H	●		L	M	●	None	Varies
Vegetative Filter Strips	L	L	L	M	●		M	L		None	2 Max
Wet Stormwater Ponds	H	H	H	H			VH	L		None	Varies

UNIT PROCESS					Recommended Use in Areas	Construction Cost Range
Volume Reduction	Peak Flow Reduction	Sedimentation	Filtration & Absorption			
M	L	H	H		1 and 2	\$5 - \$30 per SF
L	H	H	M		3 and 4	Varies
H	M	H	M		1 and 2	\$20 to \$30 per SF
L	H	M	M		2, 3, and 4	Varies
H	M	H	M		1 and 2	\$500 - \$1,000 Each
L	L	H	L		2, 3, and 4	\$10 per LF
H	M	L	L		2	Varies
H	M	H	H		2 and 3	Varies
H	L	M	M		2 and 3	\$50 - \$80 per LF
L	L	M	L		All	\$8,000 to \$15,000 ea.
L	M	L	M		2, 3, and 4	\$10 - \$30 per LF
M	L	M	H		1 and 2	\$24 - \$32 per SF
H	M	H	M		All	\$8 - \$15 per SF
L	L	M	H		2	\$10k to \$50k per Acre
H	M	H	M		2 and 3	Varies
L	L	M	M		1 and 2	\$50 - \$100 per LF
L	H	L	L		1, 2, and 3	Varies
M	M	M	M		2, 3, and 4	\$50 - \$100 per LF
H	H	M	L		2, 3, and 4	Varies

▲ Figure 2.9: This table describes a decision matrix used to determine which BMP measure(s) work best in each of the four corridor planning areas along Whiskey Road. The map on the following page graphically illustrates the BMPs suggested for each planning area.

1. Unit Process adopted from The South Carolina DHEC Storm Water Management BMP Field Manual.
2. Construction Cost Ranges are based on construction installation cost. It does not account for cost associated with design or permitting.
3. Maintenance Needs are based on how often it either requires cleaning or refurbishing. It based on Appendix A from South Carolina DHEC Storm Water Management BMP Handbook.
4. Target Pollutant based on pollutant removal efficiencies as stated in Appendix A from South Carolina DHEC Storm Water Management BMP Handbook.
5. Recommended use in study areas (Area 1 - Historic Aiken, Area 2 - Suburban Zone, Area 3 - Rural Transition Zone, and Area 4 - New Ellenton). These are recommendation sites; final BMP solutions should be chosen based on engineering decisions.

Stormwater Best Management Practices Locations

Integrating BMPs into new development and redevelopment begins at the planning level.

Careful site planning includes reducing the amount of directly connected impervious areas, fitting the proposed improvements to the site terrain, preserving and using the natural drainage systems, and planning to replicate pre-development hydrology.

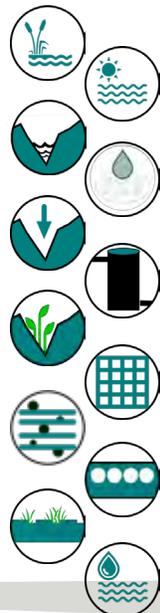
Developers and contractors can do even more during site construction to help manage quality and volume of stormwater flows. Minimizing site disturbance and compaction; retaining natural vegetation, minimizing parking areas and curb-and-gutter internal drainage controls in favor of vegetated swales, and maintaining natural buffers and drainage ways typically provide as great an impact as post-construction BMPs.



- » Constructed Stormwater Wetland
- » Dry Stormwater Ponds
- » Enhanced Swales
- » Infiltration Basins
- » Infiltration Trenches
- » Manufactured Separator Devices
- » Open Vegetated Conveyance
- » Porous Pavement
- » Subsurface Infiltration Systems
- » Underground Detention Structures
- » Vegetative Filter Strips
- » Wet Stormwater Ponds

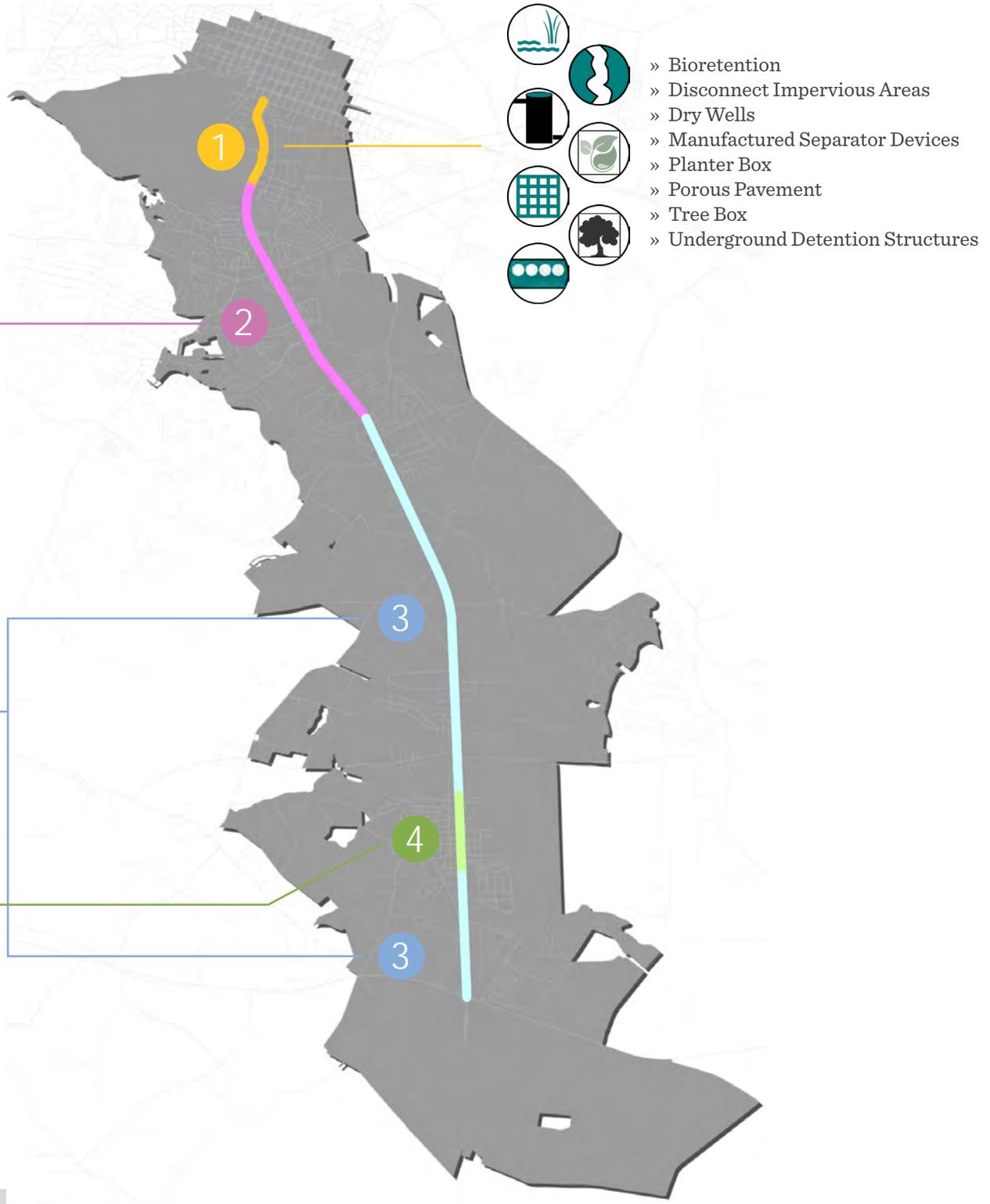


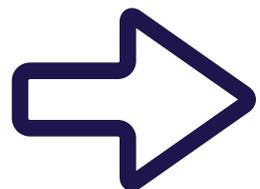
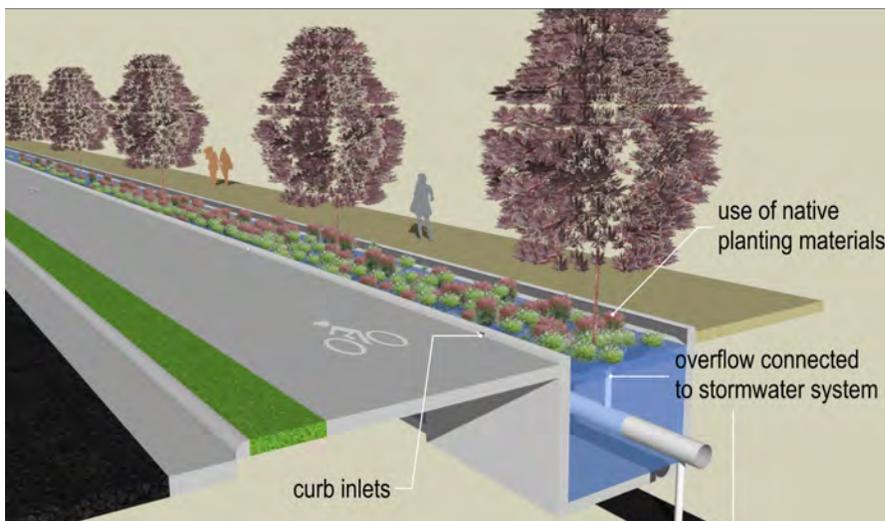
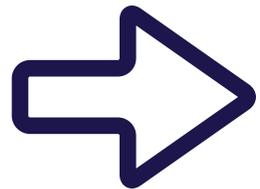
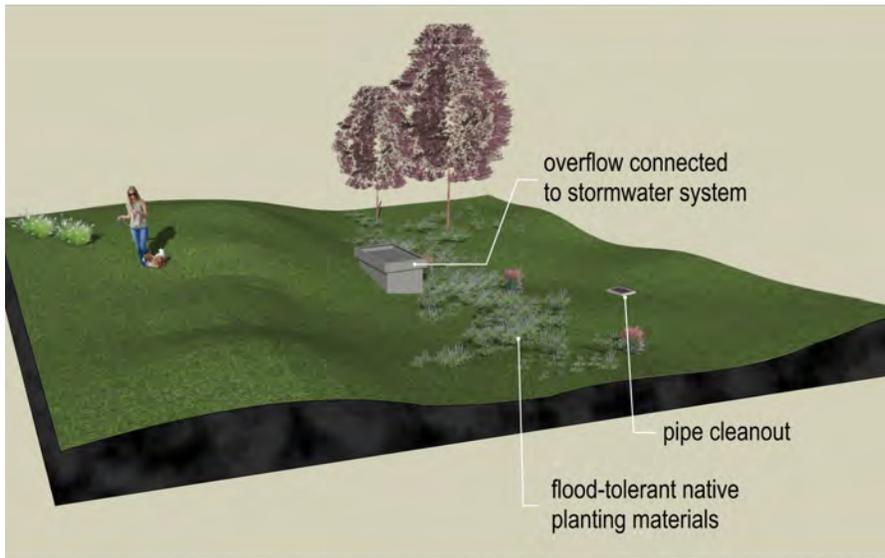
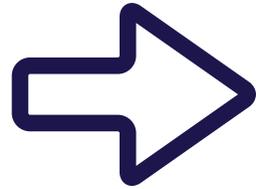
- » Bioretention
- » Disconnect Impervious Areas
- » Dry Stormwater Ponds
- » Dry Wells
- » Enhanced Swales
- » Green Roofs
- » Infiltration Basins
- » Infiltration Trenches
- » Manufactured Separator Devices
- » Open Vegetated Conveyance
- » Planter Box
- » Porous Pavement
- » Sand Filters
- » Subsurface Infiltration Systems
- » Tree Box
- » Underground Detention Structures
- » Vegetative Filter Strips
- » Wet Stormwater Ponds



- » Constructed Stormwater Wetland
- » Dry Stormwater Ponds
- » Enhanced Swales
- » Infiltration Basins
- » Infiltration Trenches
- » Manufactured Separator Devices
- » Open Vegetated Conveyance
- » Porous Pavement
- » Subsurface Infiltration Systems
- » Underground Detention Structures
- » Vegetative Filter Strips
- » Wet Stormwater Ponds

Stormwater Best Management Practices Locations





Examples of Common Stormwater Management Measures

The following descriptions and images at left help describe three of the more commonplace categories of BMP measures recommended for the Whiskey Road Corridor. Please refer to Appendix A for additional details and examples of other stormwater BMPs referenced in this report.

Planter Boxes

These are bioretention treatment control measures that are completely contained within an impermeable structure with an underdrain (they do not infiltrate). The boxes can be comprised of a variety of materials, such as brick or concrete, and are usually chosen to be the same material as the adjacent building or sidewalk. Planter boxes are filled with gravel on the

bottom to house an underdrain system, planting soil media, and vegetation. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, and biodegraded by the soil and plants.

The example shown here includes drainage to the stormwater system as well as inlets from an adjacent parking area and building downspout.

Dry Stormwater Detention Ponds

These provide temporary storage of stormwater runoff. Dry ponds have an outlet structure that detains runoff inflows and promotes the settlement of pollutants. Unlike wet ponds, dry detention ponds do not have a permanent pool. A dry pond is designed as a multistage facility that provides runoff storage and attenuation for both stormwater quality and quantity. The lower stages of a dry pond are controlled by outlets designed to detain the stormwater runoff for the water quality volume for a minimum duration of 24 hours, which allow sediment particles and

associated pollutants to settle out. Higher stages in the pond detain the peak rates of runoff from larger storms for flood and erosion control. Dry Detention ponds are designed for complete drawdown of runoff and normally remain dry between storm events.

The example shown here includes overflow drainage connected to the stormwater system, as well as, a pipe cleanout box. These areas may be connected to greenways, but visually separated with a berm and signage since the downslope areas are obviously associated with periodic flooding.

Subsurface Infiltration Systems

These are underground systems that capture and infiltrate runoff into the groundwater through highly permeable rock and gravel. It is usually not practical to infiltrate runoff at the same rate that it is generated; therefore, these facilities generally include both a storage component and a drainage component.

Typical subsurface infiltration systems that can be installed to enhance groundwater recharge include pre-cast concrete or plastic pits, chambers (manufactured pipes), and perforated pipes.

The example shown here is linked to impervious surfaces in the form of an adjacent cycle track as well as, wide sidewalks.

Market Analysis

3

A balanced community provides opportunities that enable both the young and old to thrive and stay in the area. Examining the composition of the population will define lifestyle trends and appropriate infrastructure needs.

Market Analysis

The primary goal of the Whiskey Road Corridor Study is to plan for and implement transportation improvements. Yet at the same time, this is an opportunity to transition the corridor into an asset to attract and support private investment. Such public-private partnerships are critical to the long-term success of Whiskey Road. The amount of vacant and/or underutilized land that exists in corridor provides both challenges and opportunities; so, the strategy must be prudent in where and how development should occur. While manufacturing remains the County's economic base, the new economy with emerging technologies can provide new workplace, shopping and entertainment options, while continuing to serve those who built the community during its formative years. This transition includes the expansion of products and services which provide healthy lifestyle options, medical care and job opportunities for emerging technologies. However, it must exercise caution in building too many "places" thus diluting synergies and creating sprawl along the corridor, further threatening Aiken's revered quality of life.

The dynamics of the corridor were reviewed and revealed three key areas which could provide catalyst sites for suburban retrofit, as well as, new employment and housing development options for future growth. The transportation improvements, as well as amenities and land use along the corridor will need to address a wide range of customers to include pricing and options – from affordable to luxury – for this diverse socio-economic population.



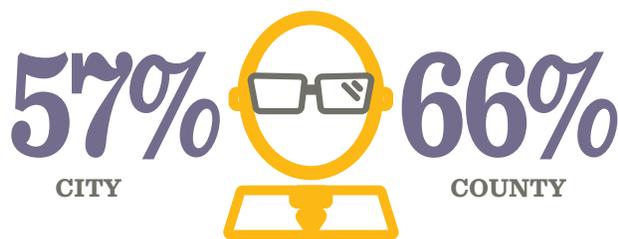
Economic Development Strategies

Economic development strategy begins with understanding the local labor market and the community’s economic base. With that understanding, economic development organizations may focus on any, or all, of the following four primary areas:



Workforce

White Collar jobs: management, business, finance, professional, sales and administrative support.



Blue Collar jobs: Industrial, Automotive, Building Infrastructure.



Economic Base

The employment location quotient (“LQ”) identifies which industry sectors contribute the greatest local job and economic growth. This is a ratio of the County percentage of employment as compared to U.S. employment. The sectors within the County with location quotients (“LQ”) greater than 1.00 demonstrate higher than U.S. averages, thus the primary drivers of the local economic base and overall job growth. The chart below highlights Aiken County’s leading industries:

Economic Base Sectors		
Employment	LQ	%
Utilities	1.97	N/A
Construction	1.44	0.92%
Manufacturing	1.37	7.81%
Retail Trade	1.09	14.24%
Administrative & Waste Service	2.42	14.37%
Arts, Entertainment, & Recreation	1.00	17.97%
Healthcare & Food Service	n/a	11.56%
Accommodation & Food Service	n/a	10.65%

Economic Base Analysis is used to understand what drives the local economy and determines real estate demand. The underlying theme suggests that jobs drive demand for real estate. In other words, for every base industry job that is created, a multiplier effect increases overall employment, in turn increasing both population and income benefiting from such job growth.

Targeted Economic Areas & Strategies

Trade areas were identified along the study corridor, based upon data and public feedback in which there are existing central places, or centers of influence, as well as, transportation patterns, existing infrastructure/ investment, existing land uses, proposed redevelopment and available undeveloped land.

A tour and analysis of the Whiskey Road corridor on a parcel by parcel basis revealed three levels (Figures 3.1-3) at which future land uses may be considered:

Ripe (green) = 1,574 acres
Parcels identified as vacant or for sale and are ripe for development or redevelopment.

Opportunity (yellow) = 401 acres
Sites that have buildings or structures in need of renovation and/or repair.

Firm (red) = 890 acres
Sites which were solidly developed or preserved and contributing to the vitality of the corridor were identified in red.



▲ Figure 3.1: Northern Section



▲ *Figure 3.2: Central Section*



▲ *Figure 3.3: Southern Section*

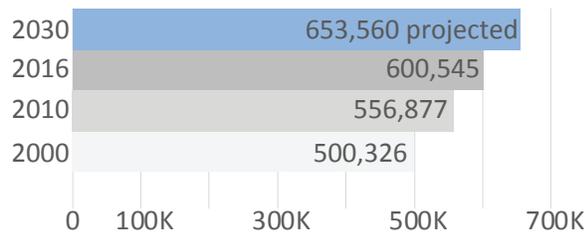
Corridor Demographics

The Whiskey Road corridor is located within the Augusta-Richmond County, GA & SC Metropolitan Statistical Area, and physically in Aiken County, SC. The corridor lies both in the city of Aiken and town of New Ellenton. The demographics of the area are changing and is experiencing slower growth compared to the rest of the state and region.

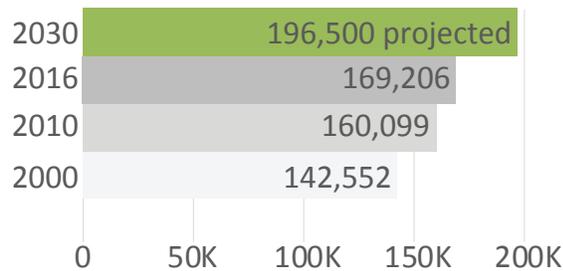
Past and projected population changes:

- » Augusta Richmond Metropolitan Statistical Area
- » Aiken County
- » City of Aiken

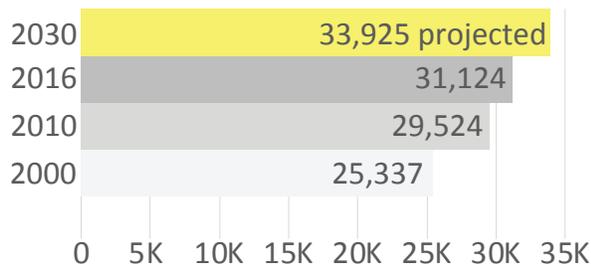
Augusta Richmond Metropolitan Statistical Area



Aiken County



City of Aiken



Household Income and Sizes

The median household income is \$51,596 for the City of Aiken while the median for Aiken County is \$46,393 and the MSA is \$46,335. The average household income is \$78,229 for the City of Aiken while the average for Aiken County is \$64,217 and the MSA is \$64,120. Aiken likely has more empty nester households than the surrounding area with a 2.22 average household size. While Aiken County has a 2.45 average household size and the MSA has a 2.55 size.



2.22

City of Aiken's average household size



9%

projected 14 year growth



16%

projected 14 year growth



9%

projected 14 year growth

Age Cohorts

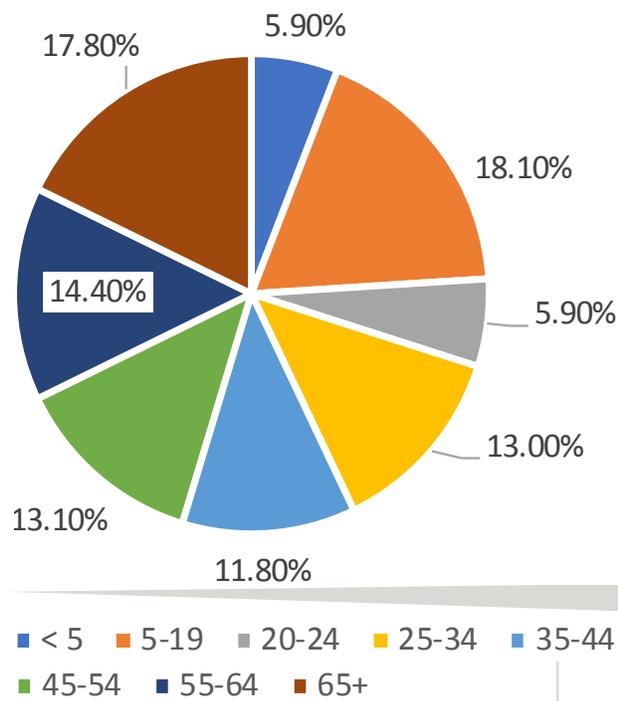
The median age in the City of Aiken is 46.6 years old, which is nearly 10 years older than Aiken County or the MSA at 37.7 years old.

The Baby Boomer generation is the primary group of residents in Aiken County at 25% of the population (up from 14% in 2010) and City of Aiken accounting for 27% of the population in 2010, rising to 30% of the population in 2016.

The Generation X and Millennial generation populations have decreased, from 23% and 27% in 2010, to 21% and 24% in 2016, respectfully.

Baby Boomers nearing retirement are seeking communities which offer an attractive quality of life and access to healthcare, cultural arts and other amenities. The migration of retirees to the Southeast and Aiken's position within the region make this community an attractive choice. Unlike the Baby Boomer generation, whose housing decisions are driven by job relocations, Millennials make career decisions based upon their desired lifestyle, then revolve their job search around their chosen community. Despite the rising influx of Baby Boomers, Aiken, like most other communities, are focused on ways that they can attract the Millennial generation.

Population by Age Graph (2016)



Educational Attainment

There is a clear difference of educational attainment when comparing the City of Aiken to the Aiken County, which has been the focus of the regional economic development partnership.

High school Graduates

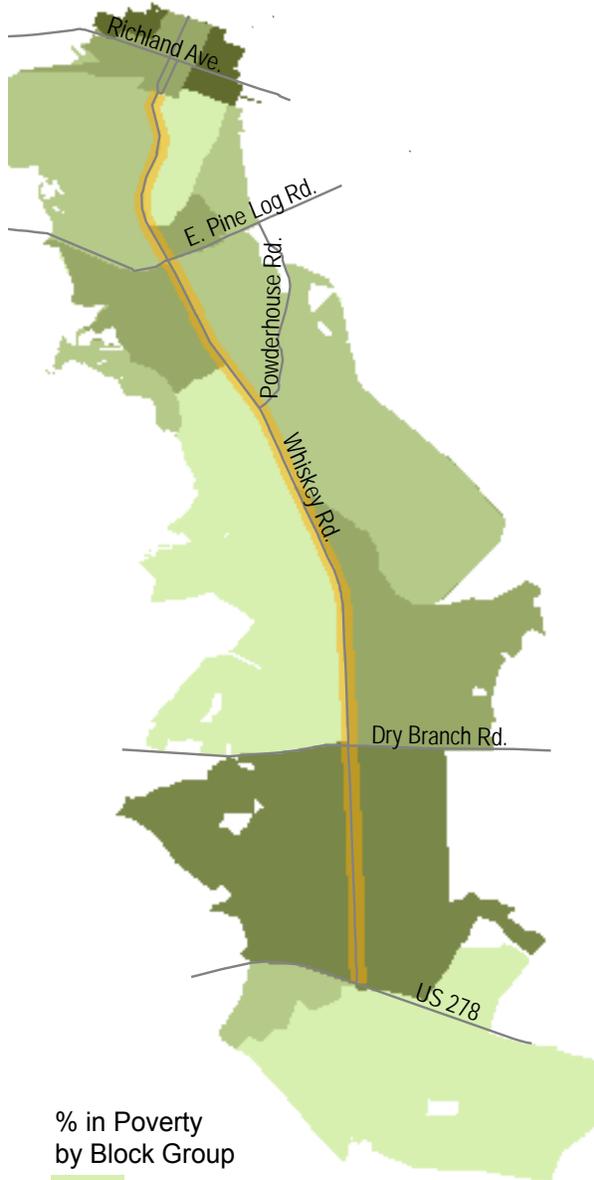


Bachelor's Degree or higher



Poverty Levels

Poverty levels are highest along the study corridor adjacent to the northern end in pockets of the downtown grid with levels reaching 30 - 50%, and along the southern end of the corridor in New Ellenton with levels reaching 30%.



% in Poverty
by Block Group

0 - 2.8%

2.8 - 8%

8 - 15.9%

15.9 - 30.6%

30.6 - 50.5%

Whiskey Rd. study corridor

Transportation Along the Study Corridor

As any typical American city, the automobile as a means of transportation dominates the study corridor. Of an estimated 19,794 along the corridor, the following is the mode share breakdown:



84%
single occupancy

9.8%
carpool



0.9%
walk

0.14%
bicycle



0.93%
other

Development Strategies

4

Development strategies for the Whiskey Road Corridor encourage placemaking and community building. Just as the roadway section varies based on the surrounding context, so should the development pattern.

Current Development Strategies of Both City & County

Aiken County and the City of Aiken share jurisdiction along Whiskey Road. Therefore, it is important to understand the current direction of both.

Key Takeaways: Aiken County Comprehensive Plan 2014-2024

The physical form of Aiken County places a value on the preservation of rural, agricultural and wooded areas with intensification of development in already urbanized settings. The current plan also ties the development of walkable communities directly to public health. Policies that require multi-modal connectivity and pedestrian friendly site design play directly into the idea of healthy communities.

The County also recognizes they have an issue with what is known as “strip corridor development” or sprawl. This development pattern results when commercial areas are not located in nodes and are separated by open space and/or low density use.

The plan outlines a goal of creating and sustaining a healthy, livable land use pattern which is characterized by:

- » Stable, attractive and diverse neighborhoods
- » Quality employment centers integrated and disbursed within the urban fabric
- » Convenient, accessible, diverse and attractive commercial nodes that are pedestrian friendly and multi-modal in nature
- » Optimizes investments in existing infrastructure through infill development and redevelopment of underutilized areas and minimizes investments in new infrastructure

Key Takeaways: City of Aiken Comprehensive Plan 2016

The City of Aiken clearly states the importance of the Whiskey Road Corridor Study in their 2016 Comprehensive Plan. The encouragement of linking transportation to land use is a key tenant of their overall recommendations. The Whiskey Road Character Area is divided into North Whiskey Road centered on the intersection at Pine Log Road and South Whiskey Road centered around the Aiken Mall redevelopment site. The key land use recommendations for Whiskey Road center around the ideas of creating walkable block patterns and enhancing inter-parcel connectivity.



Principles of Smart Growth

Health, schools, taxes, traffic, the environment, economic growth, fairness, opportunity—many of the things we care about—are all affected by development decisions. . . . What, where, and how we build have major impacts on our personal lives, our communities, and our nation.

Growth presents a tremendous opportunity for progress. Communities around the country are looking for ways to get the most out of new development and to maximize their investments.

Frustrated by development that requires residents to drive long distances between jobs and homes, many communities are challenging rules that make it impossible to put workplaces, homes, and services closer together. Many communities are questioning the fiscal wisdom of neglecting existing infrastructure while expanding new sewers, roads, and services into the fringe. And in many communities where development has improved daily life, the economy, and the environment, smart growth principles have been key to that success.

When communities choose smart growth strategies, they can create new neighborhoods and maintain existing ones that are attractive, convenient, safe, and healthy. They can foster design that encourages social, civic, and physical activity. They can protect the environment while stimulating economic growth. Most of all, they can create more choices for residents, workers, visitors, children, families, single people, and older adults—choices in where to live, how to get around, and how to interact with the people around them. When communities do this kind of planning, they preserve the best of their past while creating a bright future for generations to come.

Growth is smart when it gives us great communities, with more choices and personal freedom, good return on public investment, greater opportunity across the community, a thriving natural environment, and a legacy we can be proud to leave our children and grandchildren.

(Excerpted from *This is Smart Growth*, www.smartgrowth.org.)

1. Mix Land Uses

“Mixing land uses—commercial, residential, recreational, educational, and others—in neighborhoods or places that are accessible by bike



and foot can create vibrant and diverse communities. In large part, a mix of uses attracts people to shop, meet friends, and live in urban neighborhoods like Georgetown in Washington, D.C., or small towns like Wiscasset, Maine [or historic Aiken]. Mixed land uses are critical to achieving the great places to live, work, and play that smart growth encourages.”

2. Take Advantage of Compact Building Design

“An important part of achieving smart growth, compact building helps create the convenient neighborhood centers that people want. Compact building design also presents opportunities to absorb growth and development in a way that uses land more efficiently. By using smaller building footprints for new construction, compact design leaves undeveloped land open to absorb and filter rainwater, which in turn reduces flooding and stormwater drainage needs and lowers the amount of runoff pollution.

Other benefits accrue as well. Compact communities help achieve the density of population needed to support viable transportation alternatives. It is estimated that people will willingly walk to destinations—services, as well as, transit stops—located within a quarter to one-half of a mile radius. Thus, a minimum density of six to eight households per acre around bus stops would support bus service. Furthermore, compact neighborhoods require fewer linear feet of utility lines—like water, sewer, electricity, phone service, and others—than dispersed communities do. As a result, local governments find



that it is cheaper to provide and maintain many services to compact communities.”

3. Create a Range of Housing Opportunities And Choices

“By using smart growth approaches to create a wider range of housing choices, communities can begin to use their infrastructure resources more efficiently, better accommodate the housing needs of all residents, and help aging citizens remain in their homes. Housing is a critical part of the way communities grow, as it constitutes a significant share of new construction and development. More importantly, however, housing provides people with shelter and is a key factor in determining a household’s access to transportation, commuting patterns, access to services and education, and consumption of energy and other natural resources. Providing quality housing for people of all income levels is an integral component in any smart growth strategy. In addition to improving a household’s quality of life, housing can ensure a better jobs-housing balance and generate a strong foundation of support for neighborhood transit stops, commercial centers, and other services, thereby mitigating the environmental costs of auto-dependent development.”

4. Create Walkable Communities

“Before the mid-1900s, urban communities and neighborhoods focused on the pedestrian. They were designed to move people to their destinations. However, in the past fifty years, dispersed

development patterns and the separation of uses have led to an increased reliance on personal automobiles and to an elimination of many characteristics that support walkable communities. Today, traffic engineers’ and developers’ arguments that sidewalks will not be used leave many new streets without sidewalks or with sidewalks on only one side. The engineers and developers are right in one sense: sidewalks by themselves will not induce walking. Other pedestrian-friendly features must be present, such as an appropriate mix of densities and uses, compact street intersections, and neighborhoods that are scaled to people.”

5. Foster Attractive Communities With A Strong Sense Of Place

“Communities that have a strong sense of place represent the values of their residents and reflect the unique historical, cultural, economic, and geographical context of the area. They use natural and man-made boundaries and landmarks to create a sense of defined neighborhoods, urban communities, and regions. These communities encourage the construction and preservation of buildings, which prove to be assets over time, not only because of the services provided, but also because of the unique contribution they make to the look and feel of a community.”

Beyond the construction of buildings, these communities reflect their unique characteristics in myriad details—such as landscaping, signs, and awnings—that help to further distinguish the area for passers-by and visitors. Guided by their own vision of how and where to grow, communities that have adopted smart growth principles can direct investment and development into areas that already reflect a strong sense of place. Moreover, these communities can encourage new fringe development to make a better effort to create distinctive, unique civic assets.”

6. Preserve open space, farmland, natural beauty, and critical environmental areas

“Open space supports smart growth goals by bolstering local economies, preserving critical environmental areas, providing recreational opportunities, and guiding new growth into existing communities. Preservation of open space can have a profound impact on a community’s quality of life, and therefore a region’s economic prosperity. An economic analysis performed for the East Bay Regional Park District in California concluded



that “the provision of open space and associated recreational and educational opportunities, environmental and cultural preservation, alternative transit modes, and sprawl-limiting characteristics, all contribute positively to the quality of life in the East Bay region.” A 1997 study reported that owners of small companies ranked recreation, parks, and open space as the highest priorities in choosing a new location for their business.

Networks of preserved open space and waterways can shape and direct urban form and at the same time prevent haphazard conservation (conservation that is reactive and small scale). These networks, known as “green infrastructure,” help frame new growth by locating new development in the most cost-efficient places. Green infrastructure also ensures that the preserved areas are connected so as to create wildlife corridors, preserve water quality, and maintain economically viable working lands.”

7. Strengthen and direct development toward existing communities

“Smart growth directs development towards communities already served by infrastructure, seeking to utilize the resources that existing neighborhoods offer and to maintain the value of public and private investment. By encouraging development in existing areas, communities benefit from a stronger tax base, closer proximity of jobs and services, increased efficiency of already developed land and infrastructure, reduced development pressure in fringe areas, and preservation of farmland

and open space. In addition, the process of increasing development in existing communities can maximize the use of existing impervious surfaces, thereby improving local and regional water quality, and can create opportunities for more transportation options, which lower vehicle miles traveled and ultimately improve regional air quality. Often existing neighborhoods can accommodate much of the growth that communities require through infill development, brownfields redevelopment, and the rehabilitation of existing buildings. For example, a 1996 study found that brownfields in Detroit, Chicago, Milwaukee, and Cleveland could absorb one to five years of residential development, 10 to 20 years of industrial development, or 200 to 400 years of office space.”

8. Provide a Variety of Transportation Choices

“The science of traffic management and prediction has begun to catch up with what citizens have observed for years: new road capacity fills up almost as fast as it is constructed. Known in transportation circles as “induced demand,” studies now show that as large new roads are built people increase their driving to take advantage of the new infrastructure. Some studies suggest that between 60 and 90 percent of new road capacity is consumed by new driving within five years of the opening of a major road. In the short term, people may switch from using transit and carpools to traveling on the new road, and in the long term, with the increased accessibility of the surrounding land, development patterns shift to create more growth and new traffic in the area. In

regions around the country, travel forecasters show that the continuation of current policies and practices is unlikely to alleviate congestion.

In response, communities are beginning to implement new approaches to transportation planning, such as better coordinating land use and transportation; increasing the availability of high quality transit service; creating redundancy, resiliency and connectivity within their transportation networks; and ensuring connectivity between pedestrian, bike, transit, and road facilities. In short, they are coupling a multi-modal approach to transportation with supportive land-use patterns that create a wider range of transportation options.”

9. Make development decisions fair, predictable, and cost effective

“For a community to be successful in implementing smart growth, its vision, objectives, and actions must be embraced by the private sector. The private sector is crucial to supplying the large amounts of money and construction expertise needed to meet the growing demand for smart growth developments. If investors, bankers, developers, builders, and others do not earn a profit, few smart growth projects will be built. Fortunately, government can help reduce barriers to profitable smart growth development practices. Since the development industry is highly regulated, the value of property and the desirability of a place are determined in large part by government investment in infrastructure and by government regulation.”

10. Encourage Community And Stakeholder Collaboration In Decision Making

“A key component of smart growth is to ensure early and frequent involvement of all stakeholders to identify and address specific needs and concerns. The range of these stakeholders is broad and includes developers, urban planners, transportation engineers, conservation and environmental groups, community development advocates, historic preservationists, commuters, students, environmental justice advocates, senior citizen organizations, children’s advocacy groups, churches, parent-teacher associations, civic associations, and many others. Each is capable of contributing a unique and valuable perspective to both broad community plans and specific project designs. These perspectives are particularly critical for the construction of the mixed-

use, compact, walkable, and transit-rich communities that smart growth supports because these varied perspectives may represent a departure from what is conventional and familiar. The means of engaging the community and stakeholders are myriad and range from early stakeholder input in community plans to ongoing feedback and evaluation of the plan’s implementation as projects are constructed. Ensuring a high level of public awareness is one of the most fundamental strategies to guarantee that community needs and possible solutions are fully considered. This strategy can help local leaders better identify and support development that meets those needs.”

— from Getting to Smart Growth, www.smartgrowth.org

“If you plan cities for cars and traffic, you get cars and traffic. If you plan for people and places, you get people and places.”

—Fred Kent, Project for Public Spaces



▲ Community and Stakeholder Collaboration during Whiskey Road Corridor Process

Case Studies of Smart Growth Development Typologies

Case Study: Regional Center Development

Birkdale Village in Huntersville, NC, is a 52 acre community with 320 apartments, 300,000 square feet of retail space, and 200,000 square feet of office space. 7.4 acres are dedicated to the McDowell Creek floodplain. An example of a Regional Center, Birkdale Village includes higher density multi- and single family housing, regionally supported retail, formal open spaces and a diversity of office spaces.

Source: MacDonald, Joseph, Michael Holmes, Phillip Berke. "Case Study of Birkdale Village, NC: Comprehensive report of the Impact of Urban Design on Water Resources." (2003)



Case Study: Traditional Neighborhood Development

Baxter Village in Fort Mill, South Carolina includes 1,033 total acres, of which 500 acres are preserved as open space. In 2006, over 850 families lived in Baxter Village. A TND example, Baxter Village is primarily comprised of single family residential with locally serving retail and civic amenities for residents.

Source: Miller, Jason. The Town Paper. "Baxter Village: Progress and Preservation." (2006)



Case Study: Clustered Land Development

Located 32 miles south of Atlanta, the 1,000 acre Serenbe community preserves over 70% of the acreage for open space and woods and 30 acres are dedicated to farming. The community is projected to have approximately 1,000 to 1,200 units when it is complete. Clustered land developments include large tracts of preserved open space and farmland, medium density housing and small opportunities for neighborhood commercial uses.

Source: www.serenbecommunity.com



Catalyst Sites

During the public design charrette, the design team developed conceptual site development/redevelopment plans for areas identified as catalyst opportunities. These areas were chosen using a combination of market study evaluation, critical assessment of actual conditions, parcelization, and knowledge of planning/development trends.

The plans illustrate “best practice” scenarios and are not intended to be a final land use plan. Rather, they are one approach of many realistic scenarios given an active market and a coordinated urban strategy that encourages infill and redevelopment over sprawling development.

Urban Periphery Infill

Existing Conditions

The block between Boardman Road and Westover Drive along the corridor provides an opportunity to transition between the historic downtown area and the suburban context of Whiskey Road. The current dilapidated state of this block is part of the corridor's northern gateway and is currently in the County's jurisdiction. Along the western side of the corridor is the Palmetto Golf Club's wall of vegetation.

Key Recommendations

UP-1 Encourage controlled access of the block's redevelopment. As existing buildings find new uses or the redevelopment of the properties occurs over time, careful consideration should be given to a shared driveway and parking configuration for the outparcels along Whiskey Road.

UP-2 Actively seek tenants that will serve the adjacent neighborhood and visiting tourists.

The photosimulation at the right illustrates the idea of utilizing the existing building as a neighborhood brewery or bottleshop. This is one vision of many that could work for the area. The key is that hundreds of homes are within a ten minute walk of the block along with two hotels within a two minute walk. Golf and equine enthusiasts bookend this section of Whiskey Road to the west and east respectively and provide a steady population of potential customers.

UP-3 Convert parking in front of existing structures into outdoor extensions of the use.

As seen in the photosimulation, the idea of allowing the businesses to spill out into the current setback in the form of outdoor dining space is encouraged. This strategy transforms a previously auto-centric format of site design into one that focuses on the pedestrian experience.



▲ Urban Periphery Infill Opportunity



▲ Existing View of Underutilized Area in the Urban Periphery

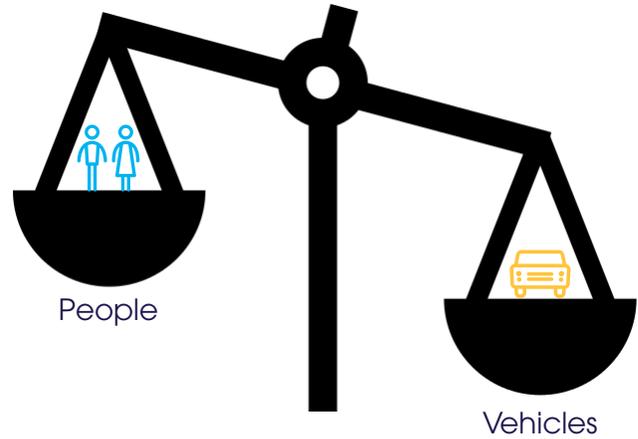


▲ Proposed Improvements to Underutilized Area in the Urban Periphery (Curbing, Sidewalk, Landscaping, Outdoor Dining Space, Enhanced Building Facade & Use)

Suburban Retrofit

Existing Conditions

The suburban context of Whiskey Road extends over two and a half miles with a number of auto-centric bigger box developments scattered along the way. This pattern of development does not encourage placemaking, only driving to and from a destination to purchase products or services. The Mitchell Shopping Center at the intersection of Hitchcock Drive and Whiskey Road is the selected catalyst site investigated as a suburban retrofit opportunity. This term simply implies that a suburban big box development with an expansive frontage of parking could incrementally change over time into a more pedestrian friendly environment with a variety of uses. Excessive driveway cuts also litter the corridor in this area.



Vehicles are given more “weight” than people in this suburban context. The result is an unbalanced and often unsafe pedestrian environment.



▲ Existing Conditions Imagery: Mitchell Shopping Center Area (Auto-Centric Environment)

Key Recommendations

SR-1 Invest in public infrastructure to control access and beautify the corridor. Particularly in the areas identified as catalyst sites, strategic public investment in the transformation of the roadway will be Phase 1 of the suburban retrofit model. The detailed multi-modal strategy along with access control are described in further detail in Chapter 5. Spot opportunities for tree planted medians, street trees, multi-use paths, and bicycle facilities are just a few of the strategies employed. Property owners are more likely to invest in improvements on private property upon seeing the commitment of dollars from the City/County in the surrounding infrastructure, safety and beautification.

SR-2 Encourage outparcel development and reexamine interior parking lots. The Mitchell Shopping Center is a prime example of an aging shopping center that could serve as a catalyst for change into a more walkable environment. As parking minimums are reexamined and reduced, the frontage parcels along Whiskey Road open up to the addition of well-designed multi-story mixed use buildings. As illustrated in the Phase 2 drawing, the parking then becomes interior to the block and should be redesigned with plantings and low impact stormwater solutions to control the impact of runoff. These best management practices for stormwater are detailed in Chapter 2 of this document.

SR-3 Promote multifamily infill housing. The areas adjacent to many of the big box developments along this suburban context quickly transition into single family neighborhoods. The plan promotes the infill of these block perimeters as townhomes to ease that transition and allow existing residential to front onto infill residential as opposed to the back of commercial structures. Phase 3 of the catalyst site indicates appropriate locations for this infill development in relationship to the Mitchell Shopping Center retrofit model.

SR-4 Utilize development regulations to transform the pattern along Whiskey Road. Phase 3 also illustrates the infill of high quality mixed use buildings on the east side of Whiskey Road. This is a longer term vision as most businesses are currently occupied and not likely to change in the near future. However, parking along the frontage of Whiskey with buildings setback to the rear of the property is not ideal for placemaking or enhancing walkability. As parcels redevelop over time, requiring buildings to address the street and keeping parking to the interior of the block is desirable.



▲ Fair Oaks Boulevard Median Improvements, Sacramento, CA



▲ Townhome Infill Development

Suburban Retrofit: Mitchell Shopping Center



▲ Existing Conditions: Mitchell Shopping Center



▲ Proposed Improvements: Mitchell Shopping Center Phase 1 of Suburban Retrofit (Public Infrastructure Enhancements)

Suburban Retrofit: Mitchell Shopping Center



▲ Proposed Improvements: Mitchell Shopping Center Phase 2 of Suburban Retrofit (Outparcel Infill Development & Parking Enhancements)

Development Data	
Development Type	Employment Campus & LID
Residential Units	Total: 30 units
Lofts (third floor)	30 units
Non-Residential	Total: 72,000 sf
Mixed Use: Retail/Office (First and Second Floors)	72,000 sf



▲ Proposed Improvements: Mitchell Shopping Center Phase 3 of Suburban Retrofit (Multi-Family Housing Infill & Adjacent Parcel Redevelopment)

Development Data	
Development Type	Employment Campus & LID
Residential Units	Total: 120 units
Lofts(third floor)	85 Units
Townhomes	35 Units
Non-Residential	Total: 200,000 sf
Mixed Use: Retail/Office (First and Second Floors)	200,000 sf

Suburban Retrofit: Mitchell Shopping Center



▲ Existing Conditions: Mitchell Shopping Center Looking North on Whiskey Road



▲ Proposed Improvements: Mitchell Shopping Center Phase 1 of Suburban Retrofit (Public Infrastructure Enhancements)



▲ Proposed Improvements: Mitchell Shopping Center Phase 2 of Suburban Retrofit (Outparcel Infill Development & Parking Enhancements)



▲ Proposed Improvements: Mitchell Shopping Center Phase 3 of Suburban Retrofit (Multi-Family Housing Infill & Adjacent Parcel Redevelopment)

Traditional Neighborhood Development

Existing Conditions

At the intersection of East Gate Drive and Whiskey Road, the Aiken Mall is slated for redevelopment in the near future. Plans for a lifestyle center with walkable retail is proposed along with enhanced outdoor amenities for visitors and residents. However, the plan does not include a residential component. To the east of Whiskey Road in this location, several large greenfield acres are located just behind the frontage development along the corridor.

A few planned roadway connections traverse through these properties including what is known as the Whiskey Road-Powderhouse Road Connector. This proposed east-west route will hopefully continue to strengthen the network in South Aiken and alleviate pressure off of surrounding roadways.



▲ *Aiken Mall Site Slated for Redevelopment into a Lifestyle Center*

Key Recommendations

ND-1 Capitalize on the planned infrastructure project and private investment on the Aiken Mall site with a high quality neighborhood development. Capital and private dollars are already being invested in this portion of the Whiskey Road corridor. Leveraging those dollars is a strong incentive mechanism to spur continued private development on the eastern side of the roadway. The large nature of the parcels in this area also give the advantage of planning a connected block structure of neighborhood streets. This block structure allows the density to respond to market conditions and realities. The same block can accommodate a range of housing types. By alley loading most blocks and eliminating

driveway cuts, the streets are fundamentally more walkable.

ND-2 Encourage a range of housing typologies and price points.

The advantage of a traditional neighborhood with single family lots (both large and small), townhome units, and apartment units is that diversity becomes inherent--both in age and in income levels. The development should mix market rate housing with more affordable units in the same blocks. As illustrated in the concept on the next page, the highest density housing should be closest to Whiskey Road, and the pattern of density would decrease as the development moves to the east.

ND-3 Provide a variety of common open space within the development.

While a number of wonderful recreation opportunities exist up and down Whiskey Road (including the Odell Weeks Recreation Center), neighborhoods thrive when common space is woven throughout the design. These can be small pocket parks and playgrounds or larger areas of preservation with publicly accessible trails. Both formal and informal green spaces should be a key tenant of the neighborhood fabric.

ND-4 Utilize the development for larger stormwater initiatives and transform them from utilitarian features into desirable amenities.

As outlined in Chapter 2 in more detail, this area has been identified as a potential regional stormwater area. Making those stormwater basins into design features of the neighborhood adds value for the entire community. Note that the concept plan takes advantage of the largest pond by creating a parkway street along its perimeter and fronting homes into the space. This enhanced natural viewshed provides yet another housing option for potential residents.



▲ *Harbor Town TND (Lake St. Louis, MO): Stormwater Amenity & Parkway Street*



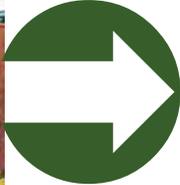
▲ Existing Conditions: Shannon Lane to Powderhouse Road



▲ Proposed Improvements: Shannon Lane to Powderhouse Road



▲ *Front Loaded Single Family Residential*

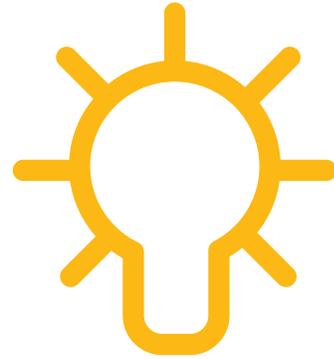


▲ *Alley Loaded Single Family Residential*



▲ *Alley Loaded Multi-Family Residential*





**Neighborhood
Block Structure
Provides Design
Flexibility
Based on Market
Demand**

New Ellenton

Existing Conditions

Heading south beyond the suburban context of Whiskey Road, a rural transition of sparse development, woodland and agricultural land exists before arriving to the community of New Ellenton. Once the corridor enters this small village of 2100 people, Whiskey Road becomes Main Street until it intersects with Highway 278 at Johnson Crossroads (entry to Savannah River Site). The five lane section of Whiskey Road currently lacks the character and sense of place the Town of New Ellenton should encourage along their Main Street.

Key Recommendations

NE-1 Build on planned infrastructure

improvements. Old Whiskey Road currently enters the corridor at an awkward angle and plans are in the pipeline to adjust the alignment of Old Whiskey Road to the south. The conceptual plan for this area illustrates capitalizing on this realignment with an entry into a potential flex employment campus.

NE-2 Provide a flex/light industrial campus to the New Ellenton-North Area to help create jobs.

Light industrial or flex space would create an environment that focuses on growing jobs with various skill levels. This type of development can also serve as incubator space for small businesses through public-private partnerships. The design form should still encourage buildings that address the street with tree enhanced parking in the rear. Tree preservation areas and street connectivity are also tenants of high quality employment campuses.

NE-3 Utilize low impact development when planning residential in environmentally sensitive areas.

The low impact residential development (LID) illustrated in the New Ellenton-North concept plan examines a site with a stream and areas of steep topography. The plan utilizes an existing farm road alignment and provides a buffer along the stream corridor. Tree preservation along Whiskey Road and in the steep slope areas add a nature-inspired character to the development. A variety of housing typologies fit into the low impact model; this example includes alley loaded narrow single family lots, cottage courts with shared garden spaces, and quadraplexes (four units inside what appears to be a large home). The resulting mix of residents could easily be multi-generational.



▲ Intersection of Old Whiskey & Whiskey Road



▲ Mini-farms and gardens as part of low impact development

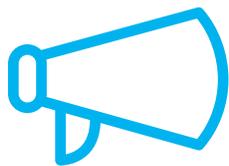


▲ Cottage court housing with shared open space

Photo Credit: neo-terra.org

NE-4 Transform the character of Main Street.

The Main Street of a small town with daily traffic volumes averaging 13,000 vehicles per day should not be carried on a typical five lane DOT section. This plan recommends utilizing the additional right-of-way to add on street parking, bicycle facilities and spot planted medians for beauty and access control. Transforming the infrastructure with these elements can still accommodate two travel lanes in each direction or the preferred alternative of one travel lane in each direction.



“Let’s take our street back.”

—Citizen Participant

NE-5 Create a facade improvement program.

Public-private partnerships are almost always necessary when revitalizing small towns such as New Ellenton. By creating a matching grant program that focuses on facade and/or exterior improvements, property owners are afforded the opportunity to elevate the sense of place their business contributes to the town. Much of the building stock along the corridor could be transformed with paint and new awnings. (see **Case Study: Let’s Paint the Town** at the end of this chapter)

NE-6 Find partnerships and incentivize strategic small scale infill along the corridor.

As illustrated in the conceptual plan for New Ellenton’s Main Street, a handful of opportunities exist for small scale infill development to weave together the village fabric. The scale of buildings should not exceed one to two stories to seamlessly tie together with the existing building stock.

NE-7 Develop workforce housing options. The encouragement of high quality workforce housing will support the addition of adjacent light industrial jobs. The current choice for affordable housing in New Ellenton is often mobile home parks directly off of Main Street. As properties redevelop over time, design standards should not allow mobile units along this frontage. The introduction of a tiny home option with shared common space should be offered as an alternative to the mobile homes as well. Narrow lot single family homes on vacant lots are also illustrated and tie into the existing neighborhood fabric.



▲ Narrow Lot Single Family Lots (Allison Ramsey Architects, Ion, SC)



▲ Katrina Cottages



▲ Tiny Home Neighborhood (allows tree preservation)

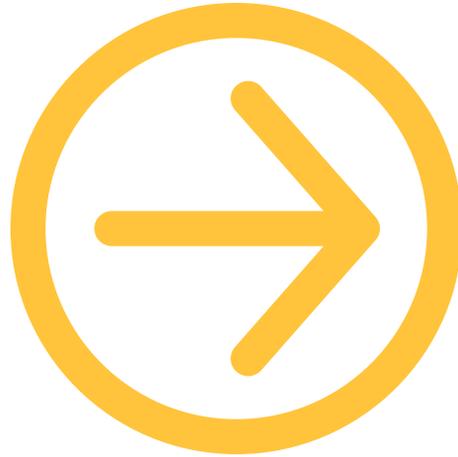
Photo Credit: thespruce.com

New Ellenton-North



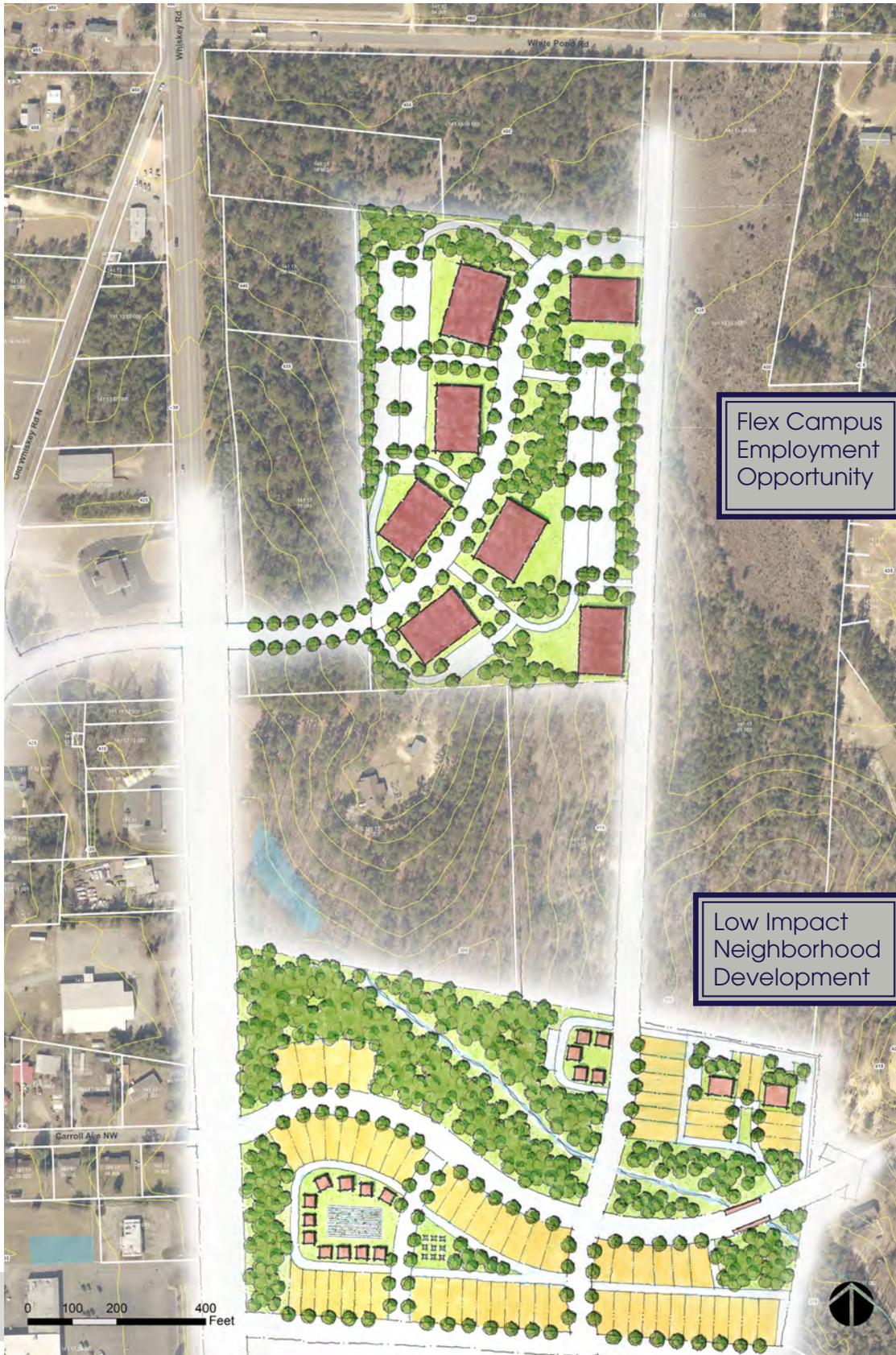
▲ Existing Conditions: White Pond Road to Meeks Avenue in New Ellenton

Development Data	
Development Type	Flex & LID
Residential Units	Total: 88 Units
Single Family Small (Cottages)	18 Units
Single Family Avg (Lots)	70 Units
Non-Residential	Total: 105,000 sf
Flex Industrial (Single Story)	105,000 SF



▲ Illustration of Flex Campus Employment Center

New Ellenton-North



▲ Proposed Improvements: White Pond Road to Meeks Avenue in New Ellenton

New Ellenton-Main Street

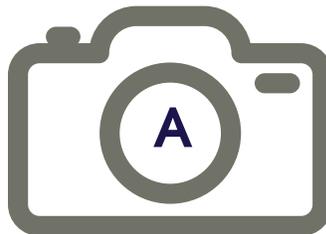
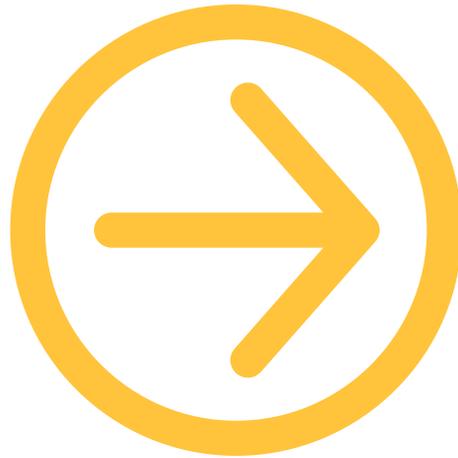


▲ Existing Conditions: Main Street in New Ellenton



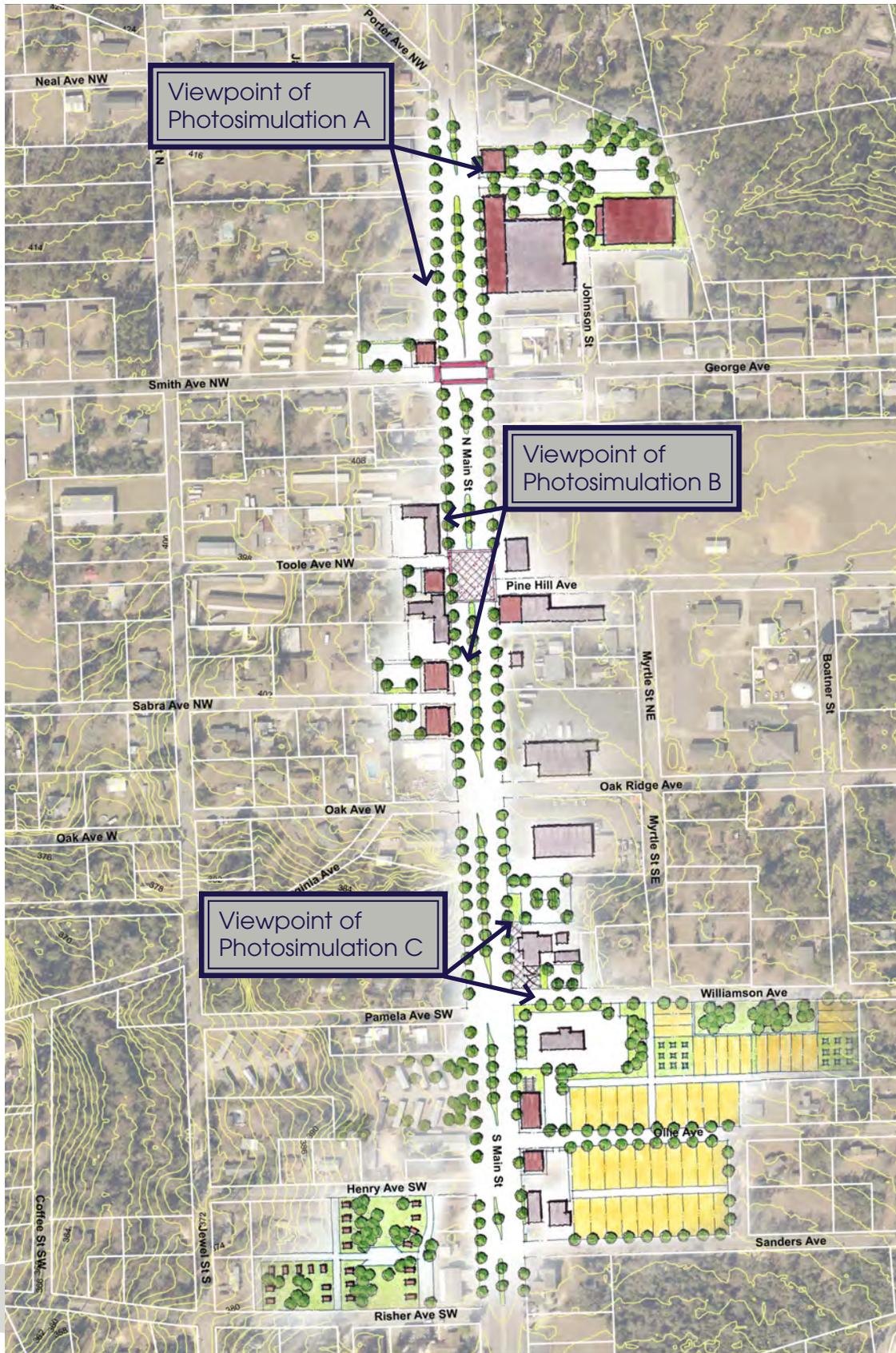
▲ Existing Conditions: Ashley on Main Furniture Gallery

Development Data	
Development Type	Village Infill
Residential Units	Total: 69 Units
Single family Small (lots)	23 Units
Single Family Avg (lots)	46 Units
Non-Residential	Total: 62,451 sf
Commercial Infill (Single Story)	40,000 sf
Flex Industrial (Single Story)	22,451 sf

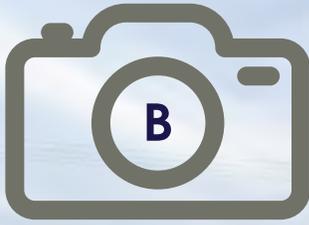


▲ Proposed Improvements: Facade Improvements for Existing Business, Signage/Wayfinding, Pedestrian Crossing & Bicycle Facilities, Planted Medians & Street Trees

New Ellenton-Main Street



▲ Proposed Improvements: Main Street in New Ellenton (Create a true Main Street for the community and utilize strategic infill.)



▲ Existing View Looking South on Main Street in New Ellenton



▲ Single Story Village Infill Development (Serenbe, GA)



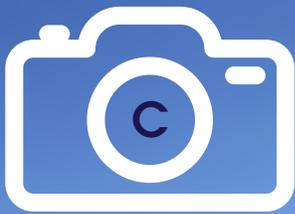
▲ Single Story Village Infill Development (Serenbe, GA)



▲ Proposed Improvements Looking South on Main Street in New Ellenton: Option A (maintain two travel lanes in each direction and parallel parking)



▲ Proposed Improvements Looking South on Main Street in New Ellenton: Option B (one travel lane in each direction with angled parking)



▲ Existing View Looking Across Main Street toward Carolina BBQ in New Ellenton



▲ Proposed Improvements Looking Across Main Street toward Carolina BBQ in New Ellenton

Precedent Imagery of Older Structures with New Use and Facade Improvements



▲ Diamond Restaurant at Plaza Midwood, Charlotte, NC



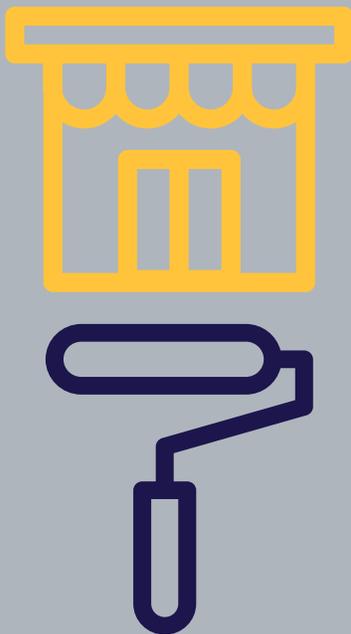
▲ Fuel Pizza (reuse of gas station), Davidson, NC



▲ Community Store, Balmoral, Victoria, Australia



▲ Ohio Small Town Museum, Ashville, Ohio



Case Study: Let's Paint the Town

“The positive change in Greenville, KY, was neither an accident nor left to chance; rather, it was the result of a small community with a vision for how to build on its local assets and infrastructure, seek innovative financing, and cultivate partnerships in a challenging economic environment. This southwestern Kentucky town’s revival can serve as a model for other small communities throughout the country working to revive their historic downtowns and Main Streets. By investing in downtown through streetscape improvements and increased pedestrian access, the city of Greenville, KY, (population: 4,000) an attractive place for entrepreneurs to open new businesses. The city and the Tourism Commission launched a “Let’s Paint the Town” initiative which joined business owners and volunteer citizens to paint building façades and restore many to their original colors and designs. Around 15 buildings were given a facelift through painting and façade restoration, including one where mid-century hand painted signs were discovered and restored after vinyl siding was removed.”

Source: <https://www.nado.org/facades-festivals-and-footpaths-greenville-kentuckys-downtown-redevelopment/>

Complete Streets & Recommendations

5

This chapter provides an overview of the transportation recommendations and an implementation strategy for the improvement options.

The development of recommendations for Whiskey Road begins and ends with respect to what the community needs, considering constraints imposed by the width of the available right-of-way and stormwater issues. These characteristics, while creating a strong sense of place and memorable vistas, create challenges for design engineers.

Over time, non-standard and in some cases undesirable design elements have crept into the corridor: sidewalks abutting fast-moving vehicular traffic; utility poles embedded in sidewalks reducing the clearance for mobility handicapped users; and narrow travelways that leave little room for error on the part of drivers.



Traffic and congestion assessments were performed for six signalized locations along the corridor. Analysis was completed for existing, no-build and build scenarios. (Figures 5.1-5.3) The build year considered is 2026. Most of these locations are performing fairly well, although some locations in the afternoon (PM) peak periods of travel are falling into a lower level-of-service (LOS E or F). Areas suffering included the higher dense areas in downtown Aiken and around the major retail areas. These are also the areas where pedestrians are more likely to be active. The large numbers of students crossing the street near the mall create both congestion for automobile traffic navigating along Whiskey Road, and potentially dangerous conditions for pedestrians.

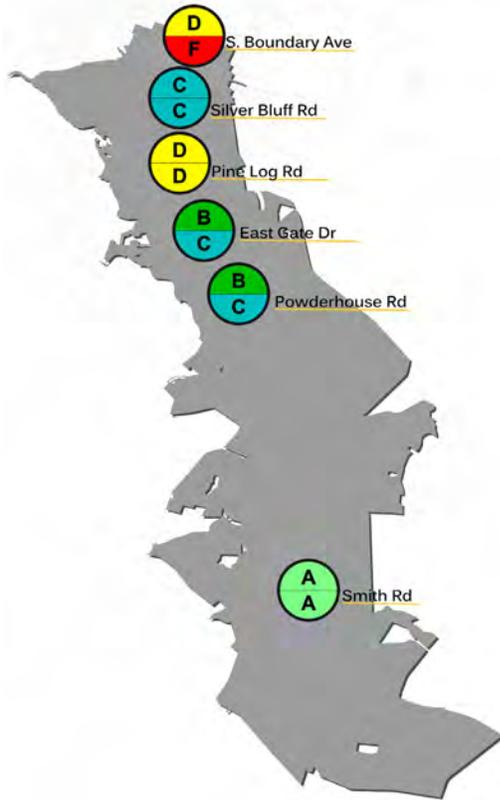
It is evident after talking to citizens, local officials and reviewing data from various analysis that additional vehicle travel lanes are not required for future growth. Addition of sidewalks, bicycle facilities and streetscaping are the needs for the corridor. The following sections address design considerations for a roadway that is safe for all modes of travel. The roadway recommendations are tailored for the context and the needs of the Aiken and New Ellenton communities.

50%

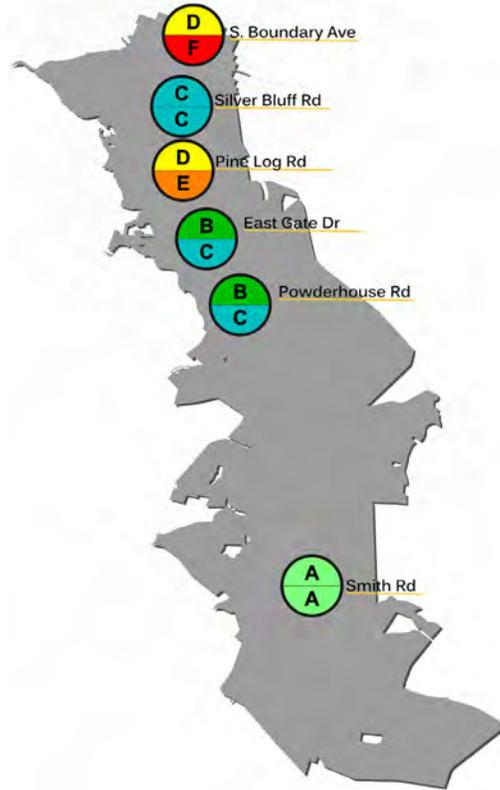
of survey respondents are satisfied with the number of existing travel lanes

75%

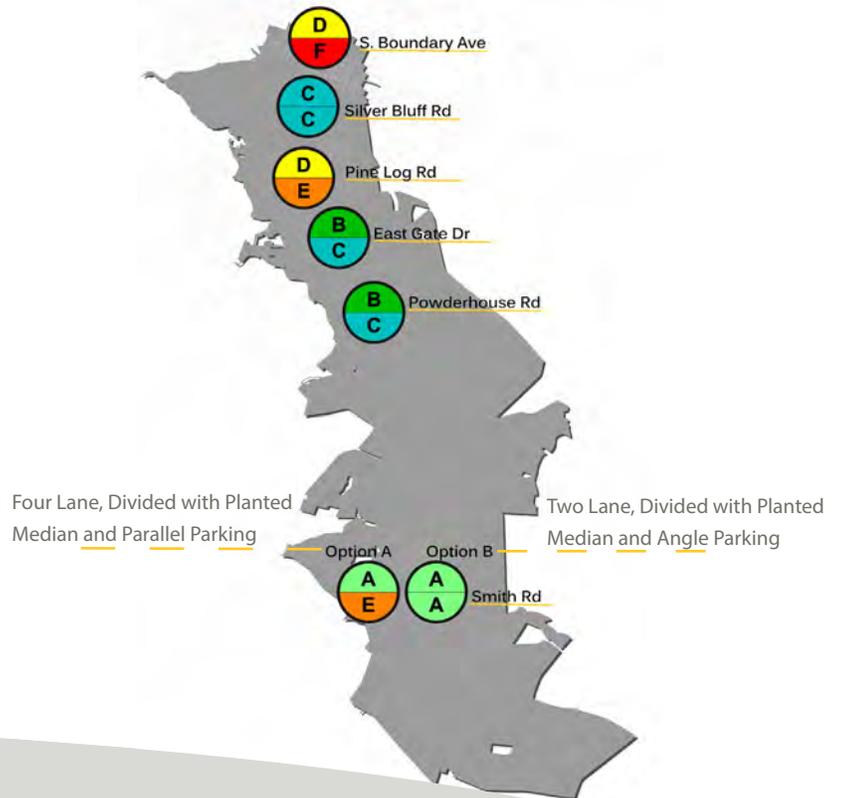
of survey respondents feel the area needs improved pedestrian crossings



▲ Figure 5.1: 2016 Existing Intersection Performance (AM times top, PM times bottom)



▲ Figure 5.2: 2026 No Build Intersection Performance (AM times top, PM times bottom)



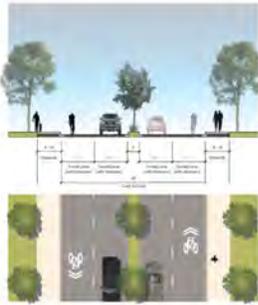
▲ Figure 5.3: 2026 Build Intersection Performance (AM times top, PM times bottom)

Complete Streets

With direction provided by local constituents including the Steering Committee, Public officials, County staff, business community, bicycle advocates, and the general public, the Project Team was able to identify key planning themes to help craft our recommendations. This input from the stakeholders, technical analysis, and the physical realities of Whiskey Road all dictated the elements that were incorporated into the final corridor design concepts.

The graphic here (Figure 5.4) illustrates how the design team addressed the major concerns of stakeholders (relative to the street) while still respecting the desire to maintain an overall vision and physical “constructability.”

It should be noted that most, if not all, of the physical improvements for bicyclists and pedestrians can be contained within the existing right-of-way. This is due to the fact that the existing ditches will be piped and covered, allowing opportunities for sidewalks and multiuse path.



New sidewalks, protected multiuse path, high quality intersection treatments, and improved connectivity are some of the suggested improvements.



TREAT WALKING AS THE MOST IMPORTANT ISSUE



The addition of street trees and better lighting, as well as recommendations to replace crumbling pavement and sidewalk, are integral to our project.



PRESENT A GREAT IMAGE TO RESIDENTS, VISITORS, AND BUSINESSES



Proposed crossing improvements for multiuse path, sidewalks at a number of locations are key recommendations.



REDUCE CRASHES AND CRASH-RELATED DELAYS



Anticipating traffic impacts from new development and proposing design standards that ensure cost-effective construction were two important points.



BETTER INTEGRATE THE ROAD WITH THE ADJACENT COMMUNITY

▲ Figure 5.4 - Complete Streets Corridor Framework

Figure 5.5: Complete Streets Basic Context Guide

Three Context Zones...

- » Defined by the overall environment and framework of the corridor
- » Stresses context-specific treatment for three primary areas:
 - Building form and massing
 - Pedestrian space and design treatments
 - Travelway modal integration (bike, transit, vehicular)



1. Travelway Zone

- » Defined by the edge of pavement or curb line that traditionally accommodates the travel or parking lanes needed for vehicles in the transportation corridor
- » Recommendations focus on modes of travel and medians
- » Travelway zone focuses on two objectives:
 - Achieve greater balance between travel modes sharing the corridor
 - Promote human scale for the street and minimize pedestrian crossing distance



2. Pedestrian Zone

- » Extends between the outside edge of the sidewalk and the face-of-curb located along the street
- » Quality of the pedestrian realm is achieved through four primary areas:
 - Continuous pedestrian facilities (on both sides of the road if possible) to maximize safety and mobility needs
 - High-quality buffers between pedestrians and moving traffic
 - Safe and convenient opportunities to cross the street
 - Consideration for shade and lighting needs



3. Building Zone

- » Define and frame the roadway
- » Building scale and massing focus on two areas:
 - Orientation (setbacks, accessibility, etc.)
 - Design and architectural character (height, etc.)



Preferred Access Plan

When developing the concept designs for Whiskey Road Complete Streets Corridor Study, several design considerations were assumed to create the highest value facility while addressing the stormwater drainage issues and minimizing construction and traffic control impacts. Because the most critical sections of Whiskey Road (i.e., near Aiken Mall) is a built environment and a retrofit of a suburban arterial, the challenges were great. Traditional design practices may be impractical and limited by the existing rights of way and challenging regional drainage problems. However, redesigning Whiskey Road to address the drainage issue will provide a greater opportunity to accommodate a higher level of bicycle and pedestrian activity, mobility and safety improvements.

The following design criteria were used when designing the Whiskey Road improvements.

- » Terrain: level (poor positive drainage).
- » Design Speed: 50 mph (Rural); 40 mph (Suburban); and 30 mph (Urban)
- » Lane widths: 11 - 12 foot wide preferred, 11-foot minimum (as approved by SCDOT).
- » Cross slope: 2%.
- » Shoulder widths: 1.5 - 2 feet wide, curb and gutter (Historic, Suburban and New Ellenton). Ditch section (3:1 slope) in Rural Transition Zone
- » Multiuse Path/Sidepath: 10-foot wide for bicycle and pedestrian use.
- » Sidewalks: 6-foot wide sidewalk preferred, 4-foot minimum (with planing strip), wider sidewalks desirable where space allows.
- » Grades: Maximum 4% grade (matches existing based on existing geometry from Pine Hollow to US 278).
- » The following provides a description of all associated design considerations for the Whiskey Road Complete Streets and Stormwater corridor improvements. Many of these items have been discussed previously in more detail.

From South Boundary Avenue to US 278 (near New Ellenton), Whiskey Road represents a narrow and sometimes dangerous passageway for vehicles,

pedestrians, and buses through a historic district and traversing through a heavily commercial area before passing through a rural section of the County. Issues related to dangerous drainage ditches, poor infrastructure design, sight distance problems, safety issues and lack of bicycle and pedestrian facilities have plagued the corridor for decades. The corridor already supports up to 26,000 vehicles per day. Compound this with the impending development pressures of 1,000 new homes, commercial development and multi-family units within the study area and the warrants for additional multimodal improvements become obvious.

Figure 5.6: Preferred Access Plan provides a high level view of the entire corridor and the associated improvements. Note, that this reflects a 20 year design plan that incorporates connectivity, as well as, signal improvements as development occurs. The following Complete Streets and connectivity design improvements are included:

- » **Spacing Standards “Rules of Thumb”:** for signals, street connections as well as driveway separation to protect the access management along the corridor.
- » **High Quality Intersection Treatments:** to enhance the safety and mobility for pedestrian and bicycle crossing. These design treatments include high-visibility crosswalks, pedestrian count downs, street trees, and pedestrian level lighting. The spacing of these with the Historic District and Suburban Transitional Zone are 90 second walk to nearest crossing.

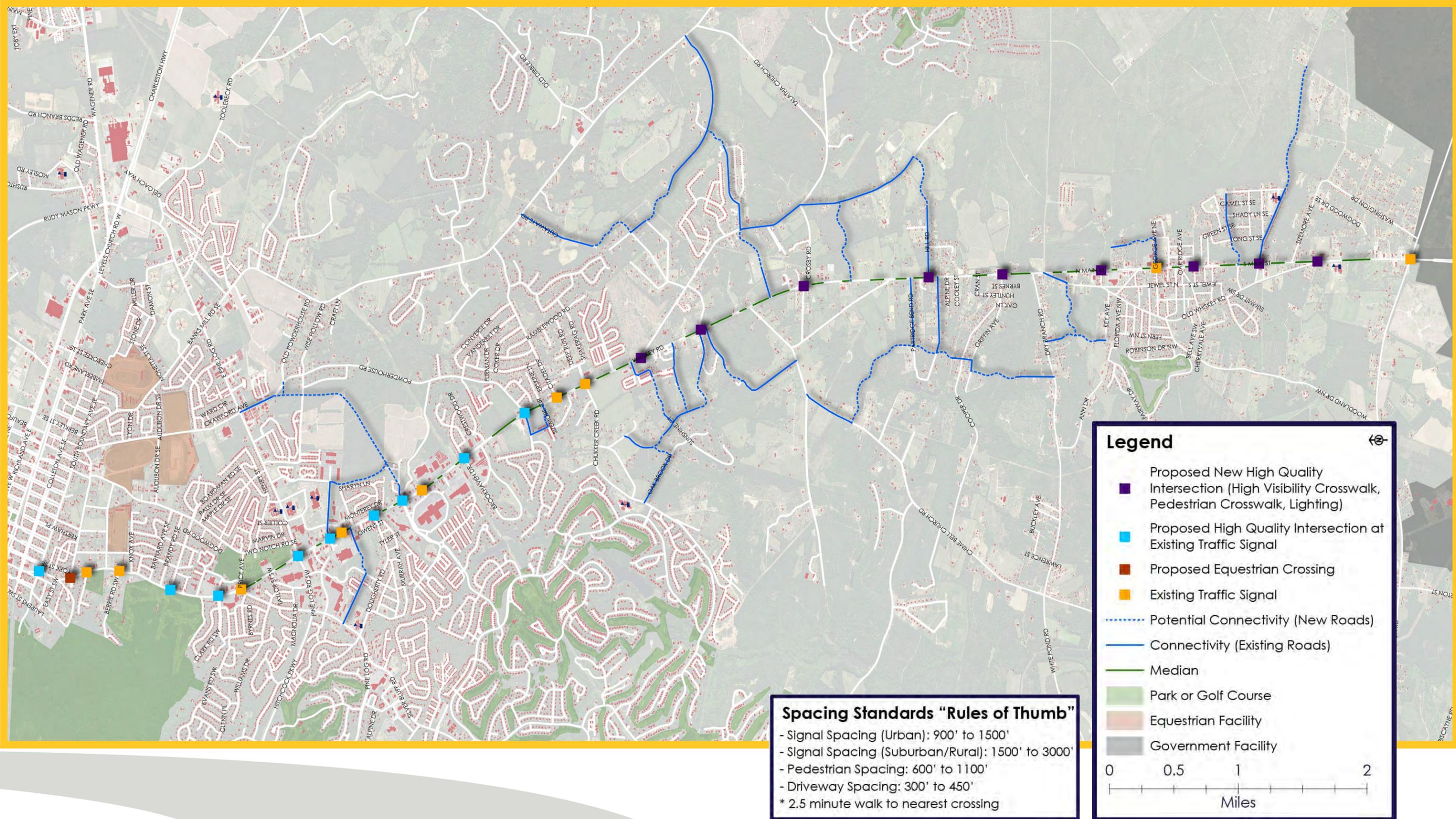


- » **Equestrian Crossing Treatments:** due to the high number of horse crossings at Grace Avenue, there is a need to improve the visibility and awareness at this intersection. Using passive and active treatments, this intersection can be improved to include flasher beacons, high visibility crosswalks, textured pavement and lighting.
- » **Connectivity:** enhanced street connectivity is essential to protecting the mobility and safety along Whiskey Road. The Preferred Access Plan highlights specific connections to be made through development and redevelopment activities. These new connections reflect new 2- or 3-lane facilities, typically built by the development community. (see blue dashed lines)



▲ Typical Collector Street Design Features

Figure 5.6: Preferred Access Plan



Legend

- Proposed New High Quality Intersection (High Visibility Crosswalk, Pedestrian Crosswalk, Lighting)
- Proposed High Quality Intersection at Existing Traffic Signal
- Proposed Equestrian Crossing
- Existing Traffic Signal
- ⋯ Potential Connectivity (New Roads)
- Connectivity (Existing Roads)
- Median
- Park or Golf Course
- Equestrian Facility
- Government Facility

0 0.5 1 2
Miles

Spacing Standards "Rules of Thumb"

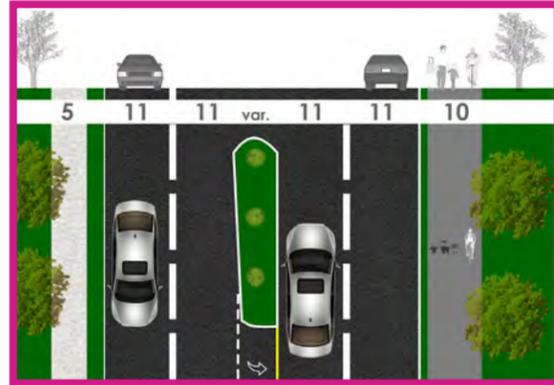
- Signal Spacing (Urban): 900' to 1500'
- Signal Spacing (Suburban/Rural): 1500' to 3000'
- Pedestrian Spacing: 600' to 1100'
- Driveway Spacing: 300' to 450'
- * 2.5 minute walk to nearest crossing

Figure 5.7: Roadway Recommendations-Cross Sections by Area

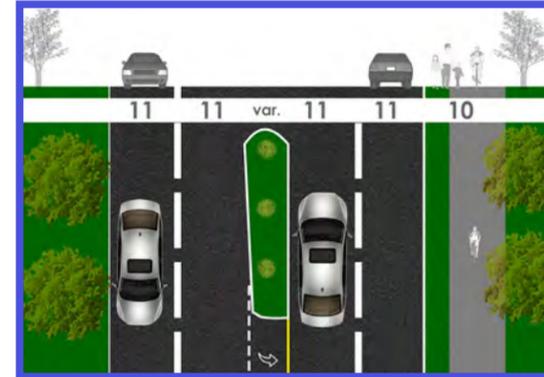
Historic District



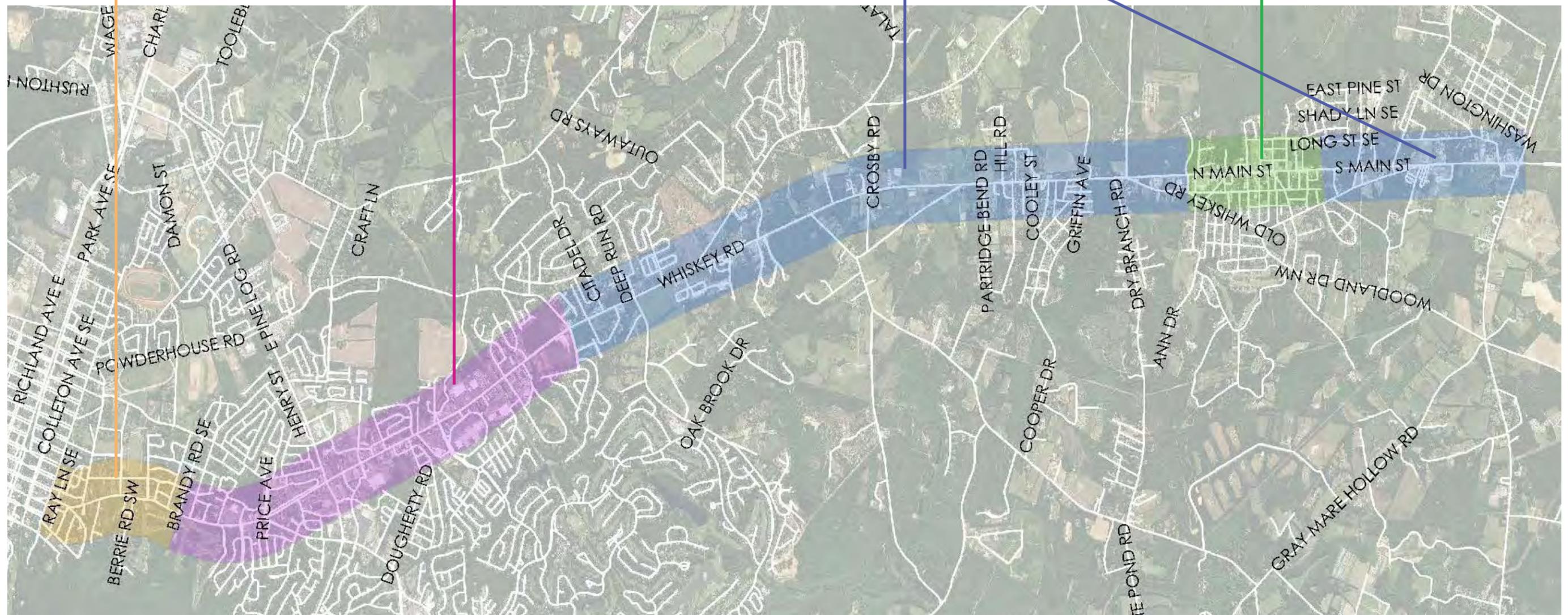
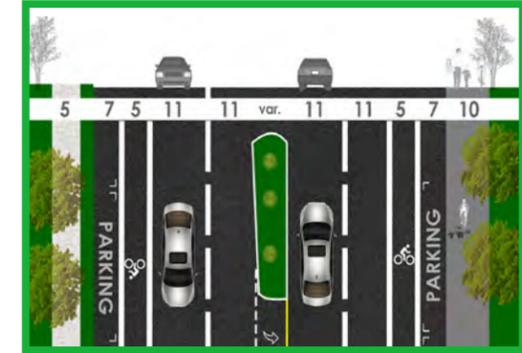
Suburban Zone



Rural Transition Zone



New Ellenton



Concept Designs & Recommendations

The design considerations for each section of the roadway (Figure 5.7) are described below followed by the concept designs, engineered using AutoCAD™. This section shows graphically (see cross-section for each Context Zone), how the typical cross sections developed for this project are used to create a context-sensitive and seamless set of design solutions that addressed the specific needs of various corridor segments.

Historic District

This segment of Whiskey Road includes recommendations for High Quality intersection treatments (for bicycle, pedestrian and equestrian crossings) at South Boundary Avenue, Grace Avenue, and Coker Springs Road and minor upgrades for sidewalks. Replace existing roll curb with curb & gutter and drainage between Summerall Court and Pine Hollow Road. Add plantable median islands at five locations along this segment of corridor to improve aesthetics and slow down vehicles (traffic calming).



▲ South Boundary Crossing Before



▲ South Boundary Crossing After



▲ Equestrian Crossing Before



▲ Equestrian Crossing After



Suburban Zone

Stormwater recommendations for this segment include piping the existing ditches and installing curb and gutter. This will allow for improvements to be made above ground without necessitating additional right-of-way. Transportation recommendations for this segment of Whiskey Road include installing a continuous 6' wide sidewalk on the west side of the corridor and a 10' wide multiuse path (or Sidepath) on the east side of the corridor. A 4' planting strip and street trees would allow for proper shade along the corridor. High Quality Intersection treatment crossings (for bicycle and pedestrian) would include high-visibility crosswalks, pedestrian count downs and pedestrian level lighting. Designated High Quality Intersections include:

- » Pine Log Road
- » Corporate Parkway
- » Monterey Drive
- » Dougherty Road
- » East Gate Drive
- » Athol Avenue
- » Brookhaven Drive
- » Powderhouse Road



▲ Suburban Zone Streetscape Before



▲ Suburban Zone Streetscape After



Rural Transition Zone

Stormwater is not a current issue within this segment of Whiskey Road. Transportation recommendations for this segment include installing continuous 10' wide multiuse path (or Sidepath) on the east side of the corridor. A 4' planting strip and street trees would allow for proper shade along the corridor. High Quality Intersection treatment crossings (for bicycle and pedestrian) would include high-visibility crosswalks, pedestrian count downs and pedestrian level lighting. Designated High Quality Intersections include Citadel Drive, Chukker Creek Road and George Avenue, as well as, several future signals installed along this segment of the roadway as warrants are met (see Preferred Access Plan).



▲ Rural Zone Before



▲ Rural Zone After



New Ellenton Zone

Stormwater recommendations for this segment include installing curb and gutter and drainage. There are two options for improving the transportation infrastructure along this segment of the corridor. In particular, this segment is a 3-block area of town that reflects New Ellenton's "Main Street". However, there are no amenities for people (bicycle, pedestrian, or transit). The following recommendations provide two options for creating a unique sense of place and identity for New Ellenton.

Option A

Convert existing roadway to a 4-lane with plantable median islands, parallel parking and wide sidewalks on both sides. Transportation recommendations for this segment include installing continuous sidewalks on both sides. A raised pedestrian table between the offset intersections of Pine Hill Avenue and Toole Avenue – marking the center of Town. Pedestrian level lighting and street trees would allow for proper shade along the corridor. High Quality Intersection treatment crossings (for bicycle and pedestrian) would include high-visibility crosswalks, pedestrian count downs and pedestrian level lighting. Designated High Quality Intersections include George Avenue and Oak Ridge Avenue.

This proposed cross section includes two options for re-purposing the lanes as seen in the attached graphic. The first option includes two travel lanes and parallel parking. The second option includes two travel lanes and a buffered bike lane. Both options require the same roadway width. One of the two options should be chosen based on local needs and desires.



New Ellenton Zone

Option B

Convert existing roadway to a 2-lane with plantable median islands, angled parking and wide sidewalks on both sides. With a current traffic demand of only 12,000 vehicles per day, this presents a good opportunity to slow vehicles passing through Town providing a “Road Diet”. Transportation recommendations for this segment include installing continuous sidewalks on both sides. A raised pedestrian table between the offset intersections of Pine Hill Avenue and Toole Avenue – marking the center of Town. Pedestrian level lighting and street trees would allow for proper shade along the corridor. High Quality Intersection treatment crossings (for bicycle and pedestrian) would include high-visibility crosswalks, pedestrian count downs and pedestrian level lighting. Designated High Quality Intersections include George Avenue and Oak Ridge Avenue.



▲ *New Ellenton Zone Before*



▲ *New Ellenton Zone After; Option A*



▲ *New Ellenton Zone After; Option B*



Concept Designs

Historic District



Suburban Zone





STORMWATER BMPS

-  TREE BOX FILTERS
-  VEGETATED FILTER STRIP
-  ENHANCED SWALES



Rural Transition Zone



New Ellenton





STORMWATER BMPS

-  TREE BOX FILTERS
-  VEGETATED FILTER STRIP
-  ENHANCED SWALES

TREE BOX FILTERS



VEGETATED FILTER STRIP



ENHANCED SWALES





Costs and Phasing

The ultimate success of the Whiskey Road Corridor Study rests on the ability of local and state officials and leaders to carry out the recommendations of the plan. This effort is made easier by describing a series of defined steps — or action items — to move the process forward. However, defining the cost and potential funding mechanisms will allow a framework or “blueprint” for implementation. From the outset of the study, a key objective was to develop cost-effective recommendations (at a variety of scales) that set the stage for additional improvements to Whiskey Road in the future. With a diminishing return on the dollar, all efforts should focus on creating an environment conducive to change along the Whiskey Road corridor.

Like other corridors throughout the state, Whiskey Road has crossed the line where commuter-based traffic congestion, unsafe travel conditions, and non-sustainable development patterns are no longer are tolerated.

The quality of private investment in both design and community amenities will have a profound impact on the attractiveness of the area, and successful and sustainable development will come only through a cooperative effort between public and private ventures.

The following Table 1 provides a breakdown of the construction costs associated with the Whiskey Road recommended transportation improvements. These include items related to Complete Streets, landscaping, signal improvements, sidewalks, new pavement, structures, curb and gutter, traffic control, etc.

The opinion of probable cost for constructing the 11 miles of transportation improvements is approximately \$15 million.

Tables 2 and 3 provide a breakdown of costs for stormwater improvements for the area. The costs were broken down in two options with a pumping station as they relate to the recommendations. The opinion of probable cost for stormwater improvements is approximately \$21.2 million for alternative A and \$24 million for alternative B.

Table 1: Estimated Costs Summary - TRANSPORTATION

Segment	Description	Length (mi.)	Construction Costs
South Boundary Ave to Summerral Court	Intersection treatments for bicycle, pedestrian and equestrian crossings. Sidewalks upgrades, replace roll curb with curb and gutter and planted medians.	.81	\$1,050,000
Summerral Court to Pine Log Street	Install 5 foot sidewalks on west side. Intersection treatments added as well as a 4 foot planting strip and pedestrian scale lighting.	1.3	\$1,590,000
Pine Log Road to Twin Lakes Drive	Intersection treatments for bicycle, pedestrian, sidewalks, and 10 foot wide sidepath on east side. Additional curb and gutter installed and plantable median islands.	2.1	\$3,550,000
Twin Lakes Drive to George Avenue	Add plantable median islands, intersection improvements and 10 foot wide sidepath on east side.	5.2	\$5,290,000
George Avenue to US 278 (Phase A)	Convert existing roadway to four lanes. Also add sidewalks, raised pedestrian table between intersection of Pine Hill Avenue and Toole Avenue, pedestrian scale lighting, intersection improvements, and plantable median islands..	2.0	\$3,780,000
George Avenue to US 278 (Phase B)	Roadway change to two lanes with plantable median, angled parking and wide sidewalks on both sides. A raised pedestrian table added between Pine Hill Avenue. and Toole Avenue.	2.0	\$3,860,000
Total			\$15,340,000

Total cost includes Phase A only. No Right of way costs included.

Table 2 : Estimated Costs Summary - STORMWATER - ALTERNATIVE A

Phase	Description	Construction Costs
Option A I	Wise Hollow Creek Drainage Project (Elmwood Park to Banks Mill Road) See Fig. 9	\$5,060,000
II	Regional Pond (large) (behind Hobby Lobby) See Fig. 9	\$5,420,000
III	Elmwood Park and Whiskey Road Drainage Improvements (Include Brookhaven Drive Improvements) (Oak Grove/East Gate Drive to Twin Lakes Drive) see Fig. 9	\$5,080,000
IV	Whiskey Road Drainage Project (Corporate Parkway to Oak Grove/East Gate Drive) See Fig. 9	\$5,670,000
Total		\$21,230,000
Option B I	Pump Station	\$20,280,000
II	Elmwood Park and Whiskey Road Drainage Improvements	\$5,080,000
III	Whiskey Road Drainage Project	\$5,670,000
Total		\$31,030,000
	Wise Hollow Creek Drainage Project	\$4,000,000

Table 3: Estimated Costs Summary - STORMWATER - ALTERNATIVE B

Phase	Description	Construction Costs
IA	Route Through Regional Pond and Basin Routing (Behind Walmart) See Fig. 9	\$340,000
IB	Dougherty Road Basin Routing See Fig. 10	\$6,200,000
IC	Brookhaven Drive Improvements and Basin Routing See Fig. 10	\$710,000
II	Wise Hollow Creek Drainage Project See Fig. 10	\$4,000,000
III	Regional Pond (Smaller) See Fig. 10	\$2,910,000
IV	Elmwood Park and Whiskey Road Improvements (Does not include Brookhaven Improvements) (Oak Grove/East Gate Drive to Twin Lakes Drive) See Fig. 10	\$5,030,000
V	Whiskey Road Drainage Project (Corporate Parkway to Oak Grove/East Gate Drive) See Fig. 10	\$4,890,000
Total		\$24,080,000

Pilot Project

What can we do now for around \$2 million?

In an effort to move forward with some of the initial improvements, the County (in cooperation with SCDOT and the City of Aiken), should consider one of the following options for implementing a cost-effective improvement (approximately \$2-\$3 million). Since the impetus for the overall Whiskey Road improvements was to address issues related to the stormwater, all three options identify stormwater improvements. Each project can be funded and constructed independent from any other project. *Full roadway and drainage design, including surveys, utility coordination, stormwater and roadway design elements for the entire 11 mile corridor is approximately \$2.6 million. See appendix for a complete breakdown of design costs.*

Option #1: Start design and construction of a downstream infrastructure improvements within the Suburban Zone in proximity to Wise Hollow Creek (Alternative A - Phase I (partial)) at a cost of approximately \$2.2 million. This cost does not include any stormwater retention or easement acquisition with a total project costs of \$5 million. See map 2.8

Option #2: Repair and maintain existing stormwater infrastructure from South Boundary Avenue to Summerall Court at a cost of approximately \$1.9 million. This includes the addition of drainage inlets and maintaining existing pipe infrastructure, including Intersection treatments for bicycle, pedestrian and equestrian crossings. Sidewalk upgrades, replace roll curb with curb and gutter and planted medians.

Option #3: Enhance stormwater infrastructure from Summerall Court to Pine Log Road at a cost of approximately \$3.0 million. This includes installing new curb & gutter and drainage inlets, as well as, construct sidewalks and median islands.

Table 4 - Estimated Costs Summary - STORMWATER - Pilot Project

Option	Description	Construction Costs
1	Downstream Infrastructure Improvements	\$2,200,000
2	Repair and Maintain Existing Infrastructure	\$1,870,000
3	Enhance Infrastructure and install curb and gutter	\$3,080,000

Appendix A

Stormwater

BMPs

SELECTION OF BMPs

PURPOSE

The purpose of this Stormwater Best Management Practices (“BMPs”) Infrastructure Plan is to provide a collection of generic stormwater BMPs for potential use along the Whiskey Road Corridor and potentially other areas of Aiken County. This plan identifies and describes a group of proposed stormwater BMPs to address a range of stormwater volume and pollution control. In the identification of these BMPs there will be provided general information which includes sizing requirements, and critical design parameters. Many of the BMPs describes have the potential to be scalable to match the discharge volumes, pollutant loads, and anticipated site conditions. This Infrastructure Plan emphasizes structural BMPs and includes a recommendation for incorporating both Green-Infrastructure (“GI”) and Low-Impact Development (“LID”) techniques. This document could be incorporated within the development document standards currently in place and used by the City of Aiken and Aiken County during private development site plan reviews and municipal capital improvement projects along the corridor. This Infrastructure Plan contains discussion for selection of BMPs, fact sheets for a variety of BMPs, a BMP selection matrix, a technical guidance section that focuses on Low Impact Development Techniques (LID) and general guidance of BMP placement based on location along the corridor. This document should be updated as new regulations and guidelines are implemented, as well, as when new BMP technologies and applications are accepted by SCDHEC and the engineering community.

GENERAL CONSIDERATIONS

The first step in selecting suitable BMPs for a site is to assess the existing site conditions. This section focuses on a number of factors that should be considered in regards to the implementation of BMPs in an urban environment.

Site Suitability

There are a wide range of BMPs available for urban environment application, from rain barrels that require little space to constructed stormwater wetlands that require a much larger footprint. The scale of the BMP is directly related to the size of the construction project. For example, size limitations may make it impractical for private landowners to design and install a stormwater wetland for a redevelopment project. However, features such as rain barrels and planter boxes, which capture roof runoff for on-site watering demands, could be incorporated into even the smallest projects. Parks or grassed areas adjacent to roadways may be ideal location for the implementation of larger scale BMPs such as a water quality swales or bio-retention areas.

Physical site constraints, which should be considered, include soil conditions, watershed size, depth to water table, depth to bedrock and slope. Often times BMPs can be modified and/or adapted to fit the physical constraints of a given site.

Soils

Soils regulate the process of surface runoff, infiltration and percolation, and are a major controlling factor in evapotranspiration through the capacity of the soil to store and release water. Furthermore, soils play an important role in removing pollutants from the water column via sorption to soil particles. The characteristics of soils at any particular site should be carefully considered during site planning.

Soil types and subsequent infiltration rates vary widely and can include a wide variety of fill types, possible contamination, organic material, and bedrock. As a result, soils should be evaluated carefully at each site and BMPs that provide groundwater recharge (i.e., dry wells) should be selected only if the site is comprised of soils that meet the infiltration requirements.

Groundwater

The depth of seasonal high groundwater is also an important factor to consider when selecting BMPs suitable for groundwater recharge requirements. Information such as distance between the ground surface and the groundwater table, depth and direction of groundwater flow, seasonal groundwater variation, regional geology, and the slope of the water table are important factors to consider. The groundwater table acts as an effective barrier to exfiltration through the BMP soil media and soils below and can prevent an infiltration BMP from draining properly.

The typical depth to groundwater ranges from 5 to 30 feet along the corridor; however, it can vary widely based on topography and underlying soil types. When developing ground water recharging BMPs additional geotechnical reporting will be required to develop a complete profile of the area to ensure that sufficient infiltration is possible.

Available Pervious Area

Pervious areas in the urban environment are critical to providing effective stormwater treatment. Several stormwater BMPs require pretreatment, which can consist of a vegetated buffer strip and all infiltration BMPs largely depend on pervious areas. For sites with high areas amounts of development, new pervious areas may be created by removing impervious surfaces. Similarly, for sites with poor permeability, a suitable BMP may be to over-excavate and backfill the area with a more permeable substrate to increase the capacity of the drainage system by increasing subsurface stormwater storage availability and the overall permeability.

Existing Infrastructure

Utilities such as gas lines, water and sewer lines, electricity, telephone, and optical cables are often located underground and can further complicate placement and selection of BMPs. Construction activities that involve excavation or the use of large construction equipment must be carefully planned and executed to avoid costly and potentially dangerous damage to overhead or underground utilities.

Cost Constraints

Cost is an important factor to consider for the implementation of stormwater BMPs. In addition to traditional capital costs, whole life cycle (WLC) costs should also be considered. WLC costs account for capital, operational, and maintenance costs. Cost estimation can be difficult due to the following:

- Project site variability;
- Unforeseen site conditions, particularly with retrofit situations, including subsurface conflicts, spatial constraints, site accessibility, safety and security;
- Differences and quality of planners, designers, and contractors;
- High cost of engineering, permitting and construction management; and
- Construction related issues such as accelerated constructions schedules, unsuitable designs, and the use of non-standard components.
- Variability in operations and maintenance costs

The estimated costs are general guidelines and the engineer should consider the additional factors listed above that could influence the final cost for implementation of the various BMPs listed below.

BMP SELECTION MATRIX

The BMP Selection Matrix (Appendix A) was developed to facilitate the inclusion of stormwater BMPs within development and/or redevelopment activities along the corridor. The purpose of this matrix is to aid in the selection of the appropriate BMPs for the particular sites of interest.

The BMP Selection Matrix includes the following categories:

- Construction Cost Range – provides an estimated typical range of construction cost for each BMP. This cost may vary depending on site hydrology, soils and location.
- Applicability – provides an estimate of the typical land use suitability, general space requirements, if BMP requires groundwater recharge, soil requirements, maintenance needs, drainage acres, and pretreatment requirements.
- Unit Processes – provides a summary of the unit treatment processes the BMP is capable of providing such as volume reduction, peak reduction, filtration, sorption, and biological process. These unit processes are ranked as H (high), M (medium), or L (low).
- Target Pollutants – provides a summary of the pollutant removal capabilities of a BMP such as sediment, nutrients, bacteria and metals. The target pollutants are ranked by H (high), M (medium) and L (low) for each BMP.

BMP FACT SHEETS

BMP Fact Sheets for each of the BMPs listed in Table 1 are attached and incorporated as Appendix B. Each BMP Fact Sheet includes the following:

- BMP Description;
- Suitable Applications, Advantages and Limitations;
- Recommended Design, Construction and Maintenance Considerations;
- Applicability to SC DHEC Stormwater Standards
- Cost Considerations; and
- Illustrations of each BMP.

The BMPs chosen for inclusion in the fact sheets are versatile systems that can be easily adapted and/or used in conjunction with other BMPs for varying site characteristics (i.e. tributary area, soil permeability, slope, land availability, depth to seasonal high groundwater table).

TECHNICAL GUIDANCE

GREEN INFRASTRUCTURE AND LOW IMPACT DEVELOPMENT TECHNIQUES

Green Infrastructure (GI) and Low Impact Development (LID) are sustainable stormwater runoff management approaches. These approaches use distributed micro-scale stormwater runoff management principles and practices to mimic the natural hydrologic cycles to treat runoff through the processes of storage, infiltration (groundwater recharge), evapotranspiration, and filtration (MA EOEEA, 2011; Low Impact Development Center, 2007). Integrating these practices into new development and redevelopment begins at the planning level. Careful site planning includes reducing the amount of directly connected impervious areas, fitting the proposed improvements to the site terrain, preserving and using the natural drainage systems, and planning to replicate pre-development hydrology.

LID and GI approaches involve non-structural changes as well as structural controls. The non-structural practices take the form of broader planning and design approaches. Non-structural practices prevent stormwater generation, as opposed to structural practices, which mitigate stormwater impacts once the issues arise. Stormwater/impacts and issues can be prevented/minimized by encouraging developers and/or private landowners to implement land development practices such as:

- Preserving site vegetation which absorbs and reduces the amount of stormwater runoff;
- Maintaining natural buffers and drainage ways to slow and store water, promote infiltration and filter pollutants;
- Designing using cluster and concentration of development;
- Using native vegetation to reduce irrigation demand, fertilizers and pesticides;
- Minimizing disturbance and maintenance;
- Disconnecting, distributing and decentralizing practices;
- Source control;
- Reduction of impervious area by eliminating curbs and gutters, which promotes infiltration to grassy areas, decreasing driveway length and/or width; and
- Providing street and parking lot sweeping to remove accumulated solids.

LID and GI structural approaches include:

- Planning location of structural BMPs which provide easy access for maintenance to reduce disturbance to existing areas;
- Using construction erosion and sediment control practices, to minimize migration of sediment during construction; and
- Choosing BMPs that promote infiltration, filtration, blend with natural terrain and reduce the disturbance footprint.

Some structural practices that provide these design and planning techniques are stormwater treatment trains. A treatment train is a series of BMPs to provide removal of coarse sediment (pretreatment BMP) followed by a treatment, filtration or infiltration BMP to provide peak attenuation, groundwater recharge or reduction of primary pollutants. An example of a treatment train is the drainage from a roadway and

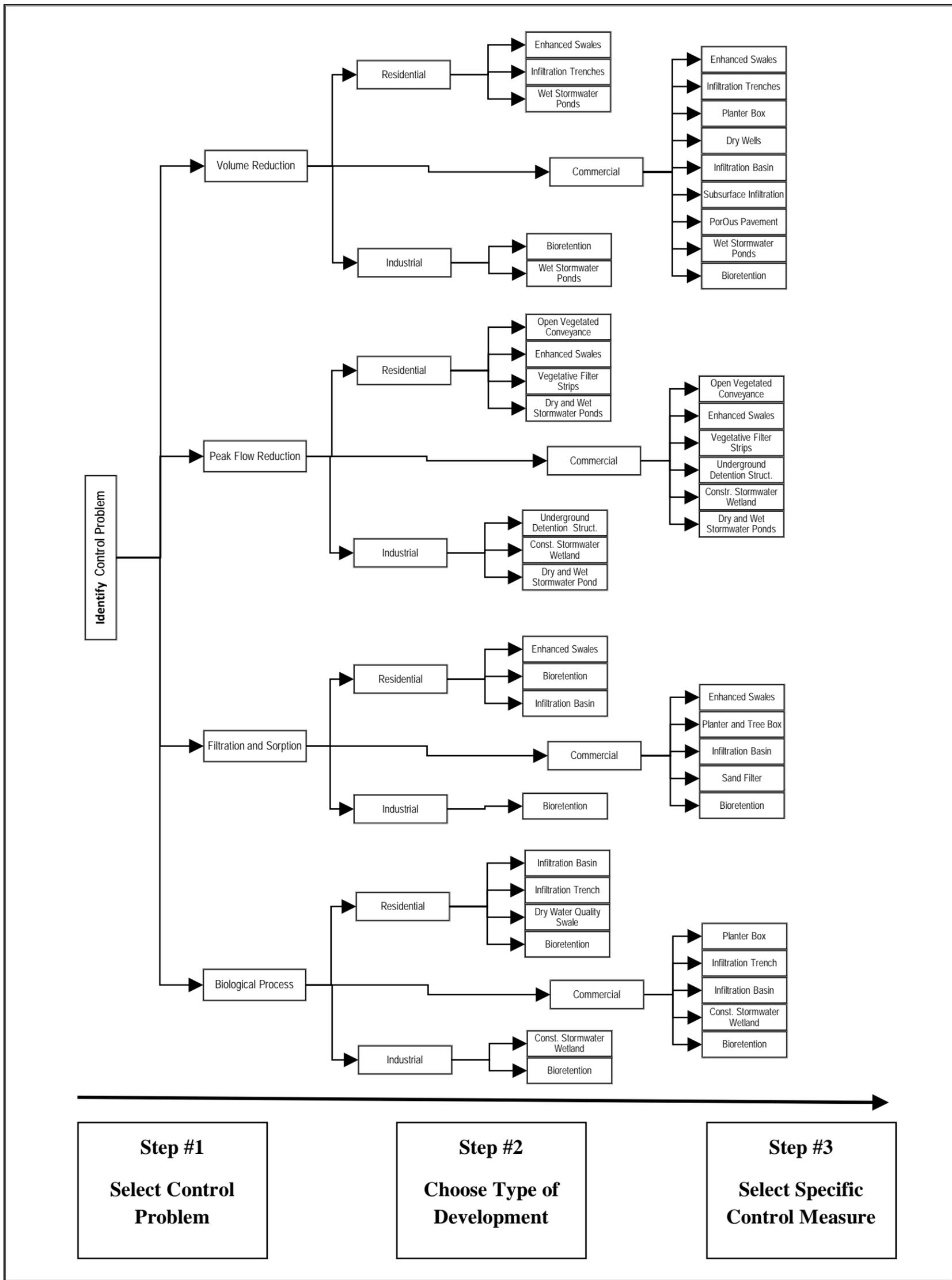
sidewalk being pretreated with a vegetated filter strip which discharges into a bio-retention area, which then provides filtration and or infiltration prior to discharging into the closed stormwater system.

EVALUATION METHODS FOR BMPS

BMP performance is often evaluated based upon effluent quality. The effluent quality of a BMP describes the concentrations of various pollutants in the flows discharged from the BMP. Other methods of quantifying the efficiency of a BMP include percent removals of pollutant loads. Traditionally, the efficiency of BMPs have often been described and compared based on percent removal of pollutants. However, BMPs do not typically function with a uniform percent removal across a range of influent quality concentrations. BMPs demonstrate high percentage removals under high loadings and poor percentage removal where pollutant concentrations are low. In highly developed, urbanized tributary areas such as industrial or commercial areas, with potentially high pollutant concentrations in stormwater runoff, the designed BMP may achieve the desired pollutants removal efficiency; however, the system may still discharge at concentrations detrimental to the receiving watershed. In under-developed or residential areas with low inflow pollutant concentrations, the designed BMP may not achieve the desired pollutant removal efficiency because the inflow concentrations are relatively low; however, the system may discharge at concentrations below levels that impair the receiving watershed. Percent removal alone, even where the results are statistically significant does not provide a useful assessment of BMP performance.

Stormwater BMPs need to be scalable to account for larger flows and higher pollutant loads from different land use types. For example, proprietary devices are most often completely scalable by simply increasing their size, flow capacity, or surface area of treatment. Underground systems that use cartridges for filtration can be configured to include more surface area of treatment within the device. Practices that require stormwater detention can be increased in size in drainage areas where flows are concentrated and occur in volumes larger than anticipated. If filtering BMPs are used, proper design for flow is required to account for overflows or bypass during extreme precipitation events. In urban areas, the filter media may require more frequent maintenance to prevent clogging and to account for higher pollutant loading. The key is to properly size the selected BMPs based upon a hydrologic assessment of the drainage area.

Permanent Stormwater BMPs Selection Flow Chart



Note:

This flow chart is for general information purposes only. Sites can vary based on many factors including development intensity, soil conditions, redevelopment opportunities, land requirements, maintenance needs, budget, etc. Engineers and plan reviewers should review BMPs on a case-by-case and site-by-site basis for effectiveness and suitability for the location.

Table 1. BMP Matrix

BMP Type	Target Pollutants ⁴				Construction Cost Range ²	Applicability							Unit Process ¹				Recommended Use in Areas ⁵
	Nutrients	Bacteria	Metal	TSS Removal		Suitable for Redevelopment	Provides Ground Recharge	Land Requirement	Maintenance Needs ³	Requires Pretreatment	Soil Requirements	Drainage Area (Acres)	Volume Reduction	Peak Flow Reduction	Sedimentation	Filtration & sorption	
Bioretention	M	H	H	H	\$5 - \$30 per Square Foot	√	√	Medium	H	√	None	1-2	M	L	H	H	1 and 2
Constructed Stormwater Wetland	M	L	H	H	Varies			High	L		None	Varies	L	H	H	M	3 and 4
Disconnect Impervious Areas	H	L	L	H	\$20 to \$30 per Square Foot	√		Medium	L		None	Varies	H	M	H	M	1 and 2
Dry Stormwater Ponds	L	L	M	M	Varies			Very High	M		None	Varies	L	H	M	M	2, 3, and 4
Dry Wells	L	L	L	H	\$500 - \$1,000 Each	√	√	Low	H		Permeable	0-1	H	M	H	M	1 and 2
Enhanced Swales	L	L	M	H	\$10 per Linear Foot	√	√	High	L	√	Permeable	5 Max	L	L	H	L	2, 3, and 4
Green Roofs	H	L	L	L	Varies	√		N/A	M		None	N/A	H	M	L	L	2
Infiltration Basins	H	H	H	H	Varies	√	√	Medium	H	√	Permeable	5 Max	H	M	H	H	2 and 3
Infiltration Trenches	H	M	M	H	\$50 - \$80 per Linear Foot	√	√	Medium	H	√	Permeable	5 Max	H	L	M	M	2 and 3
Manufactured Separator Devices	L	L	L	M	\$8,000 to \$15,000 Each	√		Low	H		None	N/A	L	L	M	L	All
Open Vegetated Conveyance	M	L	M	M	\$10 - \$30 per Linear Foot	√		Medium	M		None	5 Max	L	M	L	M	2, 3, and 4
Planter Box	M	H	H	H	\$24 - \$32 per Square Foot	√		Medium	M	√	None	0-1	M	L	M	H	1 and 2
Porous Pavement	M	L	H	H	\$8 - \$15 per Square Foot	√	√	High	M		Permeable	Varies	H	M	H	M	All
Sand Filters	M	M	H	H	\$10,000 to \$50,000 per Imp. Acre	√		High	H	√	None	5 Max	L	L	M	H	2
Subsurface Infiltration Systems	L	L	L	H	Varies	√	√	Medium	M	√	Permeable	Varies	H	M	H	M	2 and 3
Tree Box	H	H	M	H	\$50 - \$100 per Linear Foot	√		Low	M		None	0-1	L	L	M	M	1 and 2
Underground Detention Structures	L	L	L	H	Varies	√		Low	M	√	None	Varies	L	H	L	L	1, 2, and 3
Vegetative Filter Strips	L	L	L	M	\$50 - \$100 per Linear Foot	√		Medium	L		None	2 Max	M	M	M	M	2, 3, and 4
Wet Stormwater Ponds	H	H	H	H	Varies			Very High	L		None	Varies	H	H	M	L	2, 3, and 4

Notes

1. Unit Process adopted from The South Carolina DHEC Storm Water Management BMP Field Manual.
2. Construction Cost Ranges are based on construction installation cost. It does not account for cost associated with design or permitting.
3. Maintenance Needs are based on how often it either requires cleaning or refurbishing. It based on Appendix A from South Carolina DHEC Storm Water Management BMP Handbook.
4. Target Pollutant based on pollutant removal efficiencies as stated in Appendix A from South Carolina DHEC Storm Water Management BMP Handbook.
5. Recommended use in study areas (Area 1 - Historic Aiken, Area 2 - Suburban Zone, Area 3 - Rural Transition Zone, and Area 4 - New Ellenton). These are recommendation sites and BMP solutions should be chosen based on engineering decisions.

Legend

H = High
M = Medium
L = Low



Bioretention

DESCRIPTION

Bioretention areas, or rain gardens, are landscaping features adapted to provide on-site treatment of stormwater runoff. They are commonly located in parking lot islands or within small pockets of residential land uses. Surface runoff is directed into shallow, landscaped depressions. These depressions are designed to incorporate many of the pollutant removal mechanisms that operate in forested ecosystems. During storms, runoff ponds above the mulch and soil in the system. Runoff from larger storms is generally diverted past the facility to the storm drain system. The remaining runoff filters through the mulch and prepared soil mix. The filtered runoff can be collected in a perforated underdrain and returned to the storm drain system.



Small Bioretention Area

There are two types of bioretention: Filtering and exfiltrating. Filtering systems are designed with an impermeable liner and underdrain to prevent infiltration and recharge. Exfiltrating systems allow infiltration and recharge to groundwater.

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Bioretention areas provide “firstflush” pollutant removal • Well suited for ultra-urban environments • Can be integrated into parking lot islands, median strips and traffic islands to treat urban runoff and promote infiltration. • Can be distributed around a property to enhance aesthetics. 	<ul style="list-style-type: none"> • Used in areas with space constraints • Can provide groundwater recharge • Improves aesthetics • Removes multiple pollutants • Provide shade, windbreaks, and absorb noise • Can modify existing landscape – retrofit • Reduces urban heat island effect 	<ul style="list-style-type: none"> • Requires careful landscaping/maintenance • Not suitable for areas with slope > 20% • Not suitable for large drainage areas • Requires pretreatment • Not suitable where groundwater is within 6 feet of ground surface

Stormwater Standard Applicability

Provides:

- Groundwater Recharge (if unlined)
- TSS Removal (with pretreatment)

Can be constructed in:

- Higher Pollutant Load Land Use Areas
- Critical Areas
- Almost Any Soils Or Topography

Relative Cost Considerations

Estimated cost range of a bioretention is between \$5 and \$30 per square foot.

TARGET CONSTITUENTS	
M	Nutrients
H	Metals
H	Bacteria
H	TSS Removal
H	Trash and Debris
H	Hydrocarbons

UNIT PROCESSES	
M	Volume Reduction
L	Peak Flow Reduction
H	Sedimentation
H	Filtration and Sorption

LEGEND

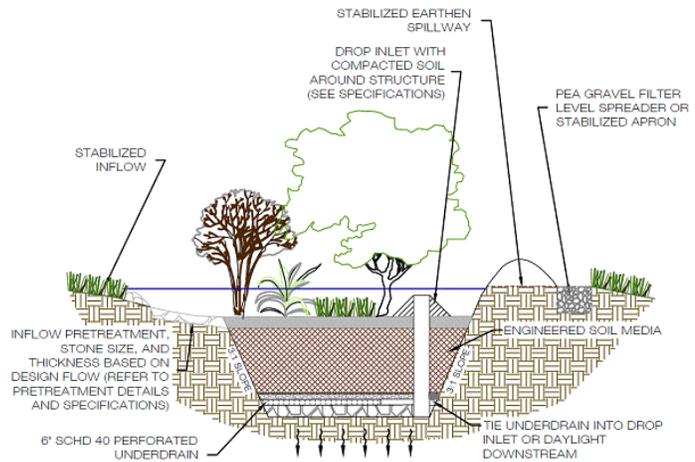
H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

- Evaluate underlying soil to determine infiltration capacity and depth to groundwater.
- Design, at a minimum, to capture and treat required water quality volume for water quality treatment or the recharge volume for groundwater recharge requirements (or the larger of the two volumes).
- Bioretention areas are typically designed in layers as follows (from bottom to top):
 - Impermeable liner and underdrain (optional)
 - Cover bottom of excavation area with coarse gravel, over pea stone, over sand
 - Between 2 to 4 feet of bioretention soil media (see specification below)
- Cover soil with 2 to 3 inches of fine-shredded hardwood mulch.
- Provide at a minimum 6 to 9 inches of ponding depth (varies with site conditions).
- Planting plan shall include herbaceous perennials and shrubs, which can tolerate frequent ponding, saline conditions, and extended dry periods.
- Design to drain within 72 hours. To prevent breeding of mosquitoes, design to drain within 24 hours.



Cross-Section Example of Bioretention

CONSTRUCTION CONSIDERATIONS

- Avoid compacting soils to maintain underlying soil infiltration capacity.
- During construction, direct only runoff from stabilized areas to bioretention. Direct construction runoff elsewhere to prevent accumulating silt and sediment within area, causing clogging.
- Place soil media in 1 to 2 foot lifts to avoid compaction.

- Plant one tree or shrub per 50 square feet and at least 3 species of herbaceous perennials and shrubs to prevent a monoculture.

MAINTENANCE

- Inspect pretreatment devices and bioretention areas regularly for sediment build-up, structural damage and standing water.
- Inspect for erosion and re-mulch void areas on a monthly basis (or as necessary).
- Remove and replace dead vegetation in spring and fall.
- Remove invasive species to prevent from spreading within bioretention area.
- Periodically observe function under wet weather conditions.

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Constructed Stormwater Wetland

DESCRIPTION

Stormwater wetlands (a.k.a. constructed wetlands) are structural practices similar to wet ponds (see [Wet Pond](#) fact sheet) that incorporate wetland plants into the design. As stormwater runoff flows through the wetland, pollutant removal is achieved through settling and biological uptake within the practice. Wetlands are among the most effective stormwater practices in terms of pollutant removal and they also offer aesthetic and habitat value. Although natural wetlands can sometimes be used to treat stormwater runoff that has been properly pretreated, stormwater wetlands are fundamentally different from natural wetland systems. Stormwater wetlands are designed specifically for the purpose of treating stormwater runoff, and typically have less biodiversity than natural wetlands in terms of both plant and animal life. Several design variations of the stormwater wetland exist, each design differing in the relative amounts of shallow and deep water, and dry storage above the wetland.



Stormwater Wetland

A distinction should be made between using a constructed wetland for stormwater management and diverting stormwater into a natural wetland. The latter practice is not recommended because altering the hydrology of the existing wetland with additional stormwater can degrade the resource and result in plant die-off and the destruction of wildlife habitat.

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Regional detention and treatment • Sites without space constraints 	<ul style="list-style-type: none"> • Low maintenance cost • Reduces peak flow rates • Treatment of large tributary areas • Removes suspended solids and particulate-bound pollutants • Provides wildlife habitat • Aesthetically pleasing 	<ul style="list-style-type: none"> • High land requirement • High capital cost • Does not provide groundwater recharge • Potential mosquito habitat if not properly maintained

Stormwater Standard Applicability

Provides:

- Peak flow attenuation (if properly designed)
- TSS removal with pretreatment

Can be constructed in:

- Almost all soils and geology, with minor design adjustments

Relativity Cost Considerations

Costs for constructed stormwater wetlands can vary widely depending design considerations and volume of treated stormwater.

TARGET CONSTITUENTS	
M	Nutrients
H	Metals
L	Bacteria
H	TSS Removal
H	Oil and grease
H	Trash and debris

UNIT PROCESSES	
L	Volume Reduction
H	Peak Flow Reduction
H	Sedimentation
M	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

NOTES

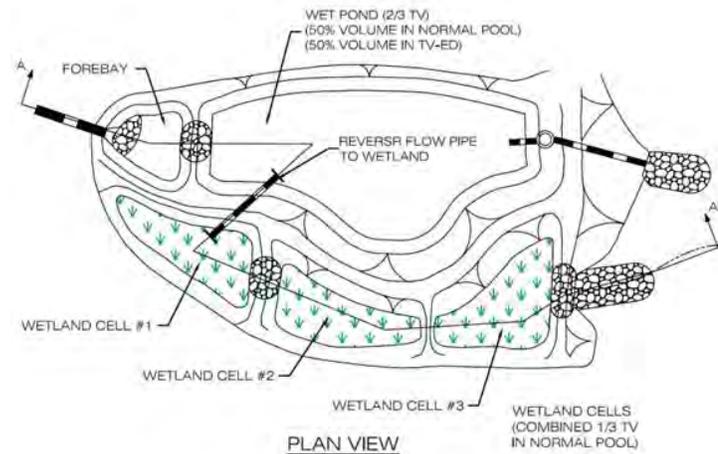
These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

Specific designs may vary considerably, depending on site constraints or preferences of the designer or community. There are some features, however, that should be incorporated into most wetland designs. These design features can be divided into five basic categories: pretreatment, treatment, conveyance, maintenance reduction, and landscaping.

Pretreatment

Pretreatment incorporates design features that help to settle out coarse sediment particles. By removing these particles from runoff before they reach the large permanent pool, the maintenance burden of the pond is reduced. In wetlands, pretreatment is achieved with a sediment forebay. A sediment forebay is a small pool (typically about 10 percent of the volume of the permanent pool). Coarse particles remain trapped in the forebay, and maintenance is performed on this smaller pool, eliminating the need to dredge the entire pond.



Treatment

Treatment design features help enhance the ability of a stormwater management practice to remove pollutants. The purpose of most of these features is to decrease the rate of stormwater movement through the wetland. Some typical design features include

- The surface area of wetlands should be at least 1 percent of the drainage area to the practice.
- Wetlands should have a length-to-width ratio of at least 1.5:1. Making the wetland longer than it is wide helps prevent "short circuiting" of the practice.

Effective wetland design displays "complex microtopography." In other words, wetlands should include zones of both very shallow (<6 inches) and moderately shallow (<18 inches) water, using underwater earth berms to create the zones. This design will provide a longer flow path through the wetland to encourage settling, and it provides two depth zones to encourage plant diversity.

Conveyance

Conveyance of stormwater runoff into and through a stormwater management practice is a critical component of any practice. Stormwater should be conveyed to and from practices safely and to minimize erosion potential. The outfall of wetlands should always be stabilized to prevent scour. In addition, dependent upon local conditions, an emergency spillway might need to be provided to safely convey large flood events. To help mitigate warming at the outlet channel, designers should provide shade around the channel at the wetland outlet.

Maintenance Reduction

In addition to regular maintenance activities needed to maintain the function of stormwater practices, some design features can be incorporated to ease the maintenance burden of each practice. In wetlands, maintenance reduction features include techniques to reduce the amount of maintenance needed, as well as techniques to make regular maintenance activities easier.

One potential maintenance concern in wetlands is clogging of the outlet. Wetlands should be designed with a non-clogging outlet such as a reverse-slope pipe or a weir outlet with a trash rack. A reverse-slope pipe draws from below the permanent pool extending in a reverse angle up to the riser and establishes the water elevation of the permanent pool. Because these outlets draw water from below the level of the permanent pool, they are less likely to be clogged by floating debris. Another general rule is that no orifice should be less than 3 inches in diameter. Smaller orifices are generally more susceptible to clogging, without specific design considerations to reduce this problem. Another feature that can help reduce the potential for clogging of the outlet is to incorporate a small pool, or "micropool" at the outlet.

Design features are also incorporated to ease maintenance of both the forebay and the main pool of wetlands. Wetlands should be designed with a maintenance access to the forebay to ease this relatively routine (5- to 7-year) maintenance activity. In addition, the permanent pool should have a drain to draw down the water for the more infrequent dredging of the main cell of the wetland.

Landscaping

Landscaping of wetlands can make them an asset to a community and can enhance the pollutant removal of the practice. In wetland systems, landscaping is an integral part of the design. To ensure the establishment and survival of wetland plants, a landscaping plan should provide detailed information about the plants selected, when they will be planted, and a strategy for maintaining them. The plan should detail wetland plants, as well as vegetation to be established adjacent to the wetland. Native plants should be used if possible.

A variety of techniques can be used to establish wetland plants. The most effective techniques are the use of nursery stock as dormant rhizomes, live potted plants, and bare rootstock. A "wetland mulch," soil from a natural wetland or a designed "wetland mix," can be used to supplement wetland plantings or alone to establish wetland vegetation. Wetland mulch carries with it the seed bank from the original wetland, and can help to enhance diversity in the wetland. The least expensive option to establish wetlands is to allow the wetland to colonize itself. One disadvantage to this last technique is that invasive species such as cattails or Phragmites (common reed) may dominate the wetland.

When developing a plan for wetland planting, care needs to be taken to ensure that plants are established in the proper depth and within the planting season. This season varies regionally, and is generally between 2 and 3 months long in the spring to early summer. Plant lists are available for various regions of the United States through wetland nurseries, extension services, and conservation districts.

CONSTRUCTION CONSIDERATIONS

- Process to prepare wetland prior to planting (Schueler 1992):
 - Once volume excavated, grade to create pool, aquatic bench, deep-water channels, and other major internal features.
 - Add topsoil and/or wetland mulch to excavated site to support plant growth.
 - Grade to final elevations and stabilize all features above normal pool.

- Measure wetland depths to nearest inch and modify pondscape plan.
- Apply erosion controls and stabilize vegetation.
- Dewater wetland at least 3 days before planting.
- Provide maintenance access to forebay, safety benches, and outlet structure with minimum width of 15 feet and maximum slope of 15%.
- Design vegetative buffers around perimeter of wetland to protect from erosion and provide additional removal of sediment and nutrients.

MAINTENANCE

- Inspect wetland during both the growing and non-growing season during first 3 years after construction to determine dominant wetland plants, presence of invasive wetland species, and accumulation of sediment in forebays and micro-pools, and stability of original depth zones.
- Inspect wetland at least once a year to evaluate health and prevent monocultures of plant species.
- Clean out sediment forebay annually to restore storage volume capacity.

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Disconnect Impervious Areas

DESCRIPTION

Disconnecting impervious surfaces from the public stormwater conveyance system and directing runoff to pervious surfaces can increase groundwater recharge and reduce stormwater volumes, flow rates, and pollutant loadings. This practice can be applied in both residential and commercial locations. By incorporating small depressions into site grading and routing impervious surface runoff to these locations where permissible, small storm volumes can be retained and the site’s rainfall-runoff response time and peak flows can be reduced.



Parking lot Example

The impervious surface must discharge into a suitable receiving area for the practices to be effective. Typical receiving pervious surfaces include landscaped areas and/or other BMPs (i.e., planter boxes, filter strips, or bioretention).

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Single- and multi-residential homes • Commercial • Densely urbanized areas 	<ul style="list-style-type: none"> • Reduce stormwater volume and flow rates • Simple, low cost, and highly applicable to many situations • Groundwater recharge 	<ul style="list-style-type: none"> • Discharge must be directed to pervious area through sheet flow

Stormwater Standard Applicability

Provides:

- Groundwater Recharge (if unlined)
- TSS Removal (with pretreatment)

Can be constructed in:

- Higher Pollutant Land Use Areas with pretreatment
- Critical Areas

Relative Cost Considerations

Can vary greatly depending on level of effort to disconnect pervious areas. Could be as simple as removing concrete flumes or the addition of intermediate BMPs.

TARGET CONSTITUENTS	
H	Nutrients
L	Metals
L	Bacteria
H	TSS Removal
L	Oil and grease
L	Trash and debris

UNIT PROCESSES	
H	Volume Reduction
M	Peak Flow Reduction
M	Sedimentation
L	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

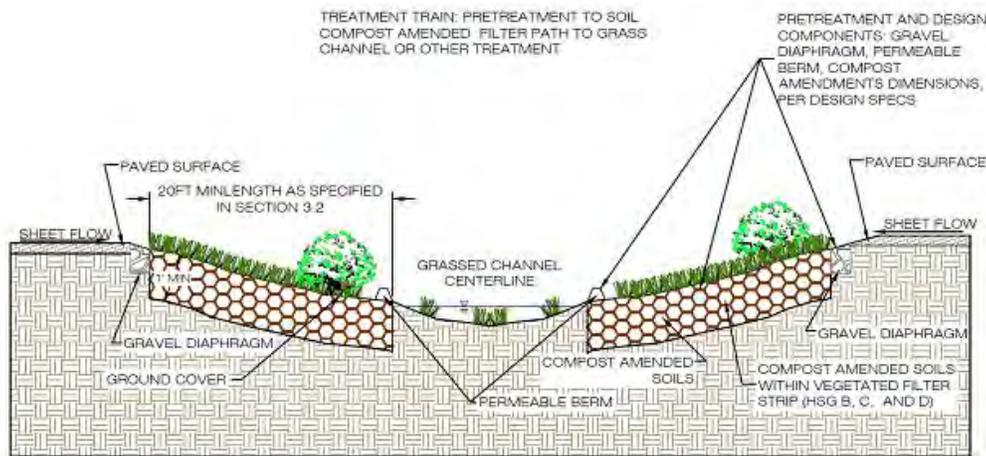
- Runoff must be directed at least 10 feet away from building foundation to prevent basement seepage.
- Rooftop area contributing to one downspout must be less than 1,000 ft².
- Building cannot be industrial.
- Long-term saturated hydraulic conductivity must be greater than 0.17 in/hr.

CONSTRUCTION CONSIDERATIONS

- Construction vehicles cannot drive over pervious area to prevent compaction.

MAINTENANCE

- Compacted soil must be amended, tilled, and re-vegetated to restore infiltration capacity.
- Clean gutters annually to prevent clogging or downspouts and pervious areas.



Cross-Section of Disconnected Impervious Areas

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Dry Stormwater Ponds

DESCRIPTION

A dry stormwater detention pond provides temporary storage of stormwater runoff. Dry ponds have an outlet structure that detains runoff inflows and promotes the settlement of pollutants. Unlike wet ponds, dry detention ponds do not have a permanent pool. A dry pond is designed as a multistage facility that provides runoff storage and attenuation for both stormwater quality and quantity. The lower stages of a dry pond are controlled by outlets designed to detain the stormwater runoff for the water quality volume for a minimum duration of 24 hours, which allow sediment particles and associated pollutants to settle out. Higher stages in the pond detain the peak rates of runoff from larger storms for flood and erosion control. Dry Detention ponds are designed for complete drawdown of runoff and normally remain dry between storm events.



Dry Stormwater Pond

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • New or existing developments • Can be used in all types of development 	<ul style="list-style-type: none"> • Can be designed to meet different peak flow attenuation • Widely known, understood, and applicable to most situations 	<ul style="list-style-type: none"> • Should not be used in areas with a high water table • Moderate pollutant removal • Can decrease property values if not properly maintained or screened

Stormwater Standard Applicability

Provides:

- Peak flow reduction

Can be constructed in:

- Most situations
- Redevelopment

Relative Cost Considerations

Costs can vary depending on size of stormwater pond. According to the EPA, a general cost estimate for construction is approximately \$0.40 to \$0.60 per cubic foot of storage.

TARGET CONSTITUENTS	
L	Nutrients
M	Metals
L	Bacteria
H	Sediment
L	Oil and grease
H	Trash and debris

UNIT PROCESSES	
L	Volume Reduction
H	Peak Flow Reduction
M	Sedimentation
M	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

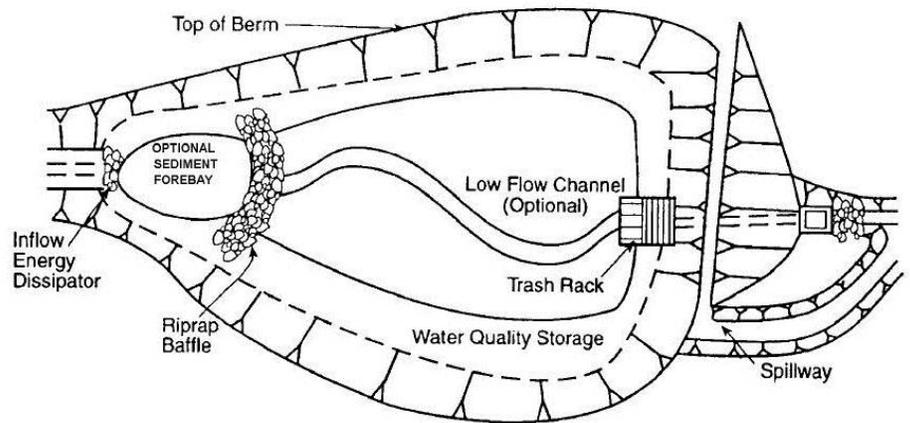
- Pretreatment should be considered to reduce the maintenance burden of the dry pond, by means of a forebay or other device.
- Outfall should be stabilized to prevent scour. A micropool at the outlet can prevent resuspension of sediment and outlet clogging.
- Typical drainage area size should be 10 acres or more. Smaller sites require smaller outlets, which become more easily prone to clogging.

CONSTRUCTION CONSIDERATIONS

- A clay cap may be needed to prevent groundwater infiltration.
- Minimize erosion potential during construction by installing control measures quickly and effectively.

MAINTENANCE

- A pond maintenance plan or agreement is required before approval.
- Regular inspection and maintenance is critical to the effective operation of dry ponds as designed.
- Conduct inspections semi-annually and after significant storm events to identify potential problems early.
- Maintenance efforts should be directed toward vegetation management and basic housekeeping practices.



Typical Plan View of Dry Stormwater Pond

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Dry Wells

DESCRIPTION

Dry wells, or seepage pits, are excavated areas filled with gravel and very similar to infiltration trenches. They are designed to receive and treat stormwater runoff from non-metal roofs or metal roofs. Dry wells are constructed to reduce stormwater runoff volumes through increased groundwater recharge and can be used as retrofits of highly urbanized areas. Dry wells are not recommended to treat parking lot runoff or areas with potentially high pollutant loadings.



Reinforced Concrete Perforated Dry Well Installation

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Applicable for private and public projects • Commercial and residential • Retrofits • Urban areas adjacent to buildings 	<ul style="list-style-type: none"> • Reduce stormwater volume through groundwater discharge • Efficient removal of trash and sediment • Simple and low cost 	<ul style="list-style-type: none"> • High potential for clogging • Treats small tributary area • Can cause structural damage to nearby buildings due to water

Stormwater Standard Applicability

Provides:

- Groundwater recharge
- TSS removal

Can be constructed in:

- Some critical areas
- Redevelopment situations outside industrial sites

Relative Cost Considerations

It is estimated that typical installation of a dry well will range from \$500 to \$1,000, depending on the size of the well.

TARGET CONSTITUENTS	
L	Nutrients
L	Metals
L	Bacteria
M	TSS Removal
L	Oil and grease
L	Trash and debris

UNIT PROCESSES	
H	Volume Reduction
M	Peak Flow Reduction
H	Sedimentation
M	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

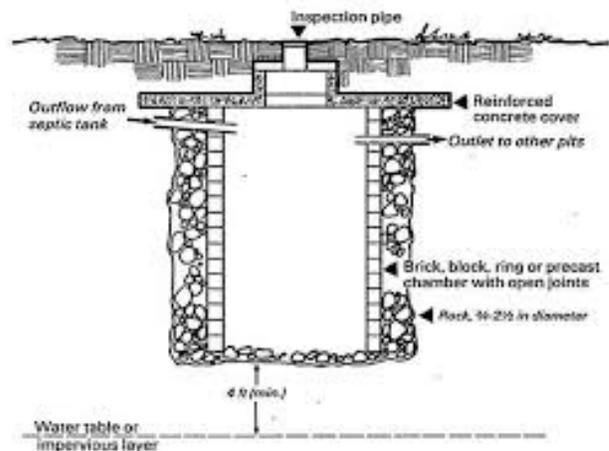
- Construct dry well 1 foot below ground surface. Maximum depth should not exceed 10 feet.
- Perforations of inlet pipe into dry well must begin 1 foot from side of well.
- Dry well must be placed at least 10 feet away from building foundation.
- Line top, bottom, and sides with a geotextile or filter fabric.
- Fill with washed 1.5 – 3 inch diameter gravel with a void ratio of 0.40.
- Design to drain within 72 hours.

CONSTRUCTION CONSIDERATIONS

- Stabilize area before construction to prevent clogging.
- Do not directly connect to stormwater conveyance system.
- Minimize compaction of underlying soils by placing uniformly graded, clean-washed aggregate in 6-inch lifts. This will prevent low infiltration rates and clogging.

MAINTENANCE

- Should inspect well at least 4 times a year and after major storm events to ensure that maximum draw down time (72 hours) is not being exceeded.
- Clean roof gutters to prevent clogging of dry well.
- Replace filter screen as necessary.



Cross-Section Example of Dry Well

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Enhanced Swales

DESCRIPTION

Enhanced swales are shallow, open conveyance channels with low-lying vegetation designed to settle out suspended pollutants due to shallow flow depths and slow velocities. Additional pollutant removal mechanisms include volume reduction through infiltration and evapotranspiration and biochemical processes that provide treatment of dissolved constituents. It is generally accepted that enhanced swales have higher pollutant removal efficiencies than grass channels. An effective vegetated swale achieves uniform sheet flow through a vegetated area for at least 10 minutes.



Examples of Enhanced Swales

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Commonly implemented adjacent to highways/roadways • Applicable for commercial, institutional, and residential purposes • Retrofit options in urban settings, especially in publicly owned green space 	<ul style="list-style-type: none"> • Replace expensive curb and gutter systems • Can achieve volume and peak flow reduction with proper design • Reduce driving hazards by keeping stormwater from street surfaces • Compatible with many LID designs 	<ul style="list-style-type: none"> • Can erode during large storms • Treats small tributary areas • Not for areas with <i>very flat grades</i>, steep topography, or poorly drained soils • Higher degree of maintenance than curb and gutter systems

Stormwater Standard Applicability

Provides:

- Peak flow reduction at small sites if properly designed
- TSS removal with pretreatment

Can be constructed in:

- High pollutant load land use areas as pretreatment if lined
- Critical Areas
- Redevelopment situations

Relative Cost Considerations

A typical enhanced swale will cost approximately \$10 per linear foot but can vary greatly depending on site-specific design considerations.

TARGET CONSTITUENTS	
L	Nutrients
L	Bacteria
M	Metals
H	TSS Removal
M	Oil and grease
M	Trash and debris

UNIT PROCESSES	
L	Volume Reduction
L	Peak Flow Reduction
H	Sedimentation
L	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

NOTES

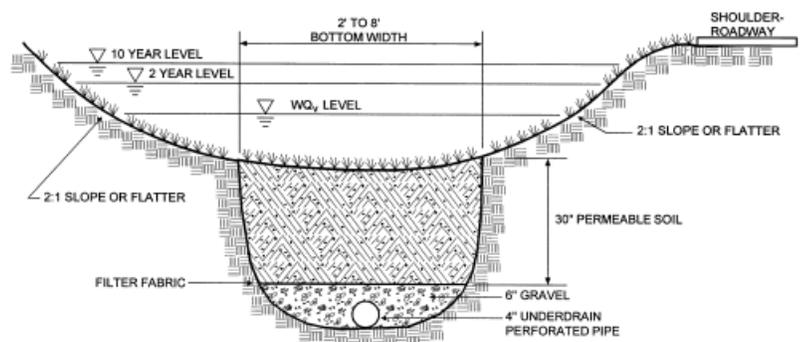
These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

- Enhanced swale normally consists of: pretreatment (forebay/ vegetated filter strip), ponding area, amended/native permeable soils, grass/vegetation, an underdrain surrounded by 6-inch gravel, and an outlet point.
- Design enhanced swales to empty between storms or to dewater within at least 72 hours and to convey 10-year storm and prevent erosion during 2-year event.
- The hydraulic residence time (HRT) must be at least 9 minutes for required water quality volume. Use Manning's Equation to calculate the HRT.
- Soil bed should be at least 18 inches deep and contain approximately 50% sand and 50% loam.
- Plant with species adapted to varying moisture conditions and able to produce dense cover.

CONSTRUCTION CONSIDERATIONS

- Use temporary erosion and sediment controls during construction.
- Select vegetation native to area to decrease mortality rate.
- Use mulch, matting, straw, and wood chips while seeding and anchor mulch immediately after seeding.



Cross-Section View of Enhanced Swale

MAINTENANCE

- Inspect during first few months to ensure adequate vegetation growth.
- Inspect slopes, soil moisture, vegetative health, soil stability, soil compaction, soil erosion, ponding, and sedimentation of swale at least twice a year to maintain overall integrity and efficiency.
- Reseed eroded areas to maintain flow reduction and pollutant removal efficiencies.

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Green Roofs

DESCRIPTION

Green roofs are vegetated roof covers designed to reduce stormwater volumes through storage of precipitation in a soil media layer and increased evapotranspiration. Green roofs decrease the impervious footprint of buildings and help mimic pre-development hydrology. They are applicable in highly urbanized locations where land is limited and expensive. Due to an observed increase in nitrogen and phosphorous discharged from green roofs, they should not be used in nutrient sensitive waters, or locations where groundwater recharge is a priority due to low base flows. There are two types of green roofs: intensive green roofs and extensive green roofs. Extensive green roofs are lightweight systems requiring minimal maintenance and a shallow soil media, while intensive green roofs are larger and deeper systems requiring regular maintenance (irrigation, fertilizing, mowing) throughout the year.



Green Roof Example

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Applicable for private and public projects • Commercial, industrial, and residential sites • New construction or retrofits • Commonly installed on buildings with flat to low-angle rooftops 	<ul style="list-style-type: none"> • Reduce stormwater volume and flow rates • Reduce heating/cooling costs of building • Conserve space in highly urbanized areas 	<ul style="list-style-type: none"> • If retrofit, requires additional structural analysis of building • Does not increase groundwater recharge • May require additional water for irrigation of plants.

Stormwater Standard Applicability

Provides:

- Peak flow attenuation (for small storms)

Can be constructed in:

- Redevelopment situations

Relative Cost Considerations

Typical installation of modular roof components can range from approximately \$20 to \$30 per square foot, however costs can range widely depending on the depth of a green roof (i.e., intensive vs. extensive).

TARGET CONSTITUENTS	
L	Nutrients
L	Metals
L	Bacteria
L	Sediment
L	Oil and grease
L	Trash and debris

UNIT PROCESSES	
H	Volume Reduction
M	Peak Flow Reduction
L	Sedimentation
L	Filtration and Sorption

LEGEND

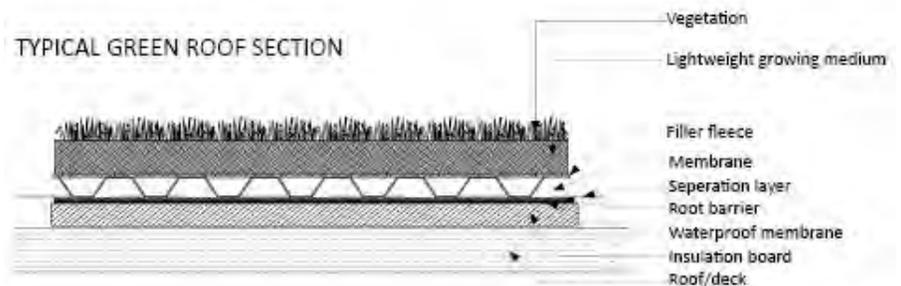
H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

- The green roof should be designed to significantly reduce the peak rate of runoff for small storms. Use a curve number of 86 to calculate peak flow rate attenuation.
- The green roof consists of: a drainage layer, multiple water proof membranes, soil media, vegetation, insulation, and an overflow bypass system.
- Membrane/Geotextile: Place an insulation layer, waterproof membrane, and a roofing membrane between the drainage layer and the roof to prevent leaks and damage to roof from stored precipitation and roots of plants.
- Soil Media (2-6 inches for extensive green roof): Choose a lightweight soil with high retention capacity and less than 5% organic material. Depth must successfully retain water quality volume and should not exceed .4 inches.
- Plants: Choose low-growing, drought-resistant, self-sowing annuals that are tolerant to extreme heat, cold, and high winds.
- Overflow By-pass System: Overflow from storms greater than water quality event or during winter months when media is frozen shall be directed to roof leaders.



Typical Cross-Section Example of Green Roof

CONSTRUCTION CONSIDERATIONS

- If overflow is bypassed to roof leaders, must conform to State Plumbing Code requirements.
- Structural support, waterproof membranes, and necessary fire resistant materials must comply with state building codes.
- When installing waterproof membranes, pay close attention to seams and application of glues and cement to prevent leaking.

MAINTENANCE

- Add additional mulch, irrigate, weed, and prune plants as necessary to preserve life of roof and established plants.
- Remove wooded plants that may become established to preserve roof integrity.
- Fertilize intensive green roofs to support growth of plants.

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Infiltration Basin

DESCRIPTION

Infiltration basins are stormwater impoundments, over permeable soils with vegetated bottoms and side slopes. Infiltration basins are designed to reduce stormwater volumes through exfiltration and groundwater recharge. Pretreatment is vital to ensuring successful performance. There are two types of infiltration basins: full exfiltration and partial, or off-line, exfiltration. Full exfiltration basins are designed to store, treat, and exfiltrate the full-required water quality volume and attenuate peak flows. Partial or off-line exfiltration basins are designed to exfiltrate a portion of the runoff (usually the “first flush” or runoff from first 0.5 inches of precipitation), while diverting the remaining runoff to another BMP through flow splitters or weirs. The type of infiltration basin is chosen based upon site conditions and limitations.



Infiltration Basin

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Contributing drainage area between 2 and 15 acres • Suitable for sites with gentle slopes, permeable soils, relatively deep groundwater table 	<ul style="list-style-type: none"> • Volume reduction • Groundwater recharge • Reduces local flooding • Provides peak flow attenuation 	<ul style="list-style-type: none"> • Requires pretreatment • Requires large pervious area • High maintenance requirement; clogging potential is high • Not for treating high loads of sediment or other pollutants

Stormwater Standard Applicability

Provides:

- Peak flow attenuation
- Groundwater recharge
- TSS removal with adequate pretreatment

Can be constructed in:

- Higher Pollutant Land Use Areas with pretreatment
- Critical Areas

Relative Cost Considerations

Infiltration basins are estimated to be \$3 to \$8 per cubic foot of storage, but can vary significantly based on site-specific design considerations.

TARGET CONSTITUENTS	
H	Nutrients
H	Metals
H	Bacteria
H	TSS Removal
M	Oil and grease
H	Trash and debris

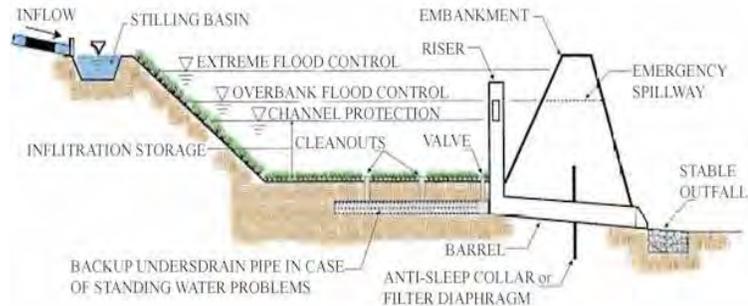
UNIT PROCESSES	
H	Volume Reduction
M	Peak Flow Reduction
H	Sedimentation
H	Filtration and Sorption

LEGEND

H = High M = Medium
L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.



Typical Cross-Section of Infiltration Basin

DESIGN CONSIDERATIONS

- Evaluate site conditions and determine soils, depth to bedrock and depth to groundwater.
- Soils shall have a minimum infiltration rate of 0.50 inches per hour.
- To adequately determine soil infiltration rates, take one soil boring for every 5,000 feet of basin area or a minimum of three borings for each basin.
- Design pretreatment BMP to treat runoff volume prior to discharging into infiltration basin.
- Size basin, at a minimum, to capture and retain the required recharge volume.
- Include 1 foot of freeboard above the required recharge volume, including the direct precipitation input.
- Design basin to drain entire volume in 72 hours.

CONSTRUCTION CONSIDERATIONS

- Rope or fence off area selected for infiltration basin.
- Prevent construction equipment from working near infiltration basin to prevent soil compaction.
- Stabilize inlet channels to prevent erosion.
- Till basin floor with rotary tiller to a depth of 12 inches to restore infiltration rates after final grading.
- Stabilize infiltration basin bottom and side slopes with dense turf, water-tolerant grass or 6 to 12 inches of coarse sand.
- Do not plant trees or shrubs in basin for they increase chance of failure due to root decay or subsurface disturbance.
- Do not construct when it is raining to limit compaction and smearing of soil.

MAINTENANCE

- Develop and implement an aggressive maintenance and operations plan.
- Inspect basin and pretreatment device after major storms for the first few months post construction to ensure it is functioning properly.

- Inspect twice a year at minimum for cracking, erosion, leakage in embankments, tree growth, condition of riprap, sediment accumulation, and health of turf and signs of differential settlement.
- Mow buffer area, side slopes, and basin bottom at least twice a year.
- Remove trash and debris to prevent clogging.
- Remove sediment from basin as necessary to prevent clogging.

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Infiltration Trenches

DESCRIPTION

An infiltration trench (a.k.a. infiltration galley) is a rock-filled trench with no outlet that receives stormwater runoff. Stormwater runoff passes through some combination of pretreatment measures, such as a swale and detention basin, and into the trench. There, runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix. The primary pollutant removal mechanism of this practice is filtering through the soil.



Infiltration Trench

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Parking lot, local roads, highways and small residential developments • Road shoulders and medians 	<ul style="list-style-type: none"> • Provides groundwater recharge • Preserves natural water balance • Suitable for small spaces • High degree of pollutant runoff control 	<ul style="list-style-type: none"> • Requires frequent maintenance to prevent clogging • Restricted to small drainage areas • Requires depth to groundwater to be greater than 2 feet from bottom of trench • Requires soils that infiltrate

Stormwater Standard Applicability

Provides:

- Peak Flow Attenuation
- Groundwater Recharge
- TSS Removal (with pretreatment)

Can be constructed in:

- High Pollutant Load Land Use Areas
- Critical Areas
- Redevelopment Areas

Relative Cost Considerations

Estimated cost range for Infiltration Trenches is \$50 to \$80 per linear foot.

TARGET CONSTITUENTS	
H	Nutrients
H	Metals
H	Bacteria
H	TSS Removal
M	Oil and grease
H	Trash and debris

UNIT PROCESSES	
H	Volume Reduction
H	Peak Flow Reduction
M	Sedimentation
H	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

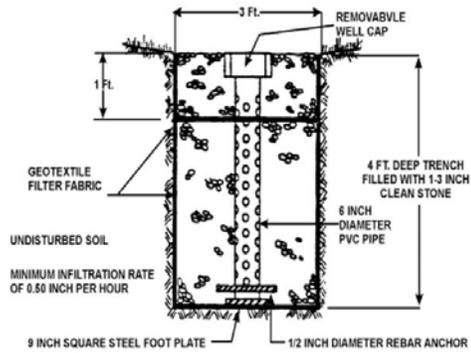
NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

Infiltration trenches have select applications. Although they can be applied in a variety of situations, the use of infiltration trenches is restricted by concerns over ground water contamination, soils, and clogging. Evaluate underlying soil to determine infiltration capacity and depth to groundwater.

- Design at a minimum to capture and treat the required water quality volume or groundwater recharge volume (or the larger of the two volumes).
- Contributing drainage area should be limited to 5 acres or less.
- Infiltration trenches are typically designed in layers as follows (bottom to top):
 - Line the sides of excavation trench with non-woven filter fabric.
 - Minimum of 6 inches of clean, washed sand (12 inches preferable) * Fill trench with 3 to 7 feet of 1.5 to 3 inch diameter washed stone (bank run gravel preferred).
 - Install a layer of filter fabric.
 - Minimum of 2 inches of pea gravel or sand layer.
 - Minimum of 6 inches of freeboard.
- Install an observation well at the center of the trench for monitoring.
- Design to drain within 72 hours.



Example Cross-Section of Infiltration Trench

CONSTRUCTION CONSIDERATIONS

- Prior to grading of the site, the area of the Infiltration Trench shall be flagged and roped off to prevent compaction of soils by heavy equipment.
- Stabilize entire area draining to facility prior to construction.
- Excavate and build the trench manually or with light earthmoving equipment.

- Place lifts of one to three inches of clean, washed stone in the trench and compact stone with a plate compactor gravel trench.

MAINTENANCE

- Remove trash and debris to prevent clogging and restore permeability.
- Remove minor sediment accumulations near inlet structure to prevent clogging.
- If clogging is observed, remove top layer of pea gravel and sediment capture layer. If slow conditions persist, entire trench may need to be excavated and replaced.
- Periodically observe under wet weather conditions to ensure all components are working properly.

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Manufactured Separator Device

DESCRIPTION

Hydrodynamic separator devices are proprietary stormwater BMPs that remove trash, debris, and coarse sediment from incoming flows using screening, gravity settling, and centrifugal forces generated by forcing the influent into a circular motion. By having the water move in a circular fashion, rather than a straight line, it is possible to obtain significant removal of coarse sediments and attached pollutants with less space as compared to other traditional gravity settling devices. Several types of hydrodynamic separation devices are also designed to remove floating oils and grease using sorbent media. Baffles and trash racks can be added to reduce trash and debris. Hydrodynamic separators are designed and manufactured by private businesses, and come in different sizes to accommodate different design storms and flow conditions. The effectiveness of proprietary separator varies greatly by design and size, so units must be correctly sized for specific soil conditions and flow profiles.



Manufactured Separator Being Installed

Hydrodynamic separators are designed and manufactured by private businesses, and come in different sizes to accommodate different design storms and flow conditions. The effectiveness of proprietary separator varies greatly by design and size, so units must be correctly sized for specific soil conditions and flow profiles.

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Pretreatment only • Sites with space constraints • Ultra-urban areas • Spill control 	<ul style="list-style-type: none"> • Can be custom-designed to fit specific needs of a specific site • Smaller footprint required • Pretreatment device • Decentralized stormwater treatment • Ideal for redevelopment or in ultra-urban setting 	<ul style="list-style-type: none"> • Must be purchased from private sector firm • May require more maintenance • Performance must be verified by third party • No groundwater recharge • No control of runoff volume

Stormwater Standard Applicability

Provides:

- TSS removal if used as pretreatment

Can be constructed in:

- Higher pollutant loading land use areas as a pretreatment device
- Critical areas as pretreatment
- Redevelopment or retrofit situations

Relative Cost Considerations

Estimated average cost range for hydrodynamic devices is \$8,000 to \$15,000.

TARGET CONSTITUENTS	
L	Nutrients
L	Metals
L	Bacteria
M	TSS Removal
M	Oil and grease
M	Trash and debris

UNIT PROCESSES	
M	Volume Reduction
M	Peak Flow Reduction
M	Sedimentation
M	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

- Design, construct, and maintain in accordance with manufacturer’s specifications.
- Typically sized based on flow rate.
- Primarily used for pretreatment and placed at beginning of stormwater treatment train.
- May have baffles or other devices to direct incoming water into and through a series of chambers and/or skirts or weirs to keep trapped sediments from re-suspending during larger flows.
- Design to include safe inspection and access ports for maintenance.

LIST OF PROPRIETARY MANUFACTURERS

- Aquashield, Inc: www.aquashieldinc.com;
- Contech Stormwater Solutions: www.conteches.com

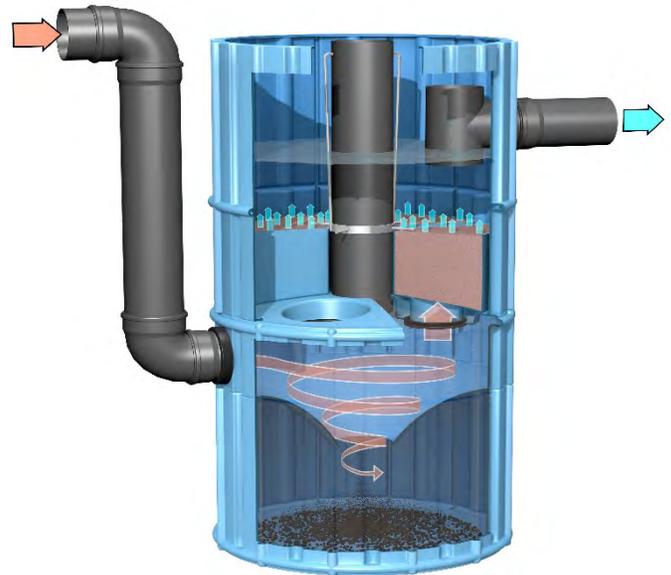


Illustration of a Hydrodynamic Separator from Sustainable Technologies

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Open Vegetative Conveyance

DESCRIPTION

Vegetated conveyances are designed and installed as an alternative to curb and gutter and hard piping stormwater conveyance systems. Open Vegetated conveyances improve water quality by providing partial pollutant removal as water is filtered by the vegetation and by the opportunity to infiltrate into the soil. Open vegetated conveyances are designed to reduce flow velocities when compared to hard piping.



Open Vegetative Conveyance

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Applicable in moderate to low density developments • Gently sloping areas (less than 5 percent) 	<ul style="list-style-type: none"> • Lowers flow velocities • Offers some filtration and limited infiltration 	<ul style="list-style-type: none"> • Soils must be able to withstand tractive forces (non-sandy soils) • Requires stabilization and maintenance to ensure maximum flow is maintained

Stormwater Standard Applicability

Provides:

- Peak flow attenuation (for small storms)

Can be constructed in:

- Low density areas
- Areas with stable soils

Relative Cost Considerations

Installation cost typically ranges from \$10 to \$30 per foot according to depth and design requirements.

TARGET CONSTITUENTS	
M	Nutrients
M	Metals
L	Bacteria
M	TSS Removal
L	Oil and grease
M	Trash and debris

UNIT PROCESSES	
L	Volume Reduction
M	Peak Flow Reduction
L	Sedimentation
M	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

- Ideal for low-density development with limited projected growth.
- Can be a cheaper alternative than traditional curb and gutter.

CONSTRUCTION CONSIDERATIONS

- Construct vegetated conveyances with trapezoidal or parabolic cross section with relatively flat slopes (flatter than 3:1).
- Install a flat bottom between 2 and 8 feet wide.
- During construction, it is important to stabilize the channel before the turf has been established, either with a temporary grass cover or with the use of natural or synthetic erosion control products.

MAINTENANCE

- The useful life of a vegetated swale system is directly proportional to its maintenance frequency. If properly designed and regularly maintained, vegetated swales can last infinitely.
- Maintenance objects for vegetated swale systems include keeping up the hydraulic and removal efficiency of the channel and maintaining a dense, healthy grass cover.
- Maintenance should include mowing, weed control, watering during drought conditions, re-seeding of bare areas, and clearing of debris and blockages.
- Remove accumulated sediment manually to avoid the transport of re-suspended sediments in periods of low flow and to prevent a damming effect from sand bars.
- Repair damaged areas within a channel.

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document, Boston Water and Sewer Commission; January 2013.

Planter Box

DESCRIPTION

Planter boxes are bioretention treatment control measures that are completely contained within an impermeable structure with an underdrain (they do not infiltrate). The boxes can be comprised of a variety of materials, such as brick or concrete, and are usually chosen to be the same material as the adjacent building or sidewalk. Planter boxes are filled with gravel on the bottom to house an underdrain system, planting soil media, and vegetation. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, and biodegraded by the soil and plants.



Planter Box

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Most commonly used in urban areas adjacent to buildings 	<ul style="list-style-type: none"> • Small footprint and simple design and construction • Aesthetically pleasing • Combines stormwater treatment with runoff conveyance • Volume & peak flow reduction 	<ul style="list-style-type: none"> • Vegetative maintenance required • Treats small volumes and contributing area • Must be constructed with underdrain system to convey excess water

Stormwater Standard Applicability

Provides:

- 90% TSS removal with adequate pretreatment

Can be constructed in:

- Higher Pollutant Loading Land Uses if used as pretreatment device

Relative Cost Considerations

Estimated cost range for planter boxes is \$24 to \$32 per square foot.

TARGET CONSTITUENTS	
M	Nutrients
H	Metals
H	Bacteria
H	TSS Removal
H	Oil and grease
H	Trash and debris

UNIT PROCESSES	
L	Volume Reduction
M	Peak Flow Reduction
M	Sedimentation
H	Filtration and Sorption

LEGEND

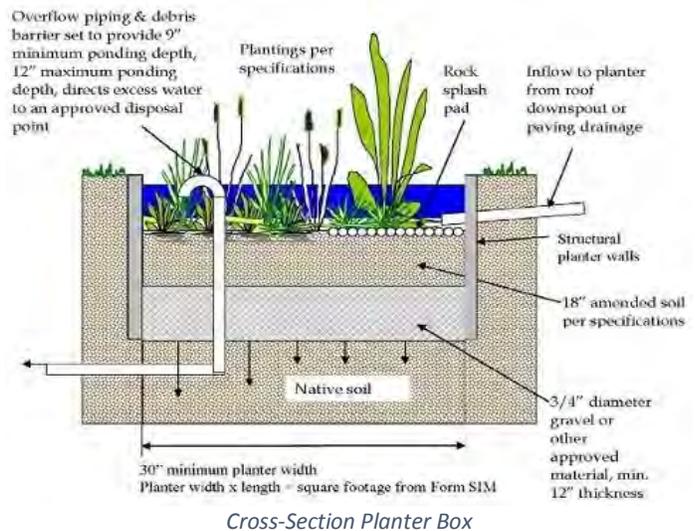
H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

- Design at a minimum to capture and treat the required water quality volume.
- Planter boxes are typically designed in layers as follows (bottom to top):
 - Concrete or brick planter box, lined with impermeable geomembrane to prevent infiltration near the building foundation.
 - Minimum 12-inch gravel layer with underdrain, which shall be slotted, polyvinyl chloride (PVC) pipe.
 - Minimum depth of 2 to 3 feet of soil media (see specification) to provide sufficient root zone for plant palette.
 - 2 to 3 inches of mulch.
 - Maximum of 6 inches of ponding above the mulch.
 - Overflow riser shall be plumbed to underdrain.



CONSTRUCTION CONSIDERATIONS

- Provide energy dissipation (e.g., splash block) at each concentrated inlet point.
- Avoid the use of treated wood or galvanized metal anywhere within the planter box.
- Material of planter boxes should be selected carefully to blend in and enhance aesthetics of adjacent structures such as buildings and sidewalks.
- Carefully select plants for proper function and minimal maintenance. Native plant species and/or hardy cultivars are best.

MAINTENANCE

- Inspect for erosion and repair areas.
- Remove accumulated fine sediments, dead leaves and trash to restore surface permeability.

- Eradicate weeds and prune back excess plant growth that interferes with facility operation.
- Periodically observe function under wet weather conditions.

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Porous Pavement

DESCRIPTION

Porous pavement is a permeable alternative to conventional asphalt and concrete and constructed in pedestrian, highly urbanized, or residential settings with low traffic speeds and volumes. A high surface void ratio allows precipitation to pass through the pavement and a stone base, where runoff is retained and sediments and metals are treated to some degree. Porous pavement is designed to achieve peak flow attenuation of small

intensity storms and groundwater recharge through infiltration into underlying soils. Porous pavement includes porous asphalt and pervious concrete, which are poured in place, and paving stones and grass pavers, which are typically precast and installed in an interlocking array to create a surface.



Permeable Pavers

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Commercial and industrial parking lots • Urban and residential settings • Retrofits • Low-volume, low-speed areas or pedestrian areas • Porous pavements are often used in sidewalks 	<ul style="list-style-type: none"> • Reduce stormwater volume and peak flow rates • Used as a retrofit in parking lots • Reduce sediment and particulate bound pollutants 	<ul style="list-style-type: none"> • Frequent clogging if not maintained • No sanding in winter • Compacting of underlying soils is common • Limited removal of dissolved constituents when underdrains are used

Stormwater Standard Applicability

Provides:

- Groundwater Recharge
- TSS Removal if storage bed is sized properly

Can be constructed in:

- Redevelopment situations

General Cost Considerations

It is estimated that a typical installation of porous pavement will cost approximately \$8 to \$15 per square foot.

TARGET CONSTITUENTS	
L	Nutrients
L	Metals
L	Bacteria
H	TSS Removal
L	Oil and grease
L	Trash and debris

UNIT PROCESSES	
H	Volume Reduction
M	Peak Flow Reduction
H	Sedimentation
M	Filtration and Sorption

LEGEND

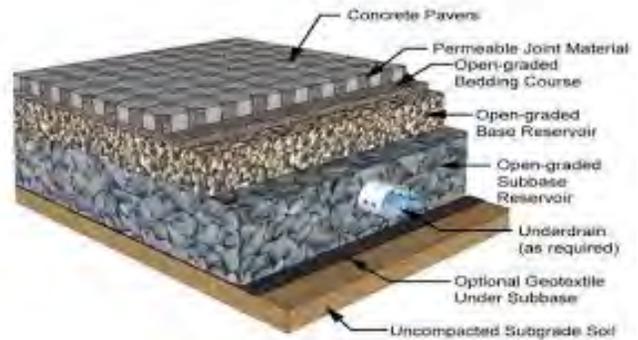
H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

- Design to retain 0.5 to 1.0 inch of rainfall and drain within 72 hours.
- Porous asphalt and pervious concrete must have 10% - 25% void space. Sub-base must have at least 40% void space.
- Storage bed requirements for porous asphalt or pervious concrete: 1) 4 inches choker course of uniformly graded crushed stone, 2) filter course at least 12 inches thick of poorly graded sand or bank-run gravel, 3) filter blanket at least 3 inches thick of pea stone gravel, and 4) reservoir course of uniformly graded crushed stone with high void content.
- Paving stones or grass pavers must have additional 1 inch layer of sand above choker course.
- Include a perforated pipe along bottom of base for even runoff distribution.



Cross-Section of Porous Pavers

CONSTRUCTION CONSIDERATIONS

- Avoid compacting soils to maintain proper infiltration rate.
- Caution must be taken during batching and placing of porous asphalt to prevent an increased percent of sand and/or asphalt than specified.
- Do not use in areas of higher pollutant loads without adequate pretreatment.
- Construct away from trees to prevent clogging from leaves.

MAINTENANCE

- Power wash and vacuum sweep area to prevent clogging.
- Do not sand or salt during the winter.
- Use snowplows with rollers on bottom to prevent damage to porous pavement.
- Periodically observe function under wet weather conditions to determine decrease in performance and clogging.

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Sand Filter

DESCRIPTION

Sand filters are engineered sand filled depressions that treat stormwater runoff from small tributary areas. Sand filters allow for the percolation of runoff through the void space within the sand before it is eventually released through an underdrain at the bottom of the filter. Stormwater runoff enters the filter from a pretreatment system (sediment forebay or vegetated filter strip) and spreads evenly over the surface. As flows increase, water backs up on the surface of the filter where it is held until it can percolate through the sand. As stormwater passes through the sand, pollutants are trapped in the small pore spaces between sand grains or are adsorbed to the sand surface. The effectiveness and efficiency of a sand filter depends heavily on the pretreatment BMPs performance to settle out sand, clay, and silt particles, which prevent clogging of the sand filter.



Sand Filter Example

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Ultra-urban sites with small drainage areas • Drainage areas that are 100% impervious, such as parking lots • Redevelopments and retrofits 	<ul style="list-style-type: none"> • Good retrofit capability • Long design life if properly maintained • Good for densely populated urban areas or parking lots • Relatively small footprint area 	<ul style="list-style-type: none"> • Pretreatment required to prevent clogging • Frequent maintenance required • Costly to build and install • Limited removal of dissolved constituents • May not be effective in winter • Can be unattractive and create odors

Stormwater Standard Applicability

Provides:

- TSS removal with pretreatment

Can be constructed in:

- Higher pollutant load land use areas
- Critical areas
- Redevelopment and retrofit situations

Relative Cost Considerations

Typical costs of sand filters can range from \$10,000 to \$50,000 per impervious acre depending on design and the use of underground structures and chambers.

TARGET CONSTITUENTS	
M	Nutrients
H	Metals
M	Bacteria
H	TSS Removal
M	Oil and grease
L	Trash and debris

UNIT PROCESSES	
L	Volume Reduction
L	Peak Flow Reduction
M	Sedimentation
H	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

- Design to handle the required water quality volume.
- Design should consist of a pretreatment component, a trench containing a gravel bed, a layer of sand, an optional grass/turf layer, and an underdrain surrounded by stone.
- Design sand filters as offline systems, away from primary conveyance/detention systems.
- Design sediment forebay, at a minimum, to equal filtering capacity.
- Design a flow diversion structure to allow design volume into the sand filter and the excess volume to bypass.
- Sand filters are typically designed in layers as follows (from bottom to top):
 - Wrap perforated underdrain in a gravel bed layer at a minimum of 6 to 8 inches of 0.5 to 2-inch diameter gravel.
 - Separate gravel bed and sand layer with filter fabric.
 - Minimum 18-inch layer of clean, washed “concrete” sand.
 - Separate sand layer and topsoil layer with filter fabric.
 - Top layer of leaf compost, peat or topsoil with grass.

CONSTRUCTION CONSIDERATIONS

- Stabilize tributary area during construction to minimize risk of clogging and failure.
- Place diversion berms around perimeter during all phases of construction.
- Stabilize depth of bed by wetting sand periodically, allowing it to consolidate, and then add extra sand. Place all excavated material downstream of sand filter.
- Top surface layer of trench should be level to ensure equal distribution of incoming runoff and minimize scouring/erosion.
- Place fence around sand filter for safety.

MAINTENANCE

- Inspect filter and remove debris after every major storm for first few months to ensure proper function. Inspect every 6 months thereafter to prevent clogging.
- Rake sand to restore infiltration rates.
- Remove sediment and trash that has accumulated on top of sand
- Remove top several inches of discolored media (presence of fine sediments) and replace with clean media to restore filtration removal mechanisms.

Subsurface Infiltration Systems

DESCRIPTION

Subsurface infiltration structures are underground systems that capture and infiltrate runoff into the groundwater through highly permeable rock and gravel. It is usually not practical to infiltrate runoff at the same rate that it is generated; therefore, these facilities generally include both a storage component and a drainage component. Typical subsurface infiltration systems that can be installed to enhance groundwater recharge include pre-cast concrete or plastic pits, chambers (manufactured pipes), and perforated pipes.



Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Private and public projects • Commercial and residential • Retrofits • Urban areas adjacent to buildings 	<ul style="list-style-type: none"> • Provide volume reduction and groundwater recharge • Can reduce downstream flooding • Efficiently remove trash and sediment • Can be simple and low cost 	<ul style="list-style-type: none"> • High potential for clogging • Can cause structural damage to nearby buildings due to water seepage • Standing water creates mosquito-breeding potential

Stormwater Standard Applicability

Provides:

- Groundwater recharge
- TSS removal

Can be constructed in:

- Critical areas
- Redevelopment situations

General Cost Considerations

There are a number of subsurface structures with variable cost depending on the manufacturer. For example, pre-cast concrete dry well type structures typically range in cost from \$500 to \$1,000 per unit depending on the size.

TARGET CONSTITUENTS	
L	Nutrients
L	Metals
L	Bacteria
H	TSS Removal
L	Oil and grease
L	Trash and debris

UNIT PROCESSES	
H	Volume Reduction
M	Peak Flow Reduction
H	Sedimentation
M	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

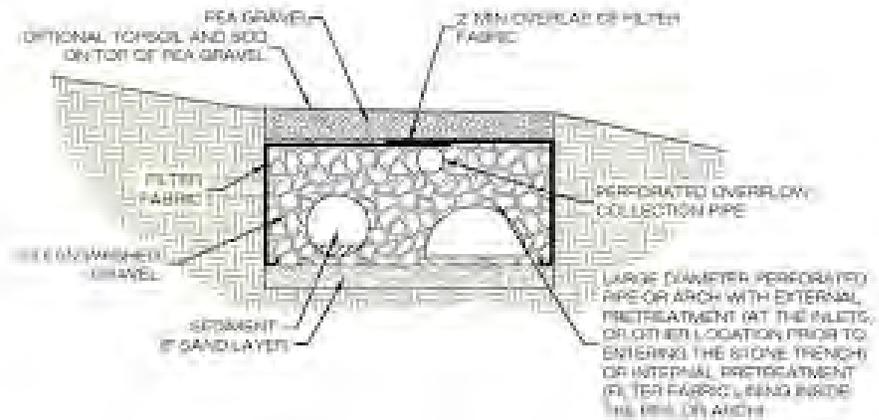
- Widely accepted design standards and procedures for designing subsurface structures are not available. A subsurface structure should be designed to store a specified capture volume for a specified period.
- Design each structure to drain within 72 hours after a storm event. The structure should also completely drain between storms.
- Infiltration structures should be designed to infiltrate at least 0.17 inches per hour.
- Take into account structural live and dead loads depending on the location of the structure.

CONSTRUCTION CONSIDERATIONS

- Stabilize area before construction to prevent clogging.
- Provide an access port or observation well to enable.
- Do not directly connect to stormwater conveyance system.
- Minimize compaction of underlying soils by keeping any heavy construction outside the area of exfiltration.

MAINTENANCE

- Inspect inlets at least twice a year.
- Remove any debris that may be clogging the device monitoring of the system.



Typical Subsurface Infiltration Cross-Section

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Tree Box Filter

DESCRIPTION

Tree box filters are a proprietary biotreatment device designed to mimic natural systems such as bioretention areas by incorporating plants, soil, and microbes. Tree box filters are installed at curb level and consist of an open bottom concrete barrel filled with a porous soil media, an underdrain in crushed gravel, and a tree. Tree box filters are highly adaptable solutions that can be used in all types of development and in all types of soils but are especially applicable to ultra-urban areas.



Tree Box Filters

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Commonly used in densely urbanized areas such as along roads, highways, sidewalks and parking lots 	<ul style="list-style-type: none"> • Reduces volume and rate of runoff • Smaller footprint required • May be used as pretreatment device • Provides decentralized stormwater treatment • Ideal for redevelopment or in ultraurban setting 	<ul style="list-style-type: none"> • Vegetative maintenance required • Treats small volumes • Treats small tributary areas

Stormwater Standard Applicability

Provides:

- TSS Removal (presumed to remove 80% TSS)

Can be constructed in:

- Higher pollutant land use areas as pretreatment device if lined
- Redevelopment situations

Relative Cost Considerations

Estimated cost range of filter strip is between \$50 and \$100 per linear foot (assuming 25 feet wide strip).

TARGET CONSTITUENTS	
H	Nutrients
M	Metals
H	Bacteria
H	TSS Removal
H	Oil and grease
H	Trash and debris

UNIT PROCESSES	
L	Volume Reduction
L	Peak Flow Reduction
M	Sedimentation
M	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

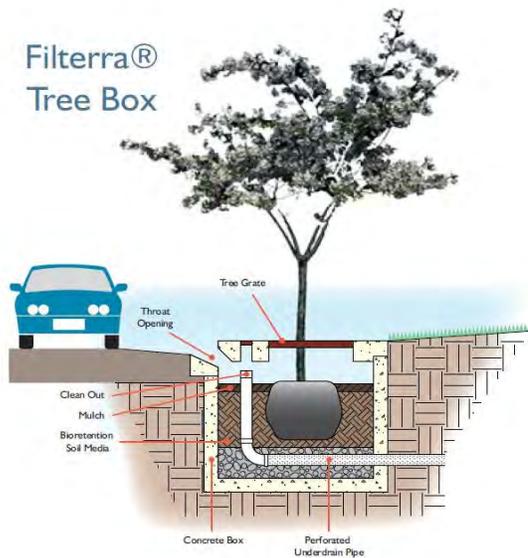
- Design at a minimum to capture and treat the required water quality volume.
- Tree box filters are typically designed in layers as follows (bottom to top):
 - Line bottom of excavation with filter fabric.
 - Install precast concrete barrel (minimum 6 feet in diameter), approximately 4 feet deep
 - Pack a perforated underdrain pipe in a clean, washed crushed stone layer (minimum 24-inch layer).
 - Minimum 1 to 2 feet of soil media (see manufacturer’s specification).
 - Minimum 6 inches of ponding depth.
 - Design an overflow riser pipe with grate, connected to perforated underdrain.
 - Design curb cut to act as inlet to tree box filter, with rip-rap pad at inlet for energy dissipation.
 - Use a deciduous tree centered in the concrete barrel.
- Design to drain in less than 72 hours.

CONSTRUCTION CONSIDERATIONS

- Provide energy dissipation (e.g., riprap) at each concentrated inlet point.
- Soil mix chosen should support growth of tree.
- Tree shall be selected carefully to blend in and enhance aesthetics of adjacent structures (buildings and sidewalks).

MAINTENANCE

- Annually check tree.
- Rake media surface at least twice a year to maintain permeability.
- Replace tree and media every 5 to 10 years to restore permeability and pollutant removal efficiency.
- Remove accumulated trash and debris to restore permeability.



Tree Box Filter Cross-Section

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Underground Detention Facilities

DESCRIPTION

Detention tanks and vaults are underground structures used to attenuate peak stormwater flows through detention or extended detention of stormwater runoff. Underground stormwater detention systems are a structural Best Management Practice (BMP) used to control the flow of stormwater. Detention systems work as an integral part of the storm sewer system to provide a temporary storage area for excess stormwater. Runoff is stored and discharged over time whenever runoff inflow exceeds the allowable discharge rate. The systems are typically installed beneath parking lots, streets and parks to maximize property usage and lower development costs. They are constructed out of concrete pipe, corrugated metal pipe, High Density Polyethylene Pipe, or concrete vaults. The design and material selection considers the potential loading from vehicles on the vault or pipe.



Underground Detention Facilities

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Highly developed areas • Spaces limited due to development • In adjacent ROW and in medians to provide additional storage opportunities 	<ul style="list-style-type: none"> • Allows for detention without taking up real estate • Can be constructed on top of to allow for additional parking 	<ul style="list-style-type: none"> • Cost can be prohibitive • Areas where replacement is costly requires more costly concrete vaults

Stormwater Standard Applicability

Provides:

- Peak flow reduction

Can be constructed in:

- Medians and greenspaces
- Under parking lots

Relative Cost Considerations

Costs can vary depending on type of materials used, size of system, and complexity of design. Underground detention should be used where space and storage options are limited.

TARGET CONSTITUENTS	
L	Nutrients
L	Metals
L	Bacteria
H	TSS Removal
L	Oil and grease
H	Trash and debris

UNIT PROCESSES	
L	Volume Reduction
H	Peak Flow Reduction
L	Sedimentation
L	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

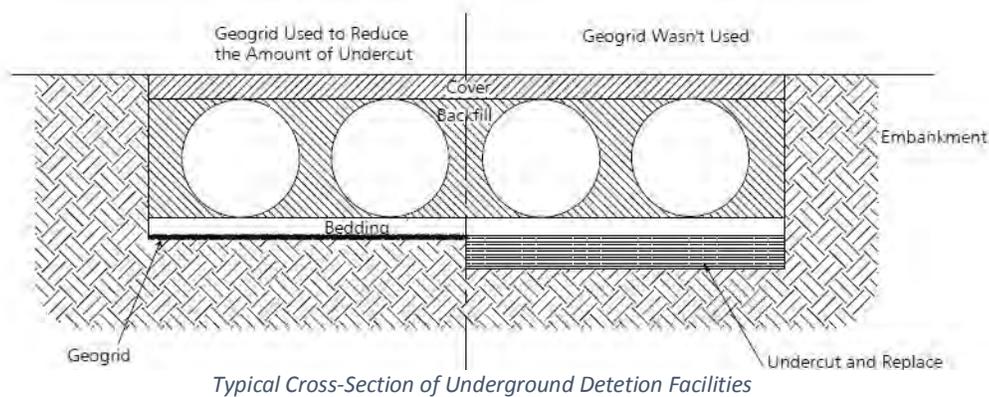
- Design of underground structures differ from conventional flexible pipe construction and should be completed with the help of designers experienced with underground detention.
- The foundation should be designed to handle any design loads that will be applied.
- Effectively sized and designed pretreatment is required based on the target constituents that need to be removed.

CONSTRUCTION CONSIDERATIONS

- Construct on a well-graded 4 to 6-inch thick granular base undercutting any unsuitable soils.
- Trench walls need to be capable of supporting the load that the pipe sheds as the system is loaded. If soils are not capable of supporting these loads, the pipe can deflect.
- Backfill material should be angular, well-graded, granular fill meeting the requirements of AASHTO A-1, A-2, or A-3.

MAINTENANCE

- The system should be designed with easy access for inspection and maintenance.
- Remove trash, debris, and sediment buildup in the underground detention facility annually by pumping them out.
- Perform structural repairs to inlet and outlets as needed based on inspections.



Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Vegetated Filter Strip

DESCRIPTION

Vegetated filter strips are uniformly graded, vegetated, pretreatment practices designed to treat low volume concentrated flows or sheet flow from adjacent roads, highways, small parking lots, and residential driveways. Vegetated filter strips are designed to capture sediment and decrease runoff velocities and runoff volumes. Filter strips provide effective treatment when combined with bioretention areas and stream buffers.



Image of Filter Strip in Parking Lot

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • Pretreat sheet flow from roads, highways, and small parking lots • Pretreat runoff from residential driveways • Retrofit options in urban settings • Side slopes of grass channels or water quality swales to enhance infiltration and remove sediment runoff from small parking lots and roads 	<ul style="list-style-type: none"> • Volume and peak flow reduction • Reduces runoff velocity • Effective pretreatment for bioretention cells • Can mimic natural hydrology • Used as part of runoff conveyance system with other BMPs 	<ul style="list-style-type: none"> • Design dictates pollutant removal efficiency • Effective on drainage areas with less than 6% slopes • Improper grading can diminish removal efficiency

Stormwater Standard Applicability

Provides:

- Some peak flow attenuation
- TSS removal

Can be constructed in:

- High pollutant land use areas as pretreatment if lined
- Critical areas as pretreatment if lined
- Pretreatment or stand-alone device for redevelopment

Relative Cost Considerations

Estimated cost range of filter strip is between \$50 and \$100 per linear foot (assuming 25 feet wide strip).

TARGET CONSTITUENTS	
L	Nutrients
L	Metals
L	Bacteria
M	TSS Removal
M	Oil and grease
M	Trash and debris

UNIT PROCESSES	
M	Volume Reduction
M	Peak Flow Reduction
M	Sedimentation
M	Filtration and Sorption

LEGEND

H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

- Contributing drainage area is limited to one acre or less.
- Filter strip typically consists of a level spreader, topsoil, and vegetation (grass).
- Design to drain within 24 hours and design flow depth to be ≤ 0.5 inches.
- Design filter strip at a minimum of 25 feet in length and as wide as the area draining to the strip.
- Plant filter strip with salt-tolerant grasses, which are also resistant to high velocities.
- Use level spreader (level trenches or curbing and concrete weirs) at head of filter strip to evenly distribute runoff across entire length.
- Design head and toe of filter strip as flat as possible to prevent erosion.



Illustration of a Filter Strip from the Los Angeles LID Handbook

CONSTRUCTION CONSIDERATIONS

- Proper grading of filter strip and level spreader is necessary to establish sheet flow.
- Use upstream sediment traps to protect area being used by filter strip.
- Stabilize soil until vegetation has established to prevent erosion.
- Use existing topsoil on site to enhance plant growth on vegetated filter strip.

MAINTENANCE

- Inspect level spreader for sediment buildup and vegetation for signs of erosion.
- Mow grass regularly.
- Reseed eroded and bare vegetated areas to restore surface permeability, increase sedimentation, and prevent creation of concentrated flow.
- Remove trash and debris to prevent creation of concentrated flow.
- Remove accumulated sediment at top of filter strip to maintain appropriate slope and prevent formation of berm.

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Wet Stormwater Ponds

DESCRIPTION

Wet ponds are constructed basins that have a permanent pool of water throughout the year or at least throughout the wet season. Wet ponds treat incoming stormwater runoff by settling and algal uptake. The primary removal mechanism is settling while stormwater runoff resides in the pool. Nutrient uptake also occurs through biological activity in the pond. Wet ponds are among the most cost-effective and widely used stormwater treatment practices. While there are several different versions of the wet pond design, the most common modification is the extended detention wet pond. In this design, storage is provided above the permanent pool in order to detain stormwater runoff and provide greater settling.



Example of a Wet Pond

Applications	Advantages	Limitations
<ul style="list-style-type: none"> • New or existing developments. • Can be used in all types of development. • Can be used in most soil types 	<ul style="list-style-type: none"> • Can be designed to meet different peak flow attenuation. • Widely known, understood, and applicable to most situations. 	<ul style="list-style-type: none"> • Highly developed areas may not be feasible due to size constraints • Can decrease property values if not properly maintained or screened

Stormwater Standard Applicability

Provides:

- Peak flow reduction
- Storage

Can be constructed in:

- Most development types

Relative Cost Considerations

Costs can vary depending on size of stormwater pond. According to the EPA, a general cost estimate for construction is approximately \$0.40 to \$0.60 per cubic foot of storage.

TARGET CONSTITUENTS	
H	Nutrients
M	Metals
H	Bacteria
H	TSS Removal
M	Oil and grease
H	Trash and debris

UNIT PROCESSES	
H	Volume Reduction
H	Peak Flow Reduction
M	Sedimentation
L	Filtration and Sorption

LEGEND

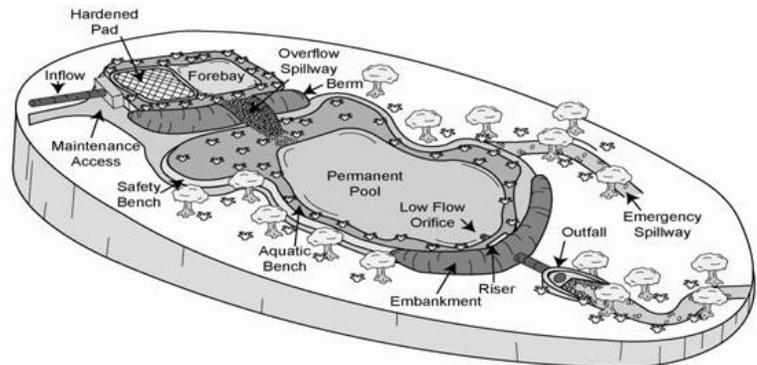
H = High M = Medium L = Low

NOTES

These designations are relative to other BMPs selected for these fact sheets. Design variations and enhancements may change the designations.

DESIGN CONSIDERATIONS

- Need sufficient drainage area to maintain permanent pool.
- Pretreatment should be considered to prevent over silting of pond by means of a forebay.
- A non-clogging outlet such as a reverse-slope pipe or a weir outlet with a trash rack.
- Typical drainage area size should be 25 acres or more.



Plan View of Wet Pond

CONSTRUCTION CONSIDERATIONS

- Direct access should be provided to allow maintenance of both the forebay and the main pool of ponds.
- Drains should be constructed to draw down the pond or forebay to allow for periodic sediment cleanouts.
- Minimize erosion potential during construction by installing control measures quickly and effectively.

MAINTENANCE

- A pond maintenance plan or agreement is required before approval.
- Regular inspection and maintenance is critical to the effective operation of dry ponds as designed.
- Conduct inspections semi-annually and after significant storm events to identify potential problems early.
- Maintenance efforts should be directed toward vegetation management and basic housekeeping practices.

Sources: EPA BMP Fact Sheets; January 10, 2017, SC DHEC Stormwater Management BMP Hand Book; July 31, 2005, and Stormwater BMP: Guidance Document Boston Water and Sewer Commission; January 2013.

Appendix B

Market Analysis



ROSE
ASSOCIATES

**TECHNICAL MEMORANDUM
MARKET ANALYSIS & ECONOMIC DEVELOPMENT STRATEGY
Whiskey Road Corridor Study
Aiken, SC
February 6, 2017**

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Executive Summary

Introduction

Rose & Associates Southeast, Inc. was retained by Stantec Consulting Services on behalf of Aiken County, SC, to provide assistance by completing a broad based real estate market analysis and economic development strategies associated with the Whiskey Road Corridor Study in Aiken, South Carolina.

In association with the transportation and land use team, we participated in public meetings and reviewed data as it relates to existing land uses, demographic dynamics, economic realities and real estate product types to further inform the Whiskey Road Study. In support of the project transportation goals, we conducted a series of analyses to identify the optimum approach to address land uses, public improvements and economic development strategies to assist in creating a vibrant and economically sustainable corridor.

The evaluation of the market to determine land uses and a viable economic development strategy begins with a few simple questions:

- **Who** is our customer?
- **What** are we trying to attract?
- **Where** do people want to be?
- **When** and how should we take action?
- **Why** does it matter?

Market and economic analysis helps to set the stage for the transportation plan, as we evaluate the various clusters of economic activity within the community and determine the capacity for future growth of housing, retail, office, industrial, civic and other uses.

At-A-Glance

We began with a review of previously prepared reports, such as the 2014 and 2016 Regional [Benchmarking Report](#) commissioned by the Greater Aiken Chamber of Commerce and the regional Economic Development Partnership, to gain an understanding of the population characteristics and market dynamics. We also prepared a snapshot of the community, as shared during our initial public meeting.

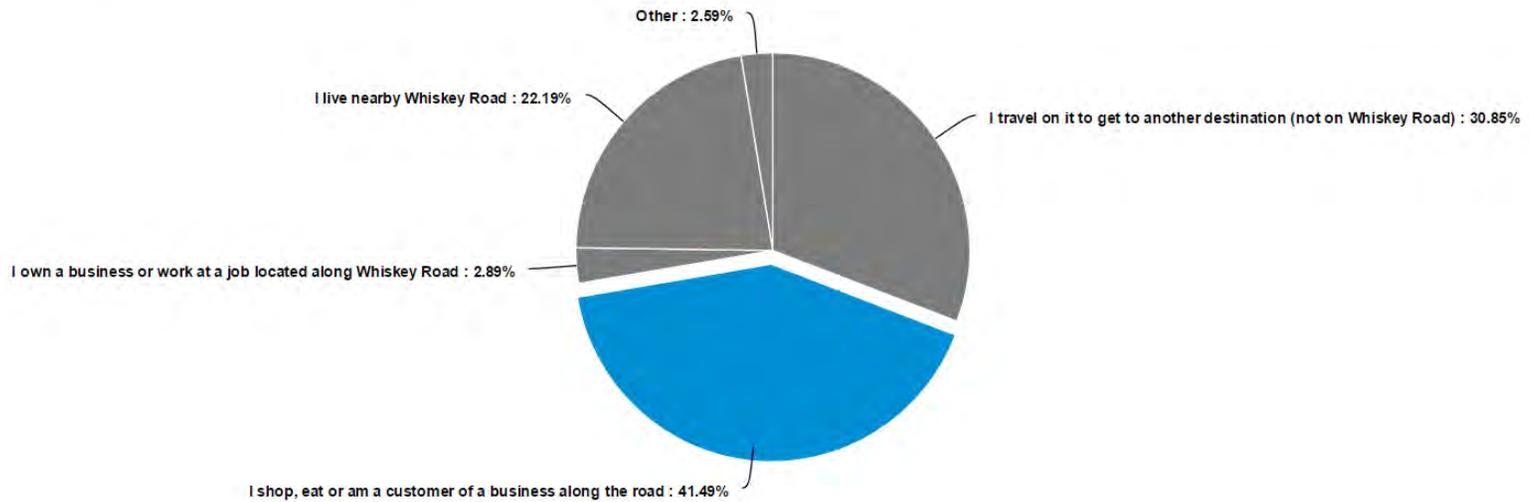
Our findings are consistent with the 2016 Benchmarking Report update, with some revealing nuances. The population in the county continues to demonstrate slow and, in some cases, negative growth, in comparison to the larger region, state and nation. There continues to be a trend of growing Baby Boomer and senior populations, and receding age cohorts, particularly with younger generations. Further details can be found in the following section of this report.

We began with a conversation with the community, which assisted in understanding how the corridor is used, the level of satisfaction with housing choices and commercial activities pertinent to the study. The respondents to an online survey created by Stantec were predominately Baby Boomers and Seniors:

Whiskey Road Respondents (as of December 2016)

Answer	Count	Percent	20%	40%	60%
Under 18	0	0%			
19-25	9	1.98%			
26-35	49	10.77%			
36-50	95	20.88%			
51-64	154	33.85%			
Over 65	148	32.53%			
Total	455	100 %			

How do you most often use Whiskey Road? (Select all that apply)



Findings

Feedback from the community through a variety of venues, including public meetings and through online surveys, revealed the community's vision and its wants and needs. The synthesis of this feedback focuses on four primary areas: Housing, Shopping, Work and Traffic. The majority of the survey respondents felt that the best housing type would be associated with mixed-use development, such as apartments and condominiums. The respondents also felt there was a need for more shopping, dining and entertainment. Our findings reveal a community that is in transition, from an industrial based economy, rooted in an equestrian culture, to one that is both simultaneously changing and aging. This changing demographic is at the intersection of the new economy, which underscores the following key themes:

Shopping is Changing

Whiskey Road is the preeminent shopping and retail corridor of the County and surrounding area. This creates both a compliment and a challenge with respect to adjacent downtown Aiken, a burgeoning historic downtown. Whiskey Road, also known as SC Highway 19, is a significant north/south connection between Interstate 20, downtown Aiken (the county seat) and U.S. Highway 278. Retail trends and the impact of online shopping is dramatically shifting retail's brick and mortar strategies as stores reduce in size and number. As a result, shopping destinations must evolve into new experiences, where shopping and dining is integrated with social gatherings and community events. The impending Aiken Mall redevelopment is a key player in this changing landscape. Integration with other land uses and multi-modal transportation connections (e.g. car, bike, pedestrian, etc.) will be critical to its future success.

Whiskey Road as a Destination

Whiskey Road's customers include local area residents, employees and visitors. Each day, many residents commute through the corridor, while many drive to the corridor for shopping, restaurants and other recreation. Therefore, the corridor serves as a "drive-through" as much as it serves as a regional destination. A large percentage of the employed population are white collar workers, while some of the largest employers are in manufacturing sectors. Regional employees could benefit from opportunities to work closer to home, reducing traffic and a stressful daily commute along a corridor that is considered dangerous, and unsafe for those walking or biking. The corridor and its changing character could evolve into more than just a shopping destination. It could become a lifestyle destination that includes a variety of housing options as well as employment and recreation.

Lifestyles for Baby Boomers & Millennials

While Aiken should provide new housing options to retain and attract a younger demographic, it should simultaneously provide opportunities for older residents to age in place, as they continue to make social and economic contributions to the community. Also for those commuting to Aiken to work each day, opportunities for housing closer to work would be a benefit. Because of shrinking family size and consumer preferences in housing, shopping and work environments, opportunities exist to diversify Whiskey Road employment opportunities and its housing stock – which would enable both the young and old to stay in their community, either after graduation or retirement.

Planning for the Future

The primary goal of the Whiskey Road Corridor Study is to plan for and implement transportation improvements. Yet at the same time, this is an opportunity to transition the corridor into an asset to attract and support private investment. Such public-private partnerships are critical to the long-term success of Whiskey Road. The amount of vacant and/or underutilized land that exists in corridor provides both challenges and opportunities; so, the strategy must be prudent in where and how development should occur. While manufacturing remains the county's economic base, the new economy with emerging technologies can provide new workplace, shopping and entertainment options, while continuing to serve those who built the community during its formative years. This transition includes the expansion of products and services which provide healthy lifestyle options, medical care and job opportunities for emerging technologies. However, it must exercise caution in building too many "places" thus diluting synergies and creating sprawl along the corridor, further threatening Aiken's revered quality of life. We reviewed the dynamics of the corridor and identified three key areas which could provide catalyst sites for suburban retrofit as well as new employment and housing development options for future growth. The transportation improvements as well as amenities and land use along the corridor will need to address a wide range of customers to include pricing and options – from affordable to luxury – for this diverse socio-economic population.

Population Characteristics

As mentioned in the Executive Summary, the demographics of the area are changing. We must look comparatively at each geographic area to understand the competitive advantages or disadvantages of each. The City of Aiken has higher median and average household income as compared to Aiken County or the Augusta Richmond Metropolitan Statistical Area (“MSA”). At the same time, it also has a higher median age - almost 10 years older than the MSA - and the smallest average household size compared to the County and MSA:

2016 Estimates (ESRI)	Aiken City, SC	Aiken County, SC	Augusta- Richmond County MSA
2016 Total Population	31,124	169,206	600,545
2016 Median Household Income	\$51,596	\$46,393	\$46,335
2016 Average Household Income	\$78,229	\$64,217	\$64,120
2016 Median Age	46.6	41	37.7
2016 Average Household Size	2.22	2.45	2.55

Source: US Census, ESRI, Rose Associates

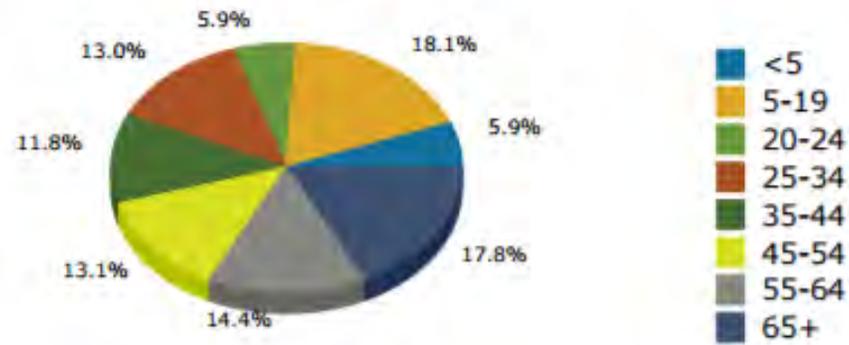
Population Growth

The 2016 update of the Regional Economic Benchmark Report for Aiken County details population. Residents aged 65 or older increased in 2014 while the percentage of residents in two age cohorts: <5 years old and <18 years old both declined during the same period, demonstrating the continued graying of the city population. The Benchmark Report further reveals the City of Aiken had a negative population growth of -0.13% while the County showed positive growth of 0.28% during the 2013-2014 time period.

Age Cohorts

A closer look into the population characteristics as they relate to age assists in understanding the impacts on the economy and real estate. Baby Boomers are the primary generation of residents in both the city and county. Baby Boomers nearing retirement are seeking communities which offer an attractive quality of life and access to healthcare, cultural arts and other amenities. The migration of retirees to the Southeast and Aiken’s position within the region make this community an attractive choice. Unlike the Baby Boomer generation, whose housing decisions were driven by job relocations, Millennials make career decisions based upon their desired lifestyle, then revolve their job search around their chosen community. Many communities are focused on ways that they can attract Millennials, also known as Generation Y, ranging in age from 15 to 34 years old. With varied needs and characteristics this generation includes a broad spectrum of life stages from teens to young adults and families. The illustration below highlights the 2016 Population by Age for Aiken County:

2016 Population by Age



Population by Generation

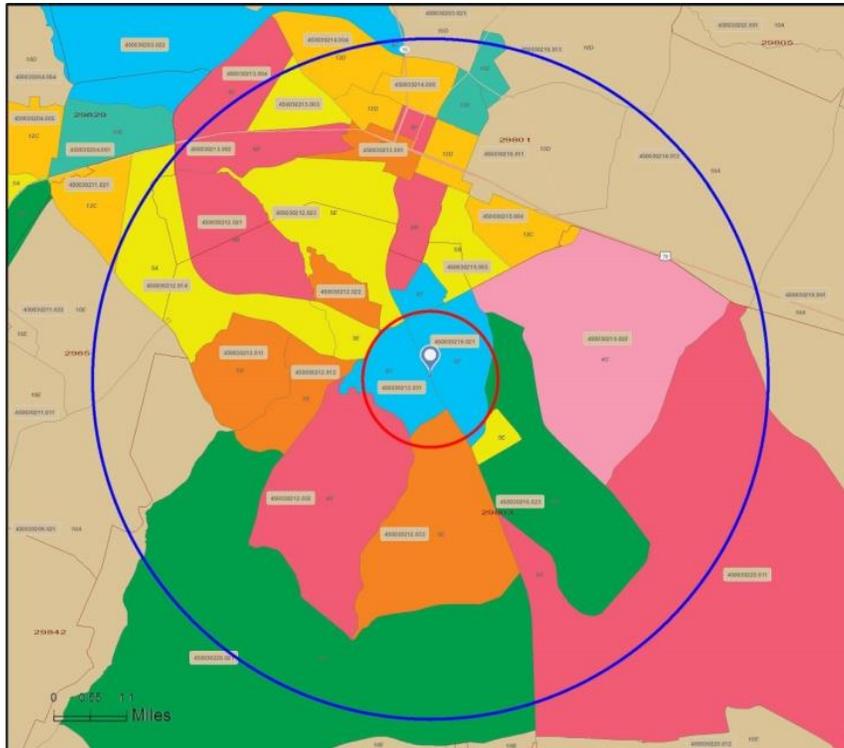
Baby Boomers	Generation X	Millennials
Aiken County		
2016 = 25%	2016 = 25%	2016 = 25%
2010 = 14%	2010 = 28%	2010 = 25%
City of Aiken		
2016 = 30%	2016 = 21%	2016 = 24%
2010 = 27%	2010 = 23%	2010 = 27%
<i>Source: ESRI, Rose Associates</i>		

Lifestyle Segmentation

Lifestyle Segmentation, as defined by ESRI’s Tapestry©, combines demographic and socio-economic data to further understand the residents in a neighborhood and the consumers in an area. Tapestry© assists in understanding lifestyle characteristics including housing, consumer and entertainment preferences. The entire U.S. population is categorized within 14 Tapestry LifeMode groups, from which 65 Lifestyle Segments can be identified at various geographic levels. These provide in-depth information about the character of Aiken’s households combining demographic, social and behavior patterns.

Tapestry LifeModes

While the region contains a variety of the 14 Lifemode groups, there are stark differences between the lifestyles of those in the City of Aiken as compared to the County. Aiken County has most of its households in only one of these groups, **Rustic Outposts (L10)**. Similarly, in the City of Aiken the majority of households are within only two: **Senior Styles, (L9) and Affluent Estates (L1)**



ESRI, Rose & Associates 2016

Tapestry Segments

These Tapestry LifeMode groups and their corresponding Lifestyle Segments assist in further identifying the area’s characteristics and needs in terms of housing, employment, shopping and entertainment:

Aiken County: Dominant LifeMode Group – Rustic Outposts (L10)



Southern Satellites is the dominant theme in Aiken County making up 20% of households. Southern Satellites is the second largest market found in rural settlements but within metropolitan areas located primarily in the South. This market is typically non-diverse, slightly older, settled married-couple families, who own their homes. Almost two-thirds of the homes are single-family structures; a third are mobile homes. Median household income and home value are below average. Workers are employed in a variety of industries, such as manufacturing, health care, retail trade, and construction, with higher proportions in mining and agriculture than the US. Residents enjoy country living, preferring outdoor activities and DIY home projects.

Rural Bypasses at 12% is the second largest group in Aiken County. Defined by open space, undeveloped land and farmland characterize Rural Bypasses. These families live within small towns along country back roads and enjoy the open air in these sparsely populated neighborhoods. Their country lifestyle focuses on the outdoors, gardening, hunting and fishing. They are more likely to own a satellite dish than a home computer. Although most households do have a connection to the Internet, their use is very limited. Those who are not yet retired work in blue collar jobs in the agriculture or manufacturing industries.

Down the Road is shown here as the third group containing 7% of the residents of Aiken County. Down the Road is a mix of low-density, semi-rural neighborhoods in large metropolitan areas. Almost half of householders live in mobile homes; approximately two-fifths live in single-family homes. These are younger, diverse communities, with the highest proportion of American Indians of any segment. These family-oriented consumers value their traditions. Workers are in service, retail trade, manufacturing, and construction industries, with higher proportions in agriculture and mining, compared to the US. This market has higher unemployment, much lower median household income and home value, and a fifth of households with income below poverty level.

Other characteristics of these groups include:

Southern Satellites	Rural Bypasses	Down the Road
<ul style="list-style-type: none"> About 79% of households are owned. 	<ul style="list-style-type: none"> Most residents own single-family homes, or mobile homes. 	<ul style="list-style-type: none"> Two-thirds of households are owned.
<ul style="list-style-type: none"> Married couples with no children are the dominant household type, with many multigenerational households. 	<ul style="list-style-type: none"> An older market, with more married couples without children and single households, the average household size is slightly lower at 2.54. 	<ul style="list-style-type: none"> Family market, primarily married couples or single-parent households.
<ul style="list-style-type: none"> Most are single-family homes (65%), with many mobile homes. 	<ul style="list-style-type: none"> Most housing was built from 1970 to 1989; vacancy rates are higher due to seasonal housing. 	<ul style="list-style-type: none"> Close to half of all households live in mobile homes.
<ul style="list-style-type: none"> Most housing units were built in 1970 or later. 	<ul style="list-style-type: none"> Residents live in very rural areas, almost entirely in the South. 	<ul style="list-style-type: none"> Four-fifths of households were built in 1970 or later.
<ul style="list-style-type: none"> Most households own 1 or 2 vehicles, but owning 3+ vehicles is common. 	<ul style="list-style-type: none"> Income is primarily derived from wages; however, dependence on Social Security and Supplemental Security Income is above average. 	<ul style="list-style-type: none"> About 18% of owned homes are valued under \$50,000 (over 3 times the US percentage).
<ul style="list-style-type: none"> Education: almost 40% have a high school diploma only; 41% have college education. 	<ul style="list-style-type: none"> Education is not a priority in this market. Almost 30% have not finished high school; only 9% have a bachelor's degree or higher. 	<ul style="list-style-type: none"> Education completed: 37% with a high school diploma only, 38% with some college education or a degree.
<ul style="list-style-type: none"> Labor force participation rate is 59.7%, slightly lower than the US. 	<ul style="list-style-type: none"> Unemployment is very high at 14%; labor force participation is low at 46%. 	<ul style="list-style-type: none"> Unemployment rate is 11.6%, higher than the US rate.
<ul style="list-style-type: none"> These consumers are more concerned about cost rather than quality or brand loyalty. 	<ul style="list-style-type: none"> Religion, faith, and traditional values are central in their lives. 	<ul style="list-style-type: none"> Labor force participation rate is 59.6%, slightly lower than the US.
<ul style="list-style-type: none"> They tend to be somewhat late in adapting to technology. 	<ul style="list-style-type: none"> Many have a pessimistic outlook of their household's financial well-being. 	<ul style="list-style-type: none"> Family-oriented, outgoing consumers; they place importance on preserving time-honored customs.
<ul style="list-style-type: none"> They obtain a disproportionate amount of their information from TV, compared to other media. 	<ul style="list-style-type: none"> They rely on television to stay informed. 	<ul style="list-style-type: none"> They put a premium on convenience rather than health and nutrition.

Aiken City: Dominant LifeMode Groups - Senior Styles, (L9) and Affluent Estates (L1)



Golden Years are independent, active seniors nearing the end of their careers or already in retirement. Golden Years residents represents the largest Segment at 13% of households in the City of Aiken. This market is primarily singles living alone or empty nesters. Those still active in the labor force are employed in professional occupations; however, these consumers are actively pursuing a variety of leisure interests—travel, sports, dining out, museums, and concerts. They are involved, focused on physical fitness, and enjoying their lives. This market is smaller, but growing, and financially secure.

Exurbanites represent 12% of households in the City of Aiken. Exurbanites residents are now approaching retirement but showing few signs of slowing down. They are active in their communities, generous in their donations, and seasoned travelers. They take advantage of their proximity to large metropolitan centers to support the arts, but prefer a more expansive home style in less crowded neighborhoods. They have cultivated a lifestyle that is both affluent and urbane.

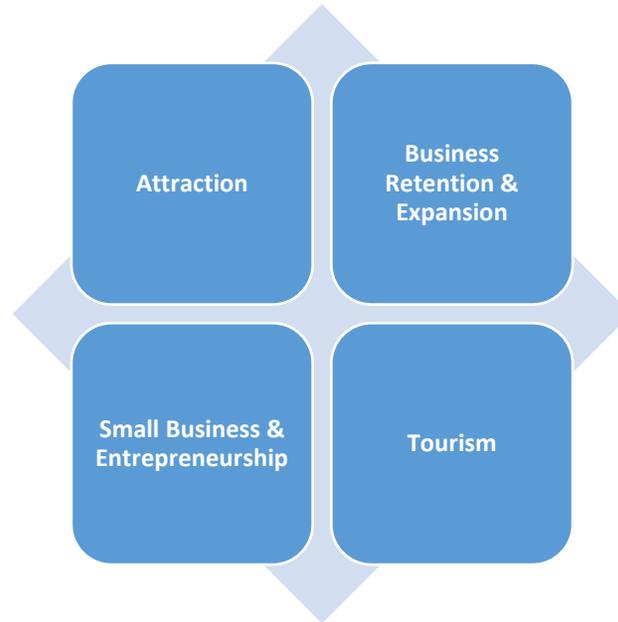
Silver and Gold also represents 12% of households in the City of Aiken, representing almost the oldest senior market (second to The Elders). The difference of 10 years in median age reveals a socioeconomic difference: This is the most affluent senior market and is still growing. The affluence of Silver and Gold has afforded the opportunity to retire to sunnier climates that feature exclusive communities and vacation homes. These consumers have the free time, stamina, and resources to enjoy the good life.

Other characteristics of these groups include:

Golden Years	Exurbanites	Silver and Gold
<ul style="list-style-type: none"> • This older market has a median age of 51 years and a disproportionate share (nearly 30%) of residents aged 65 years or older. 	<ul style="list-style-type: none"> • Established neighborhoods (most built between 1970 and 1990) found in the suburban periphery of large metropolitan markets. 	<ul style="list-style-type: none"> • Residents of Silver and Gold prefer a more bucolic setting, but close to metropolitan cities.
<ul style="list-style-type: none"> • Single-person households (over 40%) and married-couple families with no children (one-third) dominate these neighborhoods; average household size is low at 2.05. 	<ul style="list-style-type: none"> • A larger market of empty nesters, married couples with no children; average household size is 2.48. 	<ul style="list-style-type: none"> • Neighborhoods include seasonal or vacation homes, reflected in the high vacancy rate of 35%. • Mostly older married couples with no children, average household size is 2.02.
<ul style="list-style-type: none"> • Most of the housing was built after 1970; approximately 43% of householders live in single-family homes and 42% in multiunit dwellings. 	<ul style="list-style-type: none"> • Primarily single-family homes with a high median value of \$346,000, most still carrying mortgages. • Higher vacancy rate at 9%. 	<ul style="list-style-type: none"> • Predominantly single-family, owner occupied homes that have a median value of \$289,000.
<ul style="list-style-type: none"> • These neighborhoods are found in large metropolitan areas, outside central cities, scattered across the US. 	<ul style="list-style-type: none"> • Residents are college educated; more than half have a bachelor's degree or higher; almost 80% have some college education. 	<ul style="list-style-type: none"> • Well-educated seniors, 44% have college degree(s).
<ul style="list-style-type: none"> • Golden Years residents are well educated—20% have graduate or professional degrees, 26% have bachelor's degrees, and 26% have some college credits. 	<ul style="list-style-type: none"> • This labor force is beginning to retire. 1 in 3 households currently receive Social Security or retirement income. Labor force participation has declined to less than 60%. 	<ul style="list-style-type: none"> • Primarily retired, but many still active in the labor force, participation rate of 41%.
<ul style="list-style-type: none"> • Unemployment is low at 7% (Index 76), but so is labor force participation at 55% (Index 88), due to residents reaching retirement. 	<ul style="list-style-type: none"> • Unemployment remains low at 5.5% (Index 64); more of the residents prefer self-employment or working from home. 	<ul style="list-style-type: none"> • Low unemployment at 7.2%; with self-employment, highest among Tapestry markets.
<ul style="list-style-type: none"> • Median household income is higher in this market. Although wages still provide income to 2 out of 3 households, earned income is available from investments (Index 172), Social Security benefits (Index 153), and retirement income. 	<ul style="list-style-type: none"> • Consumers are more interested in quality than cost. They take pride in their homes and foster a sense of personal style. Sociable and hardworking, they still find time to stay physically fit. 	<ul style="list-style-type: none"> • More than half of the households with income from wages/salaries, Social Security, or investments, many drawing retirement incomes.
<ul style="list-style-type: none"> • These consumers are well connected: Internet access is used for everything from shopping or paying bills to monitoring investments and entertainment. They are generous supporters of the arts and charitable organizations. 	<ul style="list-style-type: none"> • Exurbanites residents are well connected, using the Internet for everything from shopping to managing their finances. 	<ul style="list-style-type: none"> • Connected, but primarily to get news and track investments, more likely to own an e-reader or tablet than a smartphone.

Economic Development Strategies

Economic development strategy begins with understanding the local labor market and the community's economic base. With that understanding, economic development organizations may focus on any, or all, of the following four primary areas:



Labor and Employment

Local employment is assessed by many data points, including educational attainment for job readiness and the employed population. Often the percentage of civilian population aged 16 or higher that is employed or seeking employment is defined as the labor force participation rate. However, these figures do not consider those that are unemployable (due to lack of skills or minimum educational attainment), the unemployed and those who have dropped out of the workforce.

Educational Attainment

The threshold issue related to employment is educational attainment. This determines the readiness of the local workforce, as the correlation between education, employment and income is well documented. There is a clear difference of educational attainment when comparing the city of Aiken to the County, which has been the focus of the regional economic development partnership.

According to the U.S. Census Bureau, for the period from 2011 – 2015, the percentage of Aiken County population who are 25 years old and older having achieved a bachelor’s degree or higher is only 25.3%. By comparison, the City of Aiken population 25 years and older with a bachelor’s degree or higher is 42.9%.

Education in Aiken:	CITY	COUNTY
High school graduate or higher, percent of persons age 25 years+, 2011-2015	89.5%	85.3%
Bachelor's degree or higher, percent of persons age 25 years+, 2011-2015	42.9%	25.3%

Source: United States Census Bureau

In addition to primary school programs for K-12, the community built an important partnership with the University of South Carolina to build its USC Aiken campus. According to [USC Aiken](#) sources: “Building partnerships has been the cornerstone of the University of South Carolina Aiken since its inception in 1961. It was then that the citizens of the Aiken community voiced the need for a local institution of higher education. Through state legislation, a governing board was formed, the Aiken County Commission for Higher Education, which continues to oversee the University’s mission.” Since then, leaders have overseen the campus as it has grown from a commuter institution to a more traditional, residentially-based campus. Today, USC Aiken has ranked in the top three public baccalaureate colleges in the South by *U.S. News & World Report’s* guide "America’s Best Colleges" for nineteen consecutive years. More than 3,500 students attend the university, providing bachelor’s and master’s degrees in 48 programs of study, and approximately 500 students graduate each year.

Workforce

Local collaborations between business and education institutions includes the most recent project, announced in March of 2016 by USC Aiken and the [U.S. Department of Energy](#) for a new facility: “The campus of USC Aiken has been selected as the proposed location for the Advanced Manufacturing Collaborative for the Savannah River National Laboratory (SRNL). The choice brings the U.S. Department of Energy one step closer to the creation of a new facility to promote partnerships among industry, academia and government in the creation and implementation of new technology.” Savannah River Nuclear Solutions (SRNS), as the operator of SRNL, has selected the Aiken Advanced Manufacturing Partnership (AAMP) to develop a proposal for space for the 70,000-square-foot space to include chemistry labs, engineering fabrication labs, high bay and industrial workspace and staff offices. Dr. Terry A. Michalske, director of SRNL and executive vice president of SRNS quotes: “We look forward to the opportunity to work with the AAMP group in creating brand new space for the Savannah River National Laboratory that can help us put science to work in collaboration with our industry, academic and government partners. This space will allow SRNL to build the future of innovation. By thinking creatively, we can more effectively partner our talent with industry and academia to address a multitude of technology needs.”

The project will help create the next generation of the workforce and ensure that new technologies through the collaborative will benefit the regional and national economy in advanced manufacturing. “We in (the) industry need that workforce really focused on science, technology and manufacturing because that is the future of this county,” Michalske said. “Without those areas, we’re in deep trouble.”

The 2016 employed population (16+ years old) who live in Aiken County are predominately employed in White Collar jobs (57.0%) which includes management, business, finance, professional, sales and administrative support. More notable, 27.1% are employed in Blue Collar industries. By comparison, in the City of Aiken, 65.8% are employed in White Collar occupations, while only 17.9% are employed in Blue Collar occupations.

Aiken County residents employed in both white and blue collar industries often do not travel outside of the county to work. And, nearly a third in the county commute out of state, primarily to neighboring Georgia. This is reflected in the percentage of workers who report commuting patterns as shown below:

Work Migration Patterns	Aiken County			Aiken		
	2012	2013	2014	2012	2013	2014
Worked in state of residence (percent)	79.8	80.1	78.9	92.7	91.7	90.5
Worked in county of residence (percent)	69.9	70.6	69.1	87.7	87.3	86.0
Worked in state but outside county of residence (percent)	9.9	9.5	9.8	5.1	4.5	4.5

Source: Greater Aiken Chamber of Commerce – Regional Benchmarking Report

Economic Base

The employment location quotient (“LQ”) identifies which industry sectors contribute the greatest local job and economic growth. This is a ratio of the county percentage of employment as compared to U.S. employment. The sectors within the county with location quotients (“LQ”) greater than 1.00 demonstrate higher than U.S. averages, thus the primary drivers of the local economic base and overall job growth. The chart below highlights Aiken County’s leading industries:

Economic Base Industry Sectors		Aiken County	
NAICS	2015	LQ	% Employment
22- Utilities		1.97	0.92%
23 - Construction		1.44	7.81%
31-33 Manufacturing		1.37	14.24%
44-45 - Retail Trade		1.09	14.37%
56 - Administrative & Waste services		2.42	17.97%
71 - Arts, entertainment & recreation		1.00	1.84%
NOTE: Other sectors with large percentages of employment in Aiken County are in: 62-Healthcare and social assistance - 11.56% 72-Accommodation and food services - 10.65%			

Economic Base Analysis is used to understand what drives the local economy and determines real estate demand. The underlying theme suggests that jobs drive demand for real estate. In other words, for every base industry job that is created, a multiplier effect increases overall employment, in turn increasing both population and income benefiting from such job growth. There are two types of jobs: those which export their goods and services outside the community (also referred to as basic employment), and those which service the local community (otherwise referred to as non-basic or service employment). Therefore, companies seeking to locate in the area with basic jobs are the goal of most economic development officials.

The corresponding growth (or decline) in jobs, population and income correspond to demand, and stability, for housing and various commercial uses of real estate. These companies, both large and small, occupy both office and industrial space and are the catalysts for subsequent growth in housing and retail. Other factors such as education and healthcare also influence workforce, wages, income and consumer expenditures. The dynamics of population characteristics and the local economy all influence land use, real estate markets and economic development strategies.

Business & Industry

As noted in the Regional Economic Benchmarking Report for Aiken County (2016 update) as well as the U.S. Census estimates, Aiken county's population grew by over 12% from 2000 to 2010, then slowed by almost half (5.69%) from 2010 to the most recent 2016 estimates. At the same time, job growth did not keep pace, with employment hovering around 70,000 employed in Aiken County over the period from 2000 to 2015. In 2015 it reached a new low of 69,208, not seen since 2004.

There are an estimated 2,686 business establishments in Aiken County per second quarter 2016 estimates from the Bureau of Labor Statistics. This has moderated from 2014 and 2015 levels of 2,677 and 2,737 respectively. Aside from the sectors of the economy – defined by traditional Standard Industry Classification (SIC) or the more recent North American Industrial Classification (NAICS) – the size or stage of each company is a factor when determining employment growth and its relationship to real estate. Similar to state of South Carolina, the large majority of establishments in Aiken County contain less than ten employees. The major employers (500+) in Aiken County represent a diverse range of both goods and services-producing sectors:

Major Employer	Number of Employees	Product/Service
Savannah River Nuclear Solutions	5388	Nuclear Processing
Aiken County Public Schools	3300	Education
Savannah River Remediation	2115	Waste Tank Closure/environmental
Shaw/AREVA	1961	Nuclear Design
Bridgestone Tire	1830	Car & Truck Tires
Kimberly Clark Corp.	1250	Consumer Paper Products
Aiken Regional Medical Centers	1200	Healthcare
Aiken County	890	Government
AGY	770	Fiberglass Yarns
Crane Merchandising Systems	746	Vending Machines
Shaw Industries	600	Carpet Yarns
University of South Carolina Aiken	534	Education

Source: Greater Aiken Chamber; October 2015

The Economic Development Partnership of Aiken, Edgefield and Saluda Counties, SC is primarily focused on business and industry attraction and expansion efforts. Though primarily in the manufacturing sectors, it's goal is to continue to diversify the industry sector landscape in both the goods-producing and service-producing sectors. According to the regional Economic Development Partnership, six key industries for attraction and expansion of business are the focus in the region:

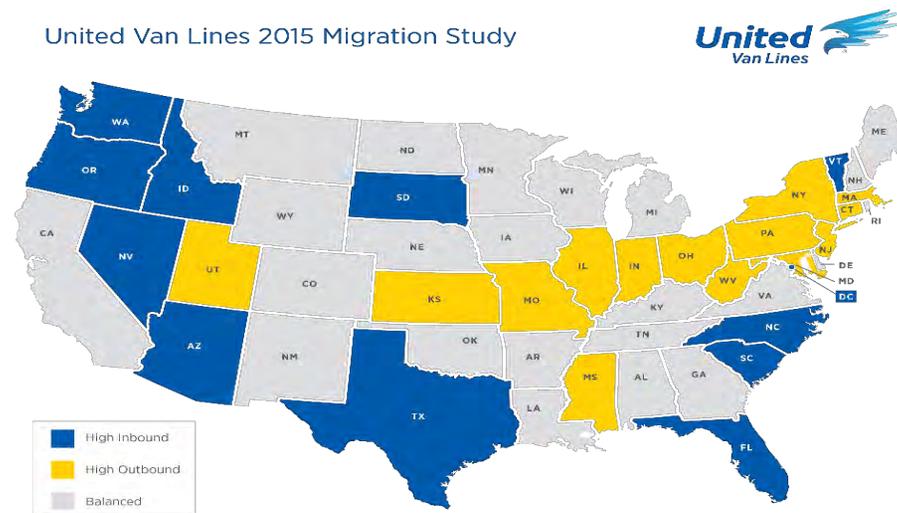
Key Industries	
Advance Manufacturing	Research & Development
Chemicals	Energy Research
Plastics	Food Processing
<i>Source: Economic Development Partnership Aiken, Edgefield & Saluda Counties</i>	

With its added emphasis on education and job readiness, these types of businesses are primarily focused on industrial space uses along Interstate 20 and key transportation corridors, including Whiskey Road.

Tourism

As demonstrated in the Economic Base analysis above, both retail trade and arts, entertainment and recreation contribute significantly in the local economy. The Whiskey Road corridor is the center of this reality, as a major regional shopping and lodging destination, bringing visitors and expenditures into the area. Visitors come to the area attractions and events such as the equestrian competitions and polo matches, the parks and gardens, golf and other recreational venues. Major employers such as the Savannah River site, university and medical centers also bring in visitors from outside the area. There are five hotels located along the Whiskey Road corridor: Clarion Inn & Suites, Fairfield Inn & Suites Towne Place Suites, Hilton Garden Inn and Hampton Inn.

According to 2015 data from United Van Lines, South Carolina continues to be a high inbound migration state, attracting newcomers to the area for work, recreation, and most notably, for retirement as well. Thoughtful estimates suggest the In-Migration Industry annually generates an estimated \$13 billion in fresh cash to the South Carolina economy.



This is demonstrated in growth in the local population and consumer spending, which contrary to employment contraction, continues to grow at a healthy pace in Aiken County. Patrick Mason of Carolinainliving.com considers the impact of tourism on the local economy, particularly those nearing or in retirement. Per their annual report, the transient leisure segment (“Turbo-Tourists”), estimated to be 6-million visitors to the Carolinas annually, are here exploring with investment and relocation motivations. These affluent, educated families visit and tour numerous destinations as part of their exploration mission. They reserve way in advance, spend more, stay longer and return more frequently on average. Beyond a \$2,000 to \$10,000 vacation, there’s a “turbo-effect” when they relocate and/or acquire a second home, investing \$250,000 to over a million in the first year. Each new household creates 1.9 jobs locally. Then, the “turbo-effect” kicks in again, as these new homeowners begin entertaining, on average, six friends and family groups a year, some of whom, like birds-of-a-feather, will also relocate or invest here. A third “turbo-effect” ices the economic cake as the research consistently reports that as many as 14% “say”, they plan to move or launch a business, bringing intellectual capital, investing millions and creating thousands of new jobs across the Carolinas. Aiken and the Whiskey Road corridor has clearly been the beneficiary of this dynamic, but where and how could this be expanded?

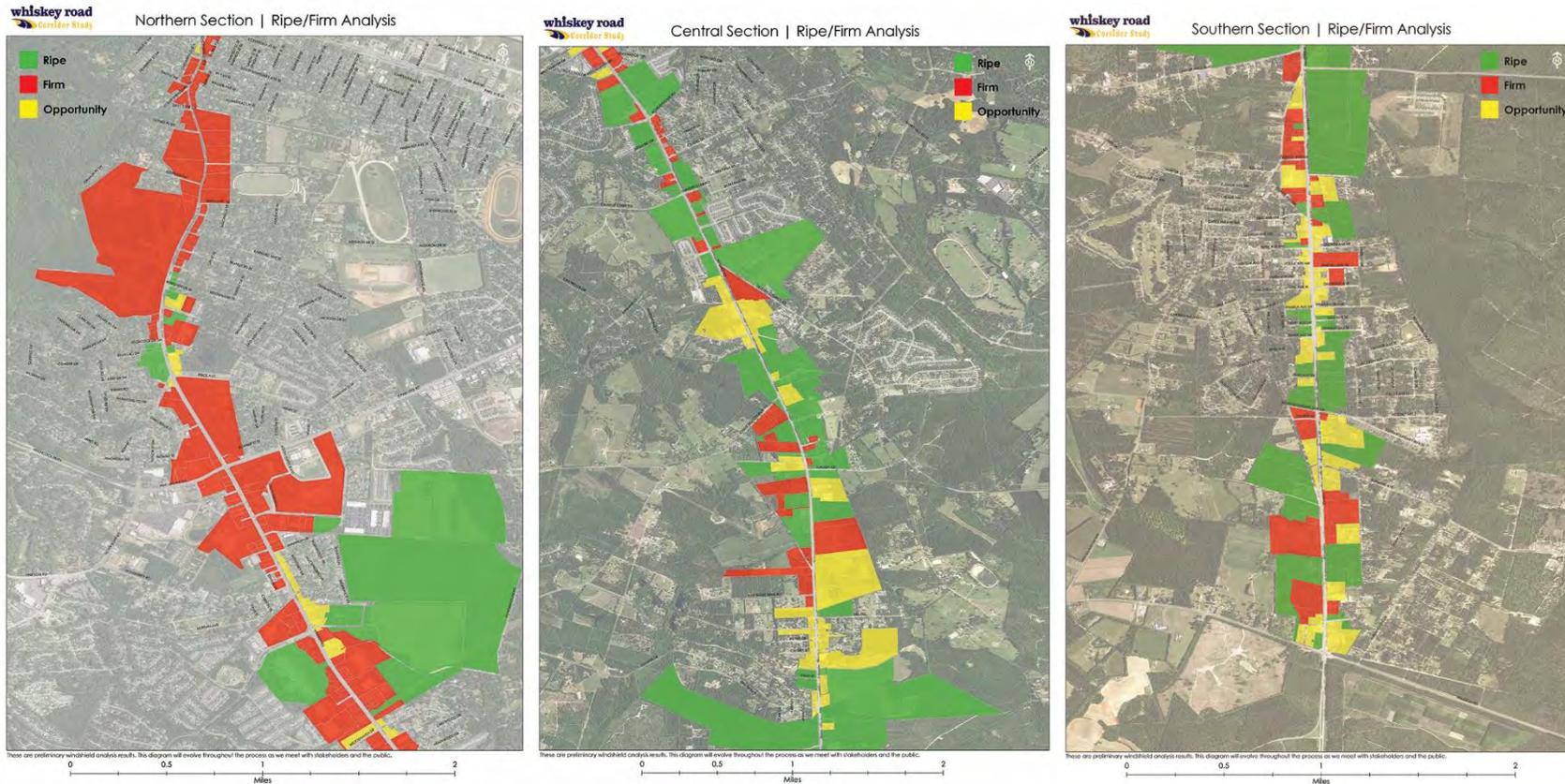
Targeted Economic Areas & Strategies

We identified trade areas along the corridor, based upon data and public feedback in which there are existing central places, or centers of influence, as well as transportation patterns, existing infrastructure/investment, existing land uses, proposed redevelopment and available undeveloped land.

A tour and analysis of the Whiskey Road corridor on a parcel by parcel basis revealed three levels at which future land uses may be considered: Ripe (in green) were those parcels identified as vacant or for sale, or in other words, ripe for development/redevelopment. Those in yellow were identified as opportunity sites, with buildings or structures in need of renovation/repair. Lastly, those which were firmly or solidly developed or preserved and contributing to the vitality of the corridor were identified in red. These parcels totaled 2,865 acres, color coded on maps of the corridor to include the following:

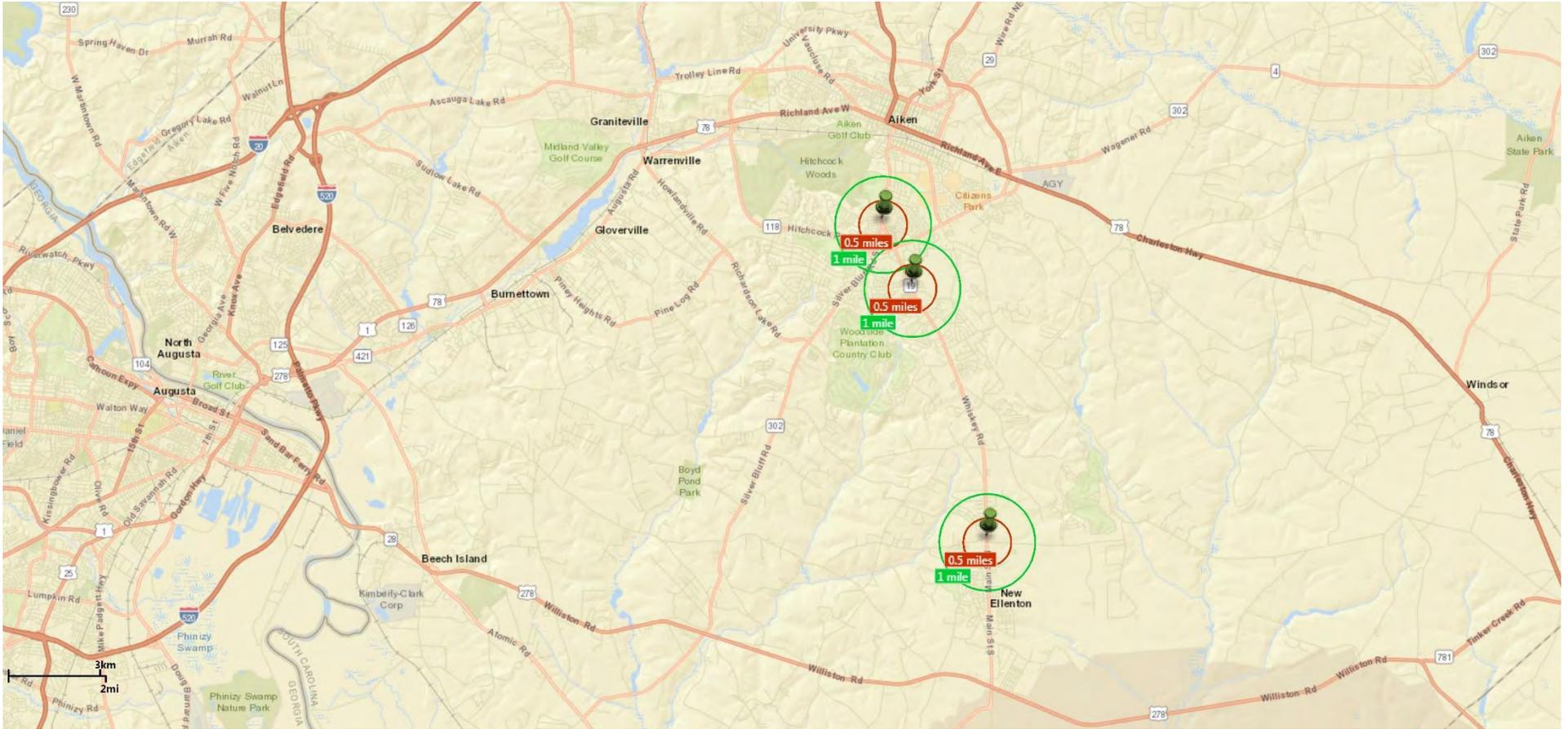
- Ripe (green) = 1,574 acres
- Opportunity (yellow) = 401 acres
- Firm (red) = 890 acres
- Total = 2,865 acres

This included analysis for three segments of the corridor:



Given the length and changing character of the Whiskey Road corridor from historic urban to suburban to rural, three targeted catalyst areas were identified from which to build place-based strategies for economic development to support current and future land uses. They are bookended to the north and south with a proposed lifestyle center at the core Aiken Mall site focused around retail and entertainment, as well as new housing options. The others include an urban infill area north of the intersection of Price, and a future town center – at New Ellenton - to support and diversify employment and housing opportunities and increase daytime population to support the corridor’s retail.

These targeted areas in the map below include primary trade areas of a .50 and 1.0-mile radius, to illustrate 5 and 10-minute walk times:



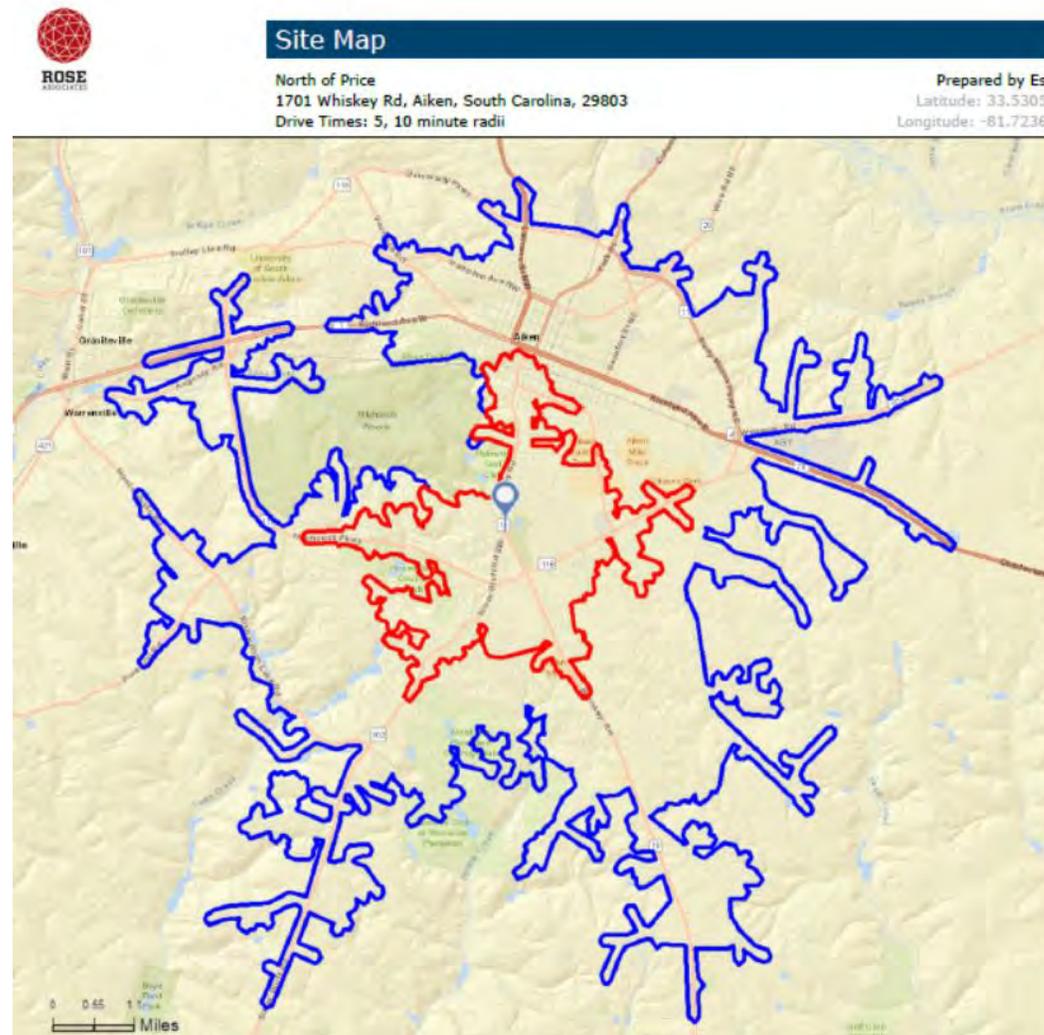
ESRI, Rose & Associates 2016

The unique characteristics of each of these areas is highlighted below:

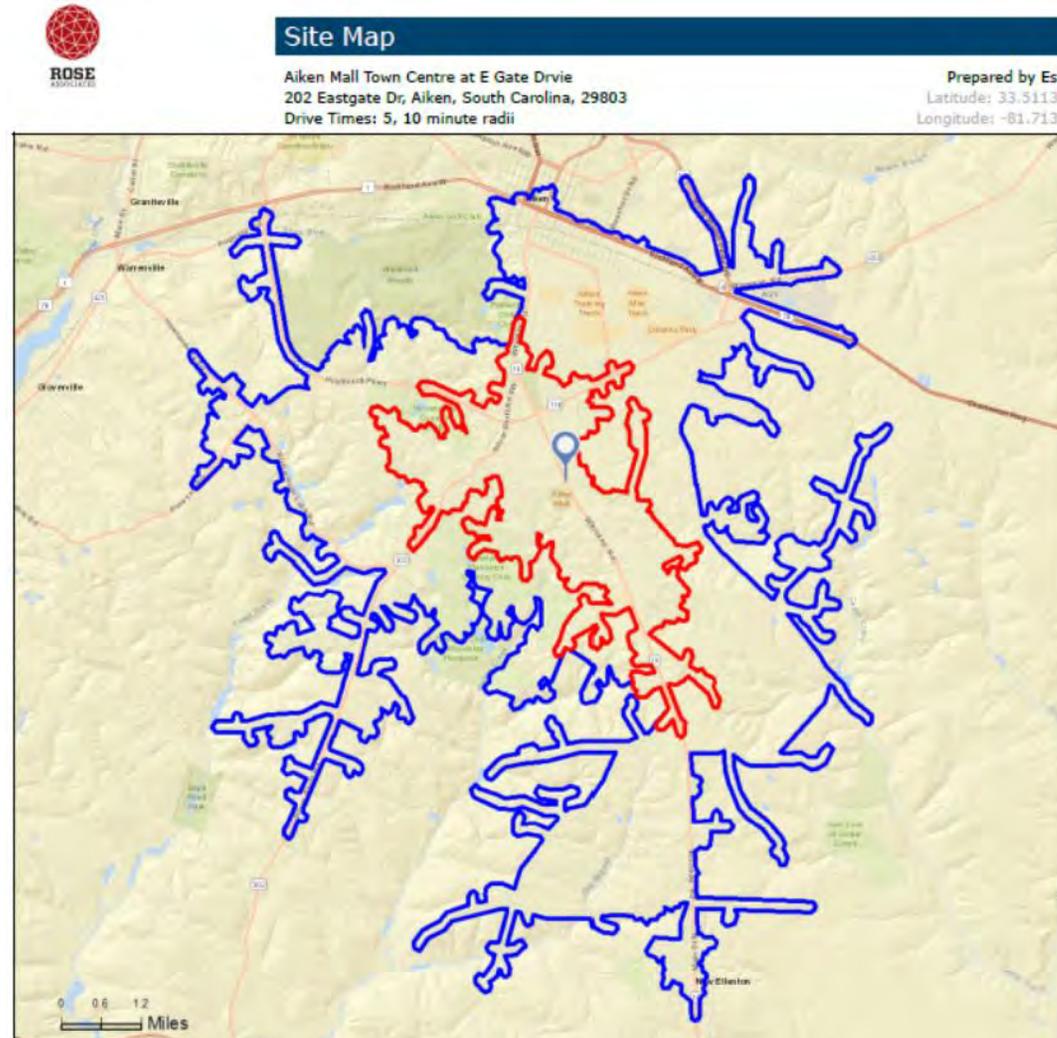
2016 Estimates (ESRI) (1 mile)	2016 Total Population	2016-2021 Population: Annual Growth Rate	2016 Median Household Income	2016 Average Household Income	2016 Median Age	2016 Average Household Size
North of Price	6,115	0.61%	\$54,604	\$73,862	43.8	2.12
Aiken Mall Town Centre at E Gate	4,555	0.37%	\$51,462	\$67,018	39.9	2.09
Old Whiskey at New Ellenton	1,185	0.93%	\$43,355	\$59,038	44.9	2.27

The secondary trade areas of 5 and 15-minute drive times for both convenience and destination-oriented goods and services were also evaluated. These trade areas assist to identify the dynamics of consumer behavior and expenditure trends to determine potential for retail, housing, entertainment and other land uses, to be further discussed in the next section. The recommended targeted areas and their corresponding key themes include:

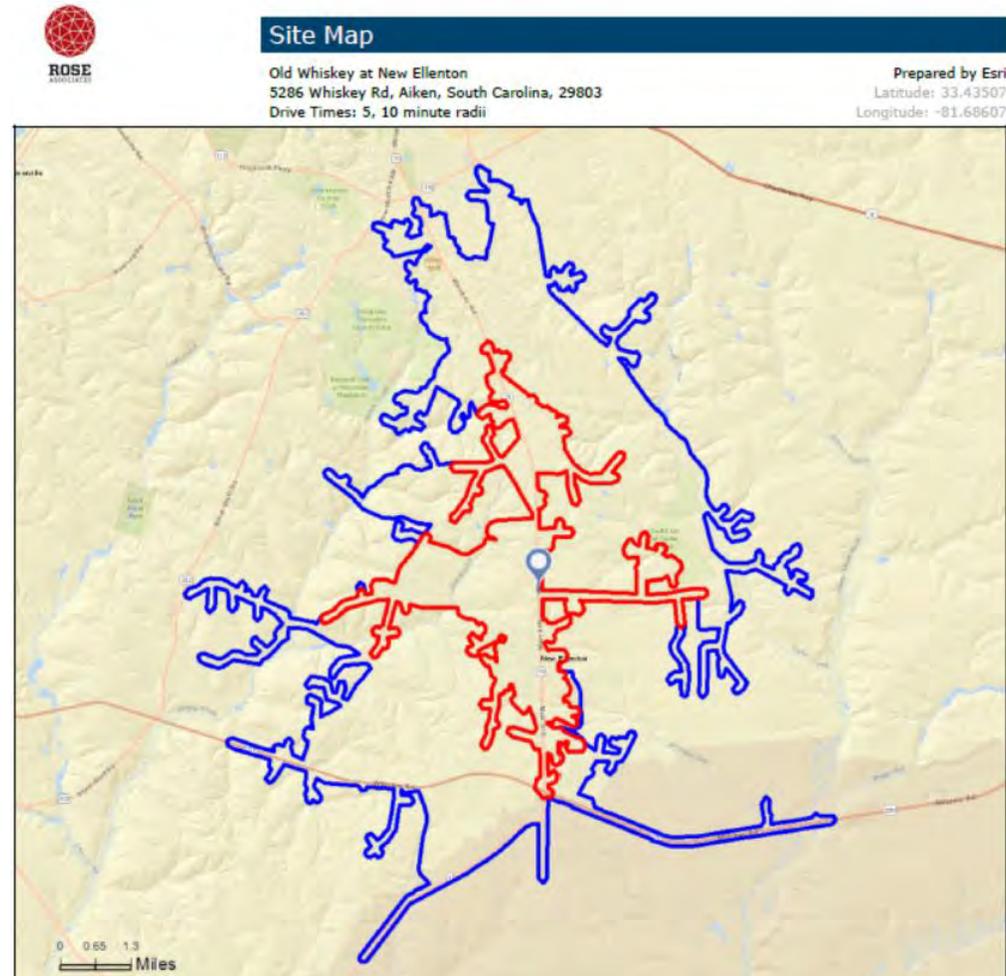
- North of Price** – On the southern edge of the historic and civic district of Downtown Aiken, this area is close to parks, public facilities and the downtown core. This area has opportunity for suburban retrofit with newer mixed use office and/or retail development filling the gap between the Aiken Mall area to the south and the established historic Aiken downtown to the north. Economic Development strategies would include expanded tourism and small business/entrepreneurship efforts linked to the downtown.



- Aiken Mall Town Centre** – The area of the corridor with the heaviest commercial and residential development. The planned Aiken Mall redevelopment will create the opportunity to make this a true lifestyle center which will draw new retailers and other development opportunities to the immediate area. The redevelopment will also strengthen existing stores and business in this section of the corridor and provide opportunities for others to relocate to this existing “central place”, providing a key center of influence for the region. The proposed redevelopment which is adjacent to the upscale Woodside community could expand and integrate alternative housing options for a walkable, mixed-use environment.



- Old Whiskey @ New Ellenton** – New Ellenton has had a challenging history. Originally chartered in 1880, the town of Ellenton was moved from its original location due to the Savannah River Nuclear Laboratory (SRNL). This event relocated Ellenton’s population of 6,000 residents 14 miles north to the new town, now called New Ellenton. The population has diminished over the years, with the current U.S. Census estimate at 2,121 residents. With large tracts of land, ease of access to adjacent areas of Aiken and surrounding counties, this area has opportunity for new residential development and future employment opportunities, along with small scale commercial goods and services. With respect to the past, this rural/suburban growth area provides an opportunity for a more prosperous future by providing a focused look at creating a future district that can restore opportunities for this community. Economic Development strategies include new employment options, which in turn would provide added daytime population to support new housing and convenience oriented retail.



Real Estate Market

According to data collected by Stantec, there are approximately 2,865 acres within the corridor study area, with approximately 1,574 acres, or 55% of the total inventory, defined as “ripe” for development/redevelopment. This will diminish over time as vacant parcels are entitled and developed. Therefore, Aiken must carefully balance where and how people work, live, shop and recreate within the community and the Whiskey Road corridor.

The current and proposed future land use strategies are benchmarked against real estate market trends. Demand for space is driven by several factors including, but not limited to, the local economy and job growth, transportation, land entitlements and infrastructure and quality of life. Real estate data is measured by submarkets, which may include specific geographic areas or counties. Analyzing real estate markets is as much art as it is science, as the data represents both a snapshot in time and prevailing trends. These are also important elements when determining local market capture in the context of the larger regional marketplace.

Work

The successful recruitment of new businesses generally results in demand in the form of either office or industrial space. The work environment is changing. The next generation of work space reflects the behaviors, attitudes and design of what was traditionally called office and industrial space. New work environments are less formal structures that are flexible and offer open spaces where workers engaged in technology, research, advance/precision manufacturing, can collaborate or perhaps be used for light assembly. Workspace structures may look more like a neighborhood coffee house than an office building and the workspace environment can even become a recruiting tool. Despite this, market data analysts and lenders continue to collect and report data based on traditional product types, including office, industrial and retail:

Aiken County	Retail		Office		Industrial	
Inventory	Survey	5-yr Avg.	Survey	5-yr Avg.	Survey	5-yr Avg.
Existing SF	9,153,638	8,875,294	1,412,572	1,359,251	12,749,261	11,033,675
12 Mo. Starts SF	35,063	98,163	0	29,121	0	864,098
Availability						
Vacant SF	691,063	745,092	146,159	102,356	418,905	987,815
Vacancy Rate	7.5%	8.4%	10.3%	7.5%	3.3%	9.0%
Rent per SF	\$8.45 NNN	\$9.47 NNN	\$15.32 G	\$14.03 G	\$3.05	\$2.24
Demand						
12 mos. Absorption SF	131,720	75,410	-58,500	20,848	512,650	755,497

Source: Newmark Grubb Wilson Kibler 2016

Office Demand

The economic development emphasis on business attraction and expansion for the six key industries noted above drive primarily industrial land uses. However, other industries such as healthcare, education and professional services diversify the industry landscape and could serve to drive demand for limited office space, where other amenities and complementary uses such as restaurants, retail and housing exist. The key areas for this type of demand could include the areas north of Price Street and in the Aiken Mall. The corridor's location and reputation as a key shopping district adjacent to the downtown make the corridor well positioned within Aiken County for such development.

Based upon annual county job growth and an estimated capture rate for Aiken, annual square footage demand estimates can be projected using the County's percentage of key employment sectors that correlate with typical office uses. Given its location within the region and Aiken County's existing office space offerings and competitive lease rates, a conservative capture rate of 25% of new county office related job growth is anticipated. Based upon current estimates of space demand per employee, this results in current estimated annual office space demand of approximately 3,400 square feet. Therefore, for the purposes of future land use planning over a 10-year period, this would equal potential demand for approximately 34,000 square feet of future office space in the Whiskey Road corridor associated with mixed-use development.

Office Supply

According to Newmark Grubb Wilson Kibler 2016 Aiken County Market Survey shown above, Aiken County had a total office inventory of 1,412,572 square feet, an increase over the five-year average of existing space. The Survey revealed approximately 146,159 square feet of vacancy representing a 10.3% vacancy rate, a 2.8% increase over the previous five-year average vacancy of 7.5%. The 2016 report reports a concern with negative absorption of -58,500 square feet over the past 12 months vs. a five-year average of 20,848 square feet of absorption. Despite the bleak 2016 history, the good news in the report shows an increase in rents for the survey period of \$15.32 per square foot, over the five-year average of \$14.03 per square foot. As of the 2016 Survey no new office space was proposed compared to the five-year average of 29,121 square feet.

The five-year average net absorption in the Aiken office market is minimal. Therefore, demand must first need to be the focus of local stakeholders and economic developers to warrant any substantial added supply to the market. Future space for office, research and other new types of workspace in a mixed-use environment along the corridor would provide the next generation of space for the future office worker, namely Millennials. The preferred locations would include those with good visibility and transportation access, which is a competitive advantage for the Whiskey Road corridor study area. Land availability and infrastructure point to the key economic target areas described above.

Industrial Demand

As noted above, the key industries as outlined by the regional Economic Development Partnership point directly to industrial uses. The industrial market within the region is quantified by two product types which serve these sectors: warehouse and flex space.

Warehouse is closely associated with high-bay distribution and logistics space, while flex space is most closely associated with research and development. Warehouse space generally has limited employment opportunities as the floor ratio of building to employee continues to grow with automated technology. Flex space, on the other hand, provides greater opportunity for job and economic growth. Over the past decade flex space has evolved into a more complex mix of uses to include clean-tech, light assembly, and precision or advanced manufacturing space. Often this includes a higher ratio of office space, with companies that might include a variety of industries, jobs and required skills more aligned with the current educational attainment and employed residents found in Aiken. Considering these factors, flex space is considered as the most appropriate product type for the corridor, closest to the Savannah River National Laboratory (SRNL).

Assuming stable county industrial employment growth consistent with that seen over the past five years, annual space demand totals approximately 10,290 square feet per year, based on a conservative 10% capture rate in the Whiskey Road corridor. Thus, a 10-year plan could ultimately support flex-light industrial space of approximately 102,000 sq. ft. in appropriate locations for new emerging clusters or those that would complement existing industries in areas with strong transportation connections, such as the New Ellenton area within the corridor and its connection to the SRNL.

Industrial Supply

Looking again to the Newmark Grubb Wilson Kibler 2016 Aiken County Market Survey, Aiken County had a total industrial inventory of 12,749,261 square feet, an increase over the five-year average of 11,033,675 square feet of existing space. The Survey revealed approximately 418,905 square feet of vacancy representing a 3.3% vacancy rate which was a 5.7% decrease in vacancy from the previous five-year average vacancy of 9.0%. The twelve month absorption of 512,650 square feet reveals a decrease from the five-year average of 755,497 square feet of absorption.

The good news in the report reveals both a decrease in vacancy and higher rents for the survey period of \$3.05 per square foot, a strong increase over the five-year average of \$2.24 per square foot. Despite the strong focus on industries producing jobs in sectors which contribute to industrial demand, there was no new industrial space proposed as of the 2016 Survey. However, data from the regional Economic Development site suggest ample land available for build to suit development.

Office & Industrial Summary

Communities that do not focus economic development efforts on providing diversified (basic) jobs are limited to providing only housing and related retail, thus becoming known as “bedroom communities”. The current economic cycle will continue to drive companies to the southeast in search of lower operating costs, skilled labor and quality of life characteristics found in this region. Aiken could benefit from offering competitive business opportunities in key targeted areas. Traditional industry clusters--healthcare, manufacturing, transportation and logistics, and research —are transforming, offering new opportunities for developing new prospects. As these industries grow, business leaders are demanding advanced workforce skills, infrastructure and support services in their location and operation decisions. Economic development organizations that understand the latest trends and decision factors impacting these industries can successfully target their marketing, incentives, workforce development and infrastructure.

Professional and medical office and flex industrial uses clustered around key demand generators are recommended to grow and diversify business establishment types, stages and employment sectors. These should be in key areas suggested to be the focus areas for employment: the Aiken Mall site and in the New Ellenton. The Whiskey Road corridor could emerge as a desirable and viable business location, by adding new Class A office within mixed-use development and flex space within campus environments.

The implementation of transportation improvements along the corridor would create synergy between the downtown, government uses, recreation, housing and commerce. This could become the catalyst for private investment along the corridor, and would also add daytime population to support the desired restaurants, retail and other service businesses in the corridor.

Strategies would include adopting policies and incentives to support the plan and to reduce entitlement uncertainty, and should be marketed to support local and regional economic development. “Shovel ready” sites would also provide reduced lead time for construction and occupancy.

FUTURE WORK SPACE

“We in the industry need that workforce really focused on science, technology and manufacturing because that is the future of this country. Without those areas, we’re in deep trouble”

Dr. Terry A. Michalske - Director of the Savannah River National Laboratory

Demand (10-year build out)

**Office Demand (25% capture):
34,000 square feet**

**Industrial/Flex Demand (10%
capture): 102,000 square feet**

Shopping & Entertainment

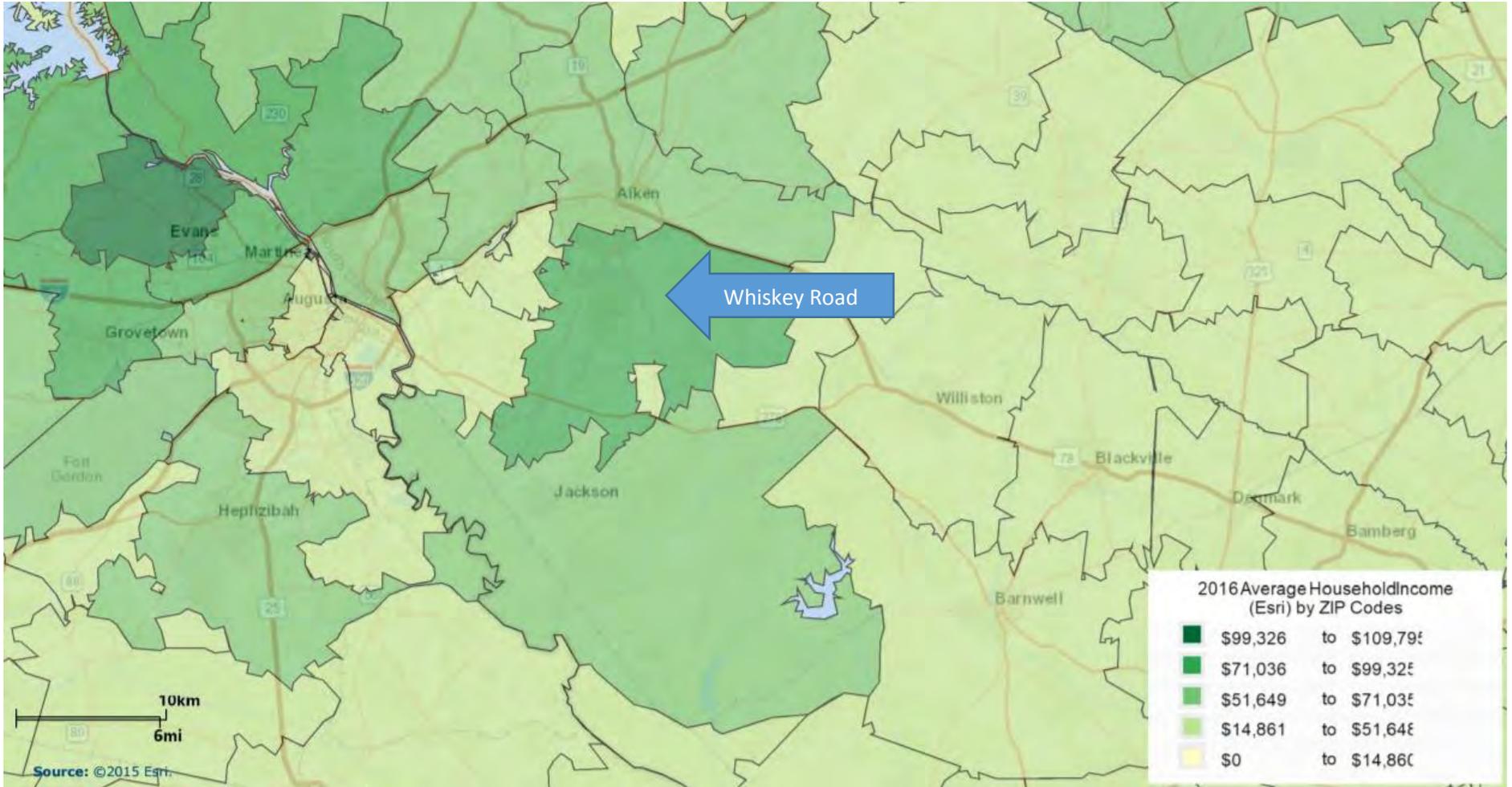
The current economic cycle has resulted in the retail industry exercising caution as it focuses on profitability over new store openings and expansion. Retail formats are quickly changing from traditional malls and shopping centers to mixed-use and Main Street formats. The residents of Aiken clearly want expanded options for this new type of shopping, recreation and entertainment. The Whiskey Road corridor is the best opportunity to provide new lifestyle environments that appeal to both Millennials and Baby Boomers, as well as visitors traveling to and through the area.

Retail Demand Dynamics

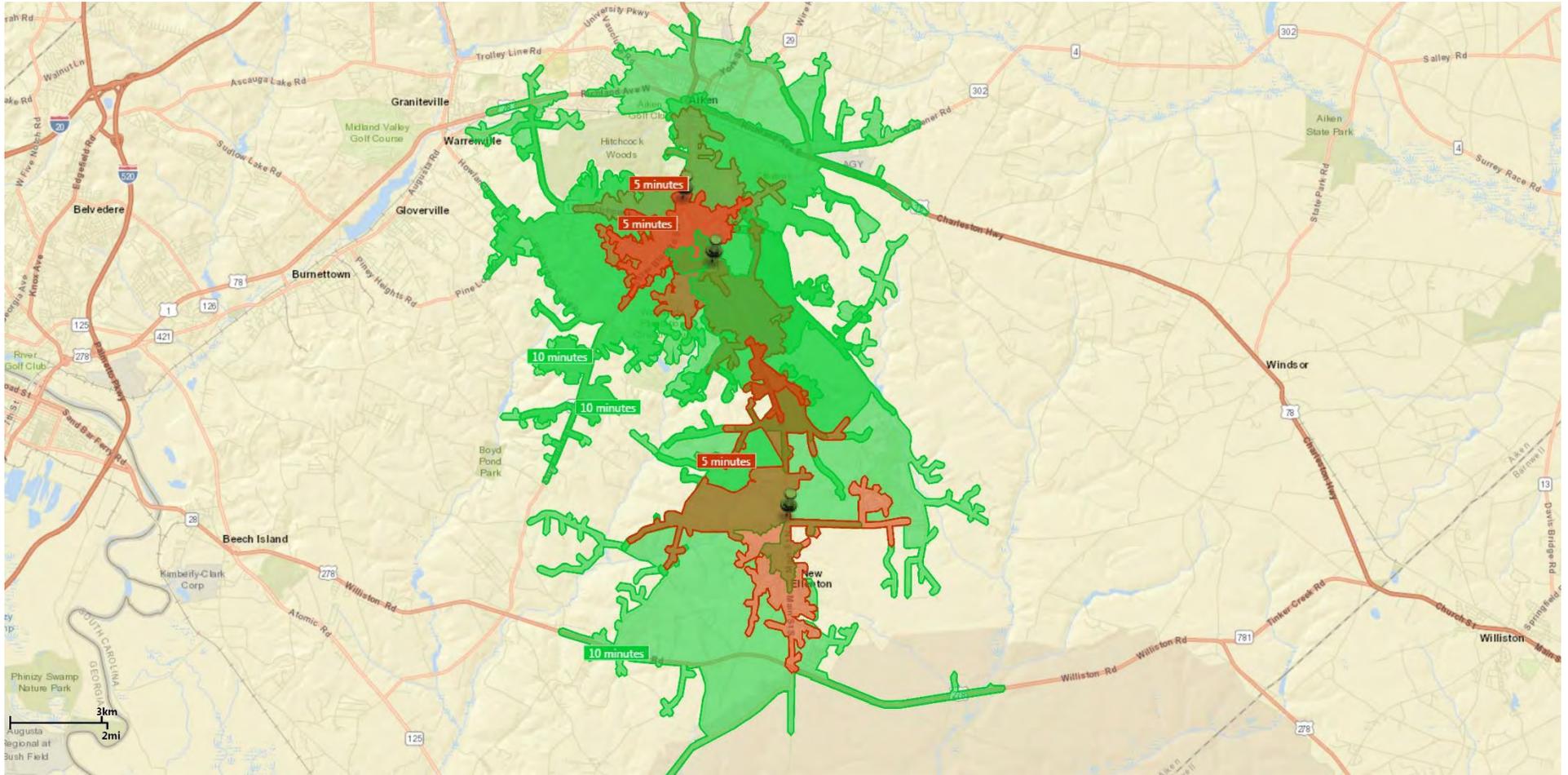
The demand dynamics for retail differ from office and industrial uses, as demand comes primarily from population, household and income growth, most often attributed to job growth. Incomes throughout the city of Aiken are the strongest in the region, particularly in the affluent areas in and around the Whiskey Road corridor as shown in the chart and map below:

2016 Estimates	Aiken City, SC	Aiken County, SC	MSA Augusta Richmond County
2016 Total Population	31,124	169,206	600,545
2016 Median Household Income	\$51,596	\$46,393	\$46,335
2016 Average Household Income	\$78,229	\$64,217	\$64,120
2016 Median Age	46.6	41	37.7
2016 Average Household Size	2.22	2.45	2.55

Source: ESRI, Rose Associates



As mentioned in earlier sections of this report, trade areas include several components that determine which retail operators might find adequate demand for their goods/services or retail sales potential. Given the dynamics of the Whiskey Road corridor, the trade areas for retail for the key commercial areas are defined within both 5 and 10-minute drive times (overview shown in the map on the following page). Consumer Expenditures outline the average dollars spent in major retail segments on an annual basis within each trade area, which may overlap in some areas. These assess both demand and supply factors to determine gaps in the market for each segment.



Source: ESRI – Target Area Drive Time Map

DRIVE TIMES: 5 minutes/ 10 minutes

In addition, the volume of automobile traffic is an important factor for retail. For example, according to Department of Transportation estimates, Whiskey Road boasts over 36,200 cars per day at the intersection of E Gate Drive at the entrance to Aiken Mall, the strongest volume along the corridor. These counts diminish substantially at either end of the corridor.

Retail Supply

The Augusta Richmond County MSA is comprised of multiple retail submarkets including the City of Aiken and several within Augusta and Richmond Counties in Georgia. Regional shopping venues surround Aiken providing goods/services for a wide variety of categories. However, the Whiskey Road corridor has the reputation of being “the” shopping area within the region. Per 2016 Survey from Newmark Grubb Wilson Kibler there is 691,063 square feet of space available in Aiken County. Rents average \$8.45 NNN (net) per square foot for all types of retail space, from new to old, and from small strip centers to neighborhood and regional centers. Aiken County’s net absorption totaled 131,720 square feet over the past 12 month compared to a five-year average of 75,410 square feet.

The substantial available retail inventory within the trade area is primarily due to the high and almost total vacancy of the (soon to be redeveloped) Aiken Mall. The redevelopment and repositioning of the Mall to a mixed-use, open “Main Street” concept will certainly upgrade, update and strengthen this location and the corridor. Employment in Retail Trade totals 14.37% in the county, and contributes to the community’s economic base.

Retail Gap

Approximately 14% of Aiken County’s current employment is in Retail Trade (NAICS 44-55), making it the fifth largest industry sector, providing jobs and bringing consumer expenditures to the region. While supply and demand is defined by employment and square feet for other product types such as office and industrial space, for retail, the actual dollar expenditures within each category are measured against demand within a given trade area. Negative gaps (**surplus**) suggest oversupply or a market where customers are drawn in from outside the area, while positive gaps (**leakage**) indicate areas of opportunity for additional retail within a given trade area. Where gaps exist in select categories, the potential expenditures must meet the income thresholds of per square foot sales. Details of surplus and leakage for all categories in the trade areas can be found below:

Key Area		5-Minute Drive Time			10-Minute Drive Time		
		Demand	Supply	Retail Gap	Demand	Supply	Retail Gap
North of Price	Total Retail Trade	\$185,349,653	\$359,477,260	(\$174,127,607)	\$548,719,216	\$667,931,753	(\$119,212,537)
	Total Food & Drink	\$20,103,770	\$63,250,783	(\$43,147,013)	\$58,781,353	\$101,725,961	(\$42,944,608)
Aiken Mall Town Centre	Total Retail Trade	\$160,399,613	\$394,236,040	(\$233,836,427)	\$578,646,794	\$526,891,221	\$60,573,573
	Total Food & Drink	\$ 17,257,972	\$72,503,815	(\$55,245,843)	\$62,849,145	\$89,387,672	(\$26,538,527)
Old Whiskey at New Ellenton	Total Retail Trade	\$45,920,253	\$43,177,825	\$2,742,000	\$215,446,350	\$230,540,224	(\$15,093,874)
	Total Food & Drink	\$4,441,882	\$3,297,648	\$1,144,234	\$22,218,621	\$39,920,371	(\$17,701,750)

Source: ESRI, Rose Associates 2016

With the large supply of retail space surrounding the mall and its well established regional destination, there are few gaps for any additional large scale regional shopping opportunities along the corridor, until or unless there is a major shift in population growth through housing or job growth. However, the gaps within the 5 and 10-minute drive times both at the Mall site and in New Ellenton suggest there is opportunity for unique and locally/regionally owned retail, grocery, restaurants and entertainment to be clustered together where existing retail momentum already exists. The specific areas demonstrating a retail gap for local/regional operators include:

- Motor Vehicle & Parts Dealers, Auto Parts, Accessories, Tire Stores
- Building Materials, Garden Equipment & Supplies
- Food & Beverage Stores, Specialty Food Stores
- General Merchandise Stores, Other General Merchandise Stores
- Food Services & Drinking Places

These retailers could differentiate the experience in Aiken from the larger national chain stores prevalent along the corridor and in surrounding areas with more desirable mixed-use formats. Much of the success of retail in Aiken is also dependent upon the continued momentum of existing retail in these areas and their ultimate build out. The adjacency of new projects to demand generators such as medical, major employment, or entertainment venues would create and drive synergy between residents, employees, and visitors. Assuming its continued position in capturing a substantial share (50%) of the retail market, demand estimates suggest the potential for 116,000 additional square feet of retail, beyond that which is replaced through redevelopment and/or relocation within the market.

Retail Summary

Regional and super-regional shopping venues are dominant in the Whiskey Road corridor. Aiken's neighborhood shopping destinations are largely supported by drive-by traffic and local residents. The corridor can support additional retail uses, limited by population and income growth, physical constraints, land costs and competition from neighboring shopping venues. Consideration must be given to the long-term policy decisions regarding retail scale and size, as larger retail formats continue to downsize and are driven to denser urban markets. Therefore, lifestyle retail should be considered in both traditional downtown and mixed-use formats, with office or residential uses integrated. These could include both re-development of existing single story retail sites, and new space, interconnected with other uses to create synergy. Locating retail near demand generators within each of the targeted areas including housing, recreation, employment and medical facilities will increase the potential for future retail demand commensurate with growth, both in the resident and daytime (employment) populations.

FUTURE SHOPPING & ENTERTAINMENT

“Millennials are expected to drive growth in suburban shopping as they age, form families and seek places to live as affordability concerns rise in urban areas. Developers of suburban destinations want to create mixed-use districts that have an urban feel and are walkable.”

*– Garrick Brown, Cushman & Wakefield
@ ICSC Convention May 2016*

**Retail Demand (10-year
buildout):**

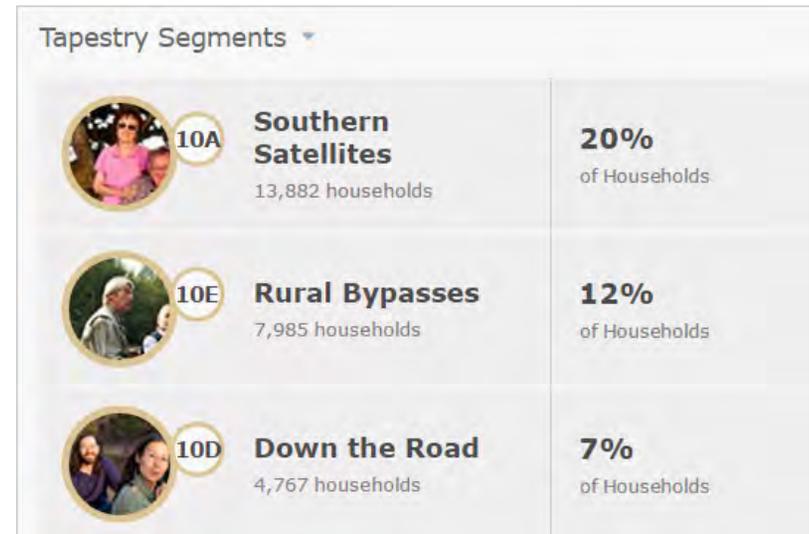
116,000 square feet

Housing

Aiken is a popular destination for people as represented by its growth rate over the last fifteen years. In 2000, Aiken County had 142,552 people. The latest estimates suggest that the population in 2016 is 169,206, growing by almost 19% and adding nearly 27,000 people. During the same period, the City of Aiken grew by 15% adding just under 5,000 additional people. The change in population and age has demonstrated its popularity as a retirement destination.

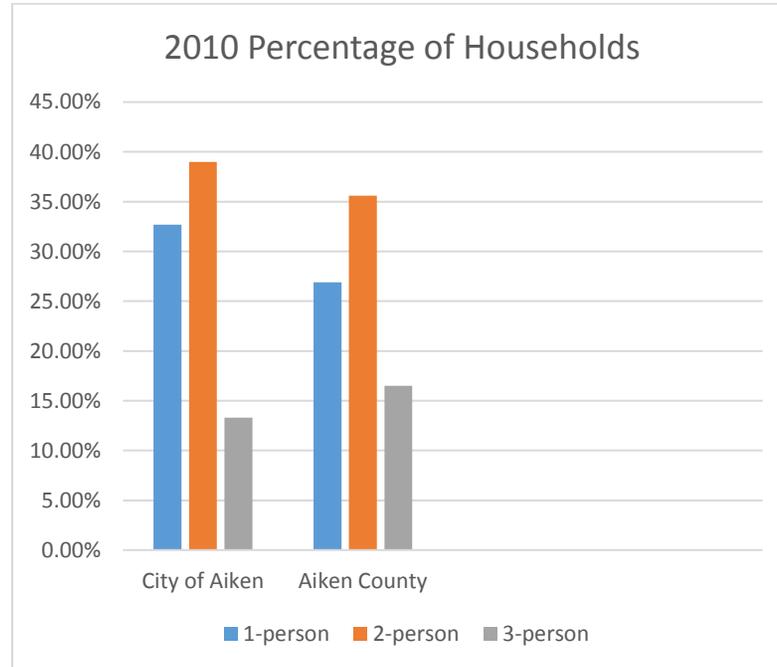
Aiken, although it has industrial and commercial activities, is largely viewed as a bedroom community serving the greater population of the Augusta -Richmond County, GA region. The city has successfully attracted working class families, empty nesters and retirees with a desire to live in a residential community with the amenities of a more urban area. Many communities want to have some balance of residential and commercial/retail activities to provide some level of services readily accessible to those living in the community and most often because of the tax producing potential benefits of non-residential development.

The status of the housing units in Aiken suggests some possible options to consider in the future that would increase the diversity of the housing stock in the region. However, there is a prior question: Who lives in the housing units currently in Aiken? The population, income, and lifestyle characteristics of the community are described in previous sections of this report. The city of Aiken has three primary Tapestry Segments which comprise the majority of households: Golden Years, Exurbanites and Silver and Gold, further demonstrating its characteristic retirement reputation. By contrast, Aiken County is defined by its more rural working class roots, with most its households in three different segments: Southern Satellites, Rural Bypasses and Down the Road. The market must consider this socio-economically diverse population. The question for the corridor is which type of housing is in most demand and what type of housing or households does it wish to attract?



Household Size

The 2010 Households chart below suggests that 72% of Aiken households in the city were either one or two-person households. And the average household size over the 2010-2016 period averaged 2.20 persons per household. By contrast, 63% of the county's households included either one or two-person households, with an average of 2.45 persons per household, suggesting more families in the county as compared to in the city limits.



Source: ESRI, Rose Associates

Housing Growth

Census data suggests that Aiken County has added 14,509 housing units since 2000, for an annual growth rate of just under 2% additional units per year. New housing growth was slower during 2010-2016, adding less than 5,000 units. The housing stock in Aiken County is predominantly owner occupied (63% in 2016) single family detached homes. Over 60% of both the population and the housing units are noted as being inside the urbanized area.

Housing Market

The Aiken Board of Realtors provides monthly market statistics to gauge the local housing market. Per its October 2016 report, not much has changed since the year began. New listings were up 22.9 percent to 220. Pending Sales decreased 0.6 percent to 172. Inventory shrank 10.8 percent to 1,307 units. Prices moved higher as Median Sales Price was up 4.6 percent to \$155,400. Days on Market decreased 2.3 percent to 167 days. Month's Supply of Inventory was down 13.1 percent to 7.3 months, indicating that demand increased relative to supply.

<u>October 2016</u>	<u>Prior Year</u>	<u>Current Year</u>	<u>+/-</u>
Average Sales Price	\$172,816	\$170,659	+/-1.2%
Median Sales Price	148,500	155,400	+4.6%
Inventory of Homes for Sale	1,466	1,307	-10.8%
Days on Market	171	167	-2.3%
Closed Sales	150	192	+28%

Source: Aiken Board of Realtors <http://www.aikenmls.com>

Per its quarterly report, “Builder confidence is as high as it has been in more than a decade, yet the pace of economic growth has been slow enough to cause pause. A low number of first-time buyer purchases and a looming demographic shift also seem to be curbing the desire to start new single-family construction projects. As older Americans retire and downsize, single-family listings are expected to rise. The waiting is the hardest part.”

The housing issues and considerations in Aiken are similar to the broader market. However, Aiken has succeeded in attracting more retirees than many other markets in the region, due to picturesque areas, low cost of living and amenities including recreation, healthcare and its cultural assets. In fact, the website [Top Retirements](#) includes Aiken as a top retirement community in the southeast with many active adult communities in the area that have a wide variety of amenities.

HOUSING

“Market predictions have been, in a word, predictable. A relatively comfortable pace of activity has been maintained thanks to continuing low unemployment and mortgage rates. The one basic drag on market acceleration has been inventory decline. There is little to indicate that the low inventory situation will resolve anytime soon”

- Aiken Board of Realtors,
October 2016 Report

Future housing considerations

The information gathered and shared about citizen preferences for housing and other development options available suggests that apart from traffic and transportation concerns, Aiken area residents are ready for some new housing choices along the Whiskey Road corridor. Preferences or opinions also include perhaps more retail opportunities, growth of business and industry, and the need for medical offices and facilities. Little is said about changing the nature of the housing stock in the area. However, some housing alternatives might deserve consideration.

The two largest population groups in terms of housing demand are the Millennials and the Baby Boomers/early retiree groups. Extensive research, including multiple national surveys, concluded that the housing preferences of these groups are substantially different than much of the housing stock in Aiken. The Millennials are primarily renters; both because they don't have the funds to buy a house and, for some, because they are making a lifestyle decision to rent rather than own. They want to live where you can walk to things, where a lot of others just like them live and where arts, culture, restaurants, and clubs are available. They are fueling the back to the city movement in this country. Downtowns and access to vibrant urban and town centers are what they seek. In this region, this is viewed as something that happens in Augusta or Atlanta. Because of the demand for housing in these areas, the cost is becoming prohibitive for many, and they are looking for other options. Vibrant town centers and mixed-use developments may become the next settlement pattern for this group.

While these population groups are moving, the target demographic for most of the housing in Aiken is relatively small and getting smaller. Households in the United States have undergone a major transformation in the last twenty-five years. The biggest population group, the Baby Boomers, has moved beyond the child rearing years. The second largest population group are the Millennials, the progeny of the Baby Boomers. Yet, the in-between group, Generation X, is shrinking in Aiken. About 25% of the households in the U.S. have school age children in them. A good portion of this group is made up of one-parent households. Aiken is competing with all sorts of similar places in the region for this declining demographic group.

With some small changes in attitudes and the zoning code, Aiken can become attractive to a much broader range of future residents, including those who have grown up in Aiken or have come to Aiken to attend the university. One option may be to provide multi-family (apartment) housing that would provide a place for the children of local residents who would prefer living in their home community but not with parents. This option is attractive to Millennials and for anyone who wishes to rent rather than own as a lifestyle statement. Other "in-fill" housing options like apartments above shops/offices can achieve the same result as an apartment complex.

The data show that there are many older adults already living in Aiken. Many reside in the houses in which they have been living when their children were at home. Many prefer options for them to find a place that is more suitable to their current circumstances. More townhomes and patio homes would help fill that vacuum. This type of housing works best when located adjacent to a town or neighborhood center where some services are available. Introducing more diverse and more dense housing into these areas not only provides an attractive living environment but also supports the current businesses and services located there and may entice others to join those already living in the area – to continue to build on its reputation as a retirement destination.

Housing attractive to older adults has some different characteristics than that which is designed for young families. Among the differences are the following:

- Master bedrooms downstairs (probably the most important factor for older adults)
- Smaller housing units (1000 to 2000 sq. ft.)
- As few steps as possible (one-story homes are very important)
- Bathroom walls that are constructed to support hand rails
- Wider entrance ways and hallways
- No responsibility for a yard; however, small planting spaces on patios are looked upon favorably
- Places to walk (walking is, by far, the primary source of exercise for older adults)
- Complete streets (streets, sidewalks and bike paths are combined)
- Compact neighborhoods (older adults seek community - the primary threat to older adults is social isolation)
- Parks, greenways, and open spaces are important (one's personal yard is replaced with communal yards maintained by others).

After people find a place to live that suits their needs, they become strong advocates for "aging in place," a term that is more related to the older adult population than it is to the younger residents living in Aiken. But the concept has meaning for any population group. The strength of this concept has led to a growing demand for intergenerational housing. This is happening in the housing market across the country but not so much in Aiken or in Aiken County. Mixing town homes, patio homes, and small apartment complexes within the context of a traditional subdivision development on modest-sized lots is becoming more and more popular. These intergenerational neighborhoods may contain or be adjacent to restaurants, retail and other substantial business and service opportunities.

One example is Aiken's only private, gated golf community, Woodside, which combines amenities with a variety of real estate options, including easy-to-maintain villas and townhomes, elegant estates and custom homes. It has been named one of *Money Magazine's* "Top Ten Retirement Communities", as well one of the 2013 Top 50 Communities in the United States by *Where to Retire Magazine*. As one of the Southeast's most prominent golf and leisure communities, residents enjoy four championship golf courses, a new wellness center, miles of walking trails and sparkling lakes, spread out over 2,800 acres of beautifully rolling countryside. Other examples for alternative housing options are shown below:



Source: www.elementcommunity.com



Source: www.experienceavalon.com



Source: www.lifeedited.com

Those responsible for planning the future growth and sustainability of the Whiskey Road corridor might consider a continued variety of housing options beyond the low-density housing patterns prevalent in the past. By adding diversity to the housing product, the corridor could become more attractive to a variety of population groups that would currently find little to satisfy their needs.

Housing Summary

We began the analysis with a series of questions, which are most relevant when considering lifestyle options. This begins with housing:

- **Who** is our customer? While the primary customer in Aiken includes Baby Boomers and Seniors, strategies to attract and retain Millennials should be among the considerations for the corridor.
- **What** are we trying to attract? To support housing lifestyle options for these groups, shopping, dining, entertainment and job opportunities should have the highest priorities.
- **Where** do people want to be? The key to a successful corridor must include ease of access and movement, as well as attractive place-making to improve and enhance the experience, for residents and visitors.
- **When** and how should we take action? Improving the safety and esthetic appeal of the corridor is the first step. This will demonstrate the community's commitment to the corridor and attract private investment. Housing is the natural progression of job growth. However, some communities focus on lifestyle destinations to attract both Millennials and Baby Boomers, at or nearing retirement.
- **Why** does it matter? Public infrastructure improvements can be a catalyst for private investment. Providing additional lifestyle options can assist local economic development officials "sell" a community, and continue to attract new and emerging industries, providing jobs and economic mobility for all its citizens.

Appendix & References

Methodology

This analysis encompasses the broader reach of the market, from a macro and micro perspective. The analysis and forecasting of market data, which includes demographic and population estimate, combined with real estate, economic and employment estimates, is both art and science. Therefore, several methodologies are utilized throughout this report, including but not limited to Economic Base Analysis, Highest & Best Use Analysis and Central Place Theory.

Data

All market research analysts begin with U.S. Census Bureau data - which has limitations as to accuracy and timeliness. Nonetheless, the data provides a benchmark as much for a retrospective look as a prospective one. Two factors must be considered when looking exclusively at demographic data: the role of economic drivers that are a departure from past trends' growth from primary centers spilling over into outlying areas (i.e. "sprawl"); and constraints due to availability of land physically and legally suited for such development. We utilize ESRI, State and U.S. Census data in our analysis. Detailed reports and data are attached for reference.

Additional data sources include Karnes, Xceligent, Costar, the Charlotte Region Board of Realtors and NC Department of Commerce.

Assumptions & Limiting Conditions

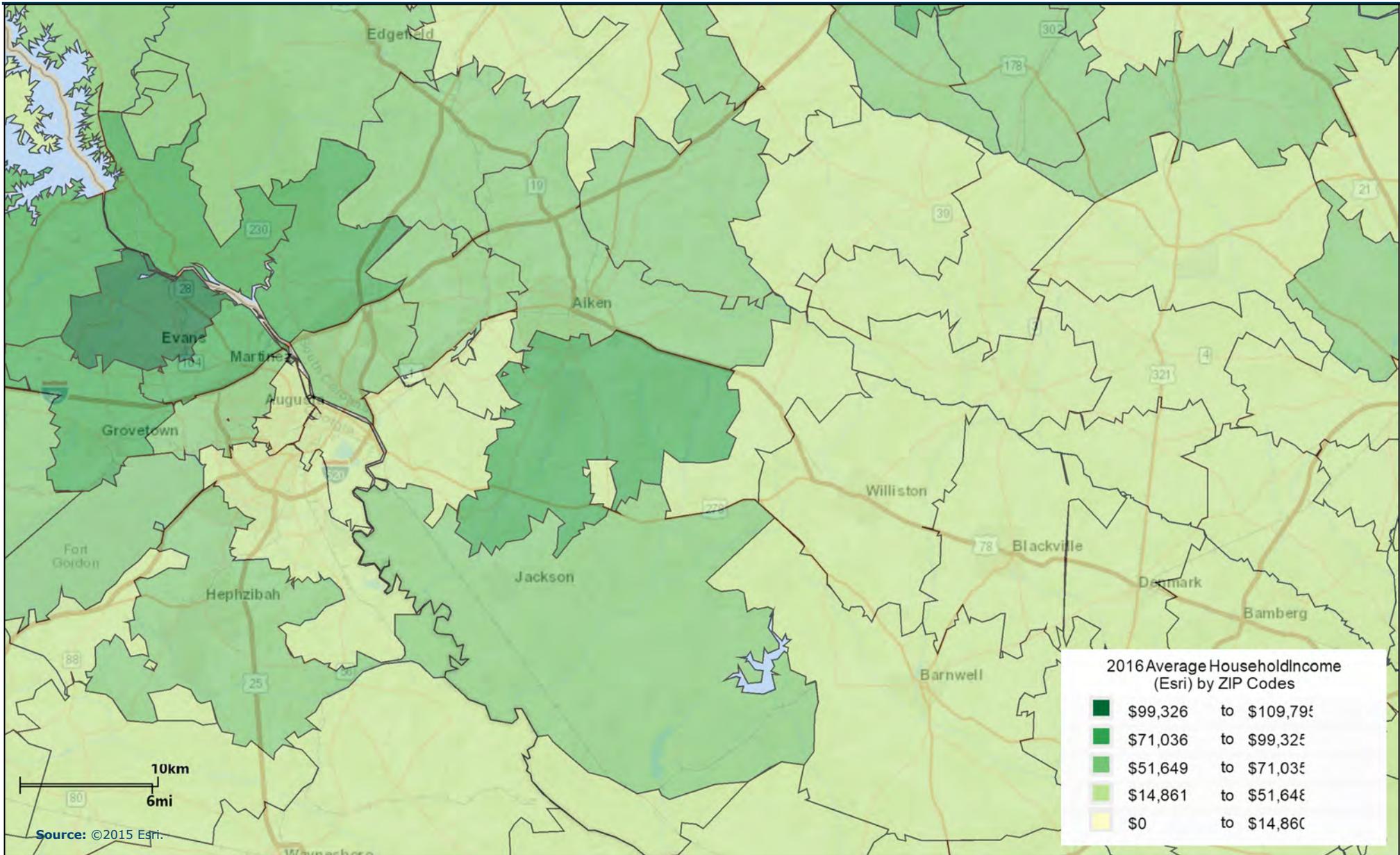
The conclusions set forth are based upon information provided by public records, municipal officials, business owners, market and demographic data obtained by Rose & Associates Southeast Inc. Neither an appraisal nor title search was performed for the site or any specific property in preparing this report. While the information included herein is believed to be accurate, no warranty or representation, expressed or implied, is made as to the information contained herein, and is submitted subject to omission, change of market conditions, or other factors outside the scope of this report or the author's control. This report is the property of Rose & Associates Southeast Inc. and the client, and shall not be duplicated in whole or in part, without express written permission, all rights reserved, 2016.

Appendix – ESRI Data



Aiken County, SC

2016 Average Household Income (Esri) by ZIP Codes



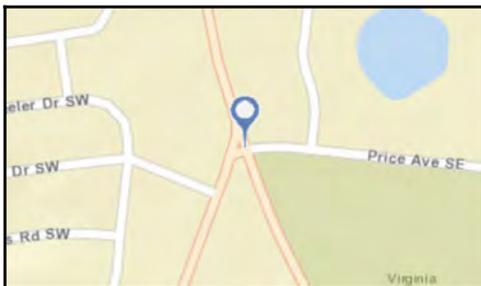
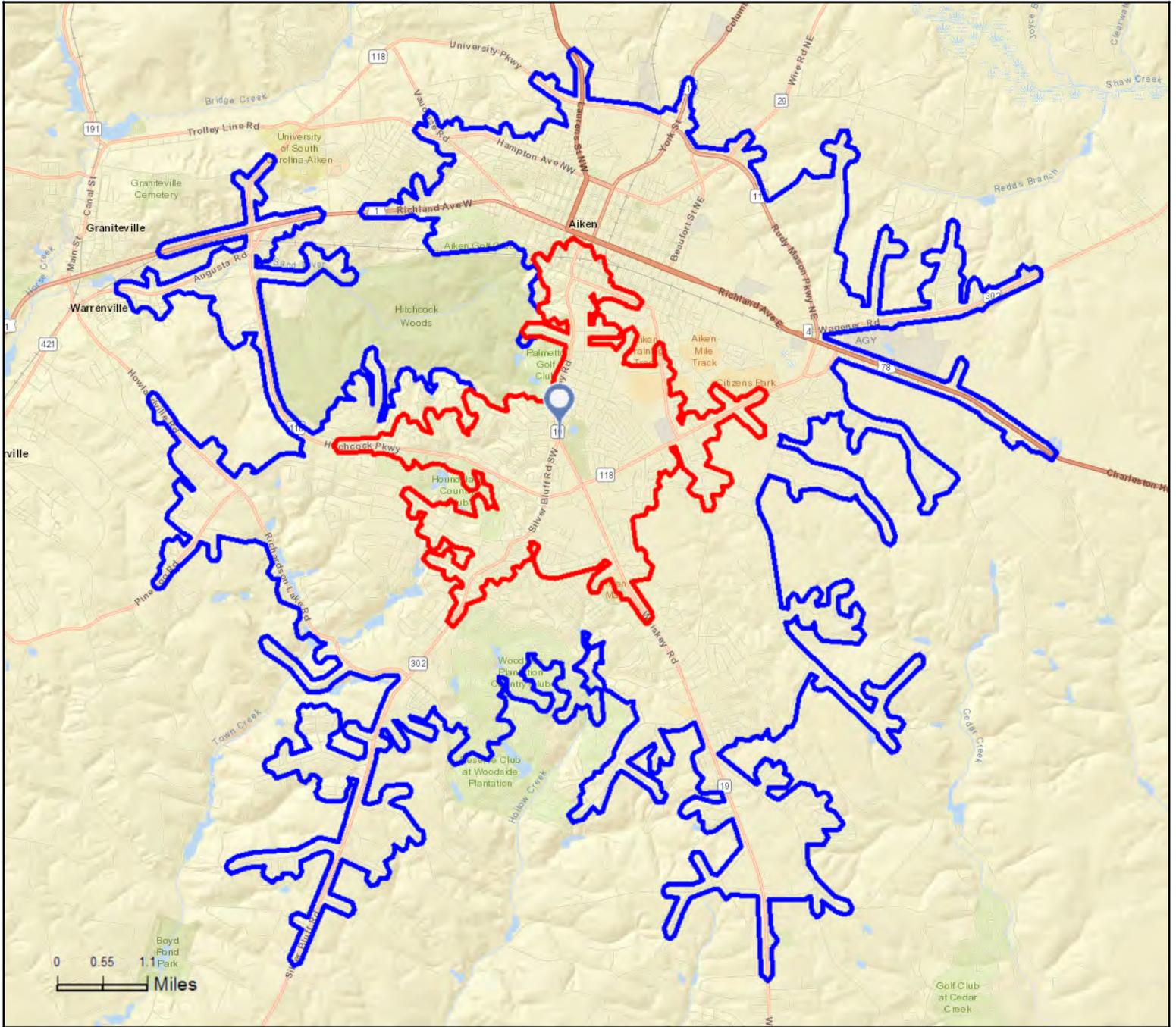
October 19, 2016



Site Map

North of Price
1701 Whiskey Rd, Aiken, South Carolina, 29803
Drive Times: 5, 10 minute radii

Prepared by Esri
Latitude: 33.53056
Longitude: -81.72369





Retail MarketPlace Profile

North of Price
1701 Whiskey Rd, Aiken, South Carolina, 29803
Drive Time: 5 minute radius

Prepared by Esri
Latitude: 33.53056
Longitude: -81.72369

Summary Demographics

2016 Population	10,705
2016 Households	4,934
2016 Median Disposable Income	\$49,130
2016 Per Capita Income	\$36,052

Industry Summary

	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Total Retail Trade and Food & Drink	44-45,722	\$205,453,423	\$422,728,044	-\$217,274,621	-34.6	200
Total Retail Trade	44-45	\$185,349,653	\$359,477,260	-\$174,127,607	-32.0	134
Total Food & Drink	722	\$20,103,770	\$63,250,783	-\$43,147,013	-51.8	66

Industry Group

	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Motor Vehicle & Parts Dealers	441	\$42,638,281	\$10,399,506	\$32,238,775	60.8	7
Automobile Dealers	4411	\$34,065,702	\$2,777,579	\$31,288,123	84.9	2
Other Motor Vehicle Dealers	4412	\$5,105,595	\$5,055,709	\$49,886	0.5	1
Auto Parts, Accessories & Tire Stores	4413	\$3,466,984	\$2,566,218	\$900,766	14.9	4
Furniture & Home Furnishings Stores	442	\$5,197,474	\$13,134,393	-\$7,936,919	-43.3	12
Furniture Stores	4421	\$3,343,462	\$4,694,096	-\$1,350,634	-16.8	7
Home Furnishings Stores	4422	\$1,854,012	\$8,440,297	-\$6,586,285	-64.0	5
Electronics & Appliance Stores	443	\$9,620,925	\$6,396,018	\$3,224,907	20.1	4
Bldg Materials, Garden Equip. & Supply Stores	444	\$9,262,937	\$25,144,808	-\$15,881,871	-46.2	5
Bldg Material & Supplies Dealers	4441	\$8,442,835	\$25,058,723	-\$16,615,888	-49.6	4
Lawn & Garden Equip & Supply Stores	4442	\$820,102	\$86,085	\$734,017	81.0	1
Food & Beverage Stores	445	\$33,060,710	\$110,235,436	-\$77,174,726	-53.9	15
Grocery Stores	4451	\$29,108,145	\$106,197,097	-\$77,088,952	-57.0	9
Specialty Food Stores	4452	\$1,976,239	\$1,177,088	\$799,151	25.3	2
Beer, Wine & Liquor Stores	4453	\$1,976,326	\$2,861,251	-\$884,925	-18.3	4
Health & Personal Care Stores	446,4461	\$11,884,204	\$22,445,785	-\$10,561,581	-30.8	18
Gasoline Stations	447,4471	\$13,552,111	\$9,098,419	\$4,453,692	19.7	4
Clothing & Clothing Accessories Stores	448	\$8,371,020	\$20,530,243	-\$12,159,223	-42.1	23
Clothing Stores	4481	\$5,505,884	\$10,107,287	-\$4,601,403	-29.5	13
Shoe Stores	4482	\$1,096,335	\$5,250,897	-\$4,154,562	-65.5	5
Jewelry, Luggage & Leather Goods Stores	4483	\$1,768,800	\$5,172,059	-\$3,403,259	-49.0	5
Sporting Goods, Hobby, Book & Music Stores	451	\$4,723,253	\$18,806,373	-\$14,083,120	-59.9	14
Sporting Goods/Hobby/Musical Instr Stores	4511	\$3,838,236	\$16,008,469	-\$12,170,233	-61.3	9
Book, Periodical & Music Stores	4512	\$885,016	\$2,797,904	-\$1,912,888	-51.9	5
General Merchandise Stores	452	\$37,890,533	\$104,405,991	-\$66,515,458	-46.7	7
Department Stores Excluding Leased Depts.	4521	\$28,879,529	\$102,145,814	-\$73,266,285	-55.9	5
Other General Merchandise Stores	4529	\$9,011,004	\$2,260,177	\$6,750,827	59.9	2
Miscellaneous Store Retailers	453	\$6,485,264	\$18,651,376	-\$12,166,112	-48.4	24
Florists	4531	\$287,078	\$293,364	-\$6,286	-1.1	3
Office Supplies, Stationery & Gift Stores	4532	\$1,529,454	\$8,181,186	-\$6,651,732	-68.5	7
Used Merchandise Stores	4533	\$396,511	\$2,263,989	-\$1,867,478	-70.2	5
Other Miscellaneous Store Retailers	4539	\$4,272,222	\$7,912,837	-\$3,640,615	-29.9	10
Nonstore Retailers	454	\$2,662,942	\$228,913	\$2,434,029	84.2	1
Electronic Shopping & Mail-Order Houses	4541	\$1,571,994	\$0	\$1,571,994	100.0	0
Vending Machine Operators	4542	\$147,280	\$228,913	-\$81,633	-21.7	1
Direct Selling Establishments	4543	\$943,668	\$0	\$943,668	100.0	0
Food Services & Drinking Places	722	\$20,103,770	\$63,250,783	-\$43,147,013	-51.8	66
Full-Service Restaurants	7221	\$9,390,653	\$23,972,773	-\$14,582,120	-43.7	35
Limited-Service Eating Places	7222	\$9,122,054	\$38,385,336	-\$29,263,282	-61.6	27
Special Food Services	7223	\$273,447	\$466,831	-\$193,384	-26.1	2
Drinking Places - Alcoholic Beverages	7224	\$1,317,616	\$425,844	\$891,772	51.1	3

Data Note: Supply (retail sales) estimates sales to consumers by establishments. Sales to businesses are excluded. Demand (retail potential) estimates the expected amount spent by consumers at retail establishments. Supply and demand estimates are in current dollars. The Leakage/Surplus Factor presents a snapshot of retail opportunity. This is a measure of the relationship between supply and demand that ranges from +100 (total leakage) to -100 (total surplus). A positive value represents 'leakage' of retail opportunity outside the trade area. A negative value represents a surplus of retail sales, a market where customers are drawn in from outside the trade area. The Retail Gap represents the difference between Retail Potential and Retail Sales. Esri uses the North American Industry Classification System (NAICS) to classify businesses by their primary type of economic activity. Retail establishments are classified into 27 industry groups in the Retail Trade sector, as well as four industry groups within the Food Services & Drinking Establishments subsector. For more information on the Retail MarketPlace data, please click the link below to view the Methodology Statement.

<http://www.esri.com/library/whitepapers/pdfs/esri-data-retail-marketplace.pdf>

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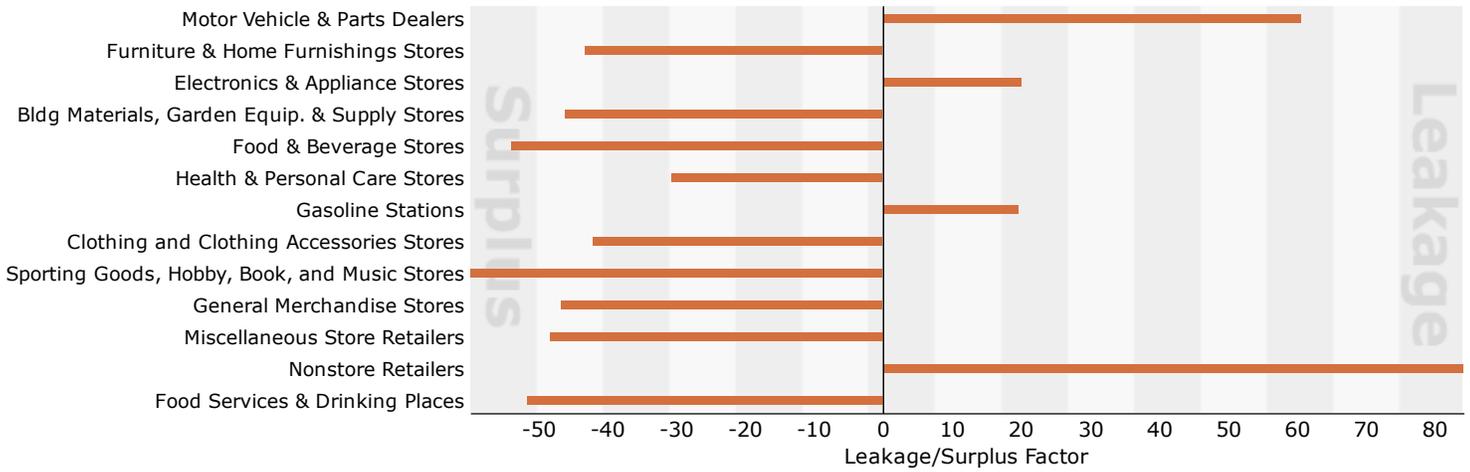


Retail MarketPlace Profile

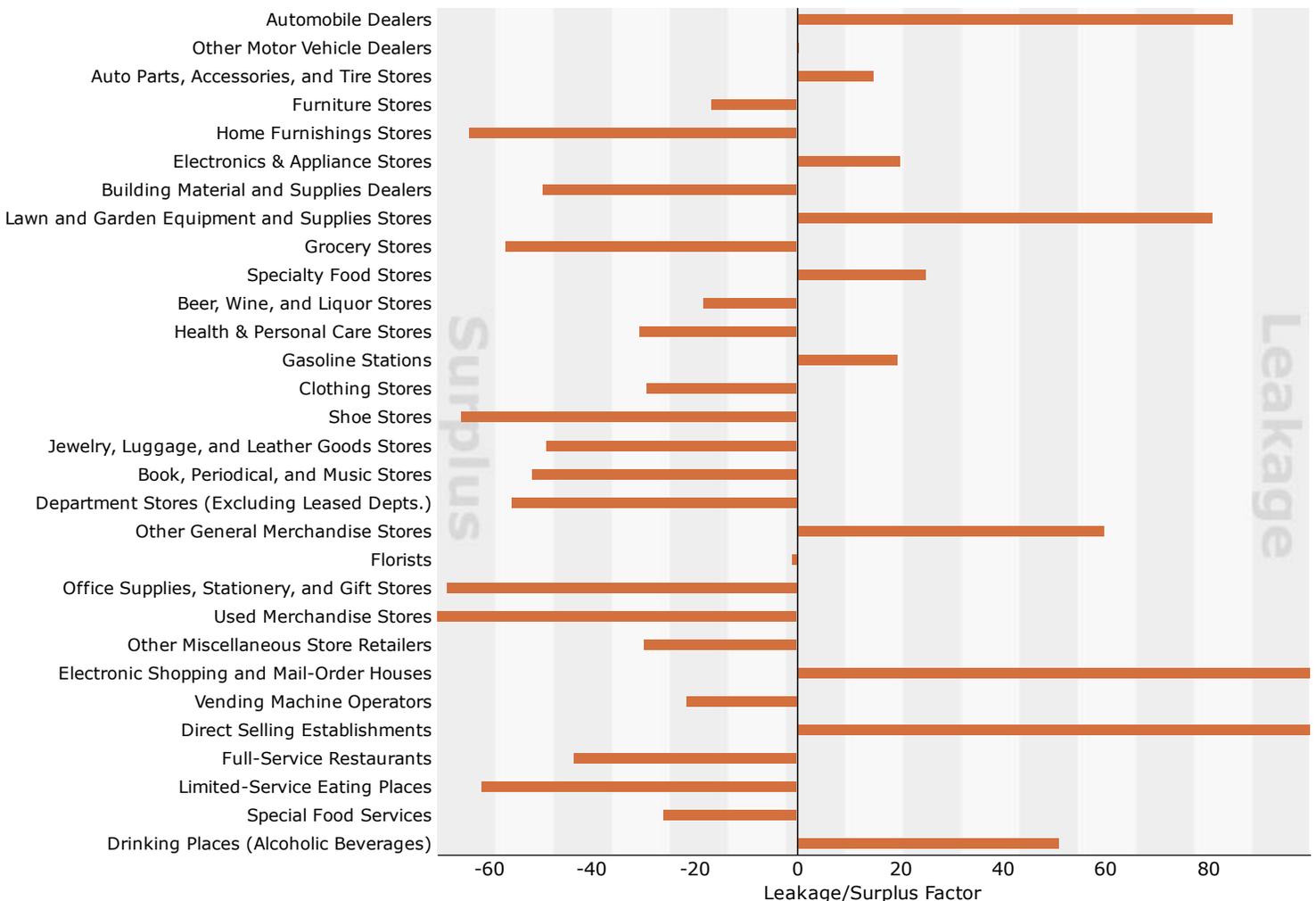
North of Price
 1701 Whiskey Rd, Aiken, South Carolina, 29803
 Drive Time: 5 minute radius

Prepared by Esri
 Latitude: 33.53056
 Longitude: -81.72369

Leakage/Surplus Factor by Industry Subsector



Leakage/Surplus Factor by Industry Group



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Retail MarketPlace Profile

North of Price
1701 Whiskey Rd, Aiken, South Carolina, 29803
Drive Time: 10 minute radius

Prepared by Esri
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Longitude: -81.72369

Summary Demographics

2016 Population	35,149
2016 Households	15,347
2016 Median Disposable Income	\$44,769
2016 Per Capita Income	\$33,677

Industry Summary

	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Total Retail Trade and Food & Drink	44-45,722	\$607,500,569	\$769,657,713	-\$162,157,144	-11.8	449
Total Retail Trade	44-45	\$548,719,216	\$667,931,753	-\$119,212,537	-9.8	316
Total Food & Drink	722	\$58,781,353	\$101,725,961	-\$42,944,608	-26.8	134

Industry Group

	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Motor Vehicle & Parts Dealers	441	\$127,398,859	\$67,492,939	\$59,905,920	30.7	33
Automobile Dealers	4411	\$101,899,561	\$47,681,649	\$54,217,912	36.2	14
Other Motor Vehicle Dealers	4412	\$15,336,697	\$9,760,615	\$5,576,082	22.2	4
Auto Parts, Accessories & Tire Stores	4413	\$10,162,600	\$10,050,676	\$111,924	0.6	15
Furniture & Home Furnishings Stores	442	\$15,406,474	\$20,488,902	-\$5,082,428	-14.2	19
Furniture Stores	4421	\$9,941,805	\$8,884,909	\$1,056,896	5.6	11
Home Furnishings Stores	4422	\$5,464,669	\$11,603,994	-\$6,139,325	-36.0	8
Electronics & Appliance Stores	443	\$28,252,673	\$12,927,521	\$15,325,152	37.2	11
Bldg Materials, Garden Equip. & Supply Stores	444	\$27,410,200	\$39,160,671	-\$11,750,471	-17.7	19
Bldg Material & Supplies Dealers	4441	\$24,967,355	\$37,152,628	-\$12,185,273	-19.6	14
Lawn & Garden Equip & Supply Stores	4442	\$2,442,846	\$2,008,043	\$434,803	9.8	4
Food & Beverage Stores	445	\$97,251,309	\$169,675,115	-\$72,423,806	-27.1	40
Grocery Stores	4451	\$85,665,394	\$162,190,554	-\$76,525,160	-30.9	24
Specialty Food Stores	4452	\$5,804,508	\$2,522,590	\$3,281,918	39.4	6
Beer, Wine & Liquor Stores	4453	\$5,781,407	\$4,961,972	\$819,435	7.6	9
Health & Personal Care Stores	446,4461	\$35,295,638	\$42,366,395	-\$7,070,757	-9.1	30
Gasoline Stations	447,4471	\$40,497,184	\$33,920,215	\$6,576,969	8.8	14
Clothing & Clothing Accessories Stores	448	\$24,549,170	\$33,336,969	-\$8,787,799	-15.2	44
Clothing Stores	4481	\$16,133,629	\$18,184,796	-\$2,051,167	-6.0	28
Shoe Stores	4482	\$3,229,585	\$7,281,771	-\$4,052,186	-38.6	8
Jewelry, Luggage & Leather Goods Stores	4483	\$5,185,955	\$7,870,402	-\$2,684,447	-20.6	8
Sporting Goods, Hobby, Book & Music Stores	451	\$13,962,883	\$28,585,926	-\$14,623,043	-34.4	27
Sporting Goods/Hobby/Musical Instr Stores	4511	\$11,382,032	\$24,947,236	-\$13,565,204	-37.3	20
Book, Periodical & Music Stores	4512	\$2,580,851	\$3,638,690	-\$1,057,839	-17.0	6
General Merchandise Stores	452	\$111,734,061	\$186,039,580	-\$74,305,519	-25.0	18
Department Stores Excluding Leased Depts.	4521	\$85,194,941	\$178,183,002	-\$92,988,061	-35.3	10
Other General Merchandise Stores	4529	\$26,539,120	\$7,856,577	\$18,682,543	54.3	8
Miscellaneous Store Retailers	453	\$19,267,371	\$33,482,041	-\$14,214,670	-26.9	60
Florists	4531	\$846,476	\$682,788	\$163,688	10.7	6
Office Supplies, Stationery & Gift Stores	4532	\$4,504,147	\$12,891,563	-\$8,387,416	-48.2	17
Used Merchandise Stores	4533	\$1,161,025	\$3,512,190	-\$2,351,165	-50.3	12
Other Miscellaneous Store Retailers	4539	\$12,755,723	\$16,395,500	-\$3,639,777	-12.5	25
Nonstore Retailers	454	\$7,693,393	\$455,479	\$7,237,914	88.8	1
Electronic Shopping & Mail-Order Houses	4541	\$4,612,193	\$0	\$4,612,193	100.0	0
Vending Machine Operators	4542	\$432,500	\$278,749	\$153,751	21.6	1
Direct Selling Establishments	4543	\$2,648,700	\$0	\$2,648,700	100.0	0
Food Services & Drinking Places	722	\$58,781,353	\$101,725,961	-\$42,944,608	-26.8	134
Full-Service Restaurants	7221	\$27,431,452	\$43,367,589	-\$15,936,137	-22.5	77
Limited-Service Eating Places	7222	\$26,739,853	\$56,230,871	-\$29,491,018	-35.5	47
Special Food Services	7223	\$800,724	\$1,045,333	-\$244,609	-13.3	5
Drinking Places - Alcoholic Beverages	7224	\$3,809,325	\$1,082,168	\$2,727,157	55.8	5

Data Note: Supply (retail sales) estimates sales to consumers by establishments. Sales to businesses are excluded. Demand (retail potential) estimates the expected amount spent by consumers at retail establishments. Supply and demand estimates are in current dollars. The Leakage/Surplus Factor presents a snapshot of retail opportunity. This is a measure of the relationship between supply and demand that ranges from +100 (total leakage) to -100 (total surplus). A positive value represents 'leakage' of retail opportunity outside the trade area. A negative value represents a surplus of retail sales, a market where customers are drawn in from outside the trade area. The Retail Gap represents the difference between Retail Potential and Retail Sales. Esri uses the North American Industry Classification System (NAICS) to classify businesses by their primary type of economic activity. Retail establishments are classified into 27 industry groups in the Retail Trade sector, as well as four industry groups within the Food Services & Drinking Establishments subsector. For more information on the Retail MarketPlace data, please click the link below to view the Methodology Statement.

<http://www.esri.com/library/whitepapers/pdfs/esri-data-retail-marketplace.pdf>

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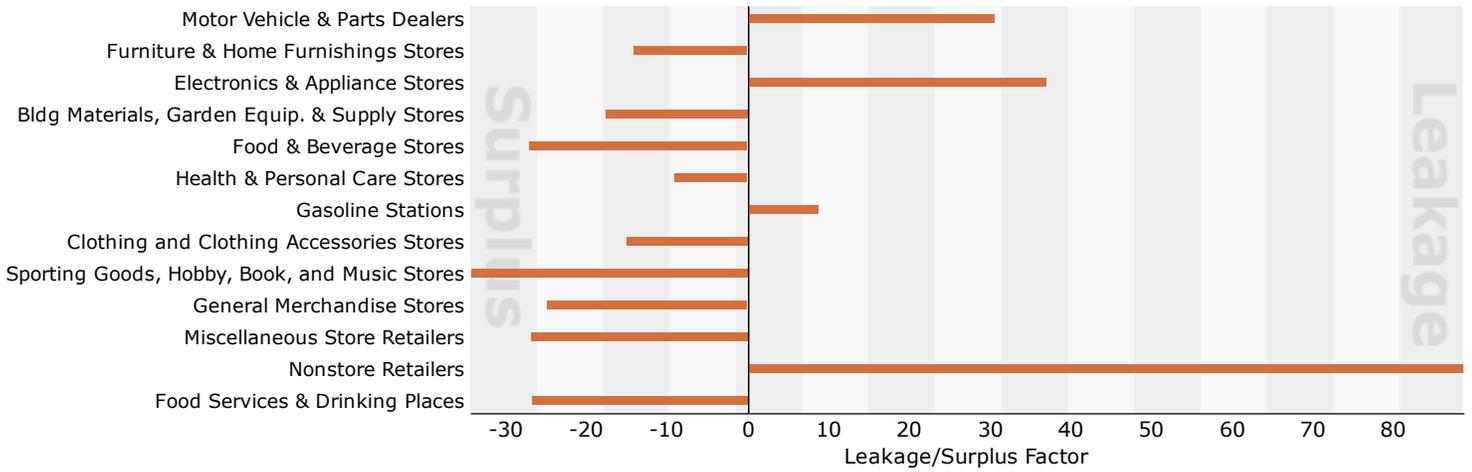


Retail MarketPlace Profile

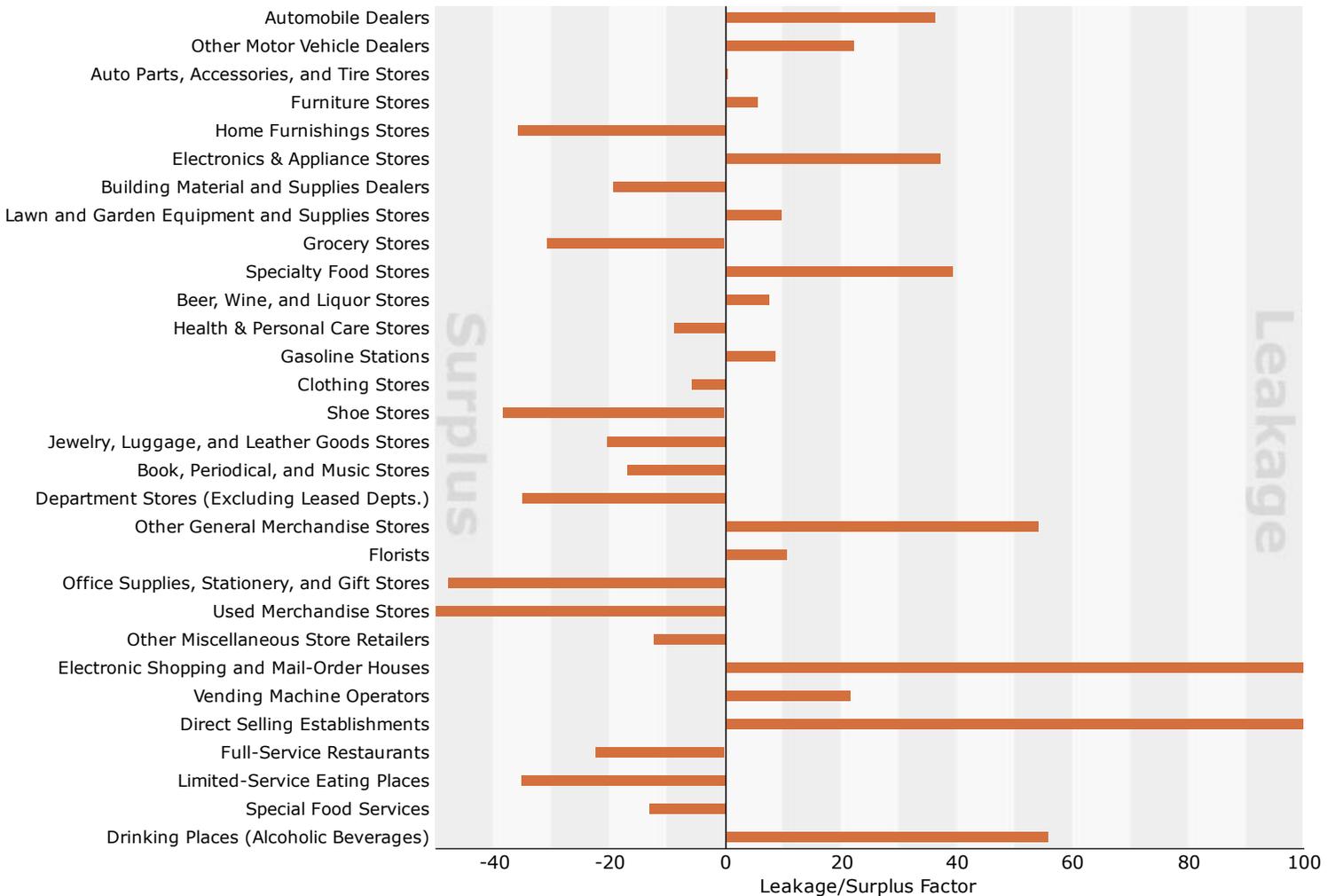
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Leakage/Surplus Factor by Industry Subsector



Leakage/Surplus Factor by Industry Group



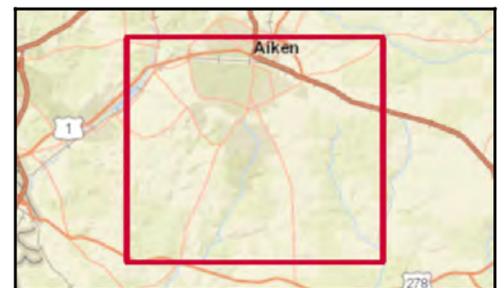
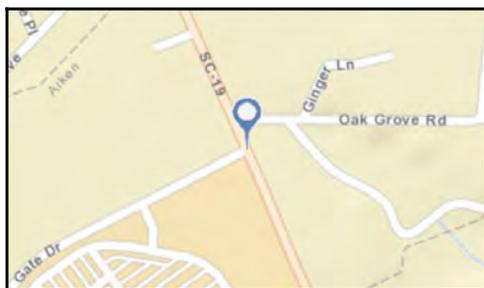
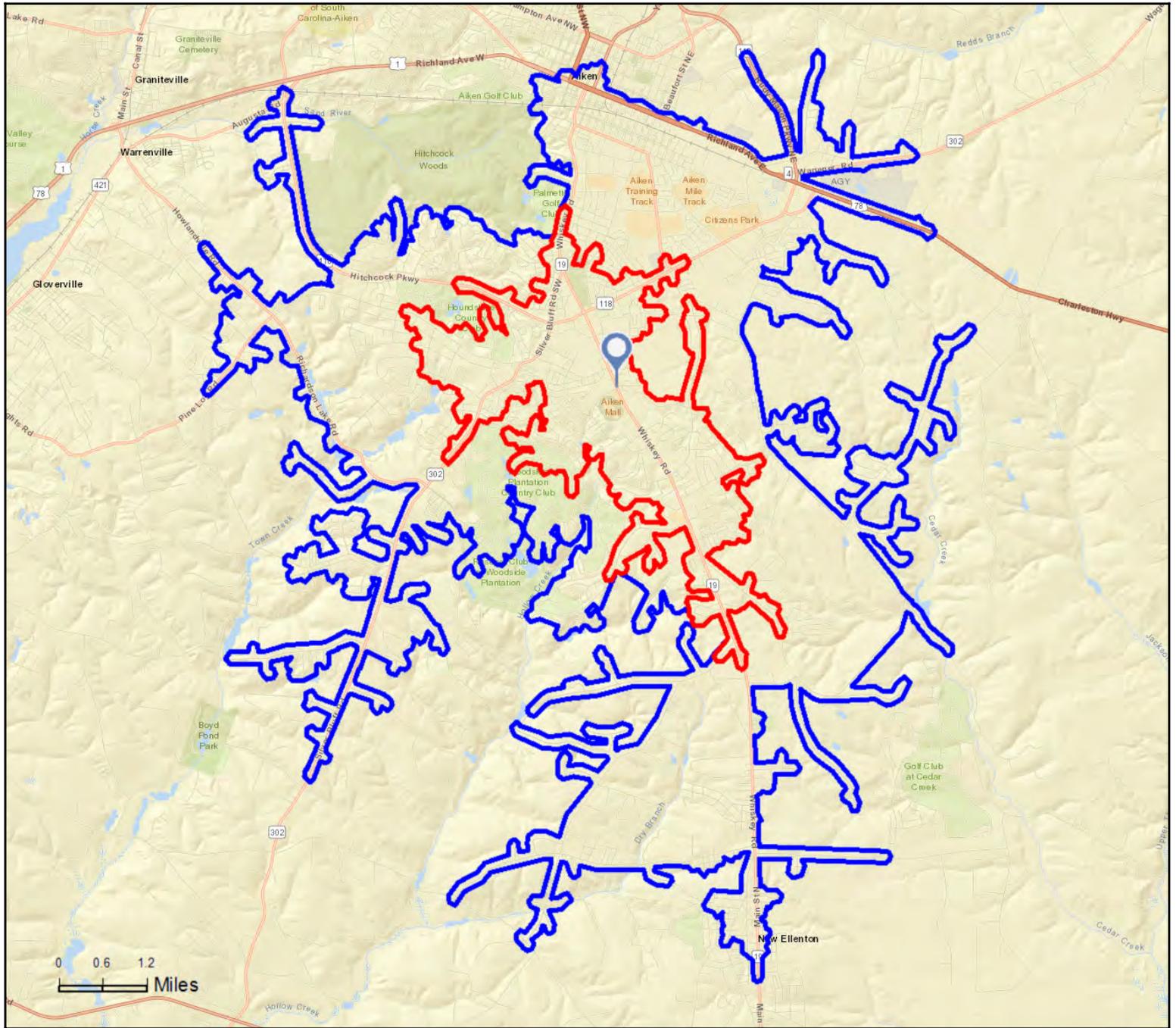
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Site Map

Aiken Mall Town Centre at E Gate Drive
202 Eastgate Dr, Aiken, South Carolina, 29803
Drive Times: 5, 10 minute radii

Prepared by Esri
Latitude: 33.51134
Longitude: -81.7131





Retail MarketPlace Profile

Aiken Mall Town Centre at E Gate Drive
202 Eastgate Dr, Aiken, South Carolina, 29803
Drive Time: 5 minute radius

Prepared by Esri
Latitude: 33.51134
Longitude: -81.71310

Summary Demographics

2016 Population	9,539
2016 Households	4,278
2016 Median Disposable Income	\$48,815
2016 Per Capita Income	\$34,728

Industry Summary	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Total Retail Trade and Food & Drink	44-45,722	\$177,657,584	\$466,739,854	-\$289,082,270	-44.9	204
Total Retail Trade	44-45	\$160,399,613	\$394,236,040	-\$233,836,427	-42.2	133
Total Food & Drink	722	\$17,257,972	\$72,503,815	-\$55,245,843	-61.5	70

Industry Group	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Motor Vehicle & Parts Dealers	441	\$37,310,244	\$27,089,845	\$10,220,399	15.9	9
Automobile Dealers	4411	\$29,933,013	\$18,954,256	\$10,978,757	22.5	3
Other Motor Vehicle Dealers	4412	\$4,416,857	\$6,206,370	-\$1,789,513	-16.8	1
Auto Parts, Accessories & Tire Stores	4413	\$2,960,375	\$1,929,219	\$1,031,156	21.1	4
Furniture & Home Furnishings Stores	442	\$4,496,664	\$9,515,962	-\$5,019,298	-35.8	11
Furniture Stores	4421	\$2,910,704	\$4,852,159	-\$1,941,455	-25.0	7
Home Furnishings Stores	4422	\$1,585,960	\$4,663,802	-\$3,077,842	-49.2	4
Electronics & Appliance Stores	443	\$8,273,509	\$6,602,567	\$1,670,942	11.2	5
Bldg Materials, Garden Equip. & Supply Stores	444	\$7,853,260	\$25,364,158	-\$17,510,898	-52.7	5
Bldg Material & Supplies Dealers	4441	\$7,161,968	\$25,259,332	-\$18,097,364	-55.8	4
Lawn & Garden Equip & Supply Stores	4442	\$691,292	\$104,826	\$586,466	73.7	1
Food & Beverage Stores	445	\$28,478,160	\$108,449,088	-\$79,970,928	-58.4	13
Grocery Stores	4451	\$25,091,455	\$105,499,303	-\$80,407,848	-61.6	9
Specialty Food Stores	4452	\$1,700,649	\$936,335	\$764,314	29.0	2
Beer, Wine & Liquor Stores	4453	\$1,686,055	\$2,013,450	-\$327,395	-8.8	3
Health & Personal Care Stores	446,4461	\$10,147,553	\$24,517,227	-\$14,369,674	-41.5	20
Gasoline Stations	447,4471	\$11,921,268	\$5,027,013	\$6,894,255	40.7	3
Clothing & Clothing Accessories Stores	448	\$7,218,014	\$24,103,034	-\$16,885,020	-53.9	25
Clothing Stores	4481	\$4,740,184	\$11,246,059	-\$6,505,875	-40.7	12
Shoe Stores	4482	\$957,723	\$6,036,452	-\$5,078,729	-72.6	6
Jewelry, Luggage & Leather Goods Stores	4483	\$1,520,107	\$6,820,523	-\$5,300,416	-63.5	6
Sporting Goods, Hobby, Book & Music Stores	451	\$4,123,300	\$21,500,355	-\$17,377,055	-67.8	14
Sporting Goods/Hobby/Musical Instr Stores	4511	\$3,353,234	\$18,616,956	-\$15,263,722	-69.5	9
Book, Periodical & Music Stores	4512	\$770,066	\$2,883,399	-\$2,113,333	-57.8	5
General Merchandise Stores	452	\$32,780,618	\$126,189,674	-\$93,409,056	-58.8	8
Department Stores Excluding Leased Depts.	4521	\$25,006,466	\$124,054,872	-\$99,048,406	-66.4	6
Other General Merchandise Stores	4529	\$7,774,153	\$2,134,802	\$5,639,351	56.9	2
Miscellaneous Store Retailers	453	\$5,621,504	\$15,554,185	-\$9,932,681	-46.9	20
Florists	4531	\$238,359	\$195,946	\$42,413	9.8	2
Office Supplies, Stationery & Gift Stores	4532	\$1,313,603	\$5,694,421	-\$4,380,818	-62.5	5
Used Merchandise Stores	4533	\$341,394	\$1,283,003	-\$941,609	-58.0	3
Other Miscellaneous Store Retailers	4539	\$3,728,148	\$8,380,816	-\$4,652,668	-38.4	10
Nonstore Retailers	454	\$2,175,519	\$322,932	\$1,852,587	74.1	1
Electronic Shopping & Mail-Order Houses	4541	\$1,347,019	\$0	\$1,347,019	100.0	0
Vending Machine Operators	4542	\$126,752	\$278,749	-\$151,997	-37.5	1
Direct Selling Establishments	4543	\$701,748	\$0	\$701,748	100.0	0
Food Services & Drinking Places	722	\$17,257,972	\$72,503,815	-\$55,245,843	-61.5	70
Full-Service Restaurants	7221	\$8,075,107	\$27,418,404	-\$19,343,297	-54.5	35
Limited-Service Eating Places	7222	\$7,854,885	\$44,158,492	-\$36,303,607	-69.8	30
Special Food Services	7223	\$230,371	\$460,398	-\$230,027	-33.3	2
Drinking Places - Alcoholic Beverages	7224	\$1,097,608	\$466,521	\$631,087	40.3	3

Data Note: Supply (retail sales) estimates sales to consumers by establishments. Sales to businesses are excluded. Demand (retail potential) estimates the expected amount spent by consumers at retail establishments. Supply and demand estimates are in current dollars. The Leakage/Surplus Factor presents a snapshot of retail opportunity. This is a measure of the relationship between supply and demand that ranges from +100 (total leakage) to -100 (total surplus). A positive value represents 'leakage' of retail opportunity outside the trade area. A negative value represents a surplus of retail sales, a market where customers are drawn in from outside the trade area. The Retail Gap represents the difference between Retail Potential and Retail Sales. Esri uses the North American Industry Classification System (NAICS) to classify businesses by their primary type of economic activity. Retail establishments are classified into 27 industry groups in the Retail Trade sector, as well as four industry groups within the Food Services & Drinking Establishments subsector. For more information on the Retail MarketPlace data, please click the link below to view the Methodology Statement.

<http://www.esri.com/library/whitepapers/pdfs/esri-data-retail-marketplace.pdf>

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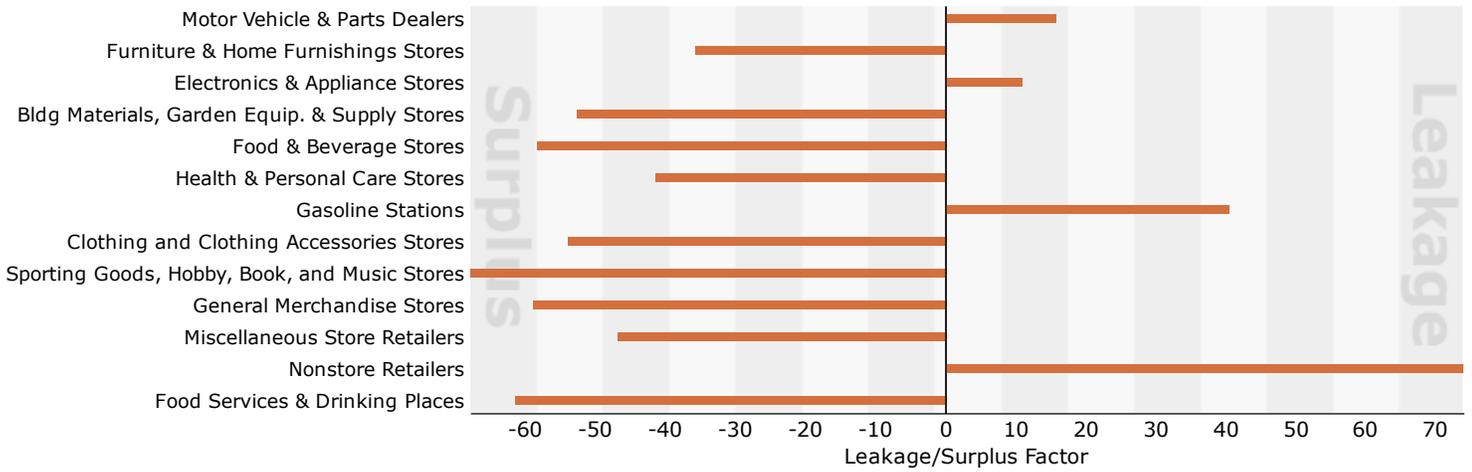


Retail MarketPlace Profile

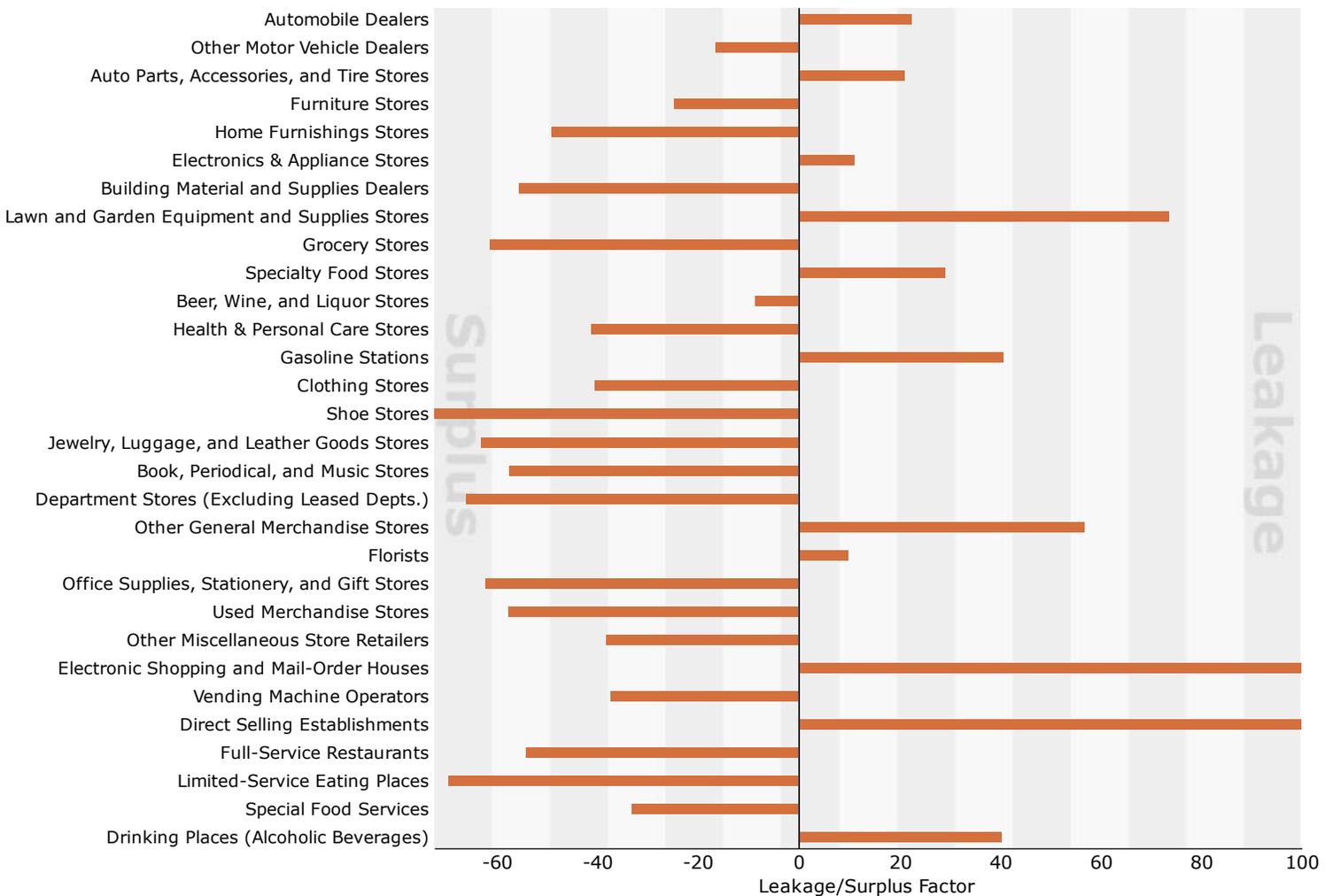
Aiken Mall Town Centre at E Gate Drive
 202 Eastgate Dr, Aiken, South Carolina, 29803
 Drive Time: 5 minute radius

Prepared by Esri
 Latitude: 33.51134
 Longitude: -81.71310

Leakage/Surplus Factor by Industry Subsector



Leakage/Surplus Factor by Industry Group



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Retail MarketPlace Profile

Aiken Mall Town Centre at E Gate Drive
202 Eastgate Dr, Aiken, South Carolina, 29803
Drive Time: 10 minute radius

Prepared by Esri
Latitude: 33.51134
Longitude: -81.71310

Summary Demographics

2016 Population	33,404
2016 Households	14,627
2016 Median Disposable Income	\$52,495
2016 Per Capita Income	\$37,849

Industry Summary	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Total Retail Trade and Food & Drink	44-45,722	\$650,313,939	\$616,278,893	\$34,035,046	2.7	365
Total Retail Trade	44-45	\$587,464,794	\$526,891,221	\$60,573,573	5.4	254
Total Food & Drink	722	\$62,849,145	\$89,387,672	-\$26,538,527	-17.4	110

Industry Group	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Motor Vehicle & Parts Dealers	441	\$137,027,370	\$55,886,233	\$81,141,137	42.1	24
Automobile Dealers	4411	\$109,247,169	\$39,702,237	\$69,544,932	46.7	10
Other Motor Vehicle Dealers	4412	\$16,886,127	\$8,698,279	\$8,187,848	32.0	4
Auto Parts, Accessories & Tire Stores	4413	\$10,894,074	\$7,485,717	\$3,408,357	18.5	10
Furniture & Home Furnishings Stores	442	\$16,503,219	\$19,285,545	-\$2,782,326	-7.8	18
Furniture Stores	4421	\$10,611,703	\$7,695,297	\$2,916,406	15.9	10
Home Furnishings Stores	4422	\$5,891,516	\$11,590,248	-\$5,698,732	-32.6	8
Electronics & Appliance Stores	443	\$30,259,453	\$11,890,206	\$18,369,247	43.6	10
Bldg Materials, Garden Equip. & Supply Stores	444	\$30,046,851	\$34,974,539	-\$4,927,688	-7.6	13
Bldg Material & Supplies Dealers	4441	\$27,376,267	\$33,678,744	-\$6,302,477	-10.3	10
Lawn & Garden Equip & Supply Stores	4442	\$2,670,584	\$1,295,795	\$1,374,789	34.7	3
Food & Beverage Stores	445	\$103,408,447	\$133,100,209	-\$29,691,762	-12.6	27
Grocery Stores	4451	\$91,036,947	\$126,762,128	-\$35,725,181	-16.4	16
Specialty Food Stores	4452	\$6,164,949	\$2,269,885	\$3,895,064	46.2	5
Beer, Wine & Liquor Stores	4453	\$6,206,552	\$4,068,196	\$2,138,356	20.8	7
Health & Personal Care Stores	446,4461	\$37,907,677	\$29,658,427	\$8,249,250	12.2	25
Gasoline Stations	447,4471	\$43,021,429	\$24,494,357	\$18,527,072	27.4	9
Clothing & Clothing Accessories Stores	448	\$26,170,313	\$29,794,988	-\$3,624,675	-6.5	37
Clothing Stores	4481	\$17,166,819	\$15,766,339	\$1,400,480	4.3	22
Shoe Stores	4482	\$3,416,591	\$6,611,905	-\$3,195,314	-31.9	7
Jewelry, Luggage & Leather Goods Stores	4483	\$5,586,903	\$7,416,745	-\$1,829,842	-14.1	8
Sporting Goods, Hobby, Book & Music Stores	451	\$15,046,858	\$26,396,847	-\$11,349,989	-27.4	23
Sporting Goods/Hobby/Musical Instr Stores	4511	\$12,301,433	\$22,882,403	-\$10,580,970	-30.1	17
Book, Periodical & Music Stores	4512	\$2,745,425	\$3,514,444	-\$769,019	-12.3	6
General Merchandise Stores	452	\$119,133,886	\$130,484,051	-\$11,350,165	-4.5	13
Department Stores Excluding Leased Depts.	4521	\$90,873,696	\$125,355,594	-\$34,481,898	-15.9	8
Other General Merchandise Stores	4529	\$28,260,190	\$5,128,457	\$23,131,733	69.3	6
Miscellaneous Store Retailers	453	\$20,670,411	\$30,426,158	-\$9,755,747	-19.1	53
Florists	4531	\$924,316	\$650,072	\$274,244	17.4	5
Office Supplies, Stationery & Gift Stores	4532	\$4,834,226	\$12,399,270	-\$7,565,044	-43.9	16
Used Merchandise Stores	4533	\$1,239,725	\$3,340,599	-\$2,100,874	-45.9	11
Other Miscellaneous Store Retailers	4539	\$13,672,144	\$14,036,217	-\$364,073	-1.3	21
Nonstore Retailers	454	\$8,268,881	\$499,662	\$7,769,219	88.6	1
Electronic Shopping & Mail-Order Houses	4541	\$4,945,373	\$0	\$4,945,373	100.0	0
Vending Machine Operators	4542	\$459,666	\$278,749	\$180,917	24.5	1
Direct Selling Establishments	4543	\$2,863,842	\$0	\$2,863,842	100.0	0
Food Services & Drinking Places	722	\$62,849,145	\$89,387,672	-\$26,538,527	-17.4	110
Full-Service Restaurants	7221	\$29,302,577	\$39,551,855	-\$10,249,278	-14.9	66
Limited-Service Eating Places	7222	\$28,587,194	\$48,219,464	-\$19,632,270	-25.6	36
Special Food Services	7223	\$858,114	\$853,097	\$5,017	0.3	4
Drinking Places - Alcoholic Beverages	7224	\$4,101,260	\$763,256	\$3,338,004	68.6	4

Data Note: Supply (retail sales) estimates sales to consumers by establishments. Sales to businesses are excluded. Demand (retail potential) estimates the expected amount spent by consumers at retail establishments. Supply and demand estimates are in current dollars. The Leakage/Surplus Factor presents a snapshot of retail opportunity. This is a measure of the relationship between supply and demand that ranges from +100 (total leakage) to -100 (total surplus). A positive value represents 'leakage' of retail opportunity outside the trade area. A negative value represents a surplus of retail sales, a market where customers are drawn in from outside the trade area. The Retail Gap represents the difference between Retail Potential and Retail Sales. Esri uses the North American Industry Classification System (NAICS) to classify businesses by their primary type of economic activity. Retail establishments are classified into 27 industry groups in the Retail Trade sector, as well as four industry groups within the Food Services & Drinking Establishments subsector. For more information on the Retail MarketPlace data, please click the link below to view the Methodology Statement.

<http://www.esri.com/library/whitepapers/pdfs/esri-data-retail-marketplace.pdf>

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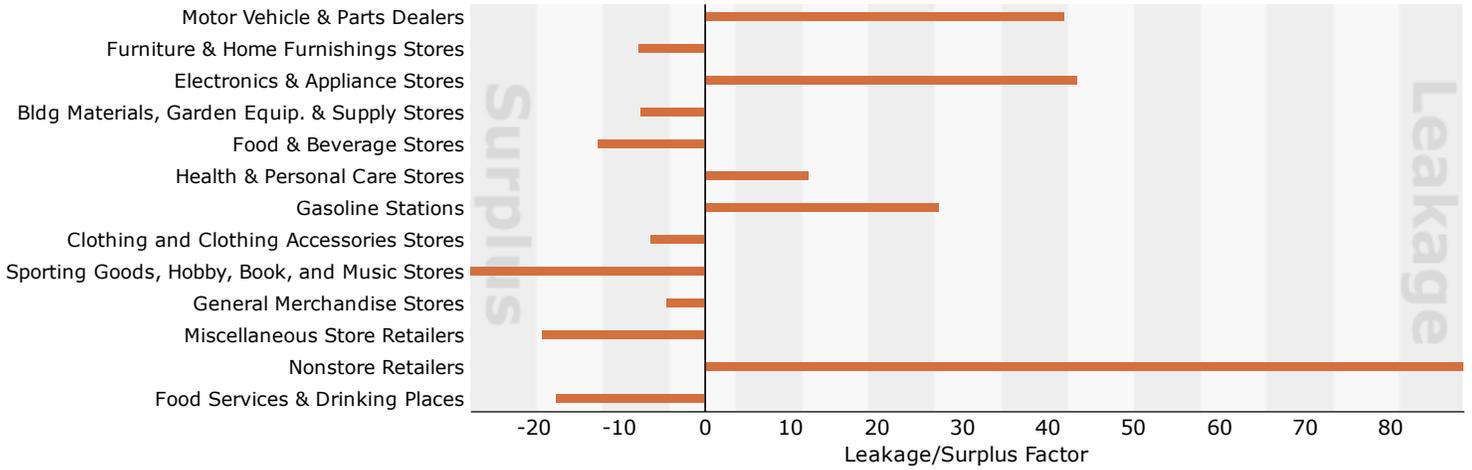


Retail MarketPlace Profile

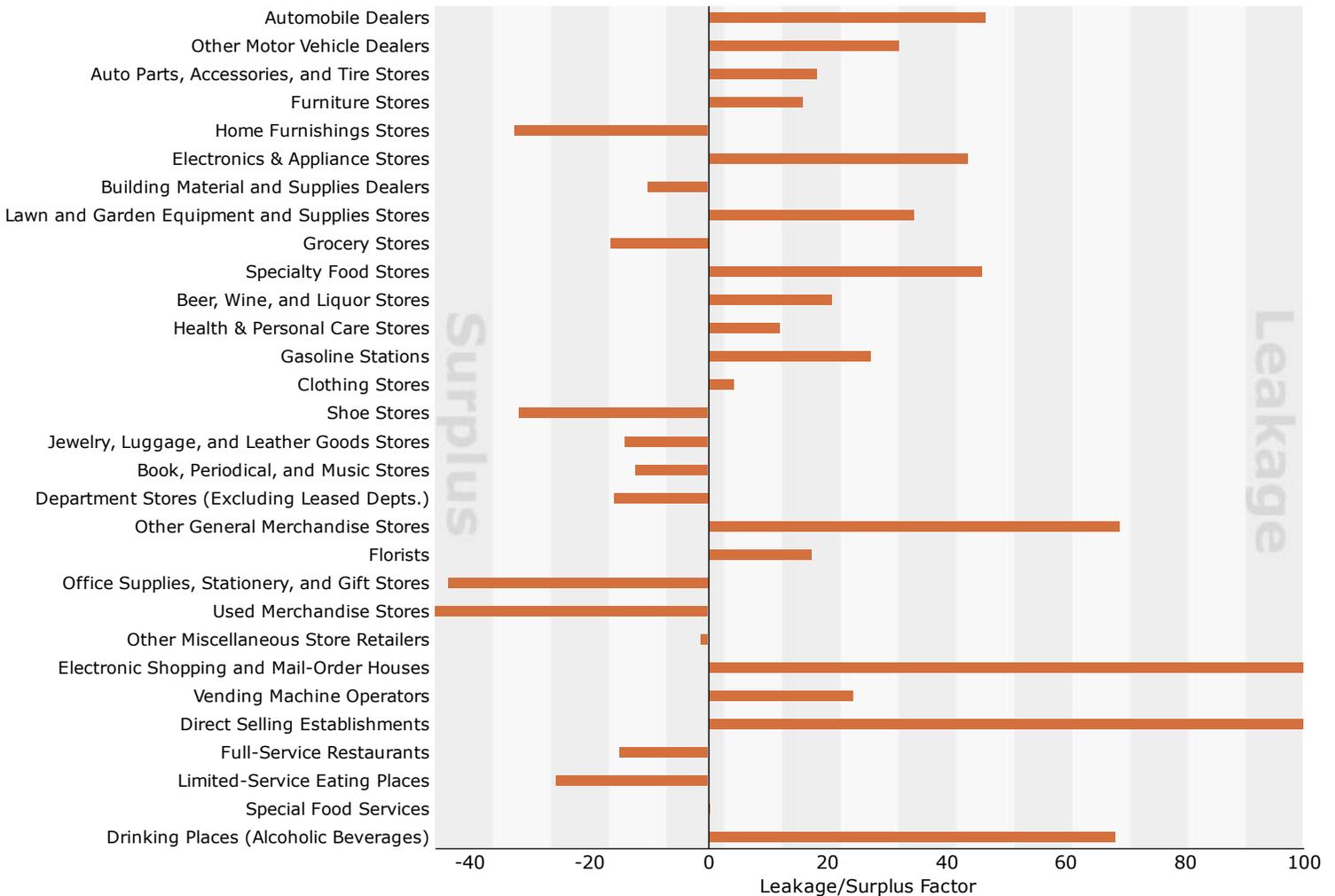
Aiken Mall Town Centre at E Gate Drive
 202 Eastgate Dr, Aiken, South Carolina, 29803
 Drive Time: 10 minute radius

Prepared by Esri
 Latitude: 33.51134
 Longitude: -81.71310

Leakage/Surplus Factor by Industry Subsector



Leakage/Surplus Factor by Industry Group



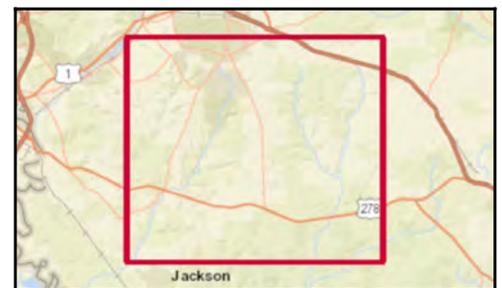
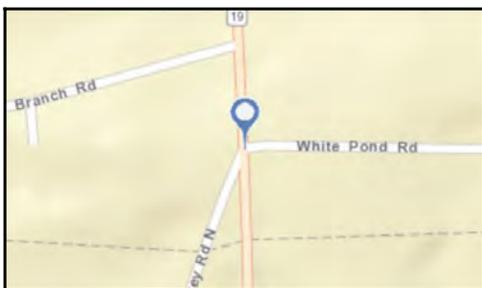
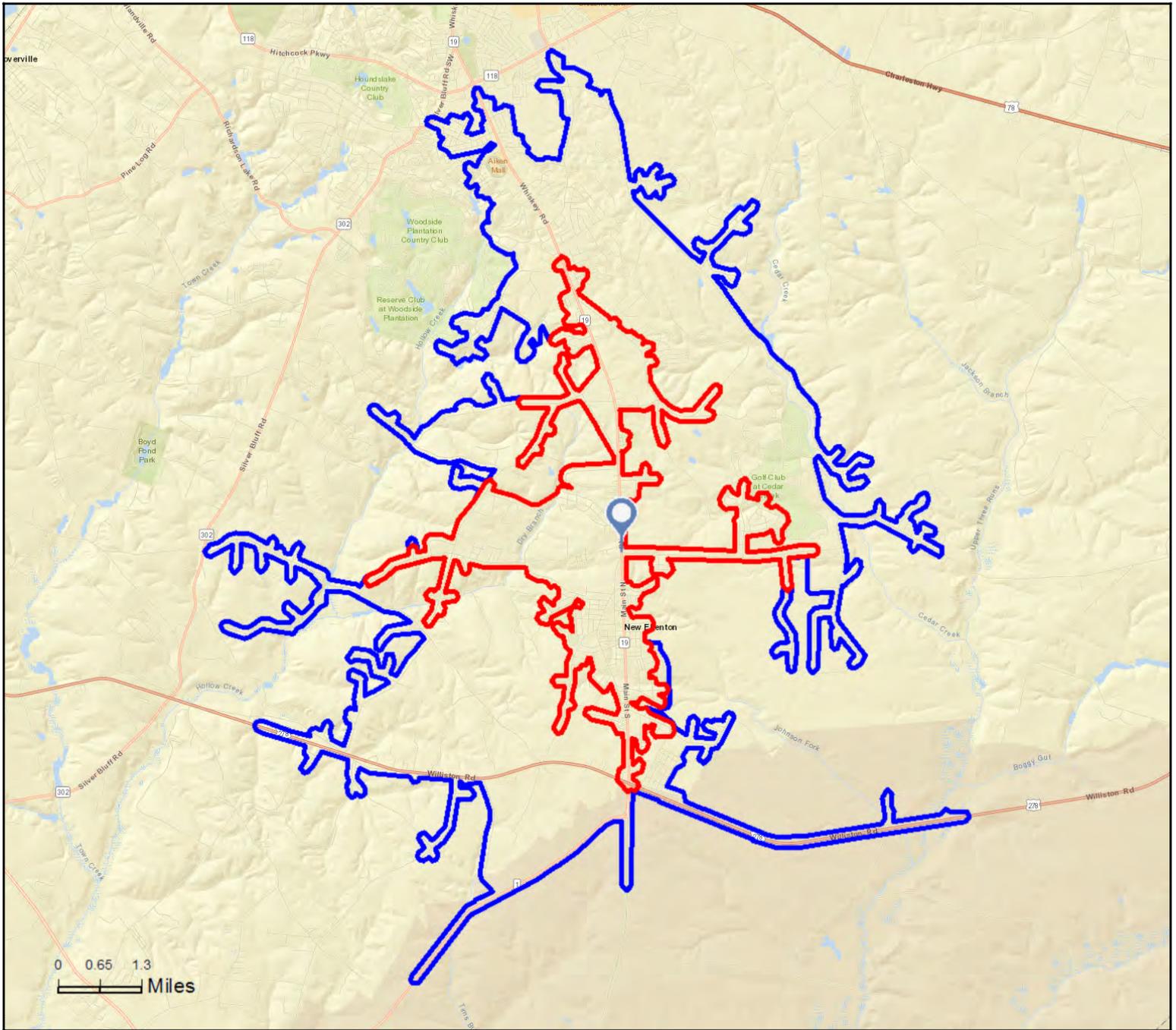
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Site Map

Old Whiskey at New Ellenton
5286 Whiskey Rd, Aiken, South Carolina, 29803
Drive Times: 5, 10 minute radii

Prepared by Esri
Latitude: 33.43507
Longitude: -81.68607





Retail MarketPlace Profile

Old Whiskey at New Ellenton
 5286 Whiskey Rd, Aiken, South Carolina, 29803
 Drive Time: 5 minute radius

Prepared by Esri
 Latitude: 33.43507
 Longitude: -81.68607

Summary Demographics

2016 Population	3,160
2016 Households	1,374
2016 Median Disposable Income	\$38,958
2016 Per Capita Income	\$26,822

Industry Summary	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Total Retail Trade and Food & Drink	44-45,722	\$50,362,135	\$46,475,901	\$3,886,234	4.0	27
Total Retail Trade	44-45	\$45,920,253	\$43,178,253	\$2,742,000	3.1	18
Total Food & Drink	722	\$4,441,882	\$3,297,648	\$1,144,234	14.8	9

Industry Group	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Motor Vehicle & Parts Dealers	441	\$11,065,601	\$16,782,351	-\$5,716,750	-20.5	3
Automobile Dealers	4411	\$8,757,985	\$16,639,389	-\$7,881,404	-31.0	3
Other Motor Vehicle Dealers	4412	\$1,530,640	\$0	\$1,530,640	100.0	0
Auto Parts, Accessories & Tire Stores	4413	\$776,975	\$0	\$776,975	100.0	0
Furniture & Home Furnishings Stores	442	\$1,204,157	\$1,259,772	-\$55,615	-2.3	1
Furniture Stores	4421	\$768,899	\$1,027,368	-\$258,469	-14.4	1
Home Furnishings Stores	4422	\$435,258	\$232,404	\$202,854	30.4	1
Electronics & Appliance Stores	443	\$2,157,068	\$0	\$2,157,068	100.0	0
Bldg Materials, Garden Equip. & Supply Stores	444	\$2,350,293	\$214,167	\$2,136,126	83.3	1
Bldg Material & Supplies Dealers	4441	\$2,113,696	\$214,167	\$1,899,529	81.6	1
Lawn & Garden Equip & Supply Stores	4442	\$236,597	\$0	\$236,597	100.0	0
Food & Beverage Stores	445	\$8,056,147	\$13,390,835	-\$5,334,688	-24.9	3
Grocery Stores	4451	\$7,143,829	\$12,928,412	-\$5,784,583	-28.8	2
Specialty Food Stores	4452	\$478,266	\$405,421	\$72,845	8.2	1
Beer, Wine & Liquor Stores	4453	\$434,052	\$0	\$434,052	100.0	0
Health & Personal Care Stores	446,4461	\$3,108,398	\$1,207,766	\$1,900,632	44.0	1
Gasoline Stations	447,4471	\$3,539,401	\$7,435,670	-\$3,896,269	-35.5	2
Clothing & Clothing Accessories Stores	448	\$1,860,909	\$0	\$1,860,909	100.0	0
Clothing Stores	4481	\$1,234,708	\$0	\$1,234,708	100.0	0
Shoe Stores	4482	\$259,536	\$0	\$259,536	100.0	0
Jewelry, Luggage & Leather Goods Stores	4483	\$366,665	\$0	\$366,665	100.0	0
Sporting Goods, Hobby, Book & Music Stores	451	\$1,165,163	\$376,032	\$789,131	51.2	1
Sporting Goods/Hobby/Musical Instr Stores	4511	\$981,498	\$376,032	\$605,466	44.6	1
Book, Periodical & Music Stores	4512	\$183,665	\$0	\$183,665	100.0	0
General Merchandise Stores	452	\$9,011,589	\$1,407,628	\$7,603,961	73.0	2
Department Stores Excluding Leased Depts.	4521	\$6,795,963	\$0	\$6,795,963	100.0	0
Other General Merchandise Stores	4529	\$2,215,626	\$1,363,493	\$852,133	23.8	2
Miscellaneous Store Retailers	453	\$1,752,157	\$252,588	\$1,499,569	74.8	2
Florists	4531	\$70,596	\$88,100	-\$17,504	-11.0	1
Office Supplies, Stationery & Gift Stores	4532	\$364,467	\$85,500	\$278,967	62.0	1
Used Merchandise Stores	4533	\$90,038	\$0	\$90,038	100.0	0
Other Miscellaneous Store Retailers	4539	\$1,227,056	\$0	\$1,227,056	100.0	0
Nonstore Retailers	454	\$649,371	\$0	\$649,371	100.0	0
Electronic Shopping & Mail-Order Houses	4541	\$358,683	\$0	\$358,683	100.0	0
Vending Machine Operators	4542	\$35,395	\$0	\$35,395	100.0	0
Direct Selling Establishments	4543	\$255,293	\$0	\$255,293	100.0	0
Food Services & Drinking Places	722	\$4,441,882	\$3,297,648	\$1,144,234	14.8	9
Full-Service Restaurants	7221	\$2,071,820	\$2,198,093	-\$126,273	-3.0	6
Limited-Service Eating Places	7222	\$2,059,732	\$876,050	\$1,183,682	40.3	1
Special Food Services	7223	\$60,848	\$0	\$60,848	100.0	0
Drinking Places - Alcoholic Beverages	7224	\$249,482	\$199,488	\$49,994	11.1	1

Data Note: Supply (retail sales) estimates sales to consumers by establishments. Sales to businesses are excluded. Demand (retail potential) estimates the expected amount spent by consumers at retail establishments. Supply and demand estimates are in current dollars. The Leakage/Surplus Factor presents a snapshot of retail opportunity. This is a measure of the relationship between supply and demand that ranges from +100 (total leakage) to -100 (total surplus). A positive value represents 'leakage' of retail opportunity outside the trade area. A negative value represents a surplus of retail sales, a market where customers are drawn in from outside the trade area. The Retail Gap represents the difference between Retail Potential and Retail Sales. Esri uses the North American Industry Classification System (NAICS) to classify businesses by their primary type of economic activity. Retail establishments are classified into 27 industry groups in the Retail Trade sector, as well as four industry groups within the Food Services & Drinking Establishments subsector. For more information on the Retail MarketPlace data, please click the link below to view the Methodology Statement.

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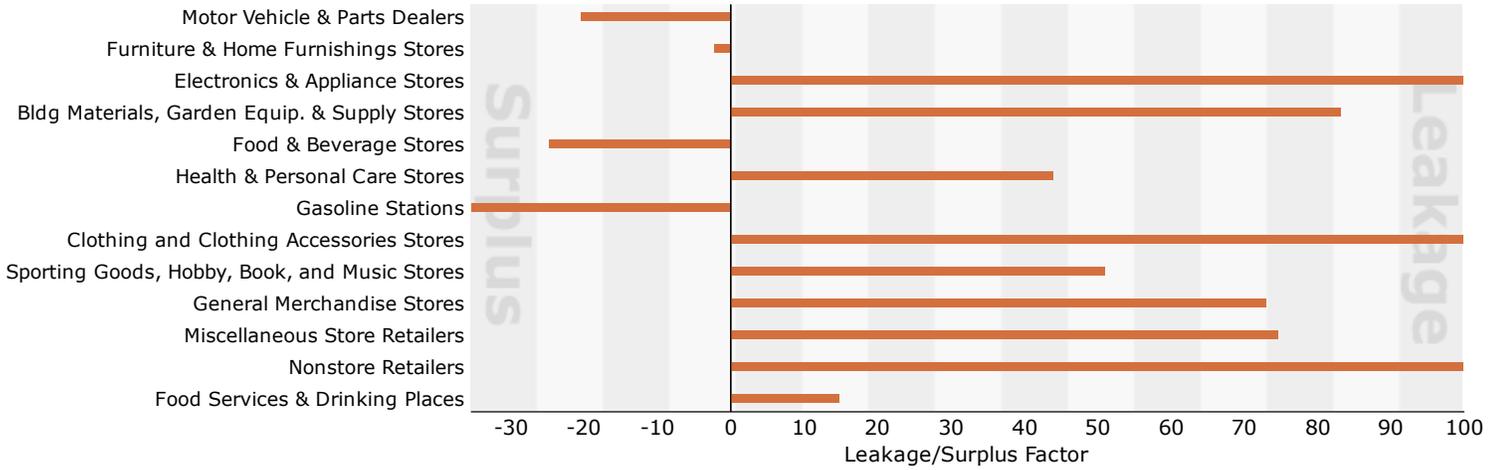


Retail MarketPlace Profile

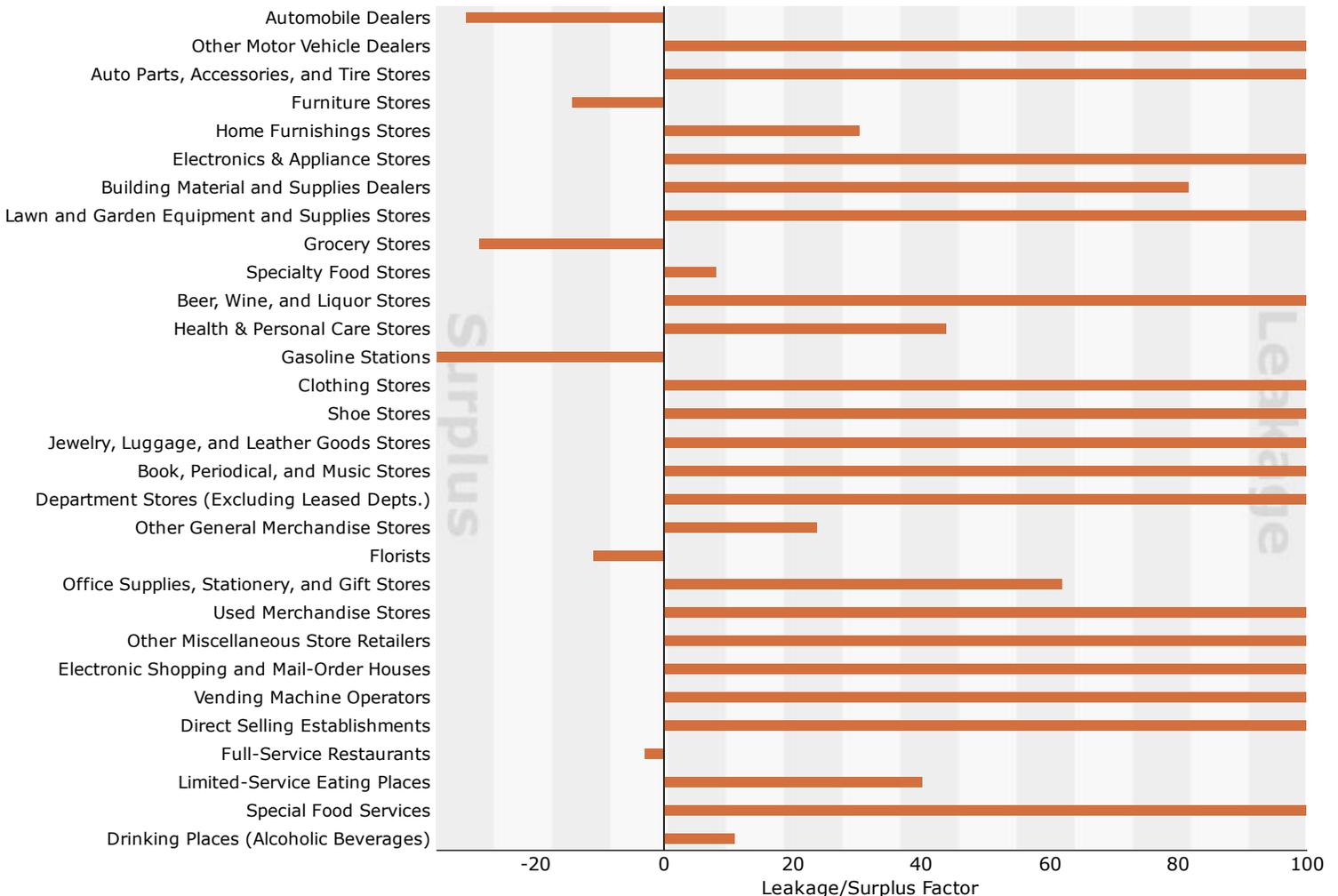
Old Whiskey at New Ellenton
 5286 Whiskey Rd, Aiken, South Carolina, 29803
 Drive Time: 5 minute radius

Prepared by Esri
 Latitude: 33.43507
 Longitude: -81.68607

Leakage/Surplus Factor by Industry Subsector



Leakage/Surplus Factor by Industry Group



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Retail MarketPlace Profile

Old Whiskey at New Ellenton
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 Drive Time: 10 minute radius

Prepared by Esri
 Latitude: 33.43507
 Longitude: -81.68607

Summary Demographics

2016 Population	13,297
2016 Households	5,659
2016 Median Disposable Income	\$50,145
2016 Per Capita Income	\$33,846

Industry Summary	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Total Retail Trade and Food & Drink	44-45,722	\$237,664,970	\$270,460,595	-\$32,795,625	-6.5	129
Total Retail Trade	44-45	\$215,446,350	\$230,540,224	-\$15,093,874	-3.4	85
Total Food & Drink	722	\$22,218,621	\$39,920,371	-\$17,701,750	-28.5	44

Industry Group	NAICS	Demand (Retail Potential)	Supply (Retail Sales)	Retail Gap	Leakage/Surplus Factor	Number of Businesses
Motor Vehicle & Parts Dealers	441	\$50,976,896	\$41,970,174	\$9,006,722	9.7	11
Automobile Dealers	4411	\$40,518,878	\$35,795,854	\$4,723,024	6.2	6
Other Motor Vehicle Dealers	4412	\$6,586,331	\$4,406,725	\$2,179,606	19.8	2
Auto Parts, Accessories & Tire Stores	4413	\$3,871,687	\$1,767,595	\$2,104,092	37.3	3
Furniture & Home Furnishings Stores	442	\$5,913,856	\$5,771,555	\$142,301	1.2	7
Furniture Stores	4421	\$3,793,396	\$3,492,491	\$300,905	4.1	4
Home Furnishings Stores	4422	\$2,120,460	\$2,279,065	-\$158,605	-3.6	3
Electronics & Appliance Stores	443	\$10,745,553	\$1,541,993	\$9,203,560	74.9	3
Bldg Materials, Garden Equip. & Supply Stores	444	\$11,111,734	\$5,243,059	\$5,868,675	35.9	4
Bldg Material & Supplies Dealers	4441	\$10,080,214	\$5,084,081	\$4,996,133	32.9	4
Lawn & Garden Equip & Supply Stores	4442	\$1,031,520	\$158,978	\$872,542	73.3	1
Food & Beverage Stores	445	\$37,750,155	\$45,112,768	-\$7,362,613	-8.9	9
Grocery Stores	4451	\$33,315,654	\$44,185,266	-\$10,869,612	-14.0	6
Specialty Food Stores	4452	\$2,245,726	\$434,906	\$1,810,820	67.6	1
Beer, Wine & Liquor Stores	4453	\$2,188,774	\$492,596	\$1,696,178	63.3	1
Health & Personal Care Stores	446,4461	\$14,159,078	\$11,058,050	\$3,101,028	12.3	9
Gasoline Stations	447,4471	\$16,061,854	\$11,935,957	\$4,125,897	14.7	4
Clothing & Clothing Accessories Stores	448	\$9,269,012	\$13,776,343	-\$4,507,331	-19.6	14
Clothing Stores	4481	\$6,097,075	\$6,238,962	-\$141,887	-1.2	7
Shoe Stores	4482	\$1,235,537	\$3,044,654	-\$1,809,117	-42.3	3
Jewelry, Luggage & Leather Goods Stores	4483	\$1,936,400	\$4,492,726	-\$2,556,326	-39.8	5
Sporting Goods, Hobby, Book & Music Stores	451	\$5,512,415	\$11,123,895	-\$5,611,480	-33.7	6
Sporting Goods/Hobby/Musical Instr Stores	4511	\$4,557,674	\$9,904,192	-\$5,346,518	-37.0	5
Book, Periodical & Music Stores	4512	\$954,741	\$1,219,703	-\$264,962	-12.2	2
General Merchandise Stores	452	\$43,122,693	\$74,676,728	-\$31,554,035	-26.8	6
Department Stores Excluding Leased Depts.	4521	\$32,775,057	\$72,785,900	-\$40,010,843	-37.9	4
Other General Merchandise Stores	4529	\$10,347,636	\$1,890,828	\$8,456,808	69.1	2
Miscellaneous Store Retailers	453	\$7,812,461	\$7,435,972	\$376,489	2.5	10
Florists	4531	\$338,385	\$119,505	\$218,880	47.8	1
Office Supplies, Stationery & Gift Stores	4532	\$1,750,247	\$2,759,950	-\$1,009,703	-22.4	3
Used Merchandise Stores	4533	\$442,229	\$289,630	\$152,599	20.9	2
Other Miscellaneous Store Retailers	4539	\$5,281,600	\$4,266,887	\$1,014,713	10.6	5
Nonstore Retailers	454	\$3,010,643	\$893,729	\$2,116,914	54.2	1
Electronic Shopping & Mail-Order Houses	4541	\$1,766,909	\$729,014	\$1,037,895	41.6	1
Vending Machine Operators	4542	\$167,042	\$164,715	\$2,327	0.7	1
Direct Selling Establishments	4543	\$1,076,693	\$0	\$1,076,693	100.0	0
Food Services & Drinking Places	722	\$22,218,621	\$39,920,371	-\$17,701,750	-28.5	44
Full-Service Restaurants	7221	\$10,356,610	\$15,995,818	-\$5,639,208	-21.4	23
Limited-Service Eating Places	7222	\$10,173,812	\$23,059,056	-\$12,885,244	-38.8	17
Special Food Services	7223	\$303,737	\$303,351	\$386	0.1	2
Drinking Places - Alcoholic Beverages	7224	\$1,384,462	\$562,146	\$822,316	42.2	3

Data Note: Supply (retail sales) estimates sales to consumers by establishments. Sales to businesses are excluded. Demand (retail potential) estimates the expected amount spent by consumers at retail establishments. Supply and demand estimates are in current dollars. The Leakage/Surplus Factor presents a snapshot of retail opportunity. This is a measure of the relationship between supply and demand that ranges from +100 (total leakage) to -100 (total surplus). A positive value represents 'leakage' of retail opportunity outside the trade area. A negative value represents a surplus of retail sales, a market where customers are drawn in from outside the trade area. The Retail Gap represents the difference between Retail Potential and Retail Sales. Esri uses the North American Industry Classification System (NAICS) to classify businesses by their primary type of economic activity. Retail establishments are classified into 27 industry groups in the Retail Trade sector, as well as four industry groups within the Food Services & Drinking Establishments subsector. For more information on the Retail MarketPlace data, please click the link below to view the Methodology Statement.

<http://www.esri.com/library/whitepapers/pdfs/esri-data-retail-marketplace.pdf>

Source: Esri and Infogroup. Retail MarketPlace 2016 Release 1 (2015 data in 2016 geography) Copyright 2016 Infogroup, Inc. All rights reserved.

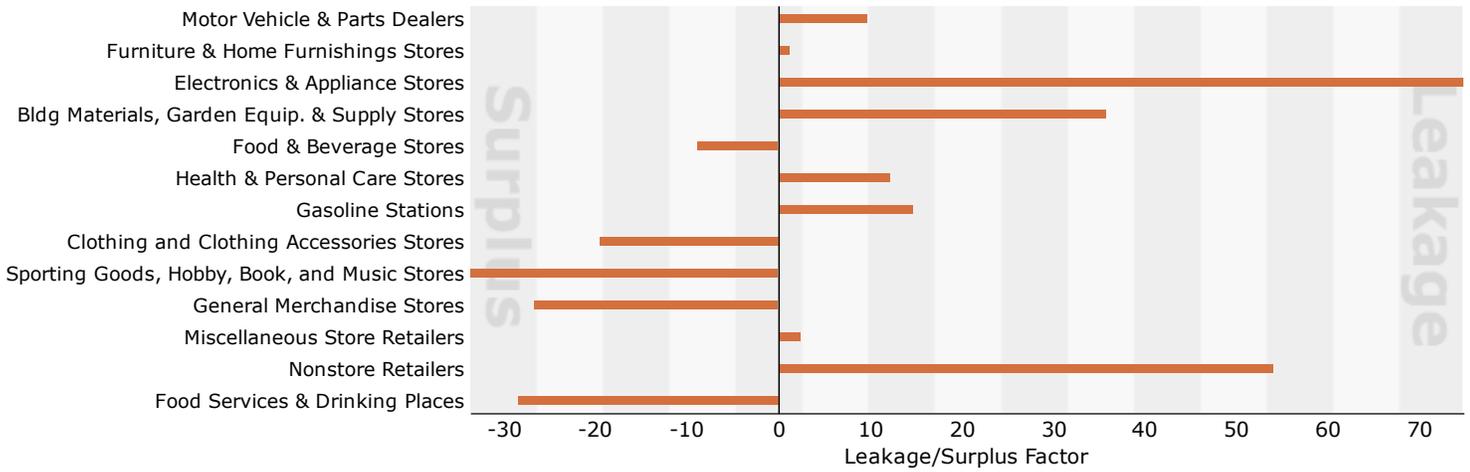


Retail MarketPlace Profile

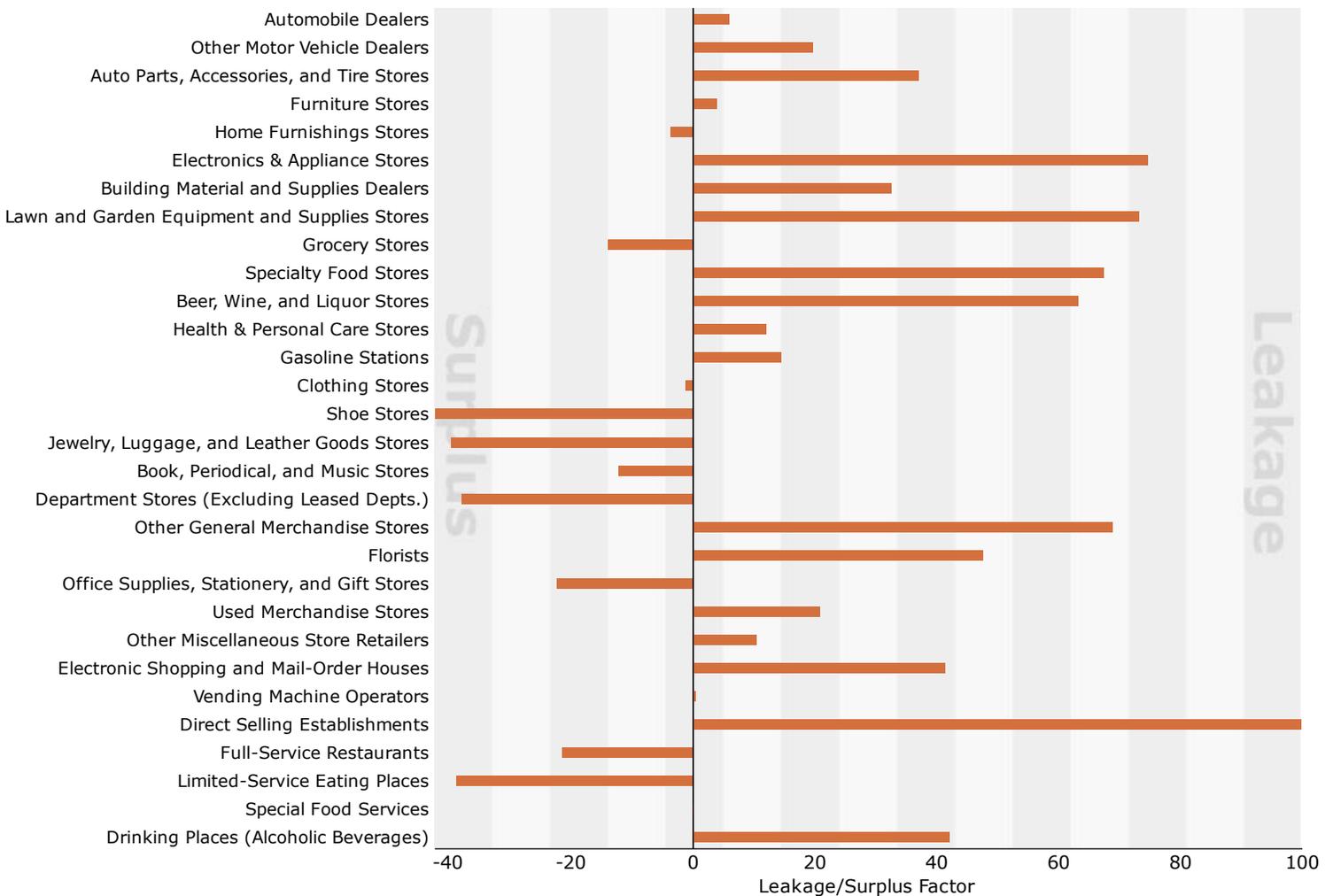
Old Whiskey at New Ellenton
 5286 Whiskey Rd, Aiken, South Carolina, 29803
 Drive Time: 10 minute radius

Prepared by Esri
 Latitude: 33.43507
 Longitude: -81.68607

Leakage/Surplus Factor by Industry Subsector



Leakage/Surplus Factor by Industry Group



Source: Esri and Infogroup. Retail MarketPlace 2016 Release 1 (2015 data in 2016 geography) Copyright 2016 Infogroup, Inc. All rights reserved.

Appendix C Preliminary Engineering Budget



SC 19 Whiskey Road Preliminary Engineering Budget
 From South Boundary Avenue to US 278
 July 16, 2017

Whiskey Road Improvements	Project Management	\$55,000
	Whiskey Road Survey	\$580,000
	Traffic Study	\$45,000
	Conceptual Design / Alternatives	\$60,000
	Public Involvement	\$52,000
	NEPA Documentation	\$35,000
	Phase 1 ESA	\$150,000
	Wetland Delineations and Env. Permitting	\$100,000
	Preliminary / Right of Way Plans	\$370,000
	Hydologic & Hydraulic Analysis	\$20,000
	Utility Coordination	\$45,000
	Final Plans	\$320,000
	Landscaping and Irrigation	\$75,000
	Lighting Plans	\$50,000
	Quantities and Cost Estimating	\$20,000
	Bid Documents and Specifications	\$12,000
	Subtotal	\$1,989,000
Drainage Improvements (Beyond Whiskey Road)	Surveys	\$120,000
	Hydologic & Hydraulic Studies	\$45,000
	Conceptual Design	\$35,000
	Wetland Delineations and Env. Permitting	\$65,000
	Preliminary Design	\$190,000
	Utility Coordination	\$28,000
	Final Plans	\$150,000
	Quantities and Cost Estimating	\$8,000
	Bid Documents and Specifications	\$7,000
	Subtotal	\$648,000
Total Estimated Cost		\$2,637,000

Notes:

1. This budget includes preliminary engineering costs to produce construction documents for bidding. It excludes acquisition of new right of way / easements, permitting fees, and construction administration.
2. This budget assumes the improvements will be designed as a single project. Separating the project into phases would warrant budget adjustments.