Chapter 4 - Green Infrastructure

The *Comprehensive Plan Update: 2006-2026: An Area-Wide Vision for Kenton County* defines green infrastructure as an "interconnected network of protected land and water that supports native species, maintains natural ecological processes, sustains air and water resources and contributes to the health and quality of life for our citizens." Green Infrastructure is a concept that elevates the importance of the natural environment to the level of the built infrastructure, requiring careful consideration and planning. Green infrastructure can broadly be defined as an interconnected system of parks, stream corridors, preserved hillsides, and large undeveloped spaces forming greenways. Green Infrastructure in some cases is also defined more narrowly to include on-site stormwater management practices including rain gardens, bio-retention systems and green roofs.

Green Infrastructure systems perform many valuable functions that typically cost less in the long run than manmade alternatives. These include; cleaning the air and water of pollution, cooling the environment, providing habitat for native species, improving our psychology, and increasing the value of the built environment. The most important contribution green infrastructure provides is on-site stormwater management.

Topographic Analysis

Drainage, geology and slope define the direction and flow of stormwater. These natural features factor into and are affected by land development. This section will provide basic information to help define these features within the study area.

Drainage

The drainage pattern of an area defines the area's watershed. Watersheds are defined by the *Comprehensive Plan Update: 2006-2026* as the land water flows across or through on its way to a common river, lake, or ocean. Watershed boundaries are established along the tops of ridges and hills and determine what direction a drop of rain or snow will fall once it hits the surface. The study area is located within two different watersheds – Banklick Creek Watershed and Licking River Watershed as shown on Map 4.1.

Banklick Creek watershed is one of the most thoroughly documented watersheds within Kenton County. This watershed has been designated as one of the three "highest priority" watersheds in the Licking River basin. In Kentucky, almost every body of water is designated with one or more uses. When these bodies of water do not meet their designated use, they are classified as "impaired" . Since 1998, the entire 19-mile length of Banklick Creek has been classified as an impaired waterway.

The Licking River watershed is approximately 170 square miles in Northern Kentucky and extends from the City of Covington in Kenton County, City of Newport in Campbell County, to the southern boundary of Kenton County with Grant County. This large watershed encompasses dense urban development in the north to very rural sparsely populated areas of southern Kenton County. The Kentucky Division of Water (KDOW) has designated a portion of the Licking River as an Outstanding State Resource Water. Three segments of the Licking River and one tributary are designated by KDOW as impaired waters .

Geology & Soils

The geology of the study area primarily consists of terrace deposits with some alluvium along Banklick Creek and Twin Oaks Golf & Plantation Club. Kope formations are also found where Latonia Terrace is located on Madison Pike.

Several soil types are located within the study area. Some of the major soil types are outlined below :

Urban Land

A majority of land within the study area is classified as urban land. This soil type is made up of areas of soils that have been so disturbed by deep cutting and filling with earth moving machinery and have affected the soil in such a way that the original soil could not

be determined. They are underlain by deep, stratified alluvium deposited by the Licking and Ohio Rivers and by glacial outwash.

Egam Silty Clay Loam
This soil is located primarily along the southern boundary of the study area along Banklick Creek. This soil is on floodplains with little or no hazard of erosion.

Nolin Silt Loam
This soil is located primarily along the Licking River within the floodplain. There is a slight erosion hazard in this soil type with flooding that occurs in winter and spring.

Licking Silt Loam
This soil type covers the Shopping Center Area and industrial land located on Howard Litzler Drive and Winston Avenue. There is no hazard of erosion with this soil type.

Alluvial Land
This soil type is located in close proximity to the southern boundary of the study area. Alluvial Land soil consists of rather narrow steep areas, along riverbanks, on the edges of stream terraces, and on edges of glaciated soils. Erosion is a hazard because surface runoff is rapid. Flooding limits most uses along the riverbanks.

Floodplain
Map 4.2 indicates significant floodplain areas exist within the study area, which are further detailed in the text below. Floodplain areas are located along the Licking River that forms the eastern boundary of the study area, and Banklick Creek, which forms the southern boundary of the study area. A major portion of the Bill Cappel Youth Sports Complex is also located within the floodplain. Twin Oaks Golf & Plantation Club is located entirely within the floodway, or areas that must be protected and reserved to discharge base flood events. A significant ravine located west of Church Street is also located within a floodplain and is heavily wooded. Undeveloped vegetated areas located in the vicinity of 33rd and 38th Streets are also located in the floodplain.

Homes in Rosedale Mobile Home Park are located in the floodplain and these dwellings are elevated for flood protection. While floodplain areas are strictly controlled through zoning for many construction purposes, they provide opportunities for recreational uses and for development of an interconnected greenway system.

Natural Features

Licking River and Banklick Creek
The Licking River, a tributary to the Ohio River, has a significant presence forming the eastern boundary of not only the study area but also Kenton County. The Licking River – named for the mineral springs and salt licks that attracted buffalo and other animals – begins in the highlands of the Allegheny Plateau in Magoffin County, Kentucky. The river flows northwest through the Eastern Bluegrass for about 300 miles before emptying into the Ohio River between Newport and Covington .

Figure 4.1 – Banklick Creek near East of Winston Avenue

Banklick Creek, a tributary to the Licking River, extends 19 miles beginning in the headwaters area in Boone County through Kenton County. Banklick Creek's confluence with the Licking River is located adjacent to the south eastern boundary of the study area. At the beginning of the 21st century, the creek reflects a highly developed, ecologically compromised watershed . As mentioned previously, since 1998,

Map 4.1 Topographic Analysis

Legend

Watershed

City boundary

Study Area

Direction of Flow

ELEVATION

784 - 872

720 - 784

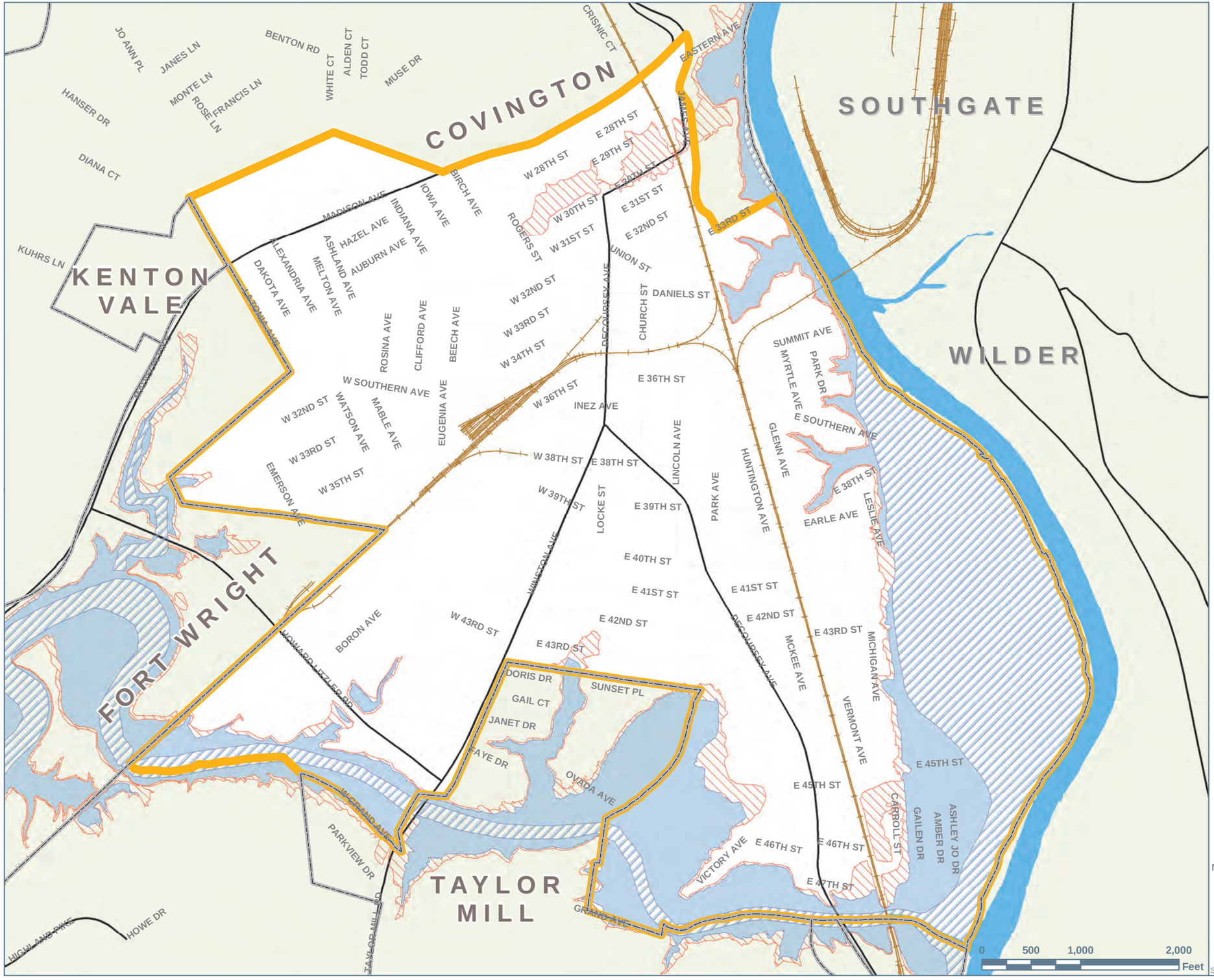
642 - 720

560 - 642

458 - 560

Source: LINK GIS Date: March, 2010

Map 4.2
Flood Area



Legend

- Floodway
- 100 YR Flood-Detailed Study
- 500 Year Flood
- City boundary
- Study Area
- Railroad
- US and State Hwy
- County and Local Roadways

Source: LINK GIS Date: March, 2010

the entire 19-mile length of Banklick Creek has been classified as an impaired waterway. The Banklick Creek is hydraulically influenced by the Licking River at its mouth, such that, at times, the Licking River flows upstream into the Banklick for 30-40 feet and has an influence on the Banklick's temperature, dissolved oxygen and other stream parameters (Limno-Tech, Inc. 1998).

Green Infrastructure Elements

Stormwater Management

Sanitation District No.1 (SD1) is the local authority that manages stormwater and sewage for major portions of Northern Kentucky. The excess stormwater and sewer discharge within the Northern Kentucky area is managed by SD1 through a series of Combined Sewer Overflows (CSO's) which discharge excess untreated sewage into rivers and streams. CSO's were designed to convey domestic, commercial and industrial wastewater as well as stormwater runoff through a single pipe system to a treatment plant. This type of stormwater infrastructure is no longer allowed for new sewer extensions. According to SD1, overflows are designed to occur when the combined system's capacity is exceeded to prevent flooding and basement backups of combined sewage. SD1 has entered into a consent decree with the U.S. Environmental Protection Agency and the U.S. Department of Justice to address a broad array of issues, including CSO's, through an adaptive watershed management approach. The consent decree requires a twenty year plan to address the issue of CSO's to ultimately improve the water quality of streams of rivers to support designated uses.

Figure 4.2 – Combined Sewer Overflow

There are presently 9 CSO's located along the boundary of the study area. Six outfalls are located on the Licking River such as the one shown in Figure 4.2 and three are located on Banklick Creek which forms the southern boundary of the study area.

Flooding and direct sewage discharge has become a reoccurring and expensive problem for local communities. The primary reason for this increase in stormwater entering the drainage system is the ever-increasing amount of impervious surfaces and lack of adequate tree canopy. Impervious surfaces are those that do not allow water to percolate through them including rooftops, parking lots, driveways, etc. Instead of infiltrating into the ground, stormwater is channeled into manmade drainage systems. As the amount of impervious surfaces increases, the amount of water entering the drainage system increases to the point of overwhelming the sewage treatment plant, thus triggering the dumping of untreated sewage into rivers and streams.

On-site stormwater management using natural systems to decrease the amount of runoff into pipes will help alleviate the issue of CSO's as discussed previously.

There are many different natural ways to reduce stormwater runoff, one of which is shown in Figure 4.3. These include bio-retention swales that can hold water during heavy rain events and clean the water as

Figure 4.3 – Example of vegetated curb extension that captures stormwater before entering the storm sewer.

it slowly percolates through the vegetation and soil, rain gardens that allow stormwater to infiltrate the soil quickly, vegetative medians, and curb extensions that reduce the amount of impervious surfaces, retention ponds, and green roofs that absorb most of the water that lands on them.

Tree Canopy

Trees provide many benefits from cooling the ground and buildings, to reducing flooding, and even help to clean the air. American Forests, a nationally recognized forestry research organization, recommend 25 percent canopy coverage for urban residential. Currently Latonia has 8 percent tree coverage within the study area.

Large areas of canopy cover are located primarily within the floodplain areas of the Licking River and Banklick Creek as shown on Map 4.3. This canopy cover acts as a riparian buffer which is integral to the health of the streams. These buffers protect the stream by filtering sediment and pollutants, cool water temperature which is critical to the health of aquatic species and stabilizes bank erosion.

Impervious Surfaces

Impervious surfaces including buildings and driveways contribute to stormwater runoff and are a contributing factor for flooding. According to the Comprehensive Plan Update: 2006-2026, impervious surfaces prevent water from entering the ground where it can be cleansed and slowly released into the surface drainage system. During the preparation of the comprehensive plan impervious surfaces for the entire city of Covington were calculated to be approximately 18 percent. The area of impervious surface within the study area is 32 percent (Map 4.4). The shopping center and industrial development on Winston Avenue as outlined on Map 4.5 comprises only 16 percent of the entire landmass within the study area, however, this area comprises approximately 50 percent of the land within the study area that is covered by impervious surfaces.

Considerations

- Opportunities to increase green infrastructure should be considered by the plan
- These techniques include, but should not be limited to:
  - Curb extensions with planters
  - Green medians on streets like Winston
  - Reforestation efforts to increase tree canopy
  - Use of green techniques as areas redevelop

Map 4.3
Canopy Cover

Legend

- Canopy Cover
- Study Area
- City boundary
- US and State Hwy
- County and Local Roadways
- Railroad

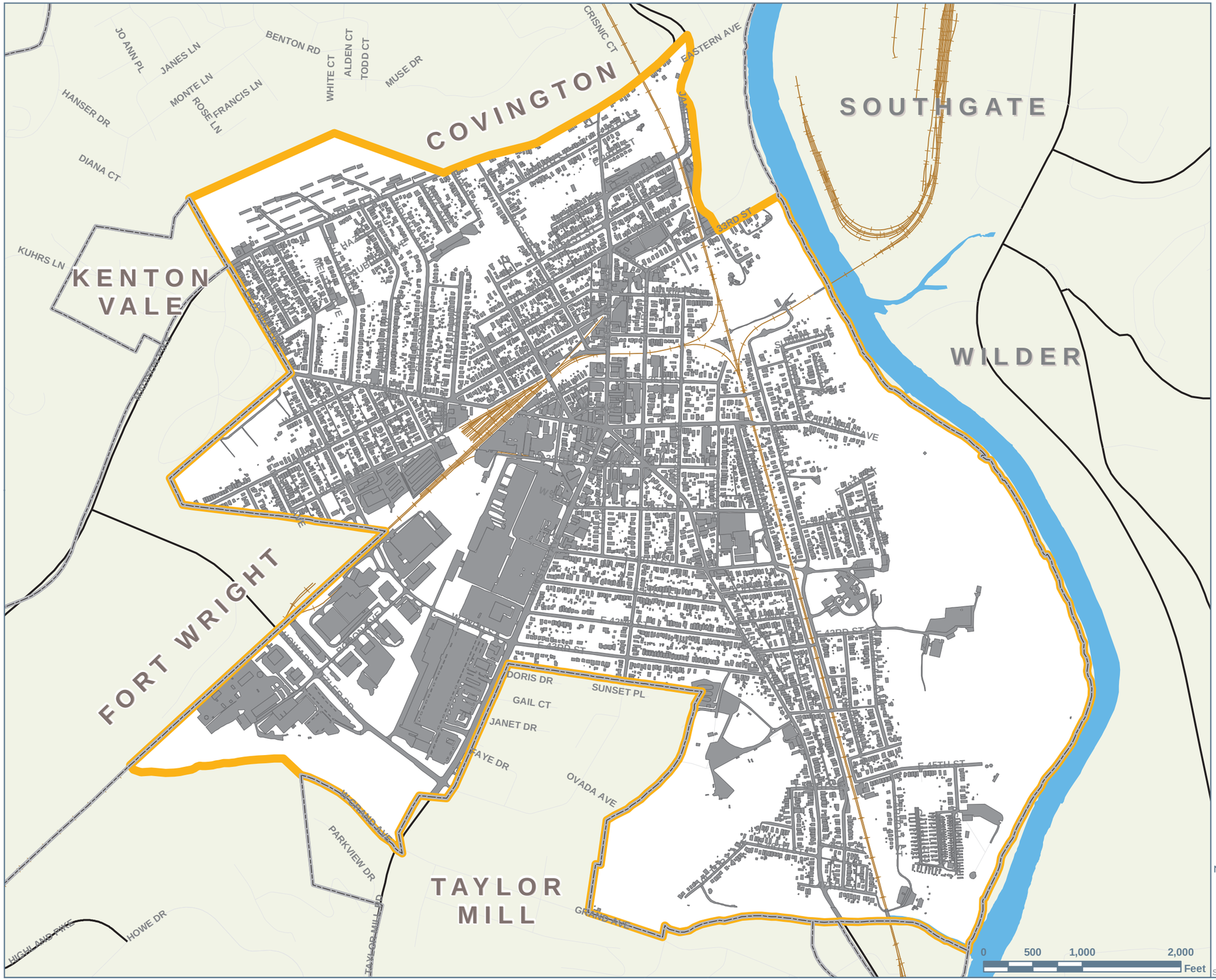
Study Boundary
Approximately 1159 acres

Canopy Cover
Approximately 93 acres

Canopy Cover
Approximately 8% of study area

Source: LINK GIS Date: March, 2010

Map 4.4
Impervious Surfaces



Legend

- Impervious Surface Area
- City boundary
- Study Area
- Railroad
- US and State Hwy
- County and Local Roadways

Study Boundary
Approximately 1159 acres

Impervious Surface
Approximately 367 acres

Impervious Surface Percentage
Approximately 32% of study area

N

Source: LINK GIS **Date:** March, 2010

Map 4.5 Impervious Surface Detail

Legend

- Detail Area
- Impervious Surface Detail
- Study Area
- City boundary
- US and State Hwy
- County and Local Roadways
- Railroad

Detail Boundary
Approximately 197 acres

Impervious Surface Detail
Approximately 106 acres

Impervious Surface Percentage
Approximately 54% of detail area

N

Source: LINK GIS **Date:** March, 2010