

Sustainable Neighborhood: The Capacity to Endure

Virginia Commonwealth University Masters in Urban and
Regional Planning Studio II Project

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Sustainable Neighborhood

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Thanks to all of you for your hard work and helping me to stay on course.

My family, friends, and Kristin without your love and support I would have never gotten through this and accomplished so much. I would also like to think the faculty of Virginia Commonwealth University without your great teaching this would have never been possible.

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Executive Summary

The neighborhood plan was prepared as a guide for developing the site to be home to a LEED ND certified sustainable neighborhood. The site is composed of four separate parcels that are owned by three private and one public owner that is an estimated 20 plus acres. To the south-east of downtown Richmond, Virginia, located in the Chimborazo neighborhood sits undeveloped land that would be a prime a location for new development to occur.

Some possible reasons for the lack of development can be due to the perceived contamination and liability concerns that area associated with a few of the parcels. Another drawback is that the site sits 100 feet above mean sea level and is slightly sloped from northwest to southeast making development difficult and expensive. These perceptions could make development difficult if developers feel that this is not an economically viable area to develop.

Although there are some restrictions to development, there are many positive aspects that make this site appealing for development. The site is located along Government Road which is major corridor that connects the City of Richmond to Henrico County meaning that there is high volume of traffic and visibility for the site. Utilities are already present, which will cut down on development time and expense. The site could be eligible for several tax credits. The first tax credit would be the one existing building left on the site, although in bad condition could be a candidate for listing on the National Register of Historic Places. The second tax credit is the perceived or real contamination and liability concerns of hazardous waste which makes the site a candidate for brownfields redevelopment. The location of the site to downtown Richmond, the James River, Rocketts Landing, and Henrico County makes this site an ideal place for development.

The Sustainable Neighborhood Plan includes a thorough analysis of existing conditions; such as the environment, smart location, connectivity, walkability, history, demographics, and the surrounding neighborhoods. Based on the these existing conditions I was able to formulate a SWOT analysis that helped in developing plan foundations, a visions and goals and objectives.

The benefits of having a sustainable neighborhood in the City of Richmond is that it would help the local economy by brining in jobs and consumers. Beyond the monetary gains the site would meet the needs of the present without affecting future generations and would be an example for other cities to follow.



Picture of St. John's Episcopal Church

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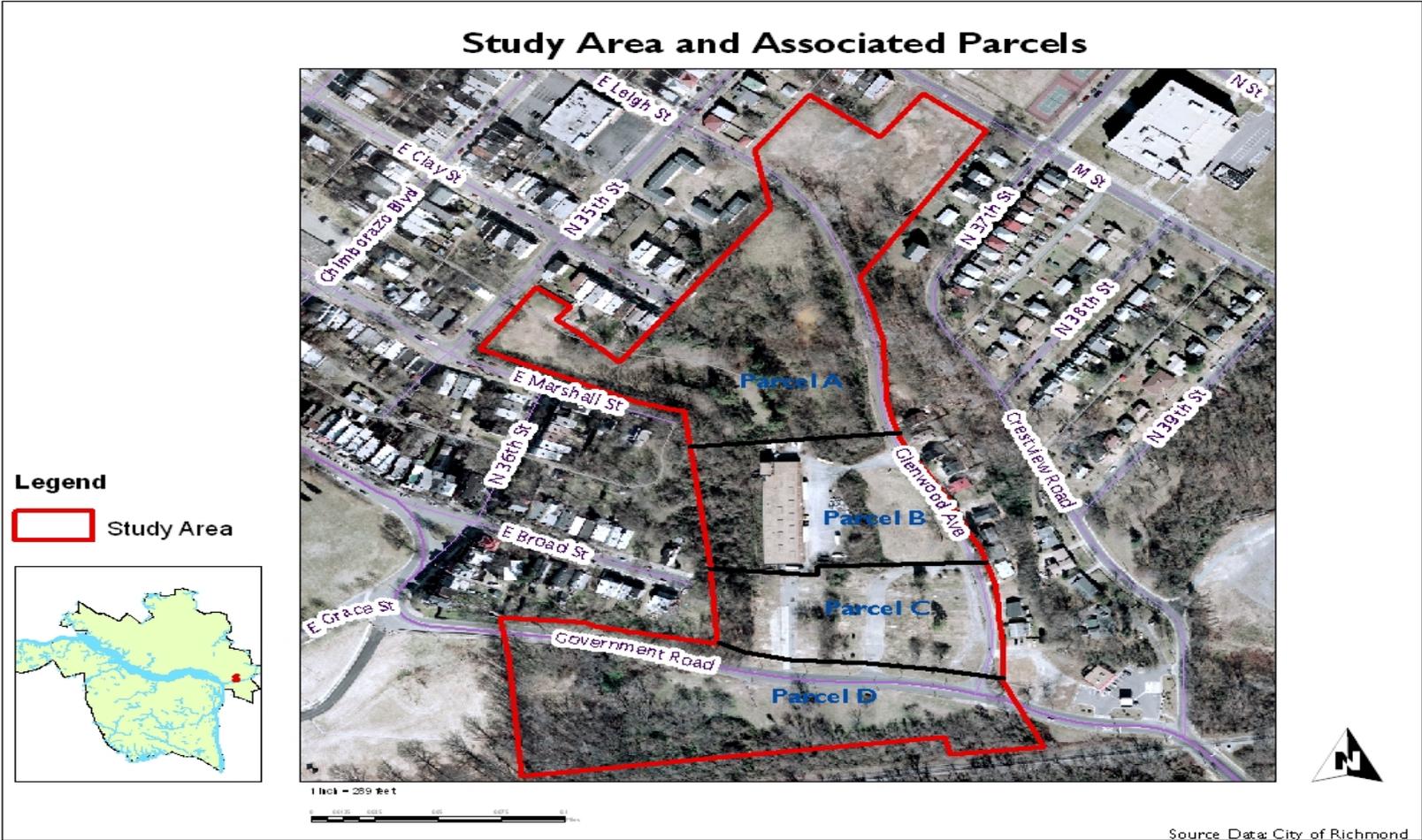
Justification for the Proposed Plan

Over the past fifty years the land use patterns in the City of Richmond have been well established, 87.6% of the land is developed and 12.4% of the land is undeveloped. This lack of land has made it difficult for new development to occur on the periphery of the city. For this reason the City needs to look at innovative ways to develop these vacant parcels to spur economic growth and population growth. The City needs to look at identifying areas for development and areas where development will not occur. Areas for development should be concentrated to identified brownfield sites and areas where population growth has occurred. Protected areas should be sites that have environmental constraints such as resource protected areas, wetlands, and floodplains, and areas identified as parks or open space. These new developments should practice environmental stewardship and sustainability to protect current and future residents.

Preferred Location

The site occupies 20 plus acres and is bounded by Government Road to the south, Glenwood Avenue to the east, M street to the north and North 35th Street to the west (Figure 1). The individual parcels making up this study area will be known as Parcel A owned by Mr. Frank Wood of Church Hill Land LLC, Parcel B owned by Mr. Matthew Logan and Mr. Lee Johnson, Parcel C owned by Mr. Charles Smith, and Parcel D owned by the City of Richmond. The study area is located in the Chimborazo neighborhood and surrounded by Fulton to the south, Church Hill to the northwest, Church Hill North to the northeast, and the James River to the southwest. It lies in close proximity to the State Capital, financial district, Shockoe Bottom and Shockoe Slip are northwest of the study area. Rocketts Landing a new mixed use community is located to the southwest less than a mile away (Figure 2).

Figure 1: Study Area and Associated Parcels



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Sustainable Development

“As the US population continues to expand rapidly, consumption land grows exponentially – currently, three times the rate of population growth. At this breathtaking pace, two-thirds of the development on the ground in 2050 will be built between now and then” (The Evidence on Urban Development and Climate Change, 2008). Current land use and neighborhood design patterns have a huge impact on the environmental performance of a particular location. Over the past fifty years major development patterns scattered land uses that are dependent on automobile use. In the United States transportation accounts for one-third greenhouse gas emissions, the majority of this coming from the use of automobiles. These automobile-oriented neighborhoods are not pedestrian friendly and do not support traditional mixed-use neighborhoods. Scattered land use patterns leads to fragmented habitats, endangered sensitive lands and water bodies, destroy precious farmland, and increase the burden on municipal infrastructure. The trend is towards sustainable development, which is defined by the Brundtland Commission of the United Nations on March 20, 1987 defines it as “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. It combines the need for the carrying capacity of natural systems with the social challenges facing humanity. The premise behind this is to place residents and jobs in close proximity to each other, which can limit the amount of automobile trips thus reducing greenhouse gas emissions (U.N General Assembly, 1987).

In 2009 the United States Green Building Council (USGBC), the Congress for New Urbanism (CNU), and the Natural Resource Defense Council (NRDC) came together to develop a rating system for neighborhood planning and development based on a combi-



Image credit: Allison Ramsey Architects

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nation of smart growth, New Urbanism, and green infrastructure and building principals. LEED Neighborhood Development (ND) places emphasis on the site selection, design, and construction elements that brings buildings and infrastructure together into a neighborhood and relate that neighborhood to its landscape as well as its local and regional context. The focus of LEED ND is on mixed-use development and walkable streets that encourage walking, bicycling, and public transportation for daily errands and commuting. The buildings and infrastructure in these neighborhoods will be environmentally responsible by reducing greenhouse gas emissions by decreasing energy consumption. It will also lessen the impact on water quality, air quality, and natural resource consumption. These neighborhoods are not only beneficial to the community, but to the individuals who reside in these communities and as well as the environment. They allow for a wide variety of residents to be a part of the community by including housing of various types and price ranges. Historical resources are an important part of green neighborhoods and look to preserve these historical resources as well as open space and the use of parks. They encourage physical activity that is beneficial to public health through green buildings, community gardens, streets, and public spaces. The rating system was originally designed for the planning and development of new green neighborhoods, specifically infill development. This type of development will help direct growth to areas where existing infrastructure and amenities exist. It also promotes the redevelopment of aging brownfield sites into revitalized neighborhoods. The integration of this rating system into the plan assures that this neighborhood will promote environmental stewardship and sustainable development that will protect current and future residents as well as address the environmental issues affecting the world today (USGBC, 2009).



Retrieved 9-4-10 from Desert News



Picture of Church Hill

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History

Parcel A

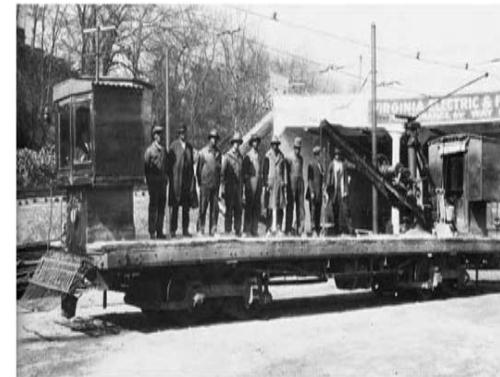
Parcel A is currently owned by Mr. Frank Wood of Church Hill Land LLC. The parcel was at one time developed into multi-family apartments between 1959 and 1965, but was torn down in the early 1990s and is currently a wooded and vacant parcel.

Parcel B

Parcel B is currently owned by Matthew Logan and Lee Johnson and was once a trolley car maintenance facility beginning in 1911. It was designed by James Bolton an engineer with the Richmond and Henrico Railway Company. “The route began at Brook Road next to Beacon’s Quarter Branch, ran along Baker Street to 5th, then on Broad to 11th, and along Marshall to a new viaduct. The bridge took the line over the valley to 21st Street, where the tracks continued on Marshall Street to 36th, then down a private right-of-way in the Miles-Goode Ravine to Government Road. Crossing Government Road the line entered the Spring Street trestle for the level crossing to its loop in Fulton, where connections were made with the line of the VP&P” (Carlton, 1986) (Figure 3). Virginia Railroad and Power Company (VRP) purchased the car barn in 1916 and turned into a Maintenance-of-Way garage and storehouse (Chen, 2008a). Since 1997; the trolley barn which consist of approximately 21,280 square-foot warehouse and associated gravel parking lot and has been used at a storage warehouse for restaurant materials and documents, carnival accessories, stage production equipment, and a woodworking and paint shop (Appendix pg. 66). A preliminary report was done for the Virginia Department of Historic Resources by Kimberly Chen of Johannas Design Group in February 2007; she also completed a National Register



Parcel A currently



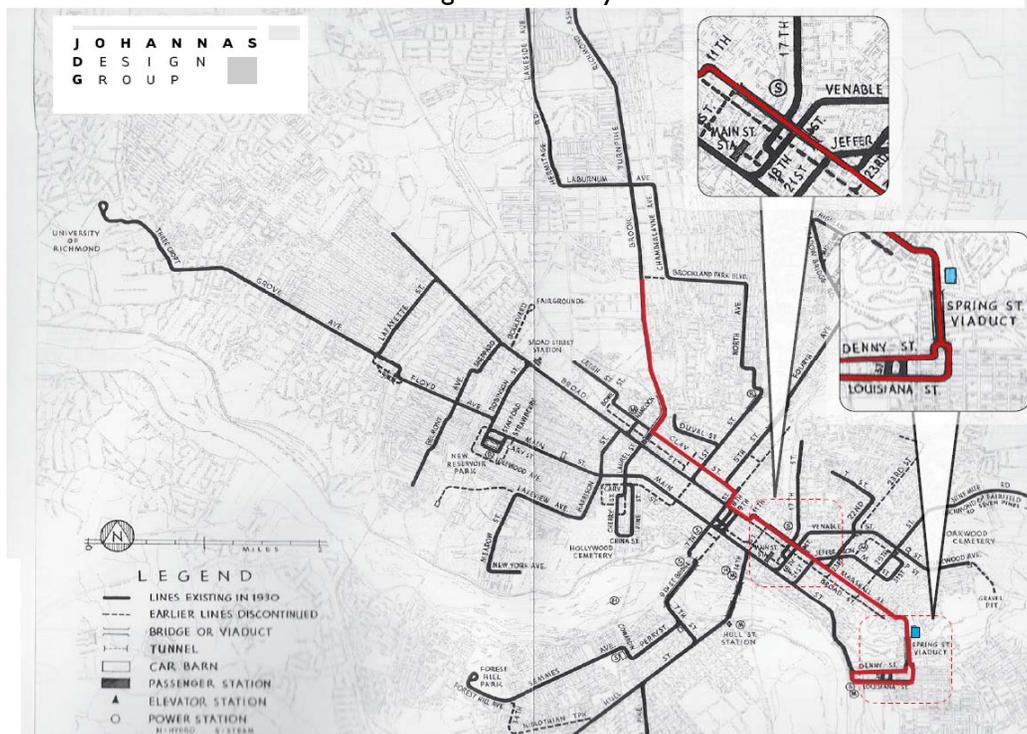
Trolley car workers

JOHANNAS
DESIGN
GROUP

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of Historic Places registration form for the Department of Interior National Park Services on August 2002. The reason for not completing the process was that the City of Richmond determined that the building was not eligible for listing on the National Register. The State Review board then came back requesting additional research which is extremely expensive. For this reason she did not pursue this any further and this is where she left it with her former client.

Figure 3: Trolley Route



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Parcel C

Parcel C is currently owned by Mr. Charles Smith and was once a trailer park from 1959-1965 and has since then been torn down and now sits vacant.

Parcel D

Parcel D which is a portion of Chimborazo Park and is owned by the City of Richmond and was once the site of the largest American Civil War Hospital, which was used to treat the Confederate Army from 1862 to 1865. During this time it treated over 76,000 soldiers, currently the hospital is owned by the National Park Service and is used as the visitor center for the Richmond National Battlefield.

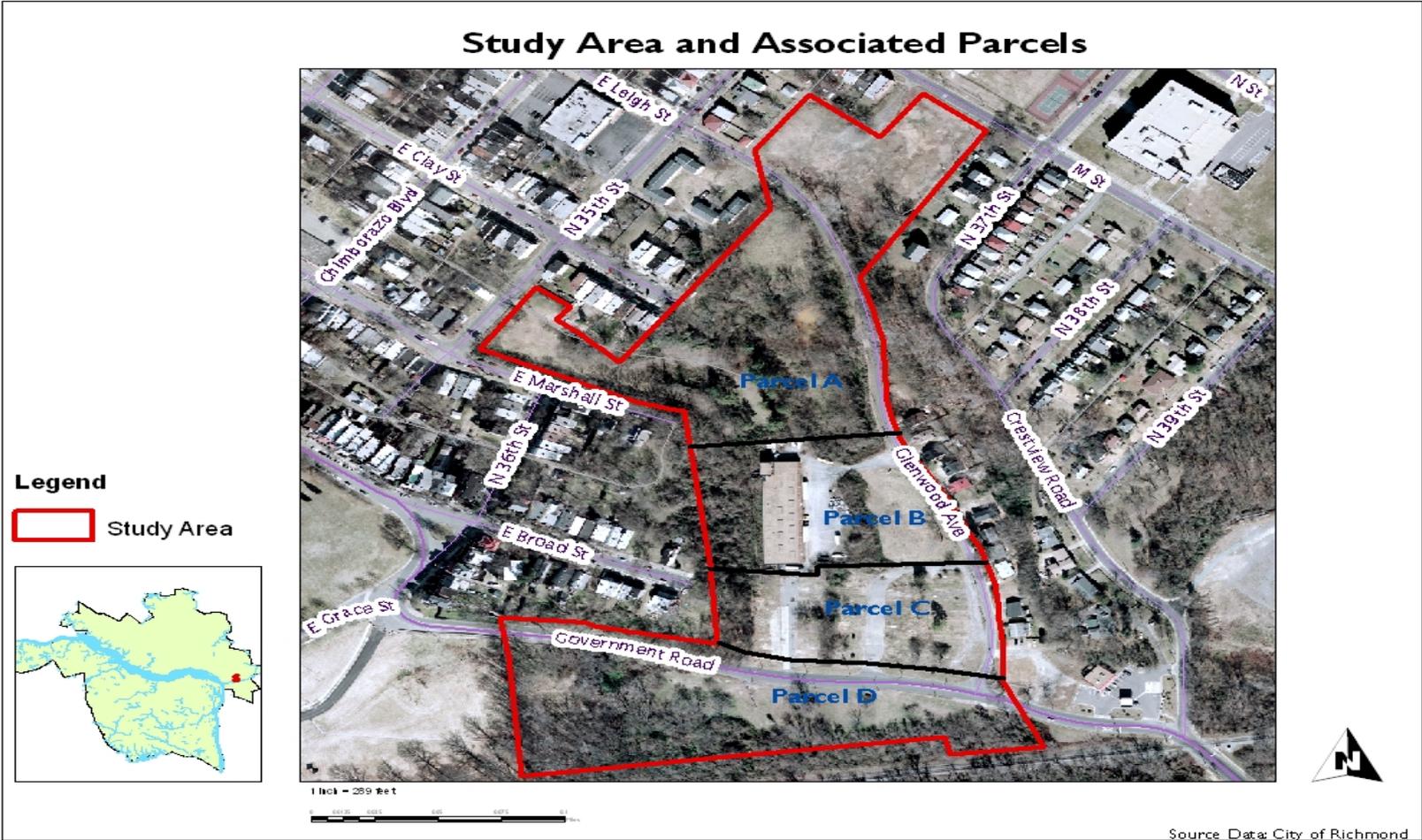
Summary

Each of these parcels (Figure 4) has its own unique history, but these parcels together are part of a larger community known as Church Hill; which has in of its self has its own unique history. The neighborhood is an Old and Historic District located in the eastern part of the City of Richmond and is often used to describe both the specific historic district and the larger general area encompassing other neighborhoods such as Union Hill, Chimborazo, Fairmount, and Peter Paul. This neighborhood was the original land plat of the City of Richmond and is rich in history. It is where Patrick Henry gave the Second Virginia Convention speech “Give me liberty or give me death speech” at St. John’s Episcopal Church which was built in 1741. In the 1950s the neighborhood went through serious physical decline due to absentee landlords. In 1956 the Historic Richmond Foundation was established to for the protection of St. John’s Church, in 1957 City Council in larger part due to the Historic Richmond Foun-



Chimborazo Park 1860

Figure 4: Study Area and Associated Parcels



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ation created a historic district ordinance while at the same time adopting the St. John's Old and Historic District. This marked the formal beginning of the preservation movement in Richmond.

The reason for looking at these parcels as a whole instead of individually is that there is the potential for Parcel B to receive historic tax credits, which can help take some of the financial burden off developers. According to the *Code of Virginia 58.1-3220.01* the property owner uses the tax credit to offset real property taxes on the parcel. So by looking at these parcels as whole instead of individually would allow the study area to receive this tax credit. This would encourage development throughout the study area instead of on a single parcel.

Demographics

General demographic data including social, economic, and housing characteristics was collected to better understand the study area. The following neighborhoods were chosen based on their proximity to the study area these neighborhoods include Church Hill (60 census blocks), Church Hill North (71 census blocks), Chimborazo (31 census blocks), and Fulton (114 census blocks) and the residents living there. As of the 2000 census there were 10,989 residents.

Social

In 2000, African Americans represented the largest racial group in these neighborhoods at 79.2 percent (8,707). The second highest represented racial group is Whites at 18.6 percent (2,047) following that is other races at 2.1 percent (235). In terms of age 62.4 percent of the population is between the ages of 18 to 64 and 12.3 percent are over the age of 64.

Economic

The median household income for these neighborhoods is \$24,819 – median household income for the City of Richmond is \$31,121. A contributing factor to this could be that only 4 percent of the population is unemployed, 30.3 percent live below the poverty line, and 31.4 percent have less than a high school education.

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Housing

There are a total of 5,291 housing units, in which only 17.7 percent of these houses are vacant. Of the 4,495 occupied housing units 48.9 percent of the residents own their homes.

Summary

The high percentage (79.2 percent) of minorities in these neighborhoods means that there is the potential of issues relating to gentrification to arise. The concept behind environmental justice is that there is equitable distribution of burdens and benefits to groups, such as racial minorities and residents of economically disadvantage areas.

The high percentage of residents between the ages of 18 and 64 (62.4 percent) gives us insight into what type of development would be ideal for this neighborhood. Since a portion of this group are baby boomers; means that development needs to more compact, pedestrian friendly, and allow for residents to do their daily shopping without getting into a car. Additionally there is a push from the younger generation for more compact and pedestrian friendly development.

The low median household income (\$24,819) is good insight into the types of housing that should be made available. There should be a mix housing type to address all income levels. The lack of vacant houses (17.7 percent) in these neighborhoods tells us that people are moving into these neighborhoods additionally the majority of residents are home owners so there needs to be less rental properties and more homes available to purchase.

The 2000 United States Census data is outdated – this is the data that is widely used by the City of Richmond. This data does not reflect any new residents that have moved into these neighborhoods in the past 10 years. These new residents could have an affect by increasing the population as well as alter such characteristics as poverty, income, and educational attainment.

Environment

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The following information is important in identifying the possible environmental constraints that exist within the study area that could make possible development difficult. It will be helpful in formulating planning alternatives for the study area and establishing areas for development as well as areas that will need to be protected to preserve the environment. It will help to mitigate the possible environmental impacts that future development will have on the study area and the surrounding area.

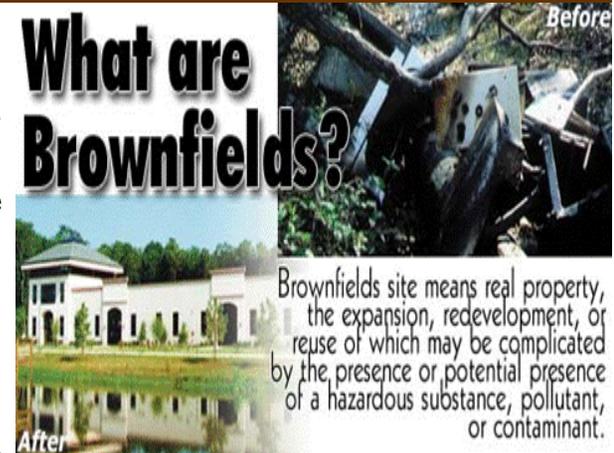
Brownfield Redevelopment

On July 1, 2003 AECOM (formally Earth Tech) prepared a Phase I Environmental Site Assessment for Parcel A, B, and C (Figure 5). This will be helpful in indentifying possible groundwater and soil contamination, and any other hazardous waste that could be harmful to humans and wildlife. The recognized environmental conditions (RECs) for each subsequent parcel in the in study area are as follows. The American Society for Testing and Materials (ASTM) defines RECs as “the presence or likely presence of any hazardous substance or petroleum products under conditions that indicate an existing release, a past release, or a threat of a release of any hazardous substance or petroleum products into structures on the property or into the ground, groundwater, or surface waters of the property”.

Parcel A

The findings for Parcel A were small piles of debris, consisting of empty aboveground storage tanks (AST), hot water heaters, various empty containers, and scrap metal. There were no signs of soil straining or depressed vegetation in the debris areas. Soil and groundwater samples need to be taken to determine if any contamination is present.

Parcel B



Retrieved 9-12-10 from www.rurdev.usda.gov



Underground Leaking Tank Retrieved 4-12-10 From <http://deq.mt.gov/Recovery/remediation/images/leakingTank.gif>

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Figure 5: Hazardous Waste Generators



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The findings for Parcel B are abandoned cars, minor surface soil straining, used tires, and various debris piles. There was a pollution complaint (PC) No. 1998-4120 assigned to and then closed for a suspected leaking underground tank(s) (LUST), there were no records to determine the contents of the tank, location, or if the tank(s) were removed from the ground. This parcel appeared in the LUST regulatory database that was searched by the Environmental Data Resource (EDR). The Virginia Department of Environmental Quality (VDEQ) issued PC No. 1998-4120 in November 1997 for petroleum-impacted soil discovered during a Phase II ESA in July 1997. Composite soil samples taken indicated that there were elevated levels of total petroleum hydrocarbons-diesel range organics (THP-DRO) concentrations above VDEQ reporting limits in soil samples. These concentrations ranged from 120 milligrams per kilogram to 514 mg/kg. These were found underneath the trolley barn and in the associated parking areas. There were borings done up to 50 feet below ground surface (bgs) and no groundwater was discovered. In December 1997 the VDEQ closed PC No. 1998-4120, based on false positive analytical results of the Phase II ESA and lack of significant risks to potential receptors. Although the VDEQ closed this case due to a false positive additional borings need to be done at various locations throughout the parcel to determine the potential for groundwater contamination. Additional soil samples should be taken from various locations to determine if there is still a presence of THP-DRO in the soil (AECOM, 2003).

Parcel C

The only findings for Parcel C were ASTs used for heating oil associated with various trailers homes. Soil and groundwater samples need to be taken to determine if any contamination is present.

Surrounding Areas

In addition to these findings it was also discovered that four LUST sites were identified within ½ mile of the property. The findings are one Resource Conservation and Recovery Act (RCRA) – was passed in 1976 to regulate the disposal of hazardous waste – small quantity generator, one RCRA Corrective Action Activity (RCRA CORRACTS) – is the EPA's list of Treatment, Storage and Disposal (TSD) facilities subject to corrective action, and two underground storage tanks (USTs) were identified within ¼ mile of the study area. There was also one historical coal gas site located within one mile of the property. Based on their distance from the study area, local topography, and current regulatory status, it was concluded that these sites were to have little or no potential adverse impact on the study area.

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Since this report was issued in 2003 the ASTs have been cleared have been cleared by the parcel owners, although there are still some debris piles, and abandoned automobiles, but the ASTs have been cleared for the site. Based on these findings there is no hazardous waste or contamination that would adversely impact future residents or wildlife. Future development would not be hindered by these findings, but there will need to be some clean up of identified areas before development can begin. This site has the potential to qualify as a Brownfield – which is an abandoned, idle, or underused industrial or commercial facilities where expansion or redevelopment is complicated by real or perceived contamination and liability concerns. In order for this to happen it will need to be defined by a local, state or federal agency once a site has this designation it can qualify for the EPA's Brownfield Program. This program provides additional funding-which can help to take some of the financial burden off developers-for Brownfield assessment and cleanup.

Steep Slope Protection

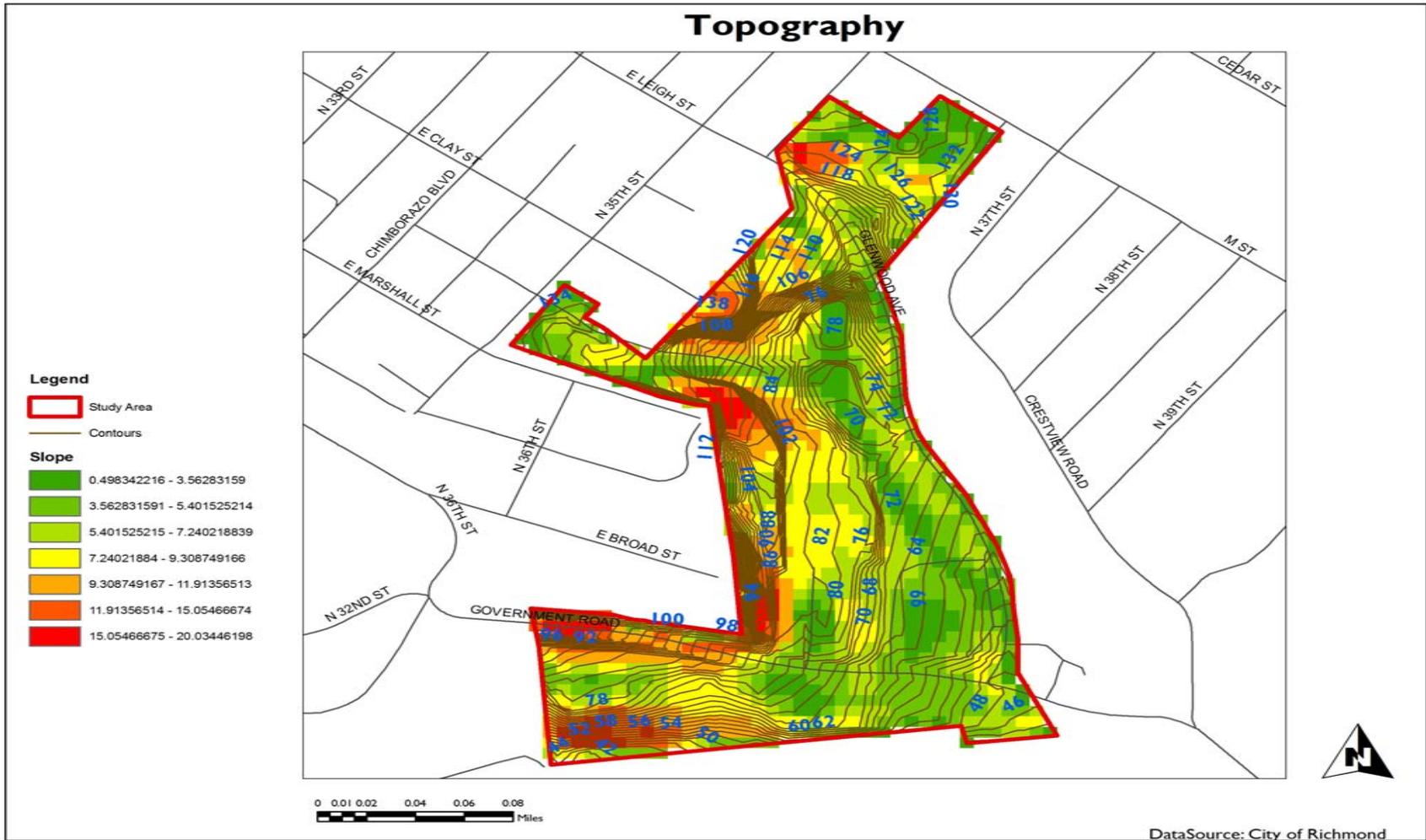
Topography

The following information is helpful in determining where development can and cannot occur due to steep elevations, to minimize erosion and protect habitat and reduce stress on natural water systems by protecting steep slopes in a natural vegetated state. There are five criteria in assessing slope stability: slope angle, composition, history, vegetation, drainage, and land use. These criteria are useful for looking at the impact slopes will have on land use planning and environmental management. The elevation of the study area is approximately 100 feet above mean sea level. There are areas that have steep slopes that could hinder future development. This can be seen by the cement retaining walls running throughout this property to help reinforce the walls of earth due to steep slopes and drop offs. These walls are helpful in reinforcing the earth from mass wasting – the spontaneous movement of earth materials under the force of gravity, this is not caused by fluid. The study area and the surrounding area are slightly sloped from northwest to southeast. Portions of the study area have elevations greater than 15 percent which is too great for development due to the impact it will have on soil stability (Figure 6).

Drainage

The amount of runoff, soil water, and groundwater has a great impact on slope stability. As the amount of runoff increases down slope it will form channels increasing the erosive power. This weakens the slope because it cuts through the soil and the subsoil which is also known as

Figure 6: Seep Slopes



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gulling. These gullies and channels can cut off groundwater which allows it to seep out and saturate the soil material. This transforms the soil into a loose and watery mass that is prone to erosion and mudflows. Changes in drainage patterns due to roads, pipelines, and bridges can also cause increased seepage and redirected stream flows can weaken slopes and cause serious failures.

The groundwater levels are similar to the Piedmont province. As stated earlier bores were done on Parcel B within 50 feet below ground surface (bgs) and no groundwater was found. Based on the topography groundwater flow within the study area is expected to be toward the south, in the direction of Gillie Creek.

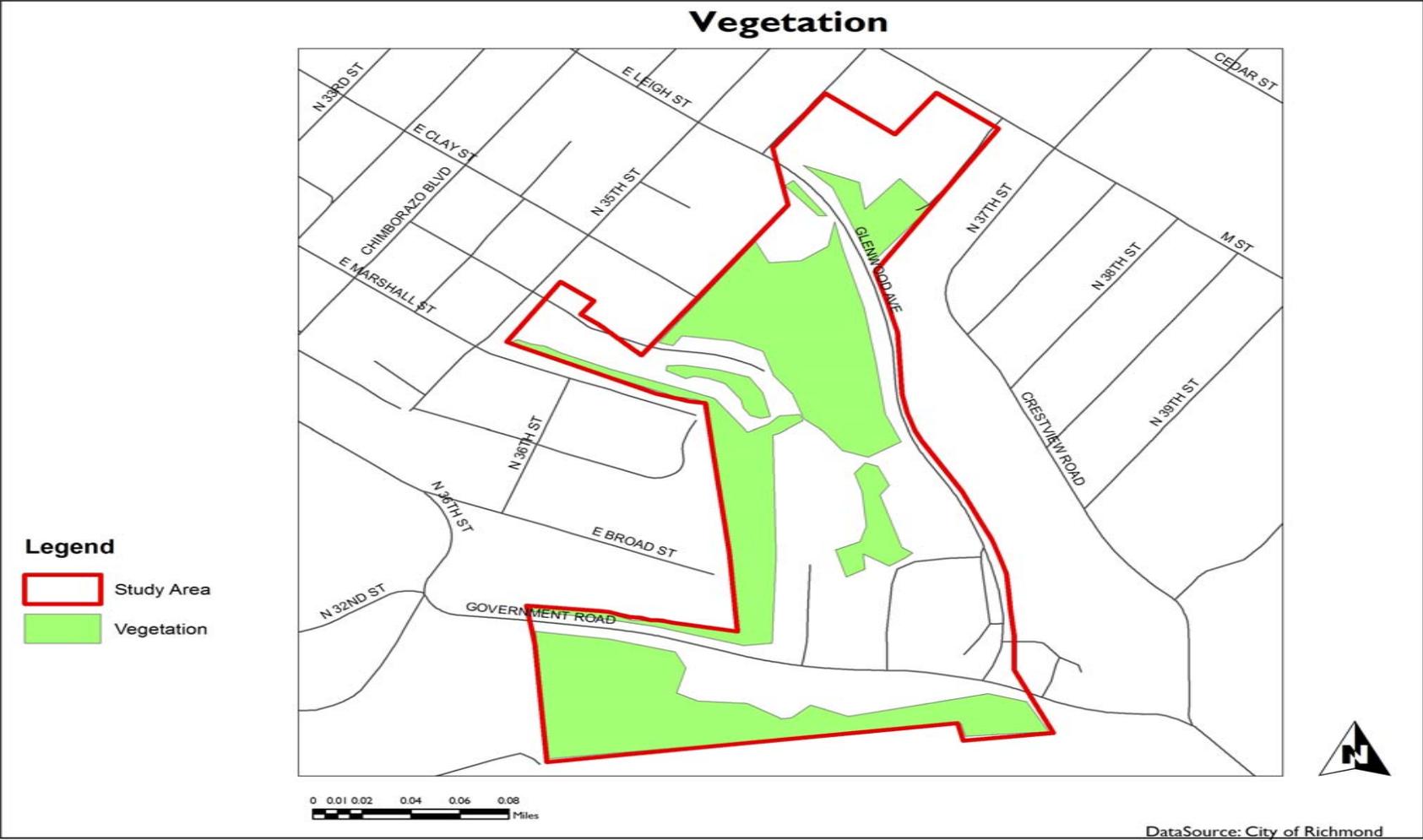
Vegetation

Vegetation is critical in helping control erosion and soil stabilization. The amount of coverage is a one of the critical factors along with canopy cover and ground cover used in estimating soil loss rates. Currently 42% of the site is covered by vegetation (Figure 7) this extensive root systems adds stability to slopes composed of clay, silt, sand, and gravel. This additional stability is mainly seen on the surface layer where the bulk of the roots are concentrated. Deforestation results in a weakened slope because of the reduced stabilizing effect of vegetation, but also increases stress from runoff and groundwater because discharge rates increase.

Summary

The steep slopes throughout the study area will limit the amount of development that can take place due to the potential for slope instability. It will also be beneficial in that it will cause development to be more compact and walkable. Future development of the site will need take into account drainage to make sure Gillie Creek and land located to south of these areas are not impacted by an increase in flooding, erosion, and contamination. The high vegetation cover is providing a natural form of erosion control and soil stabilization for the steep slopes throughout the study area. It will also help to filter out contaminants and minimize soil saturation which can lead to flooding and depressed areas of water within in the study area.

Figure 7: Vegetation Cover



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Agricultural Land Conservation

Soils

The basic understanding of soil is important in land development and hazards; it tells us the relative speed at which contaminant migration may be occurring, drainage, water holding capacity, bearing capacity for development, and water availability for plants based on the texture of the soil. The content of water depends on the particle sizes, local drainage, and topography, and climate. There are two principal forms of water that occur in both mineral and organic soils. The first is capillary water – water molecules are mobile and can move from moist spots to dry spots, second is gravity water – is water that moves in response to the gravitational force. There are three types of soil classifications in the study area: atlee, udorthents, and wateree (Figure 8).

Atlee – 27.78 percent

Is a fine sandy loam with moderate infiltration rates that are deep and moderately deep, and moderately and well drained soils that is a moderately coarse texture. This is a well drained soil that has an intermediate water holding capacity; depth to the water table is more than 6 feet and slope range is 0 to 4 percent (USDA and NRCS, 2003).

Udorthents / Dump – 15.03 percent

These soils are areas of disturbed soils where the upper most soil has been removed, filled or graded and replaced which can cause soil instability. The new fill material ranges in texture from clay, to sand, to silt and tends to be 3 to 6 feet deep. They are moderately well drained, gravelly and sandy soils. Permeability is rapid to very rapid throughout the soil. The depth to the water table is 1.5 to 4 feet below the surface. A dump includes areas of exposed and buried human refuse (USDA and NRCS, 2003).

Wateree – 57.19 percent

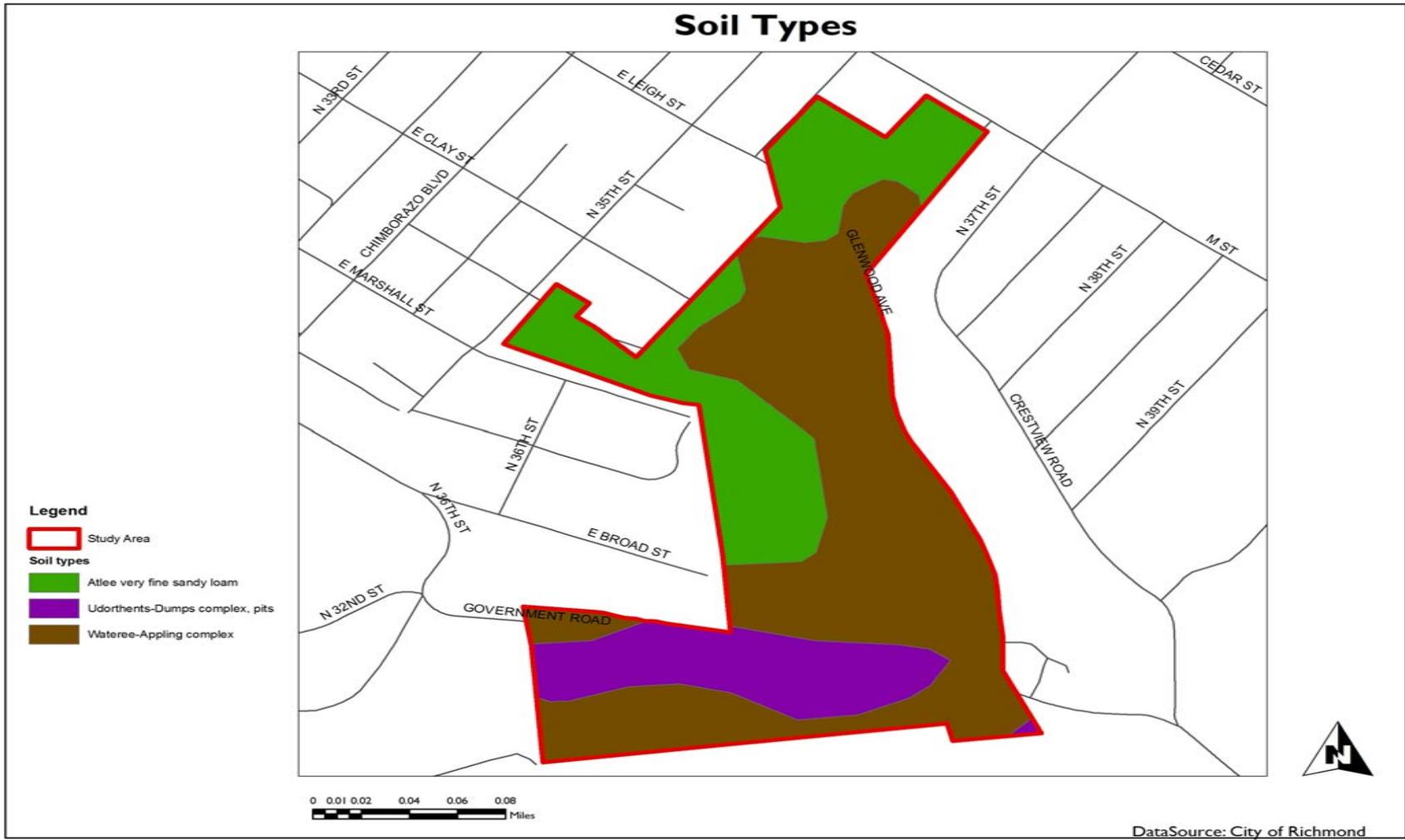
These are a coarse-loamy that consists of well drained, have a very low water capacity, moderately deep, moderately rapidly permeable soils that are formed in material that is mostly weathered from granites and gneiss. The slope range is 12 to 20 percent. (USDA and NRCS, 2003).

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Summary

Field test; such as boring to a depth of 57 feet will need to be done to determine if these soils have a bearing capacity to withstand future development. The soils high permeability rates – defined by National Soil Survey as any soil having a permeability equal to or greater that six inches of water movement per hour in any part of the soil profile to a depth of seventy-two inches - and infiltration rates means that water moves at a quicker rate through these soils. This is a positive in that groundwater will be recharged at a quicker rate and soil saturation is not likely, but is also a negative in that it allows for pollution to travel at a quicker rate since these contaminates will not be absorbed and filtered by the soil causing groundwater and water sources down gradient from the study area to be affected. None of these soils have been identified by the Natural Resource Conservation Service as prime soils, unique soils, or soils of state significance.

Figure 8: Soil Types



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Wetland and Water Body Conservation

A portion (72.14 percent) of the study area is designated as a Resource Management Area (RMA) (Figure 9) which is part of the Chesapeake Bay Preservation Act, the purpose of this act – “to protect and improve the water quality of the Chesapeake Bay, its tributaries, and other state waters by minimizing the effects of human activity upon these waters and implementing the Act, which provides for the definition and protection of certain lands called Chesapeake Bay Preservation Area which if improperly used or developed may result in substantial damage to the water quality of the Chesapeake Bay and its tributaries” (Chesapeake Bay Act, 1989). An RMA is defined “as any area that include any land types that if, improperly used or developed, have a potential for causing significant water quality degradation or for diminishing the functional value of the resource protected area” (City of Richmond, 2009). The land types that are designated as a RMAs are 100-year floodplains, highly erodible soils, highly permeable soils, and non-tidal wetlands not included in the resource protection area, and any other lands considered by the city to meet the provisions of subsection (a) of the ordinance and to be necessary to protect the quality of state waters.

Through this ordinance the City of Richmond requires that any development or redevelopment of land in Chesapeake Bay Preservation Area must meet the following performance criteria which is important since Gillie Creek empties into the James Rive which is a watershed for the Chesapeake Bay . First, is that no more land shall be disturbed than is necessary to provide for the proposed use or development. Second, is that indigenous vegetation shall be preserved to the maximum extent practicable, consistent with use or development proposed. The vegetation may be replaced with other vegetation that is equally effective in retaining runoff, preventing erosion and filtering non-point source pollution. Third, is that where best management practices (BMPs) are utilized that require regular or periodic maintenance to continue their functions. Fourth, all development exceeding 2,500 square feet or land disturbance shall be accomplished through a plan of development (POD) review process. Fifth, land development shall minimize impervious cover consistent with the proposed use or development. Sixth, any land disturbing activity that exceeds an area of 2,500 square feet – this includes construction of all single family houses, septic tanks and drain fields – shall comply with the section 50-191 of the Code. Lastly is that stormwater management criteria consistent with the water quality provisions of the stormwater management regulations shall be satisfied (City of Richmond, 2009).

There is a small drainage ditch that runs through a portion of Parcel A and Parcel B, there is also a depressed area of standing water a and potential wetland area on the eastern portion of Parcel A, adjacent to Glenwood Avenue all these can act as a barrier to groundwater flow will

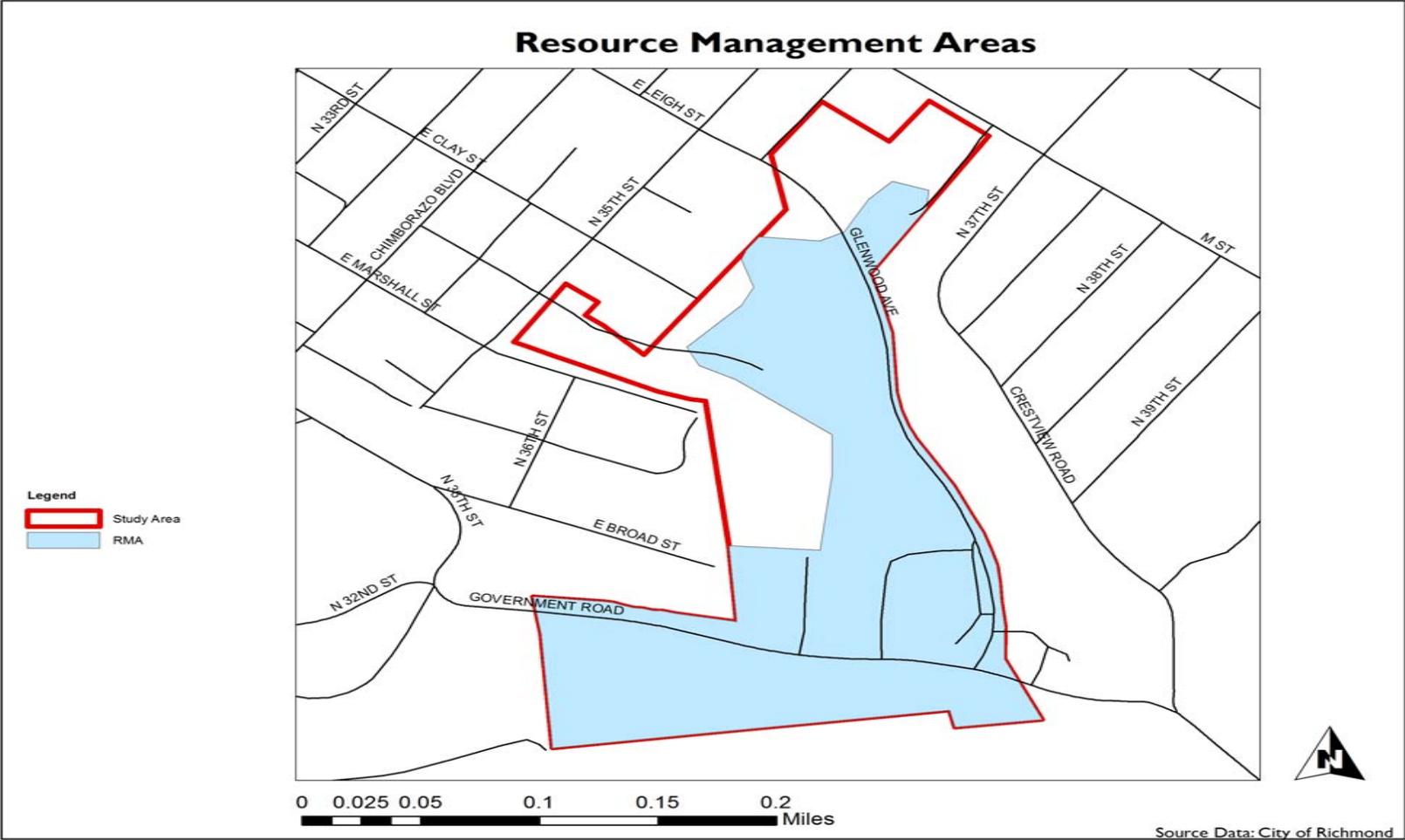
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help in the mitigation of any impacts that the Study Area will have on the Chesapeake Bay.

Summary

The RMA designation will not hinder future development, but it will mean that future development will need to practice environmental stewardship to preserve the Chesapeake Bay and its surrounding water sources through BMPs and smart development.

Figure 9: Resource Management Areas



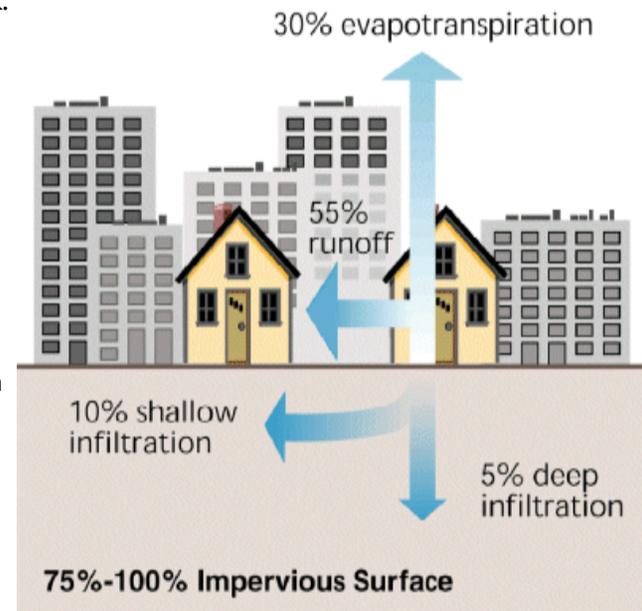
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Impervious Surfaces

Only 6.6% of the study area is covered by impervious surfaces (Figure 10). This is any surface that is not a natural surface such as roads, sidewalks, driveways, and parking lots. These surfaces are covered by impenetrable materials such as asphalt, concrete, and brick. They can also be soils that are compacted by urban development. These surfaces have a detrimental impact on the environment, by sealing the soil surface they eliminate rain-water infiltration and groundwater recharge causing an increase in runoff. An article from the Seattle Times states that “While urban areas cover only 3 percent of the U.S., it is estimated that their runoff is the primary source of pollution in 13 percent of rivers, 18 percent of lakes, and 32 percent of estuaries.” (Cappiello, 2008). Runoff carries pollutants from fertilizers, pathogens, gasoline, motor oil, heavy metals, high sediment loads from steam bed erosion, and waster. Additionally flood waters can get into combined sewers, which cause them to overflow flushing raw sewage into streams. Generally speaking when more than 10 percent of a watershed is covered by impervious surfaces, serious and continued water quality problems will result. (Daniels and Daniels, 2003).

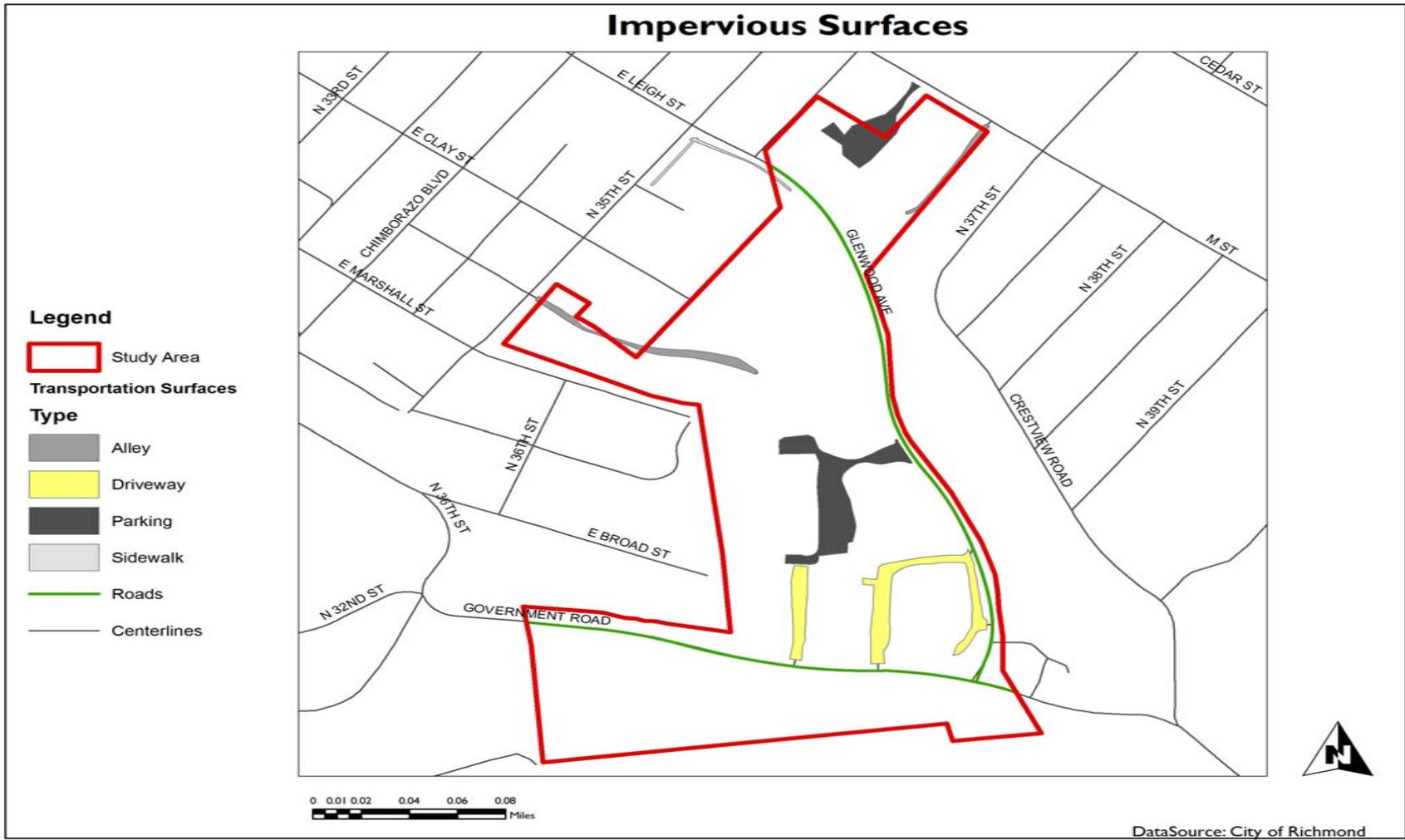
Summary

The limited amount of impervious surface means water that is carried from this site to Gillie Creek and then onto the Chesapeake Bay has a limited impact and it will be less prone to flooding since there will be less depressed areas of water. This also means that there is more natural land coverage, which acts as a filter for pollutants that are carried by surface and groundwater and allows for infiltration by the soil to naturally occur.



Stormwater Flow & Impervious Surfaces
Retrieved 09-12-10 from www.fairfaxcounty.gov

Figure 10: Impervious Surfaces



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Smart Location

Adjacent Sites Land Use

According to the LEED's ND 2009 rating system an adjacent site is "a site having at least 25 percent of its boundaries boarding parcels that are at least 75 percent developed." Adjacent to the study area sits 1,099 acres of land; 85 percent of the land is developed the majority of this is single-family residential (39 percent) and open space (26 percent). There is a limited amount of commercial (2.7 percent) land use in the adjacent sites; this tell us that many of the residents have to travel to outside areas to do their shopping, dining, and go to work (Maps can be seen in appendix on Pg. 81).

Summary

This information will be helpful in identifying what amenities are needed within the study area to help support local residents and to provide places of employment. This will have a net impact on the base employment multiplier for the City of Richmond; the flow of money will also have a net impact as residents spend more money in the local economy which will have an exponential impact on the broader economy. Additionally it will also keep down miles traveled by local residents as their dependence on cars decreases.

Study Area Land Use and Zoning

Land Use

Within the study area 75 percent of the land is vacant and at one time was previously developed. Within the study area existing infrastructure is all ready in place, meaning that neither the City of Richmond nor the developer will have to pay put in these services which will cut down the cost of housing to future home owners. The remaining land is made up of open space (23 percent) and industrial (14 percent), which has the potential for adaptive reuse (Figure 11). The surrounding land use patterns are comprised of single-family residential (39 percent), open space (26 percent) and limited commercial (2.7 percent).

Zoning

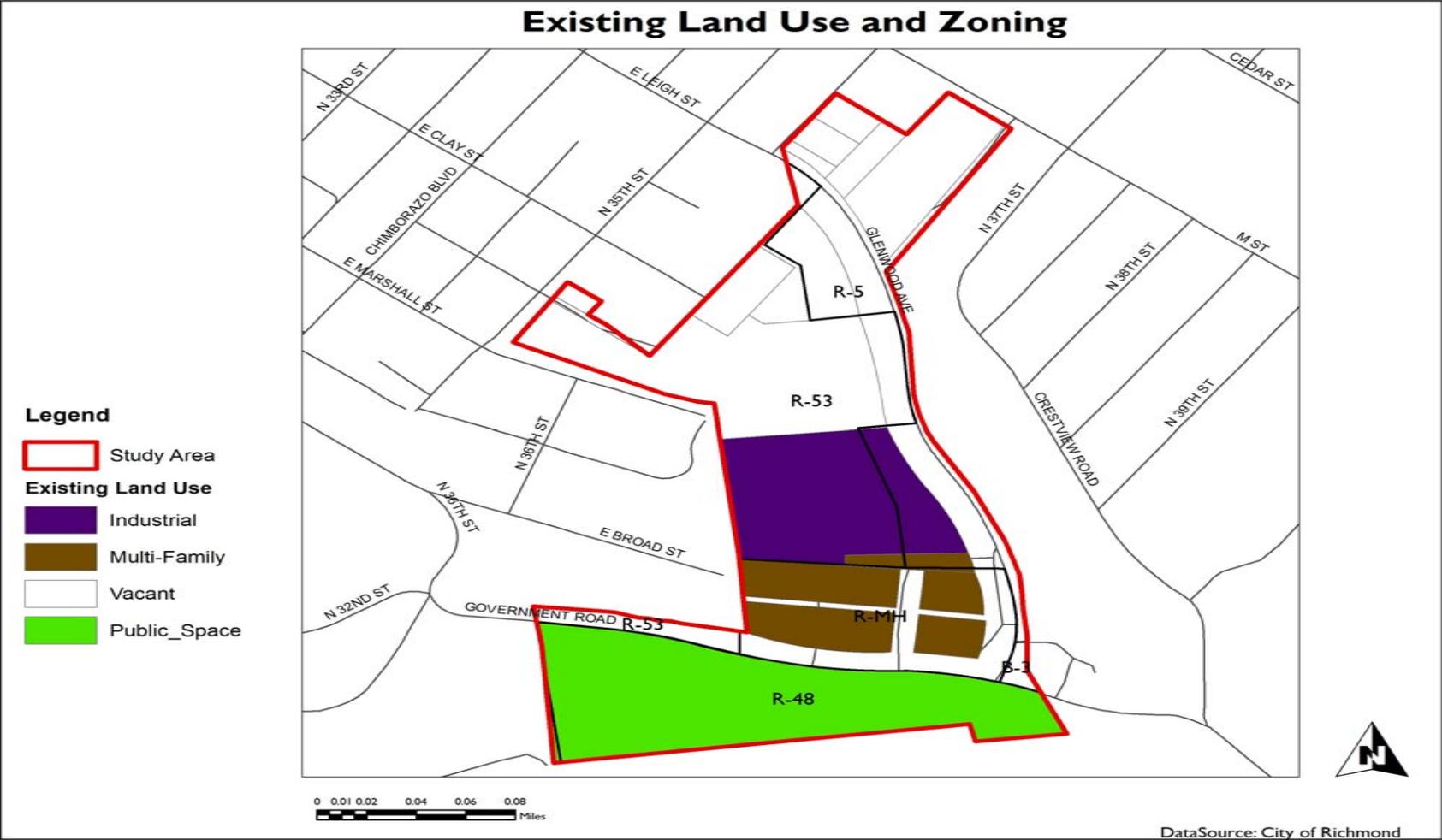
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The City of Richmond is currently in the process of rezoning the portion of the study area bounded by Government Road and Glenwood Avenue to R-63. This will help to foster compact residential uses that will promote a pedestrian friendly urban environment. That will include non-residential uses that will serve the local and broader community that will live, work and play within the neighborhood. The remaining portion of the study area bounded by Glenwood Avenue and M Street will stay R-5 (Figure 11).

Summary

The study area would be ideal for infill development due in large part to the vast amount of vacant land and that 85 percent of the adjacent land is developed. Infill development is defined as the development or redevelopment of vacant or underutilized sites in economically or physically static or declining areas. Infill development deters leapfrogging which is a form of sprawl development. This is development that skips over available land causing development to occur in outlying and isolated areas because this is the cheapest land. Many times there is not adequate infrastructure to support this new population causing many localities or developers to provide infrastructure, this additional cost is then passed onto the home buyer. This causes development to continue on the periphery. Since there are not local amenities and many of these residents have to commute to work means that they are heavily dependent on cars. Infill development in the City of Richmond will help to ensure that residents will not leave for the suburbs, help to bring in jobs, spur the local economy, as well as benefit the environment since local residents will be less reliant on cars.

Figure 11: Existing Land Use and Zoning



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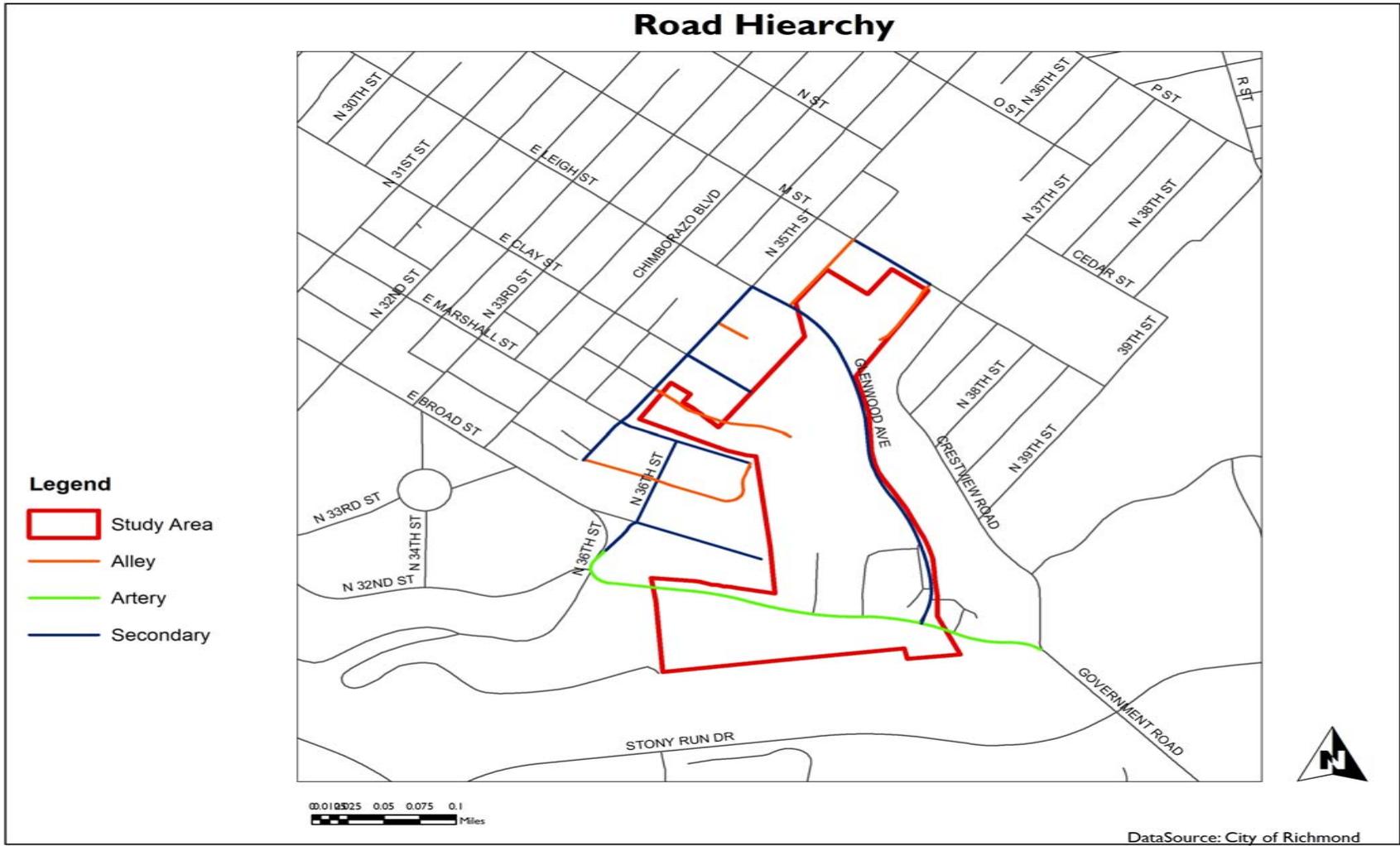
Connectivity

Connectivity means providing a variety of road networks to get from point A to point B. It provides a direct route to any destination and helps to disperse traffic. An ideal street connect is one where streets are interlinked at numerous points, intersections are closely spaced and there are few dead ends. Along with this; streets need to be more walkable by providing narrow streets, closely spaced intersections, slower vehicle speeds, and sidewalk network. In 2009 Virginia regulations prohibit subdivisions composed purely of cul-de-sacs. Connectivity also looks at how well neighborhoods are connected through alternate modes of transportation that helps to limit our dependence on cars. This new form of development is known as Transit Oriented Development (TOD). The basic premise behind this is that mixed-used residential and commercial areas are designed to maximize access to public transportation. These neighborhoods tend to be centered around a train station, metro stop, or bus stop. This is surrounded by high-density development and progressively low-density development spread out on the periphery. They tend to be located with a one-quarter to one-half mile radius of transit stop.

Street Network

There is limited access in and out of the study area; Government Road is the only artery road and is located south of the study area and runs east to west it connects the study area to the city center, adjacent neighborhoods to the southeast and southwest, and Henrico County. Glenwood Avenue is a secondary road that runs north along the study area boundary and connects to Government Road and E. Leigh Street which provides access to adjacent neighborhoods to the north. There are two alleys that connect the study area to Glenwood Avenue. The first is located in the northwest corner of the study area and at one time was used as an entrance and exit for the multi-family apartments that once occupied the site. It connects the site to N.35th Street which connects to the northwestern portion of Chimborazo neighborhood. The other alley runs along the northeast boundary and connects the site to M Street which connects to the northeastern portion of Chimborazo neighborhood. Additionally there are driveways that were once in place for the trailer homes that occupied the site. The driveways to the east connect Government Road and Glenwood Avenue and the ones to the west connect the site to Parcel B (Figure 12).

Figure 12: Road Hierarchy



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Walkability

Walkability is the measure of how friendly an area is to walking, currently there is only one sidewalk which is located on Glenwood Avenue it begins at Parcel A and ends at North 35th Street where it connects to surrounding neighborhoods. Although there are a limited amount of sidewalks in the study area; the surrounding neighborhoods are all connected by a sidewalk system. There is also one foot path on Parcel B that runs along the back of the trolley barn building but does not connect to anything else due to the steep slopes behind the building. Currently the only concern for pedestrian safety along major roads would be Government Road since there is high volume of traffic and vehicles travel at high speeds along this road.

Alternate Modes of Transportation

Alternate modes of transportation would be any form of transportation other than a car; such as bikes, bus, train, metro, or subway. In the City of Richmond bus services which are owned and operated by the Greater Richmond Transportation Corporation (GRTC) is the only choice for alternate modes of transportation. The city is in the process of working on a Bus Rapid Transportation (BRT) - which provides a faster more efficient service than an ordinary bus service - network plan that will be tested along Broad Street. The majority of bus routes operate within Richmond City limits; there are however some routes that run to adjacent counties. GRTC does have some routes that operate near or adjacent to the site. Within a 1/2 mile area there are approximately 46 bus stops there are also 37 bus stops within a 1/4 mile area (Figure 13).

Summary

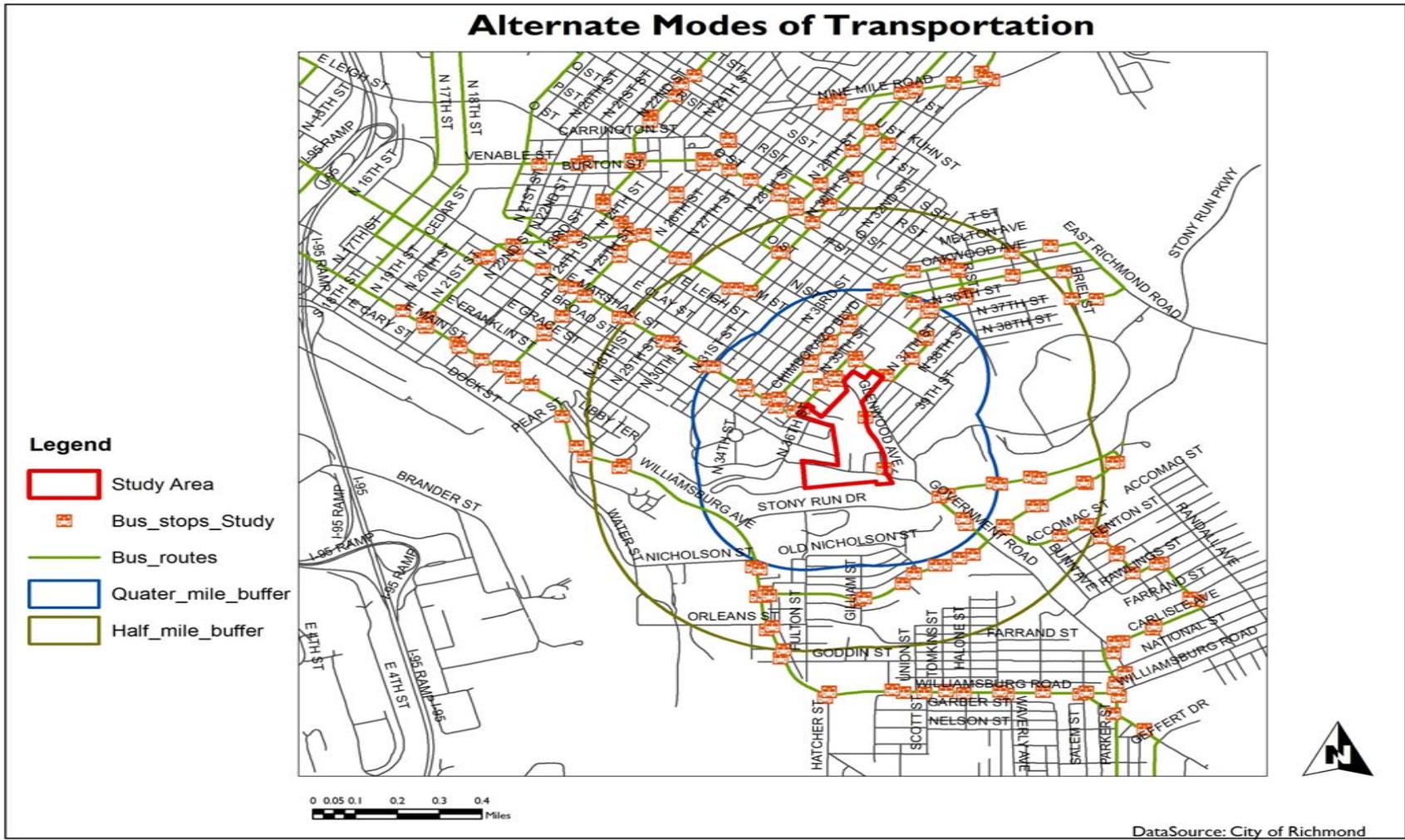


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There are a limited amount of artery roads to the study area making it harder to get from point A to point B. There is the potential for an increase in congestion along these artery roads as more residents move to the area. The existing road network within the study area and its connections to other roads makes navigating within the study area easier. The lack of sidewalks throughout the neighborhood means walkability is limited and connectivity to other neighborhoods is lacking. Pedestrian safety is a positive since there is a low volume of traffic and cars tend to drive at slower speeds, the only issue with this is along Government Road. The proximity to alternate modes of transportation makes this the site an ideal place for a neighborhood since it provides connectivity to other areas of the City as well as adjacent Counties. Residents will be able to cut down on the amount of vehicle miles traveled to get to work, do their shopping or run other errands, or just enjoy the plentiful parks and entrainment the City has to offer.

Figure 13: Alternate Modes of Transportation



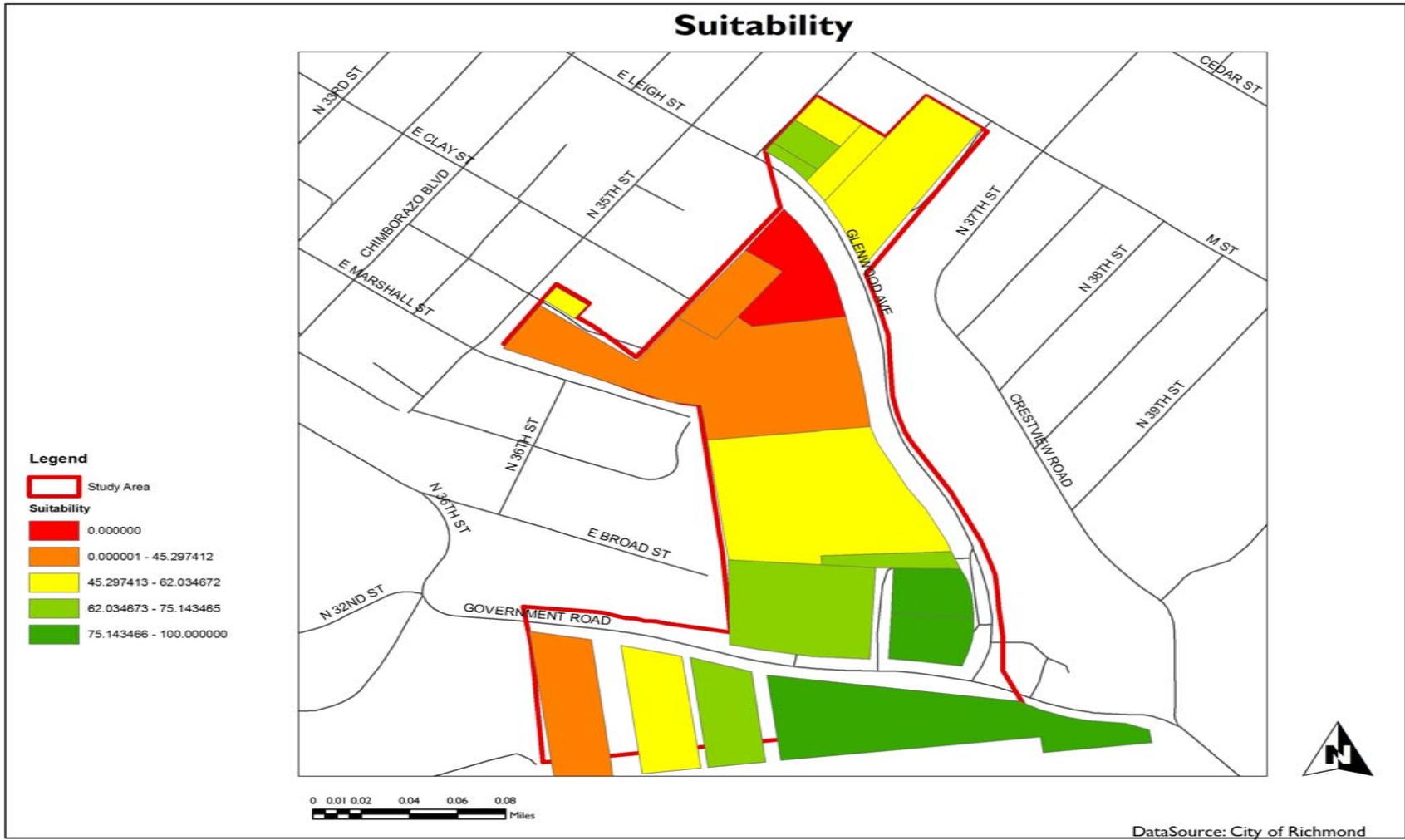
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Suitability Analysis

A suitability analysis was done using Scenario 360, which helps allows an individual to set up an analysis that scores geographic features based on their suitability or desirability of a particular application. Factors are rated independently and then combined to produce a final suitability score. Variable weights can be applied to each factor so that the final analysis places more importance on some factors and less than others. To determine the most suitable areas on the site for development; slope, aspect, proximity to bus stops, proximity to existing infrastructure, overlap of vegetation and proximity to potential wetlands were used as the suitability factors (Figure 14). The numbers on the corresponding map reflect how suitable a parcel is for development. The higher the number the more suitable a parcel is for development and the lower the number the less suitable a parcel is for development. An ideal area for development would be any area where suitability is 57% or greater the reason for this is that these parcels at least meet 50% of the assumptions for suitable development. These finding will be helpful in determining future land use for the site, and determine areas that are most suitable for development based on the constraints listed above (appendix pg. 76).

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Figure 14: Suitability Analysis at Baseline Conditions



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Strengths

- 75 percent of the land is vacant
- Existing infrastructure is all ready in place
- Proximity to bus stops
- Land was previously developed
- Adjacent neighborhoods are well established
- Connectivity to city center and adjacent neighborhoods
- Vegetation cover
- Lack of impervious surface
- High infiltration rates permeability means that groundwater recharges at a faster rate and soil saturation is not likely
- The soils are not classified by the National Resource Conservation Service as prime, unique soils, or soils of state significance
- Soil classification is sandy loam and texture is coarse
- Proximity to open space

Weakness

- Small drainage ditch that runs through Parcel A and Parcel B
- Depressed area of water and potential wetland on the eastern portion of Parcel A
- High infiltration rates and permeability means pollution will not be absorbed by soils

Sustainable Neighborhood

- Some soils have been filled or graded and replaced
- The potential for some soils to have areas of exposed and buried human refuse
- Steep slopes in portions of the study area
- Debris piles, abandoned automobiles as well as other trash located on the site.
- Potential impact of RCRA, RCRA CORRACT, and TSD
- Lack of local amenities

Opportunities

- Brownfield designation
- Resource Management Area means that future development will need to implement BMPs
- Rezoning of study area
- BRT test project along Broad Street
- Historic designation for Trolley Barn
- Provide amenities to surrounding neighborhoods
- First sustainable neighborhood in the City of Richmond
- Limitation of vehicle dependence
- Infill development
- High density development
- Pedestrian friendly environment

Sustainable Neighborhood

- Mixed use community

Threats

- Deforestation of vegetation cover
- Erosion due to development on steep slopes
- Impact future development could have on Gillie Creek and Chesapeake Bay
- Rezoning does not get passed
- Low density development
- Impervious surfaces



Plan Foundations

J O H A N N A S
D E S I G N

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Environment

Create efficient and healthy standards to promote our environment and keep it safe by improving energy efficiency through environmental management and the management of human consumption. Provide vital goods and services to humans and other organisms.

Economics

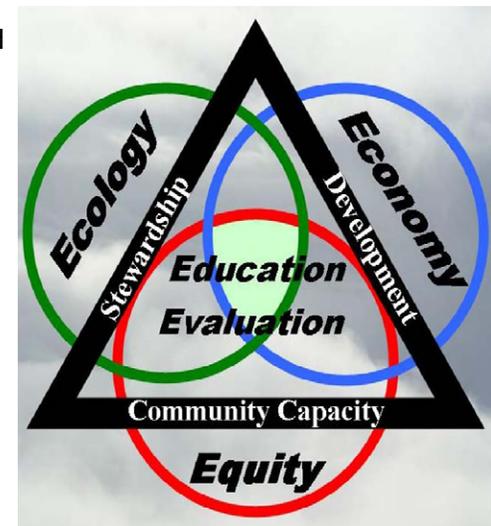
Reduce consumption, reliance on resources and the impact humans have on the environment while raising the cost of living. Reduce economic externalities on the services provided by the ecosystem and to limit growth that depletes the services provided by the ecosystem. Create new jobs and more economic growth through sustainable practices.

Social

Create a community that seeks to narrow the gap between the rich and the poor by offering a variety of housing choices by limiting large lot development and offering more housing choices. Involve members of the community in decision making through a bottom up approach and create a community that is more self-reliant based on the principals of simple living.

Educate

Work with educational institutions and organizations to promote sustainable practices so they can educate the community on sustainability potential an outcomes.



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Vision

The future belongs to those who believe
in the beauty of their dreams.

Eleanor Roosevelt

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Vision

Imagine a community that offers residents the opportunity to enjoy the natural environment in the heart of the City; a place where a variety of people from various backgrounds can live, work, and play. It will provide residents with plenty of open-space, restaurants, and neighborhood oriented services. It will be a livable community that puts pedestrians and the environment first by encouraging its residents to practice environmental stewardship as well as provides a place where they can walk or ride bikes. This is a neighborhood that will be linked to surrounding neighborhoods and the City center.

Goals and Objectives

Sustainable Neighborhood

These goals and objectives will reflect chosen LEED rating systems that are based on the sites existing conditions and SWOT analysis. They will ultimately help this community to actively engage in the prevention of loss of habitat and facilitate its recovery in the interest of long term sustainability by obtaining LEED ND certification (Table I).

Sustainable Neighborhood

Goal 1: Organize development in a manner that supports and sustains the environment for current and future residents.

Objective 1.1: Minimize erosion, to protect habitat and reduced stress on natural water systems.

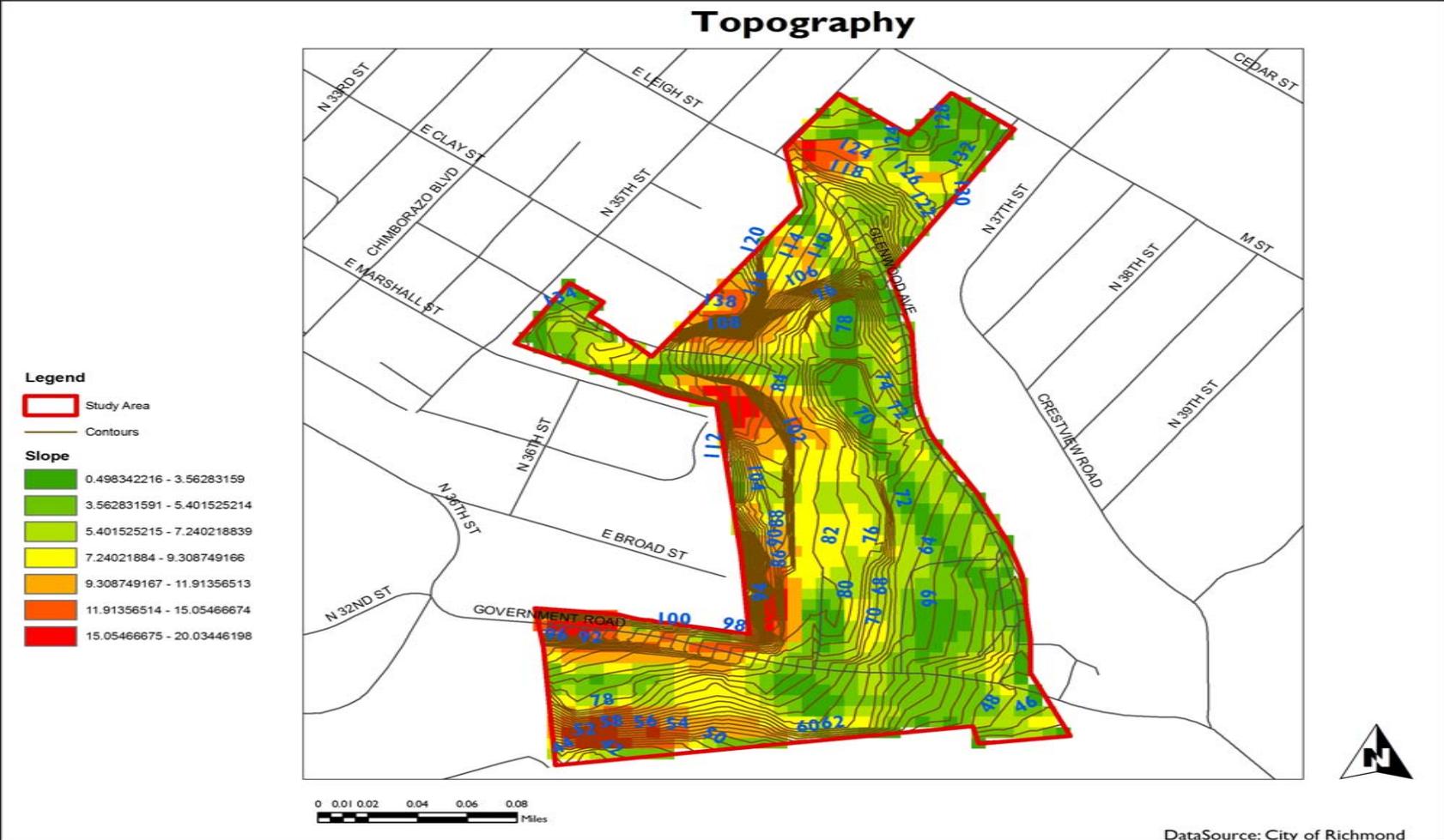
Strategy 1.1.1: Slopes greater than 15 percent comprise 4 acres of the 20 plus acres that make up the study area (figure 15 and 16). These areas will limit development to less sensitive and flatter sections of the site creating clustered development to those areas that have slopes less than 15 percent. The areas with slopes greater than 15 percent will be devoted to open space to ensure protection of residents and habitats. The preservation of these areas will help protect the neighborhood from erosion, landslides, and sedimentation loss. It is also a great way to preserve the natural scenic beauty of the native landscape, add value to the property, and provides great educational and recreational opportunities.

Objective 1.2: Require the selection of development sites to assure that the fragmentation of habitats will not occur and that they will preserve sensitive land and water bodies through the implementation of a Green Infrastructure plan.

Strategy 1.2.1: With the City of Richmond, being 87 percent developed the need for the preservation of undeveloped areas is essential. This site is one of the few last remaining undeveloped areas left in the City. Vegetation, comprises 42 percent of the area making this an ideal place for the implementation of green infrastructure. The site will integrate outdoor recreation, open space, cultural resources, and the conservation of lands. Land corridors will need to be linked to maximize the environmental, habitat and outdoor resources that will be needed to meet the growth of future populations. This will ensure that undeveloped land and waterways are protected and provide the much needed benefits to society. Development will need to be directed to suitable areas to conserve natural resources. Green space will be connected through natural connections that will help to improve water quality, improve air quality, and protect natural resources. The plan should be incorporated with the planning of roads, bike trails, water, electric, telecommunication, and other essential community support systems. The preservation of open space boundaries and the funding of these areas is important in that it will guide land development and growth to accommodate the increase in population and at the same time protecting natural resources that will provide long-term economic viability and community sustainability.

Sustainable Neighborhood

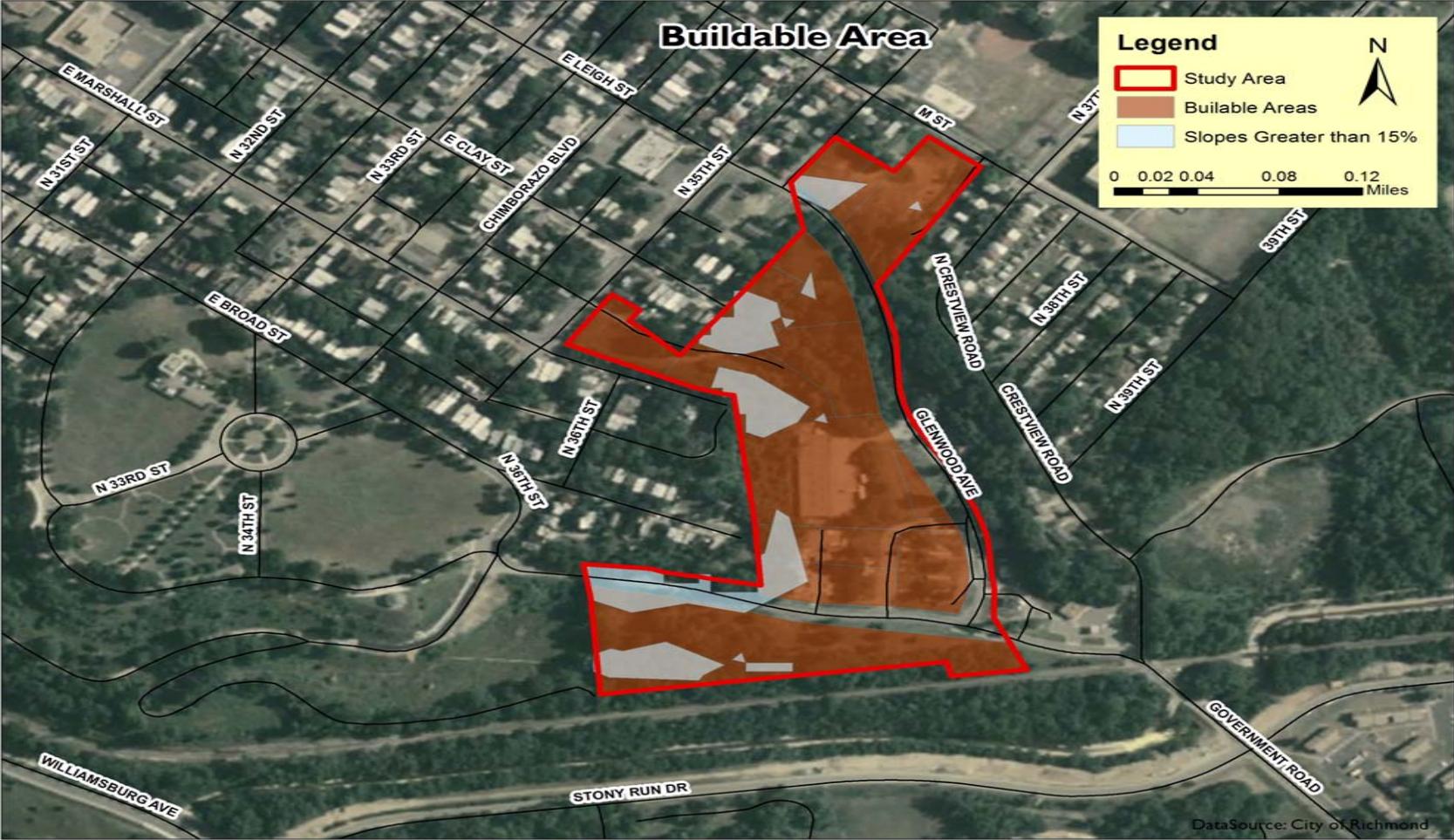
Figure 15: Steep Slopes



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Figure 16: Buildable Area



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Objective 1.3: Promote the design and construction of buildings that utilize green building practices.

Strategy 1.3.1: In order to promote the environmental character of the neighborhood the development of green buildings is essential. It is estimated that buildings account for one-half of the world's materials and energy consumption (Lanllanilla, 2010). The initial perceptions of these buildings are that they are expensive to build; upfront cost can be expensive, but a study done in 2003 by the California Sustainable Building Task Force shows that initial increase in upfront costs of approximately 2% for green design will produce lifecycle savings of more than 10 times the initial investment, or 20% of total construction cost (Kats, 2003). These buildings will correlate into lower water and energy cost for residents which will especially be beneficial to the residents in low income housing. The design and construction of energy efficient buildings will reduce air, water, and land pollution and adverse environmental effects from energy production and energy consumption.



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Goal 2: Improve water quality and reduce its use.

Objective 2.1: Reduce pollutants from wastewater and encourage water reuse by designing and constructing the neighborhood so as to retain and reuse wastewater to replace portable water through sustainable design and construction standards.

Strategy 2.1.1: Residents in the City of Richmond are charged a flat monthly rate for water and wastewater use which does not promote the conservation of water. This is a critical issue as public infrastructure is becoming overburdened with the increase in population. To reduce the impact that



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additional residents could have on the local water supply the neighborhood will encourage water reuse. This will be done through efficient site design such as narrower streets, low impact development (LID), open space design, by eliminating curbs and gutters, and implementing a sustainable urban drainage system (SUDS) (US EPA, 2008). This will help to improve water quality by reducing the amount of runoff discharged into local public infrastructure and will help to limit the total daily load (TDL) that treatment plants receive.

Objective 2.2: Limit the use of portable water and other natural surface or subsurface water resources in study area through water efficient landscaping.

Strategy 2.2.1: Land use in the study will drastically change from vacant to commercial, open space, and residential. These uses will require frequent landscaping which will require higher water consumption to maintain the overall aesthetics of the site. Efficient landscaping can be done through proper planning and design, analyzing and improving soils, appropriate plant selection, the use of practical turf areas, efficient irrigation, use of mulch, and adequate maintenance. The benefits of water-efficient landscaping are lower water bills, conservation of natural resources and the preservation of habitat for plants and wildlife, decreased energy use, reduction of runoff from stormwater and irrigation waters, fewer yard trimmings, reduce labor and maintenance cost, and the extended life of water infrastructure (USEAP, 2010).



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Goal 3: A socially equitable community that supports income diversity

Objective 3.1: Provide a variety of housing sizes and types that accommodate residents from a wide range of economic levels, household sizes, age groups, and employment sectors.

Strategy 3.1.1: Provide a reasonable amount of new rental or for-sale dwelling units priced for households earning below 80% area median income based on HUD requirements. Based on the build out analysis that was done using ArcGIS (appendix pg. 76) 123 dwelling units (Table 2) can be constructed; of these 45 percent (55 units) will be devoted to be affordable housing. Affordable housing provides benefits to residents, the community, and developers. First, it ensures that families housing costs are not so high that they cannot afford to meet education and health costs and to obtain and maintain employment. It allows residents from diverse backgrounds to be integrated with the community. Second it benefits the community by increasing the demands for goods and services which in turn provides increased local employment opportunities. Thirdly it benefits developers in that some local policies offer financial incentives in order to promote affordable housing.

Table 2

Dwelling Units Quantities	
Land Use Designation	Number of Units
LU Commercial	0
LU Mixed-Use	8
LU Parks and Recreation	0
LU Res High Density	32
LU Res Low Density	41
LU Res Medium Density	42
Total	123

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Goal 4: An active, dense, and compatible mixed-use community.

Objective 4.1: Entice future developers by offering economic incentives to spur development.

Strategy 4.1.1: This program is designed to empower states, communities, and other stakeholders in economic redevelopment to work together in a timely manner to prevent, assess, safely clean up, and sustainably reuse brownfields (US EPA Brownfield). This program allows for state and local governments to apply for community-wide and site-specific grants and funding. There are seven types of grants offered through this program: Area-Wide Planning Program Pilot Program, Assessment Grants, Revolving Loan Fund Grants, Cleanup Grants, Job Training Grants, Training, Research, and Technical Assistance Grants, and Targeted Brownfield Assessments (Appendix pg. 69).

Objective 4.2: Encourage owners of historical structures and sites to obtain money from historic preservation programs and educate owners on the advantages of these programs.

Strategy 4.2.1: Register trolley barn with the National Register of Historic Places and the Virginia Department of Historic Places. Matthew Logan and Lee Johnson need to work with Kimberly Chen of the Johannes Design Group (who has all ready began the process) to complete the process of getting the trolley barn listed on the National Register of Historic Places. The listing in the NRHS offers several federal incentives such as the Preservation Grant for Planning and Rehabilitation, Investment Tax Credits, Preservation Easements to Nonprofit Organizations (NRHP). Additionally the State of Virginia offers incentives and grants for the preservation of historic places such as the Archaeological Threatened Sites, Certified Local Government Grants, Civil War Historic Site Preservation Fund, Easements, State Grants, and Survey & Planning Cost Share Program (VDHR) (Appendix pg. 69).

Objective 4.3: Develop land use patterns that cluster diverse land uses throughout the study area and encourage walking, biking, and transit use, and reduce vehicle miles traveled (VMT).

Strategy 4.3.1: Development should be medium to high density development that incorporates a mix of residential uses and nonresidential uses that promote a pedestrian oriented urban environment that will serve the residents with many of their day-

Sustainable Neighborhood

to-day conveniences and provide these residents with the opportunity to live and work within their community. Land use designations (Figure 17) are described below and show percentage of total acres:

Mixed Use- 11%

Is located north of the along Glenwood Avenue and Government Road. It will consist of first floor office, retail, and restaurants and the upper levels will be apartments. This will be the focal point for residents of site and the surrounding area it will be their own city center. It will provide residents a place to work, shop, and live. This site was chosen based on its proximity to major roads which will allow easier access to and from site relieving traffic congestion in the surrounding area. It will be located near multi-family dwellings and a grocery store making it more compatible with surrounding uses and provide a steady stream of customers.

Commercial – 17%

Is located along Glenwood Avenue in the center of the study area and will be the site of the local grocery store. This site was chosen because it currently is the site of the old trolley carbarn which would be an ideal adaptive re-use project. It's also an ideal location because of its proximity to the proposed residential development and surrounding residents allowing residents the opportunity to walk or bike to the grocery store cutting down on VMT (Vehicle Miles Traveled). It is also located along a secondary road which will cut down on traffic congestion and will be compatible with surrounding uses.

Residential High Density – 5%

Is located on the southern portion of study area along Government Road. This will be the location of multi-family apartments. The location of the site was chosen based on three factors. First, it tends to increase traffic at an individual site so placing it along an artery road will help relieve some of the traffic congestion and prevent the use of cut-through streets on the surrounding area. Second, it is located near a bus stop making mass transit more feasible to the residents. Thirdly, multi-family housing tends to make it more financially feasible to integrate commercial and retail uses into the neighborhood. This will make the proposed retail and commercial corridor more attractive to potential developers and customers and make it more compatible with surrounding uses. Residents of multi-family housing tend to be young people just starting out, as well as senior

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citizens who no longer care to maintain a home so by locating it near these corridors it will allow the residents easy access to shopping and entertainment.

Residential High Density Attached – 15%

Is located in two areas the first is on the western portion of the study area on the corner of N. 35th Street and E. Marshall Street the second is on the eastern portion of site along Glenwood Avenue. This will be the location of high density single-family townhomes; which is compatible with the surrounding land uses single-family homes additionally there is an existing road that will connect Glenwood Avenue to N. 35th Street

Residential Medium Density Detached – 15%

Which is located in two areas the first is the west side of Glenwood Avenue and the second is the east side of Glenwood Avenue. This will be the location of medium density single-family homes. This site was chosen because the surrounding areas are comprised of single-family homes making this land use more compatible with surrounding uses as well as its proximity to an existing road that will connect Glenwood Avenue to N. 35th Street.

Parks and Recreation – 36%

These parks were placed throughout the study area to allow residents easy access to them. It will allow residents to maintain a healthy lifestyle while at the same time prevent fragmentation of habitats and will preserve sensitive land and water bodies.

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Figure 17: Proposed Land Use



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Objective 4.4: Provide a variety of open spaces close to work and home as way to promote physical activity, social networking, civic engagement, and time spent outdoors.

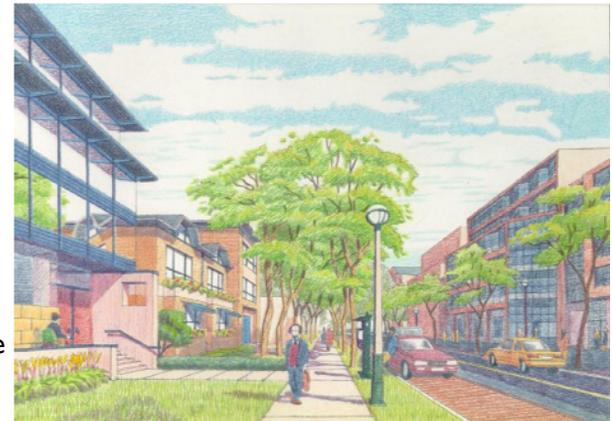
Strategy 4.4.1: A portion of the site will be maintained as open space based on proximity to planned residential and nonresidential units. The conservation of open space results in the conservation of species, the protection of biodiversity, the maintenance of clean air, clean water, and helps to maintain a healthy lifestyle. It promotes sustainable development by helping communities prevent the higher cost of unplanned development (Kane, *The Ecological and Biological Benefits of Open Space*). Not only can open space help to enhance and protect the environment it is also a good way boosting a local economy by attracting business and residents to communities, stimulates commercial growth, promotes inner-city revitalization, and boost tourism (The Trust for Public Land, *Community Benefits of Open Space*).

Objective 4.5: Provide areas for residents to walk that are safe, aesthetically pleasing, and a comfortable street environment that supports public health by reducing pedestrian injuries and encouraging daily physical activity.

Strategy 4.5.1: New buildings need to have their entries front façade face a public space; this should not include a parking lot and should be connected to sidewalks. Minimum build setbacks that are uninterrupted by parking areas along principal street frontages will ensure safety and encourage an active pedestrian environment. Streets will be narrower by offering on street parking, medians which act as traffic calming measures. Buffers between sidewalks and streets will be developed as greenways that will protect residents, pro-



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vide ascetics, and serve as a way to help minimize runoff. They will be lined with native trees that are not only pleasing to eye, but also provide shade to walkers. Which will help to the reduce heat island effect, improve air quality, increase evapotranspiration, and reduce cooling loads in buildings.

Strategy 4.5.2: A portion of the street network will be reserved for bicycle lanes to protect bicyclist. This will provide residents with alternative modes of transportation and decrease automobile dependence. New buildings will need to be designed to provide adequate parking and storage for bicycles.

Strategy 4.5.3: Need to minimize the impact that parking has on the environment and help reduce the risk to the general public. New nonresidential buildings and multi-family units where applicable need to locate all new-off street parking lots at the side of rear of the buildings. Where possible on-street parking or underground parking garages will need to developed to provide additional parking. This will help limit the amount of impervious surface, which has a negative impact on the environment and will promote walking and bicycling.



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Goal 5: Promote sustainability in surrounding neighborhoods.

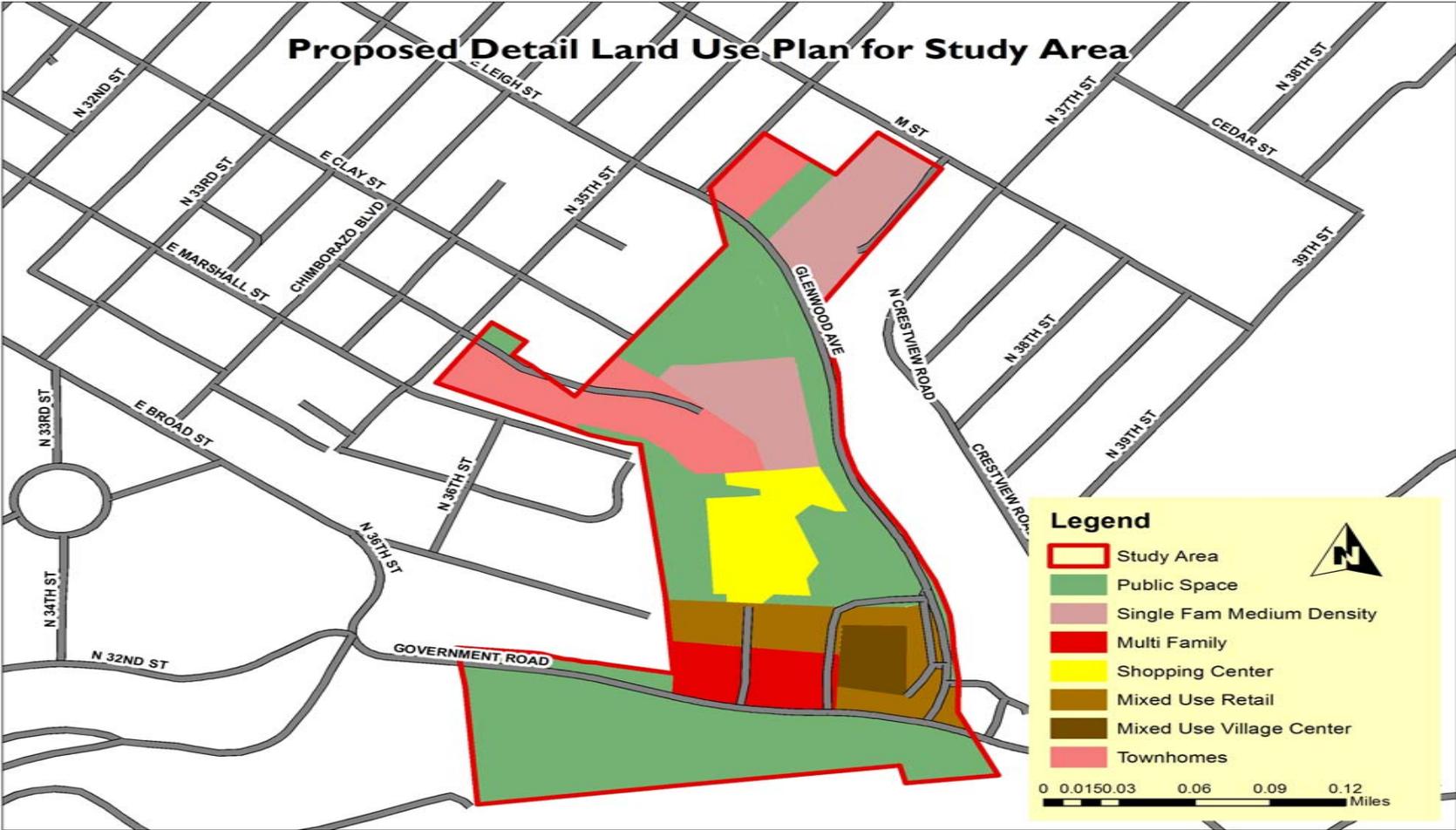
Objective 5.1: Public awareness to assist the general public in gaining a firm grasp of sustainability and the practices that promote it.

Strategy 5.1: The program should employ specific examples of everyday actions that are sustainable, descriptive, potential cumulative benefits associated with sustainable behavior, and the positive impacts of sustainability on the neighborhood and the greater Richmond region. Educate local officials

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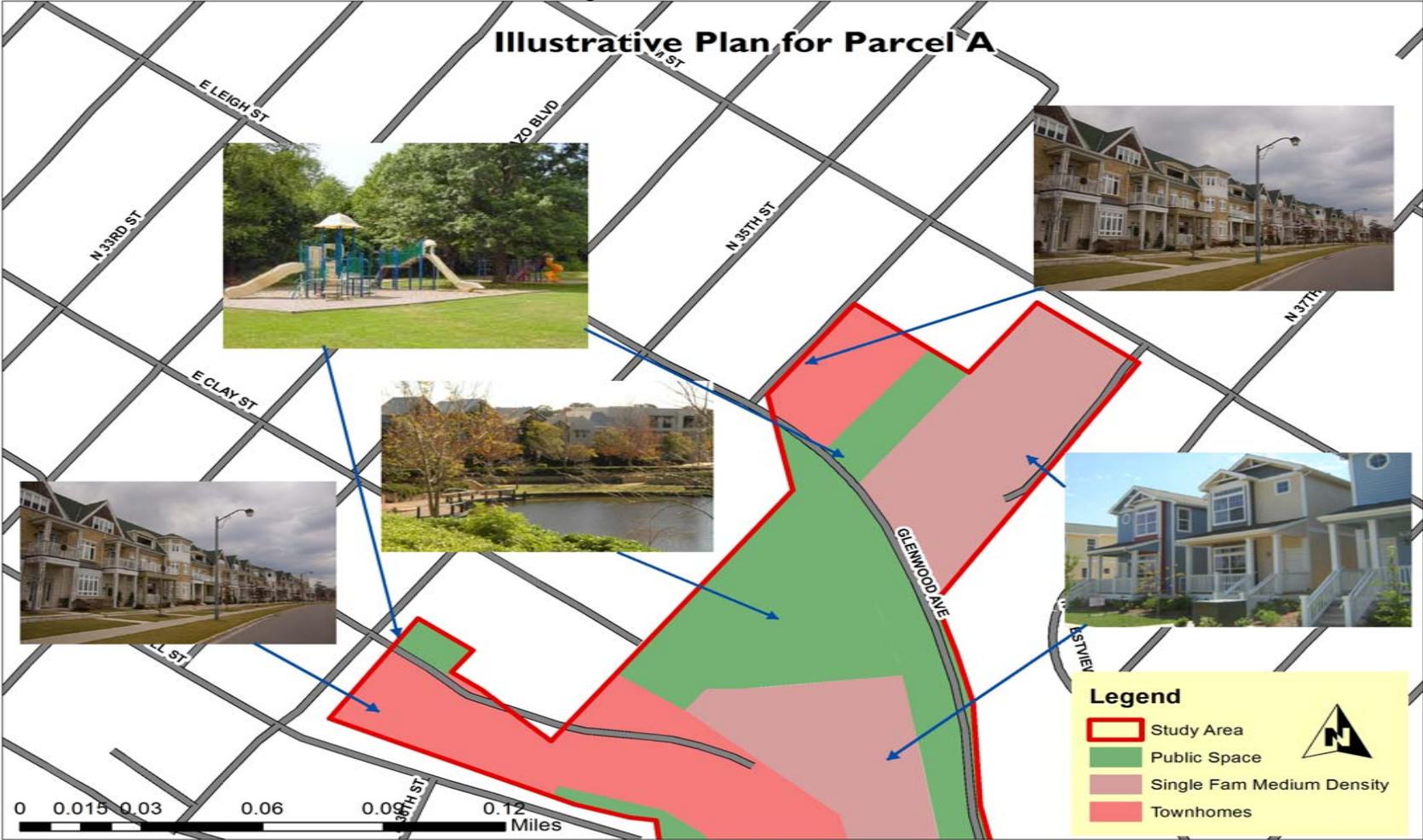
on sustainability so that they can assist in the promotion of sustainable practices and provide connections to their constituents. The City of Richmond's Sustainability Department should sponsor workshops and other educational forms for local elected officials, local business, and the public to familiarize them with sustainable practices. These leaders from local businesses, government, nongovernmental agencies, and academia should involve young people from the beginning of the process to insure their ownership and partnership in the project. An information booth should be set up near the site that contains user-friendly pamphlets, reports, web sites, and displays to promote awareness of policies and practices for sustainable development.

Figure 18: Proposed Detailed Land Use Plan for Study Area



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Figure 19: Illustrative Plan for Parcel A



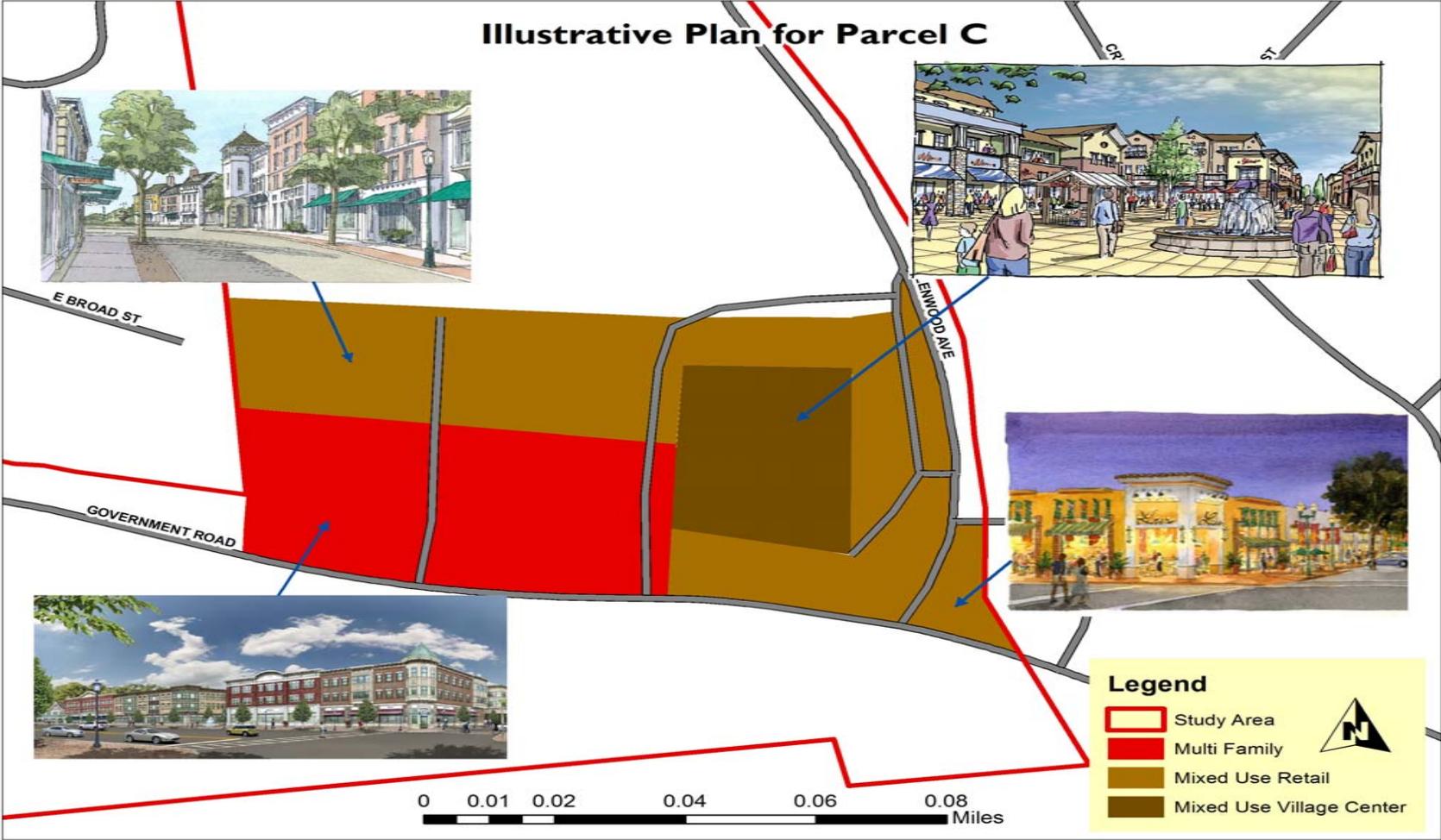
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Figure 20: Illustrative Plan for Parcel B



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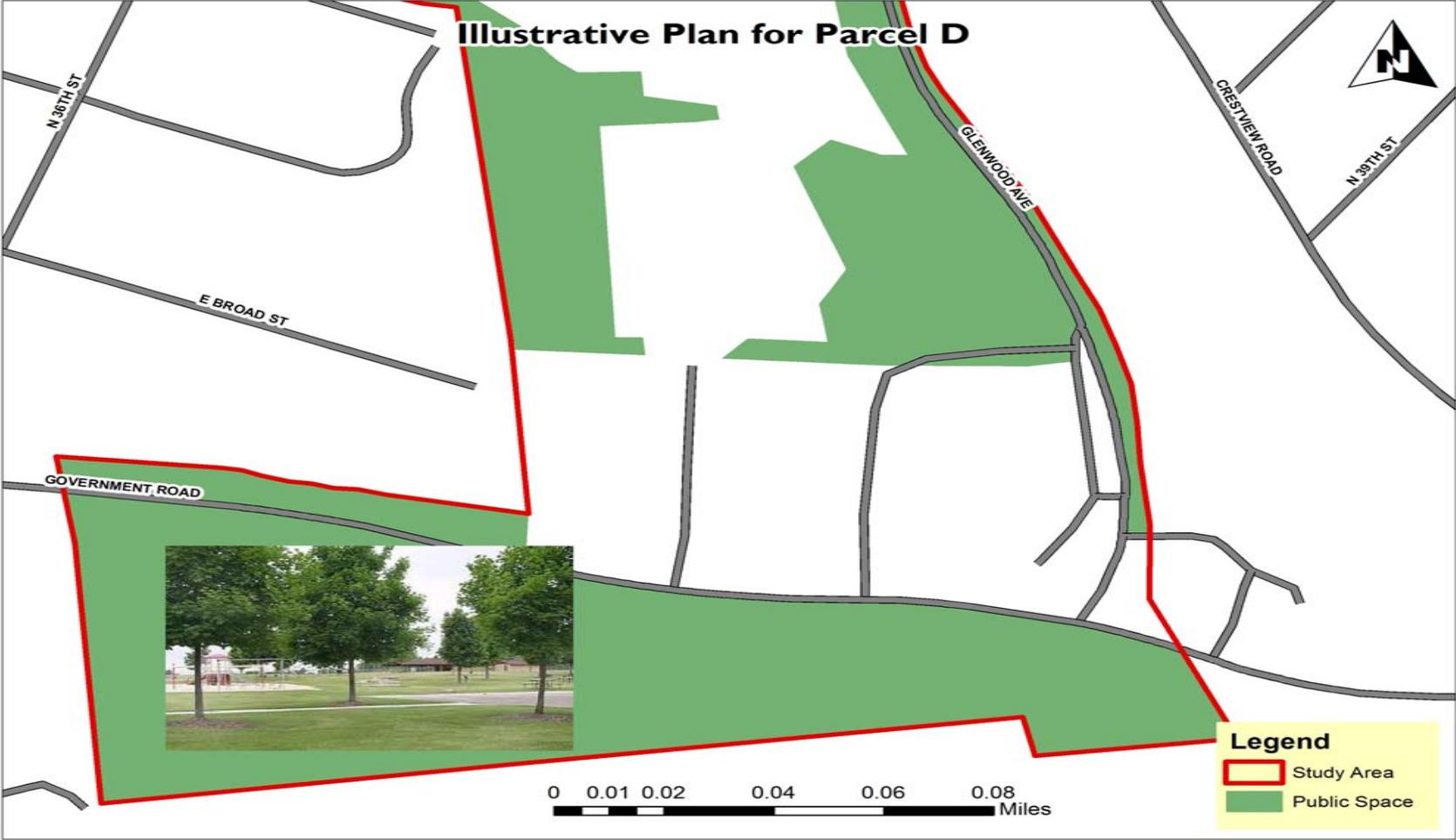
Figure 21: Illustrative Plan for Parcel C



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Figure 22: Illustrative Plan for Parcel D



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Figure 23: Illustrative Transportation Plan



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Table I: Rating System for Neighborhood

Goal	Objective	Strategy	LEED ND Description	Project Rating Point
1	1.1	1.1.1	Steep slope protection	1
1	1.2	1.2.1	Imperiled species and ecological communities	Required
1	1.2	1.2.1	Site design for habitat or wetland water body conservation	1
1	1.2	1.2.1	Long term conservation management of habitat or wetlands and water bodies	1
1	1.2	1.2.1	Minimize site disturbance in design and construction	1
1	1.3	1.3.1	Building energy efficiency	1
2	2.1	2.1.1	Wastewater Management	2
2	2.2	2.2.1	Water efficient landscaping	1
3	3.1	3.1.1	Mixed-income diverse communities	7
4	4.1	4.1.1	Brownfield redevelopment	7
7	4.2	4.2.1	Historic preservation and adaptive reuse	1
7	4.3	4.3.1	Mixed-use neighborhood centers	4
7	4.3	4.3.1	Compact Development	6
7	4.4	4.4.1	Access to recreation facilities	1
7	4.4	4.4.1	Access to civic and public facilities	1
3	4.5	4.5.1	Walkable streets	12
3	4.5	4.5.1	Street networks	2
3	4.5	4.5.1	Tree lined streets	2
3	4.5	4.5.2	Bicycle network	1
4	4.5	4.5.3	Reduce parking footprint	1
			Total Points	53

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Summary

By implementing these goals and objectives the project can receive a total of 53 out of 100 possible points giving it a LEED ND certificate of silver. In order to get the project certified by LEED ND developers must complete a three stage process: (USGBC, 2009)

Stage 1: The developer will need to get conditional approval from the local government regulatory authority to use said property for the specific types and quantities of residential and nonresidential land uses that are proposed. Once conditional approval of the plan is granted, a letter will be issued stating that if the project is built as proposed, it will be eligible for LEED ND certification. This letter will help the developer to build a case when the plan goes to the planning commission, it will also help them to attract financial commitments.

Stage 2: Any changes to the conditionally approved plan that could affect the prerequisite or credit achievement must be communicated as part of this submission. If precertification of the plan is achieved, a certificate will be issued stating the plan is Pre-certified LEED and will be listed on the USCBC website.

Stage 3: Final approval will come when the developer submits documentation for all prerequisites and attempted credits, and when the local government has approved all plans relating to the project. When certification of the completed neighborhood development is achieved, a plaque or similar award for public display at the project site will be issued and it will be listed as certified on the USCBC website.

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Appendices

Trolley Barn History

The Richmond and Henrico carbarn is important to the study area because of its possible historical tax credits, which would be a great attraction for future development. The City of Richmond was the first city in the United States to have a financially viable electric trolley system. The first run was made in 1887 by the Richmond Union and Passenger Railway Company. In 1900 a number of small companies merged to form the Richmond Passenger and Power Company (RP&P). In 1902 the RP&P split into two separate companies, RP&P and Virginia Passenger and Power Company (VP&P). The newly formed VP&P operated outside the lines of the Richmond City limits, while the RP&P continued to operate within the city limits. While these were the two major trolley companies in Richmond there was a third, the Richmond Traction Company which was formed in 1895. These three companies took out hefty loans to expand and upgrade their lines, but due to a series of strikes they were not able to pay back their loans causing them to default. In 1909 a New York financier by the name of Frank Jay Gould purchased the three companies and formed the Virginia Railroad and Power Company (VRP). In 1925 Stone and Webster changed the name of VRP to the Virginia Electric and Power Company (VEPCO). The Virginia Transit Company was formed in 1944 and tasked with managing VEPCO's transit lines. In the early 1927's street car lines were abandoned and in 1949 the Highland Park-Hull Street line made its final journey (Chen, 2008a).

Build Out Analysis

Using Scenario 3D's suitability wizard I was able to determine what sites would be suitable for development, following data layers were used in the analysis: Bus stops, utilities, vegetation, and parcels.

Suitability Wizard Process

Step 1: Created slope using spatial analysis extension and then surface analysis using DEM 30ft as my input.

Raster calculation: slope \geq 10%

Step 2: Created aspect using spatial analysis extension and then surface analysis using DEM 30ft and my input.

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Raster calculation: Aspect ≤ 160 and Aspect ≥ 200

Step3: Created new shapefile for potential wetland and created one polygon representing this shapefile.

Step 4: Used Suitability wizard to create suitability analysis using the parcel layer.

Assumptions: Utilities, aspect, slope, vegetation, wetland, and bus stops are weighted from 0 to 10, 5 being baseline. (Figure 24).

Figure 24



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Build Out Analysis

Step 1: Numeric build out analysis using proposed land use layer.

Step 2: Established density rules based on density regulations from the City of Richmond Zoning Ordinance. (Figure 25).

Step 3: Established constraints to where development cannot take place these were steep slopes and wetland areas. (Figure 26).

Figure 25

Density Rules
Density is an indication of the number of buildings per unit area. Provide density rules or numbers for each land-use type.

Click in any field to enter a number or to select an option from a provided drop-down list. You can enter information for dwelling units, floor area, or both.

Designation	Dwelling Units		Floor Area	
	Quantity	Measurement	Quantity	Measurement
LU Commercial	0	DU per acre	2.8	FAR
LU Mixed Use	5	DU per acre	2.8	FAR
LU Parks and Rec	0	DU per acre	0	FAR
LU Res High Density	43	DU per acre	0	FAR
LU Res Low Density	14	DU per acre	0	FAR

[How do I estimate floor area ratios using setbacks and building heights?](#)

For more Density Rules options, use the Advanced wizard.

Figure 26

Constraints to Development
Select any layers on which you wish to prohibit development and place a checkmark next to those where density can be transferred.

If desired, select the polygon layers on which you wish to prohibit building, such as wetlands or steep slopes.

Available Layers	Constraint Layers	Check this box if density can be transferred
Building Footprints	Potential Wetland	<input type="checkbox"/>
Buildable Area	Steep Slopes	<input type="checkbox"/>
slope		
aspect		
Study Area		
Parcels2		
Parcels		
Proposed_Land_Use_2		
Vegetation		

Minimum Lot Size: sq feet

Specify a minimum size for buildable parcels

[How do I keep buildings from being placed on roads?](#)

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Brownfield Grants and Funding

Information on brownfields development can be found at <http://epa.gov/brownfields/>.

Area-wide planning pilot program- The grant funding and direct assistance (through Agency contract support) will result in an area-wide plan which will inform the assessment, cleanup and reuse of brownfields properties and promote area-wide revitalization.

Assessment Grants - Assessment grants provide funding for a grant recipient to inventory, characterize, assess, and conduct planning and community involvement related to brownfield sites.

Revolving Loan Fund Grants -The purpose of Revolving Loan Fund Grants is to enable States, political subdivisions, and Indian tribes to make low interest loans to carryout cleanup activities at brownfields properties.

Cleanup Grants- Cleanup grants provide funding for a grant recipient to carry out cleanup activities at brownfield sites.

Job Training Grants- Job Training Grants are designed to provide funding to eligible entities, including nonprofit organizations, to recruit, train, and place, predominantly low-income and minority, unemployed and under-employed residents of brownfields-impacted communities with the skills needed to secure full-time, sustainable, employment in the environmental field and in the assessment and cleanup work taking place in their communities.

Training, Research, and Technical Assistance Grants- Training, Research, and Technical Assistance Grants provide funding to eligible organizations to provide training, research, and technical assistance to facilitate brownfields revitalization.

Targeted Brownfields Assessment- The Targeted Brownfields Assessment (TBA) program is designed to help states, tribes, and municipalities—especially those without EPA Brownfields Assessment Pilots/Grants—minimize the uncertainties of contamination often associated with brownfields.

State of Virginia incentives and Grants for the preservation of historic places

Information on these grants can be found at www.dhr.virginia.gov/homepage_general/finance.htm

Archaeological Threatened Sites: Archaeological sites are some of Virginia's most fragile resources. The Threatened Sites Program offers emergency funding for archaeological sites endangered by erosion, impending development, or vandalism. The program has saved archaeological remnants at 75-plus sites across Virginia, providing important information about our past that would have been lost.

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Certified Local Government Grants: Certified Local Governments are eligible for grants that can be used to survey architectural and archaeological resources, prepare nominations to the National Register of Historic Places, create preservation planning documents and programs, create public education programs, and rehabilitate publicly owned buildings listed on the national register.

Civil War Historic Site Preservation Fund: In 2008 the General Assembly authorized the Department of Historic Resources to award \$5-plus million in competitive grants to private non-profit organizations to match federal and other monies for the preservation of any endangered Virginia Civil War historic site listed in the "Report on the Nation's Civil War Battlefields," which was issued in 1993 by the National Park Service's congressionally endorsed Civil War Sites Advisory Commission.

Easements: By donating historic preservation easements on their properties, owners are eligible for several financial incentives. The value of an easement, determined by an appraiser, can be deducted from federal taxable income, and up to 50% of the value of the easement may be claimed as a credit against state income taxes. Donation of an easement may stabilize or lower property taxes and can lower inheritance taxes. By eliminating the right to develop the property further, owners lower its estate value. Forty percent of the value of the land included in the easement donation may be excluded from a descendant's estate.

Rehabilitation Tax Credits: Interested in rehabilitating a historic building? Property owners who complete a certified rehabilitation of a significant historic building can receive an income tax credit on 25% of their eligible expenses through the Virginia Rehabilitation Tax Credit Program and an additional 20% credit through the Federal Rehabilitation Tax Credit Program.

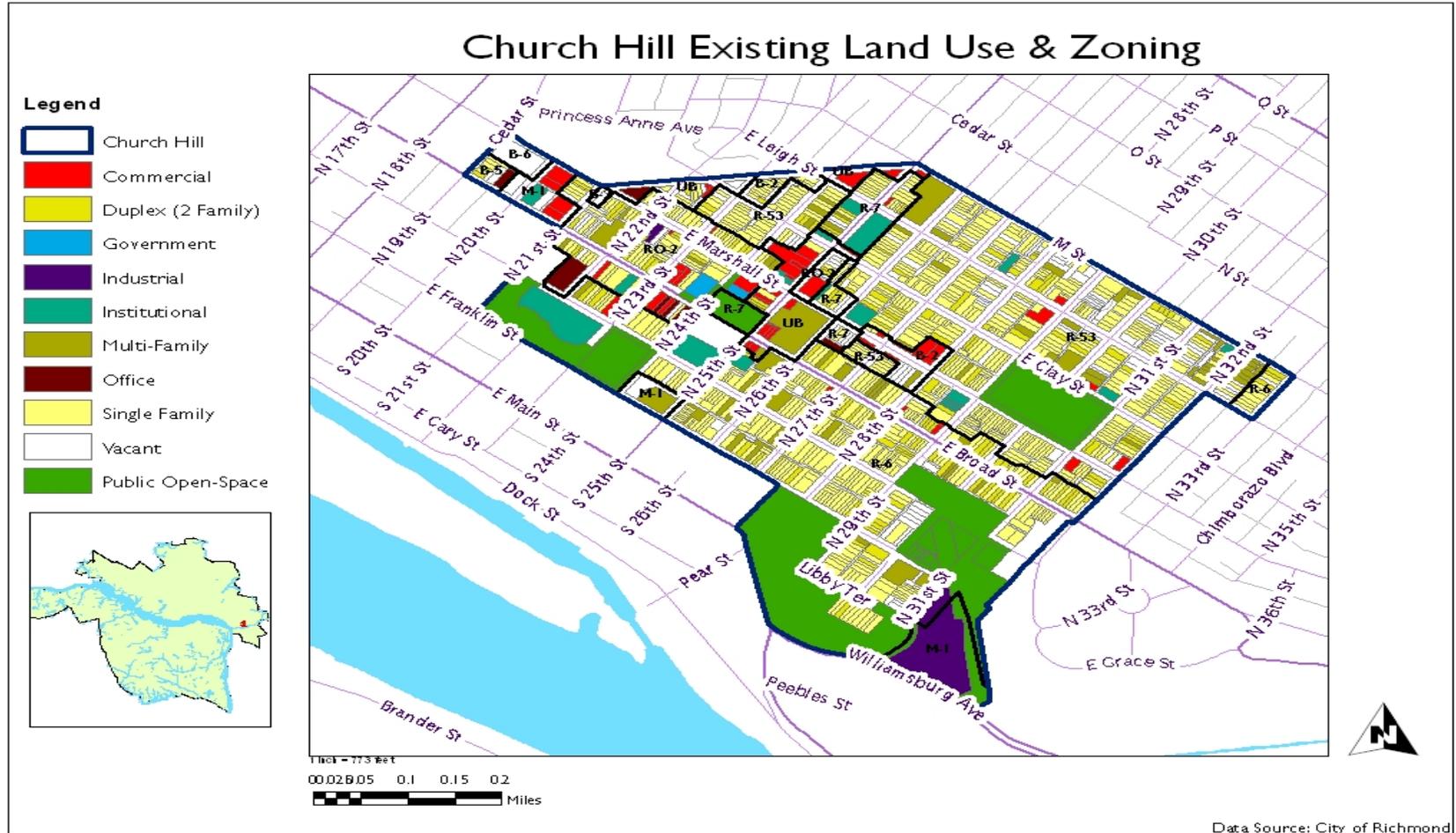
State Grants: General Assembly grants are available to local governments, nonprofit historical associations, organizations, and museums for rehabilitation, maintenance, and operation of sites or facilities, or maintenance of collections and exhibitions.

Survey & Planning Cost Share Program: Through the cost share program, localities can partner with DHR to take stock of their historic resources. By knowing all of what it has, a locality can then make sound decisions about planning development. The department partially funds and fully administers the projects, relieving often over-burdened local planning officials.

Adjacent Land Uses

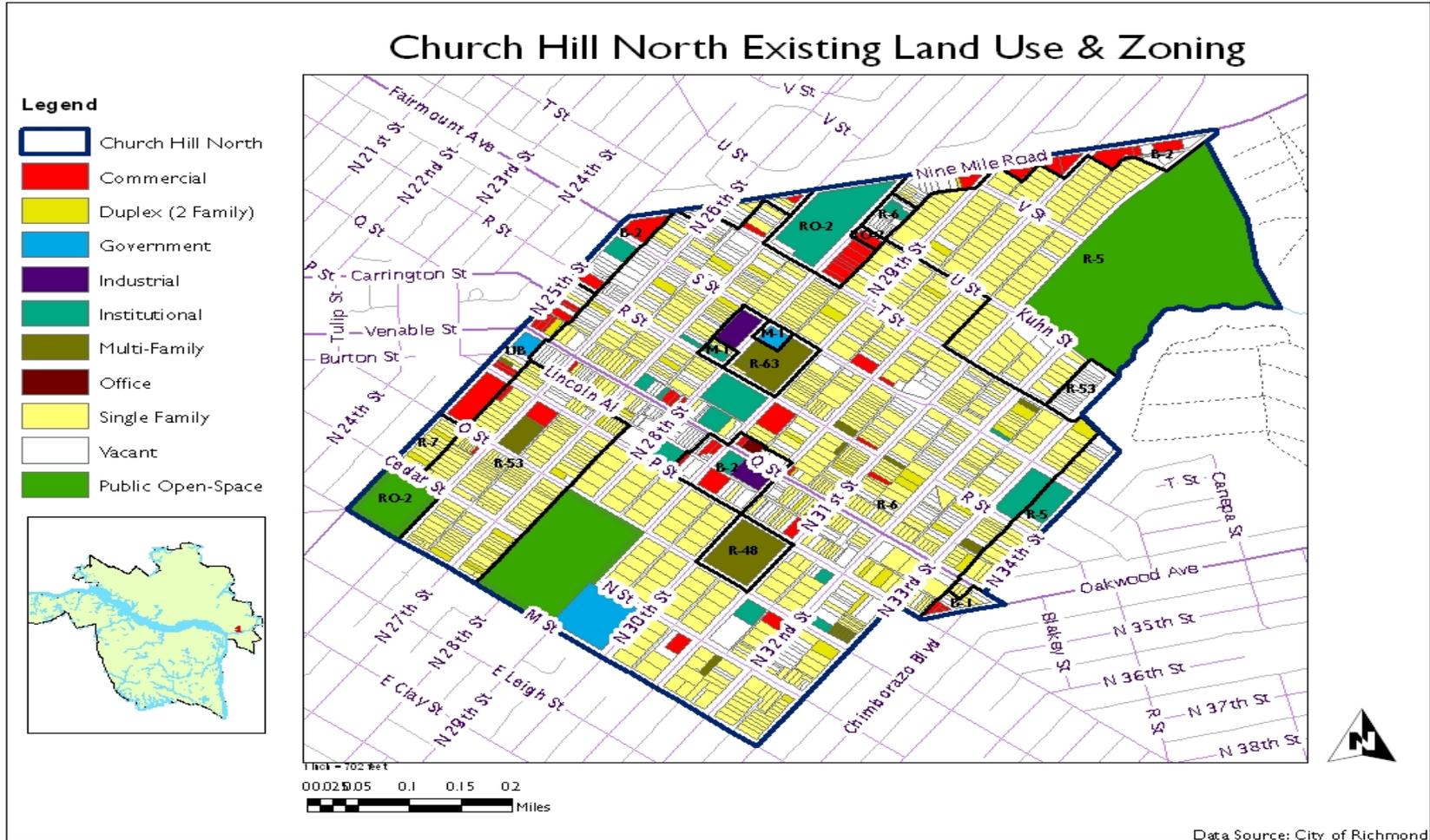
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Figure 27: Existing Land Use for Church Hill



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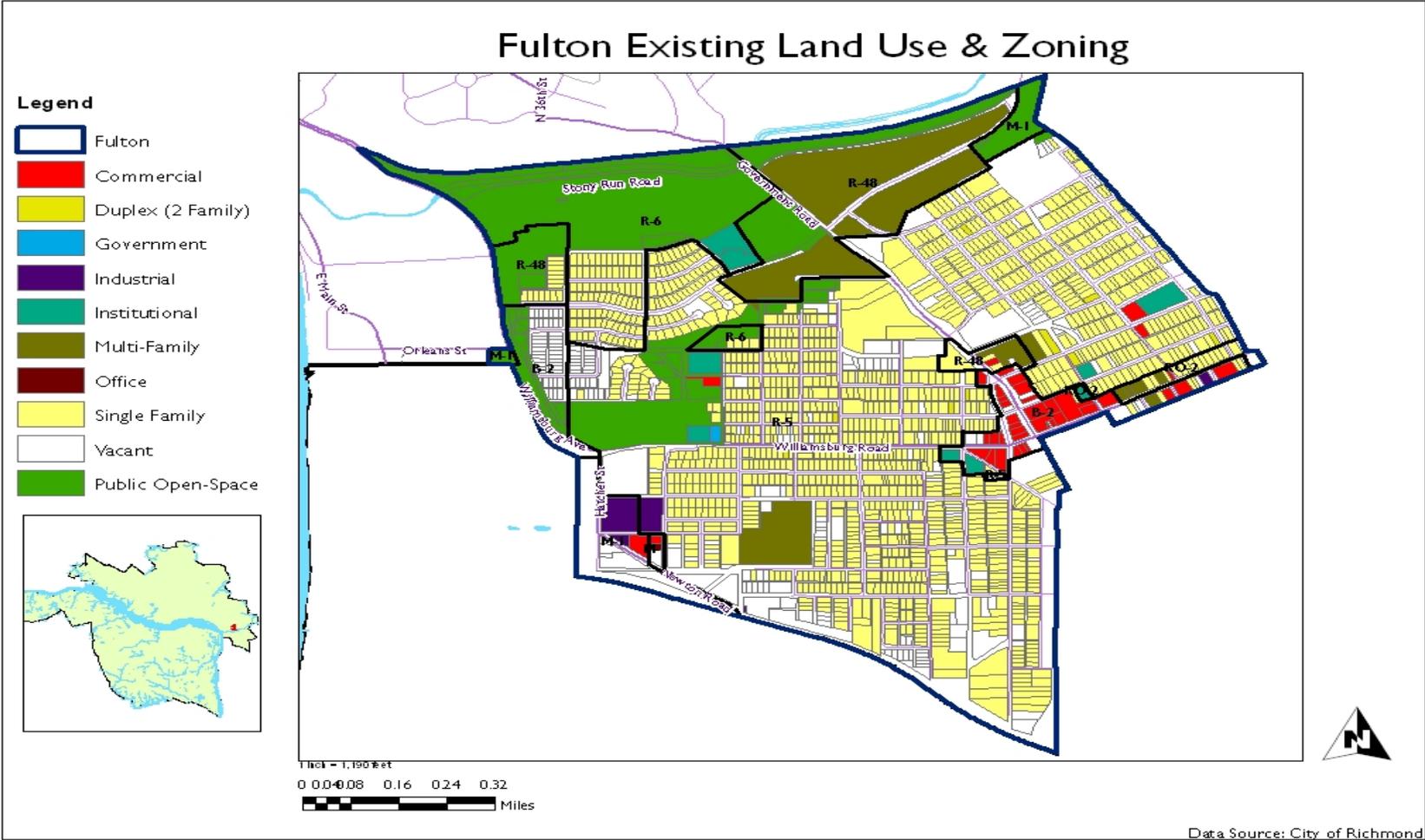
Figure 28: Existing Land Use for Church Hill North



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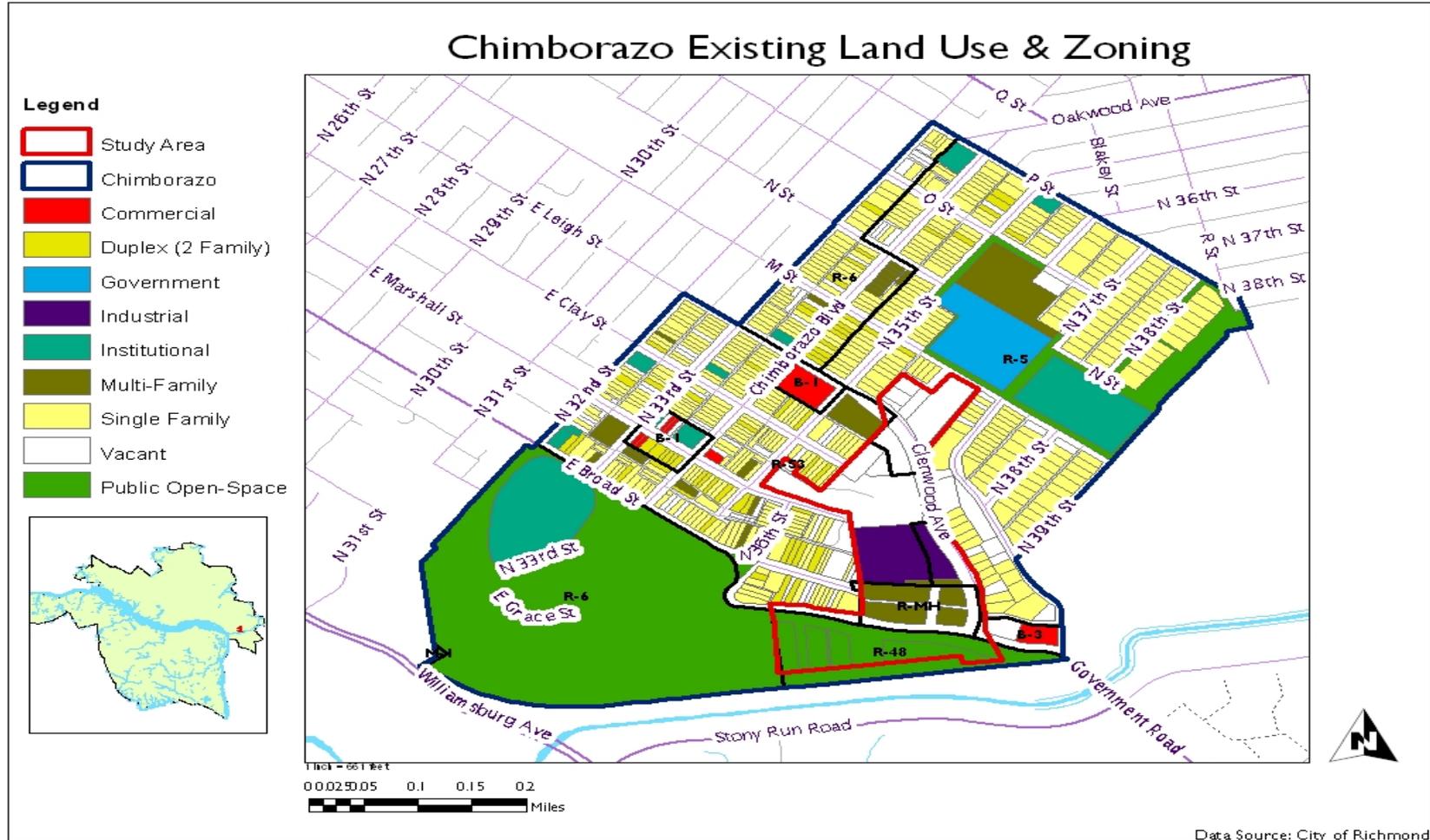
Figure 29: Existing Land Use for Fulton



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Figure 30: Existing Land Use for Chimborazo



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